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Examining the Effects of Drought on Household Food Security: A Case Study of Small-Scale Farmers in Chibombo District

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Abstract

Drought is the most devastating climatic hazard affecting agriculture and food systems globally. Small-scale farmers in developing countries face significant challenges related to climate change which impacts their ability to maintain food security. The economic consequences of drought extend beyond the immediate impact on crop production. Drought often causes market disruptions, which result in higher food prices. This research study seeks to examine the effects of drought on household food security. The study is addressed by the objectives below; To evaluate the impact of drought on household food availability, accessibility, and utilization among small-scale farmers; To identify coping and adaptation strategies employed by small-scale farmers in response to drought-related food insecurity; and To examine the role of government and non-governmental interventions in mitigating the effects of drought on household food security. A sample size of 50 respondents was selected to help provide data, and the research study utilized both qualitative and quantitative methods which included surveys and focus group discussions. The key findings showed how the level of crop loss specifically impacted the household's food stock. 22.50% of the household that had >75% loss, their food stock was almost completely depleted within a few weeks after harvest, 36.25% of the household that had 50-75% loss had run out of their food reserves halfway through the drought season leading to reduced meal frequencies, 31.25% of household that had 25-50% losses had a reduction in yields which meant food stock couldn't last until the next harvest season, and 10% of the households that had <25% losses had experienced a drop in yields although they managed to maintain enough food stocks for most of the year. The findings suggest that there is need of effective government interventions to help farmers implement effective coping and adaptation strategies by developing several policy frameworks aimed at improving climate resilience and food security such as the National Policy on Climate Change (NPCC) (2016), which integrates climate change mitigation and adaptation into national planning. Therefore, it is essential for small-scale farmers, governmental organizations such as the ministry of agriculture as well as non-governmental organizations to work together to come up with and implement effective and efficient coping and adaptation strategies that will help ensure resilience in response to drought-related food insecurity.

Keywords: Drought, Household Food Security, and Small-Scale Farmers

1. Introduction

Drought is one of the most devastating climatic hazards affecting agriculture and food systems globally. In many rural areas, where agriculture is the primary source of livelihood, drought leads to poor harvests, reduced income, and limited access to food, ultimately contributing to heightened vulnerability (FAO, 2021) [9]. Food security is a complex and multi-dimensional concept defined by the Food and Agriculture Organization (FAO, 2008) as a condition where all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life. In the context of small-scale farmers, food security is closely linked to agricultural productivity, access to resources, and the ability of households to cope with shocks, such as drought. The impacts of drought on food security are not uniform and depend on various factors, including the vulnerability of the household, the level of dependence on rain-fed agriculture, and the coping mechanisms available. In many developing countries, particularly in sub-Saharan Africa, small-scale farmers are highly dependent on rain-fed agriculture, making them particularly vulnerable to prolonged dry spells and

changing rainfall patterns (Muller *et al*., 2015).

Drought is a natural phenomenon characterized by an extended period of below-average rainfall, leading to a water deficit that adversely affects crop growth, livestock production, and water availability. In smallholder farming systems, which are often characterized by low investment in irrigation and other water management technologies, drought can have devastating consequences on agricultural productivity (Chambers *et al*., 1989). The loss of crops due to insufficient water availability leads to a decrease in food production, increased food prices, and reduced income, thereby posing a significant threat to household food security. In rural areas, agriculture forms the backbone of the economy, with small-scale farmers depending on crop sales and livestock for their livelihoods. However, drought leads to substantial economic losses for these farmers. The loss of crop yields due to insufficient water can cause a significant reduction in household income. Small-scale farmers often do not have the financial capital to invest in irrigation systems or other drought-resistant agricultural technologies, making them more vulnerable to climatic shocks (Hassan *et al*., 2016).

For small-scale farmers in Zambia and other sub-Saharan African countries, maize is the staple crop, and its cultivation is heavily reliant on rainfall (Boko *et al*., 2017). Zambia, though endowed with substantial agricultural potential, has experienced erratic rainfall patterns, particularly in agro-ecological regions where Chibombo District is located. The district's small-scale farmers often face challenges related to delayed rains, prolonged dry spells, and insufficient water availability, which directly compromise crop yields and livestock productivity (Sharma, 2016). As agriculture remains the primary source of livelihood for the majority in Chibombo, any disruption due to drought affects food security dimensions availability, access, stability, and utilization. According to the Zambia Meteorological Department (2022), Chibombo has recorded at least three significant drought events in the past ten years. The compounded effects of these events have led to widespread crop failures and reduced household food reserves, particularly among vulnerable populations with limited access to irrigation and financial services. This study aims to examine the effects of drought on household food security among small-scale farmers of Chibombo ward in Chibombo district which has approximately 48,000 small scale farmers, with a focus on understanding how drought disrupts agricultural productivity, income, and overall food security (CSO, 2016).

1.1 General Objective

Examining the Effects of Drought on Household Food Security: A Case Study of Small-Scale Farmers in Chibombo District.

1.1.1 Specific Objectives

1. To evaluate the effects of drought on household food availability among small-scale farmers.
2. To ascertain coping and adaptation strategies employed by small-scale farmers in response to drought-related food insecurity.
3. To evaluate the limitations faced by small-scale farmers in adapting to drought conditions.

1.2 Theoretical Framework

This research study was guided by the Sustainable Livelihoods Framework (SLF). The framework is widely used to explore how various livelihood assets (human, social, physical, financial, and natural) influence household strategies and outcomes, with a focus on vulnerability and resilience (DFID, 1999). Given that drought is a major climate-related shock that disproportionately impacts smallholder farming communities, the SLF provides a comprehensive lens through which to understand the multi-dimensional nature of household food security in such contexts.

The SLF is structured around key components: vulnerability context, livelihood assets, livelihood strategies, and livelihood outcomes. These elements interact to shape the livelihoods of rural households, with a particular focus on how these components are altered by external shocks, such as drought.

Applying the SLF to this study will help to better understand how drought impacts the different forms of capital and the ways in which small-scale farmers adapt their livelihood strategies in response to these shocks. The framework emphasizes the dynamic relationship between vulnerability and resilience, which is particularly relevant for studying food security outcomes in rural areas affected by recurrent droughts. For example, reduced natural capital (e.g., poor soil fertility, lack of water) may compel farmers to shift their livelihood strategies, such as switching from crop cultivation to livestock rearing or relying more heavily on social networks for food assistance. The SLF helps to assess how these shifts in strategies influence household food security outcomes, considering the interconnectedness of the five types of capital. Furthermore, it helps to identify the role of external support systems, such as government programs and NGOs, which can enhance resilience by replenishing lost assets or providing financial support during droughts. The SLF helps explain the complexities of household food security in the context of drought. Food security is not only about the availability of food but also involves access to food and the ability to utilize it for a healthy and active life (FAO, 2008). Using the SLF, the research can explore how drought-induced changes in livelihood assets (especially natural and financial capital) affect food access, availability, and utilization. The outcomes of livelihood strategies (such as increased dependence on food aid or altered dietary patterns) will provide insights into the broader impact of drought on household food security.

2. Literature Review

2.1 Effects of drought on household food availability among small-scale farmers

Droughts have become more frequent and severe in Zambia, exacerbated by the broader effects of climate change. Small-scale farmers, whose livelihoods are intricately tied to rain-fed agriculture, suffer both directly and indirectly from the impacts of drought.

In Zambia, food availability is heavily influenced by the success of smallholder agriculture, which depends almost entirely on rain-fed farming. A prolonged dry season, typically associated with droughts, severely hampers

agricultural productivity. According to the Zambia Meteorological Department (ZMD, 2021), the 2018-2019 agricultural season saw a significant reduction in maize production due to an El Niño-induced drought, leading to a 30% decrease in maize yields across major farming regions such as Southern, Eastern, and Central Provinces. This reduction in maize production was compounded by poor rainfall patterns, which directly affected the ability of smallholder farmers to produce enough food for household consumption and market sale (FAO, 2020) [8]. Consequently, food availability was severely affected as households experienced food shortages, particularly of staple crops like maize.

