

ASSESSING THE STATE OF DROUGHT PREPAREDNESS AMONG SMALLHOLDER FARMERS: A CASE STUDY OF T/A KYUNGU IN KARONGA DISTRICT.

BY

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Assessing the State of Drought Preparedness Among Smallholder Farmers in T/A Kyungu, Karonga District

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ABSTRACT

This study assesses the level of drought preparedness among smallholder farmers in Traditional Authority (T/A) Kyungu, Karonga District, an area highly vulnerable to climate induced droughts. A mixed-methods approach was employed, combining quantitative household surveys (n=47) with qualitative data from focus group discussions and key informant interviews. Findings reveal that while farmers employ various adaptive strategies such as livestock keeping (93.6%), planting drought-resistant crops (87.2%), and conservation agriculture (59.6%), the overall level of preparedness remains inadequate. The Disaster Preparedness Index (DPI) showed that 72.34% of farmers fell into the moderate preparedness category, 27.66% in low, and none in the high category. Major barriers to effective preparedness include limited access to early warning systems, agricultural extension services, irrigation infrastructure, and financial resources. The study recommends strengthening institutional support, improving climate information dissemination, promoting inclusive financial services, and enhancing seed systems and land tenure security to build long term resilience among smallholder farmers.

Keywords: drought preparedness, smallholder farmers, disaster risk reduction, climate change adaptation, Karonga, Malawi, conservation agriculture, early warning systems, drought-resistant crops, resilience.

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ACRONYMS / ABBREVIATIONS

AU : African Union

CMI : Crops Moisture Index

IPCC : Intergovernmental Panel on Climate Change

FAO : Food and Agriculture Organization

FGD : Focus Group Discussion

GDP : Gross Domestic Product

GVH : Group Village Headmen

KII : Key Informant Interview

MRCS : Malawi Red Cross and Crescent Society

MUSTE : Malawi University of Science and Technology Ethical Committee

NSO : National Statistical Office

PDSI : Palmer's Drought Severity Index

SDGs : Sustainable Development Goals

SPI : Standardized Precipitation Index

T/A : Traditional Authority

UN : United Nations

VAC : Village Agriculture Committee

VCI : Vegetation Condition Index

WFP : World Food Programme

WMO : World Meteorological Organization

DPI : Disaster Preparedness Index

FISP : Farm Input Subsidy Program

NAPA : National Adaptation Programme of Action

MGDS : Malawi Growth and Development Strategy

SCTP : Social Cash Transfer Programme

DAES : Department of Agricultural Extension Services

NASFAM : National Smallholder Farmers' Association of Malawi

MVAC : Malawi Vulnerability Assessment Committee

DCCMS : Department of Climate Change and Meteorological Services

CSA : Climate-Smart Agriculture

VSLAs : Village Savings and Loan Associations

MRFP : Malawi Rural Finance Program

USSD : Unstructured Supplementary Service Data

CHAPTER ONE: INRTRODUCTION

1.1 Background

Drought is one of the most devastating environmental challenges of the 21st century, significantly impacting agricultural productivity and food security, particularly in developing countries like Malawi. Characterized by erratic rainfall patterns and prolonged dry spells, drought results in inadequate water availability for critical purposes, including farming, livestock rearing, and domestic use. The increasing frequency and severity of drought events have exacerbated food insecurity, as agricultural productivity declines and livelihoods are disrupted.

Globally, droughts have become more frequent and intense due to climate change. According to the Intergovernmental Panel on Climate Change (IPCC, 2021), the frequency of severe droughts has increased by approximately 30% since the 20th century. IPCC also highlights that climate change will exacerbate water scarcity, with significant implications for agriculture. This concurs with the study by Lobell and Gourdji (2012) that estimates that global maize production could decline by 10% by 2050 due to climate change-induced droughts.

The period from 2014 to 2024 has witnessed several catastrophic drought events with farreaching impacts at a global note. For instance, the 2015–2017 global drought, exacerbated by one of the strongest El Niño events on record, affected over 60 million people worldwide, particularly in Africa, Asia, and Latin America (FAO, 2018). In Africa alone, the 2015/2016 El Niño-induced drought affected over 40 million people, with Southern African countries such as Zimbabwe, Zambia, South Africa, and Malawi being some of the hardest-hit countries (WFP, 2016). This drought led to a 30% decline in maize production across the region, triggering widespread food insecurity and economic instability.

In 2022, the Horn of Africa experienced its worst drought in 40 years, with over 23 million people facing acute food insecurity due to four consecutive failed rainy seasons (UNOCHA, 2022). Similarly, in 2023, the United States experienced severe droughts in the Midwest, reducing corn and soybean yields by 15% and 12%, respectively (USDA, 2023). These global

trends highlight the increasing vulnerability of agricultural systems to drought, particularly in regions reliant on rain-fed agriculture.

Malawi, a predominantly agrarian economy, has experienced recurrent droughts over the past decade, with devastating impacts on food security and economic growth. The 2015/2016 El Niño-induced drought was one of the most severe in the country's history, affecting over 2.8 million people and reducing maize production by 30% (Nyanjagha Botha, 2016). This drought led to a sharp increase in food prices, with maize prices rising by 150% in some regions, exacerbating food insecurity among vulnerable populations (FEWS NET, 2016).

In the 2018/2019 agricultural season, another drought event impacted 1.9 million people, particularly in the southern and central regions of Malawi, where maize production declined by 20% (GoM, 2019). More recently, the 2023/2024 dry spell affected 23 of the country's 28 districts, resulting in a 22.5% decline in maize production and leaving over 3.8 million people in need of food assistance (GoM, 2024). These recurring droughts have undermined Malawi's efforts to achieve food security and sustainable development, as outlined in the Malawi Growth and Development Strategy (MGDS III) and the National Agricultural Policy (2016).

Karonga District, located in northern Malawi, has not been spared from the impacts of drought. The district, which relies heavily on smallholder farming, has experienced several drought events over the past decade. For instance, the 2015/2016 drought affected over 60% of farming households in Karonga, leading to a 40% decline in maize production and widespread food shortages (Karonga District Council, 2016). The 2022/2023 agricultural season was particularly devastating, with dry spells affecting 38,605 farming households and 29,718 hectares of cultivated farmland, including maize, rice, groundnuts, and tobacco (Mkandawire, 2023). This event resulted in a 25% decline in crop yields, exacerbating food insecurity and poverty in the district.

The 2023/2024 dry spell further compounded the challenges faced by smallholder farmers in Karonga. According to the Karonga District Agricultural Development Office (2024), the dry spell affected over 70% of farming households, reducing maize production by 30% and

leaving many families reliant on food aid. These recurring drought events have highlighted the urgent need for effective drought preparedness and adaptation strategies in Karonga, particularly among smallholder farmers who lack the resources and capacity to cope with climate shocks.

The increasing frequency and severity of droughts in Malawi and globally are largely attributed to climate change. According to the IPCC (2021), global temperatures are projected to rise by 1.5°C to 2°C by 2050, leading to more frequent and intense droughts, particularly in sub-Saharan Africa. In Malawi, climate models predict a 10–20% reduction in rainfall by 2050, with significant implications for agriculture and food security (USAID, 2020). These projections underscore the urgent need for climate-resilient agricultural practices and effective drought preparedness strategies, particularly in vulnerable regions like Karonga District.

1.2 Problem Statement

Droughts are a major climate-related challenge for smallholder farmers in Malawi, where over 80% of the population relies on agriculture. With climate change increasing drought frequency and intensity, food insecurity, poverty, and rural vulnerability have worsened. Smallholder farmers, depending on rain-fed agriculture, are highly exposed due to limited resources, knowledge, and institutional support. Despite the growing threat, a critical gap remains in understanding drought preparedness at the local level, especially in drought-prone areas like Karonga District.

Most studies have focused on national-level assessments, overlooking localized contexts like T/A Kyungu where strategies are shaped by local agroecological, socio-economic, and institutional dynamics. Furthermore, many investigations have narrowly focused on isolated strategies, such as Ngwira et al. (2014) on drought-tolerant maize, or Mkwambisi D (2021) on conservation agriculture, without examining how multiple strategies interact. These studies offer insights but lack a comprehensive view of overall preparedness.

Moreover, existing research has not widely applied holistic quantitative tools like the Disaster Preparedness Index (DPI), which considers diverse indicators like access to early warning systems, resilient practices, and food and water storage. This study aims to fill these gaps

through a comprehensive assessment of multiple preparedness strategies among smallholder farmers in T/A Kyungu, and by exploring factors influencing their adoption. The findings are expected to guide targeted interventions to strengthen resilience, food security, and livelihoods in Karonga and similar contexts.

1.3 Research Objectives

1.3.1 Main objectives

1. To assess the current state of drought preparedness among smallholder farmers in T/A Kyungu, Karonga District.

1.3.2 Specific Objectives

1. To identify the drought preparedness strategies employed by smallholder farmers
2. To evaluate the effectiveness of drought preparedness measures adopted in the area
3. To identify factors influencing adoption of drought preparedness strategies among smallholder farmers

1.3.3 Research Questions

1. What are drought preparedness strategies employed smallholder farmers?
2. How effective are these employed drought preparedness in addressing drought risks?
3. What factors influence the adoption of drought preparedness strategies among smallholder farmers?

1.4 Significance of the Research

This study contributes to the achievement of several global, continental, and national development goals. At the global level, understanding drought preparedness among smallholder farmers aligns with the United Nations Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 13 (Climate Action) (UN, 2015). By promoting climate-resilient and sustainable agricultural practices, this research supports efforts to ensure continuous agricultural productivity and food availability, thereby addressing poverty and hunger while mitigating the impacts of climate change.

At the continental level, the study aligns with the African Union's Agenda 2063, specifically Aspiration 1 (A Prosperous Africa) and Aspiration 2 (A Continent with Well-Nourished and Healthy Citizens) (AU, 2015). Enhancing drought preparedness among smallholder farmers is critical for achieving food security and sustainable agricultural development in Africa.

Nationally, this research supports Malawi's National Agricultural Policy (2016) and the Malawi 2063 Vision. By providing comprehensive insights into the drought preparedness status of farmers, the study will inform the promotion of climate-resilient agricultural practices, such as irrigation farming, conservation agriculture, and the adoption of droughttolerant crops. These practices are essential for achieving the goals of the National Agricultural Policy, which emphasizes climate-resilient agriculture and food security. Furthermore, the study aligns with the Malawi 2063 Vision's pillars of sustainable economic growth, infrastructure development, and human development (GoM, 2018)

2 CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter explores the concepts of drought, its impacts on agriculture in Malawi, and the factors influencing drought preparedness among smallholder farmers and drought preparedness Strategies commonly being implemented in Malawi.

2.2 Concepts of droughts

Drought is a complex and devastating natural phenomenon with severe impacts on agriculture, ecosystems, and livelihoods. Defined generally as prolonged periods of below average rainfall (WMO, 2017), it varies in interpretation across disciplines. The FAO emphasizes drought's effect on water availability crucial for agriculture and food security (FAO, 2019). In Malawi, where agriculture is predominantly rain-fed, droughts have become more frequent and intense due to climate variability. According to the IPCC (2021), the increasing frequency and severity of droughts pose global risks to agricultural productivity.

Drought is categorized into four types: meteorological, hydrological, agricultural, and socioeconomic. Meteorological drought involves prolonged dry weather and is measured using indices like the SPI and PDSI (Mishra & Singh, 2010). Hydrological drought refers to reduced water levels in rivers and reservoirs, often worsened by high evaporation and poor water management (Van Loon & Laaha, 2015). In Malawi, this has led to water shortages impacting irrigation and domestic supply, notably during the 2015–2016 drought when Lake Malawi and Shire River water levels fell significantly (World Bank, 2016).

