The Socio-Economic Effects of Drought on Smallholder Maize Agrarian Households in Muswishi Farming Block, Chisamba District, Zambia.

Mwamba Obby, Kalapula Shepande & Mundende Kasonde

Kwame Nkrumah University

DOI: 10.29322/IJSRP.16.05.2026.p17327
https://dx.doi.org/10.29322/IJSRP.16.05.2026.p17327

Paper Received Date: 27th April 2026
Paper Acceptance Date: 24th May 2026
Paper Publication Date: 31st May 2026

Abstract

This paper examined the Socio-Economic Effects of Drought on Smallholder Maize Agrarian Households in Muswishi Farming Block, Chisamba District, Zambia. The main objective was to:

Drought poses a critical threat to agrarian livelihoods, exacerbating socio-economic vulnerabilities in rain-fed agricultural systems. This qualitative study investigates the Socio-Economic Effects of Drought on Maize Agrarian Households in Muswishi Farming Block, Chisamba District, Zambia. The research specifically aimed to: Explore the socio-economic effects of drought on agrarian households. Employing a qualitative approach, data were collected through in-depth interviews with 40 smallholder households and 5 key informants in total 45 participants, selected via simple random and purposive sampling, respectively. The findings reveal that drought inflicts profound socio-economic consequences, including catastrophic maize yield reduction, significant income loss, and deepening food insecurity. Households were compelled to employ erosive coping strategies, such as the sale of vital assets and livestock, and incurred substantial debt, thereby diminishing their long-term resilience. While farmers demonstrated awareness of climate-resilient practices like crop diversification and the use of drought-tolerant maize varieties, adoption was critically constrained by barriers such as high input costs, limited access to credit, and insufficient institutional support. The study concludes that the adaptive capacity of smallholder farmers in Muswishi is undermined by a combination of climatic shocks and systemic socio-economic constraints. To bolster resilience, a multi-faceted approach is recommended. This includes reforming input support programs to enhance access to drought-tolerant seeds and credit, strengthening targeted social protection systems, and intensifying farmer education on effective adaptation strategies. The findings contribute to a nuanced understanding of local-level drought impacts and adaptation dynamics, offering evidence-based insights for policymakers and stakeholders aiming to promote sustainable livelihoods and climate resilience in Zambia's smallholder agricultural sector

Keywords: Adaptation Strategies, agrarian, Drought, maize, Smallholder Farmers, Socio-Economic Effects, Climate Resilience, Food Security, Livelihoods, vulnerability,

1. Introduction

Anthropogenic climate change and its socioeconomic effects are major concerns of mankind. Global surface temperature has been increased significantly during the last century and will continue to rise unless greenhouse gas emissions are drastically reduced. An investigation by Intergovernmental Panel on Climate Change reviewed that global surface temperature has risen significantly approximately by 1.1^0C during the last century (IPCC, 2001).

Climate change effects are manifold and vary regionally, even locally, in their intensity, duration and areal extent. However, immediate damages to humans and their properties are not obviously caused by gradual changes in temperature or precipitation but mainly by so-called extreme events such as floods and droughts.

The general Assembly of the United Nations in 1988 recognized that climate change is a common concern of mankind and urged governments, inter-governmental and non-governmental organizations to collaborate in concerted efforts as a matter of urgency to prepare a flamework convention on climate change, (UN, 1988). To this effect, the UN framework on climate (Convention) adopted on 9th may, 1992 was negotiated in response to the growing scientific evidence of dangers posed by increased concentration of greenhouse gases in the atmosphere, (UN, 1992). There followed series of conventions on climate change, notably being the 2030 Agenda for Sustainable Development Goals (SDGs), adopted by all United Nations Member States in 2015, which provides a shared blueprint for peace and prosperity for people and the planet, now and into the future.

At the heart of this study are SDGs number 2 on ending hunger. UN Zambia (2024) highlights its specific targets has to strengthen resilience and adaptive capacity to climate related disasters, integrate climate change measures into national policies and planning among others. Zambia's agrarian economy is pivotal to its growth and sustainability, with maize being a cornerstone of both food security and agricultural income.

This case study aims to pinpoint and develop a contextual understanding of drought resilience by exploring the lived experiences, adaptive capacities and perceived barriers of smallholder maize households' farmers in Muswishi Farming Block, Chisamba District, providing recommendations for policy interventions that align with sustainable economic growth.

In line with the 2015 Nationally Determined Contributions towards SDG number 13, Zambia has formulated a number of specific policies and initiatives aimed at enhancing capacity to adapt to climate change. In addition, the country has taken urgent action or rather measures to combat climate change and its impacts some of which include; Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters, has integrated climate change measures into national policies, strategies and planning, improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. GRZ (2020) concludes that all of this is a demonstration of Zambia's resolve, from the highest level, to embrace and pursue this transformative global development agenda. Though these measures are well established, nothing much is being done on the side of implementation.

However, like many regions worldwide, Zambia has witnessed the adverse effects of climate change over recent years. These effects include erratic rainfall patterns, prolonged droughts, rising temperatures, and extreme climatic events such as heavy rainfall and flooding. thus, affecting the agrarian sector in Muswishi Area in Chisamba district in a number of ways such as; changes in crop yields and low-quality harvests. Shifts in growing seasons disrupting the traditional growing seasons and planting schedules. Increased pest and disease pressure, water scarcity affecting irrigation and crop growth, Soil degradation and significant economic losses for farmers. Joseph (2016) argues that these alterations disrupt the traditional agricultural calendar, severely impacting on crop yields and overall agricultural productivity.

In the Chisamba District rainfall results show that there is wide variations and differences from an average of 917.7mm to less than 600mm. Evidence suggests a general reduction in both annual rainfall and wet days. The rainy season normally between December and April reaches its peak in both duration and intensity between January and February. According to the meteorological data as published by Ministry of Green Economy (2025) for the 2023/2024, period of this study, in the Chisamba district where Muswishi area is found, annual rainfall results show a wide variation of 917.7mm to less than 650mm, mean annual temperature increased to 24.9^0 C from 21.9 ^{0}C. Indeed, this is evidence enough to conclude that the rainy season duration is becoming shorter, given that rainfall onset is increasingly starting late, while ceasation is increasingly coming early.

Several studies have highlighted the vulnerability of agricultural systems in Zambia to climate change. For instance, a study by (Situmbeko, 2019) emphasized that changing rainfall patterns and increased temperature variability are likely to have adverse effects on the country's staple crops, such as maize, which is central to food security.

The Muswishi area represents the epitome of agriculture in the district comprising a multitude of maize smallholder agrarian households, the farm block primarily practices rainfed agriculture. These maize smallholder farmers depend on their agricultural activities for their livelihoods, relying on successful crop yields for income and sustenance. As a result, (IPCC, 2001) states that climate change is not an abstract concept for these farmers; it is an everyday reality that directly affects their economic stability and food security. The combined challenges of erratic rainfall, prolonged droughts, and temperature fluctuations has led to reduced crop yields, crop losses, and income instability, thus jeopardizing the livelihoods of the farmers within the the area.

The effects of climate change seemed to be farfetched but in recent years, Zambia and Chisamba in particular, has not been spared in terms of floods, drought, unprecedent temperatures and so on. The country was hit by El Nino which brought a dry spell and resulted into experiencing the drought covering more than half of its part. The Ministry of Green Economy (2023, p. 2), "where the first to anticipate and gave a timely warning that the El Niño climate phenomenon, characterized by above-average Sea Surface Temperatures (SSTs) in the Pacific Ocean, is expected to persist and influence Zambia's rainfall pattern during the 2023/2024 season." This condition typically results in reduced rainfall in Zambia. As a result, the upcoming 2023/2024 rainfall season having seen how the country was hit, the Republican President Mr. Hakainde Hichilema as reported by (Mwale, 2024) on Thursday, declared drought as a national disaster and emergency being the driest agricultural season in 40 years. At national level (Zambia), records according to the (MACO, 2024) shows the following effects of the drought 2023/2024 season:

S/N	Narration	Effects
01	8/10 provinces	Reduced crop production
02	84/116	Affected by prolonged drought
03	9,800,000/19,610,769	Affected negatively
04	1,000,000/ 2,200,000 ha	Destroyed negatively
05	6,600,000 people	Need urgent humanitarian aid

Table 1: The Effects of Drought in 2023/2024

Source: (MACO, 2024)

The Chisamba District exemplifies this vulnerability. Recent meteorological data from the Ministry of Green Economy (2025) for the 2023/2024 season reveals a stark picture: annual rainfall has exhibited wide variations, dropping to less than 650mm, while the mean annual temperature has increased to 24.9°C. This confirms a trend towards a shorter, more unpredictable rainy season. The recent declaration of a national disaster and emergency by the President, citing the driest agricultural season in 40 years (Mwale, 2024), underscores the severity of the situation. The resulting socioeconomic impacts, including widespread crop failure and heightened food insecurity (MACO, 2024), highlight the urgent need to understand and strengthen local adaptive capacities.

While previous studies, such as Situmbeko (2019), have rightly emphasized the vulnerability of Zambian agriculture to climate change, there remains a critical need for contextual, ground-level research that explores the lived experiences and perceived barriers of the farmers themselves. This study therefore focuses on the smallholder maize farmers in the Muswishi Farming Block in Chisamba District, a community emblematic of rain-fed agriculture and acutely vulnerable to drought. By investigating their socioeconomic vulnerability, adaptive strategies, and the obstacles they face, this research aims to develop a nuanced, contextual understanding of drought resilience. The findings are intended to provide evidence-based recommendations for policy interventions that are not only effective but also aligned with the pursuit of sustainable economic growth and the achievement of national and international development goals.

