

**EXPLORING THE ROLE OF CIVIC EDUCATION IN CLIMATE CHANGE  
AWARENESS TO ENHANCE FOOD SECURITY AMONG FARMERS OF GWEMBE  
VALLEY OF SOUTHERN PROVINCE OF ZAMBIA**

**By**

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A Dissertation submitted to the University of Zambia in partial fulfilment of the requirement for the Award of the degree of Master of Education in Civic Education.

**UNIVERSITY OF ZAMBIA**

**LUSAKA**

**2024**

## DECLARATION

I, **Sichula Griphin**, do hereby declare that this work is my own, and that to the best of my knowledge, it has never been produced or submitted before at this University or any other institution for academic purposes, and that all sources of information have been duly acknowledged.

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**CERTIFICATE OF APPROVAL**

This dissertation of Sichula Griphin has been approved as partial fulfilment of the requirement for the award of the degree of Master of Education in Civic Education.

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## ABSTRACT

Climate change and its negative effects have become a global concern as they impend the production capacity of farmers more especially in the developing countries like Zambia. To this effect, the study explored the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley. The objectives of the study were to; explore the form of Civic Education through which farmers learned about climate change to increase food security; explore the effects of climate change on food security among farmers of Gwembe valley, and to establish sustainable measures farmers would employ to ensure food security at household amidst climate change. A sample of 25 participants was used: 15 farmers who were homogenously selected and 10 informants from different government departments such as agricultural extension officers, forestry and meteorological officers as well as fisheries and livestock who were all selected using expert purposive sampling technique. Data was collected using qualitative method through semi-structured interviews and was analysed by using thematic analysis technique. The study revealed mixed views on farmer's understanding of climate change. Positively few farmers indicated that they adequately understood climate change because they learned from the community meetings, workshops and seminars they were attending which were organized by experts from government's institutions and NGOs. Negatively, the study found that majority of the participants had inadequate knowledge about climate change due to high illiteracy levels on Climate Change issues which led to high engagement in unconventional farming as well as non-application of initiatives aimed at building resilience and food security. The study also unveiled that climate change had negative effects on agricultural production like crop farming, livestock and fish farming which resulted into food insecurity. The study found that increased food insecurity caused vulnerability of farmer's livelihood as it increased crime rate, high levels of pupils dropping out of school, increased sexually transmitted diseases, drug abuse, gender violence and divorce as well as high cost of food. The study also established that some farmers employed some sustainable measures such as crop diversification, irrigation and livestock rearing, planting drought resistant crops and practicing conservation agriculture in order to enhance food security. Based on these findings, the study strongly recommends the use of Informal Civic Education due to its flexible methods such community meetings, workshops as well as door to door campaigns in delivering climate change information to both the educated and the uneducated farmers. Also, government to intensify sensitization awareness, education, weather alert messages and climate change programs on radio and television in both English and local languages. By so doing, farmers would connect what they see or hear on television and radio to what they learn from the climate change agents and in turn, it would invoke change in attitude and behaviour towards how they perceive the whole concept of climate change.

**Key words:** *Civic education, informal civic education, climate change, food security, agricultural production, Gwembe valley.*

## **DEDICATION**

To all those who believe in themselves.

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## ACRONYMS AND ABBREVIATIONS

<b>ADRA</b>	- Adventist Development Relief Agency
<b>AEO</b>	- Agriculture Extension Officer
<b>CCAFS</b>	- Climate Change, Agriculture and Food Security
<b>CSA</b>	- Climate-smart Agriculture
<b>CSARP</b>	- Climate-Smart Agriculture and Rural Enterprises Programme
<b>CSAYN</b>	- Climate Smart-Agriculture Youth Network
<b>F</b>	- Farmer
<b>FAO</b>	- Food and Agriculture Organisation
<b>FISP</b>	- Farmer Input Support Programme
<b>FOR</b>	- Forester
<b>GACSA</b>	- Global Alliance for Climate-Smart Agriculture
<b>GHG</b>	- Green House Gas
<b>GRZ</b>	- Government of the Republic of Zambia
<b>IMF</b>	- International Monetary Fund
<b>IPCC</b>	- Intergovernmental Panel on Climate Change
<b>ITCZ</b>	- Intertropical Convergency Zone
<b>MLNR</b>	- Ministry of Lands and Natural Resources
<b>MNDP</b>	- Ministry of National Development and Planning
<b>MO</b>	- Meteorological Officer
<b>MOFLO</b>	-Ministry of Fisheries and Livestock Officer

<b>MOEWD</b>	- Ministry of Energy and Water Development
<b>MOGE</b>	- Ministry of General Education
<b>NAADS</b>	- National Agricultural Advisory Service
<b>NAP</b>	- National Adaptation Programme
<b>NAPA</b>	- National Adaptation Programme of Action
<b>NASA</b>	- National Aeronautics and Space Administration
<b>NDC</b>	- Nationally Determined Contributions
<b>NGO</b>	-Non-governmental Organisation
<b>NPCC</b>	- National Policy on Climate change
<b>REOSA</b>	- Regional Emergency Office for Southern Africa
<b>SCRALA</b>	- Strengthening Climate Change Resilience of Agricultural Livelihoods in Agro-ecological Regions I and II in Zambia
<b>SDG</b>	- Sustainable Development Goals
<b>UN</b>	- United Nations
<b>UNESCO</b>	- United Nations Educational, Scientific and Cultural Organisations
<b>UNFCCC</b>	- United Nations Forum Convention on Climate Change
<b>UNHR</b>	- United Nations Human Rights
<b>USAID</b>	- United States Agency for International Development
<b>WFP</b>	- World Food Programme
<b>ZCCA</b>	- Zambia Climate Change Act

# CHAPTER ONE

## INTRODUCTION

### 1.1 Overview

This chapter discusses the background to the study, statement of the problem, purpose of the study, research objectives and the research questions. The chapter further presents the significance of the study, research delimitation and limitations. The theoretical framework and the definitions of operational terms are also presented.

### 1.2 Background to the study

In the recent past, the world has experienced unprecedented variability of temperature, rainfall, droughts and storms caused by climate change. These factors have negatively impacted human livelihood especially on agricultural production which has necessitated a critical food insecurity in many parts of the world, particularly in developing countries. This is making it difficult for the world to attain the Sustainable Development Goals (SDGs 2030) as outlined by the United Nations, for example: goal 1; to end poverty in all its forms everywhere, goal 2; end hunger, achieve food security and improved nutrition and promote sustainable agriculture, (Food and Agriculture Organisation, 2015). As the world grapples with the effects of climate change, the need for strategies that bring about sustainable adaptation measures that enhance food security becomes increasingly urgent. One promising approach to this global pandemic is the utilization of Informal Civic Education as a climate change awareness tool. This form of Civic Education has become progressively important as it engages individuals through non-traditional means such as community-based activities, social media or grassroots campaigns on causes and impacts of climate change (Nisbet, 2010).

As the effects of climate change continue worsening, there is a growing interest by the world to explore numerous educational and innovative solutions to mitigate the damage that is often handled by experts, policy makers, and environmentalists (Nisbet, 2010). However, in his book entitled 'Civic Education About Climate change,' Nisbet argued that handling the impacts of climate change need to be much broader beyond just technical understanding of climate science rather, the emphasis should be on Civic Education and engagement which means empowering, enabling, motivating, informing and educating the public around not just the technical but also the political and social dimensions of climate change. Thus, Civic Education as a whole which may

generally be defined as educational efforts, practices and processes that affect people's beliefs, commitments, capabilities and actions as prospective members of communities, is alleged to have the potential to influence society to respond, learn and even transform in response to such factors as globalization, migration, climate change and threats like global pandemics (Crittenden & Levine, 2016, Kloubert 2014, 2019).

The United Nations Framework Convention on Climate Change (UNFCCC) (2004) defined Climate change as the alteration in the composition of the global atmosphere through varied levels of human activities leading to the observed pattern of natural climate variability over comparable time periods. Going by this definition, it is clear that human activities are a major contributor to climate change. Thus, in order to reduce the side effects of this global pandemic which has negatively affected all sectors of human life including agricultural production, there is need that humans are provided with platforms that can easily help them learn and change their attitude and behaviour towards the way they carry out their socio-economic activities. Civic Education in form of informal Civic Education is just that one platform well placed to inculcate positive change in citizens. Hill and Wood (2018) described informal Civic Education as a form of education that encompasses the wide range of learning experiences that occur outside of the classroom setting and are inspired by and contribute to the development of civic knowledge, skills, attitudes and behaviour. Thus, Civic Education on environmental issues is a significant pioneer of environmental self-efficacy and behaviour which should be viewed as a two-way process where experts and decision-makers seek input and learn from the public about preferences, needs, insights, and ideas relative to climate change solutions and policy options (Nisbet, 2010).

In line with the above, Ziervogel and Taylor (2008) postulates that the people who find environmental protection very important are more informed about environmental issues, have personal experiences of environmental problems and are more likely to make environmentally friendly choices. Once people start prioritising environmentally friendly practices, there would be likely improved agricultural practices and hence, improved food security. Thus, one would state that using informal Civic Education would enable the people of Gwembe valley to get informed about the type of agricultural practices that are environmentally friendly which would in turn help in alleviating the effects of climate change hence resulting into increased food production.

### **1.3 Statement of the Problem**

Frequent droughts and flash floods lead to poor agricultural production which negatively impact food security, lack of clean and safe water for drinking and increased livestock diseases and death (*Thurlow, 2016*). This is a case of Gwembe valley as revealed by some leaders such as headman Syamatali of Chief Chipepo and Gwembe Member of Parliament Simuzingili who stated that there was perpetual hunger in Gwembe due to poor crop yields as a result of flash floods and frequent droughts experienced in the area. Thus, if the food insecurity continues, people of Gwembe valley may be forced to migrate to other areas in search of food and work which may result into displacement and social disruption. As a result, crime rate will scale up, malnutrition, diseases and economic hardships will also rise. People may also be forced to spend more money on food and forget about other vital things like healthcare, education and housing which may perpetuate poverty leading to death. Several studies have been conducted about climate change on agriculture and food security in Zambia such as; *Ngoma, et al. (2021)*; *Lupele (2020)*; *One World.net, (2015)* but there is no study on the role of Civic Education in the climate change awareness to enhance food security in Gwembe valley which has ever been conducted. Hence, the need for this study which may help in addressing the negative consequences which may occur as a result of lack of knowledge on climate change and its effects on food security.

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

The purpose of the study was to explore the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley of Southern province of Zambia.

### **1.5 Objectives of the study.**

The following were the objectives of the study:

- i. To explore the form of Civic Education through which farmers learn about climate change to enhance food security.
- ii. To explore the effects of climate change on food security among farmers of Gwembe valley of Southern Province of Zambia.

- iii. To establish sustainable measures farmers would employ to ensure food security at household level amidst climate change in Gwembe valley of Southern province of Zambia.

## **1.6 Research Questions**

Specific research questions:

- i. How do farmers learn about climate change to enhance food security?
- ii. What are the effects of climate change on food security among farmers of Gwembe valley?
- iii. What sustainable measures would farmers employ to ensure food security at household level amidst climate change?

## **1.7 Significance of the Study**

This study is very relevant to policy makers and other stakeholders such as Non-governmental Organisations in realising that Civic Education is a significant tool that may be used to foster climate change awareness in order to enhance food security among farmers of Gwembe valley of Southern province of Zambia. It is hoped that the study may contribute to the existing body of knowledge on climate change awareness and food security in Zambia. Secondly, the findings may be valuable to educational practitioners, Gwembe District Planners, policy makers in education, green economy and environment, agriculture and fisheries and livestock in the understanding of the need to integrate Climate Change Education into Civic Education in order to reinforce climate change awareness, which in turn will help improve food security in Gwembe valley. Lastly, the findings may help in drawing recommendations for future improvement on the role of Civic Education in climate change awareness to enhance food security in Zambia.

## **1.8 Delimitations of the Study**

Gwembe valley was purposely selected as a study area primarily because it is among the areas in Zambia which has been highly hit by the climatic change effects resulting into serious food insecurity among most farming households. Crop, livestock and fish farmers who had been in the farming industry for at least 10-15 years were selected as samples because the researcher believed that they had adequate experience and knowledge on how climate change impacted their agricultural production that would enable them contribute to the study. Experts from various ministries such as Agriculture, Green Economy and Environment and Fisheries and Livestock who

were working closely with farmers in Gwembe valley were involved in this study because of their expertise. Therefore, the researcher believed that the selected farmers and experts would significantly contribute to the outcome of the study on the role of Civic Education in climate change awareness to enhance food security among famers of Gwembe valley of Southern province of Zambia.

### **1.9 Limitations of the Study**

The major limitations to this study were that: Firstly, female farmers were unwilling to participate in the study and only recommended men to represent them. Thus, the researcher only interviewed male farmers whose views may have not represented those of their female counterparts since the study was descriptive in nature. Nonetheless, this limitation was addressed using sample triangulation such as through the use of agricultural extension officers, fisheries, forests and livestock officers. Secondly, the study was conducted during the period when there was an outbreak of foot and mouth disease in Southern province, and most agricultural extension officers and livestock officers to provide information for the study were working in the fields vaccinating livestock. However, to address this limitation, a few participants who could not be reached physically were interviewed via mobile phone. Thirdly, Gwembe valley is hilly and farmers live far apart in flat areas thus it was a challenge first of all to make appointments due to poor mobile network connectivity and secondly, it was a challenge to reach the targeted participants due to the bad hilly terrains and many times the researcher bounced. Nonetheless, these challenges were addressed by the researcher moving back and forth thus the researcher spent more time in the study area than scheduled until data was collected from all the targeted participants.

### **1.10 Theoretical Framework**

The study was guided by the Ecological System Theory by Bronfenbrenner (1989). According to this theory, the ecological settings such as people, homes, families, neighborhoods and communities, influence the happenings in the society. There are four layers, which play an important role in influencing how certain things happen. These are the Microsystem, Mesosystem, Exo-system and Macrosystem (Bronfenbrenner, 1989). The innermost layer, which is known as the Microsystem, includes the family, school and neighbourhood environments. This layer is followed by the Mesosystem which connects two or more microsystems. The Exo-system incorporates the formal and informal social structures such as workplaces and the mass media,

which affects one of the microsystems (Karega, 2008). Finally, the Macro-system layer is composed of cultural values, customs and laws, which effect the environment.

In line with this study, each of the four ecological systems may impact climate change because Gwembe valley comprises people, homes, families, neighbourhoods and communities who engage in farming, charcoal burning and other socio-economic activities. If not controlled, people may continue indulging in unfriendly environmental practices such as clearing trees, unconventional farming and other practices that may lead to climate change and impact food security. Central to this study however is the exo-system which incorporates the formal and informal structures in which Civic Education is paddled through community meetings, workshops, seminars and mass media all aimed at protecting the environment to mitigate the side effects of climate change. Hence, the theory was quite appropriate for this study because it explored how each of the ecological systems would impact climate change in Gwembe valley if not controlled.

### **1.11 Definitions of operational terms as used in the study**

**Civic Education:** refers to transformative form of education aimed at empowering citizens with behaviour change directed towards the acquisition of climate change knowledge and skills to enhance food security at household.

**Informal Civic Education:** refers to the wide range of learning experiences that occur outside of the formal classroom setting and are inspired by and contribute to the development of civic knowledge, skills, attitudes and behaviour (Hill and Wood, 2018).

**Climate Change:** refers to a change in climate that persists for decades arising from natural and human activity that alters the composition of the atmosphere such as greenhouse gas emissions.

**Food Security:** refers to the availability of adequate supplies of food at Individual, household, national, regional and global levels (World Food Summit, 1996).

**Food Insecurity:** refers to vulnerability to a full range of factors such as climate change that negatively affects food availability, accessibility, utilisation, stability and sustainability.

**Agricultural production:** refers to the process of making or manufacturing something in this case raw material such as all forms of food and not limited to; crops, fruits, mushroom, tubers, livestock and fish.

**Gwembe valley:** this is a low area of land in Southern part of Zambia situated between hills and or mountains with a range of streams.

### **1.12 Organisation of the study.**

This study is organized in six chapters: Chapter one presents the background of the study on exploring the role of Civic Education in the climate change awareness to enhance food security among farmers of Gwembe valley as an introduction. The chapter then described the statement of the problem, objectives of the study, research questions, delimitations and limitation of the study. It also presented the theoretical framework, definitions of terms as well as organization of the study and the summary of the study. In essence, it was a foundation chapter, which provided the very essence as to why the study needed to be undertaken. Chapter two provides the review of literature related to the role of Civic Education in climate change awareness to enhance food security among farmers. It ends with a discussion on the integration of Civic Education into climate change adaptation measures in enhancing food security. Chapter three presents the research design, description of the study and the methodology used for the study. Chapter four provides the presentation of findings while chapter five of the study presents the discussions of the findings. The sixth chapter presents the summary, conclusion and recommendations generated from the study.

### **1.13 Chapter Summary**

Chapter one focused on the introduction to this study. The chapter gave a brief background of climate change and how informal Civic Education can provide climate change awareness. The chapter also shed light on the statement of the problem, purpose, objectives and research questions. Further, the chapter provided the significance, delimitations, limitation, and theoretical framework before providing key operational terms as used in the study.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Overview

This chapter presents the review of related literature on the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley. It starts with a discussion of the concept of Civic Education, which forms the basis of the study. The chapter looks at climate change and its causes, food security, highlights the effects of climate change on people's livelihood, and then discusses the role of Civic Education in climate change awareness. It ends with sustainable adaptation measures employed by farmers in enhancing food security in Zambia.

#### 2.2 Understanding the concept of Civic Education

Civic Education also known as Citizen Education or Democracy Education is defined differently by different scholars. However, Makowski and Pazderski (2017) in their study "Civic Inspirer" in Poland defined Civic Education using three forms: formal civic education, non-formal and informal civic education. They described Formal Civic Education as a form of education which is carried on within educational system and directed at children and youths (also at university level), and as part of the vocational training for certain employee groups. It weighs more on how young ones should exercise their rights, fulfil their duties and play an active role in public life. Non-formal Civic Education on the other hand is one which is pursued in an organized manner but outside the educational system (like NGOs), and may be directed as part of the vocational training for certain employee groups while Informal Civic Education is one that is pursued in a deliberate fashion but usually outside any system and not necessarily as part of the core activities of the specific entities offering it. Makowski and Pazderski (2017) concluded that Civic Education therefore can be defined as an all-inclusive form of education that cuts across all spheres of human endeavors. Central to this study is informal Civic Education which is offered at outside the classroom but at social centres, cultural centres and agricultural centres among others.

In a related development, Finkel (2015) identified three main elements upon which Civic Education stands; civic knowledge, civic skills and civic dispositions. He stated that civic knowledge means that citizens have an understanding of the workings of the political system and their own political and civic rights and responsibilities. Civic skills mean that citizens develop an

ability to analyze, evaluate, take and defend positions on public issues and to use their knowledge to participate in civic and political processes while civic dispositions, mean that citizens acquire traits necessary for a democracy such as tolerance, public spiritedness, civility, critical mindedness and willingness to listen, negotiate and compromise. In this regard, it is cardinal to note that Civic Education should not be viewed as a tool for merely reproducing the already existing social, economic, cultural, political and other global issues but should be seen as an education providing a more robust conceptual basis for understanding the deep inter-connection between issues of active community and national engagement. From Finkel's (2015) study, one can deduce that Civic Education should not be viewed as a deliberate process only focused at producing a politically literate citizen but as a transformative form of education aimed at producing a citizen who is well informed and committed to personal, community and national values and practices. Thus, this study takes into account this very cardinal view of Civic Education which is attained through community meetings, workshops, seminars as well as other informal settings.

### **2.3 Understanding the concept of Climate Change and its causes**

Climate change refers to a long-term shift in temperatures and weather patterns (UNESCO, 2016). These shifts may be natural, such as through variations in the solar cycle. The solar cycle is the sequence that the Sun's magnetic field goes through approximately every 11 years. Our Sun is a huge ball of electrically charged hot gas. The Earth's climate system depends entirely on the Sun for its energy. Solar radiation warms the atmosphere and is fundamental to atmospheric composition while the distribution of solar heating across the planet produces global wind patterns and contributes to the formation of clouds, storms, and rainfall. As such, it should be understood that naturally climate change is caused by variations in the sun's intensity or as a result of volcanic eruptions. However, according to the findings by the Intergovernmental Panel on Climate Change (IPCC) (2007), since the 1800s, human activities have been the major drivers of climate change largely due to burning fossil fuels such as coal, oil and gas. These activities include production of food through agricultural activities. This means that almost all forms of farming practices no matter the size in one way or the other contribute to climate change. This can be through clearing of forests by farmers for crop production or pollution of land through application of synthetic fertilizer and chemicals or air pollution through burning of forests and agricultural wastes or water pollution by fish farmers through oil spillage and gas during fishing activities as well as overgrazing by livestock. These findings were also echoed by the Food and

Agriculture Organisation (FAO) during the 28<sup>th</sup> meeting of the Conference of the Parties (COP 28) (2023) that when it comes to climate change, the world's food system is a double-edged sword with food production being the biggest emitters of global greenhouse gases and yet one of the sectors hardest hit by the effects of climate change. As to whether this is the case among farmers of Zambia, Gwembe valley in particular, was not yet known; hence the focus of this study.