Agricultural drought results from insufficient soil moisture, adversely affecting crop growth. Indices like the CMI and VCI monitor such droughts (Mishra & Singh, 2010). Malawi experienced major maize yield losses in 2016 due to agricultural droughts, with a 30% drop in production (Makoka, 2008). Socio-economic drought occurs when other drought types impact livelihoods and food security (Wilhite et al., 2007). The 2016 drought in Malawi left over 6.5 million people in need of food assistance (World Bank, 2016).

2.3 Impacts of Drought on Agriculture in Malawi

Agriculture contributes about 30% of Malawi's GDP and employs over 80% of the population (Mkwambisi et al., 2021). However, it remains highly vulnerable to climate shocks, particularly droughts. The 2015–2016 El Niño-induced drought caused maize production to decline by 12%, leaving 6.5 million people food insecure (World Bank, 2016). Rainfall levels fell to 50% below average in some areas (UNDP, 2016). These droughts have affected not only maize but also rice, sorghum, and legumes. Rice production declined by 25%, sorghum by 15%, and legumes by 20% (FAO, 2016), negatively impacting nutrition and income.

Livestock production also suffers during droughts due to diminished water and pasture, leading to increased mortality and reduced productivity. Cattle and goat deaths have risen by up to 30%, with over 100,000 cattle lost in 2016 alone (Government of Malawi, 2016). Additionally, droughts degrade soil fertility and reduce arable land, contributing to a 20% loss over two decades (Mkwambisi et al., 2021). These conditions have led many farmers to adopt unsustainable practices, worsening environmental degradation.

Droughts severely affect smallholder farmers' socio-economic conditions. Reduced productivity leads to lower incomes and deepens poverty. During the 2016 drought, smallholder farmers saw a 40% decline in income (World Bank, 2016), limiting their access to education, healthcare, and food. Food insecurity and malnutrition increased, particularly among women and children. Acute malnutrition in children under five rose to 1.5 million cases during this period (MVAC, 2016). Furthermore, national GDP declined by 3% (World Bank, 2016), constraining government investment in vital sectors.

2.4 Factors Affecting Adoption of Drought Preparedness Strategies among farmers in Malawi

Various factors affect smallholder farmers' adoption of drought preparedness strategies in Malawi, including access to resources, socio-economic status, institutional support, and cultural norms. Access to climate information and early warning systems is crucial, yet only 30% of farmers have access to such data, with even fewer able to apply it effectively (Ngwira

et al., 2014). Timely information enables farmers to adjust practices, but dissemination is often hindered by poor communication and limited extension services.

Socio-economic conditions like income, education, and gender disparities significantly influence preparedness. Wealthier and better-educated farmers are more likely to adopt drought-resilient technologies. Higher-income farmers often invest in improved seeds and water harvesting (Sibande et al., 2017), while low literacy among rural populations—only 65% adult literacy (NSO, 2018)—limits access to information. Gender disparities are also prominent. Women, who make up the majority of smallholder farmers, often lack land, credit, and training access. Female-headed households are less likely to adopt drought-resilient practices (Fisher & Kandiwa, 2014), and cultural norms restrict women's participation in decision-making.

Land tenure insecurity discourages investment in long-term drought-resilient measures. Secure land ownership encourages adoption of conservation practices (Holden & Otsuka, 2014), while insecurity limits credit access and reduces willingness to invest. Institutional support through programs like FISP and NAPA can enhance preparedness, but poor implementation and corruption reduce effectiveness. FISP subsidies are often diverted from the neediest farmers (Chinsinga, 2017). Strengthening targeting and accountability in these programs is essential.

Community-based organizations and social networks also enhance resilience. Farmers in cooperatives are more likely to share knowledge and adopt adaptive practices like conservation agriculture and agroforestry (Orr et al., 2016). These networks promote traditional and innovative knowledge exchange. Meanwhile, traditional knowledge, such as interpreting natural signs for weather prediction, remains valuable but is becoming less reliable due to climate unpredictability. Integrating indigenous and scientific knowledge can improve preparedness.

2.5 Drought Preparedness Measures and Their Effectiveness

Malawi has implemented various drought preparedness strategies at multiple levels to support smallholder farmers. These include drought-tolerant crop varieties, water conservation

techniques, climate-smart agriculture, early warning systems, and supportive policies. Drought-tolerant maize varieties like DK8031 and MH26 yield 20–30% more than traditional varieties during droughts (Fisher & Snapp, 2014), supported by FISP (Chinsinga, 2017). Additionally, the promotion of drought-resistant crops like sorghum, millet, and cassava has improved food security (Mkandawire et al., 2020).

Water harvesting methods such as small dams, treadle pumps, and drip irrigation are effective in addressing water scarcity. Farmers using these techniques reported up to 40% increased yields (Ngwira et al., 2014). CSA practices such as conservation agriculture, agroforestry, and intercropping have also proven effective. Conservation agriculture boosts yields by 25% (Dougill et al., 2017), while agroforestry using trees like Faidherbia albida improves soil moisture and fertility (Ajayi et al., 2011).

Early warning systems from the DCCMS disseminate weather forecasts and drought alerts, helping farmers adjust their practices. However, poor communication infrastructure and literacy issues limit their reach. NGOs have improved access through picture-based advisories and local radio (Tall et al., 2014). Policy frameworks like NAPA and MGDS prioritize climate resilience, and social protection programs like the SCTP have improved household food security (Miller et al., 2011). Nonetheless, issues such as poor targeting and mismanagement still undermine program effectiveness.

3 CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter outlines the research design, study area, data collection methods, and data analysis techniques employed in this study. The methodology was designed to assess the current state of drought preparedness among smallholder farmers in T/A Kyungu, Karonga District, Malawi, and to identify the factors influencing their capacity to cope with droughts.

3.2 Research Design

A mixed-methods research design was adopted to achieve the objectives of the study. This approach combined quantitative and qualitative methods to provide a comprehensive understanding of drought preparedness among smallholder farmers. Quantitative data were collected through structured household surveys to assess the prevalence and effectiveness of drought preparedness strategies, while qualitative data were gathered through focus group discussions (FGDs) and key informant interviews (KIIs) to explore the socio-economic and institutional factors influencing drought preparedness. The mixed-methods approach allowed for triangulation of data, enhancing the validity and reliability of the findings (Creswell & Plano Clark, 2017).

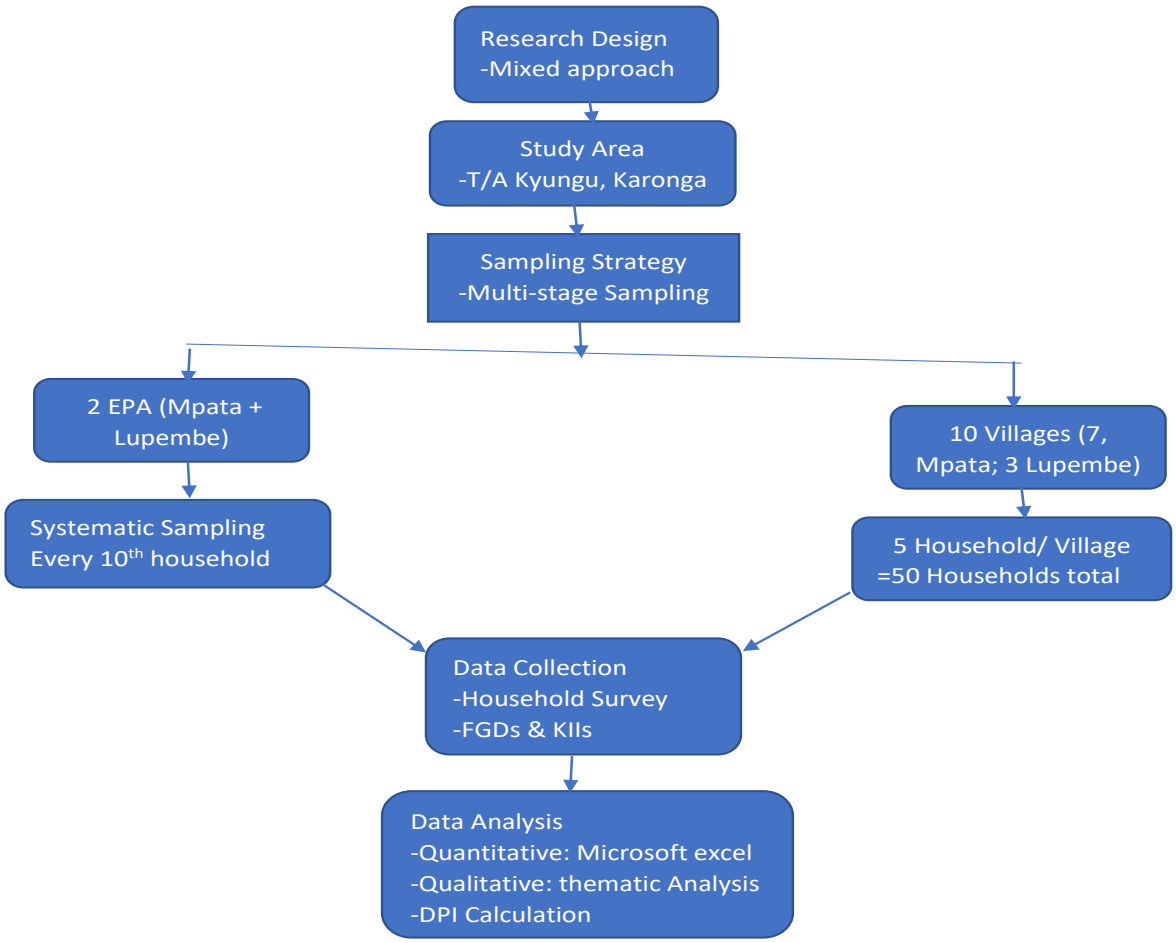


Figure 1: Show A Methodology Framework

3.3 Study Area

The study was conducted in T/A Kyungu, Karonga District, located in northern Malawi. Karonga District was selected due to its vulnerability to recurrent droughts and its reliance on rain-fed agriculture. The district has experienced several severe drought events over the past decade, including the 2015/2016 El Niño-induced drought and the 2022/2023 dry spell, which significantly impacted agricultural productivity and food security (Karonga District Council, 2016; Mkandawire, 2023). T/A Kyungu was chosen as the specific study area because it is one of the most drought-prone areas in the district, with a high concentration of smallholder farmers who are heavily dependent on subsistence farming. Figure 1 shows the

location of Karonga district as well as Tradition Authority Kyungu where the study was focused.