The Chisamba town and specific Muswishi area is chosen for the research study due to its vulnerability to drought and its reliance on rain fed agriculture, growing maize as a staple and income generating food crop, making it an ideal location to investigate Socio-Economic Adaptation to Drought Among Smallholder Maize Agrarian Households by the local agrarian community of Muswishi. In addition, the area is representative of other rural areas in Zambia, allowing the research findings to be generalized to similar contexts.

Despite national commitments to climate action and resilience building, such as those aligned with the Sustainable Development Goals (SDGs 2), the localized impact and the effectiveness of adaptation strategies remain under-explored. Smallholder farmers in areas like Muswishi, Chisamba District, face immediate livelihood disruption, yet the specific mechanisms of their socio-economic response and the systemic barriers hindering effective adaptation require focused investigation.

This study addresses this critical gap by specifically exploring the lived experiences of smallholder maize agrarian households in the Muswishi Farming Block. Its central aim was to: Explore the socio-economic effects of drought on smallholder maize agrarian households, identify strategies that can enhance drought resilience and establish the perceived barriers to adopting climate-resilient agricultural

practices. The insights generated aim to develop a contextual understanding of drought resilience and provide evidence-based recommendations for localized policy interventions.

This study adopted a qualitative research approach to deeply explore the complex socio-economic and behavioral dimensions of drought adaptation. A descriptive and exploratory research design was employed to capture the richness and nuance of farmers' experiences and perceptions.

2. Methods

2.1 Location of the Study Area

The study area is the Muswishi Area as shown in the map which is found in the Chisamba District, Central province of Zambia. Chisamba was declared a District in 2012 and confirmed by SI 49 of 2013 in a bid to take service delivery closer to the people as close as possible (Government of the Republic of Zambia, 2013). The Chisamba district lies in the central province which is one of the 10 provinces of Zambia. Its location coordinates are 14.9849° S, 28.3783° E (Zambia Statistics Agency, 2022). The district covers a total surface area of 5,526 square km. The district shares borders with Chitambo district to the north, Kapiri-Mposhi district to the northeast, Luano district to the south-east, Chongwe to the south and Chibombo to the west. The current district CDB is located 85 Km and 130 Km from Lusaka and Kabwe respectively and its proximity to the two towns offers it great potential for development.

Muswishi is a rural area, found in the northern part of the Chisamba district with location coordinates: 14.5430° S, 28.6748° E. Land Area 752,618 km2 as shown in the figure below.

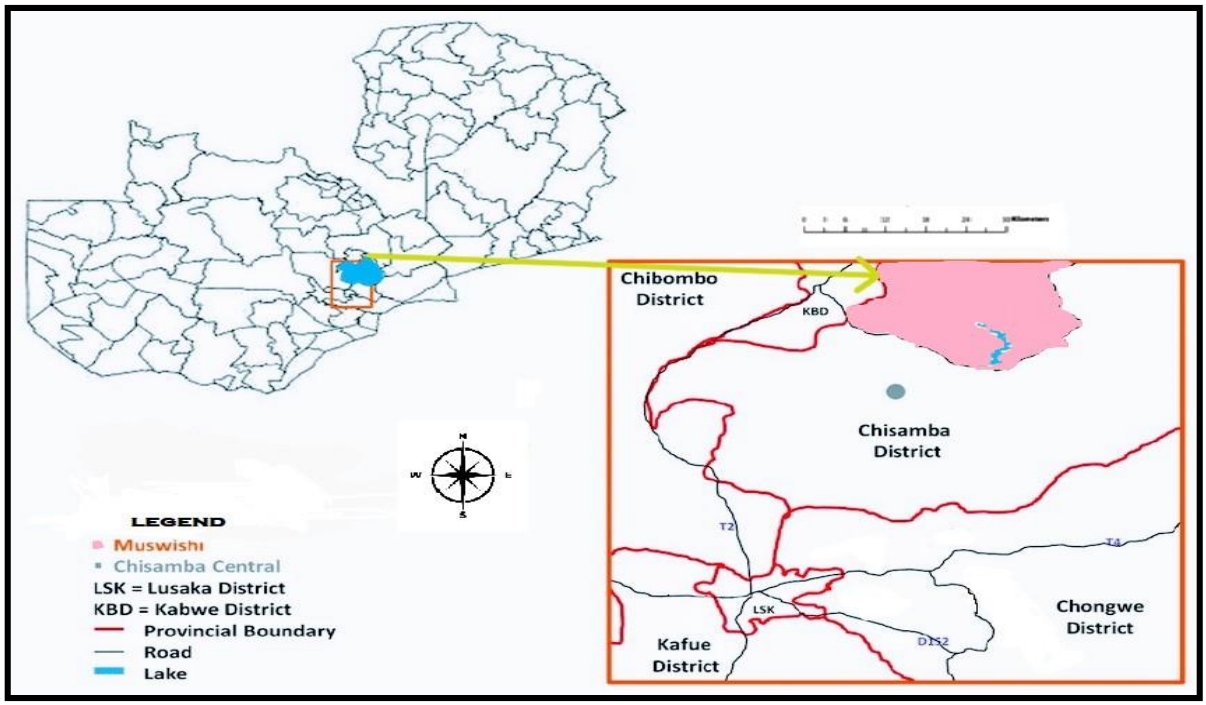

Figure 1: Map showing location of study site in Muswishi Area in Chisamba District

Source: Adapted from Google Earth (2025) and Zambia Survey Department Maps

Muswishi Area was chosen for study due to its vulnerability to drought and its reliance on rain fed agriculture, making it an ideal location to investigate socio-economic effects of drought on maize agrarian households and adaptation strategies. The rural nature of the area makes suitable for this research study of which the findings could be generalized to similar context.

2.2 Data Sources

This study employed a mixed-methods approach to data collection, utilizing both primary and secondary sources to ensure a comprehensive analysis. Primary data were collected in 2025 in the Muswishi area, Zambia, and included: In-depth interviews with 40 smallholder maize household heads, selected via simple random sampling, to understand drought impacts, adaptation strategies, and barriers to resilience. Key informant interviews with five officials from relevant Zambian government ministries (Agriculture, Water, Community Development, and Health) to gain institutional and policy perspectives and field observations using a structured checklist to document physical evidence of drought effects and farming practices, validating self-reported data. Secondary data were obtained to contextualize the primary findings and included: Government reports on drought impacts, agricultural production, and demographic data. Meteorological records from the Zambia Meteorological Department to establish climatic trends. And Peer-reviewed literature and reports from international organizations (for example, IPCC, FAO) to inform the theoretical framework.

2.3 Target Population

The target population for this study was defined as smallholder maize agrarian household heads in the Muswishi Area of Chisamba District. According to the 2022 Zambia National Census, the Muswishi Area has 3,604 households (Zambia Statistics Agency, 2022). From this, a specific subset of approximately 100 households primarily engaged in maize farming was identified as the accessible target population for this study.

2.4 Research Design

Research design is the structure for planning and executing a research project(Alghamdi, 2013). Its role is to ensure that the evidence collected enables the researcher to answer the research questions definitively. This study used a descriptive survey research design within a qualitative framework. According to (Merriam, 2009), descriptive research design is a scientific method that involves collecting and analyzing data to describe the characteristics, behaviors, or attitudes of a particular group or population. The descriptive design was preferred because it is relatively straightforward to implement, typically involving data collection through surveys and interviews, and it helps in identifying patterns and trends in the data.

2.5 Sampling Strategy

A mixed, non-probability sampling strategy was employed to select participants, consistent with the qualitative and interpretivist nature of the study, which prioritizes in-depth understanding over statistical generalization. For Household Heads: The primary sampling technique was typical case sampling (Patton, 2002). This method was used to identify and select households that were representative of the typical smallholder maize farmer in Muswishi, based on predetermined criteria such as reliance on rain-fed maize cultivation and being directly affected by recent drought events. This approach was chosen to facilitate a rich, detailed examination of common experiences, thereby providing insights that are characteristic of the population. For Key Informants: Purposive expert sampling was used to select key informants. This technique involves the deliberate identification and selection of individuals with specific expertise and knowledge relevant to the research topic (Etikan & Bala, 2016). Key informants were drawn from the Chisamba District offices of the Ministry of Agriculture, the Ministry of Water Development and Sanitation, the Ministry of Community Development and Social Services, and the Ministry of Health. This method was deemed suitable as it enabled the researcher to gather specialized insights into the institutional, environmental, and socio-economic dimensions of drought from informed professionals.

2.6 Sample Size

The total sample for this study consisted of 45 participants. Thus, 40 were smallholder maize agrarian household heads selected via typical case sampling and 5 were key informants selected via purposive expert sampling. In qualitative research, sample size determination is guided by the principle of data saturation the point at which new data collection no longer yields new thematic insights or information (Saunders et al., 2012). A sample size of 40 household heads was determined to be sufficient to achieve data saturation, given the relatively homogenous nature of the target population. The sample of 5 key informants was considered adequate to provide the necessary diversity of expert perspectives on the issue.

