

**CLIMATE LITERACY AND ADAPTATION TO CLIMATE CHANGE AMONG  
SMALL-SCALE FARMERS IN CHONGWE, ZAMBIA**

**BY**

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The University of Zambia

LUSAKA

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SMALL-SCALE FARMERS IN CHONGWE DISTRICT, ZAMBIA**

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A Masters Thesis submitted to the University of Zambia, School of Education in Partial  
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UNZA

LUSAKA

**2025**

## **DECLARATION**

I, FAUSTINA MANINGA declare that this dissertation is my own work and to the best of my acquaintance has not been presented for a degree qualification to this or any other institution.

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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**CERTIFICATE OF APPROVAL**

This is to satisfy that this study was carried out under my supervision and the final copy has been submitted with my approval as supervisor.

**Dr. Noah K. Sichula**

**Signature..... Date:.....**

## EXAMINERS' APPROVAL AND CERTIFICATION

This serves to confirm that the dissertation by **Faustina Maninga** was examined and certified by

EXAMINER 1-----date-----

EXAMINER 2-----date-----

EXAMINER 3-----date-----

Chairperson/

Board of Examiners -----date-----

Approved

SUPERVISOR-----date-----

## **DEDICATION**

To my late father, Mr. Raphael Maninga whose unwavering love, guidance, and support have been the cornerstone of my journey. Though gone, his spirit continues to inspire and motivate me daily.

To my daughter, Martha Chikondi Phiri, and my son, Raphael Patrick Phiri who give me the spirit to strive for excellence beyond limits.

## ABSTRACT

This study investigated the importance of climate literacy in influencing the attitudes and adaptation strategies of small-scale farmers in Chongwe. The report emphasizes how climate change has a substantial influence on the region's agricultural output and food security, particularly through extreme weather events like droughts and floods. The specific objectives of the study were to establish how climate literacy shapes the perceptions of climate change among small-scale farmers in Chongwe and to explore small scale farmers' involvement in climate literacy interventions in Chongwe. The study also aimed at exploring how climate literacy influences the development and implementation of climate change adaptation strategies utilised by small-scale farmers in Chongwe. To gather information from small-scale farmers, the study used a qualitative research approach and conducted interviews. Participants included forty six small-scale farmers and five extension officers. Data was analysed Thematically. The findings revealed a knowledge and comprehension gap impeding successful climate change adaptation among small scale farmers in Chongwe district. Thus, study emphasized the critical need to improve climate literacy among small scale farmers through focused educational initiatives and support networks in order to equip farmers with adequate climate smartness in their agricultural endeavors. The findings further suggested that although some farmers are aware of climate change on a fundamental level, many are not fully aware of its origins and implications thereby undermining their abilities to adapt to climate change. The findings insinuate that lack of adequate climate literacy raises exposure to climate change-related hazards and lowers agricultural production among small scale farmers in Chongwe district. Consequently, the study emphasized community-based initiatives and extension services among other multifaceted educational mechanisms in order for small scale farmers to adapt climate smart agricultural practices. The study showed that by addressing these gaps, farmers may build more resilient agricultural methods, resulting in enhanced food security and sustainable livelihoods in the face of climate change. This study proffers significant insights for policymakers, practitioners, and stakeholders seeking to help rural communities in adjusting to the challenges posed by climate change.

**Keywords:** Climate Literacy, Climate Change Adaptation, Small Scale Farmers, Chongwe

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To the farmers in Chongwe district and their families, who face numerous challenges induced by climate change? May this study contribute to improving their climate literacy and informing effective climate change adaptation strategies.

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## ACRONYMS AND ABBREVIATIONS

<b>BCG</b>	Boston Consulting Group
<b>BLF</b>	Better Life Farming
<b>CA</b>	Conservation Agriculture
<b>CELL</b>	Community Education and Lifelong Learning
<b>CSA</b>	Climate Smart Agriculture
<b>CSIT</b>	Climate-Smart Irrigation Innovative Technologies
<b>FGD</b>	Focus Group Discussion
<b>ICTs</b>	Information and Communication Technologies
<b>LTS</b>	Long-Term Strategies
<b>NDCs</b>	Nationally Determined Contributions
<b>USA</b>	United States of America
<b>USDA</b>	United States Department of Agriculture
<b>UN CC: Learn</b>	United Nations Climate Change Learn
<b>SSA</b>	Sub-Saharan Africa
<b>WAAPP</b>	West Africa Agricultural Productivity Programme

## CHAPTER ONE: INTRODUCTION

### 1.0 Overview

The study is on climate literacy and adaptation to climate change among small-scale farmers in Chongwe in Zambia. This, first chapter of the study presents the background, problem statement, purpose and objectives of the study which show the gap that must be bridged by the findings. This chapter also covers the research questions, operational definitions, significance and concludes with a chapter summary.

### 1.1 Background of the Study

In Zambia, climate change has a significant impact on agriculture and food security, especially for small-scale farmers. To this effect, agricultural operations are finding it more difficult to satisfy human demands (Maulu, Hasimuna, Haambiya et al., 2021). In particular, one of the major problems still plaguing Zambia's agriculture industry is climate change. According to Chonabayashi et al. (2020), there were 23 high-impact natural disasters recorded in Zambia between 1980 and 2020, with floods accounting for the largest percentage at 68%, followed by droughts at 28% and landslides at 4%.

Studies have revealed similar findings and proceeded to project that the entire Lusaka province would soon experience high precipitation with increased flood frequencies followed by intermittent droughts (Libanda, 2023). These changes can have significant impacts on water availability and agricultural productivity. Consequently, Libanda (2023) cautions that this will lead to scarce groundwater for irrigation, which means that farmers may need to acquire much more capital to enable them to continue farming sustainably.

With projected increased frequency and intensity of extreme weather events such as floods and droughts, climate change has the potential to affect agricultural productivity adversely particularly among small-scale farmers who often have limited resources and capacity to adapt (Dumenu & Tiamgne, 2020). In Chongwe district, of Lusaka Province, most streams and rivers such as the Chongwe River have dried up and 80 percent of the district's population are experiencing a decrease in agricultural production (ActionAid Zambia, 2019). ActionAid Zambia reports further that at least 500 female garden farmers of Kanakantapa in Chongwe are significantly affected by climate change. These changes are expected to increase risks such as

drowning, outbreaks of plant and animal diseases, as well as destruction of crops and infrastructure. For instance, the African army worms have ravaged about 37,000 hectares of maize fields in Chongwe district. Sectors of the economy that depend on food resources, such as the maize subsector, are also at risk due to shorter growing seasons (Rawlins & Kalaba, 2020).

Consequently, adaptation to climate change is a necessary strategy to complement climate change mitigation. It is important for small scale farmers in Chongwe to be aware of the implications of climate change and to take measures to improve their resilience. However, there are constraints to achieving the full measure of potential adaptation. The ability of human systems to adapt to and cope with climate change depends on factors such as wealth, technology, education, information, skills, infrastructure, access to resources and management capabilities (Walker, et al., 2022).

Given this context, climate literacy has become an important aspect of addressing the impacts of climate change on agriculture (Balogun, Marks, Sharma et al., 2020). Climate literacy refers to an understanding of the Earth's climate, climate change, and the ways in which human activities affect the climate (Simpson et al., 2021). By improving climate literacy among farmers and other stakeholders in the agricultural sector, it is possible to enhance their resilience to the impacts of climate change and improve their livelihoods.

Subsequently, consented efforts have been made to improve agricultural productivity through improved climate literacy. In the United States of America (USA), the Department of Agriculture (USDA) has developed an Action Plan for Climate Adaptation and Resilience that aims to help communities across the United States, both rural and urban, plan for and build resilience to the impacts of climate change (Shi & Moser, 2021). Similarly, a recent article by Boston Consulting Group (BCG) highlights the importance of fostering green skills to accelerate climate literacy (Rice, Weisbrot, Bradshaw et al, 2021). In Sub-Saharan Africa, where agriculture is central to economic development and growth, climate literacy plays an important role in improving agricultural productivity among small scale farmers in Sub-Saharan Africa (Abegunde, Melusi & Ajuruchukwu, 2021). By improving their understanding of climate change, farmers could make more informed decisions about their farming practices and take appropriate action to adapt to the impacts of climate change. This implies that improving climate literacy among small scale farmers could aid their adoption of Climate-

Smart Agriculture (CSA) practices that seek to increase productivity and resilience while reducing greenhouse gas emissions (Mizik, 2021).

Climate change is likely to worsen poverty, and agriculture-dependent groups and poorest countries are at the greatest risk. Farmers have begun developing and implementing climate change adaptations. This study investigates the extent to which climate change adaptations by smallholder farmers have the potential to contribute to the UN's sustainable development goals of no poverty (SDG 1) and zero hunger (SDG 2).

In March 2021, Zambia launched its National Climate Change Learning Strategy (NCCLS) which aims to raise awareness and strengthen climate change knowledge, build individual and institutional capacity in climate change mitigation and adaptation, and mainstream climate change learning into national priority sector policies and systems (UN CC: Learn Knowledge Sharing Platform, 2021). Additionally, the Government of Zambia, through a United Nations-led partnership including UNDP, FAO, and WFP, with funding from the Green Climate Fund, is implementing a 7-year project (known locally as the SCRALA project) (UN CC: Learn Knowledge Sharing Platform, 2021).

Led by the Zambian Ministry of Agriculture, the SCRALA project is helping farmers in 16 districts across five provinces better cope with climate change threats through modern technology, sustainable agricultural techniques, and enhanced understanding of climate issues. Improved weather forecasting tools are giving farmers in Zambia the support they need to build resilience and prepare for more frequent climate shocks (UN CC: Learn Knowledge Sharing Platform, 2021). However, convincing small-scale farmers to trust scientific forecasts and adopt sustainable agricultural practices is one of the biggest challenges that remain faced by experts. Climate change presents a significant threat to agricultural productivity, particularly among small-scale farmers who often have limited resources and capacity to adapt. In Chongwe, Zambia, small-scale farmers are already experiencing the impacts of climate change on their agricultural productivity (Action Aid Zambia, 2019). These are significantly in form of extreme weather events such rising daily temperature, floods and droughts (Chonabayashi et al., 2020). These changes have led to risks such as drowning, outbreaks of infectious plant diseases, zoonotic diseases, human diseases, destruction of crops, and drying up of water bodies such as the Chongwe River (ActionAid Zambia, 2019) This underscores the need for improved

climate literacy and adaptation measures among small-scale farmers and other vulnerable populations.

This study leverages on indicators for Adaptive Capacity (AC) – the relative ability of agricultural households to respond and adapt to predicted climate change impacts which were derived from the most recent statistics available at the sub-national level. Provincial statistics and indicators were primarily derived from studies undertaken by the Central Statistical Office (CSO), technical studies undertaken by the Indaba Agricultural Policy Research Institute (IAPRI), and open-source statistics published on the Zambia Data Portal (CSO, 2018). In the case of Zambia, the indicators used to estimate AC in each Province included Access to Education (% literacy rate); Access to alternative (non-agricultural) income: (% employment rate); Adoption of improved agricultural practices: (fertiliser use among small-holder farmers, manure use, herbicide use, households using improved maize seed, and adoption of intercropping.)

The AC scores generated indicate that smallholder farmers in the Central, Northern and Lusaka provinces have the highest overall capacities to respond to climate change’s impacts (ranking 1st, 2nd, and 3rd, respectively). The North-Western, Western and Eastern provinces have the lowest overall AC scores (ranking 8th, 9th, and 10th, respectively) and therefore are anticipated to be least able to respond or adapt to climate change- related impacts. However, the range is low (13%) suggesting little variation in the capacity to adapt between Zambia’s 10 provinces (CSO, 2018).

## **1.2 Statement of the Problem**

Climate change education (CCE) is an important process in building community resilience to and coping strategies for climate change (Gangwar, 2010). In order to adapt to the multifaceted nature of climate change through education, the focus should be on how to respond to societal challenges and needs (Tanner, Lockwood & Seballos, 2012).

Zambia has been heavily hit by the impacts of climate change, with droughts and floods increasing in intensity in recent years, negatively affecting livelihoods and agricultural output (FAO, 2024). In response, the country launched the National Climate Change Learning Strategy in March 2021, aiming to mainstream climate literacy and ramp up climate action. The Government of the Republic of Zambia also launched the SCRALA initiative, a project

through the United Nations-led partnership including UNDP, FAO, and WFP, with funding from the Green Climate Fund (UN CC: Learn Knowledge Sharing Platform, 2021).

Nevertheless, little is known about how climate literacy affects small-scale farmers' attitudes toward climate change adaptation efforts in Chongwe district, even with these policy and strategy interventions. The study sought to fill this information gap and discovered that small-scale farmers' limited information of climate literacy resulted in inadequate adaptation plans and heightened susceptibility. Furthermore, among all Zambian provinces, Lusaka province continues to rank third in terms of adaptive capacity (ac) indicator scores (ZAMSTATS, 2022). To guide future climate change initiatives among small-scale farmers in vulnerable and impoverished areas like Chongwe, it is imperative that this information gap be filled.

The gravity of this problem is measured by the likely consequences of not doing this study. Failure to bridge the gap identified in this statement of the problem will result in a counterproductive efforts to increase both the livelihood and the environment friendly measures (Oziewicz, 2024). The limited information of the climate dynamics reflected in the low climate literacy levels among farmers will sustain damages arising from climate change effects (Azevedo & Marques, 2017).

#### **1.4 Purpose of the Study**

The purpose of this study was to explore how climate literacy has shaped the perceptions of small-scale farmers in Chongwe district on the adaptation strategies to climate change.

#### **1.5 Research Objectives**

The research objectives of the study were to:

- i. Investigate how climate literacy shapes the perceptions of climate change among small-scale farmers in Chongwe district.
- ii. Explore small scale farmers' involvement in climate literacy interventions in Chongwe.
- iii. Establish how climate literacy influences the development and implementation of climate change adaptation strategies utilised by small-scale farmers in Chongwe.

#### **1.6 Research Questions**

- i. How does climate literacy shape the perceptions of climate change among small-scale farmers in Chongwe?

- ii. How are small-scale farmers in Chongwe district involved in climate literacy interventions?
- iii. How does climate literacy influence the development and implementation of climate change adaptation strategies utilised by small-scale farmers in Chongwe district of Zambia?

### 1.3 Significance

This study has both theoretical and practical significance. Theoretically, it contributes to understanding of how climate literacy influences small-scale farmers in Chongwe district's ability to adapt to climate change and its impact on agriculture productivity, particularly among farmers with vis-à-vis prevailing low understanding of climate literacy. Practically, it has also provided valuable insights for policymakers and practitioners working to support rural communities in Chongwe district, Zambia and other regions facing similar challenges.

### 1.7 Operational Definitions

1. **Climate Change:** Refers to long-term changes in weather patterns of a region identified by statistical tests showing changes in either mean or variability of properties such as rainfall and temperature that persist for a long period, usually a decade or longer. It is mainly due to atmospheric and land-use changes (Clayton & Karazsia, 2020).
2. **Climate Literacy:** Refers to the understanding of the Earth's climate, climate change, and the ways human activities affect the climate. It involves being aware of both climate change and its anthropogenic causes, and how this knowledge underpins informed mitigation and adaptation responses (Andrews & Krönke et al., 2021).
3. **Climate Change Intervention Programmes:** Initiatives or strategies designed to address the impacts of climate change (UN CC: Learn Knowledge Sharing Platform, 2021). They can be broadly categorized into two types: mitigation and adaptation.
4. **Agricultural Productivity:** The efficiency with which agricultural inputs are converted into outputs, such as crop yields or livestock products (FAO, 2021; Rajkhowa & Baumüller, 2024).

Assessing the potential of ICT to increase land and labour productivity in agriculture: Global and regional perspectives. *Journal of Agricultural Economics*, 75(2), 477-503.

5. **Climate Smart Agriculture (CSA):** An approach to agriculture that aims to increase productivity, enhance resilience to climate change, and reduce greenhouse gas emissions (Okpokiri, Mba, Chigozirim & Ukeh, 2021).
6. **Conservation Agriculture (CA):** A set of agricultural practices that aim to improve soil health, reduce erosion, and increase water retention by minimizing soil disturbance, maintaining soil cover, and rotating crops (Mutengwa, Mnkeni & Kondwakwenda, 2023).
7. **Climate-Resilient Crops:** Crop varieties that have been bred or selected for their ability to withstand the impacts of climate change, such as drought, heat, or flooding (Acevedo, Pixley & Zinyengere et al., 2020).
8. **Information and Communication Technologies (ICTs):** Technologies that enable the storage, retrieval, manipulation, transmission, or receipt of digital data or information (Mapiye, Makombe & Molotsi et al., 2021).
9. **Extension Services:** Services provided by government agencies or other organizations to disseminate agricultural information and provide technical assistance to farmers (Okpokiri, Mba, Chigozirim & Ukeh, 2021).
10. **Climate-Smart Practices:** Agricultural practices that aim to increase productivity, enhance resilience to climate change, and reduce greenhouse gas emissions (Okpokiri, Mba, Chigozirim & Ukeh, 2021).
11. **Climate Information:** Predictions of expected weather conditions, including forecasts and warnings, that help farmers plan and adapt their agricultural practices (Mwongera, Shikuku & Twyman et al., 2020).
12. **Adaptation:** Adjustments in both human and natural systems in response to climate stimuli and its effects that make rural communities better able to adjust to climate change and variability, moderate its potential damages, cope with adverse consequences, and exploit opportunities that come with climate change (Owen, 2020).

These key concepts provide a framework for understanding the role of climate literacy in climate change adaptation among small scale farmers in Chongwe.

## **1.8 Chapter Summary**

This chapter introduced the study on the perceptions and adaptation to climate change among small-scale farmers in Chongwe district, Zambia. It highlighted the threat of climate change to

agricultural productivity and the need for improved understanding of how small-scale farmers perceive and adapt to its impacts. The study explored the role of climate literacy in enhancing resilience and improving agricultural productivity, with the potential to inform policy and practice in climate change adaptation and mitigation. The chapter presented the problem statement, outlined the objectives, research questions, and key terms used in the study. Overall, the chapter provided a comprehensive overview of the study and set the stage for further exploration of the role of climate literacy in climate change adaptation among small scale farmers in Chongwe district, Lusaka Zambia.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.0 Overview**

This chapter reviewed several studies that endeavoured to assess the role of climate literacy in climate change adaptation among small scale farmers. The chapter has been divided in sections discussing key literature on the climate literacy and climate change adaptation. It comprises the theoretical and conceptual frameworks as well as a summary of research gaps.

### **2.1 Climate Literacy among Small-scale Farmers**

According to Simpson et al. (2021) climate literacy is described as the awareness encompassing climate change and its human-induced origins, crucial for informed mitigation and adaptation responses. Their analysis of Africa's largest representative public opinion survey reveals significant disparities in climate change literacy rates across 33 countries, spanning from 23 to 66% of the population. Moreover, they underscore a gender gap in climate literacy, indicating that, on average, rates are 12.8% lower for women compared to men.

In Nigeria, Ogunnaike, Kehinde, and Oyawole (2021) advocate for policies and programmes aimed at enhancing the proactive adaptation of small-scale farmers to climate change. They emphasize the importance of government-provided extension information and the facilitation of credit accessibility to bolster adaptation strategies among small-scale farmers. This underscores the apparent lack of access to climate change information, particularly among small-scale farmers. The study suggests that bolstering climate literacy among small-scale farmers could significantly enhance their ability to adapt to climate change and improve agricultural productivity.