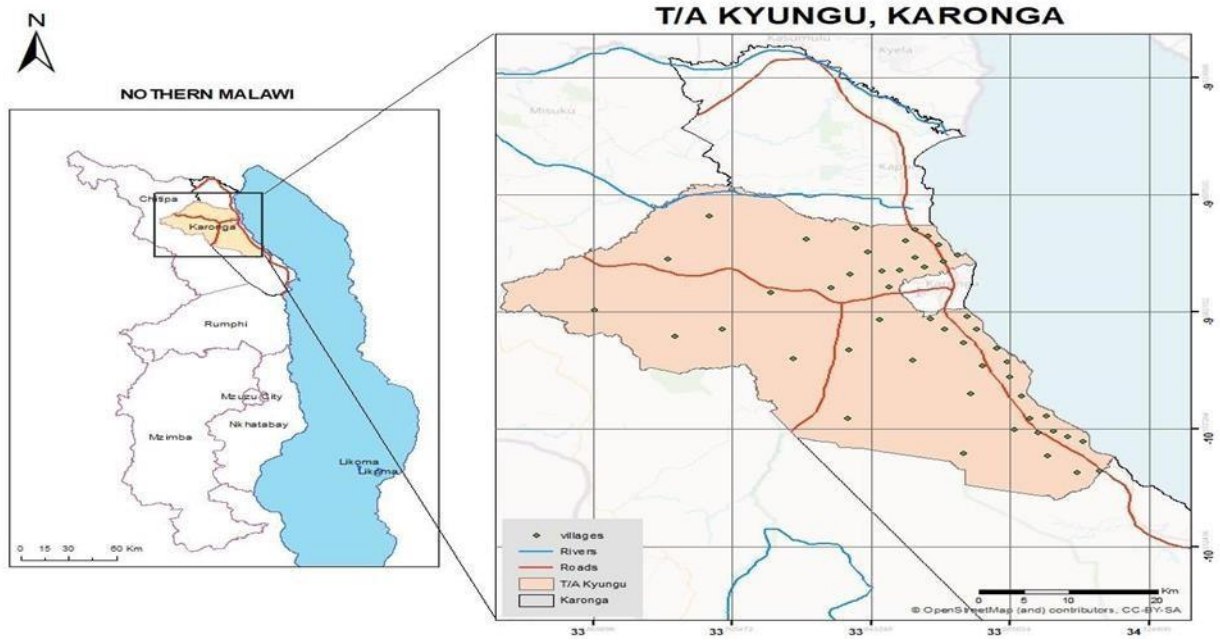


Figure 2: Study Area (T/A Kyungu)

The study area is characterized by a tropical climate, with a single rainy season from November to April and a dry season from May to October. The average annual rainfall ranges between 800 mm and 1,200 mm, but this has become increasingly erratic due to climate change (Droughts are a major climate-related challenge for smallholder farmers in Malawi, where agriculture supports over 80% of the population and is vital to the economy. Increasing drought frequency and intensity due to climate change have worsened food insecurity, poverty, and vulnerability in rural areas. Smallholder farmers, reliant on rain-fed agriculture, are especially vulnerable due to limited resources, knowledge, and institutional support for drought adaptation. Despite the growing threat, there is a critical gap in understanding drought preparedness at the local level, particularly in drought-prone areas like Karonga District.

The main crops grown in the area include maize, rice, groundnuts, and tobacco, which are highly sensitive to water stress. The majority of households in T/A Kyungu rely on agriculture for their livelihoods, making them particularly vulnerable to drought-induced shocks.

3.4 Sampling Strategy

Sampling strategy refers to the method used to select a subset of individuals from a larger population to participate in a research study. A well-designed sampling strategy is essential for ensuring that the findings of a study can be generalized to the broader population, especially in social and environmental research where representativeness is key (Creswell & Plano Clark, 2017). In this study, a multi-stage sampling approach was employed to ensure comprehensive representation of smallholder farmers in Traditional Authority (T/A) Kyungu.

The first stage involved the purposive selection of T/A Kyungu based on three main criteria: its high vulnerability to recurrent droughts, its reliance on rain-fed agriculture, and the high concentration of smallholder farmers in the area. These characteristics made it an appropriate and relevant location for assessing drought preparedness at the household level.

In the second stage, the area was stratified into two Extension Planning Areas (EPAs): Mpata EPA in the northern section around Karonga town, and Lupembe EPA in the southern section. From these EPAs, ten villages were randomly selected seven from Mpata and three from Lupembe to ensure geographic and agroecological diversity. The sample size for the household survey was determined using the Taro Yamane formula, which is widely used in social science research;

$$n = \frac{N}{1+N(e^2)},$$

Where: n = sample size, N = total population, and e = margin of error (set at 0.13 for 86% confidence level).

Using a total population of 25,331 farming households in T/A Kyungu and a margin of error set at 0.14 (for an 86% confidence level), the resulting sample size was calculated as 50 households as shown in Appendix C. Systematic sampling was then used to select five households from each of the ten selected villages, totalling 50 households. Every 10th entry on the village household lists was chosen to avoid selection bias. Households were eligible for

selection if they were actively engaged in smallholder farming, had resided in the area for at least five years, and were willing to voluntarily participate in the study. This approach ensured the inclusion of households with relevant farming experience and exposure to drought-related challenges.

For the qualitative component, participants for Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) were purposively selected based on their professional roles and expertise in agriculture and disaster risk management. These included the Director of Agriculture Services (DoAS), the Disaster Risk Management Officer (DRMO), Area Agriculture Extension Development Officers (AEDOs), and representatives of non-governmental organizations (NGOs) involved in agricultural and climate resilience programs. This multilayered sampling strategy provided both representativeness and depth, enabling a comprehensive understanding of drought preparedness among smallholder farmers in the study area.

3.5 Data Collection Techniques

Data collection is the process of gathering information systematically to address research questions or test hypotheses. Employing appropriate data collection techniques enhances the credibility and depth of research findings, especially in studies that examine complex issues like drought preparedness (Bryman, 2016). This study employed a mixed-methods approach that combined quantitative and qualitative techniques to collect comprehensive and triangulated data.

Quantitative data were collected through structured household questionnaires administered using Kobo Collect toolbox. The questionnaire was designed to capture demographic characteristics, drought preparedness strategies, and perceptions of strategy effectiveness. For accessibility and clarity, the questionnaire was translated into local languages Tumbuka and Kyangonde ensuring respondents fully understood the questions. The questionnaire was administered to 47 respondents out of 50 targeted participants, representing 94% response rate.

To complement survey data, three FGDs and five KIIs were conducted to capture community perspectives. FGDs consisted of 10 participants each, including lead farmers, traditional leaders, area agricultural extension officers, and randomly selected community members, with sessions stratified by gender to ensure inclusive perspectives. FDGs were guided by a discussion checklist that explored the challenges, experiences, and motivations behind drought preparedness behaviours. KIIs were conducted with local experts such as the District Agricultural Extension Development Officer, Area Agricultural Development Assistant, and representatives from NGOs, aiming to capture institutional perspectives on drought management and policy implementation. The combination of these tools enabled the collection of both broad statistical data and rich contextual insights, reinforcing the validity and depth of the study.

3.6 Data Analysis

The data collected were analysed using both quantitative and qualitative techniques. The survey data were cleaned, coded, and analysed using Microsoft excel. Descriptive statistics, including frequencies, percentages, and means, were used to summarize the data. The qualitative data from FGDs and KIIs were transcribed and analysed using content analysis. The data were coded and categorized into themes based on the research objectives. The themes included drought preparedness strategies, challenges faced by farmers, and institutional support for drought resilience. The qualitative findings were used to complement and contextualize the quantitative results, providing a deeper understanding of the factors influencing drought preparedness.

The level of drought preparedness among farmers was determined using the Disaster Preparedness Index (DPI). The DPI is a composite tool that evaluate individual, households or community level of preparedness to any natural disaster using preparedness indicators (Rohith V. R, 2017). The DPI index was constructed using six key preparedness indicators: drought knowledge, early warning systems, water conservation practices, adoption of drought-resistant crops, use of conservation agriculture, and access to critical resources. Key experts assisted in assigning weights to each indicator based on its relative importance, and

the weighted scores were aggregated to compute the DPI for each household. The DPI for each respondent was calculated using the following formula;

DPI=$\sum_{i=1}^{n}(Wi * Si)$,(Rohith V. R, 2017)

Where; Wi = Weighted Score of i^{th}preparedness component based on importance

Si = Score of i^{th} preparedness component n= number of indicators

The DPI scores were then categorized into three levels of preparedness: low (0–33%), moderate (34–66%), and high (67–100%). The overall DPI was determined by calculating the average of individual DPI scores.

Table 1: DPI Preparedness Levels

Preparedness Category	DPI Score (%)
Less	0 – 33
Moderate	34 – 66
High	67 – 100

4 CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the findings of the study, organized according to the key themes of the research. The results are based on data collected from household surveys, focus group discussions (FGDs), and key informant interviews (KIIs). The chapter is structured around the following themes: (1) demographic characteristics of respondents, (2) drought preparedness strategies employed by smallholder farmers, (3) effectiveness of drought preparedness measures, (4) factors influencing the adoption of drought preparedness strategies, and (5) the level of drought preparedness as measured by the Disaster Preparedness Index (DPI). Charts, tables, and graphs are used to present the data visually and enhance understanding.

4.2 Demographic Characteristics of Respondents

The sociodemographic characteristics of smallholder farmers in T/A Kyungu are summarized in Table 1 below using descriptive statistics.

Table 2: Demographic Characteristics of Respondents

Characteristics	Category	Frequency (n=47)	Percentage (%)
Gender	Male	26	55.32
	Female	21	44.68
Age Group (years)	24 – 35 years	8	17.02
	36 – 45 years	19	40.43
	46 - 59	20	42.55
Marital Status	Single	1	2.13
	Married	36	76.60
	Divorced	6	12.77

	Widowed	4	8.51
Education level	Primary	24	51.06
	Secondary	20	42.55
	Tertiary	3	6.38
Household Size	1 – 3 members	18	38.30
	4 -6 members	26	55.32
	7+	3	6.38
monthly income (MWK)	<50,000	35	74.47
	50,000 – 100,000	10	21.28
	150,000 – 200,000	2	4.26

The demographic data show that most respondents (55.32%) were men, middle-aged between 46–59 years, and married (76.60%). A significant proportion had only attained primary education (51.06%), which may limit their access to and understanding of agricultural innovations and climate information. The average household size was between 4 to 6 members, and a majority of farmers earned less than MWK 50,000 per month, highlighting financial vulnerability. These findings support previous studies by Ngwira and Botha (2020) and Chikowo et al. (2015), which show that education and income levels are important determinants of farmers' resilience and decision-making.

4.3 Drought Knowledge and Perceptions

Drought awareness is critical for shaping perception and action. Almost all farmers (97.87%) reported that they were aware of drought occurrence in their area while only 2.13% were

not aware. When asked about their experience of drought event, 100% confirmed they had experienced a drought event within the past 10 years.

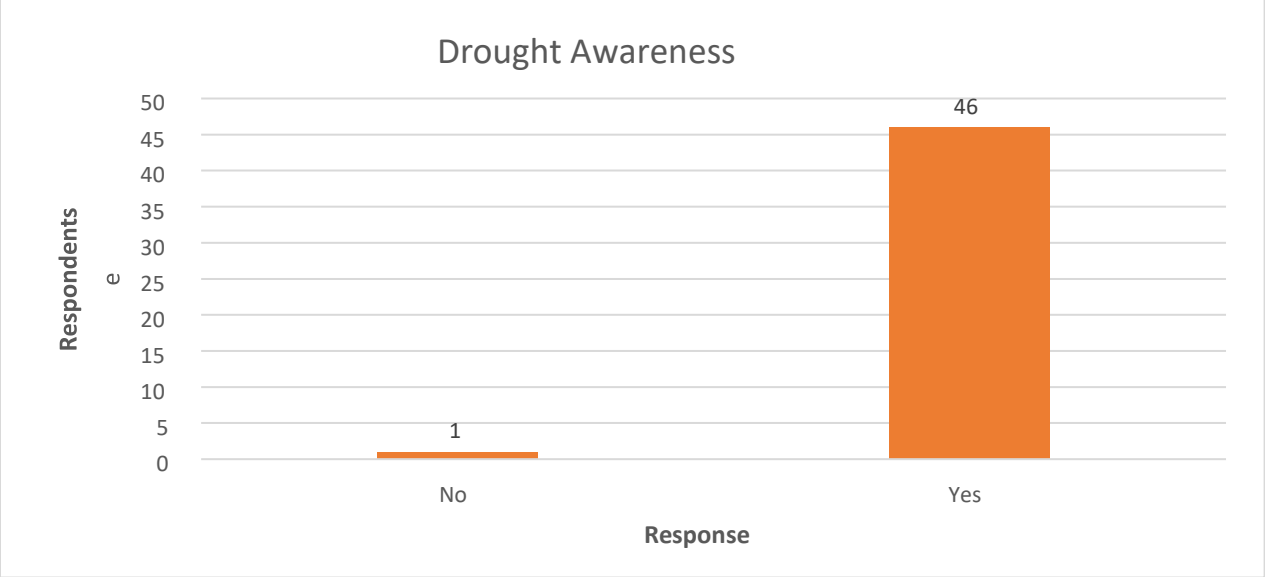


Figure 3: Respondents Drought Awareness

The frequency of droughts was also high, with 89.36% indicating that droughts occurred annually. In terms of perceived causes, climate change was the most mentioned (59.57%), followed by deforestation (31.91%). Some respondents indicated a combination of both climate change and deforestation, while others could not mention any.