Further, a report by the IPCC (2007) indicates that due to increased human activities over the past centuries, global average annual temperatures have risen to 0.7°C. That is, in the Arctic, temperatures have risen by approximately twice that rate the trend is most likely to continue as global average surface temperatures are projected to rise between 1.1 and 6.4°C by 2100 and temperature at the high northern latitudes are projected to rise between 3 and 12°C by the end of the century of which precipitation patterns are also projected to change varying from regions and seasons (IPCC, 2007b). The report further states that burning fossil fuels by man generate greenhouse gas emissions such as carbon dioxide and methane that build up in the earth's atmosphere and contribute to increases in warm temperatures and extreme weather conditions around the earth, trapping the sun's heat, which leads to rising temperatures. Clearing land and forests also release carbon dioxide as trees and other plants absorb carbon dioxide from the atmosphere as they grow. These are converted into carbon and stored in the plant's branches, leaves, trunks, roots and soil. Therefore, when forests are cleared or burnt, stored carbon is released into the atmosphere, mainly as carbon dioxide. These gases prevent heat from escaping into space hence causing climate change. Energy, industry, transport, buildings, agriculture and land use changes such as urbanization, desertification, and deforestation are among the main emitters. However, the report by the IPCC (2007b) was meant for the whole world and not focused on Gwembe valley in Zambia; thus, the need to undertake this study to ascertain if these factors also apply in Gwembe valley of Southern province of Zambia.

#### **2.4 Informal Civic Education and Climate Change**

A study conducted by Nisbet (2010) on Civic Education about Climate Change in America revealed that Civic Education played a critical role in climate change awareness. Civic Education stresses the need for greater environmental awareness as well as a greater involvement in environmental management programmes. However, for this awareness to take place, Nisbet proposed that a deliberate Civic Education forum on climate change could be held every month at a major population center or across a diversity of institution settings from schools and labor unions

to churches and malls from which each meeting would be framed around a different dimension of climate change in a way that might resonate and connect with the host site and intended participants. He stated that each deliberative forum could include the local ecological impact of climate change, the impact on agriculture and farming and other implications that may come as a result of human socio-economic activities. The study concluded that any form of climate change education should not be highly or formally organized to just discuss the causes and impacts but should be carefully and civically organized to identify and diffuse local and national solutions where the locals directly learn about the technical nature and risks of climate change about their social, ethical and economic implications. It is from this point that informal Civic Education as an inclusive discipline fit well as it does not disengage any group of people regardless of gender, age, ethnicity or educational background because any group other than the experts could identify the most serious and long-term effects of climate change such as food insecurity and suggest sustainable solutions to it. The proposals made by Nisbet (2010) were in line with those made by this study. However, the point of departure from this study was that the former focused on environmental awareness in general and did not specify the category of people to which the Civic Education forum on climate change targeted. This is where the gap is because the present study aimed at exploring the role of Civic Education in the climate change awareness to enhance food security among farmers of Gwembe valley of Southern province of Zambia.

Another study by Makowski and Pazderski (2017) in Poland established that effective Civic Education operation depends among other elements, on group action skills which create the ability to effectively work within a group of fellow citizens to tackle environmentally identified problems. Not only do activities in the realm of Civic Education facilitate gaining knowledge about individual rights and about the procedures within the democratic system, but rather informal Civic Education for instance contributes to awareness of the value of cooperation with other members of the given community, government officials and those in the private institutions such as Non-governmental Organisations who share the same goals. In this era of climate change, Civic Education is understood as a campaign devoted to the protection of rivers, trees and forest development geared at minimizing the impact of climate change. It sets itself the objective of increasing general awareness of the importance of protecting nature as part of environmental protection for quality life which cannot be done in a classroom setting. Thus, Makowski and Pazderski (2017) reported that Civic Education is pursued in the context of various unconventional

methods in form of meetings, workshops and seminars. It aims to increase awareness and understanding of the significance of environmental protection, and of biodiversity in the climate as well as contributing to the development of pre-ecological attitude hence helping to reduce the side effects of climate change. The above findings by Makowski and Pazderski (2017) were in line with the current study but the former did not specify the type of side effects of climate change they were referring to while the current study focused on food insecurity as a side effect of climate change among farmers of Gwembe valley of Southern province of Zambia.

Further, a study by the Campaign for Female Education (CAMFED) (2022) in Zambia found that Civic Education provides citizens with the knowledge they need to protect the environment through information on sustainable conservation farming practices such as crop rotation, crop diversification, conservation tillage as well as other ways of reducing carbon emission by using renewable energy sources and reducing waste. This would suggest that farmers need to attend meetings, workshops and interact with climate change agents in order for them to gain Civic skills for them to act according to the situation they find themselves into if they have to fight poverty and prevent vices that come with it such as increased crime, corruption, as well as poor living conditions. As ably put by UNESCO (2015) on civic skills, that education and awareness-raising enable informed decision-making, play an essential role in increasing adaptation and mitigation capacities of communities, and empower women and men to adopt sustainable lifestyles. In its whole form, therefore, Civic Education can be used as a tool for reminding the general public about the environmental damage brought by man in his myriad activities and about their responsibility for the natural environment. Despite the contributions of these findings to the current study however, they did not focus on the role of informal Civic Education and were not specific to the farmers of Gwembe valley which this study focused on. Thus, there was still a need to carry out an investigation through this study.

## **2.5 Understanding the concept of Food Security**

The concept of food security is multifaceted and has been interpreted widely as it has evolved over the years to reflect changes in different scholars and institutions. However, despite its vigorous changes, the widely accepted definition comes from the World Food Summit (WFS) (1996) which postulates that food security exist when all people, at all times have physical, social and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy

life. This definition simply means that food security by and large is the availability of food in the country and the ability of individuals within the country to access, afford and source adequate foodstuff regardless of class, gender or region. At family level, food security can be said to be available when all members at all times have access to adequate food for an active, and healthy life whose results are confident, healthy and more productive citizens (WFS, 1996).

According to the High-Level Panel of Experts for the Committee on World Food Security (2020), the concept of food security has six main pillars which must be taken into consideration when dealing with the conceptual and legal understanding of the right to food: agency, sustainability, availability, access, utilization and stability. In its essence, Agency refers to the capacity of individuals or groups to make their own decisions about what foods they eat, produce or how that food is produced, processed and distributed within the food system and their ability to engage in processes that shape food system policies and governance. On the other hand, sustainability refers to the long-term ability of food systems to provide food security and nutrition in a way that does not compromise the economic, social, and environmental bases that generates food security and nutrition for future generations (WFS, 2020).

The third pillar of food security which is food availability relates to the supply of food through production, distribution and exchange. This is where food production is determined by a variety of factors such as land ownership and use; soil management which is affected by crop selection, breeding and management; livestock breeding and management as well as harvesting (FAO, 1997). A study by Gregory *et al* (2015) on Climate and Food Security in India, established that crop production can be affected by changes in rainfall and temperature. This relates to the amount of rainfall received by crops which should not either be too much (flood) or too low while extreme temperatures also have negative effects on crop production impacting food availability. The study concluded that besides rainfall and temperature, some human factors also impact food availability. Land used for agriculture for example can be lost due to industrialization or urbanization or lost to desertification or to soil erosion as a result of unsustainable agricultural practices. These factors may be the case in several regions including Zambia as the study by Government Republic of Zambia (GRZ) (2016) in Zambia showed that human socio-economic activities have resulted into damage to the environment. It is this damage which has necessitated changes in weather pattern causing extreme weather variations some aligned to excessive rains resulting into floods while

others have resulted into droughts that impact the availability of food due to reduced harvests or damage to crops and livestock.

Further, the fourth pillar of food security which is food access refers to the affordability and allocation of food as well as the preferences of individuals and households (WFS, 2020). On this pillar, the United Nations Committee on Economic, Social and Cultural Rights noted that the causes of hunger and malnutrition are often not a scarcity of food but an inability to access available food, usually due to poverty United Nations Human Rights (UNHR, 2023). It must be understood that poverty can limit access to food and can also increase how vulnerable an individual or household is to price uncertainties. According to Garret (2019), access depend on whether the individual or household has enough income to purchase food at prevailing prices or has sufficient land and other resources to grow its food. The fifth pillar which is food utilization refers to the metabolism of food by individual (Luther, 2017). This relates to the fact that once the food is obtained by a household, various factors affect the quantity and quality of food that reaches members of the household. Hence, to achieve food security, the food ingested must be safe and adequate to meet the physiological requirement of each individual. It is for this reason that farmers need to be sensitized not just about the quantity but also the quality of food that gives them the much-needed nutrients for their balanced life and this can only be done through informal Civic Education which is flexible and inclusive in nature catering for all age groups.

Food stability is the sixth pillar of food security. Food stability refers to the ability to obtain food over time. According to FAO (1997), food insecurity can be transitory, seasonal or chronic. In transitory food insecurity, food may be unavailable during certain periods of time. At the food production level, natural disasters and droughts results in crop failure and decreased food availability. Instability in markets resulting in food price hikes can cause transitory food insecurity while seasonal food insecurity can result from the regular pattern of growing seasons in food production. Chronic or permanent food insecurity can be said to be long-term and persistent lack of adequate food. It is a situation where households are constantly at risk of being unable to acquire food to meet the needs of all members. FAO (1997) indicates that chronic and transitory food insecurity are related as the reoccurrence of transitory food security can make households more vulnerable to chronic food insecurity. Hence, this research aims at exploring the role of Civic Education in the climate change awareness to enhance food security among the farmers who have

been the victims of change in climate particularly through lower agricultural production resulting into food insecurity thus becoming a concern of mankind at all levels; individual, household, national, regional and global.

A study done by the IPCC (2022) on Climate Change Impact: Adaptation and Vulnerability, reported that human-induced climate change is causing hazardous and extensive disruption in nature and is negatively impacting the lives of billions of people around the world. It is estimated that about 800 million people world-over are living in extreme poverty due to food insecurity exacerbated by climate change (less than USD 1.25/day). These people lack access to proper nutrition, clean drinking water and adequate health and education services among other things. Against this background, the United Nations (UN) recognised the right to food in the Declaration of Human Rights in 1948 and declared that food was vital for the enjoyment of all other rights. The declaration was formally adopted in 1996 by the World Food Summit which pointed the way towards the possibility of a right based approach to food security (FAO, 2016). Ever since, multiple international agreements and mechanisms have been developed to address food security. The main global policy to reduce hunger and poverty is enshrined in the Sustainable Development Goals in particular goal 1 whose objective is to end poverty and goal 2 which is zero hunger, sets globally agreed targets to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture by 2030. However, these two goals can only be realized by tackling SDG goal 13 whose objective is to take urgent action to combat climate change and its impact. As such, the World Food Summit (1996), acknowledged the critical role of education in achieving food security while FAO (2016), developed several educational resources using educational strategies on climate smart-agriculture including awareness training modules designed to help farmers and other stakeholders adopt sustainable practices that can help mitigate climate change and improve food security. Thus, it is against this background that climate change and food security are a concern of Civic Education and consequently, this study.

In view of the above, the IPCC (2022) report also indicates that to avoid amounting loss of human and animal life, biodiversity and infrastructure, urgent ambitious and accelerated educational action is required in order to adapt to climate change while at the same time making a rapid, deep cuts in green gas emissions. As a result, the world has in the recent years witnessed a creation of several climate change international agreements and instruments that countries around the world ratify in order to provide guidance on how to deal with climate change effects. For example, on

12<sup>th</sup> December, 2015 at the 21<sup>st</sup> Session of the Conference of the Parties (COP21) held in Paris, France, the Paris Agreement was adopted following successful negotiations by 195 Parties to the United Nations Framework Convention on Climate Change (UNFCCC) to which Zambia is a signatory. This agreement was made as a commitment to implementing determined efforts to combat climate change and adapt to its effects while promoting sustainable development measures. The agreement also considers bringing all nations together (developed and developing) through increased support for the common cause of stabilizing Greenhouse Gas (GHG) concentrations in the atmosphere to a level that would prevent dangerous human induced interference with the climate system.

Other global policies and plans that emerged from COP 21 conference include; the Rio Earth Summit and the World Summit for Sustainable Development Goals. These policies have influenced the design and implementation of climate change projects that focus on learning. For example, the UNFCCC (2021) (Article 6) and the Kyoto Protocol (Article 10) both encourage governments to educate, empower and engage all stakeholders and major groups on climate change policies. It is in these policies that Civic Education sits well as an instrument in raising awareness among farmers on climate change in order to increase food security mainly in informal means to cater even for the most uneducated farmers yet important. The above studies informed the current study in the sense that they all recognised education as an effective tool in raising climate change awareness. The point of departure however is that the former studies did not categorically state the type of education suitable to provide climate change awareness and which bodies of government to be charged with the responsibility of offering such education and to which intended group. The present study focused on exploring the role of Civic Education in the climate change awareness with special attention to enhancing food security among farmers of Gwembe valley of Southern province of Zambia.

Another study conducted by the International Monetary Fund (IMF) (2022) indicated that climate change is intensifying food insecurity across the Sub-Saharan Africa with lasting adverse macroeconomic effects especially on economic growth and poverty. In addition, the study by the World Food programme (2022) revealed that about 123 million people (12% of the population) in Sub-Saharan Africa were estimated to suffer from high malnutrition and unable to meet basic food consumption needs with Southern Africa alone having about 45 million people facing food

insecurity driven by climate change following repeated droughts and widespread flooding. To counter these climatic effects on food security, some countries in Africa have come up with climate change adaptation initiatives and education programmes. For example, in 2015, the Ugandan government implemented a programme called the National Agricultural Advisory Services (NAADS) which educates farmers on sustainable agricultural practices such as the use of drought-resistant crops, soil conservation and water harvesting (Republic of Uganda, 2018).

Likewise, the Kenyan and Ghanaian governments have also implemented similar programmes like that of Uganda. Kenya implemented the Climate Smart Agriculture (CSA) in 2015 while Ghana implemented the Climate-Smart Agriculture and Rural Enterprises Programme (CSARP) in 2016. Both of these programmes are aimed at providing climate change awareness to farmers through various channels such as community meetings, radio programs and training workshops. These programmes were designed to help farmers understand their contribution to climate change and how in turn climate change impact their agricultural production. Further, the programmes also provide the farmers with knowledge and skills they need to adapt to climatic changing conditions to enhance food security. The programmes and methods used by the countries above to educate and sensitise the farmers about climate change to enhance food security were relevant to this study because it also aimed to advocate for similar programmes and methods in Zambia. However, it was still imperative that this study is undertaken to ascertain how effective these informal Civic Education methods could be used to increase climate change awareness to enhance food security among farmers of Gwembe valley in Zambia.

Furthermore, a study by the IMF (2022) about Food Insecurity in Africa, established that lack of resilience to climate change, and critically underlying chronic food insecurity in Sub-Saharan Africa will require careful policy prioritisation against a backdrop of financing and capacity constraints. It suggests that the continent and countries formulate policies and reforms tailored towards climate change adaptation strategies ranging from fiscal policies focusing on social assistance and efficient public infrastructure investment that can improve poorer households' access to affordable food and facilitate expansion of climate-resilient agricultural production. The suggestions by the IMF came in the wake of a realization that in Africa, the poor and mostly uneducated were the most vulnerable to the impact of climate change because this category of people lacked climate change information to enable them adopt modern agricultural methods to increase their produce. Therefore, these

strategies can only be successfully undertaken if all people regardless of status were involved in Civic Education awareness programmes that equips them with participatory knowledge which includes information and details on how they could be engaged and have a say in decisions made about climate change at community and national levels. This is in line with the conclusion made by the Danish Board of Technology (2016) that informal Civic Education approaches make it easier to exchange information between the experts and the public in which the public voice their preferences, draw attention to perceived problems and express their ideas on possible solutions.

Another study done by FAO (2020) in Zambia indicate that Zambia experienced two extreme weather patterns which affected the food security and nutrition. On one hand, it was hit by a widespread drought generated by El Nino-Southern Oscillation (ENSO) which resulted into increased food insecurity and on the other, it experienced flooding in some parts of the country in the northern region and the valley districts of southern province which included: Gwembe, Siavonga and Sinazongwe districts during the 2019/2020 farming season significantly impacted crop production and ultimately food insecurity. Thus, it is undoubtedly that climate change and variability have led to crop failure, livelihood losses, increased incidents of food insecurity and a reduced contribution of agriculture to the Gross Domestic Product (GDP) in the country. Alfani *et al.* (2019); Chisanga *et al.* (2017) and Mulenga *et al.* (2019) report that it is cardinal to understand that the agricultural sector in Zambia contributes about 6% to the National Gross Domestic Product GDP. However, the sector is dominated by smallholder farmers who depend on the rains for the production of crops which is mostly maize and other cereals. Additionally, a report by GRZ (2016) unveiled that due to increased frequencies of extreme climatic events that have directly affected agricultural productivity in some parts of the country, the sector has in the recent years recorded low crop yields, hence exposing the country to food insecurity. Thus, the need for vigorous climate change awareness through Civic Education.

According to the Integrated Food Security Phase Classification (IPC) (2022) report, the 2021/2022 rainfall performance was generally below normal for most parts of the country with the lowest seasonal rainfall total of 570 mm recorded in Gwembe District which lies in the Southern province. The report indicates that over 1.35 million Zambians countrywide were experiencing severe food insecurity due to climatic change conditions linked to prolonged dry spells, flooding, pests and diseases and reduced livelihood opportunities in some cases. Further, Alfani *et al.* (2019) observed

that climate change is likely to negatively affect food security in Zambia due to high poverty levels and low diversification in food production among the small-scale farmers in the country. Similarly, the IPCC (2007) in its report indicated that changes in climatic conditions may be the surest way of scaling up massive sufferings from hunger, malnutrition, disease and extreme poverty in rural communities because these people lack the necessary adaptive capacities to cope with climate change. In line with this report, it is therefore important that Civic Education is used as a tool to equip farmers with the much-needed climate change sustainability information in order to help them be food secure in the face of climate change.

Apart from being a signatory to various global organisations on climate change, the Zambian government has at national level developed dedicated various national policies among them the National Policy on Climate Change (NPCC), the Nationally Determined Contribution (NDC) and has also established a National Adaptation Plan (NAP) which focusses on medium and long-term adaptation measures. Further, a report by the Ministry of Lands and Natural Resources (MLNR) (2020) revealed that the government has established a Department of Climate Change and Natural Resources with the sole purpose of showing commitment to the integration of climate change across various sectors for more sensitization with a view to improving food security and eliminate poverty and hunger. However, despite the numerous reports and studies on climate change, none of these studies is known to have incorporated informal Civic Education as an effective way of raising awareness to fight climate change and improve food security. As such, it is imperative that a better understanding of the degree and magnitudes of the effects of climate change on food security is done to form adaptation planning in the country hence, the need for this study whose focus is to explore the role of Civic Education in the climate change awareness to enhance food security among farmers of Gwembe valley.

## **2.6 Effects of Climate Change**

A study by Cameron (2019) reviewed that climate change is likely to lead serious, systemic and global consequences, posing risks to economic activities and development aspirations across the globe. Thus, people need to know and be aware of such consequences and this can only be done through informal Civic Education. The following are some of the effects of climate change on food security.

### **2.6.1 Effects of climate change on Food Security and Agriculture**

A report by FAO (2019) indicates that climate change is putting the lives of millions of people at risk and for the first time in over a decade, world hunger has been on the rise affecting 11% of the global population. This is in line with Von Grebmer *et al.* (2019) who contended that recurrent extreme climate events were making it difficult to achieve food security and eliminate hunger in the world. He indicated that agricultural production was affected in two-fold: direct and indirect ways. Direct impacts were those perceived to be caused by a modification of physical features such as temperature levels and rainfall distribution on specific agricultural production for example maize and other cereals while indirect impacts were those that affect production through changes on other species such as pollinators, pests, diseases, vectors and invasive species. In Africa, a study by Alfani *et al.* (2019) established that climate change has perpetuated crop destruction from the fall of army worms to strong droughts induced by an abnormally strong El Niño cycle which has spiked a rise in food insecurity. All these put together result into low food production, consequently, there is food insecurity at household, country, regional and global levels.