Tufa, Kanyamuka and Alene et al. (2023) delve into the adoption of Conservation Agriculture (CA) practices among small-scale farmers in Zambia, Malawi, and Zimbabwe. Despite extensive evidence on the agronomic and economic benefits of Conservation Agricultural and significant investments by various stakeholders, adoption rates remain below expectations among small-scale farmers. Their findings reveal disparities between awareness, training, and demonstration of Conservation Agricultural practices and their actual adoption rates. Notably, while awareness alone does not necessarily translate into adoption, hosting demonstrations proves more effective in promoting CA practices. Therefore, the study underscores the need

for more effective methods, such as training and demonstrations, to foster the adoption of Conservation Agricultural practices among small-scale farmers.

These findings underscore the necessity for enhanced education and outreach efforts to augment small-scale farmers' understanding of climate change and the potential benefits of conservation agriculture as an adaptation strategy. Given the variability in climate change literacy rates across countries and the gender gap identified, it is conceivable that small-scale farmers may exhibit differing levels of climate literacy based on their location and gender. Further research is imperative to ascertain the specific levels of climate literacy among small-scale farmers and their implications for addressing the challenges posed by climate change (Atta-Aidoo *et al.* (2022)).

From the findings, it can be noted that the response rate to dictates of climate change is below expectations and literacy levels still remain below desired targets. What has come out common is the need for awareness programmes and training to enhance awareness and adaptation levels across the major affected areas. The need for a joint venture between small scale farmers and the authorities together with other stakeholders remain indispensable.

## **2.2 Factors of Climate Literacy**

Chigozirim, Ogbonnaya, Okpokiri, and Ikechukwu (2020) assert that the socioeconomic status of rural farmers, particularly their income and education levels, significantly influences their access to institutional support and their ability to adapt to climate change. They advocate for a multi-stakeholder approach to address climate change, emphasizing the enhancement of extension services to educate farmers on climate-smart practices. This underscores the potential of improving the socioeconomic status of rural farmers and providing them with education and support to enhance their climate change literacy.

In a study focused on Ebonyi state, Nigeria, Okpokiri, Mba, Chigozirim, and Ukeh (2021) explore the usage and determinants of Climate Smart Agriculture (CSA). They find that factors such as gender, household size, education level, income, cooperative membership, and credit use influence CSA adoption among farmers. Challenges identified include inadequate finance and poor knowledge of CSA practices. Mwongera, Shikuku and Twyman *et al.* (2020) also noted that small-scale farmers face barriers to accessing climate information due to high illiteracy levels and inefficient extension services. They recommend increased efforts by

extension agents to educate small-scale farmers on CSA practices, indicating a potential pathway to improving climate literacy.

Serote, Mokgehle and Senyolo et al. (2023) investigate barriers to the adoption of Climate-Smart Irrigation Innovative Technologies (CSIT) among small-scale farmers in South Africa. They identify insufficient communication channels, lack of financial resources, unstable land tenure systems, and inadequate training as key obstacles. Policy recommendations include improving communication channels for disseminating agro-meteorological information.

Mabuku, Senzanje and Mudhara et al (2019) also examined how socio-economic factors influenced the choice of different adaptation strategies, which were divided into short-term coping strategies and long-term adaptation strategies. The study concluded that a variety of factors influenced the choice of adaptation strategies and suggested that stakeholder interventions should consider these determinants to enhance the adaptive capacity of rural households to flooding. It revealed that factors such as age, land size, length of stay in the flood plain, duration of floods, and marital status significantly influence the choice of long-term adaptation strategies (Mabuku, Senzanje & Mudhara et al, 2019). Short-term strategies were heavily dependent on natural resources, which potentially put pressure on these resources.

In Zambia, a study by Dumenu and Tiamgne (2020) found that small-scale farmers are socially vulnerable to climate change, and that economic factors (low-income level; less diversified sources of income) and social factors (low level of ownership of radio or television; low level of access to climate change information) influenced their vulnerability levels. This agrees with earlier findings by Nyanga, Johnsen, Aune and Kalinda (2011) in which farmers attributed climate change to supernatural forces, and the extent to which they perceived conservation agriculture as a climate change adaptation strategy.

Moonga and Moonga(2018) found that small-scale farmers in Chikupi in Kafue had problems with conservation farming because of its labour intensity and therefore failed to comply with its requirements and it takes long to show good results, needs a lot of preparation of fields, very strenuous, needs precise mastering of practices to have good results, forces one to use herbicides which encourages mono cropping for some years, does not do well in heavy and sandy soils and lack of implements to use.

This trend of findings indicates a continual lack of adequate climate adaptation information and skills among small-scale farmers in Zambia. Overall, these studies highlight the persistent lack of climate adaptation information and skills among small-scale farmers, suggesting a correlation between low productivity and climate literacy skills. Simpson et al. (2021) suggests that education and mobility positively influence climate change literacy, while poverty has a negative effect. Targeted interventions aimed at increasing climate change literacy among specific demographics, such as those with lower education levels and income, as well as women, may help ensure informed responses to climate change.

The review of literature has confirmed that the factors affecting climate literacy arise from a multifaceted dimension cutting across social, political, cultural, demographic and economic factors. Efforts to increase the literacy seem to be demanding a consolidated approach across all sectors. An isolated and silo approach of managing the climate change adaptation and literacy will not yield much desired results.

### **2.3 Climate Literacy and Agricultural Productivity**

A study in lower eastern Kenya found that the uptake of adaptation information had a significant positive impact on productivity (Onyango, 2021). These findings, corroborate those of Harvey, Saborio-Rodríguez and Martínez-Rodríguez et al (2018) concluding that small-scale farmers are highly vulnerable to climate change considering that they cultivate in marginal areas and lack access to technical or financial support that could help them invest in more climate-resilient agriculture. Therefore, improving access to climate information and increasing climate literacy among small-scale farmers could be necessary for informed decision making on resource use, adapt their production methods to changing climatic conditions, and improve their productivity (Harvey, Saborio-Rodríguez, Martínez-Rodríguez et al (2018).

Similarly, a study conducted in Kenya assessed the association between agricultural extension information utilization and maize productivity among small-scale farmers in Tana River County (Gwademba, Wamae & Muthee et al., 2023). They discovered a strong correlation between the use of agricultural extension information services and increased maize productivity, emphasizing the importance of providing small-scale farmers with access to agricultural information to boost their productivity.

Furthermore, Fadairo and Keita (2021) investigated the impact of the System of Rice Intensification method, implemented through the West Africa Agricultural Productivity Programme (WAAPP), on addressing challenges faced by small-scale paddy farmers in Kindia Prefecture, Guinea. Their study revealed that WAAPP-participating farmers experienced elevated sales and income from paddy compared to previous periods, with significantly higher productivity compared to non-WAAPP farmers (Fadairo & Keita, 2021). Additionally, farmers' perceptions of market prospects post-WAAPP intervention and their age significantly influenced changes in productivity. This underscores the promotion of climate literacy-driven practices like the System of Rice Intensification method as a means to enhance agricultural productivity among small-scale farmers.

The literature has indicated that the modern success of farming is highly relying on the scientific approach rather than traditional and chancing. Cultivating on the informed decision basis has increased the productivity in most of the crops in different areas of both developing and developed countries. It is therefore an indication that engaging scientific approaches to agriculture is now the best practice across the industry and regions. This study aimed at identifying all such viable factors and assess their applicability to the local community in Chongwe and Zambia on expansion.

#### **2.4 Current Climate change Adaptation Interventions and Agricultural Productivity**

A study by Mutengwa, Mnkeni and Kondwakwenda (2023) discusses the use of Climate Smart Agriculture (CSA) technology, specifically, Conservation Agriculture (CA), to build resilience among small scale farmers in Zambia and address challenges related to food insecurity and climate change. According to Mutengwa, Mnkeni and Kondwakwenda (2023), CA is a technology that helps to restore the environmental ecosystem while reducing the cost of production for small scale farmers. The study found out that small-scale farmers in Zambia have widely adopted these practices, which have contributed to food security. The CSA techniques practiced by small-scale farmers in the area included using resistant varieties, mulching, and nitrogen management (Okpokiri, Mba, Chigozirim & Ukeh (2021)

Congruently, a case study aimed to identify the adaptation strategies used by rural households in the eastern part of the Zambezi Region in Namibia and the Mwandi District in Zambia to cope with floods (Mabuku, Senzanje & Mudhara et al, 2019). The study found that in Namibia, the majority of households coped with floods by gardening and selling poles, while in Zambia,

the major coping strategies included the sale of reeds and thatching grass. Long-term adaptation strategies in Namibia included engaging in the Mafisa cattle trade and harvesting flood water, while in Zambia, they included conservation agriculture and acquiring preparedness skills.

According to the above literature, some of the interventions mentioned have been found to be effective in improving agricultural productivity among small-scale farmers in the face of floods. For instance, the study by Mabuku, Senzanje and Mudhara et al (2019) found that rural households in Namibia and Zambia used coping strategies such as gardening, selling poles, selling reeds and thatching grass, and long-term adaptation strategies such as engaging in the Mafisa cattle trade, harvesting flood water, conservation agriculture and acquiring preparedness skills to cope with floods. These strategies were found to be effective in helping households cope with the impacts of floods.

However, the effectiveness of these interventions may vary depending on factors such as the specific context in which they are implemented, the resources available to small-scale farmers, and the support provided by institutions and policies. These limitations could affect the effectiveness of these interventions in improving agricultural productivity among small-scale farmers in the face of floods. More information would be needed to determine their overall effectiveness in improving agricultural productivity among small-scale farmers in the face of floods

Moonga and Moonga (2018) states adoption of the CA activities depends on the incentives from the promoters. Some promoters extended incentives to farmers who adopted the CA. The common incentive most farmers got for promoting CA was the supply of free inputs. The farmers received free seed, fertilizer and herbicides when their fields were used as demonstrations plots. This has not been sustainable as the farmers failed to get the same inputs when their fields were no longer used as demonstration plots. Farmers were afraid of having their fields used as demonstration plots for fear of witchcraft. The other farmers would be jealous of the one whose fields were chosen as demonstration plots. Land tenure system in the area did not allow them to make these potholes for a long time did not allow them to fence off the land as it a traditional environment. The challenges subsistence farmers of Chikupi encountered in CF were poverty which made it difficult for them to afford requisites for successful CF, lack of good and appropriate continuing education on CF, use of non-sustainable methods of teaching CF by trainers and the social and economic ethos of the area.

The review of the literature on the adaptation strategies across the captured area indicate that initiatives to respond to the effects of climate change is being tackled from short term to long term horizons. The short-term measures include the change from traditional type of practice to some new forms such as mulching and change of crops to suit drought. Long term measures involve capital investment and include harvesting of rainwater to cover for the dry spells. This review helped the study to develop the conceptual framework for investigation.

## **2.5 Prospective Interventions to Improve Agricultural Productivity**

A literature review of prospective interventions to improve agricultural productivity among small scale farmers reveals that there are several approaches being taken to address this issue. One approach is the adoption of climate-resilient crops by small-scale producers in low- and middle-income countries (Acevedo, Pixley & Zinyengere et al., 2020). Similarly, Geda and Köhl (2021) recommend that demand-driven and rapid plant breeding strategies should be prioritized to provide climate-smart and higher-yielding seed innovations in order to achieve national and global sustainability goals in Ethiopia (Geda & Köhl, 2021).

Subsequently, Mapiye, Makombe and Molotsi et al (2021) conducted a review exploring the potential of enhancing agricultural information and services dissemination to small-scale farmers through Information and Communication Technologies (ICTs) in Sub-Saharan Africa (SSA). The review found that the effective use of ICTs presents substantial prospects for transforming the productivity and livelihoods of small-scale farmers. The review recommends the development and deployment of user-driven mobile applications that provide curated skill-sharing platforms, encourage farmers to give feedback to extension systems in real-time, and promote the participation of women and youth in agriculture (Mapiye, Makombe, Molotsi et al., 2021).

In another study, George, Erick, Ciniro, Faith and Abdullah (2021) discuss the future trends of the agriculture sector in Ghana, Kenya, Uganda, and Zambia in the context of a changing climate and identifies pathways for transforming the sector towards low emissions and climate-resilient development that balances adaptation to the threat of climate change. They project that the impacts of climate change on livelihoods and food security are likely to become more severe unless global efforts to limit the increase in average global temperature to well below 2°C above pre-industrial levels, as set out in the Paris Agreement, are successful (George, Erick & Ciniro et al., 2021). To achieve this George, Erick, Ciniro et al. (2021) suggests the

formulation and implementation of low emissions and climate-resilient development strategies, such as Long-Term Strategies (LTS) and Nationally Determined Contributions (NDCs).

Other studies propose initiatives aimed at making small farms more sustainable and profitable, such as the Better Life Farming (BLF) multi-stakeholder alliance, which offers last-mile delivery solutions to help small-scale farmers become sustainable, commercially viable suppliers of agricultural products (Dias, Kaplan & Singh, 2021). The alliance creates local ecosystems of private and public partners, offering comprehensive and accessible services to small scales, including education and training, access to credit and insurance, and supplies of seeds, fertilizers, crop protection, irrigation, and farming equipment (Dias, Kaplan & Singh, 2021).

In this case, it seems that there is a need for small-scale farmers to modify production and farm management practices to cope with climate change, such as adjusting planting time, supplementing irrigation, intercropping, adopting conservation agriculture, accessing short- and long-term crop and seed storage infrastructure, and changing crops or planting more climate-resilient crop varieties (Dias, Kaplan & Singh, 2021). There is also a need for better management of natural resources such as land, water, soil, and genetic resources to achieve more productive and resilient agriculture (Dias, Kaplan & Singh, 2021).

## **2.6 Critique of Previous Research**

The studies reviewed employed a variety of methodologies, each with its own strengths and weaknesses. For instance, the studies by Simpson et al. (2021) and Ogunnaike, Kehinde and Oyawole (2021) provided valuable insights into the state of climate literacy among small-scale farmers in Africa and Nigeria respectively. However, these studies relied heavily on survey data, which may not fully capture the nuanced experiences and perceptions of small-scale farmers.

Furthermore, these studies did not explore in depth the specific barriers that small-scale farmers face in accessing climate literacy interventions. On the other hand, the study by Tufa, Kanyamuka and Alene et al. (2023) provided an in-depth analysis of the adoption of Conservation Agriculture (CA) practices among small-scale farmers in Zambia, Malawi, and Zimbabwe. However, this study focused primarily on awareness and training as factors

influencing adoption, without considering other potential factors such as access to resources or institutional support.

The critique of Moonga and Moonga (2018) is that the study did not focus on climate literacy awareness, but it focused on the on challenges that farmers were facing in the conversation farming methods.

Many studies have been conducted in Zambia in relation to climate literacy and adaptation to climate change among various sectors. For instance, Muchanga (2013) conducted a study on learning for Climate Change adaptation among Selected Communities of Lusaka province in Zambia. It aimed at surveying perceptions of climate change and educational themes that would be contextually relevant for climate change adaptation. The results showed that drawing knowledge from diverse sources or cross-disciplines can evoke behavioural and social change that is critical in order to nurture best thinking and practices regarding adaptation. This study left a gap as it did not address aspects of farmers as it took a general approach. The author admitted that the data used was from the year 2000 and hence was not only small but also never reflected the emerged issues. The author admitted that households had mushroomed, context has changed, and lessons based on lived experiences may no longer be meaningful since circumstances have changed (Muchanga 2013). Hence this study covered that gap buy working on the latest prevailing circumstances with latest data from a current established sample size. The study also delved on the specific causes rather than general approach so as to have a calibrated approach to solutioning of the identified problems.

## **2.7 Synthesis of Previous Research Findings**

These research findings highlight several common themes. Firstly, climate literacy rates among small-scale farmers vary widely across different regions and demographics. Secondly, socioeconomic factors such as income and education play a significant role in influencing access to climate literacy interventions. Thirdly, there are significant barriers to the adoption of climate-smart practices among small-scale farmers, including lack of access to resources and institutional support. However, there are also contradictions in the research findings. For example, while some studies suggest that improving access to extension services can improve climate literacy among small-scale farmers (Ogunnaike, Kehinde & Oyawole, 2021), others suggest that simply being aware of climate-smart practices does not necessarily lead to their adoption (Tufa, Kanyamuka & Alene et al., 2023). This study aimed at establishing which of

these identified factors are especially true in the area of study and that can be replicated to a wider scope in Zambia. It had also identified which ones have differed in context and may not be applicable to the Zambian context and Chongwe in particular. The findings have still added value to policy makers and the affected farmers as they can now use the bridged gap to work on what is applicable in Chongwe and other similar places in adapting to climate change as well as executive climate change literacy.

## **2.8 Relevance to the Study**

The findings from these studies are highly relevant to the research at hand. They provided valuable insights into the current state of climate literacy among small-scale farmers and the factors that influenced their adoption of climate-smart practices. These findings informed the research questions and objectives by highlighting the need to explore in depth the specific barriers that small-scale farmers face in accessing climate literacy interventions and adopting climate-smart practices. Furthermore, they underscored the importance of considering socioeconomic factors when designing interventions to improve climate literacy and agricultural productivity among small-scale farmers.

## **2.9 Theoretical Framework**

The theoretical framework for this study was based on the Diffusion of Innovations Theory, this theory provides a comprehensive understanding of the factors that influence the adoption of climate literacy and adaptation strategies among small-scale farmers for improved agricultural productivity.

### ***2.9.1 The Diffusion of Innovations Theory***

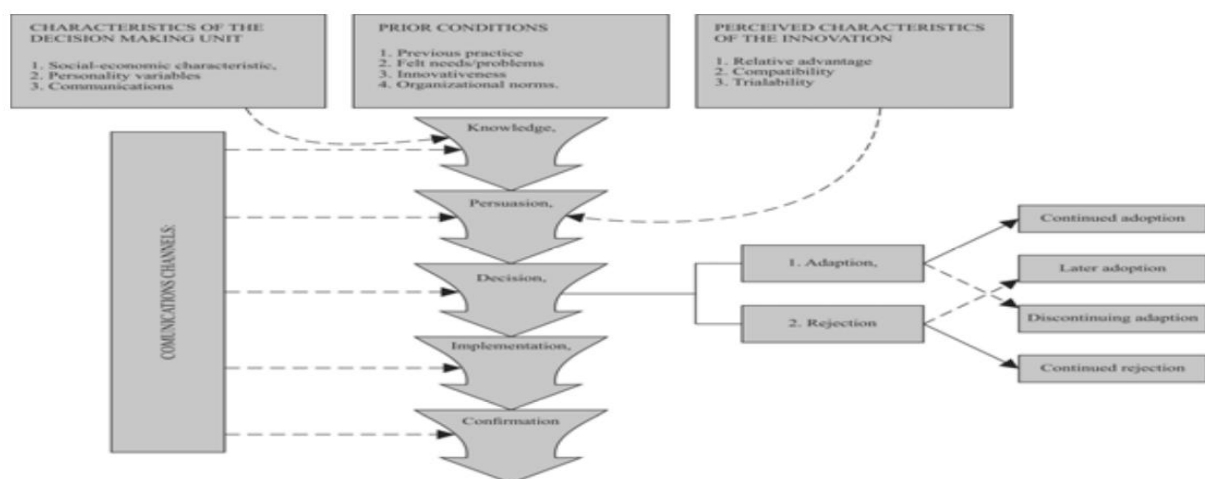
This theory, developed by Everett Rogers, explains how new ideas and technologies spread within a social system (Dewi, Cahyani & Megawati, 2023). According to the Diffusion of Innovations Theory, the adoption of new ideas and technologies is influenced by several factors, including the characteristics of the innovation itself, the characteristics of the adopters, and the characteristics of the social system (Gabriella & Hartanti, 2019).