2.7 Data Collection

The study employed Semi-Structured interview guide administered to the key informants. The purpose was to gain expert insight into the community's challenges, understand local perspectives, and gather recommendations for solutions. Focus group discussions were conducted on heads of maize farming households with similar questions applied to the key informants. The topics addressed in FGDs included crops grown, household food security levels before and after a drought, challenges in food access and barriers. This instrument

directly addressed the study's objectives. Field Observations: The researcher used non-participatory observation to objectively watch and record farmers' conditions and challenges without influencing them. This method involved taking photographs and notes to complement and validate the data gathered from the interviews and questionnaires. In essence, the study triangulated data from household surveys, expert interviews, and direct field observation to ensure a comprehensive and validated understanding of the research problem.

2.8 Data Analysis

The qualitative data for this study, collected via questionnaires, semi-structured interviews, and field observations, was analyzed using inductive thematic analysis. This process followed the systematic steps outlined by Braun and Clarke (2006), which included familiarization with the data, generating initial codes, searching for and reviewing themes, and producing a finalized analysis corresponding to the study's objectives: socio-economic effects, resilience strategies, and barriers to adoption. This allowed for the identification of recurring patterns, central challenges, and locally effective adaptation measures. Thematic analysis was chosen as the optimal method for this exploratory research because it provides a flexible, yet rigorous, approach for identifying patterns and themes directly from the data, thereby enabling a rich, in-depth interpretation of participants' perspectives without imposing preconceived frameworks.

3. Results

Objective: Explore the Socio-Economic Effects of Drought on Smallholder Maize Agrarian Households.

3.1 Effects of Drought on Maize Yield

This section outlines the results of the average yield per hectare for the seasons 2020 to 2023 and 2023/2024 based on the data gathered from the respondents. The yield categories reflect varying levels of production efficiency and these results provide insight into the performance of maize farming in the study area. The distribution of maize yield per hectare for the period 2020 to 2023 and 2023/2024 farming seasons as follows:

Bag size range (in 50kg bags)	2022/2023		2023/2024	
	Frequency	Percentage	Frequency	Percentage
1-20 bags	4	10%	21	52.5%
21-40 bags	6	15%	16	40%
41-50 bags	11	27.5%	3	7.5%
50 & above	19	47.5%	0	0%

Table 2: Mean Maize Yield per Hectare 2020-2023 Seasons and the 2023/2024

Source: Field Data, 2025

Based on the qualitative data collected for 2022/2023 farming seasons, 4% of the participants reported yields 1 to 20 bags per hectare, 15% reported 21 to 40 bags, 27.5% of the participants fall into the 41 to 50 bags category and 47.5% nearly half of participants reported yields above 50 bags per hectare.

For the 2023/2024 farming season, 52.5% of the participants reported 1 to 20 bags, 40% of the participants reports 21 to 40 bags, 7.5% reports 41 to 50 bags. Lastly 0% of the participants recorded yields above 50 bags.

Season 1: (2022/2023) 75% of farmers achieved yields above 41 bags/ha and 46% of farmers achieved yields above 50 bags/ha

Season 2: (2023/2024) 92.5% of farmers achieved yields below 40 bags/ha and only 3% of farmers achieved yields above 50 bags/ha.

There is a noticeable decline in maize yields between the two seasons, thus shifting towards lower yields in 2023/2024. Possible factors leading to the shift might include climate variability, soil degradation and changing in farming practices.

3.2 Effects of Droughts on Household Income

The survey results indicate that drought had a significant impact on household income, with a large majority (78%) reporting a severe effect. This sentiment is powerfully captured in the words of one participant who stated,

"The drought didn't just lower our income; it erased it. We lost an entire season's worth of crops. What we saved from the year before is now gone, just to put food on the table"

The other two participants, highlighting the long-term consequences, explained,

"Due to the loss of income we are eating into the money we had saved for our children's education."

"I had to sell off most of my livestock because I couldn't afford to feed them or give them water. That was my family's savings account walking away, for a fraction of the price."

"Our income is down significantly. We usually have a surplus to sell at the market, but this year it was only enough for our own consumption. So, there's no extra cash for anything."

For these households, the impact was not merely a reduction in earnings but a fundamental threat to their financial security and future prospects."

For the "Mild Effect" Group (22% of participants). This group represents participants whose impact of drought was minimal to cause any significant household income surge or rather loss.

"We noticed the drought, of course. Our farm didn't do well, and food prices at the market went up. But since my income comes from a small shop in the village, it didn't hit us as hard as our farming neighbors."

"Our income was affected, but only slightly. We have a diversified farm with some irrigation, so we were more protected than others. It was more an inconvenience than a crisis for us."

"We felt it, but we've been through worse. We had to be more careful with our spending, but it didn't fundamentally change our way of life. We consider ourselves very lucky."

These quotes indicate resilience, minor inconvenience, or that the participant's livelihood was less directly tied to rain-fed agriculture.

3.3 Effects of Drought on Access to Healthcare and Education (Financial Situation)

To understand the effects of drought on access to health and education, the researcher asked the following:

Research question: *How did the drought affect your access to healthcare and education?*

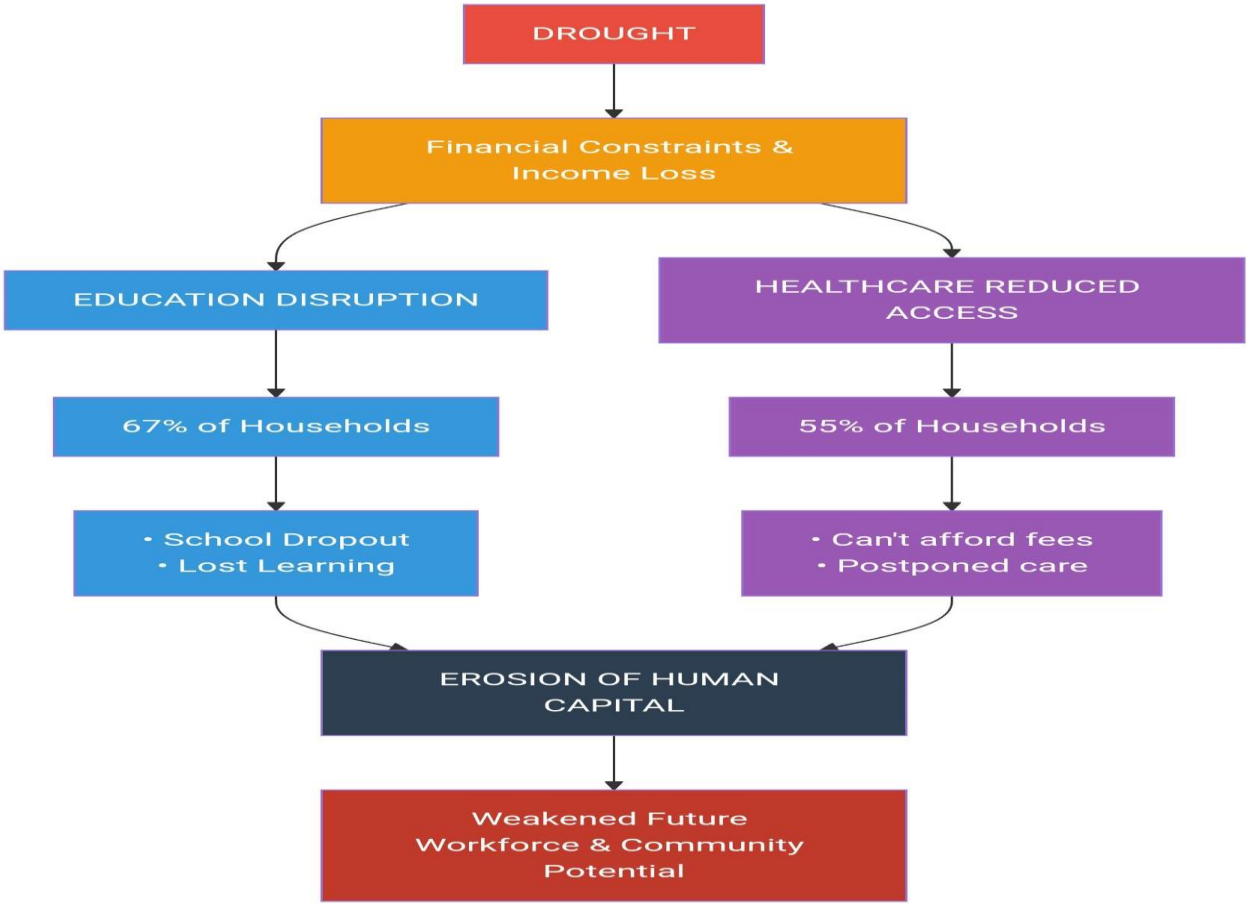

Figure 2: Effects of Drought on Access to Healthcare and Education

Source: Field Data, 2025

The data reveals that 67% of children from smallholder maize farming families experienced disruption in their schooling due to drought. A significant portion of these families 40% reported pulling children out of school to assist with labour intensive tasks on the farm or to help fetch water.

Migration was another factor contributing to disrupted schooling, with 20% of families reporting that their children missed school entirely due to relocation in search of work or food.

Health care access was severely limited, with 55% of participants reporting that they were unable to afford medical care due to loss of income post drought. Many farmers cited increased health risks, including malnutrition and waterborne diseases. Furthermore, 43% of households also reported that their health conditions were aggravated by lack of clean water, as many families were forced to rely on contaminated water sources.