Food accessibility is influenced by the economic and physical ability of households to obtain food, whether through local production or market purchases. Drought directly affects the accessibility of food for small-scale farmers by limiting their production capacity and reducing their income from crop sales. Drought reduces household income in rural areas, as many smallholder farmers rely on crop sales to purchase food and other goods. The Zambia Vulnerability Assessment Committee (ZVAC, 2019) reports that during drought years, the income of smallholder farmers declines significantly. With diminished harvests, farmers are forced to sell their remaining produce at lower prices, which leads to reduced purchasing power. In turn, this leads to higher dependency on food aid, which is often insufficient to meet household food needs (WFP, 2018).

Drought affects food utilization both directly and indirectly. Water scarcity is a significant issue during droughts, especially in rural areas where access to clean water is limited. In many parts of Zambia, small-scale farmers rely on seasonal water sources such as rivers and wells, which dry up during prolonged drought periods. The lack of clean water for food preparation and personal hygiene contributes to increased risks of waterborne diseases such as cholera and diarrhea, which in turn affect the body's ability to absorb nutrients effectively (Zambia Ministry of Health, 2020).

2.2 Coping and Adaptation strategies employed by small-scale farmers in response to drought-related food insecurity

As climate shocks grow in frequency and severity, small-scale farmers in Zambia have developed both coping and adaptation strategies to manage drought-related food insecurity (Zulu *et al*., 2021). Zambia experiences recurrent droughts, especially during El Niño years, which disrupt rainfall patterns and agricultural calendars. The 2015/2016 and 2018/2019 drought seasons, for example, caused significant crop failures and food shortages, particularly in Southern, Western, and Eastern Provinces (ZVAC, 2019). During these events, maize production, the primary staple, fell by over 30%, directly affecting household food availability and income generation.

One of the most common coping mechanisms among Zambian smallholder households is reducing the quantity or quality of food consumed. Households often resort to one or two meals per day and substitute maize with less-preferred staples like cassava or wild fruits (Chibamba and Muleba, 2020). While this helps prevent starvation, it often leads to nutritional deficiencies, especially among children and pregnant women. To purchase food during times of drought, farmers sell livestock such as goats and chickens or agricultural tools. However, such distress sales are usually at undervalued prices, diminishing long-term production capacity (Chikowo *et al*., 2019). In areas like Gwembe and Sinazongwe, repeated asset sales have been reported across multiple drought cycles.

Temporary migration to urban centers or engaging in casual labor (locally referred to as ganyu) is another coping strategy. Family members, especially youth and men, seek informal employment in towns to send money back home. While helpful in the short term, this disrupts household labor availability for agricultural production and often results in unstable income (Zulu *et al*., 2021). Many rural households depend on informal borrowing from relatives, neighbors, or village savings groups. These local safety nets provide some cushion against food shortages, but their effectiveness declines during widespread shocks when most households are equally affected (Sitko and Tembo, 2013).

2.3 Limitations faced by small-scale farmers in adapting to drought conditions

Zambia's agriculture is predominantly rainfed and dominated by smallholder households who rely on maize, groundnuts, soybeans and other staples for food and income (FAO, 2024). Recurrent droughts, most recently the severe 2023/24 El Niño-linked episode that prompted a national disaster declaration, have produced substantial crop failures, livestock losses and income shocks that directly threaten household food security and adaptive capacity (UN Zambia, 2024; FSD Zambia, 2025). Smallholders' limited asset buffers, reliance on single cropping seasons, and constrained access to institutional support make them particularly exposed to drought impacts. A repeatedly documented barrier is limited access to affordable finance and liquidity. Many smallholders lack savings, formal credit histories, or collateral required for loans, which constrains investment in drought-reducing assets such as farm ponds, solar pumps, small-scale irrigation or drought-tolerant seed (World Bank FISP review; FSD Zambia, 2025). The Farmer Input Support Programme (FISP) provides subsidized inputs but evaluations and policy notes argue it is unevenly targeted and often insufficiently focused on resilience-building investments, while cash-flow constraints force households into short-term coping (asset sales, reduced food consumption) that erode long-term adaptive capacity (World Bank, 2021; FSD Zambia, 2025). Recent post-drought assessments reported widespread sale of livestock and borrowing at high cost, clear evidence that weakened financial resilience constrains durable adaptation.

Access to timely, actionable climate and agronomic information is inconsistent. Studies and national CSA baseline reports indicate that many smallholders still rely on traditional indicators (animal/plant behavior) rather than formal forecasts, and uptake of seasonal advisories or decision-support tools is limited by weak extension capacity and a persistent rural digital divide (Ngoma *et al*., 2021). Where extension exists, it is frequently underfunded and focused on input distribution rather than tailored advice on water-conserving agronomy, planting calendars, or integrated soil-water management. Improving farmer access to localized early-warning, combined with demonstration plots and farmer-to-farmer learning, is repeatedly recommended but scaling remains a challenge. Policy fragmentation and implementation gaps limit the effectiveness of resilience programs. Zambia has multiple climate and agriculture initiatives (including GCF-funded

CSA projects and social protection options) but coordination across ministries, districts and donors is uneven, creating delays and targeting problems (UNDP, 2024). FISP's design has been critiqued for not prioritizing drought-resilient inputs or ensuring timely delivery; this undermines its potential to bolster household adaptation in the face of repeated dry seasons (World Bank, 2021). Moreover, water resource governance, including limited smallholder access to managed irrigation schemes and weak maintenance of community water assets, reduces options for effective on-farm drought buffering.

Physical infrastructure gaps are central. Many smallholders lack access to irrigation, reliable boreholes, on-farm water storage (tanks, pans), or affordable small-scale pumps and spare-parts networks; where these exist, they are often poorly maintained (UN Zambia, 2024). Even low-cost practices (contour ridging, Zai pits, mulching) require labour and sometimes community coordination; uptake is higher where extension links and initial support exist but drops off where maintenance and follow-up are absent (Tembo *et al*., 2025). The limited reach of seed distribution systems for drought-tolerant varieties also constrains adoption — varieties developed by research institutions do not always reach remote agro-dealers or smallholders in time for planting. Market failures and weak value chains reduce incentives to invest in resilience. Poor road networks, insufficient storage and lack of aggregation reduce market options for smallholders, lowering expected returns from increased or diversified production (FAO, 2023). During droughts, local markets often see price spikes and supply disruptions that erode household purchasing power while simultaneously undermining farmers' ability to invest in inputs for the next season. Strengthening farmer groups, aggregation, and rural storage can help, but evidence shows these mechanisms require robust facilitation and viable business models to be inclusive and sustainable.

Socio-economic heterogeneity matters: female-headed households, the elderly, tenants and households without formal land documentation face greater barriers to accessing inputs, extension and credit (UN Zambia, 2024). Youth outmigration reduces household labour and innovation capacity in some districts, while social capital (cooperatives, VSLA) can mitigate shocks where functioning. However, repeated droughts can erode social safety nets and increase elite capture of community resources, leaving the most vulnerable poorly served by communal adaptation measures. The 2023/24 drought demonstrated how acute shocks convert chronic constraints into humanitarian crises. Rapid assessments documented large areas with complete crop failure, livestock deaths and a sharp rise in food aid needs; many households adopted negative coping strategies (reducing meals, withdrawing children from school, selling productive assets) that jeopardize recovery and future resilience (UNICEF, 2024). The scale and speed of losses highlighted deficits in early-warning translation to action, rapid finance for emergency replants or water provisioning, and the limited capacity of social protection schemes to cushion shocks at scale.

2.4 Literature gap

Intersectionality in Food Security Programming: While existing literature highlights the marginalization of women and specific social groups, it lacks a detailed intersectional analysis of how gender, caste, ethnicity, and disability interact to influence food security outcomes. More nuanced research is needed to unpack these layers and inform inclusive policy development (Agarwal, 2010; Mazvimavi, 2014).

Coordination Mechanisms between State and Non-State Actors: Although the role of NGOs is well-documented, there is limited exploration of institutional coordination between governments and civil society in drought mitigation. Research is needed to examine the governance arrangements that enable or hinder collaboration, resource pooling, and policy coherence (Sharma *et al*., 2018; Muchadenyika and Williams, 2018).

