

THE EFFECTS AND COPING STRATEGIES TO DROUGHT OF RURAL SUBSISTANCE FARMERS: A CASE STUDY OF TA NGABU IN CHIKWAWA DISTRICT

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Dissertation submitted to Ndata School of Climate and Earth Sciences of the Malawi University of Science and Technology in partial fulfilment of the requirements for the Bachelor of Science degree in Disaster Risk Management

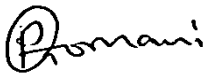
October, 2022

I, Evance Sinoya DRM/029/18 hereby declare that this dissertation for the partial fulfillment for the requirements of the Bachelor of Science in Disaster Risk Management is my own original work and that to the best of my knowledge this piece of work has not been previously submitted for assessment.

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ABSTRUCT

TA Ngabu in Chikwawa district is prone to several droughts. Drought disasters have caused extensive damages which affected many sectors of the society with agriculture in particular and this sets back development in the area. All farmers are exposed to drought but subsistence farmers are more vulnerable. Therefore, this study aimed at obtaining clear understanding of the effects and coping strategies of rural subsistent farmers to drought in this area. This was descriptive survey which employed qualitative approach. Drought conditions were assessed by analyzing rainfall data for the period of Twenty-Two years from 1996 to 2018, this monthly rainfall data was obtained from Ngabu Meteorological station. The mean and standard deviation of the rainfall was calculated and SPI analysis was used to identify dry spells and wet spells, a year was considered dry when the SPI value was less than 0 and it was considered wet when SPI value was greater than 0. Questionnaires were also administered to a sample from the study area, through interviews with households guided by the questions on the questionnaire. Focus group discussions, were used to obtain general overview of the effects of drought on subsistence farmers and also interviews with local traditional leaders. In selection of sample Multi-stage sampling technique was used given the large size of the study area. The first stage involved selecting two villages which were heavily affected by drought in the area, then purposive sampling procedure were used to select households from each of the sampled villages. Secondary information was also used to complement primary data. Primary collected data was captured and analyzed using SPSS to obtain frequency, cross-tab, as well as logistic regression analysis. The research has revealed extent to which subsistence farmers have been affected by the drought, in addition research has also found out some of coping strategies which rural subsistence farmers employed in times of drought which include food aid, drought resistance crop, remittances and irrigation.

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ACRONYMS/ ABBREVIATIONS

DCCCMS	Department of Climate Change and Meteorological Services
ISDR	International Strategy for Disaster risk Reduction
FEWS-NET	Famine Early Warning Systems Network
NGOs	Non-Governmental Organizations
SPI	Standardized Precipitation Index
WMO	World Meteorological Organization
WPF	World Food Program
IPCCC	International Panel Convention for Climate Change
SADC	South Africa Development Committee

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CHAPTER 1 INTRODUCTION

1.1. BACKGROUND

Several countries across the world and Malawi in particular have experienced increased frequency, severity and unpredictable drought effects on agriculture industry. Drought effects have become one of the major threats to agricultural production. International Strategy for Disaster Reduction ISDR (2002), defines drought as a recurring feature of the climate which normally takes place almost in every climatic regime. while Inter-governmental Panel on Climate Change (IPCC, 2007), define drought as naturally occurring phenomena that occur when rainfall in a specific region is lower than average for period of time.

Drought effects have posed a serious threat to food security. There is a general consensus among scientists, economists, and policy makers that the world is facing a serious long-term threat from climate change (Hansen et al, 2007). In addition, evidence from scientists reveals that the global mean annual temperature has significantly increased; and it is expected to further increase at a rate of 0.05°Cper decade, while rainfall has been erratic, with annual anomalies mostly below normal (Hulme et.al, 2000). Due to inadequate resources technologically and financially, developing countries are being negatively affected by drought effects

The effects of drought have some challenges attached to them and these affect the agricultural sector as well as agricultural sustainability in many developing countries like Malawi, which in turn affect the rural livelihoods of most communities. According to Slater et.al (2007), by the end of the 21st century, climate change will have a negative impact on agricultural production and hence on the efforts to reduce poverty. The past 30 years have been characterized by erratic rainfall patterns over Africa's sub-tropics and a significant decline in the amount of rainfall. This has resulted in droughts which have significantly affected agriculture and food production (Olaleye, 2010).

Agriculture is the major social-economic in southern Africa development community (SADC) region (Vilijeon, 2003), contributing between 4% and 27% of the region's gross domestic

product (GDP). The majority of the population in the region depend largely on agriculture for their primary sources of livelihood, employment and income (Preston, 2000). Smallholder farming is the most widely used method of agriculture farming in sub-Saharan Africa with majority of the rural poor depend on it for survival.

Malawi is the one of the southern Africa countries which depend much on agriculture, it is critical mainstay livelihood at the individual scale and as well as at national level (Govrnment, 2013). Agriculture is the pillar to country economy contributing a notable share of 39% of GDP and over 80% of the farmers are subsistence farmers living under poverty line making them more vulnerable to drought conditions (World Bank, 2010). Agriculture production in Malawi is heavily depend on climatic-sensitive rain-fed subsistence which highly vulnerable to recurrent weather extremes with drought in particular (World Bank, 2010).

Drought is critical problem for agriculture In Malawi, especially in southern region of Malawi due to high temperature and rainfall variability (PDNA, 2016). In Malawi several droughts occurred in 1983/1994, 1991/1992, 1996/1997, 1999/2001, 2004/05, 2007/08 and 2016/017 (Chabvungma, 2008). Resource-poor farmers whose productivity is highly threatened by frequency of droughts are affected most. For instance, it was estimated that during 2004/05, aggregate crop production was about 1,34 million tones, production was lower with about 26% percent compared to 34% harvest in 2002/03 (FAO, 2005).

The people in TA Ngabu in Chikwawa district southern region of Malawi derive their livelihoods from subsistence agriculture and other rural activities, but these livelihoods are being continuously threatened by climate change and drought in particular, Previous studies have been conducted to assess effects of drought on farmers and their coping mechanism, however they focused much on either country or district level and with few studies conducted to investigate effects and coping mechanism of farmers to drought in TA Ngabu. For instance, study carried by Famine Early Warning System Network (FEWS, 2018) which focused on country level, shows that, in Malawi farmers have been exposed to increased drought, tremendously affecting food security, while (Godfrey, 2008) also conducted the

similar study which targeted on district level of Mangochi and Nsanje and Chikwawa districts results shows that all farmers are actually affected by drought but small holders are more vulnerable. This could be a challenge to people in TA Ngabu considering that is one of the droughts prone area, where farmers are likely to suffer devasting effects of drought due to their negative strategies (mtilamtila, 2020). It is therefore against this background that this research seeks to investigate effects and coping strategies to drought of rural subsistent farmers in this area.

1.2. PROBLEM STATEMENT

Ngabu is one of the areas in Chikwawa that has been adversely affected by drought. There is rainfall variability that has negatively affected agriculture and livelihood of rural subsistence farmers. However, previous research, such as that by (Godfrey, 2000: PDNA, 2016 and Mtilamtila, 2020), mostly focused on the social-economic effects of drought on people as a whole, with little attention paid to the effects of drought on subsistence farmers and their coping mechanisms. As a result, the drought-related problems faced by subsistence farmers would go unresolved, which will lower agriculture productivity (Government,2013). However, challenges can be addressed if extent to which farmers are being affected by drought is known. Therefore, this study seeks to find out the effects and coping strategies of rural subsistence farmers to drought, this will help to find appropriate mitigation measures to alleviate adverse impacts of drought.

1.3 MAIN OBJECTIVE

The aim is to find out the effects and coping strategies of rural subsistent farmers to drought.