Further, a study conducted by Sithole and Murewi (2009) in Zambia indicates that increases in the frequency and severity of droughts (and floods in some instances) have continued to hit Zambia since the late 1980s and these have posed a serious challenge to food security for rain-fed dependent smallholder farmers. In their report, they also revealed that there would be more severe food challenges to come as current climate change predications for most tropical regions of which Zambia is located indicate a reduction in mean annual precipitation of about 20% by 2050. It is also vital to note that in Zambia, agriculture employs about 22.3% of the labour force and it is a source of livelihood for over 50% of the population (ZamStats, 2019; GRZ, 2016a, b). However, the sector is dominated by small-scale farmers whose production is largely maize-centric and rainfed which leaves the country vulnerable to climate change (Libanda *et al.*, 2016). In addition, a study by Mikkel *et al.* (2013) in Zambia concluded that for the past 20 years, most of the country's farms located in Southern, Central and Western Zambia, have become increasingly prone to drought and have received low, unpredictable, and unevenly distributed rainfall which has negatively impacted food production especially on the small-scale farmers. It was therefore cardinal that this study is conducted in order to explore the role of Civic Education in the climate change awareness to enhance food security among farmers of Gwembe valley.

Since agriculture and livestock production is largely dependent on rainfall, the country's high rainfall variability and limited irrigation capacity make them vulnerable to climate change. ZamStats (2019) report that the rising frequency of drought and shorter rainy seasons have led to increasing crop loss and food insecurity in Zambia. The higher temperatures and greater frequency of drought also degrade grazing land and lead to the loss of livestock, with risks on food security. This is in line with the Zambia Climate Change Vulnerability Mapping (2010) which indicated that Gwembe district was one of the mapped areas in Zambia with harsh conditions of climate variability affecting livestock and other economic sectors such as fishing and crop farming. Similar findings were recorded by Sichingabula (1998) when he carried out a study in Gwembe district in relation to rainfall variability. The study revealed that rainfall variability poses a serious challenge leading to reduction in the practice of livestock and crop farming which contributes positively in enhancing food security and other livelihood of the people. In view of these findings, one would indicate that the effects of climate change on food security were serious and farmers therefore, needed friendly informal Civic Education platforms such community meetings, workshops and seminars to exchange information on strategies to adopt in order to be food secure; hence the focus of this study.

According to the study conducted by the National Adaptation Programme of Action (NAPA) (2007) on Climate Change in Zambia: Impacts and Adaptation, the findings were that the impacts of climate change were a huge decrease in agricultural productivity, a significant increase in the deaths of livestock and wild animals, flooding, a decrease in tourism, drought and an increased spread of diseases. Further, the findings from a more recent study conducted by Ambukege (2019) on the impact of climate change and climate variability on agriculture and household food security in Kazungula district indicated that Kazungula which is in the Southern part of Zambia like Gwembe was being impacted by climate change and climate variability which had a negative bearing on agriculture and household food security. It states that for the people of Kazungula, climate change had negatively impacted on the four pillars of food security which includes; access, utilisation, availability and stability. As such, the majority of households were highly dependent on emergency and crisis coping strategies including sending children to feed from other relatives, and skipping meals by adults. However, although these studies are relevant to studies on climate change impacts on agriculture in Zambia, none of them provided any information on the

conceptualisation of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley hence, the need for this study.

### **2.6.2 Effects of climate change on Water Resources**

According to the Ministry of Energy and Water Development (MOEWD) (2016), climate change has a serious effect on water resources. Zambia has a relatively abundant supply of surface water and groundwater. However, surface water is unevenly distributed throughout the country, and Gwembe valley of the Southern region often experiences water shortages. For example, in a recent report made by the Syamphande Ward Councilor of Gwembe district Ms. Seminar Kabbila, about 10 villages including a school in the Gulumunyanga area were facing a critical shortage of clean and safe water for drinking, a situation which was forcing the residents to cover many kilometers in search of the commodity. She attributed the shortage of the commodity to the dry spell that hit the area in the 2022/2023 rainy season and thus, appealed to the relevant authorities in the government to take prompt action by drilling boreholes to mitigate the crisis (Byta FM News 90.3fm, June 28, 2023).

A report by MOEWD (2016) noted that during drought periods and following declines in precipitation, there have been reductions in the flow and volume of rivers, streams and lakes which have affected the accessibility and availability of surface water and groundwater for drinking, agriculture, livestock rearing, other human activities, and fisheries which contributes to more food insecurity and suffering to the people. Reduced access and availability of water resources also affect hydroelectric power in Zambia which in turn affects irrigation of crops and generation of drinking water for livestock. However, there was a need to conduct a study to explore how the people of Gwembe valley understand their contributions and how they are coping to these factors reported in Zambia by the Ministry of Energy and Water Development.

### **2.7 Sustainable measures to address the effects of climate change and adaptation.**

One of the sustainable measures to address the effects of climate change and adaptation is by maintaining the current ecosystems. A study by Dudley (2016) in Nepal revealed that maintaining current ecosystems implies strengthening, extending and in some cases refining global protected area networks to focus on maintaining large blocks of integral habitat. Additionally, Kalantary (2010) points out that protected areas are effective tools for maintaining ecosystems, as compared

with other approaches, and can play a critical role in safeguarding wildlife in the face of climate change. Significantly, such areas also help sequester carbon by retaining natural vegetation and provide many of the ecosystem services that human communities need to withstand a rapidly changing climate, such as mitigation of natural disasters, provision of freshwater and maintenance of soils. However, in as much as these studies were relevant to the current study, they did not provide the much-needed information on how the people in the affected areas were to acquire knowledge and skills on how to maintain the current ecosystem. It was therefore important that this study is conducted in order to explore the role of Civic Education in the climate change awareness to enhance food security among farmers of Gwembe valley of Southern province of Zambia.

A study conducted by the Adaptation Sub Committee (2014) in the United Kingdom argues that there is a need to protect forests from human exploitation. Forests are home to many of the world's most endangered wildlife. They also protect the planet by absorbing carbon dioxide (CO<sub>2</sub>), a major source of pollution that causes climate change. There is therefore a need to use satellite images and aerial mapping technologies to track illegal logging. Educators should also study the vulnerability of forests to climate change and explore ways to help them adapt. In an effort to strengthen natural resources, Burke, Hsiang and Miguel (2015) in their study stated that climate change demands the wise management of natural resources, firstly, because climate change increases resource scarcity. For example, in areas that are becoming drier, there is a reduction in the availability of water for household and productive use. Secondly, the role that natural resources play in buffering communities against extremes of climate becomes vital as climates become more adverse. For instance, increasing the soil's organic content improves water retention and drainage which can help crops where rain becomes more concentrated into heavy downpours. Reforestation can also reduce local temperatures, provides additional income, protects against soil erosion, landslides, and local flooding and most importantly, provides food security in times of scarcity. Despite these important findings above, there was still need to ascertain if these measures would apply in Zambia, particularly in Gwembe valley.

Dudley (2016) in his study unveiled that the only effective way to address the effects of climate change was by reducing the risk of climate-related disasters. To achieve this, there is a need to drastically reduce global carbon emissions. People must prepare for the significant and

unavoidable consequences of carbon emissions such as increasing temperatures, shifting precipitation patterns, sea level rise and the increasing intensity and frequency of extreme weather events. This can be done by increasing the resilience of communities by promoting new farming techniques, community weather monitoring and creating seed banks, restoring beach vegetation and securing access to fresh water for animals during periods of drought. The study by Dudley (2016) was in line with the present study because it proposed many ways of how communities can prepare for unfavourable climatic conditions using unconventional methods as indicated. However, the point of departure was that the former did not indicate how the new techniques would be delivered to the intended group and secondly, the study was done in Nepal while the current study focused on the role of Civic Education in climate change awareness and the study was conducted in Gwembe valley in Zambia where the situation was different hence, there was a need to conduct this study.

According to a study by FAO (2011b) in Zambia, another sustainable adaptive measure to climate change is by influencing policy. Government must play a central role to tackle the climate crisis. That is, the government should work to advance policies that reduce carbon pollution, support clean energy technologies, prepare for the effects of climate change, and curb deforestation. Public policies and legislation play an important role in facilitating adaptation to climate change. Land use planning should be regulated by policies that take steady changes as well as likely extreme events into consideration. At international negotiations, the government of Zambia should play a role in developing global climate agreements that substantially reduce carbon pollution to avoid the worst consequences of climate change and combat forest destruction and protect the wildlife that lives there.

A report by FAO (2011b) further indicates that to address the effects mentioned above, the government of Zambia should implement adaptation plans and strategies and strengthen line ministries such as; the Ministry of Education, Ministry of Lands and Natural Resources, Ministry of Green Economy and Environment, Ministry of Agriculture and the Ministry of Information with their environmentally aligned departments such as the Zambia Environmental Management Authority and the Meteorological Department. Additionally, FAO (2011b) observe that the lack of funding for climate change adaptation limits the implementation of adaptation measures that will facilitate the integration of climate considerations into social and economic development, national

poverty reduction, and growth objectives threatened by climate change and climate variability. Thus, increased funding will not only support climate change adaptation efforts and initiatives, but will also contribute to strengthening the capacities of decision-makers and stakeholders to work towards achieving climate resilience and sustainable development goals in Zambia. Nevertheless, FAO did not take into account the impact that Civic Education may play to both the farmers and planners if Environmental or Climate Change Education was made solely the call business of Civic Educators.

NAPA (2007) adds that to deal with drought, selling fewer crops to keep more for household consumption is another sure way of increasing food security. The report went on to suggest that for a household to be guaranteed of food, it needs to take into consideration the following adaptive strategies; shift agricultural production from highlands to lower lands, plant crops earlier, incorporate crop residues instead of burning them, grow more drought-resistant crops, crop rotating, intercropping, cover cropping, irrigating and sinking wells for domestic water use. Additionally, the IPCC (2007) suggested other adaptation measures that people should undertake when faced with floods. These include gathering and selling wild food, as well as the shifting of agricultural production, livestock and building houses on higher lands, burying ditches to prevent waterborne diseases, evacuating early when water levels increase, improving drainage around houses, putting plastic on top of houses, and building shelters to compensate for destroyed houses and when rainy seasons are shorter, zero grazing for livestock would be ideal. The studies by both NAPA (2007) and IPCC (2007) informed the present study because some of the suggestions they made seemed to be workable on enhancing food security in the face of climate change. The only point of departure was that the former studies did not look at whether the households in question were informed or not to put such useful suggestions into practice while climate change awareness to enhance food security among farmers of Gwembe valley through informal Civic Education was the focus of this study.

The United Nations Conference on Sustainable Development (2012) stated that if Zambia is to move towards sustainable development and ensure that adverse impacts of climate change do not undermine national efforts to attain the Sustainable Development Goals and reduce poverty and hunger, the threats of climate impacts must be addressed. The National policy on climate change should be put in place and institutional arrangements, capacities and adequate resources deployed

to develop a National Action Plan to implement the National Climate Change Response Strategy for climate resilience and low emission growth. This will be important for enhancing the resilience of communities and protecting economic growth, food security and the environment from the impacts of climate change while accelerating green growth.

## **2.8 Role of Civic Education in climate change adaptation measures to enhance food security**

The role of Civic Education in climate change adaptation to enhance food security cannot be over-emphasized. According to a report by the Zambia Climate Change Act (2016), communities are aware that weather patterns have changed but they are not aware of what to do for them to survive. In Zambia for instance, several policies and programmes on climate change have been made and relevant institutions for implementation created, but the challenge of integration of such policies and programmes and the target population to receive such information remains uncertain. In line with this observation, Fumpa-Makano (2011) also argues that lack of capacity building and lack of information on climate change suitable for different audiences is the reason for the slow pace of adoption and adaptation strategies against climate change. This is a clear indication that the majority of the people are ignorant of what they have to use climate change information for, thus indulging in environmentally unfriendly practices that exacerbates the impacts of climate change and affecting their livelihood including increased food insecurity. It is for this reason that informal Civic Education should be applied in order to bridge the gap between climate change policy implementors and the target population in order to meet the common goal as it spells out how such information can be delivered through its use of methods such as workshops, meetings, seminars, radio and television programmes as well as individual to individual interactions.

A study by Owen (2015) on Acquisition of Civic Knowledge argues that education enables people to access information on climate change and adaptation so that they make an informed decision. Communities in remote locations are particularly vulnerable and could be excluded through factors such as lack of electricity, roads, or high rates of illiteracy. Information is most accessible when communicated in the local language and in a medium that is culturally appropriate but ensures that everyone has access; for example, women can be excluded if the information is shared in public spheres to which they do not have access. Owen (2015) opined that communicating the information through informal Civic Education channels in a timely and accessible manner may require addressing barriers such as lack of infrastructure; different local languages and differentiated

access which people have access to a TV, internet, a notice board or a radio. Once these are effectively done, farmers will have first-hand and accurate information which will help them to make informed decisions on which crops to plant and in which period to plant to have a good yield supported by the current climatic condition. This is what the current study also strongly suggest.

Similarly, a study by Muntengwa *et al.*, (2020) point out that when people are empowered with knowledge on the effects of climate change and adaptation, it reduces vulnerability both by reducing exposure to climate risk and through addressing existing and emerging inequalities of power and assets that would otherwise make adaptation impossible. Successful adaptation means people becoming increasingly able to make informed decisions about their lives and livelihoods in a changing climate. In a related development, a study by the UN (2007) indicates that the poor, most of which are indigenous people are more exposed to the risks of impacts of climate change yet they are rarely involved in public discourse of climate change. Hence, improving education, training and public awareness of climate change is an important measure for persuading the whole of society to jointly participate in activities for mitigation and adaptation to climate change and the answer is only through informal Civic Education which is flexible and inclusive.

Further, the changes in weather patterns are often attributed to factors such as deforestation or some other locally caused problems. A study by Mainde (2018) in Zambia found that by linking these observations with information about emerging local trends, global climate change, and local impacts, individuals and communities can be empowered to make the transformative actions necessary for them to adapt. Without Civic Education, people continue to rely on unsustainable and often damaging coping strategies, assuming that “things will be better next year” due to ignorance. Instead, negative trends continue and assets and resources become further depleted, perpetuating a cycle of poverty. Awareness raising in general, climate and weather-specific information in particular, enable people to respond appropriately to current variability and expected changes over time. All these can only be achieved through informal Civic Education.

Additionally, Campbell and Kwak (2010) asserts that the demand for climate change information should occur at multiple levels; everyone from policy makers to subsistence farmers needs accurate and timely information that is relevant to the decisions they have to make especially on food production. This information must satisfy two requirements. Firstly, it must be tailored to the

different needs of different groups of people, and secondly, those people have to receive it. National policy makers and local planners might require different information over different planning timeframes, one to allocate forward-looking budgets and another, to implement short-term planning initiatives or identify vulnerable communities for urgent action. On the other hand, communities themselves might require different information again, like early warning for extreme weather events, or seasonal forecasts about food production. Therefore, effective informal Civic Education through participatory processes, training and workshops can help to generate an understanding of the kinds of information needed at the local level, as well as the best way to communicate it.

A study by Kumar and Vasimalairaja (2018) on the role of education in propelling climate action reveals that Climate Change Education helps people to address and develop effective responses to climate change. It helps people understand the causes and consequences of climate change, prepares them to live with the impacts and empowers them to take appropriate actions to adopt more sustainable lifestyles. Thus, farmers will get an understanding of the anthropogenic causes of climate change and the role each individual, community and society would have to play in adopting practices and behaviours that both mitigate against further damage to the environment and adapt to present and future impacts of climate change through interactions with experts and amongst themselves. Additionally, communities learn how climate change will affect them, what they can do to protect themselves from negative consequences, and how they can reduce their climate footprint. The study concluded that a good education system is one that caters for all but most importantly the one that helps to increase the resilience of vulnerable communities that are most likely to be adversely affected by climate change and should be provided through audio-visual programs, seminars, training programs and environmental awareness campaign. However, the study by Kumar and Vasimalairaja (2018) only focused on the role of climate change education overlooking the role of Civic education in climate change awareness to enhance food security; hence leaving a gap for this study.

## **2.9 Research Gap**

This chapter has highlighted the existing literature related to the role of Civic Education in climate change awareness to enhance food security among farmers and the gap in existence thereby providing a justification to conduct this study. From the literature reviewed, it has been established

that there have been little or no known studies done on exploring the role of Civic Education in climate change awareness to enhance food security among farmers because most of the studies focused on the role of education in environmental awareness or climate change in general hence the motivation to undertake this study. This motivation acted as a way of contributing to filling the gap and subsequently have a reference point in case of any changes in climatic conditions in future that may impede agricultural production among farmers particularly those in Gwembe valley.

## **2.10 Chapter Summary**

The chapter reviewed literature related to the role of Civic Education in climate change awareness to enhance food security among farmers. The literature review started with a discussion of the concept of Civic Education, which formed the basis of the study. It then proceeded to discuss climate change, related literature on the effects of climate change on food security and sustainable measures employed by farmers of Gwembe valley. The chapter ended with a discussion on the role of Civic Education in climate change adaptation measures in enhancing food security. The next chapter discusses the methodology used when conducting the study.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Overview**

This chapter presents the research methodology that was employed in this study to collect the required data. In this chapter, there is a discussion on research design, which includes the location of the study area, demography, climatic condition, soil, and the agricultural practices of the people of Gwembe valley. It then looks at research paradigm and its application to the study. The chapter also outlines the steps taken from the research design through to target population, sample size, sampling techniques, sampling procedure, the instrument for data collection and the reason for using them in this study. It ends with a discussion of data collection procedure, data analysis and trustworthiness. Ethical consideration issues of the study were also discussed.

#### **3.2 Research Paradigm**

In this study, a qualitative interpretivism research paradigm was used because of its nature of being descriptive, focusing on the collection of in-depth data, non-use of numbers and focusing on interpreting data that was collected from the study sites. The qualitative interpretivism research paradigm was chosen for this study because it enabled the researcher to carry out the study in its natural environment based on research strategy that was flexible and interactive. This is in line with Kombo and Tromp (2006) who postulates that qualitative interpretivism research seeks to understand social phenomena from the actor's perspective and how the world is experienced, and the motives and beliefs behind people's actions at a personal level. As such, qualitative interpretivism research paradigm was cardinal for this research as it brought out the most significant existing reality within the local context such as how farmers gained knowledge about climate change through informal Civic Education, how they experienced the effects of climate change on food security as well as the adaptive strategies they adopted to enhance food security in their households. During data collection, data was gathered through semi-structured interviews from all the participants.

#### **3.3 Research Design**

The study employed a single case study with a purpose to understanding the essence of a phenomenon by examining the views of the people who experienced it. Thus, farmers were

selected since they directly experienced the effects of climate change on food security. The study provided the in-depth understanding of the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley of Southern province of Zambia.

### 3.4 Location of Study Area

The study was undertaken in Gwembe valley of Gwembe district which is located in Southern province of Zambia. It lies along the north-west shore of Lake Kariba and Chikankata, bordering the Southwest of Kafue National Park. Much of the Eastern part of the district lies in the valley, while the Western part lies in the plateau. The valley is essentially a hilly and rocky area with an escarpment (Zambezi) near the plateau and a series of sleepy sloping ridges often 300m to 400m high. The higher elevations range from 900m to 1200m while the low-lying areas lie between 350m to 500m above sea level. The area stretches from Batoka Gorge in the west to the Zambezi-Kafue confluence in the east. It is about 265km long and approximately 65km in width at the widest point. It is geographically located between longitude 28° 29' to 59° 99" S and latitude 28° 00' to 0.00" E South of the equator in Agro-ecological region 1 (Swennenhuis, 2012).

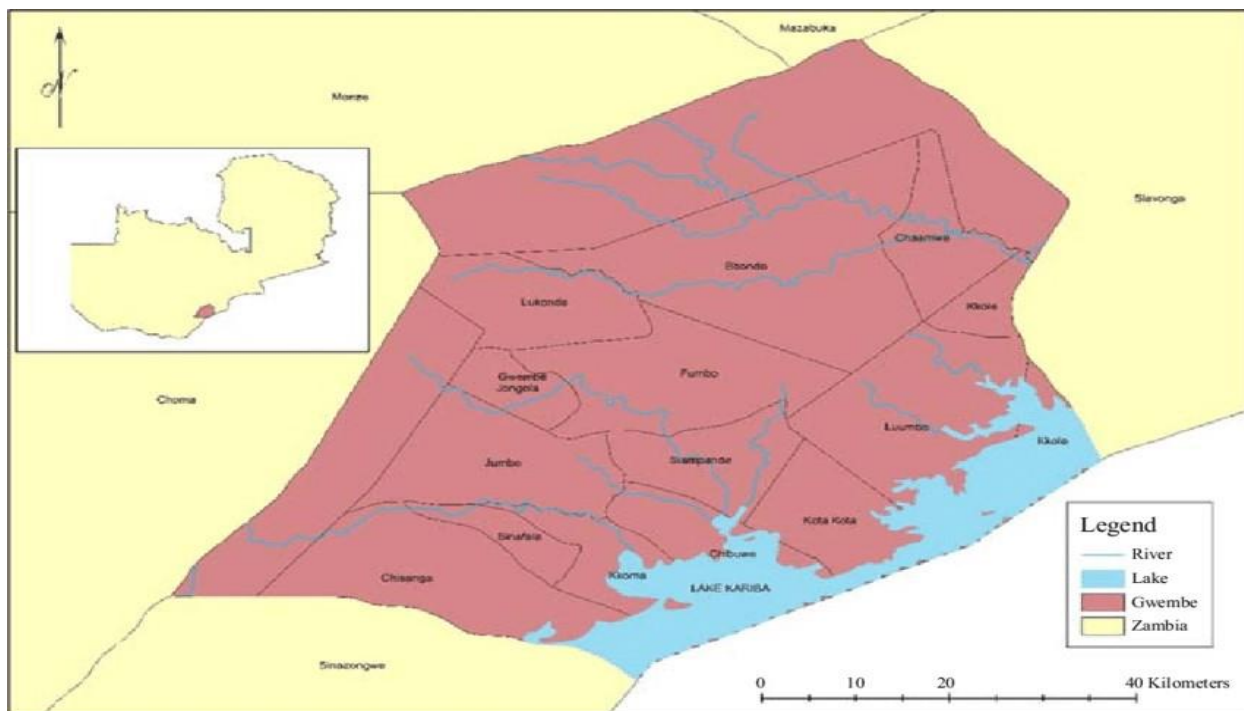


Figure 1: *location of the study area, Gwembe valley*

Source: <https://www.researchgate.net>

### **3.5 Demography**

According to CSO (2022), the population of Zambia as of September, 2022 was 19,610,769 out of which Southern Province had 2, 381,728 and Gwembe District contributed a total population of 79, 273 out of which 38,841 were males while 40, 432 were females. Gwembe valley is mostly occupied by the Tonga speaking people. The study was conducted in three villages; Munyumbwe, Njoongola and Chipepo which are part of other villages as shown in figure 1 above while almost all experts were interviewed from Gwembe Boma where they are stationed.