Effectiveness of Early Warning Systems and Climate Information Services: Studies acknowledge the presence of early warning systems but do not thoroughly evaluate their accessibility, reliability, and utility among rural households. Future research should focus on how farmers interpret and use climate forecasts and what barriers exist in the dissemination of early warnings (Rao and Sikka, 2015; Zvomuya, 2015 [18]).

3. Research Methods

This study adopted a mixed-methods approach, combining both quantitative and qualitative research designs. The quantitative component allowed for statistical analysis of the relationship between drought and household food security, while the qualitative component provided in-depth insights into the lived experiences, coping mechanisms, and perceptions of small-scale farmers (Creswell and Creswell, 2018). The case study design is appropriate because it allows an intensive investigation into a specific context, Chibombo District. The research design to be adopted in this study is a case study research design.

3.1 Target Population

Chibombo District is located in Central Province, Zambia. It lies within Agro-Ecological Region II and experiences variable rainfall patterns ranging between 800 mm and 1,000 mm per annum. The majority of its population engages in small-scale, rain-fed agriculture with maize as the primary staple crop. The target population will comprise of small-scale farming households in selected rural communities of Chibombo ward of Chibombo district. These are households cultivating less than 5 hectares of land and primarily reliant on family labor.

Chibombo ward has over 4,000 small scale farmers (CSO, 2020).

3.2 Sampling Design

This study used purposive sampling design for the sampling procedure. This is a nonprobability sampling method where the researcher will intentionally select participants based on specific characteristics or quality that align with the study's purpose. Simple random sampling was then applied to select households within the ward. This was allowed for the selection of who are most likely to provide relevant information (Alkassim *et al*., 2016).

3.3 Sample Size Determination

According to Mugenda and Mugenda (2012), a sample as a small segment of the population that is selected for observation analysis. A sample size of 10% of a studied population is considered sufficient enough to generate valid

results. Thus, the sample size of this research study consisted of 50 respondents or participants.

3.4 Data Collection Methods

This research study used a mixed method design. Mixed-Methods Design combines both qualitative and quantitative approaches to answer research questions. The approach provided a more comprehensive understanding of the research problem (Tashakkori and Teddlie, 2010). Qualitative research supports the use of tools like interviews, focus group discussions, and document reviews (Patton, 2015). These tools helped uncover systemic strengths, weaknesses, and coordination challenges in a nuanced manner. Therefore, the study used structured questionnaires (for quantitative data) followed by focus group interviews (for qualitative data) for further exploration.

3.5 Data Analysis

This study utilized data processing tools such as Microsoft Zambia's agriculture is predominantly rainfed and dominated by smallholder households who rely on maize, groundnuts, soybeans and other staples for food and income (FAO, 2024). Recurrent droughts, most recently the severe 2023/24 El Niño-linked episode that prompted a national disaster declaration, have produced substantial crop failures, livestock losses and income shocks that directly threaten household food security and adaptive capacity (UN Zambia, 2024; FSD Zambia, 2025). Smallholders' limited asset buffers, reliance on single cropping seasons, and constrained access to institutional support make them particularly exposed to drought impacts. A repeatedly documented barrier is limited access to affordable finance and liquidity. Many smallholders lack savings, formal credit histories, or collateral required for loans, which constrains investment in drought-reducing assets such as farm ponds, solar pumps, small-scale irrigation or drought-tolerant seed (World Bank FISP review; FSD Zambia, 2025). The Farmer Input Support Programme (FISP) provides subsidized inputs but evaluations and policy notes argue it is unevenly targeted and often insufficiently focused on resilience-building investments, while cash-flow constraints force households into short-term coping (asset sales, reduced food consumption) that erode long-term adaptive capacity (World Bank, 2021; FSD Zambia, 2025). Recent post-drought assessments reported widespread sale of livestock and borrowing at high cost, clear evidence that weakened financial resilience constrains durable adaptation.

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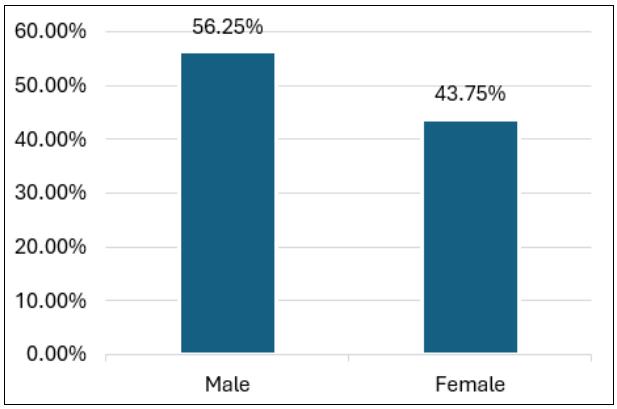
Excel for analyzing qualitative data, data entry as well as for calculating the means, frequencies, and percentages, while STATA was used to analyze the quantitative data collected from questionnaires and focus group discussions.

4. Findings and Results

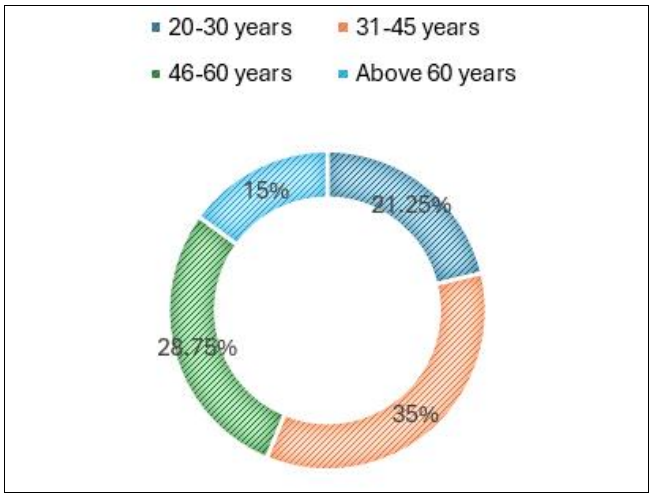
4.1 Characteristics of Respondents (Bio Data)



Source: Primary Data 2025

Fig 4.1.1: Sex of respondents

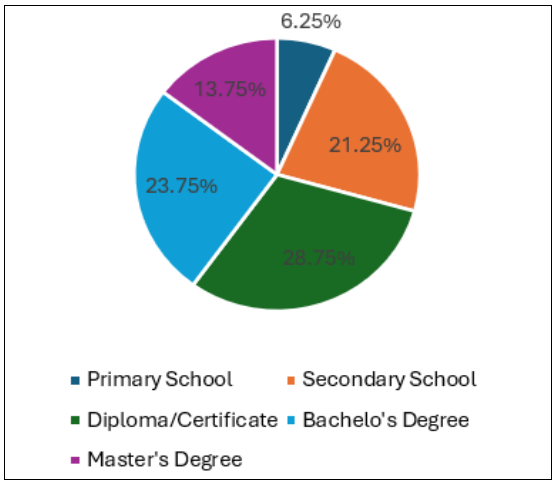
The gender of the respondents constituted of 56.25% male and 43.75% female respondents.



Source: Primary Data 2025

Fig 4.1.2: Age of the respondents

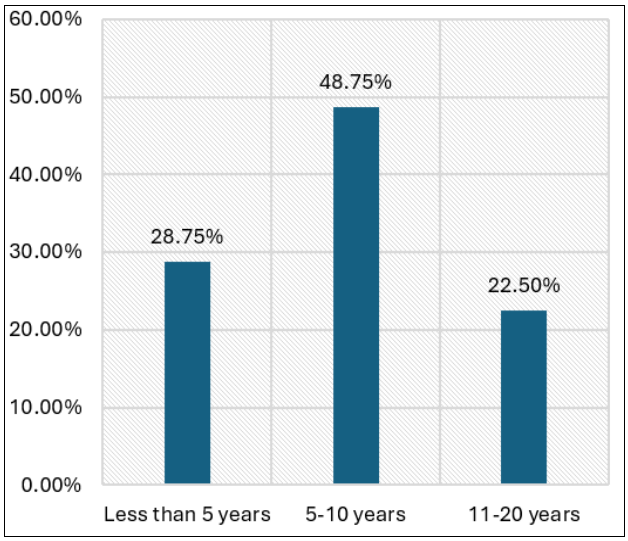
The age distribution of the respondents was such that 21.25% ranged from 20-30 years, 35% ranged from 31-45 yeas, 28.75% ranged from 46-60 years, and then 15% were above 60 years of age.