Regarding drought severity, 44.68% rated it as severe, while 27.66% rated it as very severe. Moderate droughts were experienced by 25.53%, and only 2.13% described the droughts as mild. Figure 3 below show respondents perceived drought severity in the study area.

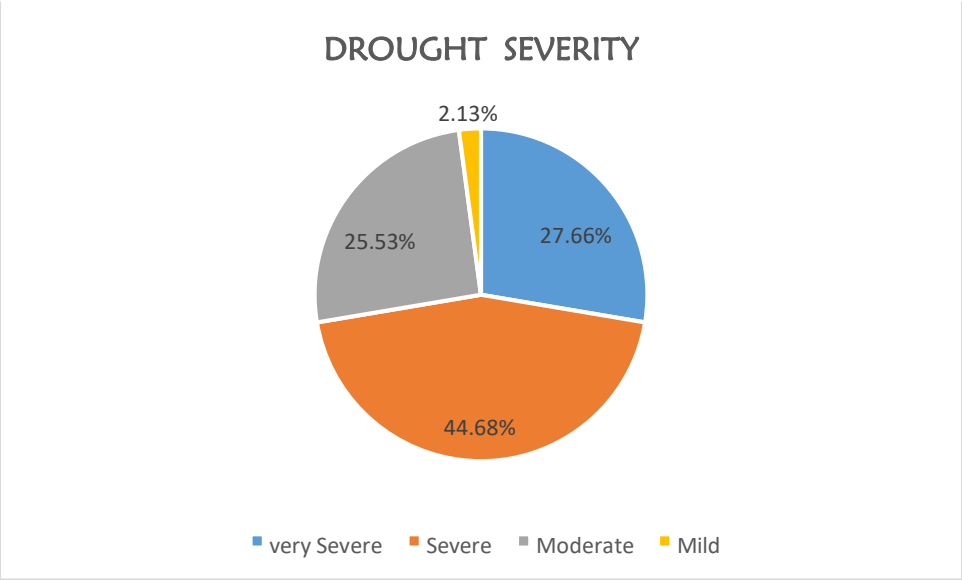


Figure 4: Perceived Drought Severity in T/A Kyungu

4.4 Drought Preparedness Measures by Smallholder Farmers in T/A Kyungu

The survey conducted among smallholder farmers in Traditional Authority (T/A) Kyungu revealed a range of drought preparedness measures employed by farmers as summarized in Figure 5 below.

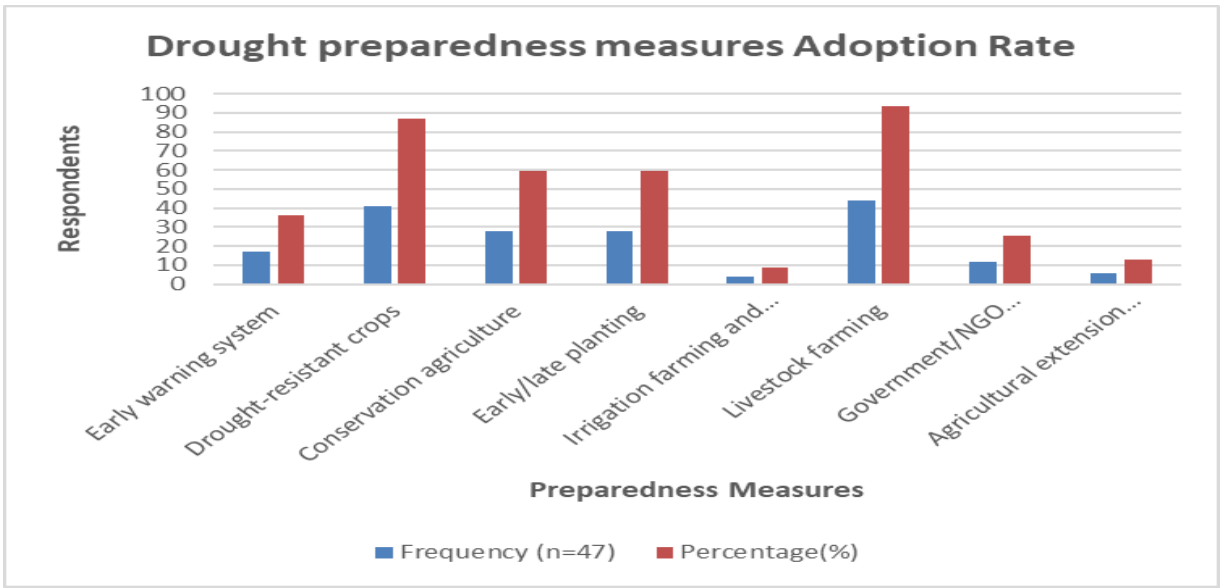


Figure 5: Drought Preparedness measures

4.4.1 Adaptive Agriculture practices

4.4.1.1 Drought-Resistant Crop Varieties

The use of drought-resistant crop varieties is another widely adopted strategy. The survey revealed that 87.23% of farmers in T/A Kyungu cultivate drought-resistant crops, with cassava (56%), groundnuts (20%) and sweet potatoes (15%) being the most prevalent. The interview with district agricultural extension also revealed that other improved maize varieties, bananas, groundnuts and sesame seeds are also used by farmers due to their ability to withstand water stress and mature early. Chikowo et al. (2015) highlight that Malawian farmers who adopted drought-tolerant maize reported more stable yields even under erratic rainfall conditions. The high adoption in Kyungu suggests a growing awareness and trust in the benefits of climate-smart agriculture.

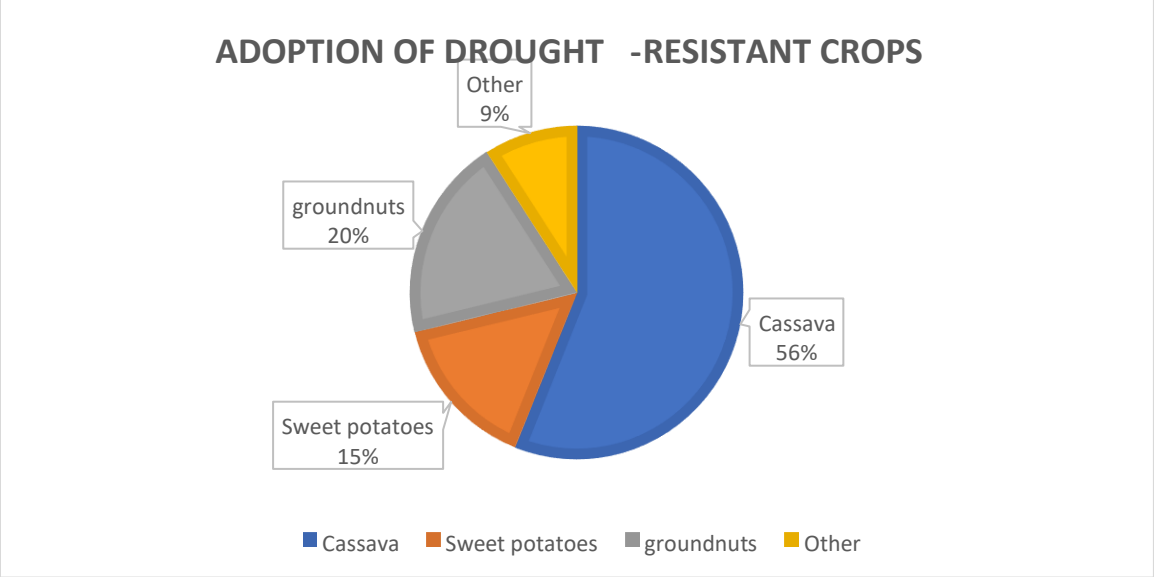


Figure 6: Pie-chart Showing Drought-Resistant Crops Grown by Respondents

However, despite their popularity, respondents reported that access to certified drought-tolerant seeds remains limited for many farmers, particularly improved maize varieties. This constraint aligns with findings from Ngwira et al. (2014), who identified gaps in Malawi's seed distribution systems as a key barrier to widespread adoption of resilient crops.

4.4.1.2 Conservation Agriculture practices

Conservation agriculture practices such as mulching, cover crops, crops rotation and intercropping are employed by 59.57% of farmers. The research results indicate that surveyed farmers employ mulching or cover crops and practice crop rotation or intercropping majority primarily combining maize with cassava and legumes such as cassava, groundnuts, pigeon peas, and beans. Farmers report these methods help maintain soil structure and moisture, particularly important during erratic rainfall seasons. Moderate adoption of conservation agriculture reflects strong promotion of these techniques by agricultural extension services and NGOs operating in Karonga District However, challenges persist in fully implementing conservation agriculture principles, for example, some farmers reported that they experience temporary yield reductions during the transition to conservation agriculture, which may discourage complete adoption. some farmers reported that they are not able to utilize these systems due to limited knowledge about ideal crop combinations or spacing techniques These implementation challenge highlights the need for context-specific adaptations of conservation agriculture principles to local farming systems and resource availability and capacity building.

4.4.1.3 Early/Late Planting Adjustments

When farmers were asked about planting timing, 59.57% of surveyed farmers reported that they adjust their planting schedules in response to changing weather patterns. Focus group discussion confirmed that adjustment in planting timing is generally based on traditional planting calendars. This reliance on traditional calendars may be due to limited access to reliable climate information such as season forecasts. The findings align with Jiri et al. (2017), who found that many Malawian farmers maintain fixed planting dates despite increasing climate variability. Those who do adjust their planting times typically rely on observable environmental cues rather than formal weather forecasts. This presents an opportunity for improved climate information services tailored to farmers' needs and communication preferences. The reluctance to modify planting schedules underscores the importance of developing and disseminating locally relevant climate adaptation advice that farmers trust and can easily implement.

4.4.2 Water conservation and management measures

4.4.2.1 Rainwater harvesting and irrigation farming

Rainwater harvesting and irrigation techniques ensure constant availability and supply of water for irrigation farming during dry-spells and dry season thereby enhancing drought resilience. Despite this, water harvesting and irrigation farming remain significantly underutilized. Irrigation farming is practiced by just 8.5% of farmers, drawing from shallow wells and boreholes. Adoption remains low due to financial constraints, lack of appropriate technology, and the high energy costs and maintenance demands of irrigation systems, echoing broader national challenges as noted by Chirwa et al. (2015). Nevertheless, those who do irrigate reported improved food security and income stability, indicating that with targeted subsidies and support for affordable, sustainable technologies, both rainwater harvesting and irrigation could become vital components of drought preparedness in the area.

4.4.3 Institutional and Financial Support Systems

4.4.3.1 Government and NGOs Assistance

Figure 6 is a summary of institutional supports as reported by respondent.

