

The Role of Informal Civic Education in Climate Change Awareness and Food Security in the Gwembe Valley, Southern Province of Zambia

Griphin Sichula, Chidongo Phiri, Mirriam Sampa Moonga and Kandondo Chileshe Selestino

Zambia

**Corresponding Author: Griphin Sichula, Zambia*

Abstract: *This study explored the role of informal civic education in promoting climate change awareness and improving food security among farmers in the Gwembe Valley, Zambia. The study used a qualitative interpretivist paradigm with 25 participants being selected: 15 farmers selected through purposive sampling and 10 experts from ministries, including Green Economy and Environment, Agriculture, and Fisheries and Livestock, chosen via expert sampling. Data was collected through in-depth interviews and analyzed thematically. The findings reveal varied perceptions of climate change and its effects on food security. A minority of farmers understood climate change through community meetings, workshops, and media such as social media, radio, and television. Nevertheless, most participants lacked informal civic knowledge due to limited climate change literacy, resulting in unsustainable farming practices and inadequate resilience strategies. Climate change was reported to negatively affect crops, livestock, and fish farming in the region. Divergent views were linked to inconsistent and ineffective information delivery by some climate change agents, often misaligned with civic education principles. Based on these findings, the study underscores the importance of integrating informal civic education into climate change awareness programs. This approach is characterized by its flexibility and inclusiveness, recommended to improve knowledge dissemination and empower farmers to adopt sustainable practices that enhance food security and resilience to climate change education*

Keywords: *Informal Civic Education, Climate change, Food security, Agricultural production, Traditional farming practices.*

1. BACKGROUND

Climate change has emerged as one of the most pressing global challenges of recent years, exerting profound impacts on various aspects of human existence. It may result from natural processes, such as internal or external atmospheric changes, or from persistent anthropogenic activities that alter the composition of the atmosphere and patterns of land use (Intergovernmental Panel on Climate Change [IPCC], 2014). However, the IPCC (2007) highlights that since the 1800s, human activities primarily the burning of fossil fuels like coal, oil, and gas have been the primary drivers of climate change. And yet, in the Zambian society, it is almost impossible to survive without agriculture activities which are affected by climate change. For instance, Phiri, Sichula and Kalimaposo (2024) observed that agriculture remains a priority sector in Zambia for attaining sustainable economic growth and employment creation. This is attributed to the country's vast natural resources such as huge tracks of arable land, water and a youthful population to support all forms of agricultural activities. Currently, the Zambian population entirely depend on agricultural related activities for their livelihoods. Among these activities, agricultural practices stand out as a significant contributor. Farmers often clear forests for crop production, leading to deforestation, while overgrazing depletes vegetation, further exacerbating environmental degradation. During the 28th Conference of the Parties (COP28) in 2023, the Food and Agriculture Organization (FAO) emphasized that the global food system represents a "double-edged sword" in the context of climate change. On one hand, agriculture is among the largest emitters of greenhouse gases; on the other, it is one of the sectors most severely impacted by climate change.

The consequences of climate change such as crop failures, collapsing fisheries, and increased livestock deaths due to fluctuating temperatures and erratic rainfall patterns have led to reduced food production. These challenges, in turn, have heightened food insecurity and hunger, particularly in developing countries like Zambia.

As these effects intensify, experts, policymakers, and environmentalists are turning to educational and innovative solutions to mitigate the damage (Nisbet, 2010). In his book *Civic Education About Climate Change*, Nisbet argues that addressing climate change requires more than a technical understanding of climate science. Instead, it demands a focus on Civic Education and engagement, which involves empowering, informing, enabling, and motivating the public to comprehend not only the scientific but also the political and social dimensions of climate change. Through robust Civic Education, citizens can be better equipped to tackle evolving environmental and political challenges. This education fosters active participation in community decision-making and problem-solving processes, ultimately leading to a more resilient and informed society.