Source: Primary Data 2025

Fig 4.1.3: Highest level of education of the respondents

The figure above shows the different levels of education of the respondents, 6.25% of which hold Primary School Certificates, 21.25% hold Secondary School certificates, 28.75% hold Diplomas and Certificates, 23.75% hold Bachelor's Degrees, and 13.75% % hold Master's Degrees.

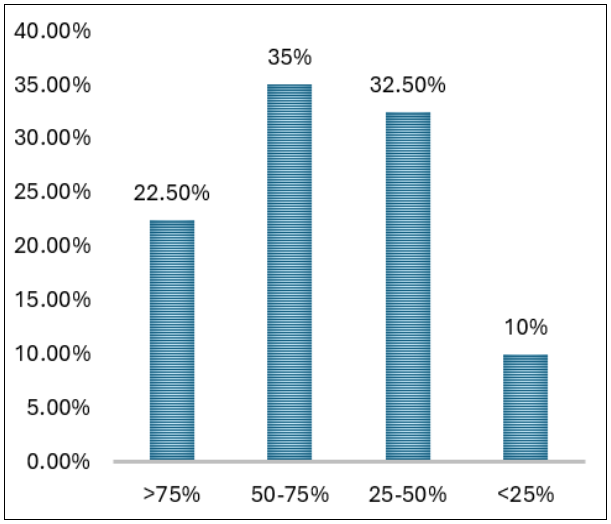


Source: Primary Data, 2025

Fig 4.1.4: Farming Experience

The figure illustrates the farming experiences of the farmers. 28.75% of which had been farming for less than 5 years, 48.75% had been farming for 5-10 years, and 22.50% had been farming for 11-20 years.

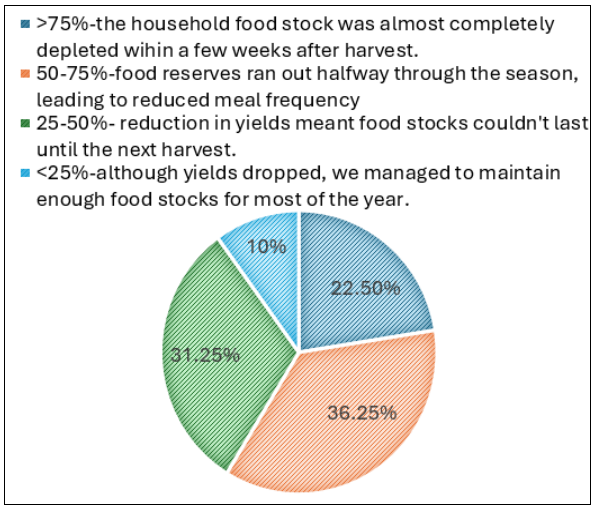
4.2 Effects of drought on household food availability among small-scale farmers



Source: Primary Data, 2025

Fig 4.2.1: Approximate percentage loss of main crops in last major drought season

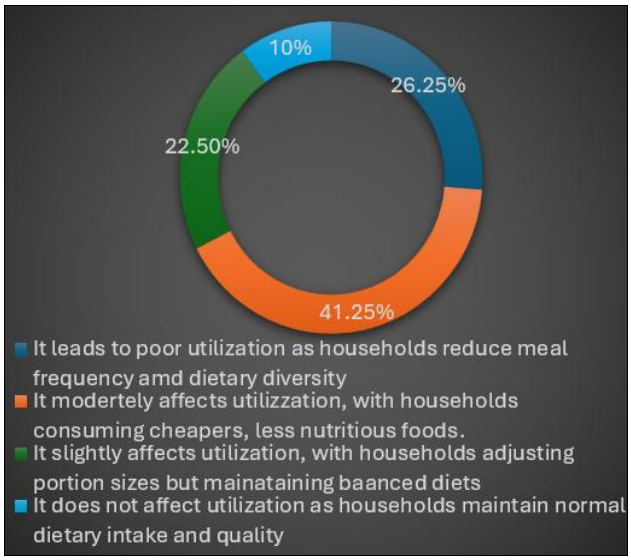
The figure shows the approximate percentage loss of main crops in last major drought season. 22.50% had losses greater than >75, 35% had losses equal to 50-75%, 32.50% had losses ranging from 25-50%, and 10% had losses less than <25%.



Source: Primary Data, 2025

Fig 4.2.2: How did that level of crop loss specifically impact the household's food stock

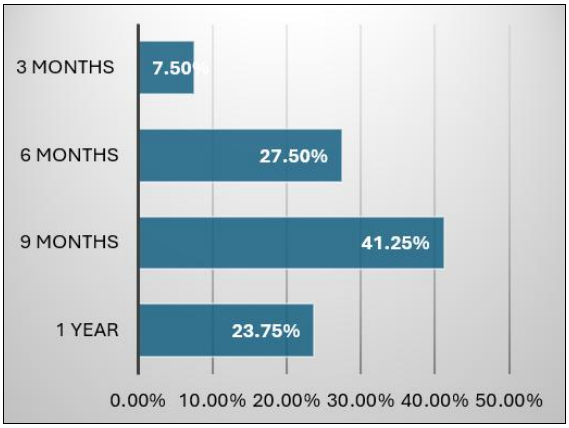
The figure describes how the level of crop loss specifically impacted the household's food stock. 22.50% of the household that had >75% loss, their food stock was almost completely depleted within a few weeks after harvest, 36.25% of the household that had 50-75% loss had ran out of their food reserves halfway through the drought season leading to reduced meal frequencies, 31.25% of household that had 25-50% losses had a reduction in yields which meant food stock couldn't last until the next harvest season, and 10% of the households that had <25% losses had experienced a drop in yields although they managed to maintain enough food stocks for most of the year.



Source: Primary Data, 2025

Fig 4.2.3: Influence of drought on household food utilization

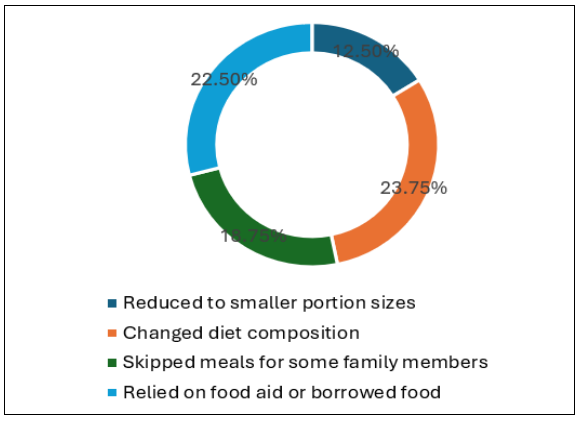
The figure displays the response of the respondents on the influence of drought on household food utilization. 26.25% said it leads to poor utilization as households reduce meal frequency and dietary diversity, 41.25% said it moderately affects utilization, with households consuming cheaper, less nutritious foods, 22.50% said it slightly affects utilization, with households adjusting portion sizes but maintaining balanced diets, and 10% said it does not affect utilization as households maintain normal dietary intake and quality.