### ***2.9.2 Actualising the Relevance of the Theory to Climate Change Adaptation.***

This theory is composed of five key elements. First, adopter characteristics categorize people as innovators, early adopters, early majority, late majority, and laggards, with behavioral variations influencing adoption rates (Smith et al., 2023; Rogers, 2003). Second, the stages of

adoption represent a five-phase cognitive growth. Humans go from awareness to sustained innovation utilization through knowledge acquisition, persuasion, decision-making, execution, and confirmation. Third, perceived relative benefit, compatibility, complexity, trialability, and observability all have a considerable impact on adoption probability because they affect user judgments (Brown et al., 2023; Rogers, 2003). Fourth, communication channels, such as mass media or interpersonal networks, facilitate the dissemination of innovation-related information, with digital platforms increasingly viewed as critical in contemporary scenarios (Johnson et al., 2022). Finally, the social system, which is characterized by structural norms, leadership dynamics, and collective values, influences adoption patterns via peer influence, cultural acceptability, and the role of opinion leaders (Gupta & Patel, 2023; Rogers, 2003). Together, these aspects provide a comprehensive perspective for studying innovation adoption across varied groups. The summary of the elements is shown in figure 2.1 below.

**Figure 2.1: Elements of Rogers’ initial model of innovation diffusion process**



Source: Rodgers (1995) in Dibra (2015)

The time dimension, which refers to the amount of time it takes for potential adopters to decide whether to embrace or reject an invention, is a significant aspect in the spread of innovation (Dibra, 2015). The time dimension in the diffusion theory is as summarised in the figure 2.3 below.

**Figure 2.2: Diffusion of Innovation Dimensions**

## DIFFUSION OF INNOVATION MODEL



Source: Rodgers (2003).

As the model assumptions show, many processes of innovation adoption play out before full embrace is attained. As a result, literacy and climate change responses will need to go through these processes, which may take some time. This explains why there may be lower literacy levels than anticipated. By investigating how climate literacy characteristics and small-scale farmers influence the adoption of climate literacy and adaptation strategies, researchers will identify the factors that influence farmers' adapting abilities and draw a link between climate literacy and agricultural productivity (Lavoie et al., 2021). This will inform prospective interventions to improve the adoption of climate literacy and adaptation methods, hence increasing agricultural productivity (Acevedo et al., 2020).

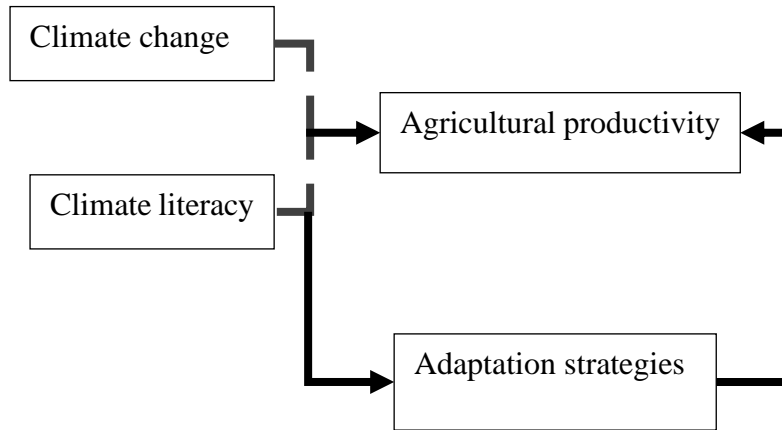
### 2.9.3 Limitations of the Theory

While the theory provides a valuable framework for understanding the role of climate literacy in boosting adaptation strategies and agricultural productivity among small-scale farmers, it also has limitations. For instance, the theory may not fully account for contextual factors specific to small-scale farmers in Chongwe district, Zambia such as local cultural or economic conditions. Additionally, this theory primarily focuses on individual behaviours and capacities, potentially overlooking broader systemic or structural factors that influence adaptation strategies. To address these limitations, this research employed a holistic approach that considered both individual and systemic factors influencing adaptation strategies and agriculture productivity among small-scale farmers in Chongwe district, Zambia.

## 2.10 Conceptual Framework

The study was anchored on the following conceptual framework as depicted in figure 2.3

**Figure 2.3: Conceptual Framework**



Source: Author (2025).

In this conceptual framework, the dependent variable was agricultural productivity, as it is the outcome that the study aimed to understand. The independent variables were climate change and climate literacy, as they are the factors that were expected to influence agricultural productivity. Climate change is shown to have a negative impact on agricultural productivity, while climate literacy is shown to have a positive impact on adaptation strategies and agricultural productivity.

The intervening variable in this framework were adaptation strategies, as they represent mechanisms through which climate literacy can improve agricultural productivity. By improving climate literacy among small-scale farmers in Chongwe, Zambia, it could be possible to enhance their adoption of effective adaptation strategies, which in turn will improve their agricultural productivity.

## 2.11 Chapter Summary

This chapter reviewed several studies that investigated the influence of climate literacy on agricultural productivity and adaptation strategies among small-scale farmers. The chapter is organized according to specific objectives and includes both theoretical and conceptual frameworks to guide the analysis. The chapter also identified research gaps and areas for further study. Overall, the chapter provided a comprehensive overview of the current state of

knowledge on the relationship between climate literacy and climate change adaptation among small-scale farmers and highlighted the need for further research in this area in Chongwe district, Zambia. The next chapter deals with the study methodology.

## **CHAPTER THREE: METHODOLOGY**

### **3.0 Overview**

This chapter outlines the study's research methodology. The parts have been divided into primary components that describe the fundamentals of the research technique, such as research design, study site, target population, and sampling size. The sampling method, data collecting tools, and data collection protocol have been highlighted. The chapter also includes information on the validity and reliability of research tools, and ethical issues. The chapter ends with the summary to the sections.

### **3.1. Research Approach**

The qualitative research methodology was employed for this study. This methodology placed emphasis on exploring the richness, depth and complexity of the subject under discussion (Hollstein, 2011). Qualitative methodology helped to bring out the meaning of participants' experiences without subjecting them to rigid pre-set categories. In this study, the qualitative methodology was considered appropriate for collecting the desired data because it sought to understand adaptation strategies and agriculture practices from the perspective of the farm hold and experience from climate literacy and adaptation to climate change among Small-Scale Farmers in Chongwe (Rahman, 2016), of course the triangulation method could have been used but the nature of study could have had challenges in securing quantitative data (Kahlke, 2014).

This approach was appropriate for this study because it sought information on the views and experiences of small-scale farmers and how climate change affected changes in their adaptation at the farm hold level.

### **3.2. Research Design**

This study used a case study research design and a qualitative methodology. Interviewing a sampled population in their environment is one way to gather data for a case study research design, which may involve a thorough investigation of the topic being studied (Pregoner, 2024; Orodho, 2003). In a chosen case study, this approach works well for gathering data on people's attitudes, beliefs, behaviors, and other social concerns (Orodho and Kombo, 2002; Hazari, 2024). The study's design was chosen in the hopes that it would allow the researcher to freely engage with participants, thoroughly examine the subject matter through in-person interviews, and provide a comprehensive picture of the situation as it existed on the ground. This strategy

allowed the researcher to emphasize a variety of perspectives on how small-scale farmers in Chongwe, Zambia, perceive climate literacy and climate change adaptation tactics.

### **3.3 Target Population**

The target population for this study was small-scale farmers in Chongwe, Zambia. This population was accessible but not definite, as the exact number of small-scale farmers in Chongwe was not known. In this study context, small-scale farmers included farmers who operated on a small scale, often with limited resources and access to institutional support (Abegunde, Sibanda & Obi, 2019). More specifically, a small-scale farmer is defined as a farmer cultivating 4.99 hectares of area under crops or less and/or raising a specified number of poultry and/or livestock largely for consumption (UN CC: Learn Knowledge Sharing Platform, 2021).

### **3.4 Study Site**

The study was conducted in Chongwe district, Zambia. Chongwe district is located in the Lusaka Province of Zambia, 45Km east of Lusaka district (Kanema & Gumindoga, 2022). It is geographically diverse, with altitudes ranging from 300 to 1300 meters above sea level (Milupi, Chileshe, Moonga, & Monde, 2020). These explain that the district is divided into three regions: the northern region with east-west hill ranges, a central plateau area, and a southern region merging into the Zambezi Valleys. They further state that agriculture is the primary economic activity in Chongwe, with crop production, horticultural production, and livestock production being prevalent

### **3.5 Sample Size**

The research sample was 51 divided into 46 small-scale farmers and 5 agricultural extension workers from the Chongwe district of Lusaka Province. Key informants in the study were local agricultural extension staff, local government officials, farmer cooperative leaders, local climate change specialists, and advocates. These gave a broad picture and background, whereas the farmers shared specific and intimate experiences. This guaranteed triangulation of data.

In qualitative research, the sample size is often determined by the concept of data saturation (Lochmiller, 2021). Data saturation is a point at which no new information or themes are observed in the data being collected (Fofana, Bazeley & Regnault, 2020). However, it is also important to provide a tentative sample size at the outset for planning and resource allocation

purposes. For this study, a tentative sample size of Forty-Six (46) small-scale farmers and five (5) key informants in Chongwe, Zambia had been chosen. The key target participants for this study were small-scale farmers in Chongwe District who were selected based on the data base from the ministry of Agriculture district coordinating office. The key informants for the study were agriculture extension officers who were selected based on their interactions with farmers in the study area. To ensure regional representativeness, at least ten (10) participants were selected from each of the three geographical regions of Chongwe district.

The iterative approach of concurrent data collection and analysis (Braun & Clarke, 2021) was employed to determine if saturation has been reached within this sample. Data saturation was achieved after interviewing all Forty-Six (46) small scale farmers and Five (05) Key informants were conducted and then data collection was ceased. This flexible approach allowed for the collection of rich and detailed data within the limited time and resources of the study. It ensured that the quality and depth of the data guided the research process rather than a predetermined number. If data saturation had not been achieved within the initial sample size, that would have been recognized as a limitation of the study. The implications of this limitation for the transferability of the results have been explicated in this report.

### **3.6 Sampling Technique**

To ensure that the sample stand for the whole population and not reflect prejudice toward a precise feature, the sampling techniques employed in this research was purposive, Location sampling (venue based). Purposive sampling was used to select the faming camp where the study was to be conducted and Forty-Six (46) small-scale farmers from the sampled farming camp. To come up with the five (5) extension officer participants, the researcher used the data provided by the district agriculture coordinating office.

### **3.7 Demographic Characteristics of Small-Scale Farmers in Chongwe District**

This section highlights the demographic characteristics of the research participants covering age, gender, and the years of farming experience, and type of farming activities they are involved in. These characteristics were essential in providing an in-depth contextual understanding of how climate literacy was shaping the adaptation practices among the participants.

Table 1: Demographic and Activity distribution of the research participants

Farmer ID	Gender	Years of Farming Experience (years)	Main Crops/Livestock
1	Male	20	Maize, vegetables, chickens
2	Female	10	Beans, maize, goats
3	Male	30	Maize, beans, cattle
4	Female	18	Maize, groundnuts
5	Male	15	Maize, beans
6	Female	28	Maize, chickens
7	Male	8	Vegetables, maize
8	Female	30	Maize, chickens
9	Male	20	Maize, soybeans
10	Female	22	Maize, groundnuts, goats
11	Male	17	Maize, vegetables, cattle
12	Female	9	Beans, groundnuts, chickens
13	Male	30	Maize, soybeans, goats
14	Female	6	Maize, chickens
15	Male	23	Maize, groundnuts
16	Female	12	Maize, beans, goats
17	Male	28	Maize, soybeans
18	Female	20	Maize, beans, chickens
19	Male	25	Maize, cassava, cattle
20	Male	7	Vegetables, maize, goats
21	Male	15	Maize, sweet potatoes
22	Female	19	Beans, maize, chickens
23	Male	10	Maize, groundnuts, goats
24	Female	14	Maize, soybeans, chickens
25	Male	30	Maize, cassava, goats, chickens
26	Female	20	Maize, beans, chickens
27	Male	25	Maize, groundnuts, goats, cattle
28	Female	11	Maize, cassava, chickens
29	Male	30	Maize, soybeans, goats
30	Female	16	Maize, beans, chickens
31	Male	32	Maize, groundnuts, cattle, goats
32	Female	15	Beans, maize, chickens
33	Male	22	Maize, soybeans, goats
34	Female	28	Maize, groundnuts, chickens
35	Male	13	Maize, vegetables, cattle
36	Female	20	Maize, groundnuts, chickens
37	Male	30	Maize, soybeans, cattle
38	Female	10	Vegetables, maize, goats
39	Male	12	Maize, beans, chickens
40	Female	22	Maize, groundnuts, goats
41	Male	10	Maize, sweet potatoes
42	Female	20	Maize, vegetables
43	Male	30	Maize, cassava
44	Female	10	Maize, beans
45	Male	25	Maize, sweet potatoes
46	Female	15	Maize, vegetables

### ***3.7.1. Inclusion and exclusion criteria***

Two criteria were used in this study to select the small-scale farmers who would participate in the in-depth interview. The participants had to be active small-scale farmers in Chongwe district; Zambia, the farmer had to be available on the study site during the data collection exercise; and duration of staying in the area because climate change is a gradual phenomenon.

To that effect, the researcher purposively selected small-scale farmers who had practiced small-scale farming in study site for at least 5 years. The 5-year criterion was necessary to allow for the inclusion of participants capable of outlining trends in climate change, associated impacts on agricultural productivity and adaption strategies over time. In the same manner, the researcher purposively selected, five (5) key informants from each of the following purposively formulated categories: local agricultural extension officers, local government officials, leaders of farmer cooperatives, and local climate change experts as well as advocates. The key informants individually participated in an in-depth interview to provide expert knowledge and experiences.

### **3.8 Data Collection Instruments**

The interview guide schedules were the main research instruments used in this study. This was used to gather information on knowledge, attitude, belief and practices related to climate change literacy. To collect data, two sets of in-depth interviews were conducted: with 46 small-scale farmers as well as 5 key informants in Chongwe district, respectively. These interviews were face to face, allowing for flexibility in the discussion while ensuring that key topics were covered. The interview protocols included open-ended questions related to each participant's perceptions of climate change, their involvement in climate literacy interventions, and the adaptation strategies employed.

### **3.9 Data Collection Procedure**

The research involved 46 small-scale farmers and 5 agricultural extension workers who are the block supervisors from the 5 agricultural camps, namely Chikuli, Kanantapa, Chalimabana, Ngwerere and Palabana. These were conveniently selected because of the proximity. Key informants in the study were local agricultural extension staff, local government officials, farmer cooperative leaders, local climate change specialists, and advocates. Essentially, the key informants gave a broad picture and background, whereas the farmers shared specific and intimate experiences. This guaranteed triangulation of data.

### **3.10 Data Analysis**

Data analysis is the act of combining information from many sources to create summaries and find trends using statistical approaches (Fofana, Bazeley, & Regnault, 2020). In this study, qualitative data gathered through in-depth interviews was analysed using thematic analysis. Thematic analysis includes recognizing emerging themes in data and dividing them into relevant categories. The data was manually transcribed and coded. Codes were allocated to sections of text that indicated a particular notion or topic. These codes were then classified into bigger categories or themes that conveyed the core of the information. The themes were then evaluated and adjusted to ensure that they appropriately reflected the facts. When presenting the results, participant verbatims were utilized to highlight the themes and offer support for the findings.

### **3.11 Trustworthiness**

Trustworthiness in qualitative research relates to the credibility, transferability, dependability, and confirmability of the study. Credibility refers to the confidence that can be placed in the truth of the research findings. In this study, credibility was ensured through triangulation, which involved using multiple data sources (interviews and focus group discussions) to cross-verify findings (Hasan, Rana, Chowdhury et al., 2021). Additionally, member checking was used. Participants were given the opportunity to review and confirm the accuracy of their responses.

Transferability refers to the extent to which the findings can be applied in other contexts or with other respondents. To ensure transferability, a detailed description of the research context, participants, data collection and analysis procedures were provided so that readers could make informed judgments about the applicability of the findings to other settings (Hasan, Rana, Chowdhury et al., 2021).

Dependability refers to the stability of data over time and conditions. To ensure dependability, an audit trail detailing all stages of the research process was maintained. This included documentation of all decisions made during the research process, raw data, data reduction, analysis products, and data reconstruction products (Hasan, Rana, Chowdhury et al., 2021).

Conformability refers to the objectivity or neutrality of the data. To ensure confirmability, reflexivity was practiced throughout the research process (Hasan, Rana, Chowdhury et al.,

2021). This involved continual self-reflection about potential biases and assumptions as well as how these might have influenced the research process and findings. By adhering to these principles, this study produced findings that were trustworthy and that contributed to our understanding of climate literacy and adaptation among small-scale farmers in Chongwe, Zambia.

### **3.12 Ethical Considerations**

This study was conducted in accordance with ethical principles and guidelines for research involving human subjects (Hasan, Rana, Chowdhury et al., 2021). Informed consent was obtained from all participants before data collection, and their confidentiality and anonymity were protected throughout the study. Each participant was informed of the purpose, benefits, and consequences of the study. The researcher also informed participants of their freedom to withdraw from the exercise at any time. During the discussions, the researcher ensured that no material with the potential to breach the confidentiality and dignity of any participant was included. Participation was voluntary.

### **3.13 Chapter Summary**

This chapter described the study methodology used to determine the findings and satisfy the objectives. The qualitative approach was justified for the Chongwe district research location. The target demographic was small-scale farmers with lofty goals for increased output. Purposive sampling was used to collect data from 46 farmers and 5 agricultural personnel. The chapter highlighted the data gathering instruments, which were interviews rather than standardized self-administered questionnaires. The data was analysed thematically, with responses divided into categories and grouped according to frequency descriptors. The validity and reliability of measures were contextualized to help develop trust in the research findings. The next chapter deals with the presentation of results.

## CHAPTER FOUR: PRESENTATION OF FINDINGS

### 4.0 Overview

This chapter presents the findings of the study on small-scale farmers as well as extension workers in Chongwe. The research findings have been presented according to the research themes that emerged from the data during thematic analysis. The themes that emerged from the data were collected and linked to the corresponding research questions of the study. The chapter begins with a description of the research participants who volunteered to participate in the study. The following were the research objectives and questions that guided the collecting, analysis and presentation of the findings:

1. Investigate how climate literacy shapes the perceptions of climate change among small-scale farmers in Chongwe district, Zambia.
2. Explore small scale farmers' involvement in climate literacy interventions in Chongwe district, Zambia.
3. Establish how climate literacy influences the development and implementation of climate change adaptation strategies utilised by small-scale farmers in Chongwe district, Zambia.

With the research questions as below:

1. How does climate literacy shape the perceptions of climate change among small-scale farmers in Chongwe?
2. How are small-scale farmers involved in climate literacy interventions?
3. How does climate literacy influence the development and implementation of climate change adaptation strategies utilised by small-scale farmers in Chongwe?