1.4 SPECIFIC OBJECTIVES

The specific objectives are

1. To assess drought conditions in TA Ngabu
2. To find out effects of drought on crop production to subsistence farmers
3. To find out coping strategies that rural subsistence farmers employed in times of drought

1.5. RESEARH QUETIONS

1. What are drought conditions in TA Ngabu

2. What are effects of drought on crop production to rural subsistence farmers?

3. What are strategies being taken by subsistence farmers in TA Ngabu to cope with drought

1.6 SIGNIFICANCE OF THE STUDY

The livelihoods of the subsistence farmers are expected to improve through knowledge and recommendations that have been put in this study. Findings of this Research can also help government and NGOs and other stakeholders to strategize on preparedness and prevention activities since the research has revealed the extent to which drought affects farmers. results of this study also can help government to provide support to indigenous coping and adaptive strategies of subsistent farmers with wide range of institutional, policy and technological support. Research has also recommended some adaptive measures that could be taken up to mitigate the impact of drought. Furthermore, study will help government to achieve Malawi 2063 goals on agriculture and food security, as it will provide useful insights into the effects of change of drought conditions on agriculture productivity hence assessing mitigation policies. Research will also provide literature for future studies on effects, coping and adaption measures to drought impact.

CHAPTER 2- LITERATURE REVIEW

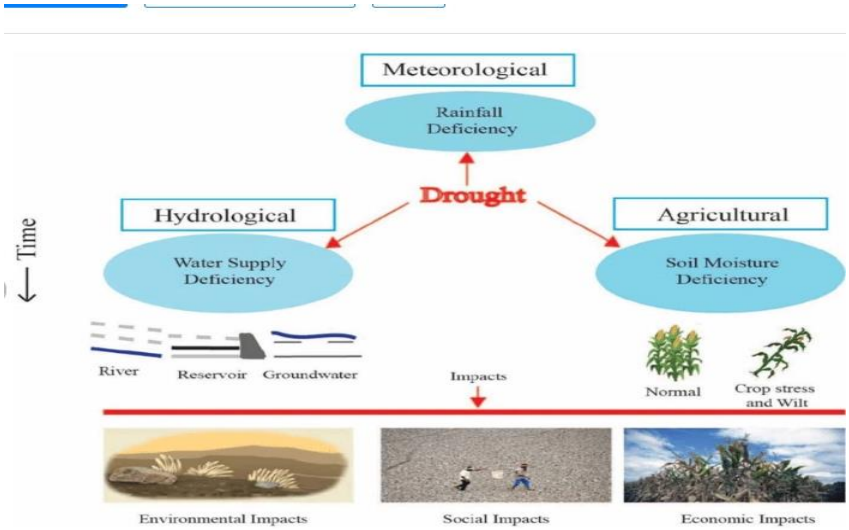
In this chapter, various literatures relevant to the topic of the research were reviewed. This includes the concept of drought, different definitions of drought, coping mechanisms, drought impacts and vulnerability. First chapter has articulated the concept of drought as well as definitions and laterally classification of the drought, second chapter will discuss effects of drought on agriculture in Malawi, final chapter will present coping strategies of rural subsistence farmers to drought.

2.1 DROUGHT CONCEPT

Drought is a normal, recurrent feature of climate change, although many numerously consider it a rare and random event. It occurs virtually in all areas, whatever their normal climate may be and its characteristics may be different from one region to another. Droughts has adverse social, economic and environmental impacts that can lead to overall reduction in food security and water sources (Wilhite, 2005). Moreover, Magotsi (2012) understands drought as the most common disaster which can undermine livelihoods and well-being despite the use of various mitigation mechanisms. They cause decline in crop yields resulting in reduction in income for farmers.

2.2 CLASSIFICATION OF DROUGHTS

The National Disaster Management Centre (NDMC) (2006) classified droughts into four perspectives namely Meteorological, Hydrological, Agricultural and socio-economic. Table below showing drought types and their duration



2.2.1. Meteorological drought

Meteorological drought is the type drought that is usually characterized by precipitation deficiency. Meteorological drought emanates from a variety of causes which differs from one region to another. Meteorological drought is associated with high temperatures; high winds, low relative humidity, greater sunshine and less cloud cover among others pave way for meteorological drought (NWS, 2006). Furthermore, reduced infiltration, runoff, deep percolation and ground water charge will also result in meteorological drought. Disturbances of the hydrological cycle will result in the meteorological drought

2.2.2. Hydrological drought

Mutasa (2012) understands hydrological drought as the reduction in rainfall on surface and sub-surface water resources which affects water reliant activities like irrigation, hydroelectricity generation, fishing and recreational activities. In Zimbabwe, for example in Chipinge hydrological droughts are common and they make through elevation as evidenced by seasonal rivers which holds water during the rainy season among others, therefore by so doing the surface water sources in Zimbabwe are therefore few and inadequate to support industrial and domestic uses and to supply sub surface water ,therefore one can note that hydrological droughts are highly probable basing on the case of Chipinge hydrological droughts has caused a lot of devastating problems in irrigation, recreation activities among others

2.2.3. Agricultural drought

Mutasa (2010) understands agricultural drought as the shortage of adequate water accessible for crops at any given stage of its development resulting in stunted growth, wilting and ultimately dwindled crop yield.

2.2.4. Socio-economic drought

this is sometimes referred to as famine drought and it usually occurs when the demand of the economic goods exceed supply as a result of weather-related shortfalls in water supply (Mutasa, 2010). He further argued that, socio-economic droughts occur as an aftermath of meteorological hydrological agricultural drought.

Figure 1 below indicates the progression of drought from one type to another, and the interrelationship between meteorological, agricultural, and hydrological drought, resulting in socioeconomic drought

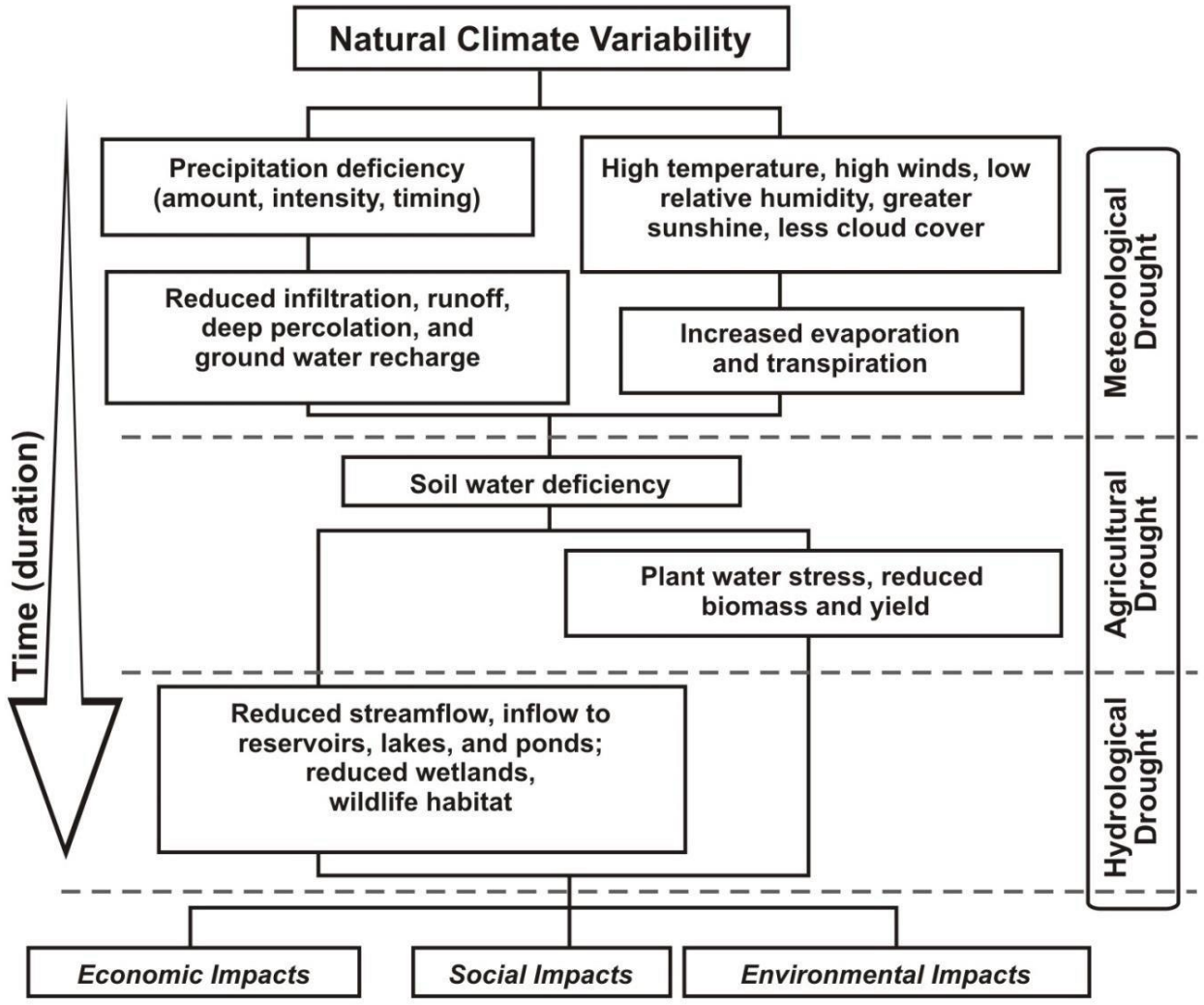


Figure 2.1. Progression of Drought: National Drought Mitigation Centre (NDMC)