1.1. Statement of the Problem

The Gwembe Valley has been experiencing frequent droughts and flash floods, which have significantly reduced agricultural production, jeopardizing food security. These climatic events have also contributed to increased livestock diseases and mortality. If food insecurity persists in this region, residents may be compelled to migrate to other areas in search of sustenance and employment, potentially leading to displacement and social disruption. Such disruptions could escalate crime rates, malnutrition, disease prevalence, and economic hardships. Additionally, limited resources may force individuals to prioritize food expenditures over essential needs such as healthcare, education, and housing, perpetuating cycles of poverty and increasing mortality rates. Given these challenges, it is crucial to explore the role of informal Civic Education in raising climate change awareness among farmers. This approach could address the adverse consequences stemming from a lack of knowledge about climate change and its impacts on food security in the region.

1.2. Aim

The aim of this study was to explore the role of informal Civic Education in enhancing climate change awareness to improve food security among farmers in the Gwembe Valley of Southern Province, Zambia.

1.3. Objectives

The objectives of the research were to:

1. Explore farmers' understanding of climate change and food security in the Gwembe Valley.
2. Examine the effects of climate change on food security among farmers in the Gwembe Valley.
3. Establish the role of informal Civic Education in fostering climate change awareness among farmers.

1.4. Significance of the Study

This study is highly significant for policymakers and stakeholders, including non-governmental organizations, as it highlights the importance of Informal Civic Education as a tool for fostering climate change awareness to enhance food security among farmers in the Gwembe Valley. The findings will benefit educational practitioners, Gwembe District planners, and policymakers in sectors such as education, green economy and environment, land management, agriculture, fisheries, and livestock. By emphasizing the integration of Climate Change Education into Civic Education, the study advocates for strengthening climate change awareness. This, in turn, could contribute to improved food security and sustainable agricultural practices in the Gwembe Valley.

1.5. Theoretical Framework

This study was guided by Bronfenbrenner's *Ecological Systems Theory* (1989). In agreement with Mwale and Phiri (2024) ecological approaches are discussed on the basis of current issues, based on ecological effects in the changes of cultivation system and the hybridisation of landscape, combined with empirical results on the environmental sustainability. According to the ecological theory, human development and behavior are influenced by interactions within four interconnected ecological systems: the Microsystem, Mesosystem, Exosystem, and Macrosystem. Central to this study was the Mesosystem, which links two or more Microsystems, such as homes, families, neighborhoods, and communities. These interconnected systems engage in socio-economic activities, including farming and charcoal burning, which, if not managed sustainably, contribute to climate change and negatively impact

food security. This framework was particularly relevant as it enabled the exploration of how interactions within and between ecological systems influence climate change and its effects on society, particularly in the context of the Gwembe Valley.

2. LITERATURE REVIEW

The literature review was structured based on the study's objectives. According to Phiri, Milupi, Kandondo., *etal* (2024) on literature review, It offers an epistemological starting point with a critique of knowledge production which this study explored as below.

2.1. Understanding the Concept of Climate Change

The Intergovernmental Panel on Climate Change (IPCC, 2007) highlights that increased human activities over the past centuries have significantly contributed to global warming, with average annual global temperatures rising by 0.7°C. The report underscores that human-induced activities such as burning fossil fuels release greenhouse gases, including carbon dioxide and methane, which trap solar heat in the Earth's atmosphere. This process results in rising temperatures and extreme weather events. Equally, Additionally, deforestation and land clearing release substantial amounts of carbon dioxide. As trees and plants absorb atmospheric carbon dioxide and store it in their branches, leaves, trunks, roots, and soil, their removal releases stored carbon back into the atmosphere. Greenhouse gases emitted from sectors such as energy, transportation, buildings, agriculture, and urbanization further exacerbate climate change (IPCC, 2007). Climate change increases disaster risk by increasing weather and climate hazards, and by increasing the vulnerability of communities and economic activities to natural hazards, particularly through ecosystem degradation (Mubita, Phiri Milupi *etal.*, 2023). This means that, without informal civic education knowledge, there is little hope for climate change management.