The presentation of the findings will follow the order of the objectives.

### **4.1. Objective 1: Perceptions of climate change among small-scale farmers in Chongwe district.**

Climate literacy is a critical component for people dealing with climate change and one of the few yet most practical and effective methods; it has both objective (knowledge as a subscale) and subjective (close to climate change perception) implications and can be thought of as a combination of science, education, and policy. Climate literacy has the capacity to alter the whole process, from individual awareness to public participation with global climate change. The first research question asked small-scale farmers about their perceptions on climate

change. This issue was critical because small-scale farmers must understand climate change in order to properly propose adaptation methods.

This section discusses how climate literacy affects the view of small-scale farmers. To examine literacy levels and how they impact views, small-scale farmers were asked questions to gather information, which served as a self-measure of climate change literacy. According to the replies to the concept of climate change, 20 small-scale farmers associate climate change with unpredictable weather, while 15 are unclear. In addition, 11 farmers reported changes in weather patterns, demonstrating a range of understanding among the participants.

For instance, participants one (1) and two (2) shared the same view and stated:

*I'm not sure exactly what it means, but I know the weather has been unpredictable for some time now. (P1)*

*I've heard of it, but I'm not sure what it means exactly. It's something to do with the weather getting worse, right? (P2)*

Other participants had a different view like those of participants 11, 12 and 13 and stated:

*I've heard a bit about it. I think it's when the weather patterns change over time, like when it gets hotter, or the rain comes late. (P11)*

*I don't fully understand it, but I think it's about the weather changing a lot, making it harder to farm. (P12)*

*It's the change in weather over time, making it more unpredictable. I've read a bit about it." (P13)*

Other participants had completely no idea of what climate change is and as reported by farmer 33 and 43:

*I'm not completely sure, but I think it's when the weather changes, like when we don't get enough rain like this year. (P33)*

*I'm not sure of the exact meaning, but I think it's why the rains are no longer coming on time and why it's so hot now. (P34)*

*"I don't understand much, but I can see things are not the same. I just know that it's harder to grow my crops and raise my chickens because of the weather. No rainfall and the vegetation are drying up." (P2)*

Across all areas of analysis, participants exhibited a significantly low level of climate information. These replies suggest that farmers have little awareness on climate change, since almost half of the participants (15) reported that they did not completely comprehend the idea. Furthermore, the climate literacy interview reported that male farmers generally have a superior comprehension of this subject, which is more or less close to perception.

When asked how climate change had affected their farming that year, and whether small-scale farmers had detected any changes in climate in their region. Everyone reported seeing changes in the climate. According to figure 3, the majority of farmers (25 answers) cited droughts, raising serious worries regarding water supplies. Furthermore, 15 farmers cited late showers, while 6 indicated a general decline in rainfall, suggesting a significant knowledge of climate-related consequences on agriculture.

Additionally, small-scale farmers were asked how climate literacy shaped their perceptions. Their responses varied and according to the findings, many farmers (20 responses) indicate that they have limited understanding of climate change, which likely affects their perceptions of its impact. Meanwhile, 15 farmers acknowledge awareness of negative effects, and 11 feel powerless to address these changes, suggesting a gap between knowledge and action.

The results from the responses further indicate that 35 farmers believe higher levels of climate literacy correlate with more effective climate change adaptation strategies, showing strong support for education as a vital factor. 6 farmers responded with "Probably," reflecting cautious optimism about this relationship, while 5 farmers expressed uncertainty.

The results generally show that categorically, farmers' literacy perceptions regarding climate change, revealing that the most of them possess a basic recognition of the subject, while about quarter of them demonstrate a low understanding and only very few reported having comprehensive knowledge.

#### **4.2. Objective 2: Involvement of small-scale farmers in climate literacy interventions in Chongwe District.**

This theme provides participants view on enhancing smallholder farmers' capacity through preventive actions to mitigate climate-related risks. This entails improving accessibility to resources, technology, and sustainable practices within farming communities. When asked if farmers had participated in any climate literacy interventions or programs almost half the respondents stated they had not participated in any climate literacy interventions programmes. There were only a few of the participants that agreed to have had been involved in climate literacy interventions. The others seemed neutral. The following response are among many participant's responses (3, 4, 5 and 6) shared the same views and stated:

*No, I haven't, but I would like to learn more about what's happening and how to deal with it. (P3)*

*No, I haven't, but I'm interested in learning more if there's a chance. (P4)*

*No, but I think it would help a lot. We need to learn how to deal with these changes. (P6)*

On the other hand, participants made an impression that these climate literacy interventions programmes were only meant for women.

*No, but I know there are programs out there. It's mostly the women in my community who need this help, but they often miss meetings. (P34)*

*No, I haven't had the chance. Sometimes I can't even go to meetings because I have to take care of my children. (P41)*

Generally, the majority of the participants' reported that they did not participate in any climate literacy interventions programmes and only a few (2 out of 46) had a chance to access such programmes. These programmes included workshops by World Vision Zambia on conservation farming, improve seed varieties and Farmer meetings by extension workers on the dangers of deforestation through the Ministry of Agriculture as well as the Ministry of Fisheries and Livestock. The major themes in this section are that even if the farmers did not get a chance to access programmes or activity meant for climate education, they were willing to learn when given an opportunity.

In order to explore small-scale farmers' involvement in climate literacy interventions, it was necessary to also understand the source of access to information as it one of the foundations of this study. The results show that all farmers had various sources of information. Out of 46 participants, 22 relied on extension officers, 15 got their information from community meetings, and 19 listened to radio programmes. This indicates that extension officers and radio programmes are the primary sources of information for these farmers.

In supporting this view, participant 27 shared the following;

*The trend in the Ministry of Agriculture is that whenever there is a new policy or development, they train specific individuals to domesticate and implement the policy in their respective farming area. In most cases, extension officers organise community meetings to share information, hence, we mostly hear about climate change from agriculture extension officers (P27).*

The key participants further reported that access to climate change information was obtained through the radio. These results imply that the major sources of information as suggested by small-scale farmers had three sources namely; extension officers, village meetings and radio. The prominent source reported was through extension officers. The next section will present the results of how climate literacy influences the development and implementation of climate change adaptation strategies utilised by small-scale farmers.

### **4.3 Objective 3: Climate change adaptation strategies utilised by small-scale farmers in Chongwe district.**

This study investigates the adaptation strategies employed by smallholder farmers in Chongwe, to cope with climate change and variability. The adoption of adaptation strategies by small-scale farmers were influenced by a combination of institutional, socioeconomic, and biophysical factors. In this case, Institutional factors, such as access to credit facilities, extension services, and climate information, play a pivotal role in facilitating the adoption of adaptation strategies. This study noted that extension workers contribute to the adoption process by disseminating knowledge and raising awareness about effective adaptation practices.

The results revealed Ten (10) adaptation strategies commonly used by smallholder farmers in Chongwe districts to mitigate the effects of climate change on their farming activities (Table1).

All the adaptation strategies reported focused on reducing the effects of drought which seem to be a more frequent problem to farmers in the study area compared to floods. Planting drought resistance crops varieties was the most widely practiced (6) adaptation strategy by farmers.

The adaptation strategies employed by small-scale farmers in Chongwe, with a total of 31 farmers actively adapting to climate change. The most common strategies include planting drought-resistant crops (6 farmers), adjusting the timing of planting (5 farmers), and water conservation techniques (4 farmers). Additionally, 15 farmers expressed uncertainty about their adaptation options, indicating a need for more support and information in implementing effective strategies.

The research participants stated that they use drought-resistant grains such as cassava and sorghum, short-season varieties, multiple cropping, livelihood diversification, dry planting, and early planting as climate change coping and adaptation strategies. The majority of adaptation solutions are sustainable, as smallholder farmers appear to choose them because they are less expensive and are based on Indigenous Knowledge Systems (IKS). The climate change adaptation strategies used by small scale farmers were stated as follows:

#### ***4.4.1. Planting drought-resistant crops***

Farmers reported that they were growing of drought tolerant crops such as cassava, millet and sorghum is usually done to curb issues of low and unreliable rainfall which are caused by climate change. They stated that the current weather conditions are making it impossible to grow maize which is the staple cereal for Zambia and for people of Chongwe, since the area does not have enabling conditions for the crop to have a good yield as it is an arid area. As a result, drought-resistant crops are suitable because they can survive in dry conditions. For instances, their views were as follows:

*I've tried planting different crops like cassava that can survive with less water, but it's still not enough. (P2, P7, P10).*

*I tried to use some of what I learned, like planting crops that use less water, but this year's drought was too severe. Still, I think it's a step in the right direction (P11).*

*I've started planting drought-resistant crops, but I still need better irrigation. Without water, there's not much we can do (P15).*

#### **4.4.2. Water conservation techniques**

Various small-scale farmers in Chongwe stated the following:

*Yes, I've started planting drought-tolerant crops like cassava and using water-saving techniques, but it's still difficult without proper irrigation (P25)*

*I've tried planting earlier, but that didn't help much. I've also thought about growing crops that need less water, but I don't know where to start (P31)*

#### **4.4.3. Adjusting timing of planting**

Farmers in Chongwe plant crops as soon as the first rains fall, based on their extensive understanding of their agro-ecological conditions and an expectation of a favourable rainfall season (based on indigenous indicators). However, it should be mentioned that some farmers in Chongwe avoid this practice since it can be risky, as they have had cases where the rains would stop after they had planted, resulting in seed waste. Some people would like to use this strategy, but they may be hampered by a lack of inputs such as seeds during the first rains.

*I try to plant a bit earlier, but sometimes that doesn't work if the rains don't come. I haven't really done much else (P37).*

*I've tried planting earlier, but it didn't help this time because the rains didn't come when I expected. I don't have irrigation, so I just rely on the rain (P39).*

*I've tried planting earlier, but when the rain doesn't come, it doesn't help. Without irrigation, it's difficult to control the situation (P16).*

*I've tried planting earlier, but it didn't help this time because the rains still didn't come on time (P20).*

*Honestly, I'm struggling. I don't know what else to do apart from planting earlier, but that hasn't worked this time (P23).*

*I tried changing my planting dates, but it hasn't helped much. I still lost many crops (P42).*

#### **4.4.4. Crop diversification**

This involves planting a variety of crops such that if other crop types fail due to the given weather conditions the surviving crops would act as safety nets. Thus, they mix crops like pumpkins, maize and beans together

*I've heard about planting different crops, but I don't know much about which ones work best. I'm still trying to figure it out (P18).*

*I've tried to plant different varieties, hoping some might do better, but they still failed (P41).*

#### **4.4.5. Reduced number of cattle**

This mitigation measure was expressed by various views:

*We've started keeping fewer cattle because there's not enough water for them during the dry season (P3).*

*I've tried planting drought-resistant crops like sorghum, but without water, even those are struggling. I also tried reducing the number of livestock to save on resources (P27).*

*I've tried planting earlier, but it didn't help much. I also started keeping fewer cattle to reduce the pressure on water and grazing land, but we still need more solutions (P31).*

*I've reduced the number of cattle I keep to save water and planted some drought-resistant crops like cassava, but it's still not enough (P37).*

#### **4.4.6. Conservation agriculture practices**

Strategies under this theme as reported by farmers were expressed as follows:

*Yes, I've started using crop rotation and mulching to keep the soil moist. But without irrigation, it's tough to manage when there's no rain (P15).*

*I've tried planting earlier and using some techniques like mulching to keep the soil moist, but it hasn't been enough (P24).*

*I've tried planting earlier and using mulching to conserve water, but it's not enough. We don't have irrigation systems, so we rely on the rain (P30).*

#### **4.4.7. Farmers unsure of adaptation options**

Apart from various strategies proposed by other farmers related to climate change mitigation, other farmers did not have adaptation options, and they stated:

*“It hasn’t worked. I lost most of my crops to the drought, and I don’t know what else to try,”(P4)*

*“My crops have failed this season. There’s no improvement at all because of the drought,”(P5).*

*“It hasn’t been effective at all. My maize is gone, and I don’t have enough water for my chickens,”(P6).*

*“I haven’t done much because I don’t know what to do. We depend on rain, and this year it wasn’t enough,”(P8).*

*“I haven’t done much. I just try to plant early, but the drought makes it hard,” (P9).*

This implies that adaptation strategies and climate risk management interventions have been tailored to address localized vulnerabilities and impacts on smallholder farmers.

In line with understanding exploring how climate literacy influences the development and implementation of climate change adaptation strategies utilised by small-scale farmers in Chongwe, participants were asked to describe the effectiveness of the stated strategies in improving their agricultural productivity.

The results revealed that 25 farmers felt their understanding of climate change has a "Limited influence" on their adaptive strategies, indicating a tendency towards reactive farming practices. The other 15 farmers express that they are "Just reacting to changes," while 6 farmers report "No significant influence" from their understanding. This suggests a pressing need for improved education and knowledge integration to enhance farmers' adaptive capacities. For example, participant (35) explained that, *“It helps a little, but the yields are still lower than they used to be.”*

Commenting on the same question, respondents (29, 30 and 46) said:

*“Without proper education, I feel like I’m just guessing at what might work,” (P, 29).*

*“They haven’t been effective this year; my crops have suffered greatly,” (P, 30).*

*“This year, I lost most of my crops due to the drought. I need better guidance,”(P, 46).*

#### **4.4.8. Effectiveness of current adaptation strategies among small-scale farmers in Chongwe**

These summarised results imply that the perceived effectiveness of strategies adopted by small-scale farmers regarding climate change adaptation are not effective. Out of the 31 farmers engaged in adaptation efforts, 10 farmers reported a "positive impact on adaptation strategies," while 21 farmers felt there was "no perceived impact," and 15 farmers were "unsure about what actions to take." This data accentuates a significant degree of uncertainty and scepticism regarding the effectiveness of current adaptation strategies among small-scale farmers in Chongwe.

In their own words, small scale farmers added:

*“They haven’t worked at all. Most of my crops are gone this season,” (P46).*

*“They haven’t been effective this year; my crops have suffered greatly,” (P45).*

*“This year, I lost most of my crops due to the drought. I need better guidance,” (P44).*

*“It hasn’t worked this year. I barely have enough to feed my family,” (P42).*

Table 2: Effectiveness of Strategies Adopted by Small-Scale Farmers

<b>Perceived Effectiveness of the Strategies</b>	<b>Number of Farmers</b>
<ul style="list-style-type: none"><li>• Positive impact on adaptation strategies</li><li>• No perceived impact</li><li>• Unsure about what actions to take</li></ul>	10 21 15
<b>Total Farmers Engaged in Adaptation Efforts</b>	<b>31</b>

Small-scale farmers were asked about their specific types of support or resources that would be most helpful for them in adapting to climate change. This question solicited responses from all the participants and revealed that three common supports were recorded. These included; irrigation systems, better seed varieties and training and education.

#### **4.4.9. Types of support or resources small scale farmers need in Chongwe**

Types of support small scale farmers in Chongwe believe would be most beneficial for adapting to climate change according to 30 responses highlighted the need for irrigation systems, indicating a critical demand for better water management to address drought effects. 10 responses requested better seeds varieties for improved resilience to climate variability, showing awareness of genetic adaptation. Lastly, 6 responses emphasized the necessity for training and education, reflecting a desire for greater knowledge to implement effective adaptation strategies.

According to respondents, they reported that:

*We need better seeds, maybe more drought-resistant ones, and information on how to deal with these changes (P1, P4).*

*Training on how to adapt would help, and if we had access to irrigation systems that would make a big difference (P2, P9, P10, and P11).*

*More information, better seeds, and maybe some financial support to invest in irrigation or other tools would help (P3, P5, and P6).*

*We need drought-resistant seeds and training on how to handle these changes. Irrigation systems would also help a lot (P7).*

*"I don't have enough understanding to come up with proper strategies. I just try to make do with what little rain we get (P8).*

*I need more access to education about climate change and resources for irrigation and better crop varieties (P46).*

#### **4.5 Key Informants' Insights**

The findings from key informants indicate that farmers had limited climate literacy, with some interviewees claiming that they did not have access to climate change-related activities. One extension worker noted, "Climate literacy among small-scale farmers is moderate, around 40%," highlighting the need for improved education and awareness efforts. The data also imply that extension workers play an important role in linking farmers with resources and providing support, with an emphasis on growing drought-resistant crops and animals. As one informant

stated, "We are encouraging farmers to cope with climate change by shifting to crops that can grow in shorter rainy seasons and using drought-resistant varieties. In short, we are encouraging Climate Smart Agriculture among farmers of levels."

According to the extension workers, climate change has severely affected small-scale farmers in various ways, including erratic rainfall and increasing disease threats. An extension worker explained, "Climate change has drastically altered rainfall patterns and seasons, making it hard for farmers to grow crops and find adequate feed for animals." Several initiatives aim to enhance climate knowledge and adaptation, but problems persist, including a need for increased financing and assistance. One informant emphasized, "Proper funding and support programs are crucial for farmers to understand and address climate challenges."

Adaptation strategies cited as being practiced among small scale farmers in Chongwe included planting drought-resistant crops, selecting animal breeds that can survive higher temperatures, and using irrigation methods. One extension worker highlighted, "Farmers are increasingly planting drought-resistant crops, raising livestock suited to warmer temperatures, and using irrigation systems." Enhanced climate literacy was recognized as crucial for improving production and resilience to climate change among small scale farmers. As one informant noted, "When farmers understand climate challenges, they're able to plan and make better choices about what crops to plant and which animals to keep."

In this regard, the success of existing adaptation measures among Chongwe's small-scale farmers was revealed to have been low, with the majority of the small scale farmers reported to have not been able to function as expected amid sudden shifts in the climate. The key informants revealed that small-scale farmers in Chongwe regarded irrigation systems as one of the most significant form of climate change adaption strategies, highlighting the urgent need for improved water management to counteract drought effects. One informant supported this notion explaining that, "Irrigation, in particular, is vital for food security and pasture growth, helping us manage the ongoing climate challenges." Other small scale farmers were reported to have sought better seeds to enhance tolerance to climatic fluctuation, displaying an understanding of genetic adaptation. In a nutshell, most extension workers emphasized the need for training and education among small scale farmers in Chongwe, suggesting a desire for additional information to adopt successful adaptation strategies. One extension worker

recommended, "Increasing access to targeted education programs tailored to the needs of small-scale farmers will help them understand and implement new strategies.

#### **4.6. Chapter summary**

This chapter provided a comprehensive overview of the findings, highlighting the varying levels of climate literacy among farmers, their involvement in climate literacy interventions, and the adaptation strategies they employ. The chapter underscores the critical role of extension workers and the need for targeted support to improve farmers' resilience to climate change.

## **CHAPTER FIVE: DISCUSSION OF FINDINGS**

### **5.1 Overview**

This chapter discusses the findings of the study presented in Chapter four in relation to the literature reviewed in Chapter two. The discussion is organized according to the themes of the study that emerged from the findings and is aligned to the research objectives concerned with understanding how climate literacy shapes perceptions of climate change, exploring small-scale farmers' involvement in climate literacy interventions, and examining how climate literacy influences the development and implementation of climate change adaptation strategies. This chapter also addresses the theoretical and conceptual frameworks, and provides recommendations based on the findings. This chapter also presents recommendations and the conclusion.