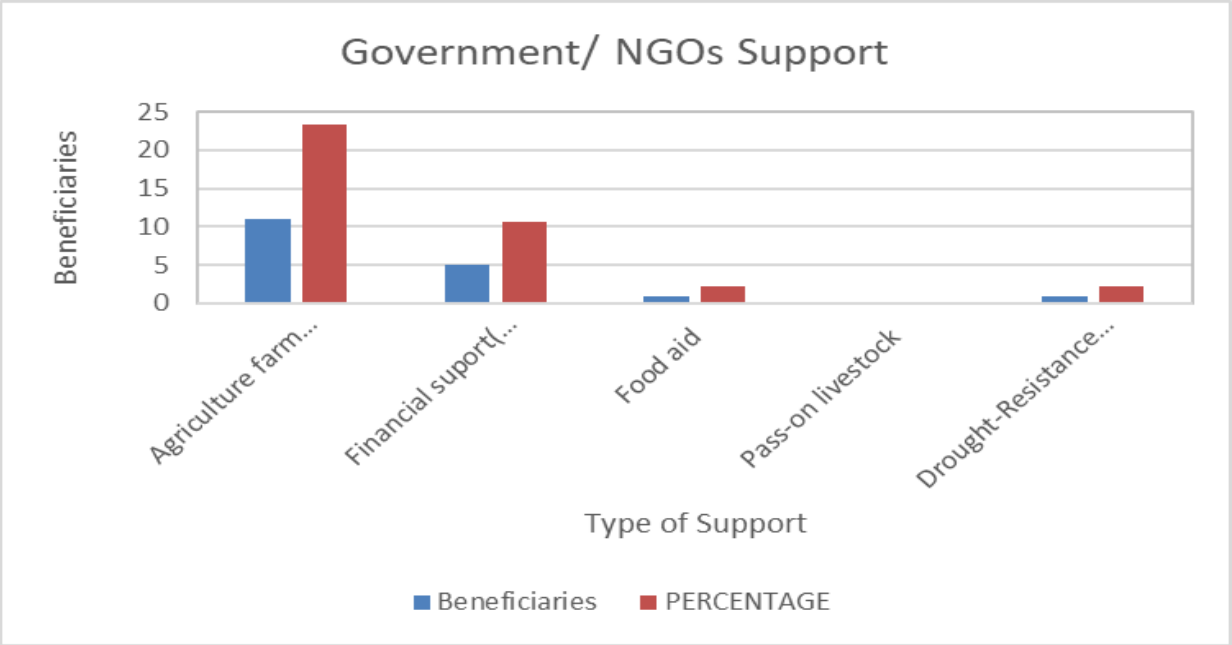


Figure 7: Types of Government / NGS Support

Support services are crucial for building drought resilience as it enhances preparedness capacities to various degree of drought risks. The study finding reports that access to financial support is limited with only 10.63% of respondents being beneficiary of Social Cash Transfer Program (SCTP). None of the farmers had savings or access to credit for emergencies. Only 25.53% had received some help from government or NGOs, mainly in the form of farm input subsidies (23.4%). This lack of support makes it hard for farmers to prepare well. Agricultural advice and training were also limited.

4.4.3.2 Agricultural Extension trainings

Training and education in drought management is one component of drought prepared as it enables farmers to know what to do during drought. Despite this, the study has observed limited capacity building as only 12.77% of respondents had received training or advice about how to manage drought. District director of agriculture reported that farmers in the district are being trained in climate-smart agriculture practices, conservation agriculture, natural resource management, and livestock production. He also mentioned NASFAM, NGOs, and Department of Agricultural Extension Services (DAES)as main providers of these trainings.

4.4.3.3 Agricultural loans and crops insurance

Access to financial services and institutional support remains limited, with only 19.1% of farmers reporting access to savings or credit facilities. This financial exclusion severely constrains farmers' ability to invest in drought preparedness measures, from purchasing resilient seeds to investing in water management infrastructure. The predominance of informal financial mechanisms (8.5% through family networks) over formal institutions (4.3% through banks) highlights the need for more inclusive financial products tailored to smallholders' needs. Successful models from southern Malawi, such as village savings and loan associations (Fisher & Kandiwa, 2014), could potentially be adapted to improve financial access in T/A Kyungu. No respondents reported having crop insurance. This limited access to credits and insurance to recover from drought and plan for the future (Mkwambisi, 2019).

4.4.4 Livestock keeping

Livestock farming was the most widely adopted preparedness measure, with 93.6% respondents indicating they kept livestock as a drought coping strategy. This high adoption is indicating that livestock is viewed not only as a reliable source of food and income but also as an asset that can be liquidated during times of crisis. This finding is supported by Masikati et al. (2017), who noted that livestock keeping is a cornerstone of resilience among rural households in Southern Africa, serving both economic and nutritional functions during prolonged droughts.

4.4.5 Early Warning systems

Figure 8 below shows number of responses when respondents asked if they receive drought early warning systems.

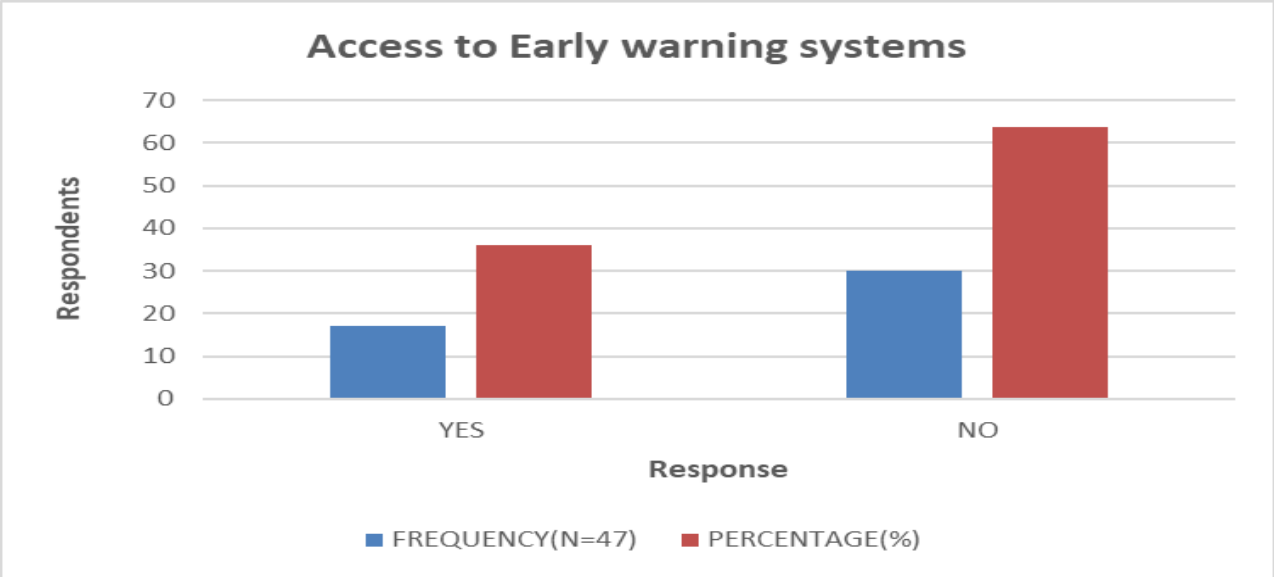


Figure 8: Access to early Warning Systems

Despite high awareness of drought occurrence in the area, access to early warning systems was limited. When respondent asked if they receive drought warning system, only 36.17% of survey farmers answered that they receive drought alerts, mostly through radio. Television and NGOs. Feedback from the disaster risk management officer on this low access to climate information, vividly supported respondent's answers. The officer clearly confirmed that

seasonal forecasts are distributed to EPAs but due to limited number of extension workers per EPA, dissemination of these climate information may be overlooked. On the other hand, 63.83% reported that they do not receive drought warnings.

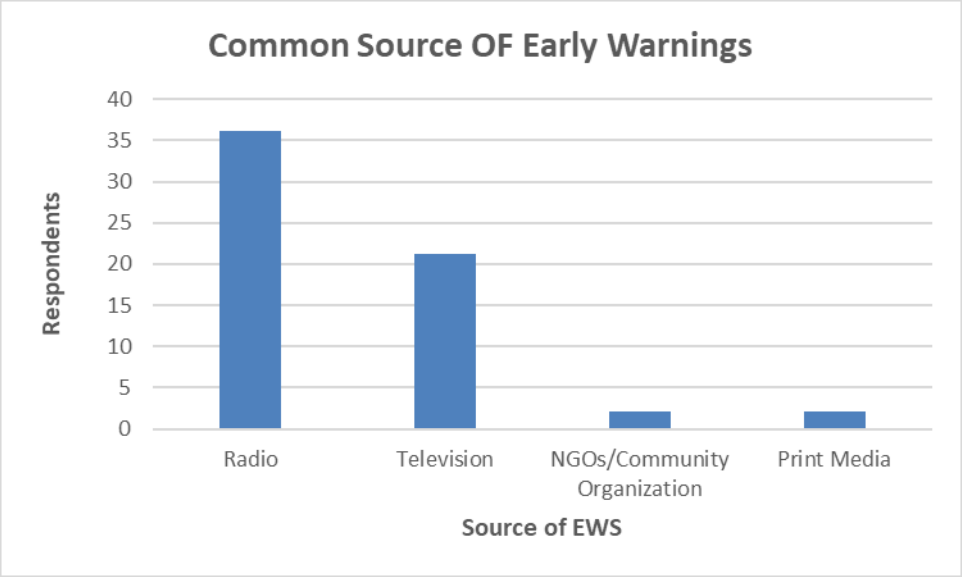


Figure 9: Common Sources of Early Warnings

4.5 Farmers Perceived effectiveness of Drought Preparedness Measures

The study assessed the perceived effectiveness of various drought preparedness measures among smallholder farmers in T/A Kyungu, revealing that livestock keeping and conservation agriculture were regarded as the most effective strategies. Most other measures, including early warning systems, irrigation farming, and agricultural extension trainings, were rated moderately effective, while drought-resistant crops and savings/credit schemes were considered less effective as shown in figure 7 below;

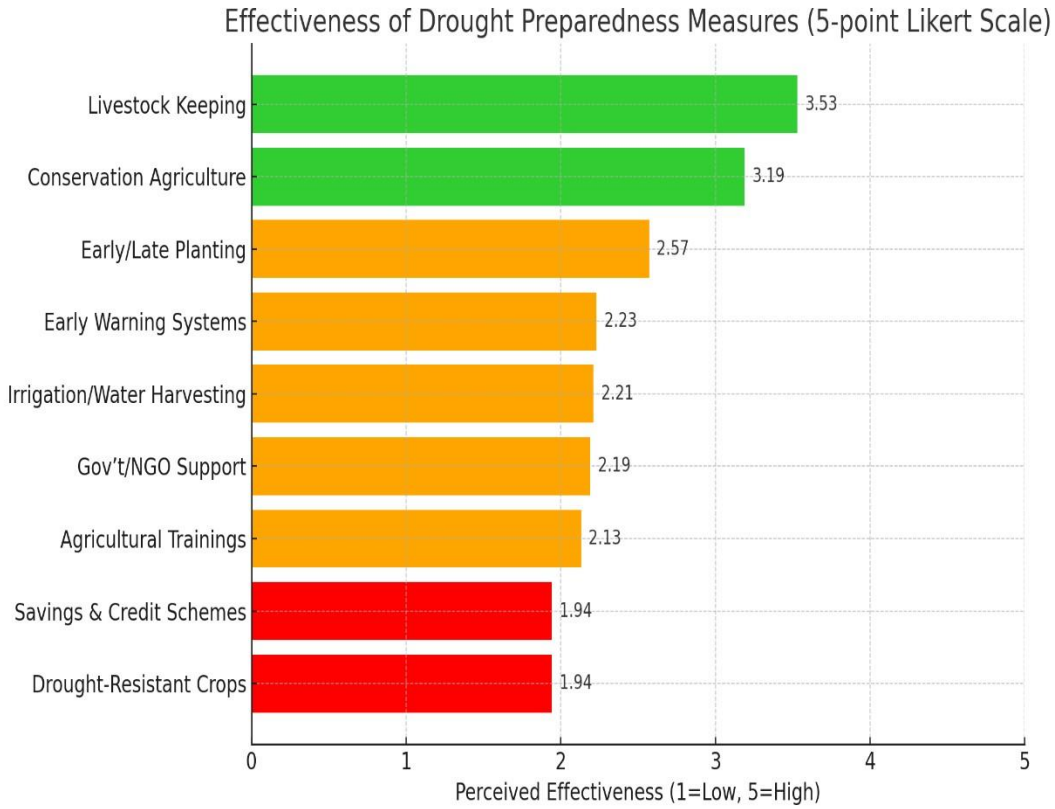


Figure 10: Perceived Effectiveness of Existing Drought Preparedness Measures Employed by Respondents

4.5.1 Livestock Keeping

Livestock rearing was rated as the most effective drought preparedness measure, with an average score of 3.53, falling within the moderate effectiveness category. Farmers view livestock as a reliable asset that can be sold for income or consumed during times of food shortage, making it a critical livelihood buffer during droughts. This finding aligns with Masikati et al. (2017), who observed that livestock in Southern Africa serves as a key livelihood asset during climatic shocks, and with Chikowo et al. (2014), who noted that Malawian farmers often depend on small ruminants and poultry as coping mechanisms during drought-related food insecurity.