2.2. Understanding the Concept of Food Security

Food security is a multidimensional concept that has been interpreted differently by scholars and institutions. The World Food Summit (WFS, 1996) defines food security as a state where all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences for an active and healthy life. This definition emphasizes that food security extends beyond mere availability, incorporating access, affordability, and adequacy of food.

The High-Level Panel of Experts for the Committee on World Food Security (2020) identifies six pillars essential for understanding food security: agency, sustainability, availability, access, utilization, and stability. Together, these pillars provide an integrated framework for addressing food security, emphasizing both the quantity and quality of food. Achieving food security requires coordinated policy interventions and sustainable practices that address these pillars comprehensively.

Global initiatives to combat hunger and poverty are enshrined in the Sustainable Development Goals (SDGs), particularly Goal 1 (End Poverty) and Goal 2 (Zero Hunger). These goals aim to eradicate hunger, ensure food security, improve nutrition, and promote sustainable agriculture by 2030. However, achieving these targets requires urgent action on Goal 13 (Climate Action), which focuses on combating climate change and its impacts.

The World Food Summit (1996) acknowledged the pivotal role of education in achieving food security, while the Food and Agriculture Organization (FAO, 2016) has developed educational resources, including training modules on climate-smart agriculture. These resources aim to equip farmers and stakeholders with sustainable practices to mitigate climate change and improve food security. Such educational initiatives demonstrate the importance of integrating knowledge and awareness into strategies for addressing global challenges

2.3. Effects of Climate Change on Food Security in Gwembe Valley, Southern Province

The Gwembe Valley, located in the southern region of Zambia, is predominantly agrarian, with small-scale farming serving as the backbone of its socio-economic structure. A report by the Zambia Climate Change Vulnerability Mapping (2010) identified Gwembe District as one of the regions in Zambia significantly affected by climate variability. This variability has had adverse effects on livestock, fishing, and crop farming. As a result, most farmers in the area face food insecurity, struggling to grow, harvest, or sustain their agricultural and livestock resources.

Given these challenges, it is evident that the effects of climate change in Gwembe Valley are severe. To address this, farmers require robust and adaptive strategies to mitigate the causes and effects of climate change. One such solution involves exposing farmers to informal civic education, which would enable them to actively participate in identifying and implementing long-lasting solutions to the issues affecting them. Informal civic education could play a transformative role in equipping farmers with the knowledge and skills necessary to enhance their resilience and achieve food security.

2.4. The Role of Informal Civic Education in Climate Change Adaptation and Food Security

Civic education has been defined by Muleya (2016: 185–198) as a subject that involves the active participation of citizens in managing societal issues and ensuring mutual support. Similarly, Makowski and Pazderski (2017), in their study *Civic Inspirer* conducted in Poland, described informal civic education as a deliberate learning process that typically occurs outside formal systems and is not necessarily part of the core activities of the entities offering it.

Hill and Wood (2018) further expanded on this by noting that informal civic education encompasses diverse learning experiences that occur outside traditional classroom settings. These experiences contribute to the development of civic knowledge, skills, attitudes, and behaviors. Examples include activities hosted at social centers, cultural hubs, and agricultural facilities where individuals are exposed to varying perspectives and develop a sense of commitment to their communities and environments.

Informal civic education, as reported by Makowski and Pazderski (2017), aims to raise general awareness of the importance of environmental protection for quality living. This is achieved through unconventional methods such as meetings, workshops, and seminars, which aim to enhance understanding of biodiversity, climate systems, and environmental sustainability. By promoting pre-ecological attitudes and fostering civic awareness, informal civic education becomes a vital tool in mitigating the adverse effects of climate change and fostering a population that is informed, engaged, and environmentally responsible.

In addition, Owen (2015) highlighted that effective communication of information through civic education requires addressing potential barriers such as limited infrastructure, language diversity, and inequitable access to information channels like television, the internet, notice boards, or radio. Informal meetings also provide opportunities to disseminate relevant and timely information. Overcoming these challenges enables farmers to access accurate and firsthand knowledge, empowering them to make informed decisions about crop selection and planting schedules in alignment with current climatic conditions.