To alleviate the suffering of agrarian households regarding healthcare access, a Key Informant from the Ministry of Health revealed that:

> *"During a severe drought, families sell their assets—sometimes even their farm tools—to pay for medical bills. Our mobile health clinics, in partnership with UNFPA, help break this cycle. By bringing basic healthcare and prenatal services to the doorsteps of farming communities, we prevent them from incurring catastrophic health expenditures. This allows them to preserve their productive assets. As one community health worker put it, 'If a mother can get her child treated for diarrhea without selling her goat, that goat is still there to provide milk or be sold for a sack of seed when the rains return.' It's about protecting their economic buffers."*

3.4 Effects of Drought on Food Security

To gather relevant data on this part, the researcher posed the following question:

Research question: *Did you experience food insecurity during and in the post drought period?*

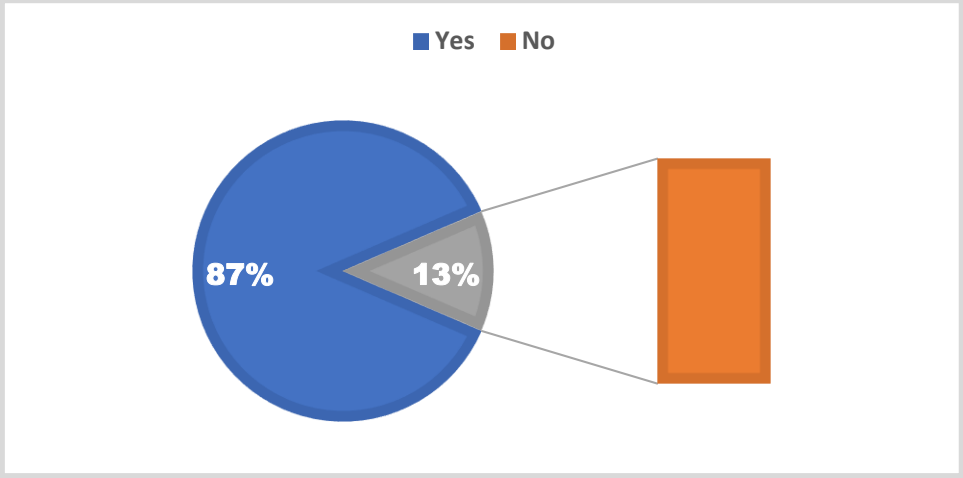

Figure 3: Food Security During and in the Post-Drought Period

Source: Field Data, 2025

The data reveals that an overwhelming majority (87%) of smallholder farmers experienced food insecurity during and in the post-drought period, pointing to a severe and widespread crisis. The statistical reality is vividly captured in the words of one participant who said: "*After the drought, our maize withered to nothing. The granary that should feed us for eight months was empty in two months. We started skipping meals, eating only once a day."* This sentiment of rapid depletion and forced coping strategies was common amongst the households.

Conversely, the small minority (13%) who avoided food insecurity often cited specific resilience strategies. As some participants noted:

"We were saved because of my brother's remittance from the city. Without that money to buy food, we would have been as hungry as our neighbors."

"I have had to take on a second job in the city, which means I'm away from my family for weeks at a time. It's a strain on all of us, but it's the only way to make up for the lost farm income for food."

This highlights that for the few who were secure, it was often due to access to alternative income or support systems, not the adequacy of their own harvest.

3.5 Effects of Drought on Water Usage

The most direct and frequently cited adjustments were related to household water conservation, with 83% of participants significantly more than the average reporting significant alterations in their water consumption habits.

This shift in behavior was evident in daily routines. As one resident noted, *"I used to take long, relaxing showers, but now I'm in and out in five minutes. It feels like a race against the clock."* This sentiment was common, with many households actively reducing shower times.

The effort extended outdoors, where water-intensive activities were curtailed. "*My garden was my pride and joy, but I have had to let parts of it go brown to save water. It's heartbreaking, but necessary,"* shared another participant, highlighting the difficult choices many faced. Furthermore, individuals became more mindful during household tasks. A common refrain was about reusing water, such as: *"I now keep a bucket in the shower to catch the cold water before it warms up, and use that to water my plants."* Others mentioned being more strategic with laundry, waiting for full loads and even re-wearing clothes to minimize washes.

An informant from the Ministry of Water Development and Sanitation pointed out that, *"to ensure good access to clean and safe drinking water, boreholes were sunk at selected central points though not adequate as compared with the population."* This indicates government efforts towards alleviating peoples suffering in the Muswishi Framing Block.

3.6 Effects of Drought on Social Relationships and Community Dynamics

Research question: *Did the drought affect your social relationships and community dynamics in anyway?*

The responses from the participants revealed a divided response. A total of 56% of participants reported that the drought had indeed affected their social relationships and community dynamics, while 44% indicated that the drought did not lead to any significant changes in these areas in the Muswishi Framing Block.

Participant H had this to say, (*arguments and fights are so frequent nowadays among ourselves than before the drought over water and food.*

Participant J added that, "*we have to depend entirely from our own resources for family survival since the drought and not concerned with how others are living."*

Participant W also had his to say, *"since the drought we have the members of the community not coming together to share food and love to the have-nots like before the drought."*

These statements highlight the potential effects of drought on social relationships and dynamics, including increased conflict, changes in community support, and shifts in social activities.

3.7 Financial Status in the Post Drought

Research question: *Did you have to take any loans or credits to cope up with drought-related losses?*

A considerable number of farmers 40% reported having taken either loan or credits to cope up with drought -related losses such as livestock and asset recovery, immediate financial relief and to maintain their farming operations. The remaining 60% participants reported not taking credits or loan of whatsoever. Below are some of the direct quotations from the participants:

Participant L explained that: *"The drought took half my herd. The loan wasn't a choice; it was a necessity. I had to buy new calves and feed for the ones that survived, otherwise there would be no future for this farm."*

Participant M was also quick to disclose that: *"There was no grain in the house, and the children's school fees were due. The loan was for survival, not for the farm. We had to live first, and worry about repaying later. "*

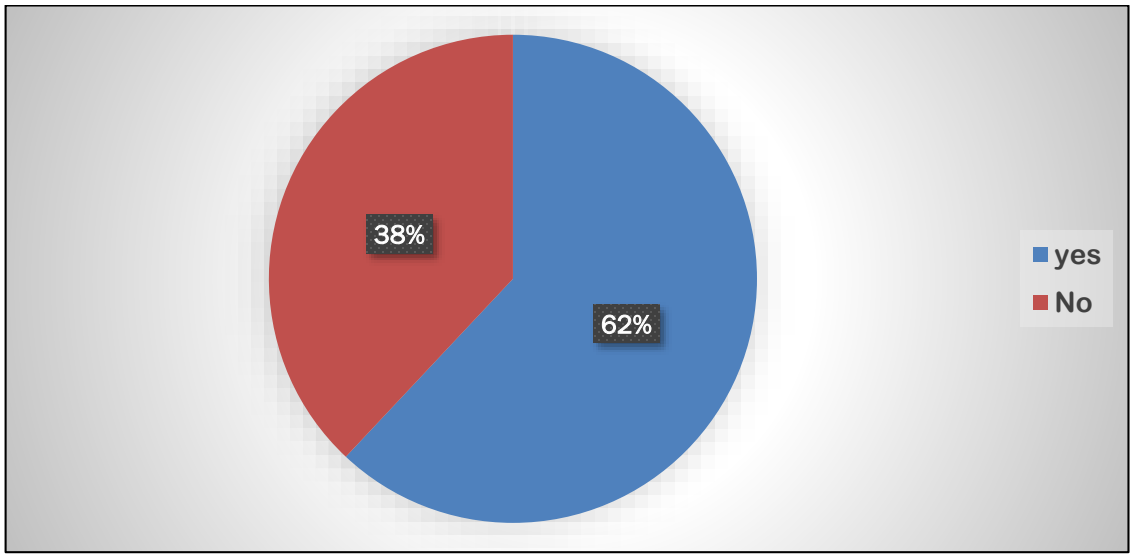

Figure 4: Sale of Assets and Livestock Due to Drought

Source: Field Data, 2025

The chart clearly shows that majority of respondents, 62% had to sell assets or livestock during and post-drought, while 38% did not. The primary reasons for selling were economic necessity, lack of resources (water, feed) and debt repayment as reported by the participants.

A considerable number of participants explained that they were forced to sell livestock or assets to cover basic living expenses during and post drought period.

Quoting one participant, "*The drought left my family with no choice but to sell our animals to earn ends meet."* Some households were using the sale of assets as a means to repay debts incurred from loans taken to survive the drought period.

Another participant added that*, "the drought hampered our ability to pay back the debts and loans, hence selling part of the farm and a plough."*

As reviewed by the research, the common assets that were sold are farm equipment such as ploughs, land, and household equipment such as television sets, satellite dish. The livestock sold included; goats, sheep, cattle, pigs and chickens. A key informant identified female-headed households, the elderly and those with no alternative sources of income as most affected. These groups had fewer assets to sell and limited capacity to engage in off-farm labour. A key informant explained that, "*Selling of assets were survivalist, not resilient. Selling a goat for a fraction of its value to buy mealie meal only solves today's problem while mortgaging tomorrow."*

3.8 Diversification Beyond Farming: A Multi-layered Safety Net

Research question: *Besides farming, what other sources of income or support does your household rely on during a difficult season?*

When faced with difficult agricultural seasons, households in the study did not rely on a single strategy but engaged in a complex web of income diversification and support mechanisms. The analysis revealed four primaries, and often overlapping, sources of resilience: small-scale enterprise, remittance networks, community-based solidarity groups, and external aid. The reliance on these strategies was not uniform but varied based on household composition, asset base, and social capital as shown in the table below.