Source: Primary Data, 2025

Fig 4.2.4: How many months the household relied on food purchases instead of own products during last drought

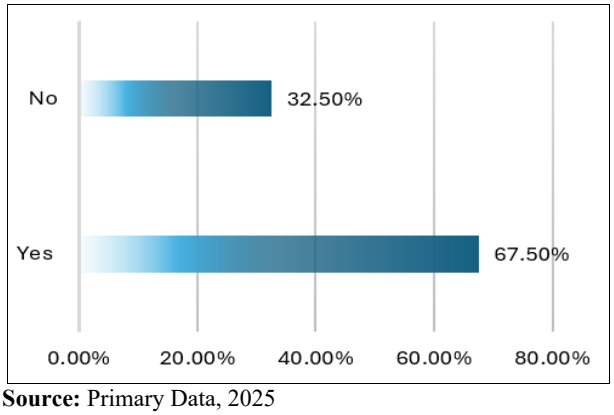
The figure illustrates how many months the household relied on food purchases instead of own products during last drought. 23.75% of the households relied on purchased food for 1 year, 41.25% relied on purchased for 9 months, 27.50% relied on purchased food for 6 months, while 7.50% of the households relied on purchased food for 3 months.



Source: Primary Data, 2025

Fig 4.2.5: Changes made to family's daily meals during drought time

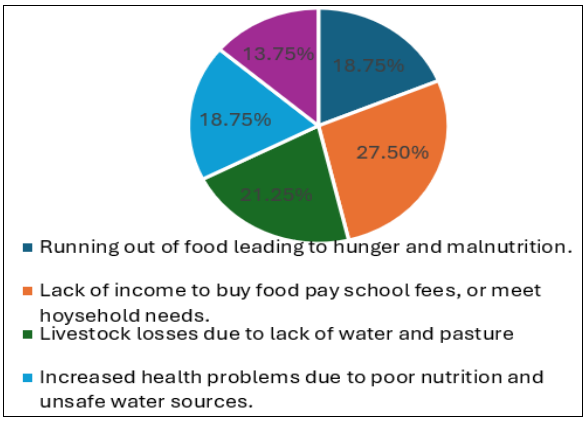
Above figure presents the changes made to the family's daily meals during drought time. 12.50% had reduced to smaller portions sizes of meals, 23.75% had changed their diet composition, 18.75% had to skip meals for some family members especially adults, and 22.50% had to rely on food aid or borrowed food items.



Source: Primary Data, 2025

Fig 4.2.6: Signs of malnutrition in children during drought period

The figure shows if the households had experienced signs of malnutrition in children during drought period. 67.50% said yes, while 32.50% said no.

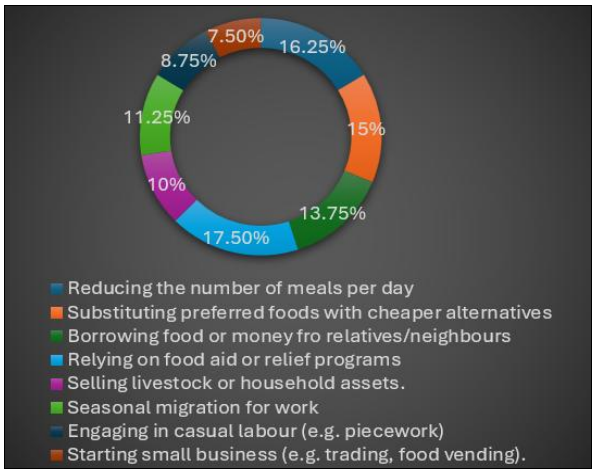


Source: Primary Data, 2025

Fig 4.2.7: Single biggest worry for the household during drought

The figure presents the single biggest worry for the households during drought. 18.75% were scared of running out of food leading to hunger and malnutrition, 27.50% were scared of lacking income to buy food, pay school fees, and meet household needs, 21.25% were scared of losing livestock due to lack of water and pasture, 18.75% were afraid of having increased health problems due to poor nutrition and unsafe use of water sources, and 13.75% were afraid of failure to plant the next season due to poor rainfall or inputs.

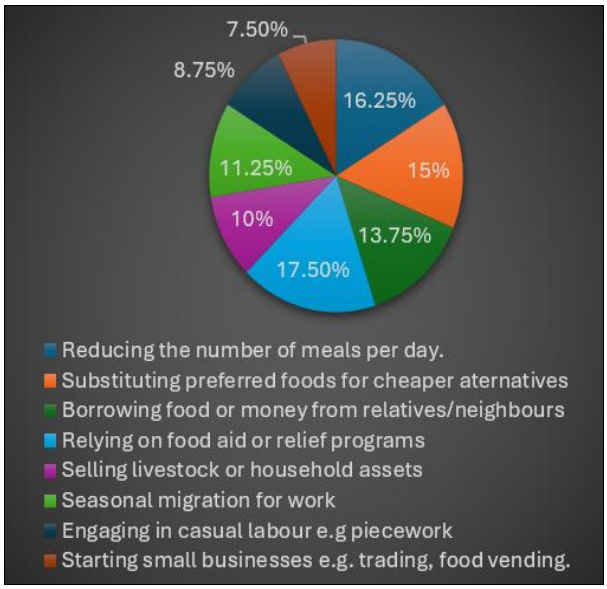
4.3 Coping and Adaptation strategies employed by small-scale farmers in response to drought-related food insecurity



Source: Primary Data, 2025

Fig 4.3.1: Coping strategies employed by household during drought

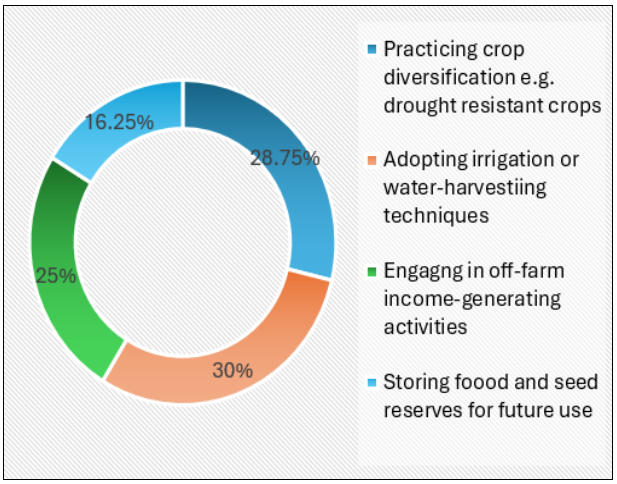
The figure displays the coping strategies employed by household during drought. 16.25% reduced the number of meals per day, 15% substituted preferred foods with cheaper alternatives, 13.75% borrowed food or money from relatives/neighbors, 17.50% relied on food aid or relief programs, 10% sold livestock or household assets, 11.25% had seasonal migration for work, 8.75% engaged in casual labor (e.g., piecework)., and 7.50% started small businesses (e.g., trading, food vending).



Source: Primary Data, 2025

Fig 4.3.2: Important strategies for family's survival

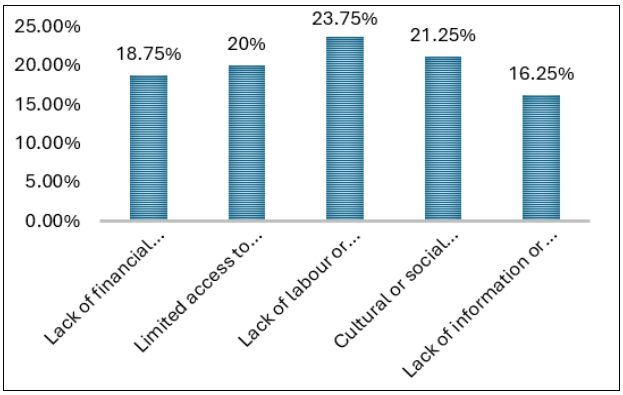
The figure shows the important strategies for family's survival. 16.25% relied on reducing the number of meals per day, 15% relied on substituting preferred foods with cheaper alternatives, 13.75% relied on borrowing food or money from relatives/neighbors, 17.50% relied on food aid or relief programs, 10% relied on selling livestock or household assets, 11.25% relied on seasonal migration for work, 8.75% relied on engaging in casual labor (e.g., piecework)., and 7.50% relied on starting small businesses (e.g., trading, food vending).