The findings of the current study strongly support this perspective, emphasizing the pivotal role of informal civic education in equipping farmers with the tools and insights needed to adapt to climate change and enhance food security.

3. METHODOLOGY

This study adopted a qualitative interpretivist research paradigm due to its descriptive nature, which prioritizes the collection of in-depth, non-numerical data and focuses on interpreting information gathered from study sites. A descriptive research design employing a qualitative approach was chosen to capture participants' views, attitudes, and opinions. The study explored farmers' understanding of climate change and its potential to enhance food security through informal civic education in Gwembe Valley.

The sample comprised three villages: Munyumbwe, Njoongola, and Chipepo, while most experts were interviewed at Gwembe Boma. A total of 25 participants were purposively selected. This group included:

- 15 farmers, representing a balanced mix of 5 crop farmers, 5 livestock farmers, and 5 fish farmers, chosen through homogeneous purposive sampling to reflect the diversity of farming activities and experiences with climate change in the valley.
- 10 experts from government institutions, selected using expert purposive sampling based on their knowledge and professional experience with climate change issues. This group comprised:
- 4 from the Ministry of Agriculture

- 3 from the Ministry of Green Economy and Environment
- 3 from the Ministry of Fisheries and Livestock

Data was collected using a semi-structured interview guide, which facilitated the collection of rich, authentic data through open-ended and follow-up questions. This approach allowed participants to provide detailed responses and enabled the researcher to probe deeper where necessary.

Data analysis followed a thematic approach, involving three coding stages:

- Open coding, to identify initial concepts and categories.
- Axial coding, to establish relationships between categories.
- Selective coding, to refine and consolidate the emerging themes.

4. DISCUSSION OF FINDINGS

The findings of this study are presented in alignment with the research questions:

- What do farmers understand about climate change and food security in Gwembe Valley?
- What are the effects of climate change on food security among farmers in Gwembe Valley?
- What are the potential roles of informal civic education in enhancing farmers' understanding and awareness of climate change and its implications for food security?

4.1. Farmers' Understanding of Climate Change and Food Security

Regarding the first research question, the study revealed varied levels of understanding among participants. While some farmers demonstrated an adequate understanding of climate change, others exhibited limited awareness. For example, participants who demonstrated awareness attributed climate change primarily to human activities, emphasizing corrupt practices resulting into deforestation and unsustainable agricultural methods as contributing factors for lack of food security in the Gwembe valley. For Phiri, Milupi, Musi et al., (2023), corruption means that the victim has severe consequences concerning her self-image, self-esteem and identity. These farmers stated that their knowledge of climate change and food security was gained through participation in community meetings and workshops organized by local stakeholders, but such efforts are affected by corrupt practices. The methods of farmer selection to attend these works on climate change remains obscure. They also highlighted their interactions with climate change agents, who provided critical information on the subject is selective. However, a subset of farmers displayed minimal understanding on change, often confusing it with natural weather variability. This disparity in knowledge highlighted the need for more targeted and inclusive awareness initiatives to ensure a collective understanding of climate change and its impact on food security among all farmers in the Gwembe Valley..

With regards to the above findings, one of the farmers from Chihepo-F2- explained that:

“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 the current 2022/2023 farming season. It has been dry, very dry because the weather is no longer stable” (29/8/23).

On food security, one of the farmers from Chihepo-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 in the mid of the year” (29/8/23).

4.1.1. Engagement of farmers in farming practices that cause Climate Change

The study found that most participants attributed human activities as major causes of climate change which were responsible for the shortage of food in Gwembe valley. They pointed out 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.

Farming Practices

The study established that conventional 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 whole-year-round had negative effects on the environment hence resulting into climate change.

The findings were evidenced in the following response given by one of the farmers from Munyumbwe-**F10**-who 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. This means 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).