### **3.6 Climatic Condition**

Gwembe valley is located in the dry tropics falling in the rain shadow region of the Zambezi River Basin. It is situated in the Agro-ecological Region 1 which has a low rainfall pattern that fluctuates around 800mm annually, a situation which exposes it more to frequent droughts (Swennenhuis, 2012). Typically, Gwembe valley lies in the sub-tropical climatic region which has three different seasons: the hot season which runs from Mid-August to November with the temperatures of 26.6 °C -32.6 °C, the rainy season runs between November and April with 27.5°C-32.6°C and the cold-dry season from Mid-April to Mid-August with the temperature of around 22.6°C - 24.3°C. The temperature is usually high with the minimum and maximum ranging between 22.6°C and 32.6°C.

A study by the World Bank (2021) indicates that rainfall in Gwembe valley is low, unpredictable and usually characterized by poor distribution. Rains are usually anticipated around mid-November and retreat by mid-March. A rainy season may be characterized by several dry spells of which some are localized while at times the entire district may be affected and this has a huge impact on both animals and human livelihood. It is also cardinal to note that in Zambia, the rainy season is affected by the Inter-Tropical Convergence Zone (ITCZ) which oscillates between the northern and southern tropics over the course of a year which has a strong influence on Gwembe valley being in the Southern part of the country.

### **3.7 Soils**

A study by Mwenda (2002) disclosed that Gwembe valley has three categories of soils; the brown valley soils that are well drained and have their texture ranging from sandy-loam to sandy-clay-loam. This type of soil has nutrients and potentially very fertile for a range of crop production. The second category is the brown podzolic soil which is mainly sandy with some amount of clay. This

type of soil lacks nutrients due to heavy leaching and generally poor for agriculture although it can support some types of crops such as millet, sorghum and sweet potatoes. The third category of soil is the solonetz which ranges from dark colored clay and commonly found in the mopane woodlands to grey-sandy or loamy hardpan soil under grasslands. This type of soil is found in basin areas and tends to be very compacted in nature as a result, it gives problems to root penetration and water logging conditions. Because of its nature, solonetz has very little use for agriculture as it also contains high contents of sodium (Mwenda, 2002). Due to these types of soils, Gwembe valley is dominated by drought tolerant shrubby vegetation which is interspaced with thorny bushes and grasses especially in the valley.

### **3.8 Agricultural Activities in Gwembe valley**

Gwembe valley is basically an agricultural area and most of the people in the region are smallholder and hoe agriculturalist whose subsistence economy is based on rainfed bulrush millet and sorghum (grown on a small scale), maize (the main crop grown on a large scale) and cotton for business. Despite being an agricultural area, the community has been grappling for several years with inadequate and intermittent rainfall received in the area which fails to sustain crop growth during the farming season (GRZ, 2017). The mean annual rainfall of 635mm received in Gwembe valley is less than the required rainfall for most maize varieties recommended for the region without supplement moisture from irrigation. Maize is the staple crop grown in Gwembe and requires an average rainfall of between 800 mm and 1000 mm (GRZ, 2017). In some instances, however, the rain pattern results in either moderate or severe floods or droughts in most parts of the district. According to Umar & Nyanga (2016), the problem is worsened by Southern region susceptibility to inter and intra-seasonal perpetual droughts. This leaves the farmers of the valley with uncertainties in agricultural prospects as crop failures are very common.

The high evaporation rates in the valley puts a lot of moisture stress on plants due to its location with a hot and dry climate and average temperatures rise up to 32.6°C. The climatic challenges have contributed to the poor crop yields realized in the area. In the years when rainfall is above normal, the tributaries of the Zambezi River flood the valley fields prior to their harvest resulting into losses of crops. Sometimes the sedimentary rocks of the Karoo system which characterizes the area make agriculturally suitable soils difficult to find in Gwembe valley (Mwila et al., 2008). This forces some farmers to travel long distances to find fertile soils along the deltas of Zambezi

River tributaries (Colson, 2011). Apart from crop farming, the people of the valley are also livestock and fish farmers. They keep sheep, goats, pigs, cattle, chickens and ducks among others. They also engage in fish farming by keeping fish in cages on lake Kariba. However, due to higher temperatures, droughts and floods propelled by climate change, the valley has poor pastures, inadequate water for both fish and drinking for animals, and recurrent foot and mouth diseases and other livestock diseases which makes farmers lose their livestock through death.

### **3.9 Sampling Procedure**

According to Hamed (2016) sampling procedure is a process of selecting several individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group where the researcher intends to investigate. In this study, homogenous purposive sampling techniques and expert purposive sampling were used to select all the participants.

The procedure for selecting the participants was as follows: Firstly, the researcher visited the selected study sites. From each site, the researcher asked for permission from the participants that is farmers, and officials from; the Ministry of Agriculture, Ministry of Fisheries and Livestock, and Ministry of Green Economy and Environment. This sample was chosen because it was believed to have the necessary data for the study. After permission was granted, the researcher asked for informed consent from the participants. Thereafter, the researcher would give the consent forms to the participants, especially those who accepted to participate in the research process by signing the consent form and expressing their willingness to participate in the research.

### **3.10 Sample Size**

According to the records from the register for Farmer Input Support Program collected from the District Agricultural Officer, there were about 22,119 smallholder farmers in Gwembe valley who engaged in one or two or in all of the following types of farming: crop farming, livestock farming and fish farming. However, the sample size that participated in this study was 25. This sample was determined through the saturation point which is a cut-off point reached when responses from participants became more repetitive (Creswell, 2014). There were 5 crop farmers 5 livestock farmers, 5 fish farmers, 3 informants from the Ministry of Green Economy and Environment, 4 informants from the Ministry of Agriculture, and 3 from the Ministry of Fisheries and Livestock.

The selected number of participants was adequate to collect sufficient information required for the study and it was also appropriate since the study was purely qualitative.

**Table 3.1 Summary of Sample Size**

<b>Sample</b>	<b>Number</b>
Farmers (Crop, livestock and fish farmers)	15
Ministry of Agriculture (Agricultural Extension Officers)	4
Ministry of Green Economy and Environment (Foresters and Meteorologists)	3
Ministry of Fisheries and Livestock	3
<b>Total</b>	<b>25</b>

**(Source: Field data 2023)**

### **3.11 Target Population**

The target population of this study comprised of the crop, livestock and fish farmers. By 2022/2023 farming season, Gwembe valley had about 15,580 estimated crop farmers, 6,500 livestock farmers and 39 fish farmers but this study targeted all the farmers who have been in the farming industry for at least 10 years uninterruptedly. Thus, the targeted farmers were identified by the use of a Farmer Input Support Program (FISP) register from the District Agricultural Coordinator’s office and the District Fisheries and livestock Coordinator’s office respectively. These were chosen because of their consistency in farming that could have given them sufficient experiences to give information that was needed for this study. Other participants included; Officers from the Ministry of Agriculture, Ministry of Green Economy and Environment and Ministry of Fisheries and Livestock. The researcher’s choice of this population was based on the belief that it could provide the necessary data needed for the study owing to their experiences and field of work or occupation.

### **3.12 Sampling Techniques**

The study employed homogenous sampling techniques to select all the farmers. Expert purposive sampling was used to select all other participants owing to their experiences, occupation and field

of work thus believing that they would have the necessary information on Civic Education, climate change and its impact on food security.

### **3.12.1 Homogeneous Purposive Sampling**

This study adopted the homogenous sampling technique due to the fact that the perceptions of participants on the understanding of informal Civic Education, climate change awareness, effects of climate change on food security, were understood by farmers who had been in the farming business for the period of 10 years or more and experienced the same problems but had diverse information, interpretation and understanding of the same problems faced.

### **3.12.2 Expert Purposive Sampling**

In this study, expert purposive sampling was used to collect data from selected government workers such as the Senior Agricultural Officer, Agricultural Extension Officers, officers from Forest Department, Fisheries and livestock, and Meteorological Department from Gwembe. These provided necessary information on the role of informal civic education in climate change awareness to enhance food security among farmers of Gwembe valley.

## **3.13 Instruments for Data Collection**

To collect the necessary data for this study, the main instrument that was used was the semi-structured interview guide. The instrument was chosen because it helped the researcher to collect data that was free from biases. Thus, the researcher collected data, which was trustworthy.

### **3.13.1 Semi-Structured Interview Guide**

In this study, the interview guide was used in order to collect data from the identified and selected participants. The participants were visited in their households and offices at their convenient time and the interviews were conducted. The interviewer and the participants were engaged in formal interviews, which allowed informant's freedom to express themselves about exploring the role of Civic Education in the climate change awareness to enhance food security among farmers of Gwembe valley. This Interview guide was used to collect primary data from all the 25 participants: Farmers, experts from the Ministry of Agriculture, Fisheries and livestock, and the Green Economy

and Environment. The sample helped the researcher to obtain useful information, perceptions and opinions that the study focused on. The research instrument was suitable for the study because in-depth information was gathered due to the open-ended structure of the questions that were provided for uniformity. It also allowed for probing thus the researcher obtained new ideas useful for the study.

### **3.14 Secondary Data Collection**

In this study, secondary data was obtained from dissertations, books, electronic data, reports and many others from the University of Zambia library, Ministry of Agriculture, Ministry of Fisheries and livestock as well as other sources that had related information on the role of Civic Education in the climate change awareness to enhance food security among farmers of Gwembe valley.

### **3.15 Summary of Data Collection Tools**

For this study, two data collection tools were used; the primary data tools through semi-structured interview guide and the secondary data tools that included reading and reviewing of the relevant documents, journals and other sources that were related to this study. These tools were adopted for the purpose of validity and reliability on the information that was collected. It is also important to note that the adopted data collection tools were appropriate to answer the questions, which were purely qualitative in nature for this study.

### **3.16 Primary and Secondary Data Analysis**

This study was qualitative in nature; therefore, thematic analysis technique was used to analyse both primary and secondary data. This was in line with Rohana (2010) who states that thematic analysis is used in qualitative research, which focuses on examining themes within the data collected. Thematic analysis is used in identifying, analysing and reporting patterns or themes within the collected data. In this study, themes such as understanding Civic Education, climate change, causes of climate change, effects of climate change on food security as well as sustainable measures in enhancing food security in Gwembe valley were generated. In addition, primary data was collected using semi-structured interviews from local farmers and experts from the Ministry of Green Economy and Environment, Ministry of Agriculture and the Ministry of Fisheries and Livestock.

### **3.17 Trustworthiness**

To establish the trustworthiness of this study, the researcher, relied on the three features proposed by Lincoln *et al* (2011); credibility, dependability and confirmability.

#### **3.17.1 Credibility**

This study used one data collection instrument to collect data from all the participants-the semi-structured interview guide. Therefore, in order to ensure credibility of the findings, sample triangulation was used with the agricultural extension officers, fisheries and livestock, meteorological, foresters as well as farmers. The use of sample triangulation provided strength to the study. Additionally, the researcher also had a lengthy engagement with participants in the study area to clarify or expand on the findings. The researcher also kept researched data on digital recorder and the notebook to track decisions and rationale which was coupled with listening to the recordings repeatedly in order to ensure that the transcripts were correct. This was in line with Creswell (2007) who pointed out that one of the strategies used to ensure credibility was the prolonged engagement and persistent observation of participants in the field. This helps to create trust between the researcher and the participants.

#### **3.17.2 Dependability**

This feature of trustworthiness was demonstrated by this study through provision of descriptive details of methods used in the collection of data, analysis and interpretation of data. This was in line with Creswell (2009) who stated that dependability of qualitative studies addresses the concern for the data to remain stable over time. Thus, the legitimacy of data for this study was clarified with participants and the interpretation, examination and discussion with the study supervisor.

#### **3.17.3 Confirmability**

Confirmability is yet another characteristic of trustworthiness which refers to the objectivity or neutrality of the data (Gunawan, 2015). To ensure confirmability for this study, the researcher provided an audit trail which highlighted every step of data analysis consisting of such records as interview transcripts, reflective journaling following interviews, notes on scheduled activities related to data analysis and provided a rationale for the decisions that were made. This helped in establishing that the findings of the study accurately portrayed the responses of the participants.

### **3.18 Ethical Consideration**

Before undertaking this study, the researcher obtained permission and clearance to conduct research from the Ethics Committee for the University of Zambia (UNZA) (Appendix H). According to Maxwell (2005), ethics refer to the quality of research procedure concerning their adherence to professional, legal, and social obligations to the research participants. These guidelines deal with voluntary participation, no harm to the participants, consent letters, anonymity and confidentiality, respect and cultural norms. In relation to this study, informed consent to participate was obtained through the signing of the consent form by all the 25 participants. Thus, any possible harm, anonymity or embarrassment during interviews were avoided as the researcher adhered to the academic and moral ethics by upholding the cultural norms and decisions of the participants. Confidentiality was also guaranteed to all participants by assuring their names would not be disclosed for whatever reason and that the information they would provide would be solely for academic purposes.

### **3.19 Chapter Summary**

This chapter presented the research design and methodology that was employed in this study to collect the required data. The chapter presented the research design, which included the location of the study area, demography, climatic condition, soil, and the agricultural practices of the people of Gwembe valley. It then looked at the research paradigm and provided its application to the study. It also gave outlined detailed steps that were taken from the research design through to target population, sample size, sampling techniques, sampling procedure, the instruments that were used in data collection and provided the reason for using them in this study. Data collection procedure, data analysis, trustworthiness as well as ethical consideration issues were also discussed. The next chapter presents the research findings.

## CHAPTER FOUR

### PRESENTATION OF FINDINGS

#### 4.1 Overview

This chapter presents the findings of the study on exploring the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley. It begins with the demographic characteristics of participants, which includes the educational level, type of farming practiced and number of years lived in the study area. Thereafter, the findings will be presented according to the research questions indicated below:

- i. How do farmers learn about climate change to enhance food security?
- ii. What are the effects of climate change on food security among farmers of Gwembe valley?
- iii. What sustainable measures would farmers employ to ensure food security at household level amidst climate change?

#### 4.2 Demographic Characteristics of Participants

The socio-economic characteristics such as educational level, type of farming practiced and number of years participants have been in the farming industry were investigated in order to understand the background information of the target population.

##### 4.2.1 Educational Levels of Participants

Table 4.1 shows that most of the participants had attained either secondary or higher education.

*Table 4.1 Educational Level of Participants*

Level of Education	Frequency
Never been to school	1
Primary	4
Secondary	8
Tertiary	12
<b>Total</b>	<b>25</b>

(Source: Field data, 2023)

The educational level of participants in Table 4.1 shows that the majority of participants had attained some level of education. As indicated (in Table 4.1), 12 participants attended tertiary education, 8 participants attended secondary education, 4 participants attended primary education while 1 participant had never attended any form of formal education. Majority of the participants attained the tertiary education, significant enough to contribute to the outcome of the study on the role of informal Civic Education in climate change awareness to enhance food security.

#### 4.2.2 Type of farming practiced by Participants

*Table 4.2 shows the type of farming each participant practiced in the study area.*

<b>Type of Farming</b>	<b>Frequency</b>
Crop farming only	4
Livestock only	0
Fish only	0
Crop and livestock	16
Crop and fish	2
Livestock and fish	0
Mixed farming	3
<b>Total</b>	<b>25</b>

**(Source: Field data, 2023)**

Table 4.2 shows that 3 participants engaged themselves in mixed farming, there was no single participant who practiced livestock and fish farming while 2 participants practiced crop and fish farming. Further, the findings showed that 16 participants who were the majority engaged mostly in crops and livestock farming. None of the participants exclusively engaged in fish farming nor livestock farming, while 4 participants practiced crop farming only. Hence, all the participants

participated in types of farming practiced in the study area and contributed to the outcome of the study.

#### 4.2.3 Number of Years lived in the Study Area

*Table 4.3 shows the number of years the participants lived in the study area*

<b>Years</b>	<b>Frequency</b>
0-5	3
5-10	6
10-20	6
Above 20	10
<b>Total</b>	<b>25</b>

**(Source: Field data, 2023)**

According to the findings in Table 4.3, 10 participants had lived for 20 years and above, 6 participants lived between 10 and 20 years, 6 participants lived between 5 and 10 years while 3 participants lived 5 years and below in the study area. Hence, all the participants lived in the area for many years and had sufficient experiences to contribute to the outcome of the study.

### 4.3 How farmers learn about climate change to enhance food security

#### 4.3.1 Views of participants on understanding climate change

In order to get the views of participants on their understanding of climate change, the following question was asked; *how do you learn about climate change to enhance food security?* The study used semi-structured interview guide and in order to get the in-depth information, the researcher probed the participants. The findings revealed mixed views of participants understanding of climate change and food security. Minority farmers felt that they adequately understood climate change and food security while the majority had a contrary view as evidenced by the themes and codes/near codes identified from the farmers' narratives (see Table 4.4).

*Table 4.4: Participants views or understanding of climate change in Gwembe valley.*

Themes	Codes or Near codes
1. Adequate Understanding of Climate change	<ul style="list-style-type: none"> <li>• Understood climate change through community meetings, workshops and seminars as well as through changes in weather pattern such as:</li> <li>• rainfall pattern</li> <li>• frequent droughts and</li> <li>• higher temperatures</li> </ul>
2. Limited Understanding of Climate change	<ul style="list-style-type: none"> <li>• High illiteracy levels among farmers on Climate Change issues.</li> <li>• High engagement in practices that lead to climate change such as:</li> <li>• Farming practices.</li> <li>• charcoal burning and</li> <li>• Motorized fishing boats.</li> <li>• Non-engagement of farmers in addressing climate change and promoting sustainable agriculture practices.</li> <li>• No initiatives aimed at building resilience and food security.</li> </ul>

**(Source: Field data, 2023)**

Below is the presentation of findings cited above on the views of the participants on the understanding of climate change in relation to food security through Civic Education.

#### **4.3.2 Reasons why farmers felt they had adequate understanding of climate change**

Participants were asked to describe their understanding of climate change. Minority participants gave detailed description of climate change and food security and cited humans as its major cause. They said that they adequately learned about what was causing changes in rainfall pattern, frequent droughts, flash floods and high temperatures being experienced in Gwembe valley through community meetings, workshops and seminars organized by experts from both the government and NGOs.