Table 3: Summary of Coping and Primary Strategies their Characteristics

Strategy	Frequency of mention	Key characteristics	Illustrative quote
Small businesses	Very high	Informal, diverse, low profit, often female-led	*"I sale vegetables and other household goods by the roadside. It's not much, but it's something."*
Remittances	High	Unpredictable, emotionally charged, urban-rural flow	*"We pray that our son in the civil service keeps his job so that he continues sending us some money for food."*
Chilimba (village saving groups)	High	Structured, predictable, builds social capital	*Our Chilimba group is our reliable security, we know it will be here."*
Govt/ NGO support	Low to medium	Unreliable, often delayed, can be divisive	*"Our relief food came once, but we have not seen it since."*

Source: Field Data, 2025

3.8.1 Small-Scale Entrepreneurialism: (Selling anything we can)

The most frequently cited strategy (very high) was engaging in small, often informal, businesses. This was not a single activity but a diverse portfolio of responses.

Many participants, particularly women, described selling basic foodstuffs (tomatoes, onions, dried fish) or household goods (soap, airtime) in local markets. As one participant, explained: *"When the maize failed, I took the little savings I had and bought soap and cooking oil in bulk from the wholesaler. I now sell it in small quantities to my neighbours. The profit is small, but it buys us relish for our nshima."*

3.8.2 Utilizing Existing Skills

Others turned specific skills into income, such as brewing traditional beer (kachasu), tailoring, or brick-making. These activities were often described as 'what we fall back on' when farming alone is insufficient.

"A participant revealed that, "the money i get from producing and selling of beer is what I use to buy maize meal now. Before, when the rains failed, we had nothing to fall back on. This alternative livelihood is a critical buffer; it's what stops a drought from becoming a famine."

3.8.3 Remittances: The Urban-to-Rural Lifeline

Financial support from family members working in urban areas or abroad emerged (high) as a critical, though unevenly distributed, safety net.

For some, remittances were a regular, expected part of their income. For most, it was an emergency request. A participant, shared: *"I had to call my son in Lusaka and tell him the crops were gone. He sent 1000 kwacha the following week. It was for buying fertilizer, but we had to use it for food instead."*

This reliance also came with emotional weight and a sense of obligation, with several participants expressing guilt about being a 'burden' to their children.

3.8.4 Community Savings Groups (Chilimba): (We are our own Bank)

The traditional practice of Chilimba (or Village Savings and Loan Associations - VSLAs) was a cornerstone of financial resilience for a significant portion (High) of the community.

Members valued the structured and predictable nature of the payouts, which often coincided with the 'hungry season.' As one participant stated*: "When my cycle for receiving the share-out comes, I know I can pay school fees and buy inputs, even if my granary is empty."*

Beyond the financial aspect, Chilimba was highlighted as a source of social support and mutual accountability, strengthening community bonds.

3.8.5 External Support: A Fragile and Unpredictable Last Resort

Government and NGO support was the least (low to medium) reliable strategy mentioned. While appreciated when it arrived, narratives were filled with uncertainty and descriptions of inadequate targeting. In confirming the external support rendered to the agrarian households in Muswishi Area by the government, one key informant narrated that, "*cash for work program was rolled out which he described as designed to build physical resilience while providing immediate income."* Another key informant added that:

> *"Our Social Cash Transfer program is a key drought resilience tool. Unlike food aid, which is bulky and specific, cash gives farmers agency. During the 2023/24 drought, we heard from many beneficiaries. One man said, 'The cash allowed me to buy feed to keep my few chickens alive, while my neighbor who received maize had to slaughter his.' This is the difference. He preserved a productive asset. The strategy here is predictability—if farmers know a cash injection is coming, they can make smarter, longer-term decisions for their households and farms instead of resorting to distress sales."*

Emergency food aid from NGOs was a last resort. Participants described the process as highly competitive and sometimes divisive, with one participant noting, *"You see the truck come, and everyone runs. But it is never enough for all, and it creates problems between those who receive and those who do not."*

4 Discussion of Findings

This part synthesizes and interprets the key findings of this qualitative study, which investigated the socio-economic effects of drought and adaptation strategies among smallholder maize farmers in Muswishi Farming Block. The discussion moves beyond mere description to analyze what these findings mean in the context of existing literature and the theoretical framework of Resilience Theory (Holling, 1973; Folke, 2006).

4.1 Catastrophic Agricultural and Economic Collapse

The near-total collapse of maize yields—evidenced by the shift from 46% of farmers harvesting over 50 bags/hectare to 89% harvesting below 40 bags/hectare—is the primary shock from which all other effects emanate. This aligns with global and regional studies on the high sensitivity of maize to precipitation deficits (Lobell et al., 2011; Situmbeko, 2019). The direct consequence was severe economic loss, with 78% of households reporting a "severe effect" on income. The poignant quote, “The drought didn't just lower our income; it erased it,” powerfully encapsulates the absolute nature of this loss. This finding is consistent with Juana et al. (2014), who noted that droughts in Botswana led to a direct decline in agricultural output and household income, pushing families into distress.

4.2 Deepening Food Insecurity and Social Strain

The most frequently reported and poignant effect was acute food insecurity. The study found that households had shifted from two or three meals a day to one, often consisting of only nshima made from purchased maize meal, with little to no relish. Many reported relying on foraging for wild leaves and fruits, a clear indicator of coping rather than adapting. As one female participant lamented, "We are eating just to silence the stomach, not for strength." This finding directly threatens SDG 2 (Zero Hunger) and is consistent with national assessments by the Ministry of Agriculture (MACO, 2024), which projected widespread food insecurity following the drought. The gendered burden of the drought, with women reporting increased time and effort spent on water collection, echoes the findings of Djoudi et al. (2016), who emphasize that climate impacts are not gender-neutral and often exacerbate existing inequalities, limiting women's capacity for other productive activities.

4.3 Asset Depletion: The Erosion of Absorptive Capacity

To cope, 62% of households resorted to selling assets and livestock. This is a classic "erosive" coping strategy that depletes the productive capital essential for future recovery (Gerber & Mirzabaev, 2017). From a Resilience Theory perspective, this represents a critical weakening of the community's absorptive capacity. The sale of a plough or a breeding animal may solve an immediate food need, but it directly reduces a household's ability to produce food in the subsequent season, trapping them in a cycle of increasing vulnerability. As one key informant astutely noted, this is "survivalist, not resilient."

4.4 Secondary Social and Human Capital Effects

The study powerfully documents the drought's ripple effects beyond agriculture, eroding the human and social foundations of the community. The disruption of children's education (67%) and reduced access to healthcare (55%) due to financial constraints represent a significant erosion of human capital. This aligns with findings from Makondo & Thomas (2019) in Zambia and Matarira (2013) in Lesotho, who noted that climate stresses undermine long-term development prospects. The quotation, “We are eating into the money we had saved for our children's education,” highlights the painful intergenerational trade-offs forced upon these households.

Furthermore, the mixed reports on community dynamics with some citing increased conflict over resources and others a breakdown of mutual support reflect the complex social renegotiations that occur under extreme stress. This finding resonates with Berkes, Colding, and Folke (2003), who argue that social capital can be both a buffer and a casualty during disasters. The strain on social relationships indicates that drought damages not only physical and financial capital but also the social networks that are crucial for informal safety nets.

4.5 Livelihood Diversification and Reliance on Social Networks

The most significant finding regarding resilience was the near-universal reliance on off-farm and non-farm income. Participants reported engaging in casual labor, petty trading, brick-making, and, distressingly, charcoal production. While casual labour and trading provide a crucial short-term buffer, their precarious nature is well-documented (Ellis, 2000). Charcoal production, a maladaptive strategy, degrades the very environment upon which long-term agricultural resilience depends, creating a negative feedback loop (Holling, 1973). This aligns with Kalinda's (2018) research in Zambia, which links environmental degradation to a lack of viable economic alternatives for rural households facing climate stress.

Temporary migration to urban areas like Lusaka by household members was another common strategy to secure remittances. Furthermore, the persistence of kinship and community support systems—sharing food, money, and labor—emerged as a vital, informal social safety net. This social capital is a foundational element of the community's resilience, a finding that corroborates the work of (Adger, 2003), who argues that social networks and collective action are critical for communities to cope with and adapt to environmental change.

4.6 Synthesis and Theoretical Implications

The findings from Muswishi present a classic case of a social-ecological system whose resilience has been critically breached by a severe climatic shock. The socio-economic effects demonstrate that the system's capacity to "absorb" the drought has been overwhelmed, leading to asset depletion and social distress, moving the community into a deeply vulnerable state (Folke, 2006).

5. Conclusion and Recommendation

5.1 Conclusion

This research underscores the acute vulnerability of smallholder maize farmers in the Muswishi area to drought, a climate shock that acts as a catalyst for a profound socio-economic crisis. The study concludes that drought's impact extends far beyond immediate crop failure, triggering a devastating chain of consequences: catastrophic income loss forces the distress sale of vital productive assets and accumulation of debt, thereby eroding the very foundation of long-term livelihood security. This, in turn, intensifies food insecurity and compromises human capital development by limiting access to education and healthcare. While farmers demonstrate awareness and have adopted specific resilient technologies notably drought-tolerant maize varieties their adaptive capacity is critically constrained by financial limitations, input access barriers, and insufficient technical support. Furthermore, institutional responses remain largely fragmented and humanitarian, failing to build systematic, long-term resilience.