Source: https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx

2.3 DROUGHT CONDTIONS IN MALAWI

Drought is the one of the recurrent phenomena, occurring at difference intensities in Malawi. In Malawi major drought was documented in agriculture years of 1983/1994, 1991/1992, 1996/1997, 1999/2001, 2004/05, 2007/08 and 2016/017 (Chabvungma, 2008).

Drought has great effects than other extreme weather events, drought is said to occur when rainfall is lower than 75% of the normal. Almost all droughts in Malawi are associated with El Nino conditions (PDNA, 2016). In Malawi drought is climatic hazard that has the most harmful effect on farmers, it causes reduction of yield leading to food insecurity and high cases of malnutrition among farmers (PDNA, 2016).

2.4 EFFECTS OF DROUGHT ON AGRICULTURE IN MALAWI

Agriculture in Malawi, plays major role much as food and economy is concerning (World Bank, 2010). Agriculture over the past decades have been affected by drought, for instance, it was estimated that during 2004/05, aggregate crop production was about 1, 34 million tones, production was lower with about 26% percent compared to 34% harvest in 2002/03 (FAO, 2005). IFPRI, (2009) further indicates that Malawi losses 4.6% of maize production in each year of drought, drought effects on agriculture affects farmers livelihood, increasing food insecurity and malnutrition (PDNA, 2016)

2.5 COPING STRATEGIES TO DROUGHT

2.5.1 coping stategies used in southern Africa

When there seems to be recurrence of a catastrophic event, people device some coping strategies. Wisner et.al, (2004) defines coping as ways that people act according to the confinements of existing resources and expectations in order to achieve various means. Mostly these are activities which are done by people in order for them to survive during the times of drought. Due to the severe impacts of drought on the lives of people, they have devised strategies to cope to the effects of drought. These strategies vary according to place and from time to time. Food Aid is used as a common drought coping strategy amongst many rural communities especially in Africa. Also, selling of livestock and engaging in food for work activities is also another coping and adapting strategy to drought (Olaleye, 2010)

In Zimbabwe, asset disposal has drastically increased over the years with people selling livestock such as cattle, goats and chicken. This results in some households getting income to buy the needed food supplies as well as to buy supplementary feeds for the remaining

livestock (Ndlovu, 2010). However, although selling of small livestock like chicken and goats was common to most households, this coping strategy does not adequately reduce vulnerability of households because of the little income they get from the market (Ndlovu, 2010).

Reduction in the number of meals taken per day is one of the coping strategies to drought in most rural communities. It is actually the most widely used strategy to cope with drought (Ndlovu, 2010). This strategy has a negative impact on the lives of people and forces some households not to consume their favorite types of food.

In Mozambique, farmers use wet lands for agriculture. Most farmers that are living in areas stricken by drought received training and technical support from the agricultural extension officers and some other organizations to improve their agricultural practices. Plots in low lying areas were allocated to some farmers so that they are able grow crops even in drought years. More so, these agricultural extension officers are encouraging farmers not to rely on rain for their agriculture but to use irrigation and pedestal pumps which the extension services will be offering (Bhavnani et.al, 2008). Thus, this coping strategy is deemed necessary for reducing the effects of drought on subsistent farmers in Mozambique.

2.5.2 coping strategies used in Malawi

In Malawi Cash transfers have been used as a one of the coping strategies to the vagaries of drought over past decades. This involves organization giving money to some more vulnerable groups (FAO, 2007). PDNA (2016) reports also revealed that farmers in some area's practices irrigation, mixed farming to cope up with effects of drought. (Chavunda, 2008) Also find out that in some drought prone areas, subsistence farmers plant drought resistant crops to cope the drought stress. Reduction in the number of meals taken per day is one of the coping strategies to drought in most rural communities that has been affected by drought (FAO, 2007), it is actually the most widely used strategy during drought times.

Food aid is another coping strategy to drought. Food aid is now one of the most common coping strategies especially in rural areas. Rural communities affected by drought in Malawi,

often get food aid from government programs such as engineered by the Ministry of agriculture. In this way, food aid has greatly benefited the most vulnerable households in Malawi (FAO, 2007). The program reduces hunger and starvation amongst households although there are challenges in accessing it.

Several coping strategies to drought are being used around the country as shown by the literature reviewed. There are some studies that have been done previously but they were not localized to TA Ngabu and this research seeks to close the gap by determining the effects and coping strategies in Ngabu.

CHAPTER 3: METHODOLOGY

INTRODUCTION

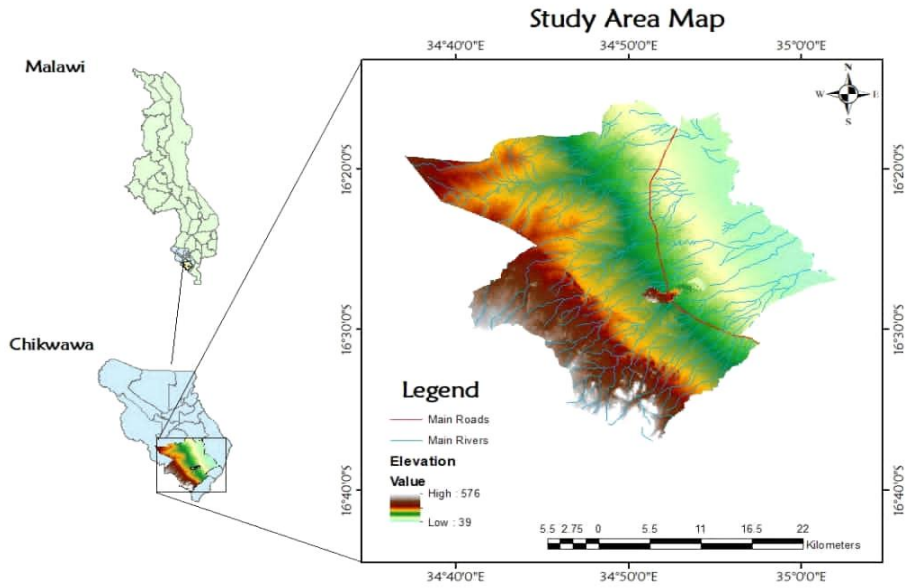
This chapter provided the research design and methodology which outlines how the research was conducted to find a way that have been identified in chapters one and two. It also bridges this chapter to chapter four of the research findings. This chapter also highlighted on the various research design and methodologies that were used in this study as well as justifying its selection and highlighting the targeted sample population. The chapter also looked at the sampling methods as well as the sampling techniques that the study used to make the research a success. This chapter again explored on the data collection procedures that were employed, provides an explanation on data analysis and presentations as well as highlighting research ethical consideration that were upheld by the research during the time of the research.

3.1. STUDY AREA

The study was conducted in Chikwawa district specifically in TA Ngabu, situated in southern part of Malawi. Its GPS coordinates are 16°, 10° ,00 .01" south and 34° 45° 00.00" east (GeoYP, 2021). Chikwawa district generally receive unreliable rainfall ranging from a minimum of 170mm to a maximum of about 967.6mm per annum, temperature is generally high with an average minimum about 27.6^{0}C in July and maximum of about 37.6^0 C Chikwawa district covers an area of 4,755km2 and has population of

356,682(National statistical office, 2018). Ngabu TA has been selected considering that is one of drought prone area in Chikwawa district.