4.5.2 Conservation Agriculture

Conservation agriculture received a mean score of 3.19, also classified as moderately effective. The practice includes minimum tillage, mulching, and crop rotation, all of which help to maintain soil moisture and improve crop resilience under erratic rainfall. These results are consistent with findings by Thierfelder et al. (2015) in Malawi and Zambia, which demonstrate that conservation agriculture practices improve productivity and drought tolerance over time, particularly when supported by training and input availability.

4.5.3 Early/Late Planting

Early and late planting strategies were rated moderately effective, with an average score of 2.57. Farmers use this approach to respond to unpredictable onset and cessation of rains. However, its moderate effectiveness suggests that without accurate weather forecasts, the timing of planting can still lead to crop failure. Kadyampakeni et al. (2015) reported similar findings in Malawi, where planting time decisions remain highly risky due to erratic rainfall patterns and limited access to reliable weather information.

4.5.4 Early Warning Systems

Early warning systems scored 2.23, also indicating moderate effectiveness. While farmers recognize the importance of climate information in guiding decision-making, limited access to reliable and timely forecasts reduces the utility of such systems. Mwalweni and Manda (2013) noted that although Malawi has established early warning structures, the dissemination of timely and localized information to rural farmers remains weak, undermining their preparedness and response capacity.

4.5.5 Irrigation Farming and Water Harvesting

With a mean score of 2.21, irrigation farming and water harvesting were also seen as moderately effective. Although these practices can significantly reduce dependence on rainfall, their adoption is hindered by high costs of equipment, limited access to water sources, and technical challenges. This echoes findings by Chirwa and Dorward (2013), who noted that

despite the government's push for small-scale irrigation in Malawi, uptake remains low due to infrastructural and financial barriers, especially among smallholder farmers.

4.5.6 Government/NGO Support

Government and NGO support registered a mean score of 2.19, reflecting moderate effectiveness. While external support—such as input subsidies, training programs, or relief aid—is valued, its impact appears limited by irregular delivery, inadequate targeting, or insufficient follow-up. According to Masangano and Mthinda (2012), extension services and support programs in Malawi are often hindered by inadequate funding and coordination, which reduces their capacity to reach and benefit the most vulnerable households effectively.

4.5.7 Agricultural Extension Trainings

Agricultural extension trainings were similarly rated with a moderate effectiveness score of 2.13. This suggests that although trainings are conducted, their frequency, relevance, or quality may not meet the needs of farmers. Moreover, limited coverage and follow-up support may hinder the translation of knowledge into practice. Ragasa et al. (2016), in their review of Malawi's extension services, found that farmers often face challenges accessing extension workers and that the effectiveness of training is often limited by a lack of contextualization and practical demonstrations.

4.5.8 Drought-Resistant Crops Adoption

Drought-resistant crop varieties received a low average score of 1.94, categorizing them as less effective. Despite their potential to withstand dry conditions, their limited adoption could be due to lack of availability, high seed costs, or poor performance under local environmental conditions. Fisher et al. (2015) found similar results in Malawi, where uptake of improved drought-tolerant maize varieties remained low due to limited distribution networks and a lack of awareness about their benefits.

4.5.9 Savings and Credit Schemes

Savings and credit mechanisms also scored 1.94, indicating low effectiveness. These schemes are meant to provide financial buffers during times of crisis, but their limited impact may be due to poor access to formal financial services, high interest rates, or lack of trust in community savings groups. Mvula and Kakhongwa (2011) observed that in rural Malawi, limited financial literacy and weak rural banking infrastructure constrain the ability of farmers to effectively use financial services as a resilience strategy.

4.6 Factors Influencing Adoption of Drought Preparedness Strategies Among Smallholder Farmers in T/A Kyungu, Malawi

The study identified multiple interrelated factors shaping the adoption of drought preparedness strategies among smallholder farmers in Traditional Authority (T/A) Kyungu, Karonga District. These findings echo broader concerns about resilience-building in the face of climate variability, particularly in resource-constrained rural areas. Below is an in-depth discussion of each factor based on survey responses and supported by relevant studies conducted in the Malawian context.

4.6.1 Access to Agricultural Loans and Financial Resources

The survey revealed that limited access to financial capital is a critical barrier for smallholder farmers in T/A Kyungu seeking to implement drought preparedness strategies. Respondents frequently cited an inability to afford drought-resilient inputs such as irrigation equipment, improved seed varieties, and livestock feed. These constraints are consistent with Chirwa and Dorward (2013), who observed that despite efforts through the Malawi Rural Finance Program (MRFP) and Farm Input Subsidy Program (FISP), many smallholders remain excluded from formal credit markets. This exclusion is often due to high interest rates, lack of collateral, and limited reach of microfinance institutions in remote areas like T/A Kyungu. Consequently, farmers are unable to invest in long-term adaptive technologies, reinforcing cycles of vulnerability. Expanding access to affordable credit through village savings and loan associations (VSLAs), as well as integrating financial literacy into extension services, could significantly enhance farmers' capacity to prepare for drought.

4.6.2 Availability and Accessibility of Drought-Resistant Crop Varieties

Farmers in T/A Kyungu expressed considerable interest in drought-tolerant crops, particularly cassava and sweet potatoes. However, a major constraint cited was the irregular and unequal distribution of certified seeds. In many instances, farmers relied on recycled seeds with poor germination rates. Kassie et al. (2015) similarly found that adoption of improved, stresstolerant varieties remains low in Malawi due to weak seed supply chains, especially in remote and marginalized communities. Women-headed households in T/A Kyungu often face additional barriers due to their limited mobility and bargaining power in input markets. To address this, community seed banks and farmer-managed seed multiplication initiatives can serve as viable models to improve availability and affordability of climate-resilient varieties.

4.6.3 Irrigation Infrastructure and Water Management Practices

The vast majority of respondents in T/A Kyungu reported dependency on rain-fed agriculture, with minimal use of irrigation technologies. A few mentioned use of roof catchment and open wells, but these were inadequate during prolonged dry spells. This pattern reflects the broader irrigation gap in Malawi, where only about 3% of cultivated land is irrigated (National Irrigation Policy, 2016). As noted by Mango et al. (2017), barriers to irrigation adoption include high upfront costs, lack of technical knowledge, and absence of institutional support. Yet, small-scale systems such as treadle pumps, drip kits, and solar-powered irrigation have demonstrated potential for scaling resilience. Enhanced government support through input subsidies and training programs tailored to smallholder realities in T/A Kyungu could make water-efficient irrigation technologies more accessible.

4.6.4 Agricultural Extension Services and Knowledge Dissemination

Survey results showed that farmers in T/A Kyungu who had access to extension services were more likely to implement drought preparedness strategies such as early planting and conservation agriculture. However, many respondents reported infrequent contact with extension officers or complete absence of advisory services. This observation is consistent with

Phiri et al. (2020), who found that Malawi's extension system is overstretched, with each agent responsible for thousands of farmers. Additionally, women and youth in T/A Kyungu often remain underserved due to cultural and logistical barriers. Scaling up farmer field schools, radio programs, and mobile-based advisory services can bridge this information gap and promote uptake of climate-smart agricultural practices. Recruiting more extension agents, especially female officers, would further enhance outreach and inclusivity.

4.6.5 Government and NGO Support Programs

Only a minority of farmers in T/A Kyungu reported receiving support from government or NGOs in the form of input subsidies, livestock restocking, or training. Those who did demonstrated better preparedness and adaptation outcomes. While Malawi's FISP and Social Cash Transfer Programs have improved food security in some areas, Holden et al. (2018) argue that inefficiencies in targeting and political interference have undermined their impact. For drought preparedness efforts to be effective in T/A Kyungu, support programs must be timely, transparent, and aligned with local needs. Better coordination between government departments and NGOs, along with community-based monitoring mechanisms, can improve delivery and accountability of resilience-building initiatives.

4.6.6 Farmer Cooperatives and Collective Action

Membership in cooperatives or farmer groups emerged as a strong enabler of drought preparedness in T/A Kyungu, with participants reporting improved access to inputs, credit, and training. Despite these benefits, overall membership remained low, often due to lack of awareness or distrust in group governance. Mango et al. (2017) highlighted that farmer organizations can enhance bargaining power, facilitate knowledge sharing, and create economies of scale for accessing markets and resources. In Malawi, cooperatives have also been instrumental in distributing drought-resistant seeds and managing shared irrigation infrastructure. Strengthening the institutional capacity of cooperatives in T/A Kyungu, encouraging inclusivity, and linking them to formal credit providers could significantly boost resilience at the community level.

4.6.7 Early Warning Systems and Drought Awareness

The majority of farmers in T/A Kyungu had limited access to early warning systems, with many relying solely on radio announcements. Few respondents had knowledge of seasonal forecasts or actionable climate information. This finding aligns with Phiri et al. (2020), who observed that while Malawi's Department of Climate Change and Meteorological Services provides forecasts, dissemination remains weak, particularly at the community level. Farmers require timely, localized, and easy-to-understand advisories to make informed decisions about planting and water use. Community-based dissemination platforms in T/A Kyungu, integration of mobile alerts (e.g., USSD and WhatsApp), and training in interpretation of forecasts can empower farmers to act proactively rather than reactively.

4.6.8 Land Tenure Security and Investment Incentives

Secure land tenure was found to be a key driver of investment in long-term preparedness measures among farmers in T/A Kyungu, such as agroforestry, composting, and soil conservation. Conversely, farmers on rented or informally held land were reluctant to invest, fearing displacement or lack of compensation. The Customary Land Act of 2016 was intended to formalize land rights in Malawi, but its rollout has been slow and uneven. Holden et al. (2018) noted that unclear land rights hinder agricultural investment and increase vulnerability to climate shocks. Accelerating the implementation of land registration programs and promoting lease agreements that reward sustainable land use practices would incentivize preparedness investments, particularly among young and tenant farmers in T/A Kyungu

4.7 Level of Drought Preparedness of farmers in T/A Kyungu

The DPI was constructed using six key dimensions: drought knowledge, early warning systems, water conservation practices, adoption of drought-resistant crops, use of conservation agriculture, and access to critical resources as shown in Table C1 of Appendix C. Each respondent's DPI score was calculated and expressed as a percentage. Refer to Appendix C for calculation of DPI score of respondents.