5.2 Recommendations

To break the cycle of vulnerability and build sustainable resilience, the following integrated recommendations are proposed:

5.2.1 For Government and Policy Makers:

- Transform Agricultural Input Support: Reform the Farmer Input Support Programme (FISP) into a targeted, climate-smart system. Prioritize guaranteed and timely access to certified drought-tolerant seeds, short-season varieties, and appropriate fertilizers, potentially using digital platforms for efficiency.
- Invest in Proactive Safety Nets: Develop forecast-based financing mechanisms to enable early action before droughts peak. Scale up shock-responsive social protection (for example., pre-emptive cash transfers) to prevent distress sales of assets and protect livelihood capital during crises.
- Fund Climate-Resilient Infrastructure: Direct investment towards small-scale, sustainable water harvesting and irrigation infrastructure (for example., rehabilitated dams, solar-powered drip kits) and support community grain storage facilities to enhance food security and market stability.
- Facilitate Access to Adaptive Finance: Promote and subsidize tailored financial products such as low-interest loans for resilience investments and affordable weather-indexed insurance to help farmers manage risk and recover from losses.

5.2.2 For Agricultural Extension Services, NGOs, and Development Partners:

- Deliver Practical, Hands-On Training: Move beyond awareness to skills-based education on a diversified portfolio of adaptation. This includes training in crop diversification (legumes, sorghum), advanced soil/water conservation, and integrated livestock management for alternative income.
- Improve Climate and Market Information Systems: Utilize accessible channels (local radio, mobile SMS, farmer groups) to disseminate timely, actionable information on weather forecasts, early warnings, and market prices to aid decision-making.
- Strengthen Community Institutions: Build the capacity of farmer cooperatives in collective bargaining, bulk input purchasing, and developing community-led drought preparedness and response plans.

5.2.3 For Smallholder Households and Farmer Communities:

- Prioritize Crop and Livelihood Diversification: Deliberately allocate land to drought-resilient crops like sorghum, millet, or legumes to spread risk. Actively explore and develop off-farm and non-farm income sources to reduce dependence on maize alone.
- Formalize and Leverage Collective Action: Strengthen existing community solidarity through farmer groups. Use collective agency to access information, share resources, pool labor for conservation works, and advocate more effectively for needed services and support from institutions.

By implementing these recommendations in a coordinated manner, stakeholders can address both the immediate socio-economic effects of drought and the underlying barriers to adaptation, thereby supporting the farmers of Muswishi and similar regions in building a more secure and resilient future.

Ethical Considerations

Participation by all participants in this was by voluntary and high confidentiality was exercised as identity of all participants remained anonymous. The rights of the participants were protected and respected.

Competing Interest

There are no competing interests concerning this paper.

References

Aaron, J.L., & Patz, J. (2001). *Ecosystem Change and Public Health: A Global*. University Press, Cambridge.

Adger, W. N. (2003). *Social Capital, Collective Action, and Adaptation to Climate Change.* Economic Geography, 79(4), 387-404.

AGRA (Alliance for a Green Revolution in Africa). (2019). *Africa Agriculture Status Report: The Hidden Middle: A Quiet Revolution in the Private Sector Driving Agriculture Transformation*. Nairobi, Kenya.

Agrawal, A. (1995). *Dismantling the Divide Between Indigenous and Scientific Knowledge. Development and Change*, 26(3), 413-439.

Ahrens, C. D., & Henson, R. (2019). *Meteorology today: An Introduction to Weather, Climate, and The Environment (13th ed.).* Cengage Learning.

Ajayi, O. C., & Mafongoya, P. L. (2017). *Indigenous Knowledge Systems and Climate Change Management in Africa.* ICRAF Working Paper No. 276. World Agroforestry Centre.

Akpan, S. B. (2020). *Gender and Agricultural Productivity in Africa: A Review Of Empirical Evidence*. Journal of Agricultural Science and Practice, 5(1), 1-11.

Alghamdi, A.H, Li L. (2013). *Adapting Design-Based Research as A Research Methodology in Educational Settings. International Journal of Education and Research*. 2013;1(10):1-12.

Altieri, M. A. (2002). *Agroecology: The Science of Natural Resource Management for Poor Farmers in Marginal Environments. Agriculture, Ecosystems & Environment*, 93(1-3), 1-24.

Arslan, A., McCarthy, N., Lipper, L., Asfaw, S., & Cattaneo, A. (2017). *Adoption and Intensity of Adoption of Conservation Farming Practices in Zambia. Agriculture, Ecosystems & Environment,* 187, 72–86. https://doi.org/10.1016/j.agee.2013.08.017

Benjamin, I.C., Justin, S.M., & Anchukaitis, K.J. (2018). *Climate Change and Drought: From Past to Future.* Available At: https: www.researchgate.net/publication/325105540_*Climate_Change_and_Drought_FromPast_to_Future* (Accessed on 16th June, 2024)

Berkes, F., Colding, J., & Folke, C. (2003). N*avigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press.

Branca,G., McCarthy, N., Lipper, L., & Jolejole, M. C. (2021). *Climate-Smart Agriculture: A Synthesis of Empirical Evidence of Food Security and Mitigation Benefits. Food Policy*, 99, 101976.

Brown,K. (2016). *Resilience, Development and Global Change.* Routledge.

Buchholc, K. (2021). *The World Map of Drought Risk.* Available at: https://www.statista.com/chart/25101/countries-by-drought-risk/ (accessed on 24th may,2024)

Carter,M. R., & Barrett, C. B. (2006). *The Economics of Poverty Traps and Persistent Poverty: An Asset-Based Approach.* The Journal of Development Studies, 42(2), 178-199.

Chambers, R., & Conway, G. (1992). *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century*. Imperial College, London.

Chanda, R. (2019). *Climate Variability and Agricultural Adaptation in Central Zambia: A Case of Muswishi Area*. University of Zambia Press.

Chibwe, K., et al. (2021). *Adaptation Strategies to Climate Change in Chisamba District, Zambia.*

Chibwe, T. (2021). *"Evaluating Smallholder Farmers' Adoption of Climate-Smart Agriculture in Chisamba District."* Zambia Journal of Agricultural Sciences, 15(2), 45-60.

Chifuwe, E. (2006). *The Social – Economic Effects of Drought and Human Response: The Case of Monze District 1970-2003, Zambia, Masters Thesis*. Unza, Lusaka.

Chikowo, R., Zingore, S., & Nyamangara, J. (2021). *Farm Management and Economic Drivers Of Adoption of Climate-Smart Agriculture in Southern Africa. in Climate Smart Agriculture for Southern Africa* (pp. 157-171). CABI.

Chisamba District Agricultural Office. (2023). *Annual Agricultural Report 2022/2023 Season*. Chisamba District Council.

Chisamba District Council. (2022). *Chisamba District Socio-Economic Profile.*

Cooper, R.C., & Schindler, P.S. (2014). *Business Research Methods*. McGraw-Hall Education, New York.

Creswell, J.W. (2003). *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches, 2nd Ed*. Sage Publications: Thousand Oaks

CSO Zambia. (2012). *Muswishi Ward Population*. Available at: https://www.citypopulation.de/en/zambia/wards/admin/chisamba/00101__muswishi/hh (accessed on 23rd may, 2024)

Cuevas, S., Pek, E., & Salman, M. (2024). *Economic Assessment of Drought Risk Management*. FAO, Rome.

Davis, K., Nkonya, E., Kato, E., Mekonnen, D. A., Odendo, M., Miiro, R., & Nkuba, J. (2012). *Impact of Farmer Field Schools on Agricultural Productivity and Poverty in East Africa*. World Development, 40(2), 402-413.

Djido, A., & Shackleton, C. M. (2021). *Exploring the Role of Household Structure and Composition in Shaping Agricultural Livelihood Strategies in Rural South Africa*. Journal of Rural Studies, 87, 1-10.

Djoudi,H., Locatelli, B., Vaast, C., Asher, K., Brockhaus, M., & Basnett, S. (2016). *Beyond Dichotomies: Gender and Intersecting Inequalities in Climate Change Studies*. Ambio, 45(3), 248-262.

Doss, C. (2018). *Women and Agricultural Productivity: Reframing the Issues*. Development Policy Review, 36(1), 35-50.

Ellis, F. (2000). *Rural Livelihoods and Diversity in Developing Countries.* Oxford University Press.

Etikan, I., & Barger, L. (2016). *Purposive Sampling: A Mythological Review*. Journal of Emerging Trends in Education Research and Policy Studies, 7(2), 1-8S

FAO (Food and Agriculture Organization of the United Nations). (2014). *Youth and Agriculture: Key Challenges and Concrete Solutions.*

FAO, (2013). *Drought, Geneva: Food and Agriculture Organisation of the United Nations*. United Nations.

FAO. (2020). *Climate Change and Agriculture in Zambia: Impact Assessment and Adaptation Strategies. Food and Agriculture Organization of the United Nations*. United Nations.

Feder, G., Just, R. E., & Zilberman, D. (1985). *Adoption of Agricultural Innovations in Developing Countries: A Survey. Economic Development and Cultural Change*, 33(2), 255-298.