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” (4/9/23)

Charcoal Burning

The findings showed that the 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. On these findings, one of the farmers from Njoongola-**F9**- had this to say:

“All those cutting trees carelessly for charcoal burning including most of the farmers here 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, one of the experts from the Ministry of Green Economy and Environment (meteorologist) from Munyumbwe-**MO**-stated that:

“Charcoal burners are among the key contributors to climate change. Gwembe valley does not have much grass because it is mountainous. When you cut down trees, it contributes to destroying the carbon circle which results in disturbing the weather pattern” (01/9/23).

The use of motorized fishing boats

The findings revealed that the petrol and diesel engines that fishermen use produce a lot of smoke which are emitted into the atmosphere during the process of fishing hence contributing to climate change.

In line with the findings above, one of the farmers from Munyumbwe-**F10**- reported that:

“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).

4.2. Effects of climate change on food security among farmers of Gwembe valley

On the second research question, participants cited several effects ranging from climate change impacts on agriculture, disruption of agricultural activities and vulnerability of livelihoods.

4.2.1. Impact of climate change on Agricultural products

The findings of the study indicated that in Gwembe valley, climate change had negative effects on crop farming, livestock as well as fish farming. It is also clear to state that studies on effects and impacts argue that research on institutional impact have been divided into intended and unintended (Phiri,

Milupi, Chivunda, Kandondo *et al.*, (2024). This means that results on both intended and unintended impact is commonly found among scholars that examines institutional reform such as Andrew Matts (2013), using a more qualitative approach, equally applied in this study and explained in the preceding paragraphs below.

4.2.2. 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 levels due to low rainfall, droughts, pests and diseases that resulted into low-crop yields.

In view of the above findings, one crop farmer from Chipepo-F15-explained 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 because there is no pasture and 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 when weather changes like what we experienced last season, crops were washed away even fish farmers lost their fish because their cages were swept away. Climate change has destroyed our way of life” (28/9/23).

4.2.3. 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 graze, during the dry season some calves 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, one of the experts from the Ministry of Fisheries and Livestock from Chipepo-MOFL1-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).

4.2.4. 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 500kgs 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).

Commenting on how climate change has affected fish, one Expert 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 costs to move those cages into deeper waters so that the fish can survive” (8/9/23).

4.3. Vulnerability of Farming Communities

Participants reported that due to food insecurity, their communities were vulnerable to vices such as early pregnancies, increased school drop outs, 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 village-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).

4.3.1. Disruption of 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. This is because food, especially mealie meal, is not affordable to those that are not in formal employment. Just about a 5kg of maize is now 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 to buy medicines for our animals or chemicals for crops and we remain broke” (6/9/23).

4.4. The Role of informal Civic Education in Enhancing Farmers’ Awareness of Climate Change and Food Security

The findings indicate that only a small number of participants gained substantial knowledge about climate change and its effects on food security through Civic Education. This learning was facilitated by various channels, including community engagement, radio and television programs, and workshops or seminars. These activities were organized by government officials, such as experts from agriculture, fisheries, forestry, and meteorology departments, as well as non-governmental organizations like Self-Help Zambia, the Adventist Development Relief Agency (ADRA), and the Strengthening Climate Resilience of Agricultural Livelihoods in Agro-Ecological Regions I and II in Zambia (SCRALA). These findings underscore the importance of integrating Informal Civic Education into local and national strategies to strengthen farmers’ adaptive capacities and ensure food security in the face of climate change

The findings were evidenced in a response from one of the fisheries and livestock officers from the Gwembe Boma-FLO-who reported that:

“People here need more sensitization and civic knowledge is the key that we use to unlock the minds of the people of Gwembe valley. Through workshops, field demonstrations, village meetings and during outreach, we give freedom to our farmers to add their voices and express themselves. I think that is civic education, but most of our farmers are illiterate and you know the illiteracy level is about 65% here which is very bad. So, we need to do more in a natural setting not like in a classroom situation, you will not see anybody” (8/9/23).

5. DISCUSSION OF FINDINGS

This section discusses the study’s findings based on the three research objectives, providing a comprehensive analysis and contextualizing the results with existing literature.