With regards to the above findings, one of the farmers from Chipepo-**F2**- had this to say:

*“Aah! What I have learned about climate change here in Gwembe is that there is a shift in weather pattern. Through the meetings I attend and also from experience, what I can say is that this change in weather has made the rainy season shorter and sometimes longer like sometimes it rains and sometimes it does not rain as it used to. In fact, we have droughts most of the times here like what happened in 2021/2022 and this year as well 2022/2023 farming season. It has been dry, very dry because the weather is no longer stable” (29/8/23).*

Another farmer from Njoongola-**F9**-shared his understanding by saying:

*“Climate change is actually the change in weather activities on the rainfall pattern, the temperatures which are now very high compared to the normal temperatures which we used to have some years ago and droughts which are persistent compared to some years ago” (6/9/23).*

Similarly, one of the agricultural extension officers from Gwembe Boma-**AEO1**- stated that:

*“Climate change is the change of weather and we have been experiencing changes in the weather pattern and this has affected humanity habitation here on earth by the changes that it has brought forth. So, sometimes we have La Nina and sometimes we have El Nino. These are opposite of the other sometimes we have drought and sometimes we have floods. And you know, during our outreach community sensitization meetings we teach our farmers ways they can use to secure their food during times of hunger” (8/9/23).*

One of the farmers from Munyumbwe-**F11**- explained that:

*“Food security is the ability to have enough food stock that can sustain a family even during the time when one does not have food straight from the farm or should I say off season” (22/9/23)*

*Another farmer from Chipepo-**F5**-disclosed that:*

*“What I have learned from our extension officers is that for a farmer like me, food security is a situation where you harvest enough that you can store and eat with your family until the next farming season and even sale some, not a farmer buying food from the market at the mid of the year” (29/8/23).*

In addition to understanding food security, one of the agricultural extension officers from Munyumbwe-**AEO3**-reported that:

*“What I can say about food security is that if we do not have enough rains because of climate change farmers will not have enough food or will not harvest food that will go round until another farming season as a result, there will be no availability of food or access to food in the communities meaning that there will be poverty. So, food security is when people have enough to eat at home and community at large” (9/10/23).*

On the same point, one of the experts from the forest department under the Ministry of Green Economy and Environment from Gwembe Boma-**FOR2**-stated that:

*“As human beings, we want a livelihood as such, we have gone into destruction of our forests which is a carbon sink. Forests trap some of the carbon dioxide and the way trees are being cut for charcoal, timber, even by farmers you would find that the carbon has nowhere to go so it contributes to the accumulation of the Green House Gases there by increasing temperatures and affecting other elements such as rainfall pattern and when you have a dry spell it means that people will not produce any food. That’s what we are teaching our people when we call for meetings but the challenge is that only a few come,” (4/9/23).*

### **4.3.3 Reasons why farmers had inadequate understanding of Climate change**

The study found that majority of the participants had inadequate understanding of climate change. Farmers cited limited understanding due to high illiteracy levels on Climate Change issues, high engagement in farming practices that lead to climate change such as charcoal burning, use of motorized fishing boats, non-engagement in addressing climate change and promoting sustainable agriculture practices and non-application of initiatives aimed at building resilience and food security.

#### ***4.3.3.1 Engagement of farmers in farming practices that cause Climate Change***

The study found out that all the participants to the study attributed humans as the major causes of climate change, which was responsible for shortages of food in Gwembe valley. They pointed out that the socio-economic activities that humans engaged in such as farming practices, charcoal burning and using motorized fishing boats during fishing activities as contributing immensely to the causes and effects of climate change on food security in Gwembe valley.

#### ***4.3.3.2 Farming Practices***

The findings of the study revealed that farmers were highly engaged in farming practices, which are major human activities contributing heavily to climate change in Gwembe valley resulting into food insecurity. Participants said that poor farming practices of using traditional farming ways such as farming on the same land for many years, using mold board ploughs, clearing all the trees in the field, continuous use of artificial fertilizer and growing the same types of crops that some farmers were using had negative effects on the environment hence resulting into climate change. High illiteracy levels among farmers on Climate Change issues, made the farmers to actively engage themselves in farming practices that cause Climate Change because they were not aware of the outcomes.

The findings were evidenced in the following response given by one of the farmers from Chihepo-**F4**-who stated that:

*“Contributors to climate change and its effects to our livelihood in Southern Province are farmers. I can assure you that most of us farmers here are uneducated and you know what that means Sir. So, what happens is that some farmers once they are given farms, they cut*

*down trees indiscriminately thereby causing climate change as large fields are left open like deserts, meaning that we cannot have rains as trees are not there to contribute to the formation of clouds and rains. I think it's just ignorance” (29/8/23).*

Another farmer from Munyumbwe-**F10**-revealed that:

*“We do not diversify the crops we plant. No crop rotation, we only grow maize and cotton, and do not grow these other crops meaning that once the soil is not repaired with other crops we opt to go and clear another piece of land and as such cutting down trees. Sometimes the chemicals we use in the soil like weed killers have an effect on the soil. Once the soil is damaged, we keep clearing new lands for growing crops leaving the other land bare and exposed to erosion” (6/9/23).*

#### **4.3.3.3 Charcoal Burning**

Another indication why farmers seemed to have inadequate understanding of Climate change was their involvement in charcoal burning in Gwembe valley. The findings showed that all the participants to the study said that people who were cutting down trees for charcoal as a means of livelihood were contributing to the effects of climate change being experienced in Gwembe valley.

This was evidenced by the response that was given by one of the farmers from Chipepo-**F2**- who had this to say:

*“People that are cutting down trees for making charcoal have drastically reduced the number of trees in the valley making it difficult for us to have normal rainfall. What I know is that trees are a major contributor to the making of rains that we receive so if they are no trees like what has happened here, how can we have rains? It cannot rain!” (29/8/23).*

Another farmer from Njoongola-**F9**-reported that:

*“All those cutting trees carelessly for charcoal burning are causing climate change because they do not just cause deforestation but they also emit some unwanted gases into the atmosphere during that process of burning charcoal which affects the rainfall pattern” (6/9/23).*

In support of the above sentiments by the farmers, one of the experts from the Ministry of Green Economy and Environment (meteorologist) from Munyumbwe-**MO**-stated that:

*“You know education is very important but most of our farmers here are uneducated and because of that when we call for meetings or workshops to talk about what is affecting them -climate change, they don’t show up if you have 10 then you are lucky and that’s why it is not surprising that some farmers do not know that careless cutting down of trees in the field and burning them for whatever reason cause deforestation, and emit unwanted gases into the atmosphere, which affects the rainfall pattern” (06/09/23).*

#### **4.3.3.4 The use of motorized fishing boats**

Another indication why farmers seemed to have inadequate understanding of Climate change was their use of motorized fishing boats. Most of the participants talked to said that there were too many fishing boats on lake Kariba most of which were powered by petrol or diesel engines. The findings revealed that these petrol or diesel engines were producing a lot of smoke, which was emitted into the atmosphere during the process of fishing hence contributing to climate change. In line with the above findings, one of the farmers in Chipepo-F7- reported that:

*“Fishermen, like those who catch kapenta (sardines), the fishing boats are too many and are not balancing the ecological systems because of too much smoke pollution that comes from diesel engines and then emitted into the atmosphere during their operations” (29/8/23).*

Another farmer from Munyumbwe-F10-said:

*“For me, I think human activities like those burning fossils, people with motorized boats in the case of those fishing on lake Kariba and those with vehicles are causing climate change due to combustion because gasses like carbon dioxide are emitted into the air and the result is what we are seeing now” (6/9/23).*

Arising from the findings on the first research question, it was evident from the study that farmers had mixed views on how they understood climate change. Positively few farmers indicated that they adequately understood climate change because they learned through informal meetings, workshops and seminars organised by government and NGOs they were attending and were also able to notice climate change in weather pattern due to change in rainfall pattern, frequent droughts, flash floods and high temperatures. Negatively, the study found that majority of the participants had inadequate understanding of climate change. Participants cited inadequate

understanding due to high illiteracy levels on Climate Change issues, high engagement in farming practices that lead to climate change such as charcoal burning, use of motorized fishing boats, non-engagement in addressing climate change and promoting sustainable agriculture practices and non-application of initiatives aimed at building resilience and food security.

#### 4.4 Effects of climate change on food security among farmers of Gwembe valley

The second research question for the study was aimed at establishing the effects of climate change on food security to the farmers of Gwembe valley. The participants were asked to describe what they perceived as the effects of climate change on food security. Participants cited several effects ranging from climate change impacts on agriculture, disruption of agricultural activities and vulnerability of livelihood among others.

*Table 4.5 shows the views of the participants on the effects of climate change on food security in Gwembe valley.*

<p>1. Climate change impact on Agriculture and wild food production.</p>	<ul style="list-style-type: none"> <li>• Impact of climate change on agricultural produce:               <ul style="list-style-type: none"> <li>-crop farming</li> <li>-livestock farming and</li> <li>-fish farming</li> <li>-wild food production</li> </ul> </li> </ul>
<p>2. Vulnerability of livelihood</p>	<ul style="list-style-type: none"> <li>• increased crime rate</li> <li>• High levels of pupils dropping out of school.</li> <li>• Increased sexually transmitted diseases</li> <li>• Drug abuse</li> <li>• Gender violence and divorce</li> </ul>
<p>3. Disruption of agricultural activities</p>	<ul style="list-style-type: none"> <li>• Disruption of proper planning.</li> <li>• Rising costs of food</li> </ul>

( Source: Field data, 2023)

#### ***4.4.1 Impact of climate change on Agricultural produce***

The findings of the study indicated that climate change had negative effects on agricultural production in relation to crop farming, livestock and fish farming. All the participants reported that climate change had negatively affected their agricultural production through low rainfall, droughts and inconsistency in temperatures.

##### ***4.4.1.1 Impact of climate change on Agricultural Crops***

All crop farmers reported that climate change had negatively affected the farming of agricultural crops and increasing food insecurity at household due to low rainfall, droughts, pests and diseases that resulted into low crop yields.

In view of the above findings, one crop farmer from Munyumbwe-**F1**-had this to say:

*“Climate change has a very negative effect on food security because once there is little or no rains it means that people will not have food because crops will not grow well and produce good harvests...sometimes rains come early but end very fast before crops mature and sometimes rains delay, the result is hunger that you are hearing about” (29/8/23).*

Another farmer from Chipepo-**F15**-added that:

*“We have been receiving very little rainfall as a result crops are not maturing to give us a good harvest especially maize hence contributing to food shortages here, for example, during the last farming season 2021-2022 rainy season, crops dried in our fields because we did not receive enough rain as compared to maybe 5-10 years ago when it could rain for almost 4-5 months” (13/9/23).*

In support of the above findings, one agricultural extension officer from Chipepo-**AEO2**-stated that:

*“When there is a dry spell, it means that there will be no crops, the yield in crops will be low, livestock will also be affected why because there is no pasture, there is no water. So, those farming in livestock will be affected, those farming in crops will be affected and also when you look at the flash floods that we experienced last season fish farmers lost their fish because their cages were swept away. Climate change has destroyed our way of life” (28/9/23).*

#### **4.4.1.2 Impact of climate change on Livestock farming**

On livestock, a livestock farmer from Munyumbwe village-F1-explained that:

*“Climate change has not just affected humans in terms of food security but also livestock because once it does not rain that much, there is little pasture, no grass for animals to eat, during the dry season some calf die because of too much heat, their mothers cannot produce milk because they are also hungry which is also contributing to food shortages for us here” 29/8/23).*

On the same topic of livestock, another livestock farmer from Chipepo-F13-added that:

*“When it is very hot the mortality rate is very high, so our birds like chickens and ducks really get into trouble and many times we have a lot of animal diseases. I think that the higher temperatures were as a result of change in climate” (14/923).*

On the same topic, one on the experts from the Ministry of Fisheries and Livestock from Chipepo-MOFLO1-revealed that:

*“Livestock has been seriously affected by climate change especially when we have floods because sometimes animals like goats get carried away by the floods and swept into flooded streams and rivers and die, so farmers are at a loss and during droughts, animals have no pasture and no water for drinking that is why we have all these diseases of foot and mouth, anthrax, worms and others which result into death or poor production and at last, its poverty for the farmer” (8/9/23).*

#### **4.4.1.3 Impact of climate change on Fish farming**

One of the fish farmers from Chipepo-F14-said:

*“It is difficult to be a fish farmer today or even to be a fisherman because the temperature has become very unpredictable which is affecting the production of fish. Sometimes it is extremely hot or extremely cold which affects the growth of fish so where a farmer was expecting to harvest let us say 500 kgs of fish you only get maybe 50-70 kg because fish is stunted and has no weight and when there is flood, we lose fish from our cages” (29/8/23).*

In agreement with the observation above, another farmer from Chipepo-F4-stated that:

*“When it comes to fishing on lake Kariba, if there is no rain, you cannot expect to have fish. Fish cannot come from deep down the lake where it stays to come to the surface because water on the surface is dirty because of no rains and also this time, the fish is not growing big as it used to maybe it has changed because of climate change” (29/8/23).*

Commenting on how climate change has affected fish, one Expert participant from the Ministry of Fisheries and Livestock from Chipepo-**MOFL1**-added that:

*“In terms of fish, if there is no water, we know that it cannot survive. So, the cages that we have near the banks of the lake will have to be moved into deeper water for fish to survive and this impacts negatively on the farmers as they have to incur a lot of cost to move those cages into deeper waters so that the fish can survive” (8/9/23).*

#### ***4.4.1.4 Impact of climate change on Wild food***

The study found out that one of the effects of climate change was on production of wild food. All the participants in the study revealed that climate change had negatively affected the production of wild food as a result of shortened rainy season, long dry spells, floods and higher temperatures. When any of these occurred, there was poor germination, growth and fruiting of wild foods. The participants who were used to what they termed as traditional way of life attributed the poor production of wild food to climate change.

These findings were evidenced in the following verbal accounts given by one farmer from Chipepo-**SSIF6**-who said:

*“Climate change has not just affected agricultural production but also wild food. Growing up from here, we never lacked food. We could collect a lot of wild foods almost throughout the year depending on the season. We could collect different types of mushrooms in rainy season, fruits like “Masuku” and others, also edible roots, we could hunt from our hills and come back with bush meat or even birds which were sustaining us. Today, you cannot find these things, they are all gone, they are finished because there is no water for them to grow or survive” (29/8/23).*

In support of the above findings, an expert from the Ministry of Green Economy and Environment (Forest department) from Gwembe Boma-**FOR2**- stated that:

*“The eco-system has also changed. Like last year, we practically had no mushroom. Production of honey has gone down, fruit trees cannot bear any more, some animal species have extinct or relocated because all these things are related to shifts in the way things are happening eventually even the lifestyle has changed because people who depend on mushroom for example, they find that mushroom is not there and they do not have anything to sale. So, things are interrelated that these things we know as climate change have really had an impact on the way of life we have known for a long time” (3/9/23).*

#### **4.4.2 Vulnerability of Farming Communities**

Another way of understanding climate change and food security in Gwembe valley lies in the vulnerability of farming communities. Some of the farmer participants revealed that their communities were vulnerable to many factors because of climate change. For instance, participants reported that due to food insecurity, their communities were vulnerable to vices such as early pregnancies, increased school going dropouts, increased divorces, high crime rates, drug abuse, diseases and high poverty levels among others.

In support of the findings above, one farmer from Munyumbwe-**F13**-pointed out that:

*“Because of climate change, there is real hunger in the community and so many things are happening like theft and heavy beer drinking because people have nothing to do but moving everywhere looking for food. Young girls also when they see a man who has something like “kantemba” (small shop) for example, they fall for that person all in search of food the results are early pregnancies, early marriages and sometimes they get diseases like sexually transmitted diseases, that’s how climate change has affected this community” (29/8/23).*

Another farmer from Chipepo villag-**SSIF14**-said that:

*“This village is in trouble because most of the families here are food insecure because the 2022/2023 farming season was very bad so a lot of us did not harvest much. Now pupils*

*are dropping out of school because they have to accompany their parents to the fields, others have to do piece works so that they can support their parents in the end we have a community with illiterate future adults. Youths are stealing, abusing drugs and because of too much hunger a lot of families are breaking up almost every day” (6/9/23).*

#### **4.4.3 Disruption of Agricultural Activities**

Another effect of climate change in relation to food security that participants mentioned was the disruption on agricultural activities. The findings revealed that climate change disrupted agricultural activities which exacerbated prices of food stuffs.

One of the farmers from Chipepo-**F5**- said that:

*“Very few families are having three meals per day which means that food especially mealie meal is not affordable to those that are not in formal employment, just about 5kg of maize now is costing around K70 and if there are 6-10 people that 5kg is only for one meal. People are starving and there is no stability of food because we did not harvest and secondly, these days there are a lot of animal diseases so we get the money meant for something else for example seeds or even for buying goats and buy medicines for our animals or chemicals for crops and we remain broke” (6/9/23).*

In addition to the above point, another farmer from the same region Njoongola-**F9**- reported that:

*“The shortage of food at household level due to poor yields has also necessitated the increase in food prices especially maize which is our staple food ...we are almost spending double the price for 50kg of maize compared to previous years and you know how hard it is to find money here where our option business which is fishing is also hampered by the reduction of fish since it is not multiplying. Sometimes we are forced by nature to invest in a type of farming we never had intention for because we have to survive and we spend more but we have little income” (29/8/23).*

In support of the above sentiments, one expert from forestry department from Gwembe Boma-**FOR1**- stated that:

*“We have of late experienced a lot of changes in terms of how and when we receive rainfall. For the past maybe three years, we have had rain starting by October and once rains start, we could have maybe some serious floods by November- December. We have had floods that we never experienced before like flash floods and after that it’s all gone and no more rains. So, now with all those changes whatever the farmers had planted get submerged or washed away completely especially in the valley most of the land is hilly and rocky so farmers usually grow crops near the rivers like along the banks of the Zambezi River. This means that once there is a lot of rain water which is coming from other districts like Pemba, if it rains heavily the water will cause floods in the valley and whatever farmers would have grown along the banks would have to be swept away. That way, farmers lose their maize and other crops which means that farmers will have to change the game plan. It’s either the following year they have to go to higher lands and establish fields there or find other alternatives and its expensive on their part shifting fields almost every year. Anyway, my brother, it is just confusing to be a farmer in Gwembe today. These people are suffering” (3/9/23).*

Arising from the findings on the second research question, participants indicated that climate change had negative effects on agricultural production in relation to crop farming, livestock and fish farming. All the participants reported that climate change had negatively affected their agricultural production through low rainfall, droughts and inconsistency in temperatures. The study further found that another effect of climate change was vulnerability of livelihood as it increased crime rate, high levels of pupils dropping out of school, increased sexually transmitted diseases, drug abuse and gender violence and divorce. Additionally, climate change leads to disruption of agricultural activities, disruption of proper planning and rising costs of food.

#### **4.5 Sustainable Measures Farmers employ to ensure Food Security at household level amidst climate change in Gwembe Valley**

The third research question to this study was on the sustainable measures that farmers employed to ensure food security at household in Gwembe valley. *The question to the participants was: what sustainable measures do you employ to ensure food security at household level amidst climate change?* The findings were revealed in the following themes: sustainable agriculture practices,

climate change adaptation and institutional support. These were supported by codes or near codes as shown in Table 4.6.

Table 4.6: Shows the views of participants on the sustainable measures that farmers employed to ensure food security at household level amidst climate change in Gwembe valley.

Themes	Codes or Near Codes
1. Sustainable agriculture practices	<ul style="list-style-type: none"> <li>• crop diversification</li> <li>• irrigation system</li> <li>• livestock rearing</li> </ul>
2. Climate change adaptation	<ul style="list-style-type: none"> <li>• drought resistant crops</li> <li>• conservation agriculture</li> </ul>
3. Institutional support through Civic Education	<ul style="list-style-type: none"> <li>• government support through expert or extension services</li> <li>• non-governmental organization's support</li> </ul>

(Source: Field data, 2023)

#### 4.5.1 Sustainable Agricultural activities employed by Farmers amidst Climate Change

To ensure food security in the face of climate change, participants to this study indicated that farmers were employing various adaptive measures one of which was practicing sustainable agriculture. Under this method, it was revealed that some farmers were engaged in crop diversification, conservation agriculture, irrigation system and rearing of livestock. The findings were evidenced through the responses that were given by participants during the semi-structured interviews.

##### 4.5.1.1 Crop Diversification

The method of crop diversification was found as one common way that some farmers used as a sustainable agricultural measure to enhance food security amidst climate change as evidenced below.

One of the crop farmers from Munyumbwe-F10-had this to say:

*“Diversification in the types of crops we are growing from the traditional ones to other varieties such as hybrid and other crops is the way to go and that is what I am doing to secure food. I have learned to grow cow pies and some type of groundnuts which I never knew about that is diversification” (6/9/23).*

Another crop farmer from Chipepo-F2-said that:

*“We are addressing the effects of climate change on food security by diversifying the crops. Some people are growing hybrid varieties that mature early instead of our usual local varieties which require a lot of rains or water and take so long to mature” (29/8/23).*

In support of the above sentiments on crop diversification as one of the sustainable measures farmers were using to enhance food security amidst climate change, one of the Agricultural Extension Officer from Gwembe Boma-AEO1-pointed out that:

*“From our office here, crop diversification is the only key to food security and that is what we have been teaching our farmers through ‘Farmer field Schools’. We also advise the Ministry of Agriculture to send varieties that can produce here especially in the valley and we go back to the farmers and ask them what has worked for them. However, trials are still underway on which crop varieties can finally be adopted” (28/8/23).*

#### **4.5.1.2 Irrigation System**

Additionally, the study found out that irrigation system was another form of sustainable agriculture practice that the farmers had started venturing into. Some of the farmers reported that they were adopting irrigation gardening in order to enhance food security at household level amidst climate change. Some farmers were taking advantage of the boreholes sunk by the government and other stakeholders while a few farmers put up their own min-irrigation systems.