Flowers, P. (2009). *Research Philosophies—Importance and Relevance*. 2009; 1:1-5

Folke, c. (2006). *Resilience: The Emergence of a Perspective for Social-Ecological Systems Analyses. Global Environmental Change*, 16(3), 253-267.

Folke,C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). *Resilience Thinking: Integrating Resilience, Adaptability and Transformability. Ecology and Society*, 15(4), 20.

Food and Agriculture Organization (FAO). (2011). *The State of Food and Agriculture 2010-11: Women in Agriculture - Closing the Gender Gap for Development*. Rome: FAO.

Food and Agriculture Organization (FAO). (2017). *The Future of Food and Agriculture: Trends and Challenges.* FAO.

Forestry Department. (2017). *A National Forest Inventory for Zambia: Central Province Report.* Ministry of Lands and Natural Resources.

Gerber, N., & Mirzabaev, A. (2017). *Benefits of Action and Costs of Inaction: Drought Mitigation and Preparedness – A Literature Review, Geneva: World Meteorological Organization (WMO) and Global*.

Government of the Republic of Zambia. (2013). *The Chisamba District (Declaration) Order, Statutory Instrument No. 49 of 2013.* Government Printer.

Grothmann, T., & Patt, A. (2005). *Adaptive Capacity and Human Cognition: The Process of Individual Adaptation to Climate Change. Global Environmental Change*, 15(3), 199-213.

GRZ. (2020). *Zambia Sustainable Development Goals Voluntary National Review 2020.* Government Printers, Lusaka.

GRZ. (2023). *National Adaptation Plan for Zambia, Government Printers*. Lusaka

Hamed, T. (2022). *What are Different Research Approaches? Comprehensive Review of Qualitative, Quantitative, and Mixed Method Research, their Application, Types and Limitations. Journal Of Management Science & Engineering Research*, 2022, 5(1), pp.53-63

Harper, D. (n.d.). *Climate. in Online Etymology Dictionary*. Retrieved October 23, 2024, from https://www.etymonline.com/word/climate

Hichaambwa, M. (2020). *The Political Economy of Maize Production and Marketing in Zambia: A Review of the Literature*. Indaba Agricultural Policy Research Institute (IAPRI).

Holling, C.S. (1973). *Resilience And Stability of Ecological Systems. Annual Review of Ecology and Systematics*, 4, 1-23.

Holling,C. S. (1973). *Resilience and Stability of Ecological Systems. Annual Review of Ecology and Systematics,* 4, 1-23.

IFAD (International Fund for Agricultural Development). (2019*). Creating Opportunities for Rural Youth.*

Intergovernmental Panel on Climate Change. (2023). *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II And III to the Sixth Assessment Report of the IPCC* [Core Writing Team, H. Lee & J. Romero (Eds.)]. IPCC. https://doi.org/10.59327/IPCC/AR6-9789291691647

IPCC. (2001). *Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge.

IPCC. (2007). *Climate Change 2007: Synthesis Report. Contribution of Working Group I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge.

IPCC. (2019). *Special Report on Climate Change and Land*. Cambridge University Press, Cambridge.

IPCC. (2022). Climate Change 2022: *Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

IPCC. (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

Joseph, R. (2016). *Climate Change: What Everyone Needs to Know*. Oxford University Press, London.

Jost, C., Kyazze, F., Naab, J., Neelormi, S., Kinyangi, J., Zougmore, R.,. & Kristjanson, P. (2016). *Understanding Gender Dimensions of Agriculture and Climate Change in Smallholder Farming Communities. Climate and Development*, 8(2), 133-144.

Juana, J., Makepe, P., Mangadai, K., & Narayana, N. (2014). *The Socio-Economic Impact of Drought in Botswana*. International Journal of Environment and Development, 11(1), pp. 43-60.

Kabika, J., et al. (2018). *Climate Variability and Change and their Potential Impacts on Smallholder Farming Systems in Zambia: A Review. Advances in Agriculture, 2018.*

Kabika, J., Mumba, K., & Phiri, M. (2018). "*Impact of Climate Variability on Maize Yields in Chisamba District, Zambia." Journal of Environmental and Agricultural Studies*, 4(1), 22-34.

Kalinda, T., Tembo, G., & Kuntashula, E. (2014). *Adoption of Improved Maize Seed Varieties in Southern Zambia.* Asian Journal of Agricultural Sciences, 6(1), 14-21.

Kalinda,T. (2018). *Deforestation in Zambia: A Livelihood and Climate Change Dilemma.* IAP.

Kansanga, M. M., Luginaah, I., Bezner Kerr, R., & Lupafya, E. (2018). *Determinants of Smallholder Farmers' Adoption of Agricultural Diversification and Improved Natural Resource Management Practices in Malawi. Land Use Policy*, 81, 221-231. https://doi.org/10.1016/j.landusepol.2018.10.043

Kasonde-Nga'ndu, S. (2013). *Writing a Research Proposal in Educational Research*. University of Zambia Press. Lusaka

Kimberlin, C.L., & Winterstein, A.D. (2008). *Validity And Reliability of Measurement Instruments Used in Research*. American journal of health-system pharmacy 65(23), 2276-2284, 2008.

Kinsey, B, Burger., K. & Gunning, W. (1998). *Coping with Drought in Zimbabwe: Survey Evidence on Responses of Rural Households to Risk*. World Development, Volume 26, pp. 89-110.

Kombo, D. K., & Tromp, D. L. (2006). *Proposal and Thesis Writing*. Nairobi: Pauline Publications Africa.

Kothari, C.R. (2011). *Research Methodology: Methods and Techniques*. New Age International Publishers, New Delhi.

Lewis, J.L., & Sheppard, S.R.J. (2006). *Purposive Sampling as a Tool for Informant Selection*. Journal Of Ethnobiology.

Lipper, L., McCarthy, N., Zilberman, D., Asfaw, S., & Branca, G. (2018). *Climate smart agriculture: Building resilience to climate change.* Springer Nature.

Louis, C. M., & Keith, M. (2008). *Research Methods in Education 8th Edition*. Routledge, eBook ISBN 9781315456539.

Lovejoy, T.E., & Hannah, L. (2005). *Climate Change and Biodiversity*. Yale University Press, New Haven.

Mackenzie, N., & Knipe, S. (2006). *Research Dilemmas: Paradigms, Methods and Methodology. Issues in Educational Research*. 2006;16(2):1-11.

MACO.(2024). *Drought Impact Assessment Report. Ministry of Agriculture and Cooperatives*, Zambia.

Makate, C., Wang, R., Makate, M., & Mango, N. (2016). *Crop Diversification and Livelihoods of Smallholder Farmers in Zimbabwe: Adaptive Management for Environmental Change.* SpringerPlus, 5(1), 1135. https://doi.org/10.1186/s40064-016-2802-4

Makondo, C.C., & Thomas, D.S.G, (2019). *Seasonal and Intra-Seasonal Rainfall and Drought Characteristics as Indicators of Climate Change and Variability in Southern Africa: A Focus on Kabwe and Livingstone in Zambia.* Springer-Verlag Gmbh, Vienna, Austria.

Matarira, C.H. (2013). *Socio-Economic Impacts of Climate Change on Subsistence Communities Lesotho.* Journal Of Sustainable Development in Africa, (JSDA)

Media Wire Express. (2024). *Zambia Enforces Electricity Rationing in Response to Drought Emergency*. Available on: https://mediawireexpress.co.tz/zambia-implements-electricity-rationing-amid-drought-crisis/ (accessed on 21st June, 2024).

Merriam, S.B. (2009). *Quantitative Research: A Guide to Design and Implementation*. John Wiley & Sons.

Ministry of Green Economy and Environment. (2024). Zambia Meteorological Department Rainfall Forecast 2023/2024 Season Issued by Edson Nkonde Director of Meteorology**.** GRZ**.** Lusaka.

Ministry of Mines and Mineral Development. (2021). *Geological Survey Report: Mineral Potential of Chisamba District.*

Mishra, A. &., Singh, V. (2010). *A Review of Drought Concepts*. Journal of Hydrology, 391(1-2), pp. 202-216.

Morton, J. F. (2007). *The Impact of Climate Change on Smallholder and Subsistence Agriculture.*

Mubanga,K. H., Kuta, F., & Mumba, C. (2020). *The Role of Home Gardens in Household Food Security in Central Zambia. Journal of Arid Environments*, 180, 104195.

Mubaya, C. P., & Mafongoya, P. L. (2017). *The Role of Indigenous Knowledge Systems in Managing Climate Change and Enhancing Food Security in Zimbabwe.* Jàmbá: Journal of Disaster Risk Studies, 9(1), a338. https://doi.org/10.4102/jamba.v9i1.338

Mulenga, B. P., Wineman, A., & Sitko, N. J. (2017). *Climate Trends and Farmers' Perceptions of Climate Change in Zambia. Environmental Management*, 59(2), 291–306.

Mulenga,B. P., Sitko, N. J., & Hichambwa, M. (2017). *The Maize Paradigm: The Political Economy of Agricultural Policy in Zambia. Food Security*, 9(6), 1183-1196.

Mushore, T. D., Mudavanhu, C., & Makovere, T. (2016). *Effectiveness of Drought Mitigation Strategies in Bikita District, Zimbabwe.* International Journal of Disaster Risk Reduction, 14, 92-102. https://doi.org/10.1016/j.ijdrr.2015.11.010

Muzari, W., Gatsi, W., & Muvhunzi, S. (2012). *The Impacts of Technology Adoption on Smallholder Agricultural Productivity in Sub-Saharan Africa: A Review*. Journal of Sustainable Development, 5(8), 69.