Figure 2, shown map of study area.



3.1. RESEARCH DESIGN

This descriptive survey design, this is type of research design that aims to obtain information to systematically describe a phenomenon or situation (Phoenix, 2009) . The study used the descriptive survey deign which allows multiple data collection and it provide insight in answering the research questions, this design also helps others to better understand for the need of research if problem is not clear (Phoenix, 2009). This research will employ both qualitative and quantitative approach.

3.2. QUALITATIVE METHODOLOGY

Qualitative approach has been be used to capture data concerning people's own opinions and perceptions on droughts, their impacts as well as the effectiveness of the drought mitigation strategies. Hence the qualitative research method has dominated in this study because it suited the nature of the research and it also provides the room for interpretive

and descriptive technique which helped to interpret and describe the behavior of people towards management of droughts in TA Ngabu. The research analyzed, interpreted and described observations and specifically the qualitative methodology anchored with interviews as well as observations. The following research instruments were used in order to achieve the objectives and to satisfy the research questions, Household questionnaire, In-depth interviews, Focus groups discussions and document review.

3.3 QUANTINTATIVE APPROACH

Quantitative research is a process that allows the process of collecting and analyzing data. It can be used to find patterns and averages, make predictions, test causal relationship and generalize results. This has been used to cater first specific objective.

3.3. SAMPLING METHODS

To get the individual respondents, a multi-stage sampling technique was used. Given the large size of the study area, the first stage involved selecting three villages that are more vulnerable to drought and that they suffer adverse effects of drought. This was followed by Purposive sampling technique which was used to select households from the sampled villages. Purposive technique was employed in this study because it helped to squeeze a lot information since only best suited villages that have adversary suffer effects of drought was selected and that they met basic criteria like practiced agriculture (Woodbury, 2010).

3.3.1 SAMPLE SIZE

The size of the sample was calculated using $n = Z^2\ (P)\ (1 - P)/e^2$ where **n** represents sample size, **Z** is the value of a normally distributed standard variant which for a 85% confidence interval takes on the value of 1.96. since the value of **P** is not known 0.5 was used; **e** is the allowable error or the desired level of accuracy the (Yamane's 1967).

$$n = Z^2\ (P)\ (1 - P)/e^2$$

$$n = [(0.85)^2(0.5)\ (1\text{-}0.6)]/\ (0.05)^2$$

$$n = 40$$

n=40 (to the nearest whole number)

Therefore, 40 subjects will be involved in the study using randomly sampling and interviews.

3.4 TARGET POPULATION

Small-scale farmers were basically targeted for this survey irrespective of their gender. These were crop famers. This study consisted of 40 farming households. For the purpose of this study, a household is a group of people in a housing unit living together as a family and sharing the same kitchen. The household head represented his or her household members as the respondent for the survey. The head of the household is defined as the person making major economic, social and household decisions Irrespective of age and gender

3.5. DATA COLLECTION

To achieve first objective secondary monthly precipitation data for a period of 22 years (1996-2018), was collected from Ngabu meteorological weather station. For specific objective two and three data was collected through interviews using questionnaire, and focus group discussion and observations and interviews with help of questionnaire consisted of open-end questions

3.5.1. HOUSEHOLD QUESTIONNAIRE

This was the main tool for the research. The household questionnaire aimed at collecting data from a significant number of households in a structured way, according to specific questions in a way that will allow statistical analysis. The questions comprised of closed and open-ended to cater for both quantitative and qualitative needs. A total of 40 questionnaires were evenly distributed amongst households and responses were returned. Questionnaires were chosen because they are vital when it comes to gathering information on attitudes and opinions of the respondents. The questionnaires also managed to give an insight to some of the questions that could not be answered by the respondents. The open-ended questions allowed gave a room for probing for more insights on the effectiveness of

the coping and adaptation strategies to drought currently being used by the respondents. Closed ended question could not leave room for more insights since the respondent was to answer only what was asked.

3.5.2. FOCUS GROUP DISCUSSIONS (FGDS)

FGDs are informal, guided discussions about a particular topic. This was a better method of getting indications of how common an idea, value or behavior is likely to be in the community. FGD's with about 10-15 selected ordinary community members with similar backgrounds were held to gather opinions on the effects of drought on rural subsistent farmers in the area. Each group had one facilitator. The groups were deliberately kept small so that participants do not feel intimidated and are able to express opinions freely. This method also borrows aspects of dreams/visioning to allow respondents to share their views and aspirations, particularly in relation to their resilience (Woodhill, 2002).

3.5.3. IN-DEPTH INTERVIEWS

These are sometimes referred to as semi-structured interviews, the in-depth interviews comprise of open-ended questions to individuals or institutions selected basing on their knowledge and experience on the subject. These were used to gain information, feelings, motives and beliefs from the key informants. The interviews were guided by a series of broad, instead of pre-determined, questions that permitted new questions to feature in the discussions. The interviews also encourage the respondents to express views at length and this aided in developing in-depth understanding of qualitative issues associated with this research (Peninsula Research and Development Support Unit, 2009)

3.6. DATA ANALYIS AND PRESENTATION

To assess drought condition from collected secondary data, Standardized Precipitation Index (SPI) was used since it considers precipitation which is main indicator of drought. SPI may be defined as a coefficient of variation specifically the difference between annual precipitation and long-term mean precipitation (in this case twenty-two years) divided by the standard deviation for that time period (McKee et al., 1993). To calculate SPI values

drought indices calculator 1.7 was used since it is simple and recommended. Using the Standardized Precipitation Index (SPI), a drought is identified when the SPI returns a negative value i.e. SP<0 and no drought when SPI returns positive SPI>0. Mathematically, SPI is represented as

$$\text{SPI} = \frac{Xi - Xm}{Sd}$$

Where xi refer to annual mean precipitation, xm is average precipitation from metrological station where data shall be collected

In table 1 below is a classification system as proposed by McKee E (1993) linking SPI values with drought intensities that is used to categories droughts

SPI VALUE	CATEGORY
0 to -0.99	Mild drought
-1.00 to -1.49	Moderate drought
-1.50 to -1.99	Severe drought
-2 or less	Extreme drought

3.6.1. Missing Values

Missing rainfall data was estimated using the arithmetic method mathematically given as;

$$\bar{X} = \frac{1}{n}\sum n\ i{=}1\ Xi$$

Where n is total number of days in a month, Xi is daily rainfall and $\bar{X}$ is the average mean. This method involves replacing the missing values with the average value for a given rainfall station.

Data collected using questionnaires was coded using numbers for easy input into the computer software program SPSS. The coding system helped to quantify responses into percentages of the sample size. This also helps to see the popular responses in all the aspects

addressed by the questionnaire with respect to the set objectives. The study also used the thematic Analysis for the study's data presentation and analysis. Thematic analysis entails the presentation of data in a narrative or tabula, graphs, diagrams or charts form. The study also used simple narrative language and graphical presentations so that the results of the study would be easily understood by the audiences (Statistics Canada, 2009).

3.7. ETHICAL CONSDERATION

This is an important aspect of the research to ensure ethical principles are taken care of. Such ethics issues include confidentiality, protection from harm, privacy, consent or assent for pictures. The respect for the participants was greatly emphasized, to this effect, the following guidelines was adhered to during data collection, no one was forced to participate in the study against his/her will, no monitory allowances was promised to the respondents, and Confidentiality of all information gathered from the participants was assured to be approved and reviewed by MUST research committee.