One crop farmer from Munyumbwe-F4- had this to say:

*“Some of us have joined cooperatives and we have since purchased submissile solar powered water pumps for the irrigation of vegetables and maize including during winter.*

*We have also bought reserve tanks for storing water for irrigation but not yet in full operation” (29/8/23).*

Another farmer from Chipepo-**F12**-said that:

*“Here we have a lake, some of us are doing gardening along the banks of the lake, those close to Zambezi River are gardening along the banks of the river. We are irrigating our vegetables although with difficulties but we are managing bit by bit lifting the buckets and containers of water. So, I think we need to improve irrigation system. This can help people have food throughout but drilling many boreholes would be the greatest idea for improving the production of food here. We are very hard-working people and trust me, we can do it all we want is water and pumps” (29/8/23).*

In support of the point above, an agricultural extension officer from Munyumbwe-**AEO3**-mentioned that:

*“A few farmers have shown potential of sustaining their household through gardening so we need more, even simple irrigation although that may not work in all the areas as you know this place is hilly and drier but in some lower areas it can be done. So, we are lobbying the government to invest more in irrigation” (9/10/23).*

#### **4.5.1.3 Livestock Rearing**

According to the findings of this study, another sustainable measure that some farmers were using to enhance food security at household level in the face of climate change was rearing of livestock. A few farmers reported that they were adjusting from dependence on crop farming to livestock farming since crops heavily depended so much on rainfall which has become unpredictable. Some farmers talked to said that they were being trained by the government officers from the ministry of agriculture in collaboration with ministry of fisheries and livestock on how to keep desert goats which they said were yet to yield the results.

In support of the above findings, one farmer from Chipepo-**F6**-disclosed that:

*“I am shifting from depending so much on growing crops like I mentioned to rearing animals like desert goats that grow very fast and are resistant to diseases, and also chickens. I can sale the goats and buy food” (29/8/23).*

Another farmer from Munyumbwe-F11- stated that:

*“We have our back-up backyard garden where we grow a bit of vegetables that help us to eat at home and also sale a little but we are also getting into rearing of livestock” (28/9/23).*

In support of the above findings, one of the Agricultural Extension Officers from Gwembe Boma-AEO2-reported that:

*“From agriculture, we have a programme where we are giving goats, so people are rearing goats and once your goat gives birth, you give a kid to another person just like that so there those kinds of programmes aimed at alleviating poverty and empower people” (28/8/23).*

#### **4.5.2 Climate change Adaptation**

The study found that there were about three common climate change adaptation measures that farmers employed in enhancing food security in Gwembe valley. These were; growing drought resistant crops and conservation methods.

##### **4.5.2.1 Drought Resistant Crops**

The study unveiled that one of the climate change adaptation measures which some farmers in Gwembe valley were using to enhance food security at household level was by growing drought resistant crops. Some crop farmers reported that in order to increase food security amidst climate change, they adopted different types of drought resistant crops because they realized that these crops survived in harsh weather conditions such as the ones they experience in Gwembe.

In line with the above findings, one of the crop farmers from Chipepo-F6-had this to say:

*“Apart from the hybrid crops that we are being encouraged to grow, some farmers are slowly reverting to growing drought resistant crops such as cassava, millet and sorghum” (29/8/23).*

In addition to the findings above, another crop farmer from Munyumbwe-F7-mentioned that:

*“What can work here since the climate is changing maybe we need to change the seeds we are using completely like maize growing we go back to finger millet and sorghum growing” (29/8/23).*

In supporting the points above, one of the Agricultural Extension Officers from Gwembe Boma responsible for Chipepo village-**AEO2**-stated that:

*“As a Ministry of Agriculture, we have a programme through which we are training farmers to plant drought resistant crops like millet, sorghum and cassava even cow pies. These even if they do not have enough rainfall, at least farmers will yield something and they will have food to eat, but it is not easy as some farmers are so resistant to change” (28/8/23).*

#### **4.5.2.2 Conservation agriculture**

The study also established that another sustainable agricultural method that farmers employed to increase crop yield and food security amidst climate change was conservation farming. Some farmers explained that they were changing their traditional way of farming on the same piece of land for many years and planting the same type of crop which was maize in order to help the soil regain its fertility and also prevent soil erosion and compaction. This was evidenced from the responses that some of the farmers gave with regards to sustainable agriculture through conservation farming.

One of the crop farmers from Munyumbwe-**F10**-had this to say:

*“We were used to farming using the knowledge our forefathers imparted in us of using a common plough or hoes but now we are slowly applying what they are calling ‘better farming practices’ that do not cause much damage to the environment. The Agriculture Officers and Self-help Africa are teaching us different modern farming practices such as mixed farming and we are slowly adopting these methods” (6/9/23).*

Another farmer from Njoongola-**F9**-explained that:

*“What I have seen is that farmers need to be smarter and change the way of farming. Instead of planting maize and apply fertilizer the traditional way, they will never harvest anything because the rains will go at the time when they just apply top dressing. So, for me*

*I have learned to apply basal dressing which is organic at the time of planting because maize comes out with power and grows very fast and within a few weeks I apply top dressing meaning that before the rains go, the maize would have matured or nearing maturing” (6/9/23).*

On this topic, one of the Agricultural Extension Officer from Gwembe Boma-**AEO1**-reported that:

*“As a Ministry of Agriculture, we are doing away with conventional tillage practices because of the bad effects it has on the soil. We are encouraging conservation agriculture. Farmers have to change the way they are doing their farming. The response is very slow but we hope to get there some day, we have to be smart, that smartness is coming to smart agriculture” (28/8/23).*

### **4.5.3 Institutional Support**

Participants were asked to explain if they were getting any form of sensitization or education from the government or other institutions with regards to sustainable measures they were using in ensuring food security at household. The findings revealed through participant’s responses that they were getting support from the government departments and non-governmental organisations.

#### **4.5.3.1 Government Institutions**

The findings revealed that the government institutions that were offering sensitization programs on climate change and its effects on food security and sustainable measures were the Ministry of Agriculture, Ministry of Green Economy and Environment as well as the Ministry of Fisheries and Livestock. To convey climate change information to the target groups, these institutions were using methods such as community meetings, workshops and seminars among other Civic Education methods.

In support of the above findings, one of the farmers from Munyumbwe-**F10**-mentioned that:

*“Sometimes officers from the ministry of agriculture and also those from livestock conduct workshops where they teach us how to grow drought resistant crops and better farming practices” ((6/9/23).*

Another farmer from Chipepo-**F3**-had this to say:

*“During meetings with officers like those from Agriculture or the Disaster Management and Mitigation Unit and councilors we learn about climate change when they are giving us fertilizer and seeds” (29/8/23).*

To confirm the above findings, one of the Agricultural Extension Officers from Munyumbwe-**AOE3**-added that:

*“Our aim is to teach farmers or sensitize farmers and capacity build them on climate change with regards to agriculture. So, we organize community meetings and workshops with a view to capacity build our farmers so that in situations where we do not have rain because of climate change they have something that is also to improve their income, food security by them practicing proper smart agriculture but some farmers shun such programs and that’s our biggest challenge” (9/10/23).*

#### **4.5.3.2 Non-Governmental Organisations (NGOs)**

With regards to Non-governmental Organisations, some farmers indicated that they were gaining a lot of knowledge on climate change and its effects on food security and sustainable measures by attending farmer workshops aimed at fighting food insecurity. They mentioned NGOs such as Self-help, Adventist Development Relief Agency (ADRA), World Food programme (WFP) and, Strengthening Climate Resilience of Agriculture Livelihood in Agro-ecological Regions I and II (SCRALA) as playing a pivotal role in educating them on sustainable measures to enhance food security amidst climate change.

Contributing on the above findings, one farmer from Munyumbwe-**F10**-said that:

*“NGOs like Self Help Africa give out different packages that comprise of crops that are drought resistant and teaches us different methods of farming like potholing. Sometimes they call for meetings but sometimes they just distribute these seeds to individuals” (6/9/23).*

Another farmer from Chipepo-**SSIF6**-stated that:

*“I have a farm where I am planting crops and with the coming of Self Help, I have joined livestock farming and I make sure that I attend every workshop they organize” (29/8/23).*

In the same vein, one of the Agricultural Extension Officers from Gwembe-**AOE2**-stressed that:

*“The Ministry of Agriculture is working with other collaborative partners such as Adventist Development Relief Agency (ADRA), World Food Programme (WFP), Strengthening Climate Resilience of Agriculture Livelihood in Agro-ecological Regions I and II (SCRALA) project who are working tirelessly in ensuring that the farmers and people in general are food secure as they have brought other methods of sensitizing people about climate change but the problem is with the farmers themselves as some of them are found not to be interested. So, what can we do? We are trying sir” (28/8/23).*

Arising from the findings on the third research question, the sustainable measures that were employed by farmers to ensure food security at household level amidst climate change in Gwembe Valley were sustainable agriculture practices such as crop diversification, irrigation system and livestock rearing. Other measures included climate change adaptation such as drought resistant crops and conservation agriculture. Farmers also got support from the government and NGOs through experts who sensitized farmers through community meetings, workshops as well as expert and farmer interaction.

#### **4.6 Chapter Summary**

The chapter presented the findings on the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley of Southern province of Zambia. It looked at the understanding of climate change and food security, the impact of climate change on food security as well as the role of Civic Education in climate change awareness. Further, the chapter looked at the sustainable measures that farmers of Gwembe valley employed to enhance food security amidst climate change. The next chapter presents the discussions of the findings.

## **CHAPTER FIVE**

### **DISCUSSION OF FINDINGS**

#### **5.1 Overview**

This chapter presents the discussion of the findings and correlating to relevant literature before adding researcher's voice to the outcome of the study. This is aimed at establishing the merging knowledge from the study. The discussion is organized based on the set objectives of the study. It addresses the following objectives:

- i. How do farmers learn about climate change to enhance food security?
- ii. To explore the effects of climate change on food security among the farmers of Gwembe valley.
- iii. To establish sustainable measures that would be employed by farmers in ensuring food security at household level amidst climate change.

#### **5.2 How farmers learn about Climate Change to enhance Food Security**

Concerning the first research objective, the study revealed mixed views on farmer's understanding of Climate Change to enhance Food Security. Positively, few farmers indicated that they adequately understood climate change because they learned through informal Civic Education as they attended community meetings, workshops, seminars as well as the one-on-one interactions with experts. All the participants acknowledged that agricultural production in Gwembe valley was solely dependent on rainfall. As such, households were food insecure as they were unable to harvest crops as much as they used to in the past due to reduced and unpredictable rainfall pattern, higher temperatures, flash floods and droughts which left their crops drying and resulted into poor crop harvest and hunger. These findings were in line with Gregory *et al* (2015) who indicated that crop production can be affected by changes in rainfall and temperature which relates to the amount of rainfall received by crops which should not either be too much as in flood or too low while extreme temperatures also have negative effects on crop production impacting food availability.

The study further revealed that farmers who were more educated were able to interpret and apply climate information correctly into their farming activities than the uneducated ones. Results

showed that the educated participants were able to give detailed understanding of how they perceived climate variability in their farming activities in terms of increases in temperature, increases in pests and diseases, reduction in rainfall, onset of rainfall and how short the farming season would be in a particular season. They also showed that they were able to enquire more about the modern farming practices in reference to crop, livestock and fish farming during community meetings. The uneducated farmers on the other hand, could only give basic responses based on their past experiences and knowledge which made them more hesitant to apply new climate information into their farming practices. Thus, the study established that farmers had diverse perceptions on the effects of climate change on their farming activities depending on their levels of education, exposure and experiences.

The study also found that due to informal meetings, seminars and workshops about climate change and how it affected farming activities and livelihood of the farmers, some participants got more engaged in working together with experts in exchanging information aimed at addressing climate change through promoting sustainable agriculture practices. This knowledge shared gave freedom to the farmers to develop more initiatives in problem solving as climate change agents in their communities. This implied that once farmers were conscientized, they made more informed decisions on what modern farming practices they would adopt including the type of seeds they would plant in order to increase food security at household level. This kind of civic approach is in line with UNESCO (2015) which argued that education and awareness-raising enabled informed decision-making, played an essential role in increasing adaptation and mitigation capacities of communities, and empowered women and men to adopt sustainable lifestyles.

Based on the findings, it is clear that informal Civic Education would be very cardinal to expose all the farmers to regardless of their levels of education and experiences so that they could be empowered with skills and knowledge on climate change and how they could adjust their mindset and behaviour, and adopt modern agricultural methods if they were to increase food security and get out of poverty circles. This is in line with the findings of Anabaraonye (2018) who postulate that through trainings and workshops, farmers acquire new knowledge on climate change which results into the transference of skills, knowledge and ideas on individuals, people or organisations for the purpose of equipping them to confront the challenges life presents. Thus, poor presentation and access to Civic Education information on climate change which would change farmer's

behaviour and attitudes about climate change and its effects on food security and livelihood would be catastrophic.

Negatively, the study found that majority of the participants had inadequate understanding of climate change. The farmers cited inadequate understanding due to high illiteracy levels on climate change issues, high engagement in farming practices that lead to climate change such as charcoal burning, use of motorized fishing boats, non-engagement in addressing climate change and promoting sustainable agriculture practices and non-application of initiatives aimed at building resilience and food security. The findings resonate very well with the Ecological system Theory by Bronfenbrenner (1989) on which this study is based; as the theory states that the ecological settings such as people, homes, families, neighborhoods and communities, influence the happenings in the society. In this case, human social and economic activities contributed to climate change in Gwembe valley thus influenced how farmers carried out their daily activities in order to survive. The findings were also in line with GRZ (2016) which stated that human socio-economic activity has resulted into damage to the environment which imposed changes in weather pattern causing extreme weather variations, some aligned to excessive rains resulting into floods while others resulted into droughts that impacted the availability of food due to reduced harvests or damage to crops and livestock. These socio-economic activities also include the aspect of food production as stated by Cosquer during the COP 28 (2023) summit, that food production was one of the main drivers of climate change and it accounts for about a third of all man-made global greenhouse gas emissions. Hence, the study revealed that the farmers of Gwembe valley contributed immensely to climate change as a result of farming practices they engaged during food production.

This study revealed that informal Civic Education would play a very critical role in empowering farmers of Gwembe valley with information on climate change and its impact on their livelihood. The findings were threefold: the role of Civic Education in raising awareness about climate change and its impact on food security, importance of engagement of farmers in addressing climate change and promoting sustainable agriculture practices and farmer's initiatives aimed at building resilience and food security at household level. The findings showed that participants understood the impact of climate change on food security through the informal Civic Education they were exposed to. By attending community meetings, workshops and seminars which were organized by

government officials and other stakeholders such as non-governmental organisations, experts and farmer to farmer interactions, participants learned how the weather pattern had changed and how it negatively influenced agricultural activities and livelihood. Participants acknowledged that they experienced a drastic low crop yields in the recent past which they attributed to changes in rainfall pattern, droughts and higher temperatures, therefore, found it necessary to be attending social-economic gatherings for the purpose of acquiring skills and knowledge and learning modern methods of farming to enhance food security in the face of climate change. This is supported by Makowski and Pazderski (2017) who postulates that informal Civic Education is pursued in the context of various unconventional methods in form of meetings, workshops and seminars. It aims to increase awareness and understanding of the significance of environmental protection, and of biodiversity in the climate as well as contributing to the development of pre-ecological attitude hence helping to reduce the side effects of climate change. This civic approach is also in line with Almol and Verbar (1963) who stated that for citizens to fully participate in community activities, they should be informed and actively participate in community affairs wherein being informed meant that citizens should undergo some form of training in a more relaxed and flexible way. It is on this principle that informal Civic Education is anchored and that once citizens were informed, they would acquire knowledge, skills and disposition needed for one to participate in affairs that affected them in community such as poor agricultural produce due to climate change and other global pandemics.

Considering the findings of the study presented on objective one, it was clear that farmers had mixed views on how they understood climate change. Positively few farmers indicated that they adequately understood climate change because they were exposed to some informal Civic Education through community meetings, works and seminars as well as through change in weather pattern they noticed due to change in rainfall pattern, frequent droughts, flash floods and high temperatures. Negatively, the study found that majority of the participants had inadequate understanding of climate change. The farmers cited inadequate understanding due to high illiteracy levels on climate change issues, high engagement in farming practices that lead to climate change such as charcoal burning, use of motorized fishing boats, non-engagement in addressing climate change and promoting sustainable agriculture practices and non-application of initiatives aimed at building resilience and food security.

### **5.3 Effects of climate change on food security among the farmers of Gwembe valley**

The findings on the second objective about the effects of climate change on food security among the farmers of Gwembe valley revealed that the impacts were overwhelming. All the 25 participants indicated that climate change had negatively affected agricultural production as well as the production of wild food. In relation to this objective, three main themes emerged: climate change impact on agricultural produce and wild food, vulnerability of livelihood and disruption of agricultural activities.

#### **5.3.1 Impact of climate change on Agricultural produce and wild food.**

The study established that climate change had negatively affected all sectors of agricultural production ranging from crop farming, livestock and fish farming as well as the production of wild food. All the 25 participants stated that agricultural produce had drastically reduced due to changes in climatic conditions of reduced rainfall, temperature variability, floods, drought and shortened rainy season. It must be understood that Gwembe valley is mountainous. As such, farmers in the valley had their fields situated below the mountains which made their crops vulnerable to floods, extreme temperatures and droughts. On the other hand, wild foods such as mushrooms, roots and fruits that would naturally grow in the forests and mountains due to favourable atmospheric conditions of good rains, vegetation and temperature, just like caterpillar and wild animals and birds would multiply, had either reduced or extinct. During research, most of the participants stated that in the recent past, they were no longer collecting wild food for home consumption or for sell as they used to. They cannot find any animal or bird to hunt, be it during floods or droughts. Participants attributed the reduction of wild food and extinction of some birds and wild animals in the region to unfavourable conditions exacerbated by climate change. These findings in Gwembe valley were inconsistent with the general conclusion made in Zambia by Kalantary (2010) who reported that one of the common adaptation measures people took when faced with flood was gathering and selling wild food. This clearly shows that with the passage of time, things change as in the case of Gwembe valley, an indication that the world has evolved and needs modern innovations and Civic Education is better placed to offer such.

On crop farming, the study established that all the farmers grew maize as their staple food. However, it was discovered that almost all the farmers in Gwembe valley were conservatives who

grew numerous local maize varieties as well as recycled hybrids. More than half of the farmers planted more than one local variety during the rainy season although a few farmers had started learning how to plant hybrid varieties. Nonetheless, it was established during the interaction with the participants that crop production had drastically reduced for the past few years not only due to erratic rainfall and droughts but also because of emerging different types of pests and diseases that were attacking their crops. This was making it difficult for most farmers especially the uneducated and poor farmers to harvest enough grain for household sustainability as they could not easily interpret the changing weather conditions and make adjustments accordingly. These findings could be likened to assertions by Von Grebner *et al.* (2019) who stated that recurrent extreme climate events were making it difficult to achieve food security and eliminate hunger in the world. He indicated that agricultural production was affected in two-fold: direct and indirect. Direct impacts were those perceived to be caused by a modification of physical features such as temperature levels and rainfall distribution on specific agricultural production for example maize and other cereals while indirect impacts affected production through changes on other species such as pollinators, pests, diseases, vectors and invasive species. This was confirmed by this study when almost all the participants indicated that in the recent years, they were unable to harvest as much grain as they used to due to different strange pests and diseases that were attacking their crops in addition to erratic rainfall, flash floods and droughts.

On livestock farming, the findings were that all the 5 livestock farmers and others were aware and had knowledge about the effects of climate change on livestock. The participants had livestock between 15 and 100 on average although this depended on their location as some places for example, Munyumbwe and Njoongola where drier and lacked pasture and drinking water thus had farmers with a smaller number of livestock especially cattle compared to Chipepo which was surrounded by lake Kariba where animals had access to drinking water. However, all the participants indicated that the number of livestock mostly cows had decreased in population due to increased challenges they were facing in the recent past. The study revealed that in the past 10 to 20 years, a lot of farmers lost their livestock due to climate variability that resulted into lack of availability of clean and safe drinking water, changing temperatures, droughts, flash floods, rampant diseases, lack of availability of pasture and heat stress which they were experiencing. The study revealed that the outbreak of animal diseases and pests occurred almost every year and retarded the growth of livestock farming. Some farmers lamented that at least 1 or 2 farmers out

of 50 lost 1 or 2 cows per day in the region due to thirsty, hunger, heat stress, or diseases exacerbated by climate change. These results were similar with the findings in South Africa by Mandleni and Anim (2011) who stated that about 86% livestock farmers in the Eastern Cape of South Africa were aware of the increases in temperature pattern and weather conditions necessitated by drought and resulted in increased loss of livestock but it was difficult to act. On the other hand, the study revealed that livestock farmers were not provided with early warning systems prior to an outbreak of a disease for them to take preventive measures in good time. Some participants mostly the uneducated also explained that they were not preview to meteorological data thus did not have information on how weather conditions would impact their livestock.