Table 3: Distribution of Respondents Based on Their DPI Scores

DPI CATEGORY	SCORE RANGE (%)	FREQUENCY(n=47)	PERCENTAGE (%)
Low Prepared	0 – 39	13	27.66
Moderate Preparedness	40 – 69	34	73.34
High Preparedness	70 -100	0	0.00

The DPI results reveal that the preparedness level among farmers in T/A Kyungu is generally low to moderate. Out of the 47 respondents, the results show that 13 farmers (27.66%) were categorized as having low preparedness (DPI score between 0–39), 34 farmers (72.34%) were classified under moderate preparedness (DPI score between 40–69). None of respondents fell under the high preparedness category (DPI score between 70–100). This distribution highlights that while most farmers have taken some measures to cope with drought, a significant proportion still lack adequate strategies or resources to effectively prepare for and respond to drought risks.

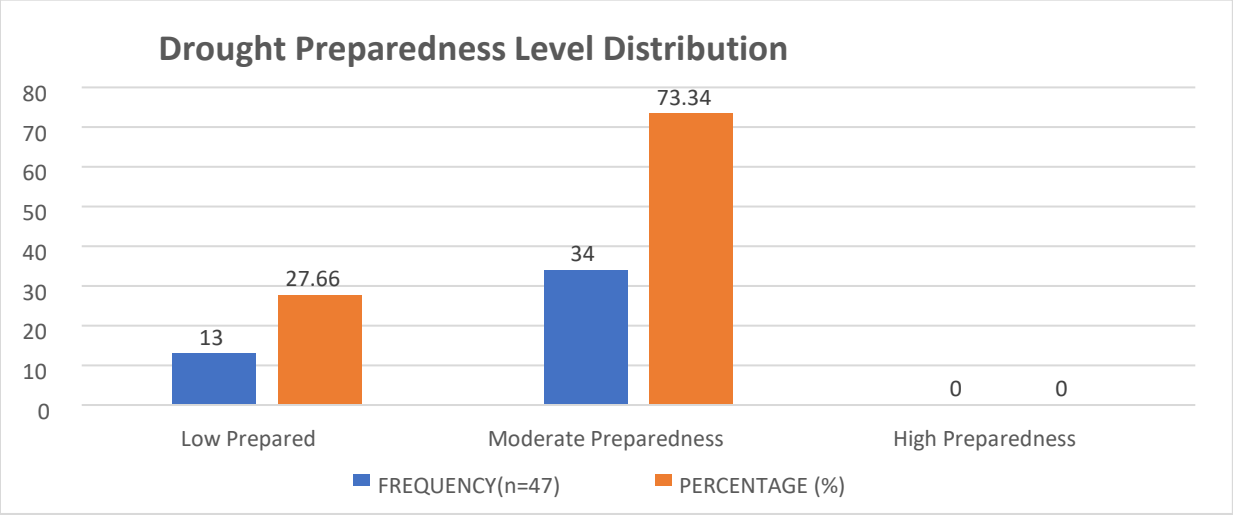


Figure 11: Distribution of Respondents Based on Their DPI Scores

4.7.1.1 Overall Level of Preparedness

The average DPI score for all respondents was calculated to be 40.30%, placing the overall preparedness level at the lower threshold of the moderate category. This suggests that although farmers in T/A Kyungu are not entirely unprepared, their current level of preparedness is insufficient to withstand severe or prolonged drought events. The marginal nature of this average score indicates that many farmers hover just above low preparedness, reinforcing concerns about their vulnerability.

The result reflects that most farmers have knowledge about drought and had adopted drought-resistant crops. However, significant gaps remain in the use of early warning systems, water conservation techniques, and access to necessary agricultural resources such as credit, inputs, and extension services. For instance, early warning systems were underutilized, with many respondents unaware or unable to interpret early warning information. Water conservation practices such as rainwater harvesting and mulching were sparsely practiced, which reduces the resilience of farmers to water shortages. Furthermore, respondents also reported limited access to resources especially financial capital and government support as a key limitation for scaling up their preparedness strategies.

This pattern is indicative of systemic constraints in the farmers' ability to effectively anticipate, plan for, and respond to drought-related challenges. The absence of high preparedness among all respondents underscores critical gaps in both individual and institutional adaptive capacity. This finding aligns with studies conducted in other parts of Malawi, such as by Ngongondo et al. (2011) and Kadyampakeni et al. (2012), who found that limited access to drought-resistant technologies, weak extension service delivery, and underdeveloped infrastructure significantly impede rural communities' ability to prepare for climatic shocks.

In Karonga specifically, reliance on rain-fed agriculture, poor water storage systems, and minimal access to timely climate information all contribute to suboptimal drought readiness. According to Chinseu et al. (2019), most farmers in northern Malawi, including Karonga, lack access to critical resources such as irrigation, drought-tolerant seeds, and agricultural advisories, which constrains their resilience. Furthermore, the study by Phiri et al. (2015) in

Machinga and Balaka showed that farmers with access to early warning systems and financial credit exhibited higher preparedness levels, suggesting that improving access to such services can significantly elevate DPI scores. In Karonga, however, these enabling factors remain unevenly distributed and often inaccessible to poorer households and women farmers, thereby exacerbating vulnerability.

The absence of high preparedness among respondents demonstrates that while there is a basic understanding of drought risk, the structural support required to translate knowledge into action is lacking. Interventions such as improving access to weather information, promoting conservation agriculture through farmer field schools, and enhancing the availability of affordable credit facilities could significantly elevate preparedness levels.

5 CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

This chapter is organized into two main sections: the first presents the conclusions drawn from the study's findings on the level of drought preparedness among smallholder farmers in T/A Kyungu, including the socio-economic and institutional factors that influence preparedness. The second section provides recommendations aimed at addressing the identified challenge

5.1 Conclusions

This study set out to assess the level of drought preparedness and the key factors influencing the adoption of preparedness strategies among smallholder farmers in Traditional Authority (T/A) Kyungu, located in Karonga District, Malawi. The findings clearly demonstrate that while a range of adaptive strategies are employed by farmers in the area, their overall level of drought preparedness remains moderate, with critical deficiencies in access to finance, institutional support, and adoption of climate-resilient technologies. The analysis confirms that farmers in T/A Kyungu face a combination of structural and socio-economic challenges that significantly hinder their ability to fully prepare for and respond to drought conditions.

The demographic characteristics of respondents indicate that most farmers in the area are middle-aged, married men with limited formal education (primarily at the primary level) and low monthly household incomes, typically below MWK 50,000. These characteristics are significant as they directly influence the capacity of households to adopt and sustain effective drought preparedness strategies. Limited financial resources and educational attainment restrict access to improved agricultural inputs, technical knowledge, and long-term investments in resilience-building infrastructure. Despite these challenges, the most commonly adopted preparedness measures in T/A Kyungu included livestock keeping (93.6%), planting of drought-resistant crops such as cassava and sweet potatoes (87.23%), and conservation agriculture techniques like mulching and minimum tillage (59.57%). However, essential strategies such as irrigation and use of early warning systems were notably underutilized—only 8.5% of farmers practiced irrigation, and just 36.17% used early warning information in decision-making.

The Drought Preparedness Index (DPI) results further reinforce the moderate readiness status of the region. A significant portion (72.34%) of smallholder farmers in T/A Kyungu fell into the moderate preparedness category (40–69%), while 27.66% were classified as having low preparedness (0–39%). Alarmingly, none of the respondents attained high preparedness (70–100%), underscoring widespread vulnerability to climate-induced shocks such as prolonged dry spells and erratic rainfall. Among the primary factors limiting adoption of preparedness strategies were high costs of irrigation equipment, seeds, and inputs for conservation agriculture; weak institutional support with only 25.53% of respondents reporting assistance from government or NGOs; and low penetration of climate information services, forcing most farmers to rely on traditional indicators rather than scientific forecasts. Additionally, tenure insecurity discouraged investment in long-term resilience measures, particularly among farmers operating on rented land.

These findings from T/A Kyungu reflect broader trends observed across Malawi, where structural limitations continue to impede efforts to build resilient agricultural systems. Similar studies by Chirwa and Dorward (2013) and Ngwira et al. (2014) have highlighted the persistent challenges of input access, financial exclusion, and institutional inefficiencies that compromise smallholder resilience. Without well-coordinated and targeted interventions, the farmers of T/A Kyungu—and indeed those across Malawi—will remain highly exposed to the adverse impacts of climate variability, with significant implications for food security, nutrition, and rural livelihoods.

5.2 Recommendations

To improve drought preparedness among smallholder farmers in T/A Kyungu and other similar agroecological zones in Malawi, a multifaceted and inclusive approach is needed.

- **Strengthen Financial Inclusions**

Strengthening financial inclusion mechanisms such as microfinance institutions and village savings and loan associations (VSLAs) is critical to increasing farmers' ability to invest in drought preparedness. This should be coupled with the introduction of innovative risk

financing tools, including drought-indexed insurance, to provide safety nets against weather related losses.

- **Improve Seed Distribution Systems**

Improving seed distribution systems is also paramount. Community-based seed multiplication programs need to be scaled up to ensure farmers in T/A Kyungu have consistent access to certified drought-tolerant varieties like cassava and sweet potatoes. These efforts should be supported by government initiatives such as the Farm Input Subsidy Program (FISP), with a strong focus on equity and transparency in seed allocation. To address the glaring gaps in irrigation use, the government and its development partners should prioritize the provision of low-cost irrigation equipment such as treadle pumps and drip kits. Training programs on rainwater harvesting and water use efficiency will further enhance resilience in the face of erratic rainfall patterns.

- **Strengthen Early Warning Systems**

The effectiveness of drought response also depends heavily on the quality and timeliness of climate information. Strengthening early warning systems through radio broadcasts and mobile platforms will improve awareness among rural farmers. Training programs on interpreting forecasts and integrating that knowledge into farming calendars should be institutionalized. At the same time, the expansion of agricultural extension services remains crucial. Hiring more extension workers, incorporating mobile-based advisory services, and organizing regular farmer field schools will facilitate knowledge transfer on conservation agriculture and other climate-smart practices.

- **Enhance Farmer Cooperatives and Address Land ownership Security**

At the community level, support for farmer cooperatives should be enhanced. These groups can provide critical platforms for collective action, bulk purchasing, savings, and information sharing. By linking cooperatives to financial institutions, farmers in T/A Kyungu can improve their access to credit and markets. Equally important is addressing land tenure insecurity. Accelerated implementation of the Customary Land Act will help formalize land ownership,

while promoting lease agreements with clear terms can encourage long-term investments in soil and water conservation.

- **Research and Monitoring**

Finally, there is a pressing need for research and monitoring tailored to the local context. This includes studies on climate-resilient crop varieties best suited to Karonga's semi-arid conditions and evaluations of irrigation models appropriate for resource-constrained settings. Establishing a local drought monitoring system will also provide critical feedback on the effectiveness of preparedness interventions and support evidence-based decision-making.

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Appendix A: HOUSEHOLD SURVEY QUESTIONNAIRE

Household Survey Questionnaire

Assessing the State Drought Preparedness Among Smallholder Farmers. A Case of T/A Kyungu in Karonga District.

Introduction

This interview seeks to gather insights on drought preparedness. Your input will help to understand the broader community preparedness measures and the factors influencing drought resilience.