Source: Primary Data, 2025

Fig 4.3.3: Long-term adaptation strategies adopted by the household during drought

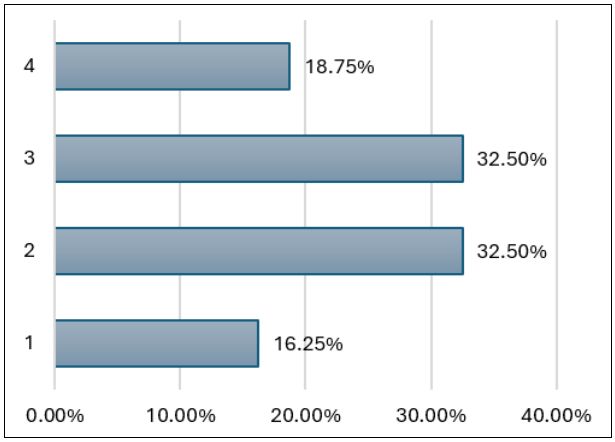
Above is a figure presenting the long-term adaptation strategies adopted by the household during drought. 28.75% practiced crop diversification (e.g., drought resistant crops), 30% adopted irrigation or water-harvesting techniques, 25% engaged in off-farm income-generating activities, and 16.25% stored food and seed reserves for future use.



Source: Primary Data, 2025

Fig 4.3.4: Prevention from using known strategies

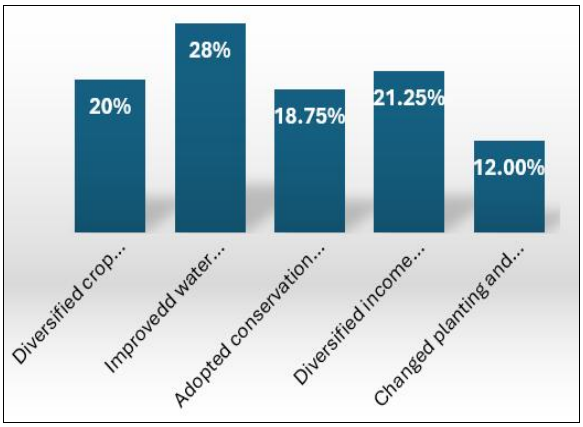
Above figure is a representation of the issues that prevented the respondents from using the strategies the knew about but couldn't adopt. 18.75% lacked financial resources, 20% had limited access to support programs, 23.755 lacked labor or manpower, 21.25% experienced cultural or social restrictions, and 16.25% lacked information or skills.



Source: Primary Data, 2025

Fig 4.3.5: Rating of the effectiveness of main coping strategies

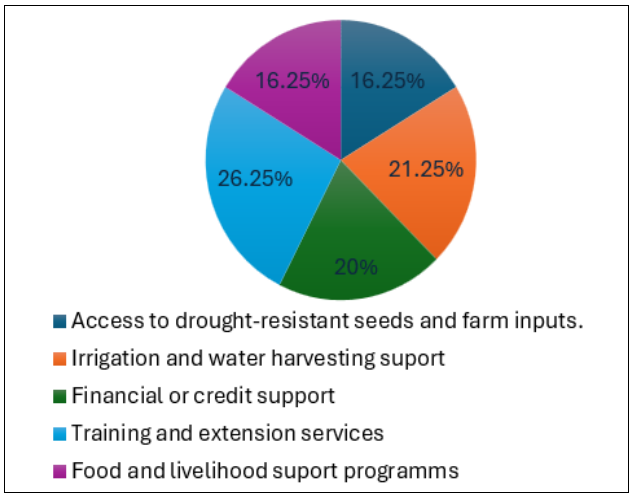
The figure shows the rating of the effectiveness of the main coping strategies of the respondents on a scale of 1 to 5. 16.25% rated the strategies 1 out of 5, 32.50% rated the strategies 2 out of 5, another 32.50% rated the strategies 3 out of 5, and 18.75% rated the strategies a 4 out of 5.



Source: Primary Data, 2025

Fig 4.3.6: Long-term changes made to the farm or livestock in past drought

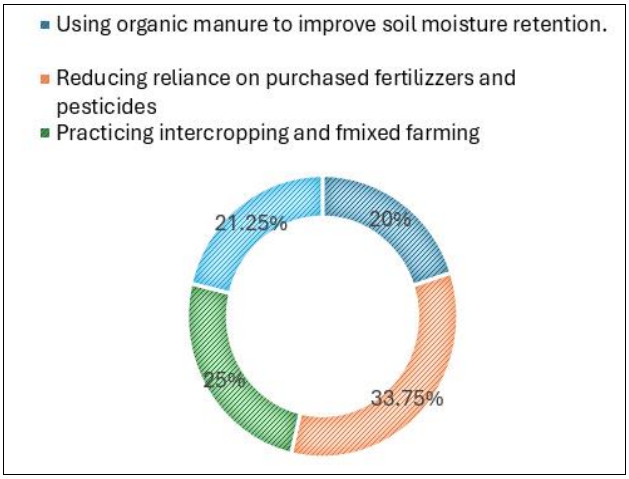
The figure is an illustration of the long-term changes made to the farm or livestock in past drought. 20% diversified their crop production, 28% improved their water management, 18.75% adopted conservation farming systems, 21.25% diversified their income sources, and 12% changed their planting and farming schedules.



Source: Primary Data, 2025

Fig 4.3.7: Type of support to be received for the next drought

The figure displays the type of support the respondents would want to receive for the next drought. 16.25% wanted access to drought-resistant seeds and farm inputs, 21.25% wanted irrigation and water harvesting support, 20% wanted financial or credit support, 26.25% wanted training and extension services, while 16.25% wanted food and livelihood support programs.

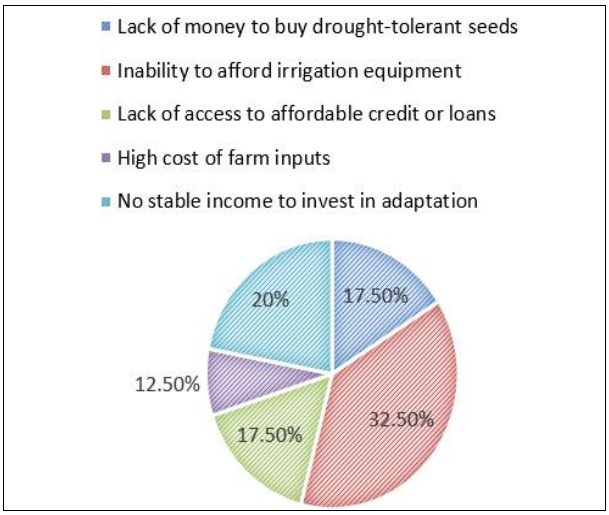


Source: Primary Data, 2025

Fig 4.3.8: Agricultural input-related strategies adopted during drought

Above figure displays the agricultural input-related strategies adopted during drought. 20% of the respondents used organic manure to improve soil moisture retention, 33.75% reduced reliance on purchased fertilizers and pesticides, 25% practiced intercropping and mixed farming, and 21.25% conserved seed from previous harvests for replanting.

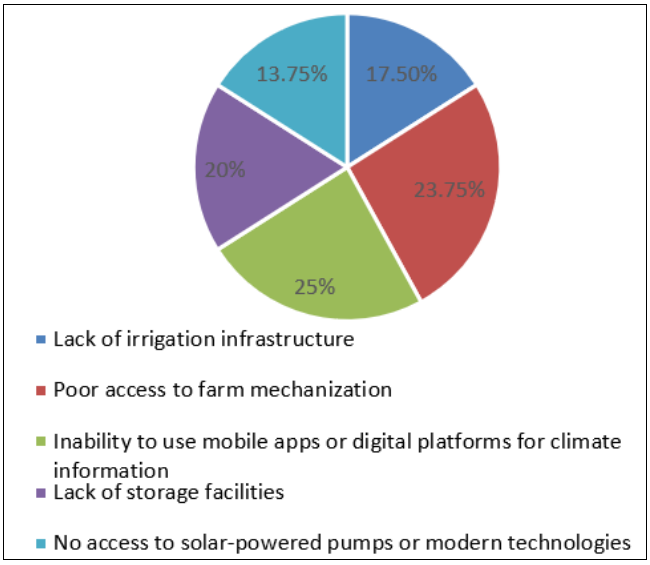
4.4 Limitations faced by small-scale farmers in adapting to drought conditions