### **5.3.2 Vulnerability of Livelihood**

According to the findings, climate change did not just affect physical production of food in the communities of Gwembe valley, it also made farmer's livelihood vulnerable to a lot of factors. Some participants disclosed that due to the impact of climate change on food security, some households lived in poverty which escalated social and economic hardships such as increased school dropouts, increased divorces, gender-based violence, early marriages and unwanted pregnancies, drug abuse and sexually transmitted diseases, all of which had negative effects on society. The study also revealed that in the recent years, there was an increased crime rate notably: theft of fish in the dams or cages, cattle rustling and theft of grain (crops) in the fields before harvest or in the barns. These and many other vices increased the levels of food insecurity on the households that lost their items through theft. Further, the study also discovered that due to perpetual droughts in the area, most of the streams and rivers dried and livestock had little or no water for drinking while the vegetation was also dry. This resulted into livestock not having enough pasture thus resorting to eating crops in the farmer's fields which increased food insecurity at household level. These findings were similar to those of Digambar (2011) who reported that with severe drought, there was a direct impact on the growth of edible grass species and the regeneration of fodder in pasture and forest fodder is decreasing leading to a shortage in diversity and quality of livestock fodders. Due to poor pasture and lack of safe drinking water, some participants reported that they lost their livestock due to diseases and pests that come with increased temperatures. This meant that farmers lost twice both crops and livestock hence, increasing food insecurity making farmer's livelihood vulnerable.

### **5.3.3 Disruption of Agricultural activities**

The study revealed that climate change disrupted agricultural activities of the farmers in Gwembe valley and increased the cost of life in the area. Participants stated that in the past 10-20 years, they had experienced a reduction in rainfall which affected crop production and increased livestock and fish diseases and pests. This meant that farmers were to adjust from the way they had been farming to adopt the new ways. Almost all 25 participants stated that it had become very difficult for farmers to plan well for the following rainy season since some seed varieties were failing to produce a good harvest due to uncertainty in predicting weather events such as floods and dry spells and shifts in the onset and offset of rains which had a serious negative impact on the suitable seeds to plant. Hence, more often than not, farmers were forced to plant more than once each farming season which meant that they had to source for funds and replan on what to plant whenever their plants failed again. These findings in Gwembe were similar to the findings by De Pinto *et al.* (2019, b) who stated that climate change is uncertain, it is difficult for farmers to plan their production activities, especially in rainfed farming systems. In addition, the study established that due to higher temperatures especially in the dry seasons, prevalence of diseases on livestock and fish was very high. As such, farmers were forced to sell some of their assets including their livestock in order to buy chemicals and medicines for their livestock and crops.

Further, the study found that during flash floods, farmers especially those who planted their crops below the mountains and along the banks of the Zambezi River and Lake Kariba had their crops washed away by the runoff water. Some farmers also indicated that when they had information that there would be floods, they were forced to switch their fields from lower lands to higher lands for fear of their crops getting submerged and washed away and when there would be little rains, they shifted to the lower lands. This switch of fields year after year disrupted proper agricultural planning on part of the farmer and sometimes made farmers spend more money than expected on labour and seeds. These happenings resulted into scarcity of food and increased the prices of the commodity which became even worse between December and March as many of the farmers had converted some of their grain into recycled seeds and planted, thus remained with little or nothing for home consumption or extra for sale.

Based on the findings on the second research objective, it was clear that climate change had negative effects on agricultural production in relation to crop farming, livestock and fish farming.

All the participants reported that climate change had negatively affected their agricultural production through low rainfall, droughts and inconsistency in temperatures. The study further found that another effect of climate change was vulnerability of livelihood as it increased crime rate, high levels of pupils dropping out of school, increased sexually transmitted diseases, drug abuse and gender violence and divorce. Additionally, climate change leads to disruption of agricultural activities, disruption of proper planning and rising costs of food.

#### **5.4 Sustainable Measures Farmers Employ to ensure Food Security at household level amidst climate change in Gwembe Valley**

Concerning the third research objective, the study revealed a number of sustainable measures employed by farmers to enhance food security at household amidst climate change. The following measures emerged from the participants during the interviews. These were: sustainable agricultural practices, climate change adaptation and institutional support.

##### ***5.4.1 Sustainable Agricultural Practices***

The study established that agricultural practices were among the sustainable measures that farmers of Gwembe valley employed in order to enhance food security at household. Participants reported that some of them started engaging in a number of practices with the notable ones being: crop diversification, conservation agriculture, irrigation system and rearing of livestock.

###### ***5.4.1.1 Crop Diversification***

The findings of the study were that some participants indicated that crop diversification would help them increase yields in the face of climate change. They stated that although they were predominantly conservative and were used to growing the same local type of crops for years, they had started embracing other crops such as hybrid varieties. Some farmers had started diversifying crops because the local varieties they used to grow had drastically dropped its yield thus, it was not helping to alleviate food insecurity. Some participants reported that they had started seeing benefits in growing hybrid varieties of crops such as maize which is their staple food. They pointed out early maturing, resistant to diseases and pests, increased yields and high nutritional value as some of the benefits of growing hybrid varieties. The findings were consistent with the study conducted in Zimbabwe by Makate *et al.* (2016) who assumed that there were several benefits

associated with crop diversification such as pest and disease control, increased fertility, reduced yield invariability, increased crop income and promoting biodiversity among agricultural producers. As such, it was established that diversification had the potential to increase availability, affordability, accessibility and stability of food. However, some participants complained that even if they had some information about the benefits of crop diversification, it was difficult for them to completely adopt the high yielding hybrid seeds because of the higher prices and scarcity of the said seeds. Apart from higher prices and scarcity of the seeds, some farmers were still skeptical about the hybrid varieties as they thought that they contained harmful properties which made them mature early and that would slowly kill them and their children. This made some of them (farmers) especially the poor and uneducated to remain growing the locally recycled seeds which they were used to and had trusted over the years.

#### ***5.4.1.2 Conservation Agriculture***

Conservation agriculture was another sustainable climate smart agricultural practice that this study found being applied by some farmers of Gwembe valley as a measure of increasing food security amidst climate change. The study established that a few farmers had started shifting from their conventional tillage methods of using mold board plough to the new methods of ripping or zero tillage. Some farmers stated that they had learned that their traditional method of ploughing by an ox was responsible for the formation of the plough pan which hampered the development of a deeper rooting system of crops and damaged the environment hence negatively influencing the uptake of nutrients resulting into crop failure and poor harvest when faced with higher temperatures. For this reason, some farmers talked to by the researcher reported that they had started seeing some improvements in their yields the past few years they applied minimum tillage system. These findings were in conformity with those by Bista *et al.* (2017) in Nepal who indicated that reduced tillage practices were classified under conservation agriculture and repetitive conventional tillage was a major cause of soil aggregate destruction and organic matter breakdown which leads to soil nutrients loss through greenhouse gas (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) emissions thus, reduced tillage practices reduced organic matter degradation and improved the soil for farming. Also, Chalise *et al.* (2020), in Western Nepal observed that the food shortage situation was increasing as a result of many environmental effects induced by conventional agriculture practices which had significant amount of soil loss from conventional agricultural fields.

A study conducted in Zambia by FAO/REOSA (2010) on farming systems reported that Zambia suffered from unsustainable production, soil erosion and climate change and its agricultural systems were only suitable for minimum tillage because the practice was known for increasing agricultural productivity and income especially for poor farmers since it helped in repairing the environment. It was for this reason that some farmers had adopted the minimum or zero tillage after being taught about its benefits to both the soil and the crops. Nonetheless, some farmers argued that they did not understand how conservation agricultural practices like ripping could improve food security, prevent land degradation and improve the resilience of cropping systems amidst changing conditions because in the past, they could have bumper harvests with the same conventional tillage methods they practiced. As such, the study established that farmers did not have adequate information about the benefits of conservation agriculture simply because their traditional knowledge and experiences were overlooked by those who were championing climate change education hence the resistance to change. These findings were in line with those of Nyanga *et al.* (2011) who observed that actors involved in promoting modern agriculture technologies like conservation agriculture technologies have often not taken into account perceptions of smallholder farmers on climate variability. He stated that this resulted in promoting agriculture technologies among smallholder farmers which have not been supported by farmers. This could have been one of the reasons for the slow adoption of these technologies by the farmers of Gwembe valley as well.

#### ***5.4.1.3 Irrigation System***

The study established that Gwembe valley was experiencing perennial hunger because the agriculture sector was facing a lot of challenges due to the district's unique topography and physiography coupled with erratic rainfall not favourable for crop production. Thus, in order to enhance food security, the study found that a few farmers most of whom lived in Chipepo village had set up irrigation systems along the banks of lake Kariba where they grew mostly vegetables in smaller gardens with very few growing winter maize and sugarcane. Their irrigation systems were either powered by mini-diesel or petrol generators or they simply used hand buckets for watering their crops. Participants stated that they had decided to get into irrigation following the scarcity and high cost of food in the area which was exacerbated by poor crop harvest. A few farmers in Munyumbwe and Njoongola had small vegetable gardens either at their backyards or near the

village water wells. Some farmers explained that they would want to expand their gardens but it was difficult for them to find reliable water sources due to the topography of the area which made it difficult to sink workable boreholes while those along the Zambezi River and lake Kariba could not extend their gardens due to wild animals such as hippos, elephants and crocodiles that were terrorizing them. The study also established that some farmers had joined cooperatives and were part of the Chabbobboma irrigation project which is a Zambian government initiative project working in collaboration with cooperating partners. The project aimed at contributing to economic growth and poverty reduction by ensuring food, income and nutrition security among beneficiaries and enhance crop yields through assured all year production for crops thereby increasing income and eradicate poverty in order to mitigate the impact of climate change among beneficiaries of Gwembe valley.

#### ***5.4.1.4 Rearing of livestock***

The findings of the study were that rearing of livestock was another major part to sustainable agriculture for farmers of Gwembe valley. However, it was discovered that grain cultivation and livestock production were actually complementary and for the most part, households of Gwembe combined the production of subsistence crops with some number of livestock as mixed farming system. Since time immemorial, the occupants of Gwembe were known for their pastoral farming until now they kept their tradition of rearing livestock which they pass on from generation to generation. The study revealed that in the face of climate change, some farmers kept livestock in order to enhance food security and reduce poverty in a harsh environment like Gwembe valley. Some farmers stated that livestock provided them with essential goods and services such as milk, meat, eggs, leather and manure as well as ploughing and transport services. Others also indicated that they kept livestock as a store of value especially in the face of climate change as an alternative means of food or income in a case of crop failure. This was essentially correct and consistent with the World Bank (2017) which reported that in harsh environments such as mountains and drylands, livestock was often the only way sustainably convert natural resources into food, fiber, and work power for local communities. It indicated that around 500 million pastoralists world over rely on livestock herding for food, income and as a store of wealth, collateral or safety net in times of crop failure. Apart from cattle which is the main livestock in Gwembe valley, some farmers indicated that they had also started experimenting rearing desert goats which were believed to be drought

tolerant, resistant to diseases and heat and had higher production of milk and beef thus they were looking forward to maximizing these purported benefits.

## **5.5 Climate change adaptation**

Achieving the sustainable development goals of the United Nations of no poverty (goal 1) and zero hunger (goal 2), requires innovations in agriculture and development of climate-smart and economically feasible approaches for smallholder farmers and the farmers of Gwembe valley are no exception. The study established that adapting to climate change was another effective sustainable measure that the smallholder farmers of Gwembe valley applied in order to enhance food security at household in the face of climate change. This adaptation was mainly focused on incorporating drought resistant crops with the local ones.

### ***5.5.1 Drought Resistant Crops***

Drought, a period of inadequate rain or no rainfall at all, is the main cause of crop yield loss in Gwembe valley and ultimately causing food insecurity and hunger for many households in the region. The findings of the study were that almost all the farmers of Gwembe valley had adopted drought resistant crops as one effective sustainable measure of increasing food security and alleviating poverty at household amidst climate change. Participants explained that climate change had come to stay and its negative effects on food security through erratic rainfall, dry spells, floods and unprecedented temperatures would not be mitigated overnight thus it was prudent that farmers adopted workable solutions if there were to be food secure and the only way was by turning to drought resistant crops. The study revealed that some farmers adopted crops such as millet, cassava and sorghum as well as cowpeas, soya beans and beans. The reason for adopting these crops was that they grow and mature with the little amount of water or rain they receive. Importantly, other participants stated that there were more benefits of planting drought tolerant crops including producing larger crop yields compared to other crops. These results were similar to those found in India by Padakandla (2016) who noted that planting drought tolerant varieties in most environments leads to up to 25% more crop yields because these crops were water efficient and tend to withstand prolonged exposure to drought and their water needs are less than other crops. However, the study also established that farmers needed more information on how and where they could access other drought resistant crop varieties other than what they were given by the

government. More sensitization and information were needed on the benefits of drought tolerant crops as most of the participants talked to by the researcher indicated that crops like millet, sorghum, cassava and cowpies were primitive crops thus were being looked down upon by many.

## **5.6 Institutional Support**

The study found that the fight against food insecurity and poverty exacerbated by climate change in Gwembe valley was not left to the farmers alone. A lot of stakeholders were concerned and thus had come on board with climate change awareness information and technical support to help in the fight with the farmers. The notable institutions include: the government and NGOs with their expertise offering extension services.

### **5.6.1 Government's Support**

It was established that the Government of the Republic of Zambia was working with the farmers of Gwembe valley in the fight against poverty perpetuated by climate change. Through its various ministries and departments such as the Ministry of Agriculture with the Agricultural Extension Officers, Ministry of Green Economy and Environment with the Forestry and Meteorological field officers and the Ministry of Fisheries and Livestock with its field agents were on the ground to offer both information and technical support. The study found out that the agricultural extension officers were offering agricultural services ranging from sensitization on the causes and effects of climate change, crop diseases and pests and climate smart agricultural practices such as: minimum tillage, crop rotation, crop diversification and intercropping among others. All these programs were aimed at helping farmers get involved in mitigating climate change in order to enhance crop yield and food security. This is similar to the findings by Martens (2017) who noted that government and non-governmental organisations employ adaptation and mitigation strategies to respond to climate change risks, to limit future negative impacts and to enable communities to cope with adverse effects. In addition, participants talked to by the researcher pointed out that the Ministry of Agriculture with its partners were supporting the farmers with farm inputs under a program called 'Farmer Input Support Program' (FISP) under which the farmers were given seeds and fertilizer as one way to alleviate poverty especially to the most vulnerable smallholder farmers.

Further, the study revealed that agents from the forestry department were supporting the farmers with knowledge on the importance of preserving the environment and had since embarked on various programs with the notable ones being: teaching farmers on efficient use of wood by using fuel efficient stoves, cut a tree, plant another program as well as the bee-keeping and mushroom growing as alternative sources of income and increasing food security at household level. The study also found that officers from the meteorological department were supporting the farmers with information with regards to weather updates. Some farmers talked to especially the educated ones indicated that they were getting informed about the changes in weather conditions through interaction with officers from the meteorological department hence they knew when the rainy season would start and how long it would last thus helped them to plan well and prepared suitable seeds for the season. However, the findings of the study with regards to the information flow was that most of the farmers did not get information on weather conditions early enough for them to make adjustments to their farming plans. This was evidenced during interviews as some participants lamented that they incurred a lot of loses of farm inputs due to delayed information or non-availability of information on the changing weather conditions. The study established that some farmers did not get information in good time due to inadequate man power of meteorological officers at the district, lack of exposure to internet, and poor radio and television signals hence exposed them to more vulnerability.

In addition to the foregoing, fisheries and livestock extension agents like their counterparts from other government departments were in the region to provide information and technical support on the effects of climate change on fish and livestock farming. On fish for example, the study revealed that farmers were receiving information and technical know-how on modern methods of keeping fish which included the use of cages on water bodies such as rivers and lakes (Zambezi River and lake Kariba), how to protect the fish from predators and diseases among others. Further, the study found that a few fish famers had been empowered with government loans which they used to purchase and install fish cages. The loan was meant to support farmers alleviate poverty and also increase food security at household level. On livestock, the study established that the government empowered some farmers through cooperatives with drought tolerant goats known as desert goats in a program called “give a goat”. This empowerment project was meant to help farmers diversify their agricultural practices in order to help them increase food security in the face of climate change which impacted negatively on crop production. Some beneficiaries of the project indicated that

they received support in form of vaccinations and provision of livestock health related information. The government had also sunk a few boreholes in selected points in villages to provide safe drinking water for livestock.

In relation to the above however, the study revealed that to a larger extent, livestock farmers did not have enough income to improve their farming. Some farmers lamented that many times they lost their livestock due to lack of finances to buy vaccines and medicines for immediate treatment of their livestock whenever there was an outbreak of diseases as the government's intervention would take too long, and sometimes the vaccines would reach the farmers when the livestock had already died. In addition, some farmers indicated that they had to walk long distances to take their animals to drink water as some boreholes that were sunk by the government and their cooperating partners were dry thus this affected them from doing other social economic activities due to too much time spent on finding water and pasture for animals. These findings were similar to Nhemachena & Hassan (2007) who stated that insufficient access to inputs, lack of knowledge, no access to water, lack of credit, lack of information and high cost of adaptation were among the many challenges experienced by livestock farmers. Thus, there was need to equip farmers with skills and most importantly, information on how they can access soft loans from financial institutions to enable them find more alternative sustainable measures to alleviate poverty in their homes.

### **5.6.2 Non-governmental Organization's Support**

The study established that the perpetual food insecurity and poverty exacerbated by climate change through droughts and or floods had attracted attention from a lot of stakeholders and institution some of which were the Non-governmental Organizations. During interviews, some participants indicated that they were getting support from a number of NGOs in terms of information, technical, material and finances. The findings were that the NGOs were working alongside government in raising awareness and understanding about climate change, its effects and adaptation measures in relation to increasing food security and alleviating poverty. Some NGOs conducted informal community meetings, seminars, workshops and door to door interactions with farmers with a view to providing information and awareness on how to cope with climate conditions as part of their community service. This was in line with David & Theron (2014) who indicated that the primary

objective of NGOs was to provide assistance to individuals or developing communities in order to promote sustainable development at grassroots.

Some participants stated that they learned about climate smart agriculture and its benefits to both the farmer and the environment from the NGOs. The study also indicated that some NGOs were also involved in other community services such as provision of community cold rooms for fish farmers, sinking of boreholes, empowering farmers with farming inputs such as seeds, chemicals, fertilizer as well technical information on sustainable measures all aimed at increasing food security and alleviate poverty. These services provided by NGOs in Gwembe valley were consistent with the findings of Werker and Ahmed (2007) who stated that NGOs are perceived as private organisations seen basically offering humanitarian or cooperative work, as well as other business objectives that aim to relieve suffering, promote interests of the poor, protect the environment, provide basic services or do community development in developing countries. However, it was also noted that the NGOs were much present in selected villages especially those along the main road and left vulnerable farmers in far flown areas of Gwembe valley who needed climate change information even more. As such, some farmers continued to engage in unfriendly environmental practices such as conventional tillage and cutting down trees on large farming portions that continue to cause climate change resulting into poor agricultural produce, increased food insecurity and poverty.

### **5.7 Contribution of the study**

This study has made significant contribution to the existing studies related to the role of informal Civic Education in climate change awareness to enhance food security among farmers. The study has provided an understanding to stakeholders such as the Ministry of Green Economy and Environment, Agriculture, fisheries and Livestock, Lands as well as the Ministry of Education on how farmers would understand climate change through informal Civic Education. While it was clear that some educated farmers were aware of climate change and its impacts on food security through informal Civic Education, the study also revealed that the uneducated farmers had very inadequate knowledge simply because they shunned community meetings and workshops organized by experts which they described as being too formal and technical. As such, climate

change agents are encouraged to adopt the use of informal Civic Education which is flexible and inclusive.

The study also identified the challenges encountered by farmers because of the effects of climate change. These include crop yield reduction, loss of livestock and fish, increased food prices volatility, increases in pests and diseases, increased crime rate, high levels of pupils dropping out of school, increased sexually transmitted diseases, drug abuse, gender violence, divorce as well as shifts in agricultural activities. Awareness of these challenges may lead to the formulation of climate smart policies that are responsive to the plight of farmers and find means and ways of addressing these challenges to uplift the welfare of farmers of Gwembe valley.

Lastly, the study has enriched our understanding that some famers were applying a variety of climate change sustainable measures to enhance food security at household. Some measures include; crop diversification, irrigation system, livestock rearing, planting drought resistant crops as well as practicing conservation agriculture. Nevertheless, the study established that the majority of farmers were still skeptical about the safety and usefulness of these methods owing to their traditional experiences and beliefs as well as inadequate or lack of climate literacy. The study therefore calls for an integration of traditional knowledge into climate change education by policymakers and climate change agents so that the farmers feel part of the solution and find it easy to connect their experiences with the modern skills and knowledge to improve food security.