### **5.2 Climate Literacy and Perceptions of Climate Change**

#### ***5.2.1 Understanding of Climate Change***

Climate literacy, a subset of science literacy, has gained popularity in recent years (Azevedo & Marques, 2017; Niepold et al., 2008). This definition presupposes that a climate-literate individual understands climate systems, knows how to obtain trustworthy information, communicates well, and takes informed decisions about climate change (USGCRP, 2009). Research has expanded the definition of climate literacy to include specific circumstances, such as using social sciences to increase climate literacy (Cooper et al., 2019; Shwom et al., 2017). This study acknowledges the USGRP definition but focuses on establishing a reference measurement for the Chongwe environment.

This study revealed that farmers in Chongwe district have significantly low climate information levels across all dimensions of analysis. These responses imply that farmers have low information on climate change because nearly half of the participants did not fully understand the idea of climate change. However, the detailed scientific knowledge among farmers was generally lacking, which is consistent with the literature that highlights gaps in climate literacy among small-scale farmers (Simpson et al., 2021; Ogunnaike, Kehinde & Oyawole, 2021). The limited understanding of climate change among farmers suggests a need for more comprehensive education programs that go beyond basic awareness. This could involve integrating scientific explanations with practical examples relevant to the farmers' experiences.

The findings of the current study are in tandem with those of Simpson et al. (2021) who noted that gender dynamics further complicate the interplay between climate literacy and farmer perceptions. The gender gap in climate literacy noted by Simpson et al. (2021) was not explicitly observed in this study, but it remains an important consideration for future interventions. Simpson et al. (2021) highlight that climate literacy rates are, on average, 12.8% lower for women than men across 33 African countries. This gender disparity is attributed to several factors, including lower levels of education and access to information among women.

In the context of this study, while the gender gap was not explicitly observed, it is important to consider the broader evidence that suggests women generally have lower climate literacy rates. Among the 46 small-scale farmers interviewed, both genders were represented. This suggests that both genders offer distinct perspectives shaped by their respective roles in agricultural production and household management. Specifically, women may possess unique insights into food security challenges that could be overlooked in predominantly male-focused narratives. Integrating gender-sensitive approaches in climate literacy programs is essential for enhancing the collective understanding of climate change and fostering inclusive, community-driven adaptation strategies.

Despite the balanced gender representation, the detailed analysis did not reveal significant differences in climate literacy levels between men and women. However, this does not negate the broader trends observed in other studies. For instance, a policy brief on gender-transformative climate literacy emphasizes that gender-invisible approaches to climate education have not effectively addressed the gendered impacts of climate change (Brookings, 2023). Additionally, the intersection of climate, gender equality, and education highlights that women and girls often bear a disproportionate share of the burden of climate change and are frequently left out of decision-making processes (Brookings, 2023).

Given this broader context, it is crucial to ensure that future interventions in Chongwe address potential gender disparities in climate literacy. This can involve targeted education programs for women and girls, ensuring they have equal access to climate information and resources, and actively involving them in climate adaptation strategies.

### ***5.2.2 Observed Changes in Climate***

The findings reveal that small-scale farmers in Chongwe have observed significant changes in climate, including delayed onset of rains, shorter rainy seasons, loss of forests, and increased temperatures. These observations align with existing literature, which documents similar climatic changes affecting agricultural practices (Tufa, Kanyamuka & Alene et al., 2023). This alignment underscores the critical need to address these changes through effective adaptation strategies.

Further analysis shows that all the 46 farmers interviewed have noticed changes in the climate in their area. The majority of farmers (25 responses) reported experiencing droughts, highlighting significant concerns about water availability. Additionally, 15 farmers mentioned late rains, and 6 referred to a general decrease in rainfall. These observations indicate a clear recognition of climate-related impacts on agriculture, emphasizing the urgent need for adaptive measures to address these challenges.

The consistent reports of droughts and late rains suggest that water scarcity is a major issue for these farmers, affecting their ability to sustain crops and livestock. The recognition of these changes by all participants indicates a widespread awareness of climate impacts, even if detailed scientific understanding is lacking. This widespread awareness can be leveraged to implement targeted education and support programs that address specific local challenges.

Similarly, the findings underline the need to combine farmers' observations with scientific data in the development of appropriate adaptation strategies. Combining local knowledge with scientific research will help us come up with more resilient agricultural practices tailored to the specific conditions faced by small-scale farmers in Chongwe. This approach can help mitigate the adverse effects of climate change and improve the sustainability of agricultural practices in Chongwe district.

#### ***5.2.2.1 Delayed Onset of Rains***

A prevalent concern among farmers is the delayed onset of rains, which disrupts traditional planting schedules and adversely affects crop yields. One male farmer articulated this issue, stating, "The rain used to come in November, but now it sometimes comes much later, and when it comes, it's not enough." Similarly, a female farmer observed, "The rains have become very unpredictable. This year, it came too late, and the crops didn't grow well." These quotes

reflect a growing uncertainty in agricultural planning, as farmers struggle to adapt to unpredictable weather patterns. The disruption of planting schedules can lead to lower yields and increased vulnerability to food insecurity, highlighting the urgent need for timely and accurate weather information to inform agricultural decisions. (Tufa, Kanyamuka & Alene et al., 2023).

#### ***5.2.2.2 Shorter Rainy Seasons***

Farmers also reported that the rainy seasons have become shorter, complicating their ability to sustain crops. An extension worker noted, "The droughts and shorter rainy seasons create real difficulties in meeting basic agricultural needs." A female farmer further elaborated, "This year, the rains didn't come on time, and when they came, they weren't enough. My beans didn't grow well, and the maize dried up before it could mature." The shortening of rainy seasons not only threatens crop viability but also exacerbates the challenges posed by delayed rains. This dual impact highlights the need for farmers to adopt more resilient agricultural practices and crop varieties that can withstand these changing conditions. (Brookings, 2023).

#### ***5.2.2.3 Loss of Forests***

Although less frequently mentioned, the loss of forests was recognized as a significant factor contributing to climate change. One farmer remarked, "deforestation, droughts, and floods are the main factors contributing to climate change here. Deforestation, in particular, has widespread effects, impacting not only the climate but also agriculture and the land overall." This statement indicates awareness among farmers of the interconnectedness of environmental degradation and climate change. Deforestation can disrupt local ecosystems, reduce biodiversity, and alter rainfall patterns, further complicating agricultural practices. Addressing deforestation through sustainable land management practices is essential for mitigating climate impacts and promoting agricultural resilience. (Simpson et al., 2021; Ogunnaike, Kehinde & Oyawole, 2021)

#### ***5.2.2.4 Increased Temperatures***

Increased temperatures emerged as another significant concern, affecting both crop and livestock health. One female farmer explained, "The dry seasons are getting longer and hotter, and when the rain comes, it's either too much or too little." Another extension worker added, "High temperatures can be fatal to animals and bring about new diseases that we didn't face as often before." These observations highlight the direct impact of rising temperatures on

agricultural productivity and livestock health. The increasing frequency of extreme weather events necessitates the development of adaptive strategies that can help farmers cope with these challenges, such as implementing heat-resistant crop varieties and improving animal husbandry practices. (Azevedo & Marques, 2017; Niepold et al., 2008)

#### ***5.2.2.5 Validating Local Knowledge***

The consistency between farmers' observations and documented climatic changes accentuates the validity of their experiences. This alignment underscores the importance of incorporating local knowledge into climate literacy programs. Farmers' firsthand observations can serve as a valuable resource for developing targeted adaptation strategies. As one farmer noted, "I don't understand much about climate change, but I see that things are harder now. We can't rely on the weather anymore." Another farmer emphasized, "I don't fully understand it, but I know the drought is making farming very difficult." These sentiments illustrate a disconnect between scientific understanding and practical experience, suggesting that education and outreach efforts should prioritize translating complex climate concepts into actionable strategies that resonate with farmers' lived experiences. (USGCRP, 2009).

#### ***5.2.3 Impact on Agricultural Practices***

The changes in climate have led to several challenges, including reduced crop yields, heat stress on livestock, and increased economic strain. These findings align with studies that document the adverse effects of climate change on agricultural productivity (Harvey, Saborio-Rodríguez & Martínez-Rodríguez et al., 2018; Onyango, 2021). The impact of climate change on agricultural practices highlights the urgent need for effective adaptation strategies. According to farmers, adopting the planting of draught resistance varieties that can tolerate the effects of climate change to improve crop productivity. This finding corroborates a study conducted by FAO in developing countries which revealed that planting different crop varieties enhances achievement of a sustainable agricultural growth for food security amidst climate change (McCarthy, Lipper & Zilberman, 2018). Improving climate literacy among farmers can enhance their ability to implement such strategies, thereby mitigating the negative effects on productivity.

#### ***5.2.4 Understanding of Climate Literacy and its Influence on Perceptions of Small-Scale Farmers***

The responses of small-scale farmers when asked how their understanding of climate change had shaped their perceptions of such changes were noted. The findings revealed that many farmers (20 responses) have a limited understanding of climate change, which likely affects their perceptions of its impact. This limited understanding can lead to misconceptions about the causes and effects of climate change, making it difficult for farmers to implement effective adaptation strategies. The lack of detailed knowledge means that farmers may not fully grasp the long-term implications of climate variability on their agricultural practices, leading to reactive rather than proactive measures.

Meanwhile, 15 farmers acknowledge awareness of the negative effects of climate change, indicating that some level of understanding exists, but it may not be comprehensive. Additionally, 11 farmers feel powerless to address these changes, suggesting a significant gap between knowledge and action. This feeling of powerlessness can be attributed to a lack of resources, support, and education on how to effectively respond to climate challenges. Bridging this gap requires targeted educational programs that not only increase climate literacy but also provide practical tools and resources to empower farmers. By enhancing their understanding and providing actionable strategies, farmers can better adapt to the changing climate and improve their resilience. This is in line with Simpson et al., 2021; Ogunnaike, Kehinde & Oyawole, 2021.

#### ***5.2.4 Perception on Climate Change***

The findings indicate that 35 farmers believe higher levels of climate literacy correlate with more effective climate change adaptation strategies, showing strong support for education as a vital factor. (Gangwar, 2010). This overwhelming support underscores the importance of investing in educational initiatives that enhance farmers' understanding of climate change and its impacts. Thus, by improving climate literacy, farmers can make more informed decisions about crop selection, irrigation practices, and other adaptive measures. This, in turn, can lead to increased agricultural productivity and sustainability, helping farmers to better cope with the adverse effects of climate change.

Six farmers responded with "Probably," reflecting cautious optimism about the relationship between climate literacy and effective adaptation strategies, while five farmers expressed

uncertainty. This cautious optimism and uncertainty highlight the need for further research and evidence-based programs that demonstrate the tangible benefits of climate literacy. Providing farmers with success stories and case studies of effective adaptation can help build confidence in the value of climate education. Additionally, creating platforms for knowledge exchange and peer learning can foster a community of informed farmers who support each other in implementing adaptive practices. Overall, the data emphasizes the critical role of education in enhancing the adaptive capacity of small-scale farmers in Chongwe.

#### ***5.2.4 Climate Literacy Levels among Small Scale Farmers***

The evidence of climate literacy levels among small-scale farmers in Chongwe revealed that a good number of farmers possessed basic recognition of climate change phenomena, while a minimum number demonstrate partial understanding, and very few had comprehensive knowledge. This significant knowledge gradient within the farming community highlights the varying degrees of understanding and awareness among farmers. The majority of farmers have a rudimentary grasp of climate change, recognizing its basic concepts and impacts, but lack the in-depth knowledge necessary to fully comprehend and address its complexities.

This stratification in climate literacy levels is critical because it directly influences how farmers perceive and respond to climate change. (Moonga and Moonga, 2018). Farmers with only basic recognition may not fully understand the long-term implications of climate variability, leading to less effective adaptation strategies. In contrast, those with comprehensive knowledge are better equipped to implement proactive measures that enhance resilience and sustainability. The observed changes in climatic patterns, including delayed onset of precipitation and elevated temperatures, are corroborated by the farmers' experiential observations, establishing a clear nexus between empirical climate data and local phenomenological understanding. This alignment underscores the importance of integrating scientific data with local knowledge to develop effective adaptation strategies.

The significant knowledge gradient also suggests a need for targeted educational interventions that elevate farmers from basic recognition to comprehensive understanding. Providing tailored education programs that address the specific needs and contexts of small-scale farmers can be a significant tool in bridging the knowledge gap and empowering small-scale farmers in Chongwe to make informed decisions. These programs should incorporate practical examples

and hands-on training to ensure that farmers can apply their knowledge effectively. Enhancing climate literacy at all levels will not only improve individual resilience but also strengthen the overall adaptive capacity of the farming community in Chongwe. This approach is essential for mitigating the adverse effects of climate change and ensuring the long-term sustainability of agricultural practices in the region.

### **5.3 Small-Scale Farmers' Involvement in Climate Literacy Interventions**

There is a relationship between various nodes in the Knowledge-Action Network, focusing on climate change adaptation among small-scale farmers in Chongwe, Zambia. This network analysis elucidates the complex interconnections between knowledge acquisition pathways and practical implementation. It highlights the interconnectedness and relative importance of key aspects such as Climate Literacy, Local Knowledge, Adaptation Strategies, Resource Access, Implementation, and Farming Practices. The high centrality and impact scores of Adaptation Strategies and Implementation underscore their pivotal roles in driving effective climate adaptation. With the low impact responses, adaptation Strategies are crucial for integrating various elements of the network, ensuring that farmers adopt practices that enhance their resilience to climate change. This study emphasized the importance of putting these strategies into practice effectively. These findings suggested that focusing on these nodes can significantly enhance the overall effectiveness of climate adaptation efforts. (Moonga and Moonga 2018)

Climate Literacy, while also showing limited record and a significant impact indicates potential for further enhancement to increase its network influence. This is critical as higher levels of climate literacy among farmers are correlated with more effective adaptation strategies, as indicated by the responses of 35 farmers. Local Knowledge and Resource Access, though valuable, have lower centrality and impact scores, suggesting that these areas could benefit from increased integration and support. Enhancing Local Knowledge and Resource Access can strengthen their roles in the network, making them more influential in driving climate adaptation. The low impact perception of farming practices highlights the need for continuous improvement in agricultural techniques to cope with climate variability. Overall, the analysis underscores the necessity of a holistic approach that strengthens all aspects of the Knowledge-Action Network, ensuring that small-scale farmers in Chongwe are well-equipped to adapt to the ongoing climatic changes.

### ***5.3.1 Participation in Programmes***

The findings highlight a significant discrepancy in the involvement of small-scale farmers in climate literacy interventions, with farmers in this study indicating no participation in formal programs. This lack of engagement underscores critical barriers, including accessibility issues, the relevance of content and socioeconomic factors that may impede participation. The expressed desires of farmers to gain knowledge about climate change adaptations suggest an untapped potential for greater engagement if appropriate educational frameworks are established. For instance, one farmer noted, "No, I haven't, but I would like to learn more about what's happening and how to deal with it" (Male, 48 years old). Another echoed this sentiment, stating, "No, I haven't, but I think it would help a lot. We need to learn how to deal with these changes" (Male, 36 years old). These quotes illustrate a strong desire among farmers for knowledge and skills related to climate change, yet their lack of participation indicates systemic issues that need to be addressed. This is in line with what Moonga and Moonga, 2018 says.

The systemic barriers to participation may disproportionately affect specific demographic groups, particularly women, who traditionally face greater obstacles in accessing educational and financial resources. Addressing these barriers through targeted outreach, accessible learning formats, and community-based programs could facilitate increased participation in climate literacy initiatives. For example, creating mobile learning units or community-based workshops that are scheduled at convenient times for women and other marginalized groups could help bridge the gap. Additionally, integrating climate literacy into existing agricultural extension services and leveraging local leaders to champion these programs can enhance their reach and effectiveness. This approach not only improves individual resilience but also strengthens the overall adaptive capacity of the farming community in Chongwe.

Going forward, the sources of information on climate literacy for small-scale farmers in Chongwe. Out of 46 respondents, 22 farmers rely on extension officers, making them the most significant source of information. This highlights the crucial role that extension officers play in disseminating climate-related knowledge and supporting farmers in adapting to climate change. The reliance on extension officers underscores the importance of strengthening these services through increased funding, robust training programs, and ongoing support to ensure they can effectively communicate climate information and assist farmers in implementing adaptation strategies.

Additionally, 19 farmers obtain their information from radio programs, indicating that radio is a vital medium for reaching farmers with climate literacy content. This suggests that radio programs are an effective tool for disseminating information to a broader audience, especially in rural areas where access to other forms of media may be limited. Community meetings are also a significant source of information, with 15 farmers relying on them. This reflects the importance of local gatherings in facilitating the exchange of knowledge and experiences among farmers. The combined reliance on extension officers, radio programs, and community meetings highlights the need for a multi-faceted approach to climate literacy that leverages various channels to reach and educate farmers effectively. By enhancing these information sources, we can improve farmers' understanding of climate change and their capacity to adapt to its impacts.

#### ***5.3.1.1 Significance of Limited Engagement***

Although the small number of participants in climate literacy interventions may seem insignificant at first, the positive feedback from those who attended workshops highlights the potential benefits of increased training and education. Attendees reported a better understanding of climate change and adaptation strategies. One farmer who attended a workshop mentioned, "Yes, actually. Last year, I attended a workshop on using drought-resistant seeds and water conservation methods" (Male, 39 years old). This finding aligns with the research of Tufa, Kanyamuka & Alene et al. (2023), which posits that hands-on training, and demonstrations significantly surpass mere awareness in promoting the adoption of climate-smart practices. The contrast between the few participants and the positive outcomes from those who did engage suggests that expanding access to such programs could yield substantial benefits for the broader farming community.

#### ***5.3.1.2 Barriers to Participation***

The low participation rates in climate literacy programs may stem from various factors, including a lack of awareness about available programs, perceived irrelevance, or barriers in accessing training opportunities. (UN CC: Learn Knowledge Sharing Platform, 2021). Many small-scale farmers may view climate change as a distant concern rather than an immediate threat, leading to apathy toward climate literacy initiatives. One farmer expressed this challenge, stating, "I don't feel prepared at all. I think we need more information and help to know what to do" (Female, 32 years old). Another farmer added, "No, I haven't. But I would

really like to learn. We need to know what we can do to survive this" (Female, 42 years old). These sentiments reflect a critical gap in communication and outreach that must be addressed to foster greater engagement.

### ***5.3.1.3 Strategies for Improvement***

Addressing these barriers is essential to fostering greater involvement in climate literacy programs. Increasing awareness of available programs, demonstrating the immediate relevance of climate literacy, and making training opportunities more accessible can enhance participation rates. As one farmer suggested, "We need more workshops like that, and also irrigation systems. We're too dependent on rain, and with climate change, that's not working" (Male, 39 years old). This statement highlights the need for not only educational workshops but also practical infrastructure improvements to support sustainable farming practices. Another farmer emphasized the need for targeted support, stating, "We need better seeds, maybe more drought-resistant ones, and information on how to deal with these changes" (Male, 48 years old). This indicates a desire for comprehensive support that combines education with tangible resources. (ZAMSTATS, 2022).

### ***5.3.2 Sources of Information***

Small scale farmers primarily received information through extension officers, community meetings, and radio programs. This aligns with the literature, which emphasizes the critical role of extension services in disseminating climate information (Okpokiri, Mba, Chigozirim & Ukeh, 2021).