Source: Primary Data, 2025

Fig 4.4.1: Financial limitations faced in adapting to drought conditions

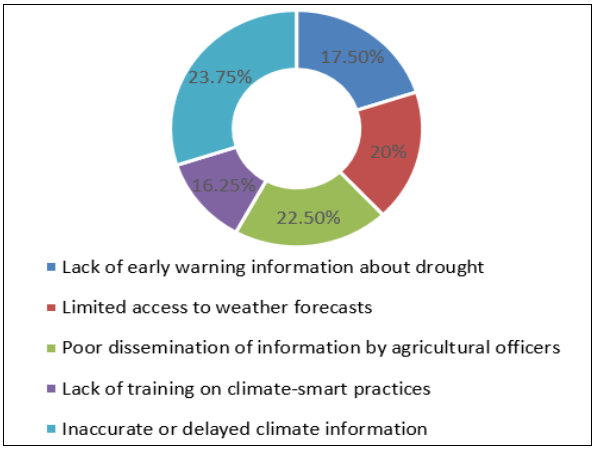
The figure shows the financial limitations faced in adapting to drought conditions. 17.50% said lack of money to buy drought-tolerant seeds, 32.50% said inability to afford irrigation equipment, 17.50% said lack of access to affordable credit or loans, 12.50% said high cost of farm inputs, while 20% said they had no stable income to invest in adaptation.



Source: Primary Data, 2025

Fig 4.4.2: Technological challenges limiting the ability to cope with drought

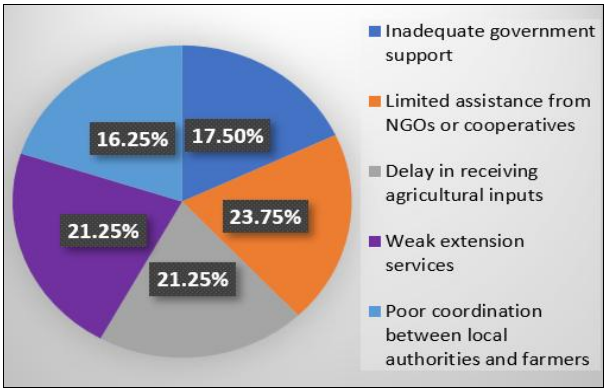
The respondents were asked what technological challenges limited their ability to cope with drought. 17.50% said lack of irrigation infrastructure, 23.75% said poor access to farm mechanization, 25% said lack of storage facilities, 20% said inability to use mobile apps or digital platforms for climate information, while 13.75% said no access to solar-powered pumps or modern technologies.



Source: Primary Data, 2025

Fig 4.4.3: Information-related challenges that hinder the ability to adapt to drought

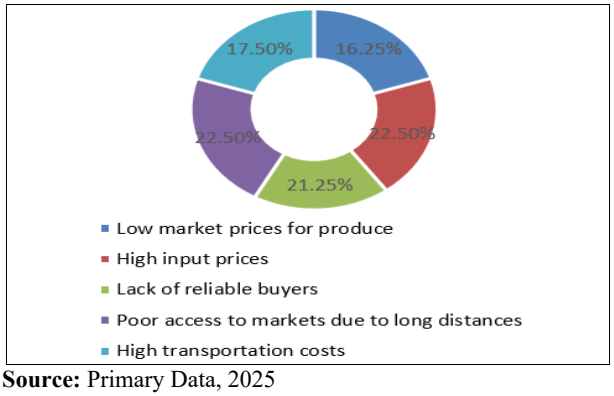
The figure shows the information-related challenges that hindered the ability to adapt to drought.17.50% was lack of early warning information about drought, 20% was limited access to weather forecasts, 22.50% was poor dissemination of information by agricultural officers, 16.25% was lack of training on climate-smart practices, while 23.75% was inaccurate or delayed climate information.



Source: Primary Data, 2025

Fig 4.4.4: Institutional challenges affecting adaptation efforts

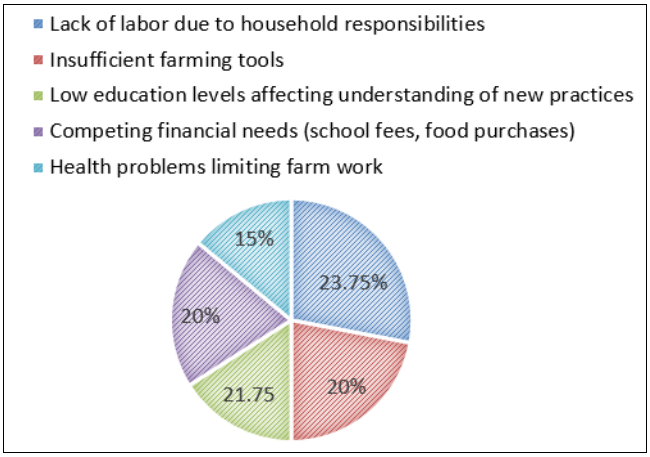
The figure illustrates the institutional challenges affecting adaptation efforts.17.50% were inadequate government support, 23.75% were limited assistance from NGOs or cooperatives, 21.25% were delay in receiving agricultural inputs, 21.25% were weak extension services, 16.25% were poor coordination between local authorities and farmers.



Source: Primary Data, 2025

Fig 4.4.5: Market-related limitations that restrict the ability to adapt to drought

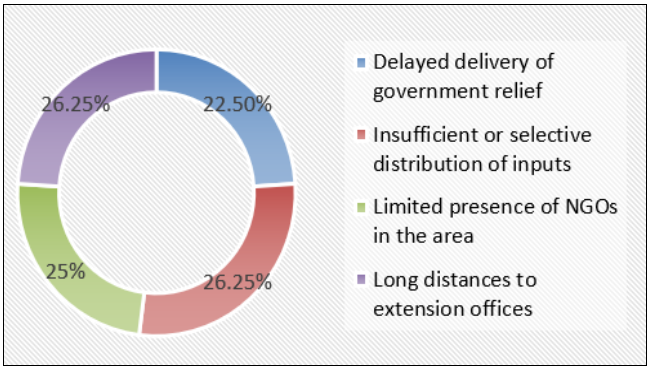
The figure shows the market-related limitations that restrict the ability to adapt to drought. 16.25% were low market prices for produce, 22.50% were high input prices, 21.25% were lack of reliable buyers, 22.50% were poor access to markets due to long distances, while 17.50% were high transportation costs.



Source: Primary Data, 2025

Fig 4.4.6: Household-level limitations affecting the ability to adapt

The figure displays the household-level limitations affecting the ability to adapt. 23.75% were lack of labor due to household responsibilities, 20% were insufficient farming tools, 21.25% were low education levels affecting understanding of new practices, 20% were competing financial needs (school fees, food purchases), and 15% were health problems limiting farm work.



Source: Primary Data, 2025

Fig 4.4.7: Challenges faced in accessing support services during drought

The figure illustrates the challenges faced in accessing support services during drought. 22.50% were delayed delivery of government relief, 26.25% were insufficient or selective distribution of inputs, 25% were limited presence of NGOs in the area, and 26.25% were long distances to extension offices.

4.5 Discussion of Results

This section addresses some of the key of the study and briefly gives an analysis to the study in line with the research question and objectives.

The findings from the presented charts clearly demonstrate that drought has a profound and severe impact on household food security, particularly by disrupting food availability, accessibility, and utilization among small-scale farming households. To begin with, the level of crop loss had a direct and significant effect on household food availability. Households that experienced severe crop losses exceeding 75% (22.50%) reported that their food stocks were depleted within a few weeks after harvest, indicating critical food shortages and immediate post-harvest hunger. Similarly, households that suffered 50–75% losses (36.25%) ran out of food midway through the drought season, forcing them to reduce meal frequencies and depend on external assistance. This shows that drought undermines household food availability by reducing crop yields and shortening the duration for which food stocks can sustain families. Even households with moderate losses (25–50%) faced reduced yields, making it difficult for food reserves to last until the next harvest. Only a small proportion (10%) with minimal losses managed to maintain adequate food stocks for most of the year, reflecting the role of yield stability in ensuring consistent food availability. The interlinked dimensions of food security, availability, accessibility, and utilization, are directly affected by prolonged droughts, which have become more frequent and severe due to climate change (USDA, 2022). The U.S. Department of Agriculture (USDA) reported that over 60% of small-scale farms experienced yield losses during drought years, leading to widespread reductions in household food availability (USDA, 2022).