5.1. Perceptions of Climate Change and Food Security

The study revealed diverse perceptions among participants regarding climate change. A minority of participants indicated that they had gained knowledge about climate change through community meetings, workshops, seminars, door-to-door engagements, and media platforms such as radio and

television programs. These participants acknowledged that socio-economic activities, particularly conventional agricultural practices and charcoal burning, significantly contributed to climate change. The findings align with the Government of the Republic of Zambia (GRZ) (2016), which reported that human socio-economic activities have contributed to environmental damage, leading to weather pattern changes. These changes have caused extreme weather variations, ranging from excessive rainfall and floods to prolonged droughts, which negatively impact agricultural production and lead to food insecurity and the majority of farmers in Gwembe Valley were found to be contributing to climate change through unsustainable farming practices, further exacerbating food insecurity in the region.

5.2. Effects of Climate Change on Food Security

Concerning the second objective, the study established that climate change had adversely affected crop farming, livestock, and fish farming in Gwembe Valley. Majority of the participants reported a significant decline in food production over the past few years due to erratic rainfall, droughts, extreme temperatures, and an increase in pests and diseases. These challenges particularly impacted farmers with lower levels of education and impoverished farmers, who struggled to adapt to changing weather conditions and ensure household food sustainability. The findings are consistent with the assertions of Von Grebner et al. (2019), who noted that recurrent extreme climate events make it increasingly difficult to achieve food security and eliminate hunger globally. Changes in physical climate variables, such as temperature and rainfall, directly impact agricultural yields, particularly crops like maize and cereals, while indirectly affecting species such as pollinators and pests. The study also revealed that livestock farming suffered due to recurring animal diseases and pests. Farmers lamented frequent livestock losses, with estimates suggesting that 1–2 farmers out of 50 lose at least one animal daily due to thirst, hunger, heat stress, or climate-related diseases. These challenges underscore the pervasive impact of climate change on food security in the region.

5.3. The Role of Civic Education in Enhancing Understanding of Climate Change and Food Security

Regarding the third objective, the study highlighted the critical role of Civic Education, particularly informal methods, in enhancing farmers' understanding of climate change and its implications for food security. Participants indicated that community meetings, workshops, and seminars organized by climate change agents, NGOs, and experts provided essential knowledge and skills. Farmer-to-farmer interactions were also identified as valuable platforms for sharing information about changes in weather patterns and agricultural practices. Participants acknowledged the need for Civic Education to address the challenges posed by declining crop yields, droughts, and temperature increases. These findings align with Makowski and Pazderski (2017), who emphasized that informal civic education delivered through unconventional methods such as community meetings and workshops aim to raise awareness about environmental protection and biodiversity. Such approaches foster pre-ecological attitudes, equipping farmers with the tools to mitigate the adverse effects of climate change.

The study further supports the perspective of Almond and Verba (1963), who posited that informed citizens are better equipped to actively participate in community affairs. Informal civic education provides the knowledge, skills, and dispositions necessary for individuals to address challenges, such as poor agricultural yields due to climate change. The study also revealed disparities in farmers' perceptions and adaptive capacities based on their education levels. Educated participants demonstrated a stronger understanding of the effects of climate change and were proactive in seeking information on modern farming practices. In contrast, farmers with lower levels of education primarily relied on traditional ecological knowledge and were more reluctant to adopt new techniques. This emphasizes the need for informal civic education programs to be inclusive, ensuring that all farmers, regardless of their formal education, are equipped with the knowledge and skills required to adapt to modern agricultural practices. These findings echo the work of Anabaraonye (2018), who identified education as a key driver of empowerment. Training sessions and workshops equip farmers with the knowledge and skills required to confront the challenges posed by climate change. A lack of access to civic education, however, could result in poor adaptation strategies, further jeopardizing food security in the region.