3.7. LIMITATIONS OF THE STUDY

Luck of experience was main challenge considering that project was done by undergraduate, funds to finance the project, time, and illiterate participants were also some of challenges encountered

4.0 CHAPTER FOUR RESULTS AND DISCUSSIONS

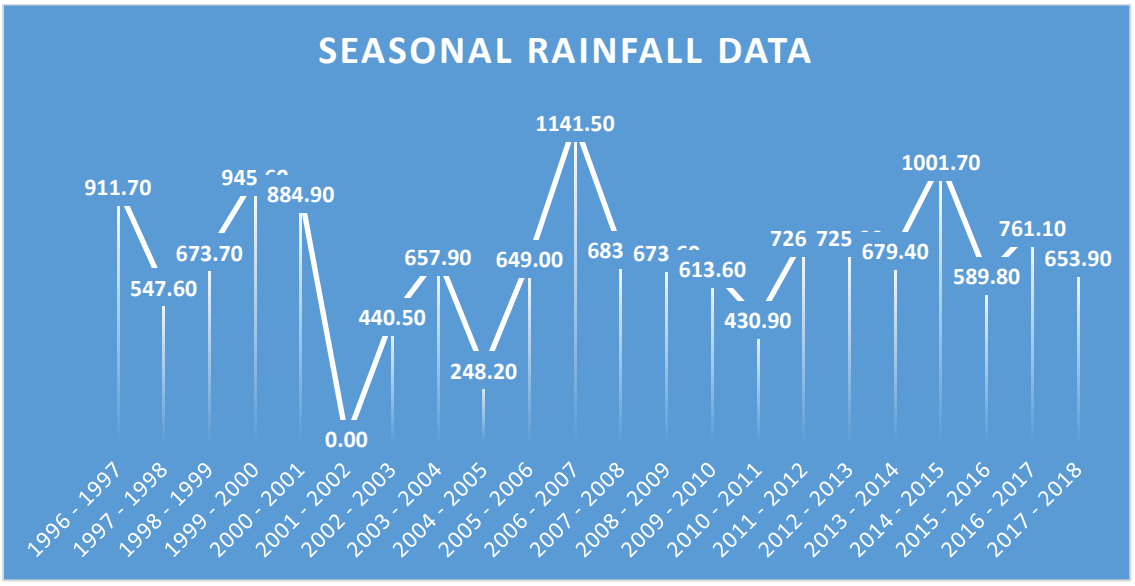
4.1. INTRODUCTION

This chapter looks at the data analysis and data presentation. This is done with the aid of graphs, tables and pie charts for easy interpretation of the data. The data was generated from the interviews, FGDs and household questionnaires. The findings are assessed against the research objectives. This is vital because it also helps in identifying the gaps left out, thus, building a strong base for conclusion of the research as well as the recommendations

4.2 THE STANDARDISED PRECIPITAION INDEX (SPI) ANALYSIS

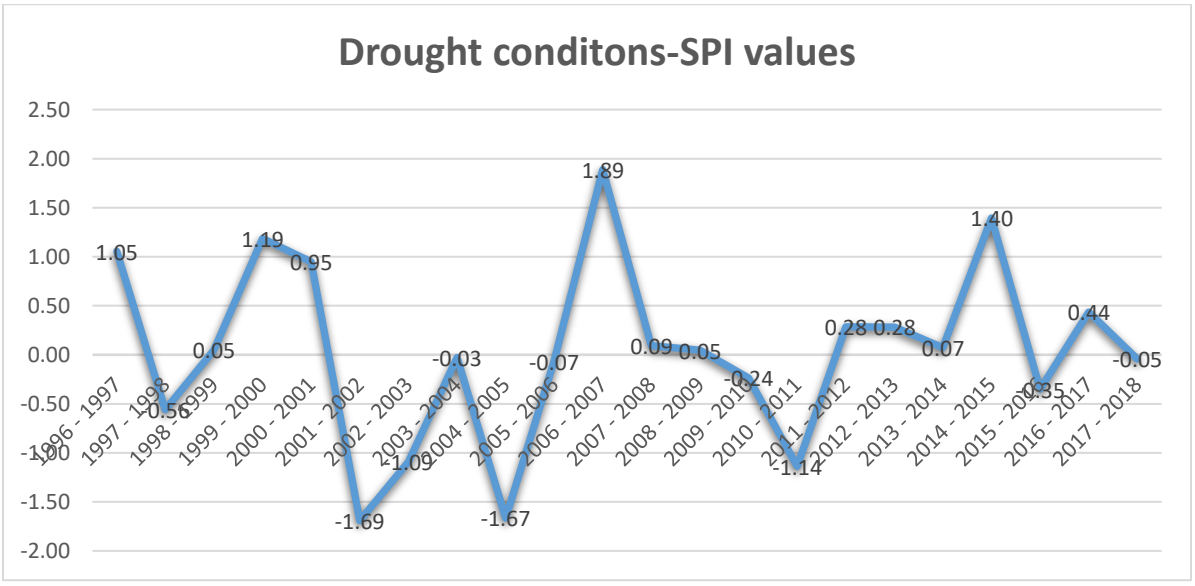
From the SPI analysis on the rainfall data for Ngabu meteorological station during the twenty-Two years under study, the following observations were made. Out of the twenty-Two years of rainfall season which were studied, 10 of those years experienced drought scenarios meaning that the SPI values were below normal or less than zero.

6-month SPI: (period: NOV-APRI)	Rain seasons	
Year	SPI values	seasonal rainfall data
1996 – 1997	1.05	911.70
1997 – 1998	-0.56	547.60
1998 – 1999	0.05	673.70
1999 - 2000	1.19	945.60
2000 - 2001	0.95	884.90
2001 - 2002	-1.69	0.00
2002 - 2003	-1.09	440.50
2003 - 2004	-0.03	657.90
2004 - 2005	-1.67	248.20
2005 - 2006	-0.07	649.00
2006 - 2007	1.89	1141.50
2007 - 2008	0.09	683.90
2008 - 2009	0.05	673.60
2009 - 2010	-0.24	613.60
2010 - 2011	-1.14	430.90
2011 - 2012	0.28	726.20
2012 - 2013	0.28	725.90
2013 - 2014	0.07	679.40
2014 - 2015	1.40	1001.70
2015 - 2016	-0.35	589.80
2016 - 2017	0.44	761.10
2017 - 2018	-0.05	653.90



This figure 3, above is showing the trend of seasonal rainfall data in TA Ngabu, from November to April of the other year.

Figure 4, below is showing trend of drought conditions in TA ngabu



Looking at the results in figure 3 above and categorizing the SPI values in terms of drought categories, it has shown that, out those twenty-Two drought cases which were identified in

the study, there were no extreme drought categories which were experienced in TA ngabu. 5 of those drought scenarios were under mild drought category, while three were under moderate conditions and the remaining two were under severe drought category. The following table gives a summary of the SPI values, drought categories and the years or rainfall seasons in which these drought scenarios were experienced in TA ngabu during the twenty-two years under study.

Table 3: Drought categories experienced in TA Ngabu for the past 22 years

SPI VALUES	DROUGHT CATEGORY	YEARS OF SEASONS EXPERIENCED DROUGHT
0 to -0.99	Mild drought	1997-1998, 2005-2006, 2009-2010, 2015-2016, 2017-2018
-1.00 to -1.49	Moderate drought	2002-2003, 2003-2004, 2010-2011,
-1.50 to -1.99	Severe drought	2001-2002, 2004-2005

4.3. ANALYSIS OF QUESTIONAIRES

40 households were selected from three villages of TA ngabu for the purpose of data collection. Villages were selected on basis that are more vulnerable to drought and that they suffer adverse effects of drought, to get these three villages researcher was assisted by district disaster risk reduction coordinator where he elicited Ngabu, Malekeza and kasudzu villages respectively as more prone villages to drought. Researcher further consulted office of TA Ngabu on population of those elicited villages and this data acted as basis on selected number of households. As previous started that the study covers 40 households, 16 from Ngabu, 13 from malekeza and 11 from kasudzu village. All the thirty-five questionnaires

were completed and returned, although some questions were not answered. This was because some questions were not applicable to certain farmers. Below is analysis of questionnaire data.