Regarding food utilization, drought was reported to have a major influence on how households use and consume available food resources. A total of 26.25% of respondents stated that drought leads to poor food utilization due to reduced meal frequency and limited dietary diversity, while 41.25% said it moderately affects utilization as family's resort to cheaper and less nutritious food options. These adjustments indicate that nutritional quality declines significantly during droughts, exposing households to risks of malnutrition, especially among vulnerable groups such as children and women. A study by Raiten and Aimone (2017) found that households affected by drought often reduce the intake of fruits, vegetables, and proteins, increasing reliance on starch-heavy diets with minimal nutritional value. Poor water availability due to drought also affects the preparation and safety of food. In rural drought-affected areas, water sources may become contaminated or depleted, limiting cooking and hygiene practices (DeLind, 2018). This creates public health risks, particularly for children, and reduces the effectiveness of food consumption.

The findings presented illustrate how small-scale farming households employ a range of coping and adaptation strategies in response to the adverse effects of drought on household food security. The reveal that households rely heavily on short-term coping mechanisms to survive immediate food shortages during drought periods. About 16.25% of respondents reduced the number of meals per day, while 15% substituted preferred foods with cheaper alternatives, indicating direct compromises in food quantity and quality. Similarly, 13.75% borrowed food or money from relatives and neighbors, and 17.50% depended on food aid or relief programs, showing a dependence on informal social networks and humanitarian support as safety nets during crises. In response to drought impacts, smallholder farmers in Zambia have developed several coping strategies. These include diversification of crops, reducing meal sizes, selling livestock, and relying on social networks for food assistance (Muleya *et al*., 2020). However, these coping strategies are often short-term solutions that may not build

long-term resilience to recurring droughts. One of the most common coping mechanisms among Zambian smallholder households is reducing the quantity or quality of food consumed. Households often resort to one or two meals per day and substitute maize with less-preferred staples like cassava or wild fruits (Chibamba and Muleba, 2020). While this helps prevent starvation, it often leads to nutritional deficiencies, especially among children and pregnant women.

Other households adopted economic coping mechanisms such as selling livestock or household assets (10%), seasonal migration for work (11.25%), engaging in casual labor (8.75%), and starting small businesses (7.50%). These strategies reflect attempts to generate income for purchasing food when own production is insufficient. However, such measures are often erosive coping strategies, as they involve liquidating key productive assets or taking up unsustainable livelihood options, which may reduce household resilience in the long term. Temporary migration to urban centers or engaging in casual labor (locally referred to as ganyu) is another coping strategy. Family members, especially youth and men, seek informal employment in towns to send money back home. While helpful in the short term, this disrupts household labor availability for agricultural production and often results in unstable income (Zulu *et al*., 2021).

These coping responses are consistent with findings from other drought-prone regions, where households resort to immediate consumption-smoothing strategies at the expense of future livelihood stability (Nkoya *et al*., 2022). While such measures temporarily improve food accessibility, they do not enhance food availability or utilization, as dietary quality and nutritional intake often decline during periods of food scarcity. The findings also show that households are adopting more sustainable adaptation strategies aimed at reducing vulnerability to future droughts. The most common were irrigation and water-harvesting techniques (30%) and crop diversification (28.75%), including the use of drought-resistant varieties. These practices enhance food availability by stabilizing agricultural production even under erratic rainfall conditions. Similarly, 25% of households engaged in off-farm income-generating activities, diversifying livelihoods to reduce dependence on rain-fed agriculture. Another 16.25% stored food and seed reserves, reflecting proactive measures to ensure food security during lean periods. These strategies align with climate adaptation and resilience-building literature, which emphasizes the importance of diversification, irrigation, and storage in strengthening household adaptive capacity (Adger *et al*., 2011). They also contribute positively to all three pillars of food security—ensuring availability through consistent production, improving accessibility through diversified income, and promoting utilization through sustained dietary intake.

Looking ahead, households expressed the need for external support to enhance their adaptive capacity. 26.25% preferred training and extension services, 21.25% wanted irrigation and water harvesting support, and 20% requested financial or credit assistance. Additionally, 16.25% wanted access to drought-resistant seeds and inputs, while another 16.25% sought food and livelihood support programs. These preferences underscore the importance of institutional and technical interventions in promoting sustainable adaptation. Effective extension services, financial inclusion, and input support are crucial for improving household resilience and ensuring sustainable food security in drought-prone areas. Households also adopted input-related measures to maintain soil fertility and crop production. 33.75% reduced reliance on chemical fertilizers and pesticides, 25% practiced intercropping and mixed farming, 20% used organic manure to enhance soil moisture retention, and 21.25% conserved seed from previous harvests. These eco-friendly practices enhance soil health, improve water retention, and reduce production costs—contributing to food availability and environmental sustainability.

The results show the limitations and challenges faced by the small-scale farmers in adapting to drought conditions. Some of which were financial limitations where some farmers lacked money to buy drought-tolerant seeds, inability to afford irrigation equipment, lack of access to affordable credit or loans, high cost of farm inputs, and no stable income to invest in adaptation. It is clear from the literature review that cash-flow constraints force households into short-term coping strategies like asset sales, reduced food consumption etc. which erode long-term adaptive capacity. Recent post-drought assessments reported widespread sale of livestock and borrowing at high cost, clear evidence that weakened financial resilience constrains durable adaptation (World Bank, 2021; FSD Zambia, 2025). Some technological challenges also limited their ability to cope with drought. This is due to lack of irrigation infrastructure poor access to farm mechanization, lack of storage facilities, inability to use mobile apps or digital platforms for climate information, and lack of access to solar-powered pumps or modern technologies. Information-related challenges that hindered the ability to adapt to drought were lack of early warning information about drought, limited access to weather forecasts, poor dissemination of information by agricultural officers, lack of training on climate-smart practices, and inaccurate or delayed climate information.

The institutional challenges affecting adaptation efforts were inadequate government support, limited assistance from NGOs or cooperatives, delay in receiving agricultural inputs, weak extension services, poor coordination between local authorities and farmers. Market-related limitations that restricted the ability to adapt to drought were low market prices for produce, high input prices, lack of reliable buyers, poor access to markets due to long distances, while high transportation costs. Just like in the literature review, weak rural markets, poor storage, and high transaction costs reduce incentives for investment in drought-resilience. Smallholders with limited market access cannot reliably convert higher productivity or diversified production into better incomes, reducing the economic rationale for investing in resilience (PMFBY, 2023).

Adeniyi (2023) also asserts that weak market linkages and poor rural infrastructure (roads, storage, aggregation points) reduce smallholders' ability to convert higher or stabilized production into market incomes that could finance adaptation. During droughts, price volatility and buyer risk can both harm incomes and reduce incentives to invest in resilience. Input and output market failures—scarcity of affordable quality seed, fertilizers and spare parts—compound on-farm constraints. The household-level limitations that affected the ability to adapt were lack of labor due to household responsibilities, insufficient farming tools, low education levels affecting understanding of new practices, competing financial needs (school fees, food

purchases), and health problems limiting farm work. Some of the challenges faced in accessing support services during drought were delayed delivery of government relief, insufficient or selective distribution of inputs, limited presence of NGOs in the area, and long distances to extension offices.

5. Acknowledgement

To my mom, thank you for being my rock, my confidante, and my biggest supporter. I couldn't have done this without you. To my amazing sisters, thank you for being there for me through thick and thin. Your encouragement and support have meant the world to me. I'm thankful to my friends, who have made this journey more enjoyable and memorable. Your camaraderie and support have been invaluable. I would like to express my sincere gratitude to my supervisor Dr Chisala for his expert guidance, patience, and support throughout this project. Your feedback and encouragement have been instrumental in shaping my work.

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