6. CONCLUSION

This study has demonstrated the critical role of informal civic education in raising awareness about climate change and its implications for food security among farmers in the Gwembe Valley, Southern

Province of Zambia. In agreement with Phiri Chidongo, Somba Maureen, Chileshe Kandondo et al (2022), methodologically, the study used an inductive and qualitative approach based on interviews and group discussions with key informants, as the best methods of collecting data for climate change. The findings revealed that while farmers were generally aware of the link between climate change and food insecurity, there were significant disparities in the depth of their understanding. Educated farmers showed a higher capacity to comprehend and apply climate change information, enabling them to adapt their agricultural practices to suit changing climatic conditions. In contrast, farmers with lower levels of education struggled to make these connections, relying largely on traditional knowledge and showing resistance to adopting modern climate-smart agricultural practices.

Many farmers were aware that their economic activities such as conventional farming methods and charcoal burning contributed to climate change. However, gaps in scientific understanding, especially among farmers with lower levels of education, limited their ability to fully grasp the consequences of these activities on weather patterns, crop failure, and livestock losses. The study highlighted the inadequacy of current climate change education efforts, with significant gaps in the dissemination and accessibility of information by government extension officers and NGOs.

Therefore, there is an urgent need for enhanced informal civic education programs to bridge these knowledge gaps. Such initiatives must be comprehensive and inclusive, targeting both farmers and the institutions responsible for delivering climate change education. Addressing these gaps is vital for improving food security, fostering sustainable agricultural practices, and achieving Sustainable Development Goals (SDGs) 1 (No Poverty), 2 (Zero Hunger), and 13 (Climate Action) by 2030.

7. RECOMMENDATIONS

Based on the findings and conclusions, the study made the following recommendations:

1. Establish a Climate Change Desk in Gwembe District

- The government should set up a dedicated climate change desk in Gwembe District to provide community-level climate change literacy programs.
- Such a desk would serve as a centralized hub for disseminating climate-related information, coordinating adaptation strategies, and offering tailored training for farmers.
- With proper management, this initiative would empower farmers of all educational backgrounds to make informed decisions about climate adaptation and foster resilience in agricultural practices.

2. Increase Climate Education and Awareness Campaigns

- The government and NGOs should intensify efforts to educate farmers about climate change through awareness campaigns, environmental sensitization programs, weather alerts, and dedicated climate change programs.
- These initiatives should leverage radio and television broadcasts in both English and local languages to ensure accessibility and inclusivity. By connecting visual and auditory content with practical information delivered by climate change agents, farmers can better understand and apply the knowledge.

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AUTHORS' BIOGRAPHY

Sichula Griphin is a holder of M. A in Civic Education and B. A. in Education from the University of Zambia and a Diploma in Education from Nkrumah College of Education. He is a teacher of Civic Education at Luanshya Boys Secondary School. *His research interests are in informal Civic Education and Climate Change Education with a view to enhancing food security among small-scale farmers especially farmers with lower levels of formal education.*

Chidongo Phiri is Senior Lecturer, Researcher and Civic educator at the University of Zambia in the faculty of Education, Department of Language and Social Sciences Education. She holds a B.A. Social Sciences, M.A and PhD in Sustainable Development and Globalization from Cork, Republic of Ireland and PhD in Governance from Cape Town. Dr. Phiri Chidongo is passionate about governance and Civic accountability as he is the patron for civic association in Zambia

Miriam Sampa Moonga, is a Senior lecturer and researcher, an environmental educator at the University of Zambia (UNZA) in the faculty of Education, Department of Language and Social Sciences Education. She holds a B.A. in Education, M.A and PhD in Environmental Education all from UNZA. She is very passionate about ESD activities. *Especially networks and has attended, participated and presented several papers at local, regional and international training, workshops and conferences on EE/ESD. Her research interest is in ESD.*

Kandondo Chileshe Selestino is a senior academic and researcher, a governance expert at the University of Zambia (UNZA) in the faculty of Education, Department of Language and Social Sciences Education. He holds a B.A. in public administration, M.A and PhD from the Netherlands and the USA. He is very passionate about governance activities. Especially networks and has attended, participated and presented several papers at local, regional and international training, workshops and conferences on local government administration. His research interest is in public administration and local government.

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