4.3.0. SECTION A: DEMOGRAPHIC DATA.

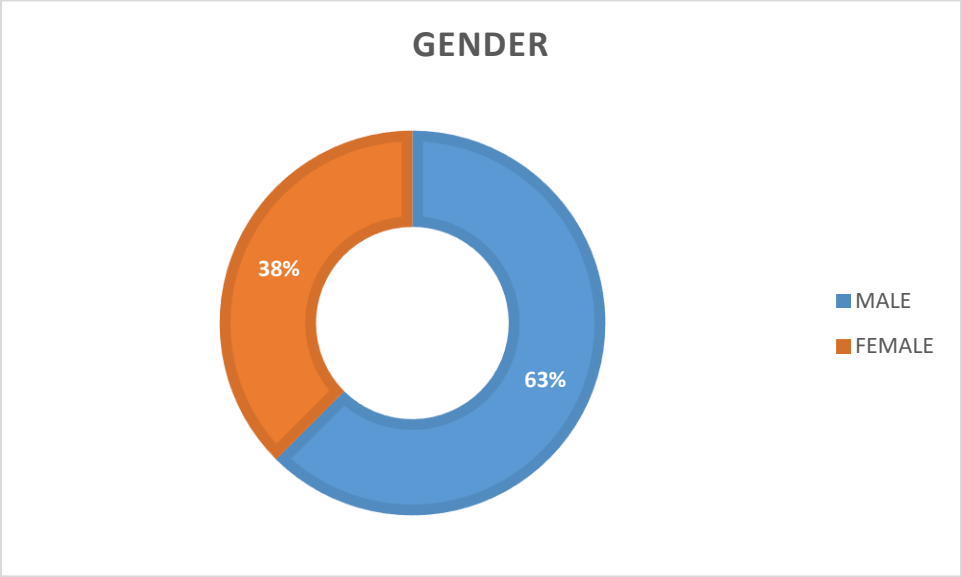
Demographics present a picture of the sample used in the research and how it represents the different characteristics of the population. Demographic information provides data regarding research participants and necessary for determination of whether the individuals in particular study are a representative sample of the target population for generalization purpose. Demographic data like age, gender, level of education as well as the marital status of respondents.

4.3.1. GENDER

The distribution of respondents according to gender was also considered. The sample shows that 28% of the interviewed people were men and 63% of the respondents were women. Research found that low population of male respondents in this area is because, men tend to migrate to towns or nearby places in search for jobs to support the families. This might be caused by the fact that their usual means of life is threatened by drought, hence migrate in search of greener pastures to support their families.

Table 4.1 Gender

Category	Frequency	Percentage
Male	15	38%
Females	25	63%
Total	40	100%

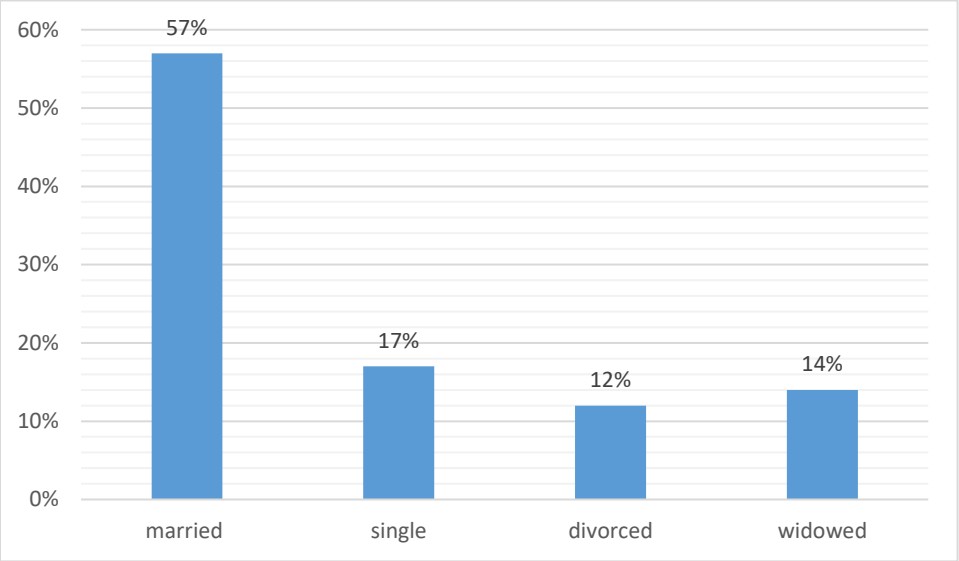


As shown in the figure above they were more males than females. 38% respondents were males and 63% were females

4.3.2. MARTIAL STUTAS

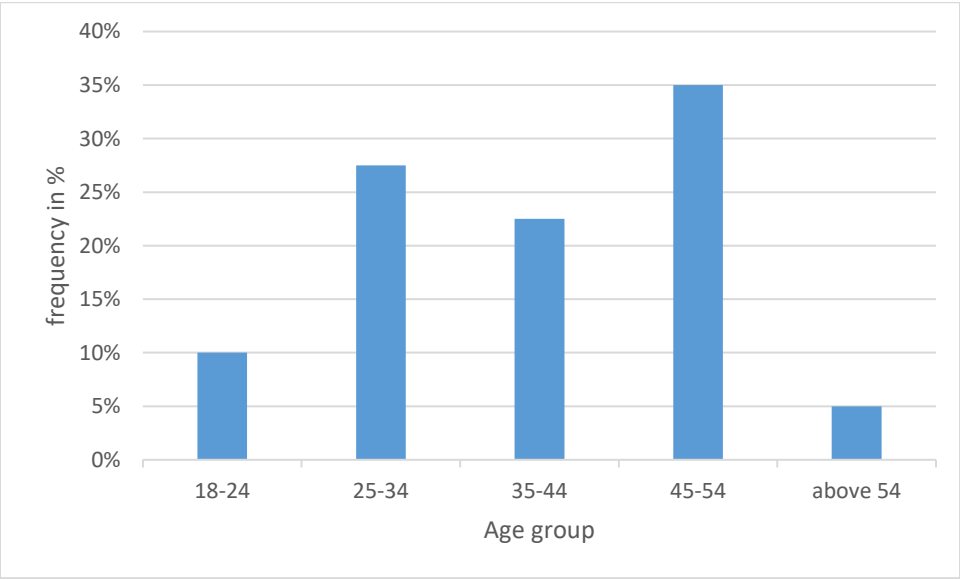
Table 4.2 marital status

Category	Frequency	Percentage
Married	20	57 %
Divorced	6	17 %
Single	4	12%
Widowed	5	14%



The study found out that the majority of the respondents in TA Ngabu were married 57%, 14% were widowed and then 17% of them were single of which majority of them were females and lastly the divorced constituted 12% of the respondents. There is high percentages of windowed, this is a cause for concern because the widows are usually one of the vulnerable groups in communities who need to be assisted to cope with catastrophes like drought.

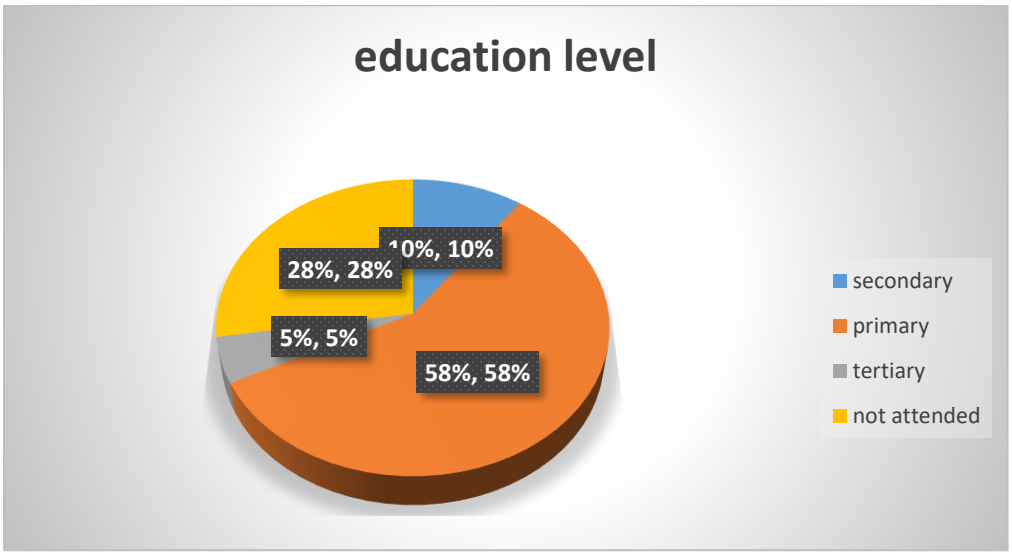
4.3.3. AGE GROUP



Most of the respondents of this study were between the ages of 45-54(constituting 35% of the total respondents). The age group of 25-34 years has 28%, 35-44 years consists of 23%, e age group of 18-24 constitute 10% and lastly the age group of 54 years and above has 5% each. This clearly shows that information was obtained from key district informants who have useful and first-hand information.