Basing on the findings on the third research question, farmers employed sustainable measures to ensure food security at household amidst climate change in Gwembe Valley. These were sustainable agriculture practices such as crop diversification, irrigation system and livestock rearing. Other measures included climate change adaptation such as drought resistant crops and conservation agriculture; while the government and some NGOs offered a range of support through expert or extension services which were all aimed at fighting food insecurity and alleviate poverty.

## **5.8 Chapter Summary**

This chapter has discussed the findings of the study as presented. The study revealed that some farmers learned about climate change and its impact on food security through informal settings such as community meetings, workshops, seminars, as well as door to door interaction between

climate change agents like government officers, NGOs officers and individuals. This approach makes the Ecological System Theory under which this study is anchored upon to sit well as it involves all its layers (Microsystem, Mesosystem, Exo-system and Macrosystem) that play an important role in influencing how certain things happen in society. However, it was also noted that farmers needed more sensitization and more information on how they could be involved in the fight against climate change. For example, it was clear from the apathy exhibited by some uneducated farmers to attend some meetings organized by government officials on matters of climate change awareness. The study concluded that there was need by those involved in Climate Change Education in Gwembe valley to be more proactive in the methods they were using to deliver the information to the farmers as well as how they presented it so that they could see sense that could provoke change of attitude and behaviour. The only way was by using informal Civic Education in totality basing on its flexible methods yet deep rooted in delivering the information that lasts in the minds of the recipients.

## **CHAPTER SIX**

### **SUMMARY, CONCLUSION AND RECOMMENDATION**

#### **6.1 Overview**

This chapter presents the summary, conclusion and recommendations drawn from the findings of the study. The aim of this study was to explore the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley of Southern province of Zambia. The chapter ends with recommendations and suggestions for further studies.

#### **6.2 Summary**

The focus of this study was about exploring the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley of Southern province of Zambia. It was divided into six chapters. Chapter one gave the background to the study and also brought out the objectives, significance and the theoretical framework of the study. Chapter two focused on literature review based on related studies across the globe. In chapter three, the study presented the methodology employed during the study and other vital aspects such as research paradigm as well as tools for data collection and analysis.

Chapter four brought out presentation of results which was done qualitatively in form of verbatim from participants while chapter five discussed the results as presented in chapter four. This chapter (four) mainly brought out the status of informal Civic Education in providing climate change awareness information related to changes in climatic conditions such as droughts, floods as well as variability of temperatures that were responsible for food insecurity in the area. Challenges farmers encountered due to food insecurity exacerbated by climate change and strategies to be employed were expansively dealt with. Subsequently, chapter six made conclusions and recommendations drawn from the findings of the study.

#### **6.3 Conclusion**

This study focused on the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley of Southern province of Zambia. Based on the density of the findings of the study, objective one revealed that farmers had mixed views on how they understood climate change. Positively, few farmers indicated that they adequately understood

climate change issues because they learned through informal Civic Education by attending community meetings, workshops and door to door interactions with experts. Negatively, the study found that majority of the participants had inadequate understanding of climate change. The farmers cited inadequate understanding due to high illiteracy levels on Climate Change issues which led to high engagement in farming practices that cause climate change such as conventional farming, use of motorized fishing boats, non-engagement in addressing climate change and promoting sustainable agriculture practices and non-application of initiatives aimed at building resilience and food security. The findings also showed that there were clear disparities in terms of the depth of understanding of how their agricultural practices and other economic activities such as charcoal burning contributed to climate change. It was observed that the educated farmers were able to understand, interpret climate change information and adjust their farming practices to suit the climatic conditions as advised by the experts. The willingness to attend climate change workshops and meetings was also good although they bemoaned that the said workshops and meetings were rarely organized thus appealed through this study to those concerned to increase the frequency of such meetings. On the other hand, the uneducated ones did not adequately understand how the farming activities they had been practicing from time immemorial could result into changes in weather conditions today and affect the rain pattern. The findings of the study on the second research question revealed that climate change had negative effects on agricultural production in relation to crop farming, livestock and fish farming. All the participants reported that climate change had negatively affected their agricultural production through low rainfall, droughts and inconsistency in temperatures. The study further found that another effect of climate change was vulnerability of livelihood as it increased crime rate, high levels of pupils dropping out of school, increased sexually transmitted diseases, drug abuse and gender violence and divorce. Additionally, climate change leads to disruption of agricultural activities, disruption of proper planning and rising costs of food. On sustainable measures, the study showed that some farmers were adjusting to the modern climate change methods of agriculture. Some farmers engaged in activities such as rearing of livestock, crop diversification, conservation farming and other activities. However, it was revealed that there was slow implementation of these measures because some farmers particularly the uneducated were shunning away the capacity building meetings and workshops due to their conservatism and skepticisms of whether these methods would work. As such, a more robust civic community participatory approach needed to be applied. This civic

approach will help to integrate indigenous technical knowledge and universalistic science that aims at reflecting local practices in its approaches to adaptation responses. Thus, there is an urgent need for more of such informal Civic Education meetings to capacity build not only the farmers but also the government extension officers and the NGOs handling climate change education for the purpose of exchanging expertise, experiences, knowledge and skills about the scourge if the fight is to be won, food security enhanced and SDGs number 1, 2 and 13 are to be achieved by 2030.

#### **6.4 Recommendations**

From the research findings and conclusion of the study, the following are the recommendations made:

1. Government and NGOs to increase education and awareness, environmental sensitization, weather alert messages and climate change programs on radio and television both in English and local languages. This will help farmers connect what they see or hear on television and radio to what they learn from the climate change agents.
2. Government to open an exclusive climate change desk in Gwembe district to offer community climate change literacy. If well managed, this will enable informed decision-making about local adaptation which in turn will enhance the ability to comprehend climate information by farmers of all educational background.
3. The Ministry of Green Economy and Environment to consider creating Environmental and Civic Education Groups (ECEG) in Gwembe valley. This group can be tasked with the responsibility of teaching farmers about climate action in their communities by promoting the environment through Civic Education approaches.
4. Government to consider investing in sinking more boreholes and build reserve dams in Gwembe valley. This will help farmers invest in long-term irrigation farming, livestock like desert goats, sheep, chicken and other species which will help in increasing food security.

## **6.5 Suggestions for Future Studies**

Based on the information collected from the field:

1. This study was conducted in Gwembe district in Southern province only, there is need to conduct a similar study in other provinces of Zambia in order to have a broader view of the outcome of the study.
2. There is need for research on how informal Civic Education can help in passing climate change information to both the educated and the uneducated famers so that they get the same message at the same time with the same meaning.

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## APPENDICES

### APPENDIX A:

Semi-Structured Interview Guide for farmers

**The University of Zambia. School of Education, Department of Language and Social Sciences Education**

Dear Participant,

You are among the few farmers who are purposively selected to participate in this study entitled “Exploring the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley”. The information you will provide is in confidence and for anonymity’s sake. This study is being conducted under the supervision of the University of Zambia, School of Education. I will appreciate your cooperation and truthful responses to this interview.

### Questions

- i. How long have you lived/stayed in Gwembe Valley?
- ii. What is your level of education?
- iii. What type of farming are you engaged into or practice?
- iv. For how long have you been practicing the type of farming you mentioned above?
  1. What is your understanding of climate change?
  2. How do you know about the issues of climate change?
  3. Who are the key contributors to the effects of climate change in Gwembe valley?
  4. Describe how the stakeholders you mentioned in question 3 above contribute to the effects of climate change in Gwembe valley?
5. What do you understand by food security?
6. As a Farmer, how do you think climate change affects food security in Gwembe Valley?
7. How does climate change affect the type of farming you practice?
8. Explain how you are addressing the effects you mentioned above to ensure food security.
9. Describe some sustainable measures that you are applying/practicing to increase food security in Gwembe valley amidst climate change.
10. What do you understand by civic education?
11. In your view, how does Civic Education raise climate change awareness on food security in your area?

12. Explain some strategies you would put in place to promote Civic Education in relation to climate change awareness to improve food security?

Thank you for your time.

## **APPENDIX B:**

Interview Guide for Ministry of Green Economy and Environment Officials

**The University of Zambia. School of Education, Department of Language and Social Sciences Education**

Dear Participant,

You are among the few officials from the Ministry of Green Economy and Environment purposively selected to participate in this study entitled “Exploring the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley”. The information you will provide is in confidence and for anonymity’s sake. This study is being conducted under the supervision of the University of Zambia, School of Education. I will appreciate your cooperation and truthful responses to this interview.

### **Questions**

- i. How long have you lived/worked in Gwembe Valley?
- ii. What is your level of education?
- iii. What type of job/ service do you offer here?
  1. How would you describe climate change?
  2. Who are the key contributors to the effects of climate change in Gwembe valley?
  3. Describe how the stakeholders you mentioned in question 2 above contribute to the effects of climate change in Gwembe valley?
4. What is your understanding of food security?
5. As an expert (in Forestry/Meteorology), how do you think climate change affects food security in Gwembe valley?
6. Explain how you are helping in addressing the effects you mentioned in question 5 above.
7. Describe some sustainable measures that you are teaching your farmers to improve/increase food security in Gwembe valley amidst climate change.
8. What do you understand by civic education?
9. In your view, how do you use Civic Education to raise climate change awareness on food security in relation to your field/expertise?
10. Explain some strategies you would put in place to promote Civic Education/awareness in relation to climate change awareness to improve food security?
11. Any other comment you would like to share with me concerning the topic under discussion?

## **APPENDIX C:**

Semi-Structured Interview Guide for Ministry of Agriculture Officials

**The University of Zambia. School of Education, Department of Language and Social Sciences Education**

Dear Participant,

You are among the few Officials from the Ministry of Agriculture purposively selected to participate in this study entitled “Exploring the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley”. The information you will provide is in confidence and for anonymity’s sake. This study is being conducted under the supervision of the University of Zambia, School of Education. I would appreciate your cooperation and truthful responses to this Interview.

### **Questions**

- i. How long have you lived/worked in Gwembe Valley?
  - ii. What is your level of education?
  - iii. What type of job/ service do you offer here?
- 
1. How would you describe climate change?
  2. Who are the key contributors to the effects of climate change in Gwembe valley?
  3. Describe how the stakeholders you mentioned in question 2 above contribute to the effects of climate change in Gwembe valley?
  4. What is your understanding of food security?
  5. As an expert (Agriculture Extension Officer), how do you think climate change affects food security in Gwembe valley?
  6. Explain how you are helping in addressing the effects you mentioned in question 5 above.
  7. Describe some sustainable measures that you are teaching your farmers to increase food security in Gwembe valley amidst climate change.
  8. What do you understand by civic education?
  9. In your view, how do you use Civic Education to raise climate change awareness on food security in relation to your field/ expertise?
  10. Explain some strategies you would put in place to promote Civic Education in relation to climate change awareness to improve food security?
  11. Any other comment you would like to share with me concerning the topic under discussion?

## **APPENDIX D:**

### **Semi-Structured Interview Guide for the Ministry of Fisheries and Livestock officials The University of Zambia. School of Education, Department of Language and Social Sciences Education**

Dear Participant,

You are among the few Officials from the Ministry of Fisheries and Livestock purposively selected to participate in this study entitled “Exploring the role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley”. The information you will provide is in confidence and for anonymity’s sake. This study is being conducted under the supervision of the University of Zambia, School of Education. I would appreciate your cooperation and truthful responses to this interview.

#### **Questions**

- i. How long have you lived/worked in Gwembe Valley?
  - ii. What is your level of education?
  - iii. What type of job/ service do you offer here?
- 
1. How would you describe climate change?
  2. Who are the key contributors to the effects of climate change in Gwembe valley?
  3. Describe how the stakeholders you mentioned in question 2 above contribute to the effects of climate change in Gwembe valley?
  4. What is your understanding of food security?
  5. As an expert (from fisheries/livestock), how do you think climate change affects food security in Gwembe valley?
  6. Explain how you are helping in addressing the effects you mentioned in question 5 above.
  7. Describe some sustainable measures that you are teaching your farmers to improve/increase food security in Gwembe valley amidst climate change.
  8. What do you understand by civic education?
  9. In your view, how do you use Civic Education to raise climate change awareness on food security in relation to your field/expertise?
  10. Explain some strategies you would put in place to promote Civic Education in relation to climate change awareness to improve food security?

11. Any other comment you would like to share with me concerning the topic under discussion?

**Thank you for your participation.**

**APPENDIX E: Consent and Assent Form**

**Research Topic:** Exploring the Conceptualisation of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley.

**Dear Participants,**

This consent form serves to give you an understanding of the purpose of this research and subsequently the procedure to follow when undertaking it. Implications for your participation are explained. Make sure you read carefully or that it has been explained to your satisfaction.

**Description**

This study is purely for academic research. The research is a student at the University of Zambia pursuing a Master of Education degree in civic education. This research is a major requirement for the researcher to complete this programme.

**Purpose**

The researcher wishes to explore the Conceptualisation of Civic Education in relation to climate change awareness in enhancing food security in Gwembe valley.

**Consent**

Participation in this activity is purely voluntary thus, you are also free to object to participate.

**Confidentiality**

All the data collected from this research will be treated with the utmost confidentiality.

Participants are assured of anonymity in this research.

**Rights of Participants**

The rights of the participants will be protected and respected. Participants are assured that they shall not suffer no harmed as a result of participating in this exercise. Participants are free to ask for clarification at any point of the exercise to inform the researcher if they feel uncomfortable about any procedure in the research.

**Declaration of the Consent**

**I have read and fully understand this document. Therefore, I agree to participate in this exercise.**

**Participant's Name**.....

**Signature** ..... **Date**...../...../.....

**APPENDIX F: Permission Letter**  
Gwembe District Commissioner,

Gwembe,

August, 2023

Sichula Griphin

The University of Zambia,

Department of Language and Social Sciences Education,

P.O. Box 32379, Lusaka.

Dear Sir/Madam

**RE: PERMISSION TO CONDUCT AND COLLECT DATA FROM SELECTED OFFICERS AND FARMERS FROM THE BOMA AND VILLAGES RESPECTIVELY IN GWEMBE DISTRICT.**

Refer to the above subject matter. I am a student at the University of Zambia pursuing a Master's degree in Civic Education focusing on Exploring the Role of Civic Education in climate change awareness to enhance food security among farmers of Gwembe valley. The target population for this study are: farmers, experts such as Agriculture Extension Officers, Forestry and Meteorologists, and those from Fisheries and livestock. I am preparing for data collection for my study and therefore seek permission through your office to enable me collect data from the selected individuals as indicated.

Thanking you in advance.

Yours sincerely

Sichula Griphin: 22001223

**APPENDIX G: Introductory Letter**



**THE UNIVERSITY OF ZAMBIA  
SCHOOL OF EDUCATION**

Telephone: 291381  
Telegram: UNZA, LUSAKA  
Telex: UNZALU ZA 44370

PO Box 32379  
Lusaka, Zambia  
Fax: +260-1-292702

Date... 28/08/2023 .....

**TO WHOM IT MAY CONCERN**

Dear Sir/Madam

**RE: FIELD WORK FOR MASTERS/ PhD STUDENTS**

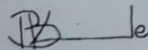
The bearer of this letter Mr./Ms. SICHULA GRIPHIN Computer number 22001223 is a **duly** registered student at the University of Zambia, School of Education.

He/She is taking a Masters/PhD programme in CIVIC EDUCATION

The programme has a fieldwork component which he/she has to complete.

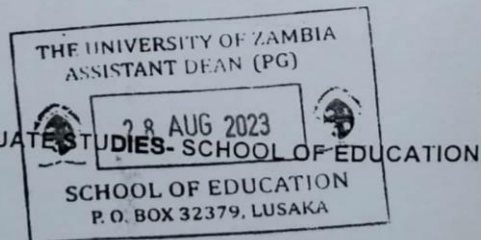
We shall greatly appreciate if the necessary assistance is rendered to him/her/.

Yours faithfully



Bibian Kalinde (Dr)  
ASSISTANT DEAN POSTGRADUATE STUDIES- SCHOOL OF EDUCATION

cc Dean-Education  
Director-DRGS



**APPENDIX H: Approval of Study**



**THE UNIVERSITY OF ZAMBIA  
DIRECTORATE OF RESEARCH AND GRADUATE STUDIES**

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Great East Road Campus | P.O. Box 32379 | Lusaka10101 | Tel: +260-211-290 258/291 777  
Fax: (+260)-211-290 258/253 952 | E-mail: [director.drgrs@unza.zm](mailto:director.drgrs@unza.zm) |  
Website: [www.unza.zm](http://www.unza.zm)

**APPROVAL OF STUDY**

***IORG No. 0005376***

***HSSREC IRB No. 00006464***

10<sup>th</sup> August, 20223

**REF NO. HSSREC-2023-JUL.-027**

Mr. Griphin Sichula

The University of Zambia

School of Education,

P.O. Box 32379

**LUSAKA**

Dear Mr. Sichula, G.

**RE: “EXPLORING THE ROLE OF CIVIC EDUCATION IN CLIMATE CHANGE AWARENESS TO ENHANCE FOOD SECURITY IN GWEMBE VALLEY OF SOUTHERN PROVINCE OF ZAMBIA”**

Reference is made to your submission of the protocol captioned above. The HSSREC resolved to approve this study and your participation as Principal Investigator for a period of one year.

<b>REVIEW TYPE</b>	<b>ORDINARY REVIEW</b>	<b>APPROVAL NO. HSSREC-2023-JUL-027</b>
Approval and Expiry Date	Approval Date: 10 <sup>th</sup> August, 2023	Expiry Date: 9 <sup>th</sup> August, 2024
Protocol Version and Date	Version - Nil.	9 <sup>th</sup> August, 2024
Information Sheet, Consent Forms and Dates	<input type="checkbox"/> English.	To be provided
Consent form ID and Date	Version - Nil	To be provided
Recruitment Materials	Nil	Nil
Other Study Documents	Questionnaire.	
Number of Participants Approved for Study		

Specific conditions will apply to this approval. As Principal Investigator it is your responsibility to ensure that the contents of this letter are adhered to. If these are not adhered to, the approval may be suspended. Should the study be suspended, study sponsors and other regulatory authorities will be informed.

#### **CONDITIONS OF APPROVAL**

- No participant may be involved in any study procedure prior to the study approval or after the expiration date.
- All unanticipated or Serious Adverse Events (SAEs) must be reported to HSSREC within 5 days.
- All protocol modifications must be approved by HSSREC prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address.
- All protocol deviations must be reported to HSSREC within 5 working days.
- All recruitment materials must be approved by HSSREC prior to being used.
- Principal investigators are responsible for initiating Continuing Review proceedings. HSSREC will only approve a study for a period of 12 months.
- It is the responsibility of the PI to renew his/her ethics approval through a renewal application to HSSREC.
- Where the PI desires to extend the study after expiry of the study period, documents for study extension must be received by HSSREC at least 30 days before the expiry date. This is for the purpose of facilitating the review process. Documents received

within 30 days after expiry will be labelled “late submissions” and will incur a penalty fee of K500.00. No study shall be renewed whose documents are submitted for renewal 30 days after expiry of the certificate.

- Every 6 (six) months a progress report form supplied by The University of Zambia Humanities and Social Sciences Research Ethics Committee as an IRB must be filled in and submitted to us. There is a penalty of K500.00 for failure to submit the report.
- When closing a project, the PI is responsible for notifying, in writing or using the Research Ethics and Management Online (REMO), both HSSREC and the National Health Research Authority (NHRA) when ethics certification is no longer required for a project.
- In order to close an approved study, a Closing Report must be submitted in writing or through the REMO system. A Closing Report should be filed when data collection has ended and the study team will no longer be using human participants or animals or secondary data or have any direct or indirect contact with the research participants or animals for the study.
- Filing a closing report (rather than just letting your approval lapse) is important as it assists HSSREC in efficiently tracking and reporting on projects. Note that some funding agencies and sponsors require a notice of closure from the IRB which had approved the study and can only be generated after the Closing Report has been filed.
- A reprint of this letter shall be done at a fee.
- All protocol modifications must be approved by HSSREC by way of an application for an amendment prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address or methodology and methods. Many modifications entail minimal risk adjustments to a protocol and/or consent form and can be made on an Expedited basis (via the IRB Chair). Some examples are: format changes, correcting spelling errors, adding key personnel, minor changes to questionnaires, recruiting and changes, and so forth. Other, more substantive changes, especially those that may alter the risk-benefit ratio, may require Full Board review. In all cases, except where noted above regarding subject safety, any changes to any protocol document or procedure must first be approved by HSSREC before they can be implemented.

Should you have any questions regarding anything indicated in this letter, please do not hesitate to get in touch with us at the above indicated address.

On behalf of HSSREC, we would like to wish you all the success as you carry out your study.

Yours faithfully,



*Dr. J.I. Ziwa*

**DR. J. I. Ziwa**

**CHAIRPERSON  
THE UNIVERSITY OF ZAMBIA HUMANITIES AND  
SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE - IRB**

cc: Director, Directorate of Research and Graduate Studies  
Assistant Director (Research), Directorate of Research and Graduate Studies

Assistant Registrar (Research), Directorate of Research and Graduate Studies