Section A: Household Demographics

1.Respondent ID: _____

2. Gender:

☐ Male ☐ Female

3. Age: _____ years

4. Marital Status:

☐ Single ☐ Divorced

☐ Married ☐ windowed

5. Education level:

☐ No formal education ☐ Secondary

☐ Primary ☐ Tertiary

6. Household size (number of members):

☐ 1-3 ☐ 4-6 ☐ 7+

7. Household Monthly Income:

☐ Less than K50,000

☐ K50,000 – K100,000

☐ K150,000 – K200,000

☐ K250,000+

8. Years of farming Experience: _____

9. Farmland Size in hectares:

☐ Less than 1 ☐ 2-3

☐ 1

10. Type of Land Ownership:

☐ Private ☐ Customary

☐ Rented

11. Main source of livelihood:

☐ Business ☐ Employment
☐ Farming ☐ Fishing

Section B: Drought Knowledge and Awareness

12. Are you aware of drought occurrence?

☐ Yes ☐ No

13.What do you think causes drought?

_____

14. Has your area experienced drought in the past 10 years (2014-2024) period

☐ Yes ☐ No

15. How often does drought occur in your area?

☐ Every year ☐ Occasionally
☐ Every 2-3 years ☐ Rarely

16. What are main impacts of drought on your farming activities?

☐ Reduced crop yields ☐ Water scarcity
☐ livestock losses ☐ food insecurity

17. How severe do you consider drought events in your area?

☐ Mild ☐ Severe
☐ Moderate ☐ very severe

18. Do you have access to weather forecasts/drought early warnings?

☐ Yes ☐ No

19. If YES, through which source?

☐ Radio ☐Community meeting
☐ Television ☐ NGO
☐ Extension officer ☐Public loudspeakers

20. How often do you receive drought early warnings?

☐ Regularly ☐ Rarely
☐ Occasionally

Section B: Adaptive Agricultural Practices

21. What are your main crops grown? (List up to 3):

a._____ b._____
c._____

22. Do you use any of the following drought adaptation practices? (Multiple answers allowed)

☐ Drought-resistant crop varieties
☐ Crop rotation/intercropping

☐ Mulching/cover crops
☐ Conservation agriculture
☐ Early/late planting to avoid drought

23. Do you practice rainwater harvesting?
☐ Yes ☐ No

24. If yes, which rainwater harvesting methods are you using:
☐ Ponds ☐ Trenches
☐ Roof catchment

25. Do you use irrigation during dry spells?
☐ Yes ☐ No

26. If YES, which of the following is the source of water?
☐ Well ☐ Dam
☐ River ☐ Drip irrigation

Section C: Access to Resource

27. Do you have savings/credit access for drought emergencies?
☐ Yes ☐ No

30. Do you use drought-resistant crops varieties in your farm?
☐ Yes ☐ No

31. If YES, what drought-resistant crops do you use in your farm?
_____
_____

32. Do you own livestock?
☐ Yes (list all) ☐ No

33. Primary water source for household & farming
☐ Rain-fed ☐ Borehole
☐ Lake/River ☐ Dam

34. Do you have a backup water storage system?
☐ Yes ☐ no

35. If YES, What backup water storage system do you use

_____

Section D: Institutional Support & Information Access

36. Have you received government/NGO support for drought preparedness?

☐ Yes ☐ No

37. If YES, Which of the following support? (multiple answers allowed)

☐ Subsidy agricultural farm inputs

☐ Trainings

☐ Food aid

☐ Pass on Livestock

☐ financial support

☐ Irrigation equipment

☐ Drought- resistant crops

38. Have you received agricultural extension training on drought management?

☐ Yes ☐ No

39. Are you part of a farmer group/cooperative for drought resilience?

☐ Yes ☐no

40. If YES, what type of farmers' cooperative is it?

☐ Group savings ☐ Training

☐ Bulk input buying

41. Do you have crops insurance?

☐ Yes ☐ No

Section E: Perceived Drought Preparedness

42. On a scale of 1-5, how prepared do you feel for a severe drought? (1 = Not prepared, 5 = Fully prepared).

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

43. Rate the following drought preparedness measures in enhancing your drought preparedness (Likert Scale; 1=Not effective, 5= very effective).

Drought-resistance crops adoption: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Access to savings, loans/credits: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Livestock farming: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Conservation agriculture practices: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Early/late planting: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Drought Early warning: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Agriculture extension training: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Irrigation farming/ water harvesting: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Government/NGOs Support programs: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

44. what challenges do you face in preparing for drought

_____
_____
_____
_____

Section G: Recommendation and Suggestions

45 Are there any traditional/ local practices your household uses for drought management?

_____
_____

46. What additional support do you need to improve your drought preparedness?

_____
_____
_____
_____

47. what recommendation do you have for improving drought preparedness in your community?

_____
_____
_____
_____
_____
_____

Interviewer: _____
Date: ___/___/___

Appendix B: FOCUS GROUP DISCUSSION GUIDE

Focus Group Discussion (FGD) Guide

Assessing the Current Drought Preparedness Level Among Smallholder Farmers in Karonga District. A Case Study of T/A Kyungu.

Facilitator Date:

Location:

Participants:

Duration:

Introduction

This interview seeks to gather insights on drought preparedness. Your input will help to understand the broader community preparedness measures, level of your preparedness to drought shocks, and factors influencing drought resilience. This will therefore help in developing targeted interventions for enhancing resilience of this society.

Consent & Recordings

Confirmation of consent for recording (if applicable)

II. Themes Discussion

Theme 1: Drought Preparedness Strategies

1. What actions do you take to prepare for or cope with droughts? (Probe: crops, water storage, irrigation, etc.)
2. Which strategies work best? Why?
3. Are there traditional methods your community uses? If yes (mention)

4. Have you received training or resources (e.g., seeds, tools) to prepare for droughts? From whom?

5. How accessible are these programs?

Theme 2: Effectiveness of Measure

1. Can you share an example where a strategy helped your farm survive a drought?

2. What challenges do you face in implementing these strategies? (e.g., cost, labor, knowledge).

3. How do droughts typically affect your harvests, income, or food security?

4. Have some strategies failed? Why?

Theme 3: Barriers & Enablers.

1. What makes it hard to adopt drought-preparedness measures? (e.g., money, land, gender roles).

2. Do women/men face different challenges? How?

3. How do local leaders/NGOs/government assist with drought preparedness?

4. Are early warnings (e.g., weather forecasts) available and useful?

Recommendations

1. What support do you need to better prepare for droughts? (e.g., training, loans, infrastructure).

2. How can the community work together to build resilience?

Appendix C: KEY INFORMANT INTERVIEW CHECKLIST

KEY INFORMANT INTERVIEW CHECKLIS

Assessing the State of Drought Preparedness Among Smallholder Farmers in Karonga district. A Case Study of T/A Kyungu.

Interviewer:

Date

Location:

Participant:

Introduction

This interview seeks to gather insights on drought preparedness. Your input will help to understand the broader community preparedness measures and the factors influencing drought resilience.

Participants profile

1. What is your role in the community or institution?
2. How long have you been involved in agriculture/climate-related work here?

Section 1: Drought Preparedness Strategies

1. How can you describe drought conditions in Karonga District over the past 10 years?
1. What drought preparedness strategies are smallholder farmers in this area using?
2. Which strategies are most common? Why?
3. Are there traditional/local knowledge practices used to cope with drought?
4. What government/NGO programs exist to support drought preparedness here?

5. How accessible are these programs to farmers?

Section 2: Effectiveness of Measures

1. Which strategies do farmers report as most effective? Why?
2. Can you share examples of successful or failed interventions?
3. What limits the effectiveness of these strategies?
4. How do droughts typically impact crop yields and food security here?

Section 3: Adoption Factors

1. What factors hinder farmers from adopting drought preparedness measure?
2. How do extension services/climate advisories reach farmers?
3. Are there cultural beliefs affecting adoption?

Section 4: Recommendations

1. What actions are needed to enhance drought resilience here?
2. How can policies/programs better support farmers?
3. How can farmers be more involved in planning drought responses?
4. Is there anything else you'd like to share about drought preparedness here?

Thank You

Appendix D: Data Collection and Sampling Details

I. Sampling Framework

a. Taro Yamane's Formula for Calculating Sample Size

$n = \frac{N}{1+N(e^2)}$, where N= Total Population; n= sample size; e= error of margin (e= 0.14 of 86%)

$$n = \frac{23262}{1+23262(0.14\text{^}2)}$$

$$n = \frac{23262}{456.935}$$

$$n = 50.9$$

$$n = 50$$

Therefore, Sample size is 50

Table B1: Study Area Selected Villages and Households

Study AREA	EPA Name	Sampled Villages	Sampled Households
M	MPATA	Gwebe Nyirenda	5
		Mwafongo	5
		Kasote	5
		Mwanyongo	5
		Peter Mwangalaba	5
		Malema 3	5
		Mwangosi	5
	LUPEMBE	Kayuni	5
		Mwenelupembe	5
		Mwalughali	5

TOTAL	2	10	50

Table B2: Sampling Criteria for Household Survey

CRITERIA	Measurement
Farming Experience	At least 5 Years
Residency in the area	At least 5 Years

Appendix E: Disaster Preparedness Index Calculations

a) **DPI Formula;**

$$DPI = \sum_{i=1}^{n} (Wi * Si)$$

Where Wi= Weight of key indicator

Si = Score of sub-indicators(i) for each key indicator

n = Number of indicators

b) **Weights of Drought Preparedness Indicators For DPI**

These weights are average scores of each Key indicator by expert ratings of each indicator based on its importance in drought preparedness.

Table E1: weighted score of key preparedness indicators by Key Informants

Preparedness Indicator	DDRMO's Rating (%)	DDAS's Rating (%)	AEDO's_Lupembe EPA Rating (%)	AEDO's_Mpata EPA Rating (%)	Weight (%)
Drought Knowledge	15	10	15	5	11.25
Early Warning system	15	20	10	10	13.75
Water Conservation & Management	20	25	20	15	22.5
Drought-Resistant Crops Adoption	15	20	20	25	20

Conservation Agriculture Practices	20	15	15	20	17.5
Access to resources & Support	15	10	25	10	15

NOTE: These are expert input based on their Perception.

Table E2: Drought Preparedness Index Calculation for Respondent 1

Key Indicator	Score (Si)	Weighted Score (Wi)	DPI Score (Wi * Si)
Drought Knowledge	0.83	11.25	9.34
Early Warning Systems	0.00	13.75	0.00
Water Conservation	0.00	22.50	0.00
Drought Resistance Crops	1.00	20.00	20.00
Conservation Agriculture	0.50	17.50	8.75
Access to Resources/Support	0.00	15.00	0.00
		TOTAL DPI	38.09

c) SCORING RATIONALE

1) Drought Knowledge (11.25%):

- Aware of drought: Yes (1)
- Experienced drought: Yes (1)

- Severity: Moderate (0.5 on a 0–1 scale)
- Score: 1+1+0.5/3=0.83

2) Early Warning Systems (13.75%):

- Receives warnings: No (0).
- Score: 0.0

3) Water Conservation (22.5%):

- Rainwater harvesting: No (0).
- Irrigation during dry spells: No (0).
- Score: 0.00

4) Drought-Resistant Crops (20%):

- Uses drought-resistant crops: Yes (1).
- Score: 1

5) Conservation Agriculture (17.5%):

- Practices used: 2/4 (Crop rotation, Mulching).
- Score: 2/4 = 0.5

6) Access to Resources & Support (15%):

- Savings/credit access: No (0).
- Government/NGO support: No (0).
- Score: 0

Therefore;

DPI= (0.83*11.25)+ (0.00*13.75)+(0.00*22.50)+(1.00*20.00)+(0.50*17.50)+(0.00*15.00)

= 9.34+0+0+20+8.75+0

=38.09

Respondent 1's Drought Preparedness Index (DPI) = 38.09%. This indicates low to moderate preparedness, with strengths in drought-resistant crops and conservation agriculture but significant gaps in water conservation and access to resources.