The probable reason why large number of the respondents (35%) were older than 41 years can be attributed to rural urban migration which is predominant among age groups younger than 30 years. This age group is highly mobile as the move from one place to another looking for work or a better school.

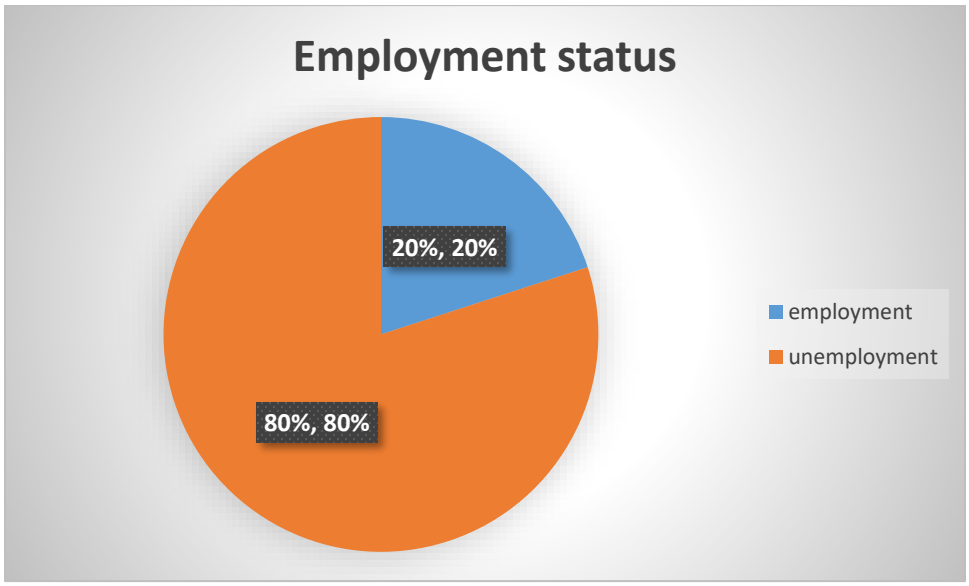
4.3.4 LEVEL OF EDUCATION



From the results 58% have reached primary education and 28% have not attended any school, 5% of the respondents have reached tertiary education and lastly 10% of the respondents did attend secondary school. There is high number of those attended primary education and of those who did not attended school than those of secondary and tertiary education, this shows that the greater percentage of the community is uneducated. This is a risk in the fact that they may fail to interpret instructions on inputs for farming,

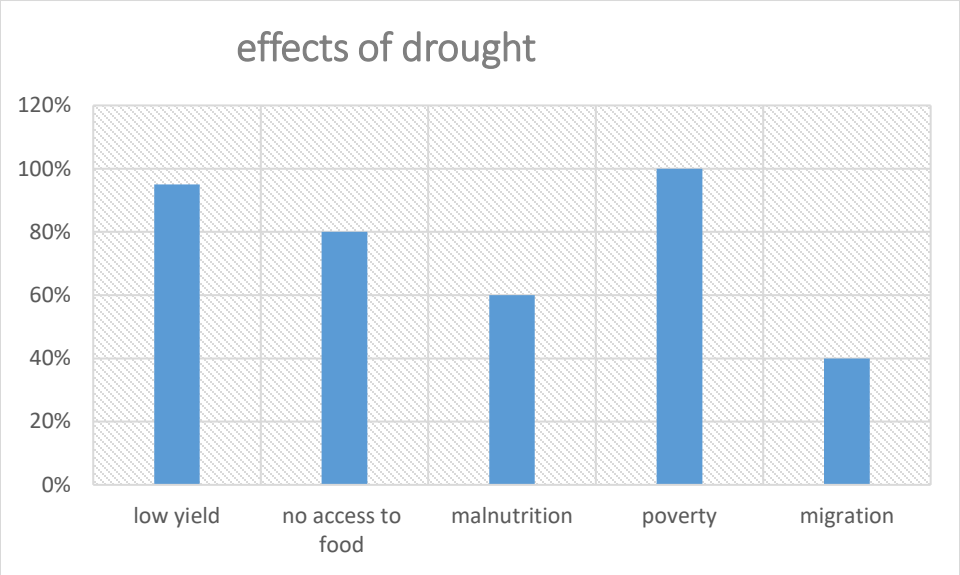
understanding early warning messages for drought may be a challenge to them. All these make the greater part of the community be at risk of drought because of lack of education

4.3.5. EMPLOYMENT STATUS



The study has found out that of all the respondents 80% are unemployed and only 20% of them are employed. Therefore, due to the large number of unemployment the study has noticed that the households are likely to be more vulnerable to drought since the majority of them are not employed and as a result most households rely on food aid as a drought coping strategy to cope with drought and food aid is mostly received from the government, well-wishers and other NGOS.

4.4. EFFECTS OF DROUGHT ON CROPS TO RURAL SUBSITENCE FARMERS



When drought strikes there is likely to be a partial or total crops failure during periods of severe drought. First is low yield, the analysis of yields of households show that 95% did not have enough for their own use and only 5% said they had enough food during drought. This shows that there is high risk of low yields caused by drought in the area and this affects their livelihoods because 85% of the households indicated that their main source of livelihood is farming. This is supported by other authors when they argue that climate change is expected to increase the frequency and severity of droughts, worsening the likelihood of poor yields, crop failure and livestock mortality (PDNA, 2007).

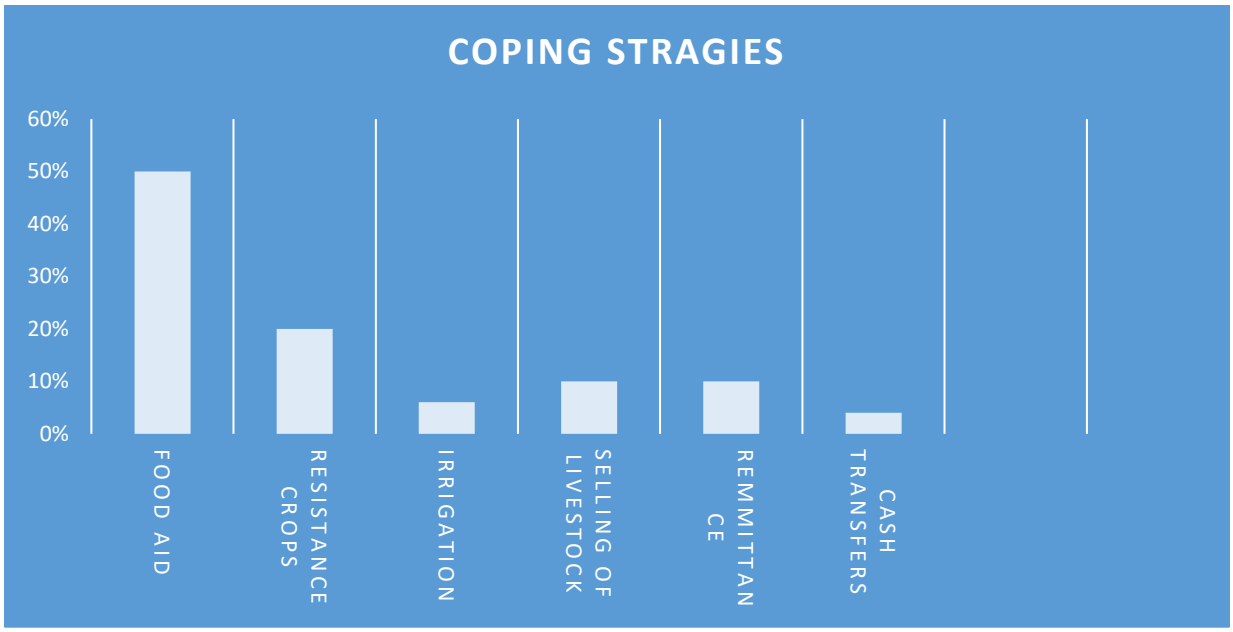
Graphs above also shows 80% percent of the farmers said that they did not have access to good food during severe drought period due to crop failure while 20% percent said they had access as they were practiced min and hand irrigation. However, most of the farmers claimed reduction in food quantity during years of severe drought which in turns affects their diet rendering people to malnutrition.