Mwale, S. (2024). *President Hichilema Declares Drought National Disaster. Central Province Administration, Kabwe*. Available at: https://www.cen.gov.zm/?p=2078 (accessed on 21st June,2024)

Mwanga, G. (2021). *The Impact of Climate Change on Children's Education in Zambia.* UNICEF Zambia.

Mwelwa, E. (2020). *The Climate of Zambia: Trends and Implications for Agriculture*. Lusaka: Meteorological Department Press.

Neuman, W.L. (2003). *Social Research Methods: Qualitative and Quantitative Approaches 5th edition,* Alyn and Bacon, Boston

Ngoma, H, Lupiya, P, Kabisa, M,. & Hartley, F. (2021). *Impacts of Climate Change on Agriculture and Household Welfare in Zambia: An Economy-Wide Analysis. Climate Change* 167. doi: 10.1007/S10584- 021-03168-Z.

Ngoma, H., et al. (2015). *Climate Variability and Change: Farmer Perceptions and Understanding of Intra-Seasonal Variability in Rainfall and Opportunities for Climate Services in Zambia.*

Nyamadzawo, G., Wuta, M., Nyamangara, J., & Gumbo, D. (2013). *Opportunities for Optimization of In-Field Water Harvesting To Cope with Changing Climate in Semi-Arid Smallholder Farming Areas of Zimbabwe.* SpringerPlus, 2(1), 1-9. https://doi.org/10.1186/2193-1801-2-100

O'Brien,K. (2018). *Is the 1.5°C Target Possible? Exploring the Three Spheres Of Transformation. Current Opinion in Environmental Sustainability*, 31, 153-160.

Oxfam, (2016). *How Climate Change is Making Drought and Humanitarian Disaster Worse in East Africa*, Addis Ababa: Oxfam.

Patton, M.Q. (2002). *Qualitative Research & Evaluation Methods (3rd Ed.).* Sage Publications, Inc.

Peter, R., et al. (2006). *The World's Water 2006 – 2007: The Biennial Report on Fresh Water Resources*. Island Press, Washington.

Peterman, A. (2011). *Widowhood and Asset Inheritance in Sub-Saharan Africa: Empirical Evidence From 15 Countries*. Development Policy Review, 29(5), 543-571.

Porter,C., Dube, S., & Zivali, T. (2021). *Drought and Human Capital: The Impact of Shocks on Education and Health.* World Bank Policy Research Working Paper 9635.

Poulton, C., Dorward, A., & Kydd, J. (2010). *The Future of Small Farms: New Directions for Services, Institutions, and Intermediation.* World Development, 38(10), 1413-1428.

Rojas, O, Li, Y., & Cumani, R. (2014). *Understanding the Drought Impact Of El Nino on The Global Agriculture Areas: An Assessment Using FAO's Agriculture Stress Index (ASI).* Rome: Food and Agriculture Organization of the United Nations.

Rosenzweig, C., et al. (2014). *Assessing Agricultural Risks of Climate Change in the 21st Century in a Global Gridded Crop Model Intercomparing*.

Satriadi, S., et al. (2019). *K-12 Students' Misconception Ability on Global Warming.* available at: https://www.researchgate.net/figure/Illustration-of-Global-Warming_fig1_337444368.

Saunders, M.N. K et al., (2012). *Research Methods for Business Students (6th Ed.).* Pearson.

Schlenker, W., & Lobell, D. B. (2010). *Robust Negative Impacts of Climate Change on African Agriculture. Environmental Research Letters*, 5(1), 014010.

Sharma, R., & Resnik, M. (2003). *Research Methodology: A Practical Approach*. (ISBN:978-93-5368-225-4)

Short, J.R., & J. F. (1984). *The Social Fabric of Risk: Towards the Social Transformation of Risk Analysis*. Rev., 49(Dec.), 711-725.

Siampale,A. (2021). *Effectiveness of Agricultural Extension Services in Promoting Climate-Smart Agriculture in Zambia*. University of Zambia Press.

Siatwiindi et al. (2021). *Climate Change Impacts on Rainfed Maize Yields in Zambia Under Conventional and Optimized Crop Management. Climate Change* 167(3), 39,2021

Sibanda, L. M., Mwale, M., & Mphande, F. A. (2022). *The Potential of Index-Based Agricultural Insurance in Zambia:* A review. Zambia Social Science Journal, 9(1), 45-67.

Siebet, S. (2019). *Globe Drought: Towards Improved Drought Risk Analysis and Projection At Global And Regional Scales*. Available at: https:www.researchgate.net/profile/MichaelHagenlocher/publication/331101645/figure/fig1/AS:726342249246722@1550184895546/The-conceptual-framework-used-in-the-GlobeDrought-project-to-analyze-drought-risk-and.ppm

Simatele, D., & Simatele, M. (2015). *Climate Variability and Urban Food Security in Sub-Saharan Africa: Lessons From Zambia.* Journal of Hunger & Environmental Nutrition, 10(1), 46-62. https://doi.org/10.1080/19320248.2014.929533

Sitko, N. J., & Jayne, T. S. (2014). *Structural Transformation or Elite Land Capture? The Growth of "Emergent" Farmers in Zambia. Food Policy*, 48, 194-202. https://doi.org/10.1016/j.foodpol.2014.05.006

Situmbeko,S. M. (2019). *Climate Change and Maize Production in Southern Zambia: A Vulnerability Assessment.* Lambert Academic Publishing.

Tamminen, K.A., & Zoë, A. P. (2020). *The Routledge International Encyclopedia of Sport and Exercise Psychology*, 535-549, 2020

Tengö, M., & Belfrage, K. (2004). *Local Management Practices for Dealing with Change and Uncertainty: A Cross-Scale Comparison Of Cases in Sweden and Tanzania.* Ecology and Society, 9(3).

The World Bank. (2007). *Drought Risk Reduction Framework and Practices: Contributing to the Implementation of the Hyogo Framework for Action*. Published by the United Nations secretariat of the International Strategy for Disaster Reduction (UN/ISDR). Geneva.

Thornton, P.K., Jones. P.G., Ericksen, P.J., & Challinor, A.J. (2017). *Agriculture and Food Systems in Sub-Saharan Africa in A Four-Plus Degree World*. Philosophical Transactions of the Royal Society Series A, 369,117-136.

Tschakert,P. (2007). *Views from the Vulnerable: Understanding Climatic and other Stressors in the Sahel.* Global Environmental Change, 17(3-4), 381-396.

United Nations Zambia. (2024). *The Sustainable Development Goals in Zambia*. Available at: https://zambia.un.org/en/sdgs/13 (retrieved on 14th June, 2024).

United Nations. (1988). *Call for a UN Conference on Environment and Health*. UNGA res,43/196, Yale University Press, New Haven.

United Nations. (1992). *United Nations Framework Convention on Climate Change.* United Nations, New York.

Vanclay, F. (2004). *Social Principles for Agricultural Extension to Assist in the Promotion of Natural Resource Management.* Australian Journal of Experimental Agriculture, 44(3), 213-222.

Vermeulen, S. J., et al. (2012). *Climate Change, Food Security, and the Role of Agricultural Research. Global Environmental Change*, 22(4), 585-595.

Walker, B., Holling, C.S, Carpenter, S.R.., & Kinzig, A. (2004). *Resilience, Adaptability and Transformability in Social-Ecological Systems. Ecology and Society*, 9(2), 5.

Ward, P. S., Makhija, S., & Spielman, D. J. (2018). *The Drought Resilience of Maize–Legume Cropping Systems in Kenya.* Agricultural Systems, 162, 173-182. https://doi.org/10.1016/j.agsy.2018.01.024

WHO. (2010). *Drought*. Available at: Https://www.Who.Int/health-topics/drought#tab=tab_1 (Access On 24th May, 2024)

Wilhite, D., & Glantz, M. (1985). *Understanding The Drought Phenomenon: The Role of Definitions. Nebraska:* Drought Mitigation Center Faculty Publications.

Wilhite, D., Sivakumar, V., & Pulwarty, R. (2014). *Managing Drought Risk in A Changing Climate: The Role of National Drought Policy*. *Weather And Climate Change Extremes*, Volume 3, pp. 4-13.

World Bank. (2009). *Gender in Agriculture Sourcebook*. Washington, DC: The World Bank.

World Bank. (2020). *Zambia Economic Brief: The Economic and Social Impacts of Climate Change.* World Bank Group.

Yanda, Z.Y., & Mubaya, C.P. (2011). *Managing A Changing Climate in Africa: Local Level Vulnerabilities and Adaptation Experiences*. Mksuki Na Nyota Publishers Ltd.

Zambia Meteorological Agency (ZMA). (2019). *State of the Climate in Zambia 2018/2019 Rainfall Season Report.* Government of the Republic of Zambia.

Zambia Meteorological Department. (2024). 2023/2024 *Rainfall Season Report*.

Zambia Statistics Agency. *(2022). 2022 Census of Population and Housing: Preliminary Report.* Lusaka, Zambia.

Zambia Survey Department. (2015). *Topographic Map Series of Central Province*, Sheet 1327-C1.

Zambia Water Resources Management Authority. (2019). *Kafue River Basin: Integrated Water Resources Management Plan.*