#### ***5.3.1.1 Extension Officers***

Extension officers emerged as the most commonly used source of information among both male and female farmers. Out of the 46 farmers interviewed, **22 farmers** (12 males and 10 females) reported receiving regular visits and advice on farming practices from extension officers. One male farmer noted, "The extension officers come to our farms regularly and give us advice on what to plant and how to take care of our crops." This statement highlights the proactive nature of extension services, which not only provide information but also foster a supportive relationship with farmers. Similarly, a female farmer stated, "We get most of our information from the extension officers who visit us. They tell us about new farming techniques and how to deal with the changing weather." This demonstrates that extension officers are crucial in equipping farmers with the knowledge necessary to adapt their practices in response

to climate variability. The reliance on extension officers indicates a significant trust in these professionals as credible sources of information. Tufa, Kanyamuka and Alene et al. (2023) states that regular engagement with farmers can help to bridge the knowledge gap regarding climate-smart agricultural practices, thereby enhancing farmers' capacity to respond effectively to climate challenges.

### ***5.3.1.2 Community Meetings***

Community meetings also served as a significant source of information, with **15 farmers** (8 males and 7 females) mentioning discussions facilitated by local leaders and NGOs. A male farmer shared, "We have community meetings where local leaders and NGOs discuss farming practices and how to adapt to climate change." This illustrates the importance of collective learning and knowledge-sharing within the community. A female farmer added, "The community meetings are very helpful. We learn a lot from the discussions facilitated by the local leaders." These meetings provide a platform for farmers to engage in dialogue, share experiences, and collectively address challenges related to climate change. The community meetings not only enhance knowledge but also foster a sense of solidarity among farmers. By discussing common issues and solutions, these gatherings can empower farmers to advocate for their needs and explore collaborative adaptation strategies. (Mabuku, Senzanje & Mudhara et al, 2019).

### ***5.3.1.3 Radio Programs***

Radio programs were another key source of information, with **19 farmers** (10 males and 9 females) mentioning broadcasts that provide weather forecasts and farming tips. One male farmer said, "I listen to the radio programs that provide weather forecasts and farming tips." A female farmer echoed this sentiment, stating, "The radio programs are very helpful. They give us information on how to deal with the changing weather." The accessibility of radio as a medium allows farmers to receive timely information that can directly impact their farming decisions. However, while radio programs are beneficial, they may not always provide the localized, specific guidance that farmers need. The general nature of the information may leave some farmers uncertain about how to implement suggestions in their unique contexts, as indicated by the reliance on other sources like extension officers and community meetings for more tailored advice. (Atta-Aidoo J et al. 2022).

These findings call attention to the importance of extension officers, community meetings, and radio programs as key sources of information for farmers in Chongwe. The gender dynamics indicate that both male and female farmers rely on these sources, with a slightly higher number of male farmers utilizing extension officers and radio programs. This underscores the need to continue supporting and enhancing these channels to effectively disseminate climate-related information and support farmers in adapting to climate change.

To maximize the effectiveness of these information sources, it is crucial to ensure that extension services are adequately resourced and trained to meet the diverse needs of farmers. Additionally, community meetings should be encouraged as platforms for ongoing education and collective problem-solving. Finally, radio programs should strive to provide more localized content that addresses specific agricultural challenges faced by farmers in Chongwe, thereby enhancing their overall climate resilience.

#### **5.4 Influence of Climate Literacy on Adaptation Strategies**

The data indicates varying levels of strategy adoption, with traditional methods showing higher implementation rates compared to resource-intensive solutions. This disparity relates significantly with the farmers' climate literacy levels, suggesting that knowledge constraints directly influence adaptation choices.

Additionally, that the findings reveal that the demographic characteristics, including years of farming experience and crop diversity, significantly influence the development and implementation of climate change adaptation strategies. Specifically, 19 farmers have over 20 years of experience, which provides them with a wealth of knowledge that can inform effective adaptation practices. Conversely, 14 farmers have between 6 and 10 years of experience, indicating a need for targeted educational interventions to enhance their adaptive capacity.

Moreover, the reliance on staple crops, particularly maize, which is cultivated by 38 farmers underscores the need for tailored educational interventions that facilitate the adoption of climate-resilient agricultural practices. As evidenced in the demographic profile, the presence of both relatively inexperienced and seasoned farmers necessitates inclusive educational programming that fosters intergenerational knowledge transfer, enhancing the efficacy of adaptation strategies employed within the community. (Mabuku, Senzanje & Mudhara et al, 2019).

It is also applicable that gender-sensitive approaches be emphasized to develop and implement effective climate literacy programs. Women, who make up half of the sample population, often play a very critical role in resource management and food security and must be actively involved in these educational efforts so that their needs and views are taken into consideration. Thus, by fostering a more inclusive and equitable educational environment, the adaptation strategies that would be developed would be comprehensive and effective in building the resilience of the farming community at large.

In further discussion of findings, the results highlight a critical aspect of climate change adaptation among small-scale farmers in Chongwe: the influence of their understanding of climate change on their adaptive strategies. The data reveals that 25 farmers feel their understanding has a "limited influence" on their adaptive strategies, indicating a predominant tendency towards reactive farming practices. This suggests that while farmers may recognize changes in climate, their limited understanding prevents them from developing proactive and informed adaptation strategies. Instead, they are likely responding to immediate climatic events without a long-term strategy, which can lead to suboptimal adaptation and increased vulnerability to future climate variability. This reactive approach underscores the need for comprehensive climate education programs that not only raise awareness but also equip farmers with the knowledge and skills to anticipate and plan for climatic changes.

Furthermore, the data shows that 15 farmers are "Just reacting to changes," and 6 farmers report "No significant influence" from their understanding of climate change on their adaptive strategies. This indicates a significant gap between knowledge and action, where even those who are aware of climate change impacts feel powerless or uncertain about how to effectively respond. This gap can be attributed to several factors, including a lack of access to relevant information, insufficient training on adaptive practices, and limited resources to implement changes. (Onyango, 2021).

Addressing this gap requires a multi-faceted approach that includes targeted education, practical training, and support systems to help farmers transition from reactive to proactive adaptation. When scientific knowledge is integrated with local experiences and providing continuous support, small scale farmers' adaptive capacities become enhanced, enabling them to develop and implement strategies that are resilient to climate change. This approach is

essential for building sustainable agricultural practices and improving the overall resilience of the farming community in Chongwe.

#### ***5.4.1 Adaptation Strategies Employed***

The findings indicate various strategies that small-scale farmers employed in adapting to climate change, depicting both innovative and traditional ways aimed at mitigating its impacts. The study shows the adaptation strategies employed by small-scale farmers in Chongwe, with a total of 31 farmers actively adapting to climate change. One of the major strategies included planting drought-resistant crops, with 6 farmers planting crops like cassava, sorghum, and millet. This crop replacement is crucial for ensuring food security in light of the increasingly erratic climatic conditions. (Fadairo & Keita, 2021).

Drought-resistant crops are generally more resilient, requiring less water, hence more appropriate for the challenges of a changing climate. As one farmer noted, "We've tried planting different crops like cassava, which can survive with less water" (Female, 35 years old). Besides, water conservation techniques were used by 4 farmers through practices such as mulching and rainwater harvesting.

These are important strategies for retaining soil moisture and optimizing water use, especially in an environment where water shortage is an increasing concern. The timing of planting had also been adjusted by 5 farmers, who had begun planting earlier to avoid potential dry spells. This flexibility in agricultural timing is critical for adapting to seasonal changes brought about by climate change. However, this strategy does not always yield positive results, as one farmer shared, "I've tried planting earlier, but it didn't help this time because the rains still didn't come on time" (Female, 31 years old). More crop diversification has also been practiced as a means of managing risk; 3 farmers have been planting different crops in order to avoid the potential failure of some. This spreads the risk and makes livelihoods more resilient, enabling farmers to adapt better to climatic uncertainty.

In livestock management, 3 farmers reported having reduced the number of cattle to reduce pressure on water and feeding resources, showing a pragmatic adaptation to resource constraints. One farmer stated, "I've started keeping fewer cattle because there's not enough water for them during the dry season" (Male, 50 years old). Drought-tolerant seeds, mentioned

by 2 farmers, show a shift toward novel solutions in order to keep up with agricultural technological advancements that improve resilience against drought.

The adoption of conservation agriculture practices, such as crop rotation and minimal tillage by 2 farmers, demonstrates an interest in sustainable agriculture methods that could help improve soil health and reduce erosion. Despite these proactive steps, the data indicates that information and training are key areas of support. Whereas only 2 farmers have approached knowledge through workshops and extension services, there is definitely a need for more widespread outreach and training programs geared to the local context. For instance, whereas many respondents wish to invest in irrigation systems, only 2 farmers have actually done so; thus, the lack of resources and infrastructure remains very real. Finally, the incorporation of local knowledge and traditional practices by 1 farmer reflects the potential value of indigenous methods in adapting to climate variability.

The findings revealed that 31 out of 46 farmers were actively doing something to adapt to climate change, while 15 farmers said they did not know what to do. The 15 farmers who feel uncertain about their options point to the need for improvement. Targeted education, extension services, and community involvement can therefore be employed to enable the stakeholders in agriculture to involve more farmers in effective adaptation strategies as a means of building resilience within farming communities.

#### ***5.4.2 Effectiveness of Adaptation Strategies***

The evaluation of adaptation strategies among small-scale farmers, as depicted in table 3, indicates a varied level of effectiveness. Among the 31 farmers who reported actively engaging in adaptation efforts, only 10 expressed that their strategies had a positive impact on mitigating the effects of climate change. This leaves 21 farmers who did not perceive their efforts as effective, raising important considerations regarding the challenges and limitations of the employed approaches. While it is encouraging that a majority of farmers are attempting to adapt to climate change, the relatively low number of those who find their strategies useful suggests mismatch between adoption and tangible outcomes.

This discrepancy may be attributed to multiple factors, including inadequate access to resources, such as drought-resistant seeds or irrigation systems, and the complexities inherent in local environmental conditions. For instance, one farmer noted, "It helps a little, but the

yields are still lower than they used to be" (Female, 35 years old). Another farmer shared a direr situation: "My crops have failed this season. There's no improvement at all because of the drought" (Male, 36 years old). These statements highlight the ongoing struggles faced by farmers despite their efforts to adapt. This is in line with a study by Moonga and Moonga (2018)

Additionally, the perceived ineffectiveness of certain strategies could stem from a lack of knowledge regarding best practices or the suitability of specific techniques to individual farming contexts. One farmer emphasized the need for better support: "*We need more information on how to survive this drought and access to better tools like irrigation systems*" (Female, 50 years old). Moreover, the finding that 15 farmers reported feeling uncertain about what actions to take highlights a critical gap in knowledge and support. For these farmers, the absence of clear guidance can result in hesitance to adopt more effective techniques, ultimately undermining the overall adaptation capacity of the farming community. This underscores the importance of targeted educational initiatives that can clarify effective practices and foster confidence among farmers in their decision-making processes.

In light of these findings, it is evident that while some farmers are proactively seeking to adapt to climate change, a significant number require additional support to enhance the efficacy of their strategies. Strengthening educational programs, improving access to resources, and cultivating a collaborative environment for knowledge exchange are essential steps toward improving the overall effectiveness of adaptation efforts within the agricultural community. (Fadairo & Keita, 2021). Addressing these needs may lead to more successful outcomes in the face of the ongoing challenges posed by climate change.

#### ***5.4.3 Influence on Strategy Development***

There are challenges in the development of adaptive strategies among farmers. The study reveals that 25 farmers feel their understanding of climate change has a "limited influence" on their adaptive strategies, indicating a tendency towards reactive farming practices. This reactive approach suggests that many farmers are not proactively planning for climate variability but are instead responding to immediate changes as they occur. This can lead to less effective adaptation measures, as reactive strategies often lack the foresight and preparation needed to mitigate long-term impacts. The fact that 15 farmers express that they are "Just reacting to

changes" further underscores this issue, pointing to a broader trend of insufficient proactive planning within the farming community.

The limited influence of climate change understanding as supported by Simpson et al. (2021), on strategy development suggests a pressing need for improved education and knowledge integration. Farmers who are better informed about climate change and its potential impacts are more likely to develop effective, proactive adaptation strategies. This knowledge can empower them to anticipate changes and implement measures that enhance their resilience. For instance, understanding seasonal weather patterns and long-term climate trends can help farmers make informed decisions about crop selection, planting schedules, and water management practices. However, the current data indicates that many farmers lack this critical knowledge, which hampers their ability to adapt effectively.

Moreover, the finding that 6 farmers reported "no significant influence" from their understanding of climate change on their adaptive strategies highlights a critical gap in knowledge dissemination and application. This gap can be addressed through targeted educational initiatives and extension services that provide farmers with the necessary information and tools to integrate climate knowledge into their farming practices. Programs that enhance farmers' understanding of climate change and its implications can help shift them from reactive to proactive adaptation strategies. This shift is essential for building long-term resilience in the agricultural sector, ensuring that farmers are better equipped to handle the ongoing and future challenges posed by climate change.

#### ***5.4.4 Helpful Resources for Climate Change Adaptation***

The data revealed that 30 responses highlighted the need for irrigation systems, indicating a critical demand for better water management to address the effects of drought. This significant number underscores the importance of reliable water sources in maintaining crop yields and livestock health during increasingly erratic weather patterns. The instance Muchanga (2013), emphasis on irrigation systems suggests that farmers recognize the necessity of investing in infrastructure that can provide consistent water supply, thereby reducing their vulnerability to prolonged dry spells. This demand aligns with broader trends in agricultural adaptation, where water management is often a key component of resilience strategies.

In addition to irrigation systems, 10 responses requested better seeds for improved resilience to climate variability, showing an awareness of genetic adaptation as a crucial factor in climate resilience. The preference for drought-resistant and climate-resilient seed varieties indicates that farmers are looking for ways to enhance the robustness of their crops against adverse weather conditions. This awareness reflects a proactive approach to adaptation, where farmers seek to leverage advancements in agricultural science to mitigate the impacts of climate change. By adopting seeds that are better suited to withstand extreme conditions, farmers can potentially improve their yields and ensure food security despite the challenges posed by a changing climate.

Lastly, 6 responses emphasized the necessity for training and education, reflecting a desire for greater knowledge to implement effective adaptation strategies. This highlights a critical need for capacity-building initiatives that can equip farmers with the skills and information required to navigate the complexities of climate change. Training programs and educational workshops can play a pivotal role in disseminating best practices, innovative techniques, and up-to-date research findings. By fostering a deeper understanding of climate change and its implications, these programs can help shift farmers from reactive to proactive adaptation strategies. Overall, the data emphasizes the multifaceted nature of support required by farmers, encompassing infrastructure, genetic resources, and knowledge enhancement to build a resilient agricultural sector. (Muchanga 2013).

## **5.5 Key Informants' Insights**

### ***5.5.1 Role and Responsibilities of Extension Workers***

This section provides a comparative overview of insights from key informants, highlighting common themes and differences in their responses. Extension workers play a crucial role in connecting farmers with resources and providing support, with a focus on promoting drought-resistant crops and livestock. The impacts of climate change, such as irregular rainfall and increased disease pressures, significantly affect small-scale farmers. Various programs aim to improve climate literacy and adaptation, though challenges remain, including the need for better funding and support. Adaptation strategies include employing drought-resistant crops, selecting livestock breeds that withstand higher temperatures, and adopting irrigation techniques. Enhanced climate literacy is seen as vital for improving productivity and resilience among farmers.

These findings align with existing literature emphasizing the significance of extension services in enhancing climate literacy and agricultural productivity (Ogunnaike, Kehinde & Oyawole, 2021). The insights gathered from key informants highlight the critical need to strengthen these extension services. Achieving this requires increased funding, robust training programs, and ongoing support for extension officers to enable them to effectively disseminate climate-related information and assist farmers in implementing appropriate adaptation strategies. One extension worker explained:

(KI) 1 *"As an extension officer, my role is to connect farmers with government resources and programs, making sure they have essential supplies like fertilizers and seeds."* Another added, *"We ensure that farmers have enough supplies, such as fertilizers and seeds, and offer support in containing diseases that could affect livestock and crops."*

### **5.5.2 Climate Literacy and Productivity**

Extension workers observed a direct relationship between climate literacy and agricultural productivity, noting that farmers with higher levels of understanding tend to implement more effective adaptation strategies. This finding corroborates previous studies that demonstrate the positive correlation between climate literacy and agricultural outcomes (Onyango, 2021; Gwademba, Wamae & Muthee et al., 2023). The implications of this relationship underscore the necessity of investing in tailored education programs that address the unique needs and contexts of small-scale farmers. Such initiatives can enhance farmers' capacity to adapt to climate fluctuations, ultimately improving their productivity.

One extension worker noted:

(KI) 2 *"When farmers understand climate challenges, they're able to plan and make better choices about what crops to plant and which animals to keep."* Another emphasized, *"Climate literacy allows farmers to anticipate which vaccinations or disease prevention measures are needed for their livestock."*

It is apparent from the insights of extension workers that climate literacy significantly influences farmers' adaptation strategies. Extension workers emphasized that when farmers possess a solid understanding of climate challenges, they are better positioned to make informed decisions regarding crop selection and livestock management. As one extension worker articulated, (KI) 1 *"When farmers understand climate challenges, they're able to plan and make better choices."* This connection reinforces the importance of investing in education

and outreach activities that not only convey essential climate concepts but also empower farmers to apply this knowledge in practical ways. Enhancing climate literacy will significantly contribute to the effectiveness of adaptation strategies and strengthen the resilience of small-scale farmers in the face of ongoing climatic changes.

### ***5.5.3 Impacts of Climate Change on Small-Scale Farmers***

Extension workers also highlighted the substantial effects of climate change on small-scale agriculture. They pointed to altered rainfall patterns, recurrent droughts, and increased disease pressures on crops and livestock as significant challenges facing farmers. As one extension worker noted, "Climate change has drastically altered rainfall patterns and seasons, making it harder for farmers to grow crops and find adequate feed for animals." These insights revealed the urgent need for adaptive measures to help farmers navigate the increasingly unpredictable climate landscape. (Rahman, 2016). Another extension worker added, "The droughts and shorter rainy seasons create real difficulties in meeting basic agricultural needs." They also mentioned, "Seasonal changes mean there's less pasture for animals, which puts livestock at risk. Fish farming also suffers as groundwater becomes scarce."

### ***5.5.4 Climate Literacy among Small Scale Farmers***

Estimates suggest that climate literacy among farmers remains moderate, according to extension workers. While there are ongoing efforts by government entities and NGOs to enhance this literacy (Muchanga 2013), many farmers still struggle with a comprehensive understanding of climate dynamics and their implications for agricultural practices. As one extension worker observed, while some farmers grasp basic concepts, (KI) 5 "most lack a deep understanding of how climate change affects their farming practices and what they can do to adapt." This highlights the need for continued educational initiatives that enhance climate knowledge specifically tailored for small-scale farmers. Another extension worker noted, (KI) 2 "Climate literacy is essentially an understanding of climate and its impact on day-to-day weather patterns. Among small-scale farmers, I'd rate climate literacy at around moderate".

### ***5.5.5 Climate Interventions and Programs***

Several programs have been established to assist farmers in adapting to climate change. These initiatives focus on promoting drought-resistant crops, improving irrigation systems, and introducing livestock breeds better suited to changing climate conditions. demands (Maulu, Hasimuna, Haambiya et al., 2021). As noted by extension workers, "There are several

programs... aimed at both mitigating climate change and helping farmers adapt.” However, effective implementation and awareness of these programs among farmers are critical for their success. One extension worker mentioned, (KI) 4 "We have different programs that are intended to mitigate as well as implement adaptation processes on climate change."

#### ***5.5.6 Effectiveness of Climate Interventions***

The extension workers embarked on a shift in farming practices, noting that while much attention has been directed toward preventing global warming, adaptations are slowly starting to take shape. Libanda (2023) revealed similar findings that farmers are increasingly turning to crops that require shorter rainy seasons and utilizing drought-resistant varieties. As one extension worker indicated, (KI) 4 “Most of the focus has been on preventing global warming rather than adapting.” But we are starting to see changes in farming practices.” This transition underscores the evolving nature of agricultural responses to climate change. Another extension worker added, (KI) 3 “Farmers are shifting to crops that can grow in shorter rainy seasons, using drought-resistant varieties, and adopting livestock breeds that can tolerate hotter temperatures."

#### ***5.5.7 Strategies for Adapting to Climate Change***

Extension workers reiterated the importance of employing drought-resistant crops, selecting livestock breeds that withstand higher temperatures, and adopting irrigation strategies as critical measures for adaptation. (Libanda, 2023) They emphasized the need for farmers to be informed about which crops or farming methods to use, such as conservation farming and rainwater harvesting. One worker stated, (KI) 5 “Education programs and support from the government and NGOs are crucial in helping farmers adapt to these changes.” This indicates a recognition that ongoing education and support are vital to enhancing the effectiveness of adaptation strategies. Another extension worker noted, (KI) 1 "We need to know what crops or what methods to use, such as conservation farming and rainwater harvesting."

#### ***5.5.8 Challenges in Climate Literacy and Recommendations for Improvement***

Despite the identified benefits of climate literacy, extension workers pointed to multiple challenges in enhancing farmers’ understanding of climate issues. These include a lack of seriousness toward climate change among some farmers and a pressing need for adequate funding and support programs as noted by one extension worker, (KI) 2 "*A big challenge is that some farmers don't take climate change seriously, viewing it as a fundraising topic.*" To

overcome these barriers, it is essential to expand access to targeted education programs, ensure proper funding, and address misconceptions regarding climate change. By enhancing climate literacy, small-scale farmers will be better equipped to adapt to and mitigate the impacts of climate variability on their livelihoods. (Chonabayashi et al. 2020). Another extension worker emphasized, (KI) 1 "We need proper funding and support programs to help farmers understand these issues."

Findings from key informants have shown the critical role that extension workers can play in improving climate literacy and supporting small-scale farmers to adapt to climate change. It is therefore upon these challenges and using the insights provided by the key informants that effective strategies that will improve the resilience and productivity of the small-scale farmers in Chongwe can be developed. Extension workers pointed out that if the farmers have a good understanding of the climate challenges, then they are able to make good decisions in relation to crop selection and livestock management. As one extension worker articulated, (KI) 4 "When farmers understand climate challenges, they're able to plan and make better choices."

This connection reinforces the importance of investing in education and outreach activities that not only convey essential climate concepts but also empower farmers to apply this knowledge in practical ways. Enhanced climate literacy can be used to enhance the overall effectiveness of adaptation strategies and therefore reinforce the resilience of small-scale farmers against the ongoing climatic changes.

## **5.6 Theoretical and Conceptual Frameworks**

The findings of this study therefore support the Diffusion of Innovation Theory, which explains how new ideas, practices, and technologies are transmitted within a social system. According to the theory, the adoption of innovation is influenced by factors such as characteristics of the innovation, traits of the adopters, and the dynamics of the social system in which the adoption takes place (Rogers, 2003). This theoretical framework can suitably be used to study the adoption of climate literacy and adaptation strategies by small-scale farmers in Chongwe.

The characteristics of an innovation include perceived advantage, compatibility, simplicity, trialability, and observability of its results, which determine whether it is adopted or rejected. In relation to this, for instance, perceived advantages accruable through improved climate literacy, leading to increased crop yields, are a source of motivation that helps in new

technologies and practices. In addition, the adopters' attributes, including their education level, experiences, and social networks, play important roles in the adoption process of innovative strategies. Farmers who are more educated or have supportive community networks may be more likely to seek out and apply climate-related information and practices.

The social system includes the broader cultural, economic, and institutional factors that facilitate or hinder the adoption process. In Chongwe, local cultural beliefs and agricultural practices may either encourage or discourage the adoption of new farming techniques. For instance, conventional farming might conflict with innovative approaches and hence challenge the integration of climate literacy into the local agricultural system. Besides, other factors such as economic conditions-like the availability of resources and any kind of financial support to implement a new technology-will modify the rate of adoption by the farmers.

Whereas the Diffusion of Innovations Theory provides a robust framework through which to understand the mechanics of the adoption of climate literacy and adaptation strategies, one does well to keep in mind that there are certain contextual issues particular to Chongwe. (Dibra, 2015). These include local cultural values, historical agricultural practices, available support structures, and economic conditions that affect how an innovation is viewed and adopted. For example, community participation and local governance can help in disseminating climate information, which can enhance farmers' response to the adoption of new practices.

Full climate literacy and effective adaptation require a holistic approach that encompasses both individual and systemic factors; thus, the complexity of the adoption process should be acknowledged, and tailored interventions that echo the experiences and conditions of the local farmers should be emphasized. Potential interventions could include community-based education programs, participatory demonstrations of new practices, and building farmer networks for knowledge and experience sharing. Addressing the personal and contextual determinants of adoption should make climate literacy interventions by various stakeholders more effective in ultimately improving resilience among small-scale farmers in Chongwe to prevailing climatic changes.

Against the background of the study, any discussion and analysis putting into the limelight the impact of climate literacy on perception, adoption of adaptation strategies, and increased productivity in agriculture among small-scale farmers in Chongwe, is all the more fitting.

While there are significant challenges, such as limited participation in climate change intervention programs and variability in the effectiveness of adaptation strategies, targeted interventions can enhance climate literacy and support farmers in adapting to climate change. From such challenges, using the insight from key informants, some effective strategies could be drawn to enhance the resilience and productivity of the small-scale farmers in Chongwe.

### **5.7. Chapter Summary**

In this chapter, the findings of the study were discussed. The discussion revealed that small-scale farmers in Chongwe District generally have limited climate literacy, with some lacking access to climate change-related activities. This limited understanding affects their perceptions and adaptation strategies towards climate change. Extension workers were identified as key facilitators in mitigating this gap by connecting farmers to essential resources and providing support, particularly in the adoption of Climate Smart Agricultural practices among small scale farmers in Chongwe district. Thus, the findings align with the Diffusion of Innovation Theory, which explains how new ideas, behaviors, and technologies spread within a social system. According to Rogers (2003), the adoption of innovations is influenced by the characteristics of the innovation, the traits of the adopters, and the dynamics of the social system. This theoretical framework is relevant for understanding how small-scale farmers in Chongwe adopt climate literacy and adaptation techniques, highlighting the interaction between innovation characteristics, adopter attributes, and social system dynamics

## **CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS**

### **6.1. Overview**

This chapter presents the conclusion and recommendations of the study based on the research objectives and questions that guided it. The findings were based on the responses obtained from the participants. These were discussed with the literature reviewed and conclusions drawn from there. The purpose of the study was to explore how climate literacy has shaped the perceptions of small-scale farmers on the adaptation strategies to climate change in Chongwe District of Zambia.

### **6.2. Conclusion**

The conclusion on the on the first objective is that the small-scale farmers perceived climate literacy positively in that they have seen the effects of climate change through droughts and floods leading to their crop failures and livestock mortality. The desire for climate literacy hinges on the need for small-scale farmers to adapt strategies that can help to avert climate effects. The small-scale farmers in Chongwe district are willing to participate in climate literacy interventions in order to save their crops and livestock and ensure sustainable food security. Finally, the small-scale farmers in Chongwe do understand the influence of climate literacy on the development and implementation climate adaptation strategies as a result they welcome education on climate literacy to enhance their understanding on climate change.

The purpose of this study was to explore how climate literacy has been shaping the perceptions of small-scale farmers on the adaptation strategies to climate change in Chongwe, Zambia. This study looked at how climate literacy shapes the perceptions of climate change among small-scale farmers. The study also explored small scale farmers' involvement in climate literacy interventions and how climate literacy influences the development and implementation of climate change adaptation strategies utilised by small-scale farmers in Chongwe. The research technique used a qualitative approach, with interviews serving as a data gathering instrument to gather information from small-scale farmers.

In this regard, the first objective of the study sought to establish how climate literacy shapes the perceptions of climate change among small-scale farmers in Chongwe. The study revealed that while some farmers are aware of climate change, many of the farmers had limited knowledge on climate change as they did not have a thorough understanding of its causes and

implications. In as much as the farmers lacked knowledge on climate change, they had observed significant changes in climate, including delayed onset of rains, shorter rainy seasons, loss of forests, and increased temperatures. moreover, small scale farmers insufficient understanding on climate impaired their ability to apply effective adaptation methods, resulting in lower agricultural productivity and increased vulnerability to climate-related risks.

The second objective was developed in order to explore small scale farmers' involvement in climate literacy interventions in Chongwe. The study outlined that most of the small-scale farmers surveyed have implemented strategies such as planting drought-resistant crops, adjusting planting schedules, and employing water conservation techniques. These efforts are influenced by their understanding of climate impacts and their capacity to respond. The diversity in adaptation strategies across different regions due to climate change highlights the ingenuity and resourcefulness of small-scale farmers in addressing climate risks. Despite these efforts, a significant number of farmers remain unsure about effective adaptation strategies. Some farmers expressed that their strategies had a positive impact on mitigating the effects of climate change. While other small-scale farmers did not perceive their efforts as effective, raising important considerations regarding the challenges and limitations of the employed approaches. While it is encouraging that a majority of farmers are attempting to adapt to climate change, the relatively low number of those who find their strategies useful suggests a disconnect between adoption and tangible outcomes.

The final research objective sought to tap into the understanding how climate literacy influences the development and implementation of climate change adaptation strategies utilised by small-scale farmers in Chongwe. The study revealed that while farmers may recognize changes in climate, their limited understanding prevents them from developing proactive and informed adaptation strategies. Instead, they are likely responding to immediate climatic events without a long-term strategy, which can lead to sub-optimal adaptation and increased vulnerability to future climate variability. it is evident that while some farmers are proactively seeking to adapt to climate change, a significant number require additional support to enhance the efficacy of their strategies. Strengthening educational programs, improving access to resources, and cultivating a collaborative environment for knowledge exchange are essential steps toward improving the overall effectiveness of adaptation efforts within the agricultural

community. As climate literacy influences the development and implementation of climate change adaptation strategies utilised by small-scale farmers.

### **6.3 Recommendations**

Based on the conclusions of the findings, the following recommendations are made:

#### **To the Government of the Republic of Zambia through the Ministries of Agriculture, Ministry of Fisheries and Livestock, Ministry of Education and Ministry of Green Economy and Climate**

1. The government of Zambia should develop comprehensive integrated education programs to explain climate literacy to rural communities like the small-scale farmers in Chongwe district that integrate scientific explanations with practical examples relevant to farmers' experiences. The Tailored programs should address the specific needs and contexts of small-scale farmers.
2. The government should increase funding, training, and support for extension officers to enable them to effectively disseminate climate information and support farmers in implementing adaptation strategies to rural communities such as small-scale farmers in Chongwe district.
3. The government should provide funds such as loans and grants to support rural communities as small-scale farmers in Chongwe district to enable them access better resources such as drought resistant seeds and irrigation systems to enhance their adaptation to climate change.

#### **To the Local Small-Scale Farmers**

4. The study recommends that local small-scale farmers should get involved in leveraging community networks and local knowledge to improve the reach and effectiveness of climate literacy programs. Local farmers should participate in community meetings and radio programs as they valuable channels for getting information on climate change.
5. The study also recommends that small scale farmers and Agriculture Extension Officers Should Implement continuous monitoring and evaluation of adaptation strategies to identify the most effective approaches and make necessary adjustments.

#### **6.4. Suggested Area for Further Research**

The following were identified as possible areas for future research:

1. Enlarge such a study to cover the entire Lusaka Province
2. Use such a study to focus on the Women and Youths

## REFERENCES

- Abegunde, V. O., Melusi, S., & Ajuruchukwu, O. (2021). The contribution of climate-Smart Agriculture to Farming in Sub-Saharan Africa: evidence from small scale Farmers in South Africa. In Fatunbi AO & Sarfat P (Eds) *Proceeding of the First Biennial Climate Smart Agriculture Conference*, Accra, Ghana. 1-2 December 2020. (PP 18-22) FARA
- Abegunde, V. O., Sibanda, M., & Obi, A. (2019). The dynamics of climate change adaptation in Sub-Saharan Africa: A review of climate-smart agriculture among small-scale farmers. *Climate*, 7(11), 132.  
*Accra, Ghana. 1-2 December 2020. (PP 176-184) FARA*
- Acevedo, M., Pixley, K., Zinyengere, N., Meng, S., Tufan, H., Cichy, K., Bizikova, L., Isaacs, K., Ghezzi-Kopel, K., & Porciello, J. (2020). A scoping review of adoption of climate-resilient crops by small-scale producers in low- and middle-income countries. *Nature Plants*, 6(10), 1231-1241. <https://www.nature.com/articles/s41477-020-00783>
- ActionAid Zambia. (2019, October 16). *The Effects of Climate Change in Chongwe District, Extension C of Kanakantapa*. Retrieved September 5, 2023, from <https://zambia.actionaid.org/stories/2019/effects-climate-change-chongwe-district-extension-c-kanakantapa>
- Asrat, P. & Simane, B. Farmers' perception of climate change and adaptation strategies in the Climate literacy: a systematic review and model integration. *International Journal of Global Warming*, 12(3-4), 414-430
- Atta-Aidoo J, Antwi-Agyei P, Dougill AJ, Ogbanje CE, Akoto-Danso EK, Eze S (2022) Adoption of climate-smart agricultural practices by smallholder farmers in rural Ghana: An application of the theory of planned behavior. *PLOS Clim* 1(10): e0000082. <https://doi.org/10.1371/journal.pclm.0000082>
- Balogun, A. L., Marks, D., Sharma, R., Shekhar, H., Balmes, C., Maheng, D., ... & Salehi, P. (2020). Assessing the potentials of digitalization as a tool for climate change adaptation and sustainable development in urban centres. *Sustainable Cities and Society*, 53, 101888.
- Brookings. (2023). *COP29 and the intersection of climate, gender equality, and education*. Retrieved from <https://www.brookings.edu/articles/cop29-and-the-intersection-of-climate-gender-equality-and-education/>

- Chigozirim, O. N., Ogbonnaya, O., Okpokiri, U., & Ikechukwu, C. (2020, December). Institutional interventions, socioeconomic status and climate-smart practices of farmers in southeast, Nigeria. In *Biennial Africa Climate Smart Agriculture Stakeholders Conference* (p. 97).
- Chonabayashi, S., Jithitikulchai, T., & Qu, Y. (2020). Does agricultural diversification build economic resilience to drought and flood? Evidence from poor households in Zambia. *African Journal of Agricultural and Resource Economics*, 15(311-2020-1781), 65-80.
- Clayton, S., & Karazsia, B. T. (2020). Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology*, 69, 101434.
- CSO (2016). Post-Harvest Survey, accessed on <https://www.zamstats.gov.zm/index.php/publications/category/12agriculture?download=720:phs-report-2014-2015-final-pdf> ;
- CSO (2018) Zambia In Figures <http://www.zamstats.gov.zm/phocadownload/Dissemination/Zambia%20in%20Figure%202018.pdf> ;
- Dabus watershed, North-West Ethiopia. *Ecol. Process.* 7(1), 1–13 <https://doi.org/10.1186/s13717-018-0118-8> (2018).
- Del Chiappa, G., Bregoli, I., & Atzeni, M. (2021). Uncovering knowledge on travel behaviour during COVID-19: A convergent parallel mixed-methods study in the context of Italy. *Italian Journal of Marketing*, 2021(4), 393-419.
- Dewi, D. E., Cahyani, P. A., & Megawati, L. R. (2023, May). Increasing Adoption of the Internet of Things in Indonesian Agriculture Based on a Review of Everett Rogers' Diffusion Theory of Innovation. In *Business Innovation and Engineering Conference (BIEC 2022)* (pp. 303-309). Atlantis Press.
- Dias, L. M., Kaplan, R. S., & Singh, H. (2021). Making Small Farms More Sustainable — and Profitable. *Harvard Business Review*. <https://hbr.org/2021/08/making-small-farms-more-sustainable-and-profitable>
- Dibra, M. (2015). Rogers theory on diffusion of innovation-the most appropriate theoretical model in the study of factors influencing the integration of sustainability in tourism businesses. *Procedia-Social and Behavioral Sciences*, 195, 1453-1462.

- Dumenu, W. K., & Tiamgne, X. T. (2020). Social vulnerability of smallholder farmers to climate change in Zambia: the applicability of social vulnerability index. *SN Applied Sciences*, 2(3), 436. <https://link.springer.com/article/10.1007/s42452-020-2227-0>
- Fadairo, O. S., & Keita, M. S. (2021). The West Africa Agricultural Productivity Programme (WAAPP): Smallholder paddy productivity and market linkages in Kindia Prefecture, Guinea. *Afrika Focus*, 34(1), 127-154.
- Fofana, F., Bazeley, P., & Regnault, A. (2020). Applying a mixed methods design to test saturation for qualitative data in health outcomes research. *PloS one*, 15(6), e0234898.
- Gabriella, V., & Hartanti, L. E. P. (2019). Analysis of Strategy and Implementation Diffusion of Innovation of Qlue Application Technology in Jakarta Smart City. *Jurnal InterAct*, 8(1), 6-15.
- Geda, S. A., & Köhl, R. (2021). Exploring smallholder farmers' preferences for climate-smart seed innovations: empirical evidence from southern Ethiopia. *Sustainability*, 13(5), 2786.
- George, W, Erick, O, Ciniro, C. J, Faith, L, and Abdullah, K. (2021). Aligning long-term low carbon climate-resilient development strategies with nationally determined contributions (NDCs) and national adaptation plans (NAPS) in the agriculture sector in Africa: the case of Aenya, Ghana, Uganda and Zambia. In *Fatunbi AO, and Sarfat P (Eds) Proceeding of the First Biennial Climate Smart Agriculture Conference, Accra, Ghana. 1-2 December 2020.* (PP 101-113) FARA
- Gwademba, G. K., Wamae, P. W., Muthee, D. W., Masinde, J. M., & Adam, A. A. (2023). The Use of Agricultural Extension Information Services in enhancing Maize Productivity among Smallholder Farmers in Tana River County, Kenya. *East Africa Journal of Contemporary Research*, 3(1), 1-16.
- Harvey, C. A., Saborio-Rodríguez, M. R., Martínez-Rodríguez, M. R., Viguera, B., Chain-Guadarrama, A., Vignola, R., & Alpizar, F. (2018). Climate change impacts and adaptation among smallholder farmers in Central America. *Agriculture & Food Security* 7(57). <https://doi.org/10.1186/s40066-018-0209-x>
- Hasan, N., Rana, R. U., Chowdhury, S., Dola, A. J., & Rony, M. K. K. (2021). Ethical considerations in research. *Journal of Nursing Research, Patient Safety and Practise (JNRPSP)* 2799-1210, 1(01), 1-4.

- Hazari, A. (2024). Introduction to research methodology. In *Research Methodology for Allied Health Professionals: A comprehensive guide to Thesis & Dissertation* (pp. 1-6). Singapore: Springer Nature Singapore.
- Hollstein, B. (2011). Qualitative approaches. *The SAGE handbook of social network analysis*, 1(01), 404-416.
- Hunter, D., McCallum, J., & Howes, D. (2019). Defining exploratory-descriptive qualitative (EDQ) research and considering its application to healthcare. *Journal of Nursing and Health Care*, 4(1).
- IAPRI (2015). *Rural Agricultural Livelihoods Survey*  
[https://agriprofocus.com/upload/post/RALS\\_2015\\_Survey\\_Report\\_Finalv-edited1456827249.pdf](https://agriprofocus.com/upload/post/RALS_2015_Survey_Report_Finalv-edited1456827249.pdf);
- IAPRI (2017) *Zambia Agriculture Status Report*  
[https://www.researchgate.net/publication/322676437\\_Zambia\\_Agriculture\\_Status\\_Report\\_2017](https://www.researchgate.net/publication/322676437_Zambia_Agriculture_Status_Report_2017)  
*in Chikupi resettlement in Kafue District of Zambia. National Journal of Advance Online ISSN: 2455-216X; Impact Factor: RJIF 5.12 www.allnationaljournal.com Volume 2; Issue 6; November 2016; Page No. 07-19*
- Kahlke, R. M. (2014). Generic qualitative approaches: Pitfalls and benefits of methodological mixology. *International journal of qualitative methods*, 13(1), 37-52.
- Kanema, E. M., & Gumindoga, W. (2022). Effects of changing climate on the groundwater potential: A case of Chongwe and Rufunsa Districts along the Chongwe River Catchment, Zambia. *Physics and Chemistry of the Earth, Parts A/B/C*, 127, 103192.
- Lavoie, A. L., Dentzman, K., & Wardropper, C. B. (2021). Using diffusion of innovations theory to understand agricultural producer perspectives on cover cropping in the inland Pacific Northwest, USA. *Renewable Agriculture and Food Systems*, 36(4), 384-395.
- Libanda, B. (2023). *Climate Risk Assessment Strengthening Zambia's Rationale for Climate-Financed Projects in The Area of Resilient Wash Services*. Lusaka: United Nations Children's Fund Zambia Country Office – Water, Sanitation and Hygiene
- Lochmiller, C. R. (2021). Conducting thematic analysis with qualitative data. *The Qualitative Report*, 26(6), 2029-2044.
- Mabuku, M. P., Senzanje, A., Mudhara, M., Jewitt, G. P. W., & Mulwafu, W. O. (2019). Strategies for coping and adapting to flooding and their determinants: A comparative

study of cases from Namibia and Zambia. *Physics and Chemistry of the Earth, Parts A/B/C*, 111, 20-34.

- Mapiye, O., Makombe, G., Molotsi, A., Dzama, K., & Mapiye, C. (2021). Information and communication technologies (ICTs): The potential for enhancing the dissemination of agricultural information and services to smallholder farmers in sub-Saharan Africa. *Information Development*, <https://doi.org/10.1177/026666669211064847>
- Maulu, S., Hasimuna, O. J., Haambiya, L. H., Monde, C., Musuka, C. G., Makorwa, T. H., ... & Nsekanabo, J. D. (2021). Climate change effects on aquaculture production: sustainability implications, mitigation, and adaptations. *Frontiers in Sustainable Food Systems*, 5, 609097.
- Milupi, I., Chileshe, B., Moonga, M. S., & Monde, P. (2020). Women and Natural Resource Conservation: A Study of Chongwe District, Zambia. *International Journal of Humanities Social Sciences and Education (IJHSSE)*, 7(3), 22-30. [<http://dx.doi.org/10.20431/2349-0381.0703004>]
- Mizik, T. (2021). Climate-Smart Agriculture on Small-Scale Farms: A Systematic Literature Review. *Agronomy*, 11(6), 1096. <https://doi.org/10.3390/agronomy11061096>
- Moonga ALH and Moonga SM, 2018. *Challenges Faced by Small-scale farmers*
- Mutengwa, C. S., Mnkeni, P., & Kondwakwenda, A. (2023). Climate-Smart Agriculture and Food Security in Southern Africa: A Review of the Vulnerability of Smallholder Agriculture and Food Security to Climate Change. *Sustainability*, 15(4), 2882.
- Mwongera, C., Shikuku, K. M., Twyman, J., Läderach, P., Ampaire, E., Van Asten, P., & Winowiecki, L. (2020). Limited access and use of climate information by small-scale sugarcane farmers in Kenya. *Climate Services*, 20.
- Nyanga, P. H., Johnsen, F. H., Aune, J. B., & Kalinda, T. H. (2011). Smallholder Farmers' Perceptions of Climate Change and Conservation Agriculture: Evidence from Zambia. *Journal of Sustainable Development*, 4(4), 73-85.
- Obilor, E. I. (2023). Convenience and purposive sampling techniques: Are they the same. *International Journal of Innovative Social & Science Education Research*, 11(1), 1-7.
- Ogunnaike, M. G., Kehinde, M. O., and Oyawole, F. P. (2021). Determinants of smallholder Farmers Adaptation Strategy to Climate Change in Nigeria. In *Fatunbi AO, and Sarfat P (Eds) Proceeding of the First Biennial Climate Smart Agriculture Conference*,
- Okpokiri, I. C., Mba, A.N., Chigozirim, N. O., and Ukeh, O. O. (2021). Analysis of usage and determinants of climate smart agriculture among farmers in Ebonyi state,

- Nigeria. In *Fatunbi AO, and Sarfat P (Eds) Proceeding of the First Biennial Climate Smart Agriculture Conference, Accra, Ghana. 1-2 December 2020.* (PP 157-165) FARA
- Onyango, D. A. (2021). *Climate Change Adaptation Information for Improved Agricultural Productivity among Smallholder Farmers in Lower Eastern Kenya. Master Theses: Department of Agricultural Economics and Extension* [18]. University of Embu. Accessible at: <http://repository.embuni.ac.ke/handle/embuni/3878>
- Owen, G. (2020). What makes climate change adaptation effective? A systematic review of the literature. *Global Environmental Change*, 62, 102071.
- Oziewicz, M. (2024). The climate literacy revolution. *The Ecological Citizen*, 7, 16-23.
- Pregoner, J. D. (2024). Research approaches in education: A comparison of quantitative, qualitative and mixed methods. *IMCC Journal of Science*, 4(2), 31-36.
- Rahman, M. S. (2016). The advantages and disadvantages of using qualitative and quantitative approaches and methods in language “testing and assessment” research: A literature review. *Journal of education and learning*, 6(1).
- Rajkhowa, P., & Baumüller, H. (2024). Assessing the potential of ICT to increase land and labour productivity in agriculture: Global and regional perspectives. *Journal of Agricultural Economics*, 75(2), 477-503.
- Rawlins, J., & Kalaba, F. K. (2020). Adaptation to climate change: Opportunities and challenges from Zambia. *African Handbook of Climate Change Adaptation*, 1-20.
- Rice, M., Weisbrot, E., Bradshaw, S., Steffen, W., Hughes, L., Bambrick, H., & Upton, L. (2021). *Game, Set, Match: Calling Time on Climate Inaction*. New York: Boston Consulting Group
- Roger, E. M., (1995), *Diffusion of Innovations*, Fourth edition, New York: Free Press.
- Roger, E. M., (2003), *Diffusion of Innovations*, Fifth edition, New York: Free Press.
- Serote, B., Mokgehle, S., Senyolo, G., du Plooy, C., Hlophe-Ginindza, S., Mpandeli, S., Nhamo, L., and Araya, H. (2023). Exploring the Barriers to the Adoption of Climate-Smart Irrigation Technologies for Sustainable Crop Productivity by Smallholder Farmers: Evidence from South Africa. *Agriculture*. 13(2):246.
- Shah, A., Nazari, M., Antar, M., Msimbira, L. A., Naamala, J., Lyu, D., Rabileh, M., Zajonc, J., & Smith, D. L. (2021). PGPR in Agriculture: A Sustainable Approach to Increasing Climate Change Resilience. *Frontiers in Sustainable Food Systems*, 5. <https://doi.org/10.3389/fsufs.2021.667546>

- Shi, L., & Moser, S. (2021). Transformative climate adaptation in the United States: Trends and prospects. *Science*, 372(6549), eabc8054.
- Simpson, N. P., Andrews, T. M., Krönke, M. et al. (2021). Climate change literacy in Africa. *Nat. Clim. Chang.* 11, 937–944 <https://doi.org/10.1038/s41558-021-01171-x>
- Simpson, N. P., Mach, K. J., Constable, A., Hess, J., Hogarth, R., Howden, M., ... & Turner, B. L. (2021). A framework for complex climate change risk assessment. *One Earth*, 4(4), 489-501.
- Tufa, A. H., Kanyamuka, J. S., Alene, A., Ngoma, H., Marenya, P. P., Thierfelder, C., & Chikoye, D. (2023). Analysis of adoption of conservation agriculture practices in southern Africa: mixed-methods approach. *Frontiers in Sustainable Food Systems*, 7, 1151876.
- UN CC:Learn Knowledge Sharing Platform. (2021). *Zambia has launched its National Climate Change Learning Strategy - a big step towards ramping up climate change education*. Retrieved from <https://www.uncclearn.org/news/zambia-has-launched-its-national-climate-change-learning-strategy>
- Walker, S. E., Bruyere, B. L., Zarestky, J., Yasin, A., Lenaiyasa, E., Lolemu, A., & Pickering, T. (2022). Education and adaptive capacity: The influence of formal education climate change adaptation of pastoral women. *Climate and Development*, 14(5), 409-418.

## APPENDICES

### Appendix1: Interview Protocol for Small Scale Farmers

#### Introduction

Hello and thank you for agreeing to participate in this study. My name is Faustina Maninga, and I am a master's degree student of Adult Education from the University of Zambia. I am conducting research on the role of climate literacy in climate change adaptation among small scale farmers in Chongwe. The purpose of this interview is to explore the role of climate literacy in influencing small scale farmers' climate change adaptation in Chongwe, according to your experience. The data gathered will be used to better understand the experiences and needs of small-scale farmers in Chongwe with regards to climate change, and to identify potential interventions and programmes that could support their adaptation efforts. Your participation in this interview is voluntary and you may choose to stop at any time. Do you have any questions before we begin?

1. Could you please tell me a bit about yourself? (Prompt for information such as age, gender, education level, years of farming experience, type of farming engaged in such as cattle ranching or simply livestock, crop cultivation, poultry, fish farming grown, etc.)
2. How do you define climate change?
3. Have you noticed any changes in the climate, which have affected agriculture in your area?
4. How has your understanding of climate change (climate literacy) shaped your perceptions of these changes?
5. Do you think higher levels of climate literacy in among you as small-scale farmers correlate with more productive and effective climate change adaptation strategies among them? How do you explain this?
6. Have you participated in any climate literacy interventions or programs?
7. If so, which ones and what was your experience like?
8. How have these interventions influenced your understanding of climate change?
9. What strategies (farming practices) have you used to adapt to the effects of climate change on the kind of farming that you practice?

10. How has your understanding of climate change (climate literacy) influenced the development and implementation of these strategies?
11. Can you describe the effectiveness of these strategies in improving your agricultural productivity?
12. Are there any specific types of support or resources that would be most helpful for you in adapting to climate change?

Thank you for taking the time to participate in this interview. Your responses will be very helpful in understanding the experiences and needs of small-scale farmers in Chongwe concerning climate change. If you have any further questions or concerns, please feel free to contact me at 0977639170. Thank you again for your time and participation.

## **Appendix 2: Interview Protocol for Key Informants**

### **Introduction**

Hello and thank you for agreeing to participate in this study. My name is Faustina Maninga, and I am a master's degree student of Adult Education from the University of Zambia. I am conducting research on the role of climate literacy in climate change adaptation among small scale farmers in Chongwe. The purpose of this interview is to gather your insights and expertise on this topic. Your participation in this interview is voluntary and you may choose to stop at any time. Do you have any questions before we begin?

1. Could you please tell me a bit about your role and your experience working with small-scale farmers in Chongwe?
2. In your opinion, what are the main impacts of climate change on small-scale farming in Chongwe?
3. How have these impacts affected different types of farming such as livestock farming, fish farming, poultry farming, and crop cultivation among small scale farmers in Chongwe district?
4. How would you define climate literacy?
5. In your experience, what is the level of climate literacy among small-scale farmers in Chongwe?
6. What factors do you think influence the level of climate literacy among these farmers?
7. Could you discuss any climate literacy intervention programs that are currently in place for small-scale farmers in Chongwe?
8. In your opinion, how effective have these interventions been in improving climate literacy and promoting climate change adaptation among small-scale farmers?
9. Do you think higher levels of climate literacy among small scale farmers correlate with more productive and effective climate change adaptation strategies among them? How do you explain this?
10. What strategies have small-scale farmers in Chongwe been using to adapt to the effects of climate change?
11. How has climate literacy influenced the development and implementation of these strategies?

12. Based on your experience and expertise, what actions or interventions would you recommend in the quest to improve climate literacy and promote climate change adaptation among small-scale farmers in Chongwe?

Thank you for taking the time to participate in this interview. Your insights will be very helpful in understanding the role of climate literacy in climate change adaptation among small-scale farmers in Chongwe. If you have any further questions or concerns, please feel free to contact me. Thank you again for your time and participation.

### **Appendix 3: Consent Form for Participation in Research Study [English]**

Title of Study: Climate Literacy and Adaptation to Climate Change among Small-Scale Farmers in Chongwe, Zambia

**Researcher:** FAUSTINA MANINGA

**Supervisor:** DR. SICHULA, N.

**Institution:** The University of Zambia

#### **Purpose of the Study**

The purpose of this study is to explore the role of climate literacy in influencing small scale farmers' climate change adaptation in Chongwe, Zambia.

#### **What You Will Be Asked to Do**

If you agree to participate, you will be asked to take part in an interview or a focus group discussion. The interview or discussion will take approximately 90 minutes and will be audio-recorded with your consent.

#### **Risks and Benefits**

There are no known risks associated with participating in this study. The benefits include contributing to a better understanding of the experiences and needs of small-scale farmers in Chongwe concerning climate change.

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#### **Confidentiality**

Your participation in this study is confidential. Your responses will be anonymized and used only for research purposes. Audio recordings will be securely stored and accessible only to the research team.

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## **Voluntary Participation**

Your participation in this study is voluntary. You may choose not to answer any question or to stop participating at any time without any penalty.

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## **Questions**

If you have any questions about the study, please feel free to contact Faustina Maninga at 0977639170.

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By signing below, you acknowledge that you have read and understood the information above and agree to participate in this study.

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**Participants Name (Print) :** \_\_\_\_\_

**Participants Signature :** \_\_\_\_\_

**Date:** \_\_\_\_\_

## **Appendix 4: Consent Form [Nyanja]**

### **Chikumbuntima Chokuti Muntu Akhale Wokambirana Mu Nchito Yothetsa Zovala**

**Dzina la Nchito Yothetsa Zovala:** Kukhala Ndi Chidziwitso Cha Moyo Wa Nyengo Ndikusinthika Kwake Pakati Pa Ogwira Nchito Ya Ulimi Wosayenera Kwambiri Ku Chongwe, Zambia

**Wothetsa Zovala:** FAUSTINA MANINGA

**Wothandizira:** DR. SICHULA, N.

**Malo Othandizira:** The University of Zambia

### **Cholinga Cha Nchito Yothetsa Zovala**

Cholinga cha nchito yothetsa zovala ndi kukhala ndi chidziwitso cha moyo wa nyengo ndikusinthika kwake pakati pa ogwira nchito ya ulimi wosayenera kwambiri ku Chongwe, Zambia.

### **Zomwe Mukhala Mukugwiritsa Nchito**

Ngati mukhala mukufuna kugwiritsa nchito, mukhala mukufuna kugwiritsa nchito mu nthano kapena mu nkhani yomwe anthu ambiri akugwiritsa nchito. Nthano kapena nkhani yomwe anthu ambiri akugwiritsa nchito idzakhala yosavuta ndipo idzakhala yoperekedwa ndi inu.

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### **Zovuta Ndizabwino**

Palibe zovuta zomwe zikuoneka kuti zikugwiritsidwa nchito mu nchito yothetsa zovala. Zabwino zake ndi kuti mukhala mukupereka chidziwitso cha kumvetsa ndi zofunika za ogwira nchito ya ulimi wosayenera kwambiri ku Chongwe pokhudza moyo wa nyengo.

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## **Kukhala Osatseguka**

Kugwiritsidwa kwako nchito mu nchito yothetsa zovala ndi kosatseguka. Zomwe mukupereka zikhala zosavuta ndipo zikhala zikugwiritsidwa nchito chabe pokhudza nchito yothetsa zovala. Zomwe mukupereka zikhala zikusungidwa bwino ndipo zikhala zikugwiritsidwa nchito ndi anthu omwe akugwira nchito.

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## **Kugwiritsidwa Kwako Nchito Ndikosavuta**

Kugwiritsidwa kwako nchito mu nchito yothetsa zovala ndikosavuta. Mukhoza kusankha kuti musagwire nchito kapena kuti musagwire nchito nthawi iliyonse ngati palibe cholakwika.

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## **Mafunso**

Ngati muli ndi mafunso pokhudza nchito yothetsa zovala, chonde musadabwe kutumiza ufulu kwa Faustina Maninga pa 0977639170.

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Pomwe mukulembapo pansi, mukudziwa kuti mwawerenga ndipo mwamva chilichonse chomwe chili pachipewo, ndipo mukufuna kugwiritsa nchito mu nchito yothetsa zovala.

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## **Dzina la Wogwiritsidwa Nchito (Lembani):**

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## **Lemba Pansi Dzina:**

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## **Tsiku:**

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## Appendix 5: Budgeting

<b>Expenditure Area</b>	<b>Percentage of Total Budget</b>	<b>Amount (ZMW)</b>
Research Materials	20%	3,200
Data Collection	25%	4,000
Travel and Logistics	15%	2,400
Miscellaneous Expenses	10%	1,600
Thesis Preparation and Submission	30%	4,800
Total	100%	<b>16,000</b>

## Appendix 6: Time Chart

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Start thesis research	Jan-23	10 days	Apr-23	19 days	100%
Submit concept note	May-23	3 days	May-23	6 days	100%
Research topic accepted by supervisor after necessary corrections	Jun-23	10 days	Jun-23	5 days	100%
Submit first research proposal	Aug-23	1 day	Aug-23	1 day	100%
Proposal Approved for Departmental Thesis Presentation	Aug-23	1 day	Aug-23	2 days	100%
Departmental presentation conducted, advised to revise part of the proposal	Oct-23	1 day	Oct-23	1 day	100%
Proposal accepted by supervisor for submission to the Research Ethics Committee	Nov-23	14 days	Nov-23	14 days	100%
Submit proposal for ethical approval	Dec-23	1 day	11 Nov-23	1 day	100%
Proposal accepted by the Research Ethics Committee	10-Jan-24	28 days	Feb-24	33 days	100%
Conduct data collection	12-Jan-24	5 days	23-28 June 24	10 days	100%
Conduct data analysis and reporting	17-Jan-24	30 days	Dec 24	67 days	100%
Expected to finish report	25-Jan-24	28 days	April-25	90 days	100%