Research also found that 60% percent of the respondents' family members fall sick during the drought period, 40% percent of the respondents claimed none of their family members fall sick during the same period. Out of the farmers that members of their household fell sick during the drought period, 50% percent of them claimed that the sickness was due to malnutrition as a result of reduction of number of meals per day due to drought.

High poverty rate is another effects study has found, results from analysis of employment status indicated 80% of the population are not employed they depend on rain-fed

agriculture as their source of livelihood which is adversely affected by catastrophic events liked drought. Respondents also emphasize that during period of severe drought, drought devasted food supplies and dry up water sources. Withered crops and starving animals thus destroying families' livelihood, leading to increased poverty

4.5 DROUGHT COPING STRATEGIES EMPLOYED IN TA NGABU



The study has found out that 50% of the households during drought derived its livelihood from food aid, 20% from drought resistant crops, 10% from cash remittances, 6% from

hand irrigation and lastly 10% of the households derived their livelihood from selling livestock

4.5.1 FOOD AID AND CASH TRANSFERS

During an interview, all village heads from three villages emphasized Food aid have been the most or at the core of drought coping strategies in communities which are prone to drought. they also responded that government and other organizations like red cross, Care International have been playing a leading role in helping communities in in TA ngabu to cope with drought. However, study has also found that food aid is mostly received from the Government, World Vision, Care, Red Cross and other NGOS. Households also relied on hand irrigation as shown in the diagram above. The study also notes that those who rely on irrigation are those who are cited near Save River. However, the study found out that the locals generally do not directly benefit from the irrigation schemes that clearly explains the least number of households using this strategy. However, there is need to note that farmers really benefit from irrigation since food aid may result to creation of dependency syndrome in the community.

4.5.2. DROUGHT RESISTANCE CROPS

The study also found that growing of drought resistance crops is another drought coping mechanism employed in TA ngabu and it constituted 20%. During an interview some households responded that, during the times of drought they embark on growing drought resistant crops such as sorghum. They further responded that they plant the drought resistant crops earlier on before the heavy rains so for them to be able to sustain for a long time. They also indicated that they diversified their crops like growing ground nuts as well as cash crops e.g cotton, sugar cane, sweat potatoes and rice in which they claim to use them as their source of income. This is also nailed by Godfry (2002) who nailed that to improve food security in food deficit areas, the production of drought resistance crops as sorghum, millet, needs to be encouraged. However, most of the responses from households indicated that the distribution of most agricultural inputs is mostly affected by political controversies with those with higher political ranks looting most of the staff at the expense of the majority. Hence most farmers had to choose from what was available and mostly

maize had been the seed of choice by most farmers. Moreover, the study also found out that NGOs like world vision, red cross has been providing inputs to communities that are vulnerable to drought. However, the biggest challenge remains the sustainability of the inputs provided by NGOs as well as their lack of continuity.

4.5.3 SELLING OF LIVESTOCK

The study also indicated that, selling of livestock is another strategy that the households employ in order to cope with drought. At an interview the village head of Ngabu highlighted that during the times of drought the community experience a large number of livestock deaths therefore people are forced to sale their livestock at a lower price and barter trade as to one cattle being exchanged with some bags of maize, which is not profitable. Hence this clearly indicated that selling of livestock have been used as a source of food and income for households living in areas which are prone to drought.

4.5.4 CASH REMMITTENCES

Households also responded that, during the times of drought they rely on remittances from their relatives, friends in order to meet their daily needs in times of drought. These remittances were mainly sent by relatives and family who migrated in neighboring places and countries in order to help their families to cope with drought. During an interview the some of the respondents revealed that, as a result of drought there is a large number of school drop outs especially from girl child where by the parents may force into marriage to earn money for them to buy food.

in additional to above strategies some households also responded that they reduced meal portions, often skip some meals and as a result adult skip some meals so that children can eat, eating wild fruits the whole day, use of available resources, sending of other family members to other relatives, cash remittances, selling of livestock's, barter exchange as well as migration to neighboring countries looking for employment to support the family back home, are some of coping strategies mentioned by farmers.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter summarizes the findings of this research, conclusions and appropriate recommendations were also made.

5.2. CONCLUSSION

The study has found that people in the region are more vulnerable to drought ranging from mild to severe droughts with adverse impacts on rural subsistence farmers. Impacts include, reducing crop yield, malnutrition, increasing rate of poverty, no access to good foods and forced migration. Although this could be attributed to several factors Amid these drought impacts, however, residents still have other ways to cope. These strategies include food aid, reduction in number of meals, hand irrigation, sale of livestock, and cultivation of drought-resistant crops on the other hand, the effectiveness of these survival and adaptation strategies has been widely questioned.

Most of the people in the study area greatly rely on food aid for survival. The food aid is given to them by NGOs like World Vision and WFP and government. This has created dependency syndrome amongst the local people. Furthermore, there are some strategies which include food For Asset, diversification of livelihoods and conservation agriculture which the people use to cope and adapt to drought. The drought coping and adaptation strategies have significantly failed to adequately address the full needs of people during the drought episodes. The strategies are only successful when being practiced for a short term. They do not address the long-term impacts of drought. Additionally, the strategies do not also build a concrete base for community resilience.

5.4 RECOMMENDATIONS

5.4.1 Recommendation in terms of Early Warning System According to 2002/03 annual reports of National Department of Agriculture, only a handful of extension workers have been trained in terms of weather data interpretation to help with early warning system during drought as at that period, it was still evident that not so many extension workers

were working in this regard, this was reflected in the percentage of farmers that were aware of drought incidence before its onset in the study area, there is need to intensify such projects. Among other stake holders such as manufacturers of agricultural equipment's, utilities and various inputs, farmers are one of the most important end users of early warning systems. As such, information about anticipated weather or climate changes should be communicated to them on time so as to be able to strategies ahead of such impending disasters in order to reduce their level of vulnerability to such disasters. In the light of this, all available medium of communication and awareness should be employed to convey information about any form of disaster.

5.4.2 Recommendation in terms of farmers' preparedness Most farmers claimed that they were not prepared for drought because of lack of information about impending disasters, while others claimed that they did not know what to do to prepare even if they have access to such information. This research made it known that with farmers' financial status, level of education and lack of valuable information, it is impossible for them to manage and cope with drought without external help or assistance from governments and agencies at all levels. Making available useful information about an impending drought may not be enough; there is also the need to go a step further by providing information about how to cope with such disaster.

5.4.3 The government and NGOs should advocate for water harnessing projects in the area so that irrigation projects in the area will be revived and reduce food aid programe which creates dependency syndrome

5.4.4 More Drought Resistant Crops, the promotion of drought resistant crops can also improve the livelihood of communal farmers since they can still harvest surplus for sale even if the rainfall is below normal. When they harvest they can sell and use the income to buy the food of their choice. The agricultural inputs programmes run by the government and NGOs should supply households with the small grains and other cash crops which are drought resistant like cotton and sunflower to ease the problem of low harvests. The

agricultural inputs programmes should also be followed by monitoring programmes to see if communities are really implementing the small grains programme.

5.4.5 Diversification of Livelihoods Communities need to be exposed to other forms of livelihood which can assist in the event that yields from the fields are not sufficient. This can be promoted through art and culture at school so that children graduating into adults will have skills to generate an income by using their talents. Crafts, weaving and fruit harvesting sare among the forms of livelihood which are carried out in other areas.

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APPENDICIES

FIGURE 1 and 2 shows secondary source image of food aid programme in TA ngabu



Sources: https://www.google.com/search?sxsrf=ALiCzsaIFSIGFp4RiCIsKGQxsvzxXiflbA: