

**DROUGHT COPING STRATEGIES OF PEASANT FARMERS IN WORUBOGU: A FARMING COMMUNITY
IN TOLON DISTRICT OF NORTHERN GHANA.**



**A RESEARCH PROJECT SUBMITTED TO VAN HALL LARENSTEIN UNIVERSITY OF APPLIED SCIENCES IN
PARTIAL FULFILMENT OF THE REQUIREMENT FOR MASTER OF SCIENCE IN MANAGEMENT OF
DEVELOPMENT.**

BY

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DIDICATION:

I humbly want to dedicate this work to my late mother Mambora Manayam and to my daughter Verena Mambora and her mother Adam Samira for all the support and encouragement they gave to me during my studies.

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List of Abbreviations

SDGs	Sustainable Development Goals
MoFA	Ministry of Food and Agriculture
DDA	District Director of Agriculture
DCE	District Chief Executive
MTRP	Medium Term Report Plan
NGOs	Non-Governmental Organizations
FAO	Food and Agriculture Organisation
WFP	World Food Programme
UNEP	United Nations Environmental Programme
IPCC	Intergovernmental Panel on Climate Change

Abstract:

The impact of drought on developing country like Ghana cannot be underestimated most importantly if Ghana as nation wants to achieve the Sustainable Development Goals 1 and 2 which are aimed at reducing extreme hunger and poverty by 2030. The study was aimed at identifying the coping strategies used by farmers in Worubogu to respond to drought in the Tolon district of Northern of Ghana. There was lack of knowledge as to how farming households were coping to reduce drought vulnerability. Hence the study was aimed at identifying their coping strategies and why they used the kind of coping strategies in the area. The findings is to be used by government through the ministry of food and agriculture (MoFA) to help design programmes and policies to help reduce drought vulnerability in of farmers. Findings showed that farmers were using different coping strategies to mitigate drought impact. These coping strategies ranged from off-farm coping strategies and on-farm coping strategies. On-farm coping strategies identified were mixed cropping, late planting etc whereas Off-farm coping strategies identified were migration and other income generating activities in Worubogu community. Data was collected from farmers using qualitative research methods like interviews, observations and focus group discussions.

CHAPTER 1

INTRODUCTION

1.0 Background:

The northern region is located in the savanna ecological zone. Majority of the people are engaged in agriculture as peasant or small scale farmers. However, the region for the past two decades has persistently been experiencing a reduction in its rainfall pattern with the worst vulnerable victims been farmers. According to Dietz et al (2004), Northern Ghana has a uni-modal rainfall season making it vulnerable to drought risk as compare to southern Ghana which is having two raining season within the year. Agriculture is the main livelihood providing food and income for many rural folks in Ghana. Impacts of drought therefore is felt very much in rural farming communities if there is reduction in the yields of major crops especially that of maize as this has the propensity to worsen poverty and also derail their food security (Devereux, 2000)

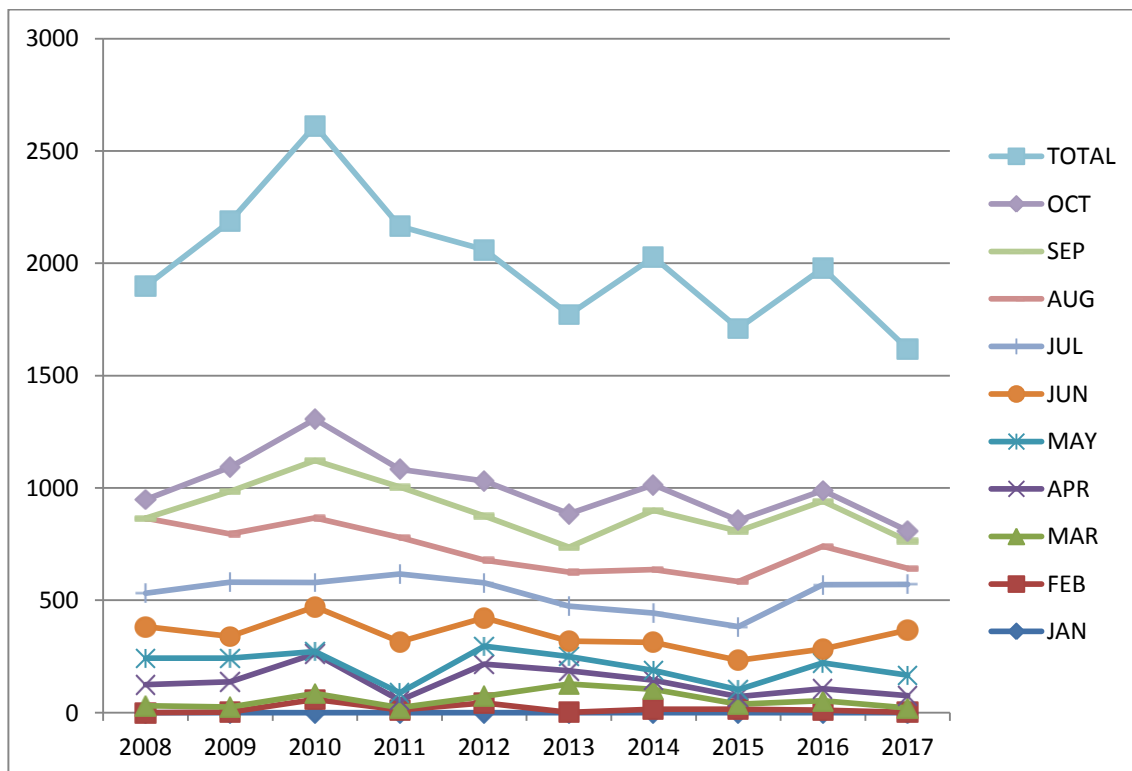
FAO (1997) categorically stated that communities that have lived under drought situations for longer periods have developed local coping strategies to lessen the impacts of drought. (FAO, 1997) FOA further cited a situation in South Africa where communities have developed effective response to alleviate food shortages caused by drought. This is an indication that drought coping strategies are very important measures that vulnerable communities must adapt to improve their food security with expected outcome aimed reducing their vulnerability to drought and building resilience.

According to FOA-ADAPT (2011) it is imperative for governments and other stakeholders to develop policies and mechanisms that would incorporate climate adaptation program as a way of militating against extreme climatic variations such as drought. To this end, climatic adaptation policies according to FOA-ADAPT (2011) are long term measures that are aimed at mitigating climate change impact whereas coping strategies are short or immediate measures that are aimed at mitigating climate change impact. This implies that both adaptation and coping strategies are very vital if we want to achieve resilience in the agricultural sector in the wake of climatic extremes such as drought.

Table 1 Tolon yearly rainfall in Milimeters

TOLON YEARLY RAINFALL IN MILIMETERS (MM)

YEAR	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	TOTAL
2008	0.0	0.0	30.5	94.5	116.9	140.8	148.8	334.6	245.0	82.8	948.9
2009	0.0	3.1	21.3	112.6	105.7	97.3	240.7	214.3	189.7	108.6	1093.3
2010	0.0	58.8	26.8	176.6	10.3	199.3	107.6	287.2	255.0	184.4	1306
2011	0.0	12.3	10.1	31.7	34.3	227.0	302.4	162.0	224.3	78.3	1082.4
2012	0.0	43.8	28.3	143.7	79.7	127.1	154.8	101.0	196.9	155.3	1030.6
2013	0.0	1.2	126.1	58.5	63.3	69.3	156.3	151.0	110.1	149.8	885.6
2014	0.0	15.0	88.8	40.2	43.4	125.7	130.5	192.5	265.1	112.5	1013.7
2015	0.0	15.7	22.3	33.7	30.9	130.2	149.6	200.6	225.2	47.1	855.3
2016	0.0	10.6	42.7	52.6	116.0	60.7	286.7	171.8	200.4	47.8	989.3
2017	0.0	0.6	20.0	54.4	91.1	201.0	204.0	71.3	122.3	44.8	809.5



1.2 Problem Statement:

The Ministry of Food and Agriculture (MoFA) is to design a programme to enable its development partners to fund climate resilient programmes for farming households in Tolon district to effectively cope with drought. MoFA lacks the knowledge on the coping strategies used by farmers during periods of drought. Drought has become a trend for the last five years as rainfall pattern keeps reducing as indicated in the table above leading to low crop production, reduction of household incomes and periodic food shortages especially in the lean season which often spans from April to August. To help farmers become more resilient (MoFA) wants to know how farmers are coping, so they can implement policies to increase farmers' productivity.

1.3 Research Objective:

The objective of the research is to identify on-farm and off-farm coping strategies used by farmers' in Worubogu in the drought season and to use the research findings to make a recommendation to MoFA. MoFA could use this information to design a programme to enable its development partners to fund climate resilient programmes for farming households in Tolon district to effectively cope with drought and by doing so improve household food availability and accessibility during drought.

1.4 Main Research Question:

What are the coping strategies used by farmers to respond to drought in Worubogu and why do they use them?

1.5 Sub-Research Question:

- a. What are the on-farm and off-farm coping strategies used by farmers in Worubogu?
- b. What is the influence of on-farm coping strategies to household food availability in Worubogu?
- c. What is the influence of off-farm coping strategies to household food accessibility in Worubogu?

1.6 Justification for the study:

The study would contribute to the already existing knowledge on the coping strategies of drought and also serve as a baseline for other stakeholders in the agricultural sector to inform them on how they could incorporate and design programmes and policies that would enhance the resilience of farmers.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction:

This chapter presents to the reader main definitions of concepts that used in the study and also review the work of other authors who have conducted similar works elsewhere in the world.

2.2 Definition Concepts and Operationalization

Peasant farmer:

A peasant farmer can be defined under these definitions (Salami et al., 2010)

1. Base on the agro-ecological zone in which he or she operates
2. The type and composition of his or her farm portfolio and land holding
3. Base on his or her annual income from the sales of farm produce.

For the purpose of this study, the a peasant farmer is a farmer who cultivate between 1-5 acres of farm size and his or her aim of production is to feed his family and sell surplus food for income.

Household:

A group of persons living together under the same roof who share common personal belongings and feeds from the same cooking pot (PHC,2010)

Food security:

According to the World Food Programme (1996) food security exist when people at all times can physically access safe and nutritious food of their choice of preference in sufficient quantities to meet their dietary requirement. Food security has four dimensions availability, accessibility, and utilization and sustainability. For the purpose of this study, food security means food availability and food accessibility.

Availability:

“The amount of food that is present in a country or area through all forms of domestic production, import, food stocks and food aid”. (Napoli et al., 2011; WFP, 2009 p.170)

Accessibility:

Refers to the ability of a household to have access to adequate and quality amount of food regularly through multiple combinations of sources such as borrowing, gifts, purchasing, or food assistance (Napoli et al., 2011; WFP, 2009 p.170)

Drought:

From literature there is no universal definition of drought due to the nature of drought complexity but except to give it an operational or conceptual definition (Whilite, 2000). For the purpose of this study, drought refers to the significant reduction in rainfall pattern for which reason bring about lose of soil moisture which result to destruction of food crops and farmers' livelihood.

Types of drought**Agricultural drought:**

According to Backerberg and Viljoen (2003), agricultural droughts are described as situations where the amount of water in the soil is not able adequately support plants life. Wu and Wilhite (2004) on the other hand defined agricultural drought in terms of plant response by using degree of departure from expected yield as an indicator of weather conditions for a given year on the theory that crops are good indicators of weather and their response presents a reliable tool for measuring drought. Rouault and Richard (2003) on the hand decide to define agricultural drought by giving a time line of (3 to 6 month time line) for agricultural drought to be the season when deficiency in precipitation results in damage to crop.

Meteorological drought:

Wilhite (1999) describe meteorological drought to be the first indicator of drought. According to him, this type of drought is region specific with precipitation been different from a certain time period.

Hydrological drought:

According to Whilite (2002) hydrological drought refers to deficiencies in surface and subsurface water supplies. According to him, hydrological drought is concerned with longer absence precipitation which eventually leads to shortfall of in surface water and sub-sub-surface water supplies like streams, lakes and reservoirs.

Socio-economic drought:

As the name implies, this type of drought often refers to a phenomenon of demand and supply where people economic livelihoods and well being are determined by the amount of precipitation. (Backerberg and Viljoen, 2003; Wilhite, 1996)

2.3Coping strategies used by farmers in Africa

According to Fadina and Barjolle (2018), farmers in Benin are coping with drought by resorting to mixed cropping and intercropping. This according to them was meant to safeguard against total crop loss in the event of drought.

According to Laube et al., (2012) farmers in the Upper East region of Ghana have resorted to cultivating crops by varying planting dates with the expectation to mitigate total crop destruction in an event of limited rainfall and extreme warmer conditions. According to Akponikpe et al. (2010) farmer's quest to adequately respond, farmers in Ghana, Burkina Faso and other African countries have devised an effective strategy to cope with the situation by also delaying the sowing of their crops to correlate with the rain fall pattern.

It has been documented by Jerie et al (2011) that farmers in Mberengwa district in southern Zimbabwe have resulted to planting different crops, early planting, using drought resistant seeds and barter trading and working for cash. To cope with drought conditions households have found it prudent to result to selling of

animals like chickens to buy food but also noted that when the food prices escalates, they are often compelled to shift in selling of larger animals like cow, sheep and goats to purchase food (Masendeke et al (2014) ; Carr.,1997). This claim is supported by UNEP (2002) when it stated that during drought conditions, households might sell financial assets like animals to purchase food.

Furthermore, Masendeke et al (2013), identified that vulnerable households sometimes cope with food shortage during drought periods by reducing the number of daily meals consumed. As part of measures to cope with devastating effects of drought on farming activities, households have diversified their income sources by not depending on crops alone instead, they integrated livestock rearing alongside food crop cultivation (FOA, 2016). This idea is strongly supported by Fadina et al (2018) when they stated that; crop-livestock diversification was one of the strategies adopted by households to cope with drought.

According to Antwi-Agyei et al (2014), households in Ghana have adopted on-farm coping strategies such as; changing the timing of planting, planting early maturing crops, crop diversification, planting of drought tolerant crops and crop rotation. Antwi-Agyei et al (2014) further stated that among some off-farm coping strategies that were adopted by households to mitigate drought impacts included livelihood diversification, relying on social support from friends and family members, embarking on temporal migration, changing their diets and reducing their food consumption. FOA (2016) argues that migration was a coping strategy adopted by many vulnerable households in many African countries. Through migration, family members are able to remit or send monies home for their families to support their families' home. Pande et al (2010) also argues that some farming households in their quest to cope with drought, have resorted to the use indigenous or local seed to plant with the anticipation that they are more tolerant to more than other improved or hybrid seeds.

A study conducted by Hassan and Nhemachena (2008) among some 8000 farmers in Africa through a survey indicated that farmers coped to drought by practicing crop diversification, growing different crops, varying planting and harvesting dates, resorting to dry season irrigation, planting drought tolerant seeds, growing different crops on the same piece of plot or different plots. Hassan and Nhemachena (2008) also argued that the most dominant drought coping strategy in Africa was crop production along rearing of livestock as 79% said was the most effective strategy.

2.4 CONCEPTUAL FRAMEWORK

The research adopted components of the Sustainable livelihood framework (DFID, 2000). Components of the framework adopted were; Vulnerability context where climate change indicators like rainfall or drought can either be a trend or a shock in the affected area. Livelihood strategies of the framework were also used to analyse the various coping strategies adopted by households in the affected area in their quest to reduce or lessen the impact on their wellbeing and livelihoods. Livelihood outcome was also used to analyse the outcomes of their coping strategies.

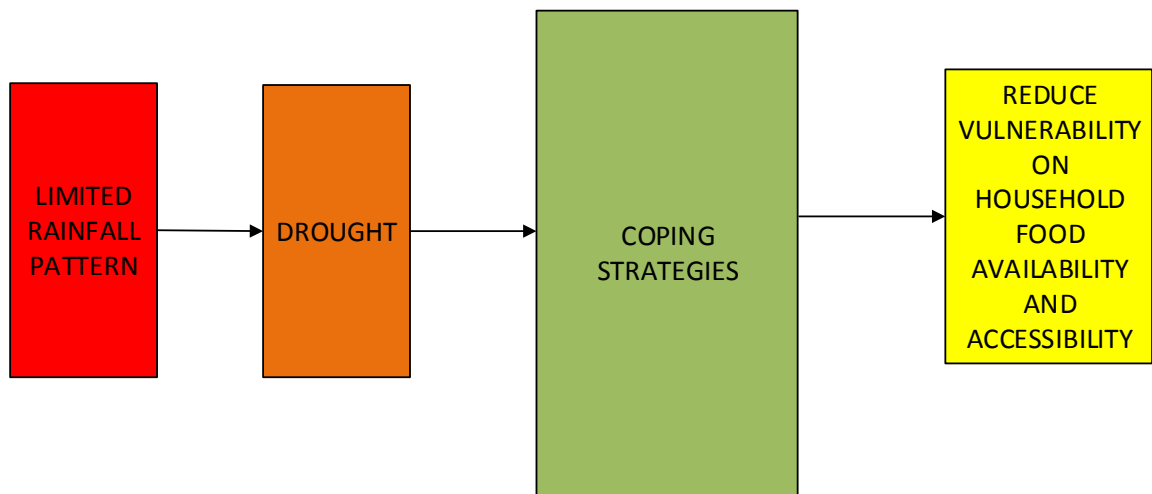


Figure 1 Conceptual framework

(Source: Author's construction, 2018)

The researcher adopted conceptual the Sustainable Livelihood Framework for his analysis

Vulnerability context

Vulnerability:

FAO-Adapt (2011) defines vulnerability as the degree to which a system or society is susceptible to, and unable to cope with adverse impacts of extreme climatic variability such as drought. It is noted that farming communities residing in an already fragile environment would further be exposed to dry conditions and extreme hotter temperature thereby increasing production high cost of production and crop failure resulting to hunger and extreme poverty. (FAO-ADAPT, 2011; FAO, 2008b)

2.5 Coping strategies (livelihood strategies)

According to Babi et al (2005) coping strategies are very short term responses that are employed by households that have suffered natural disasters such as droughts or floods with the aim of lessening the effect on their livelihoods. For the purpose of this study coping strategies are the same as livelihood strategies. To support this idea livelihood strategies are the set of available options or activities that an individual implements to achieve a positive or desirable outcome. The greater the diversity of activities or options, the higher resilience of the household to the shock (DFID,2000) With livelihood strategies.

Livelihood Outcome

Livelihood outcomes are the desired expected results which are obtained or met when the right livelihood strategies are implemented. They include reduced vulnerability, greater food access food access and increased resilience (DFID, 2000).

Resilience

Resilience according to FAO –ADAP (2011) refers to the ability of a social system to be able to be able to withstand or absorb climate shock by maintaining its form or structure and the capacity to adapt to the change with positive outlook for a long duration of time. Adger (2000) stated that describes social resilience as the ability of a community to withstand climatic shock such as drought or flood, economic and social changes. Walker et al (2006) equally agrees with Adger when he argued that resilience was the ability of a system to absorb shocks in order to maintain its structure and identity.

For the purpose of this study, resilience is the ability of a farming household to be able to still increase their food production as well as have the financial ability to purchase food in sufficient quantities through combination of different strategies.

2.6 On-farm coping strategies:

According to the FOA-ADAP (2011) On-farm coping strategies are the farming practices or activities that are employed by farmers to improve on their production during climate extreme conditions such as floods or drought which is often requires an immediate response.

2.7 Off-Farm coping strategies:

They are short term measures employed farming households to aid in the generation of extra incomes to support vulnerable households to augment their incomes the shortfalls in production FOA-ADAP (2011)

2.8 OPERATIONALIZATION OF COPING STRATEGIES

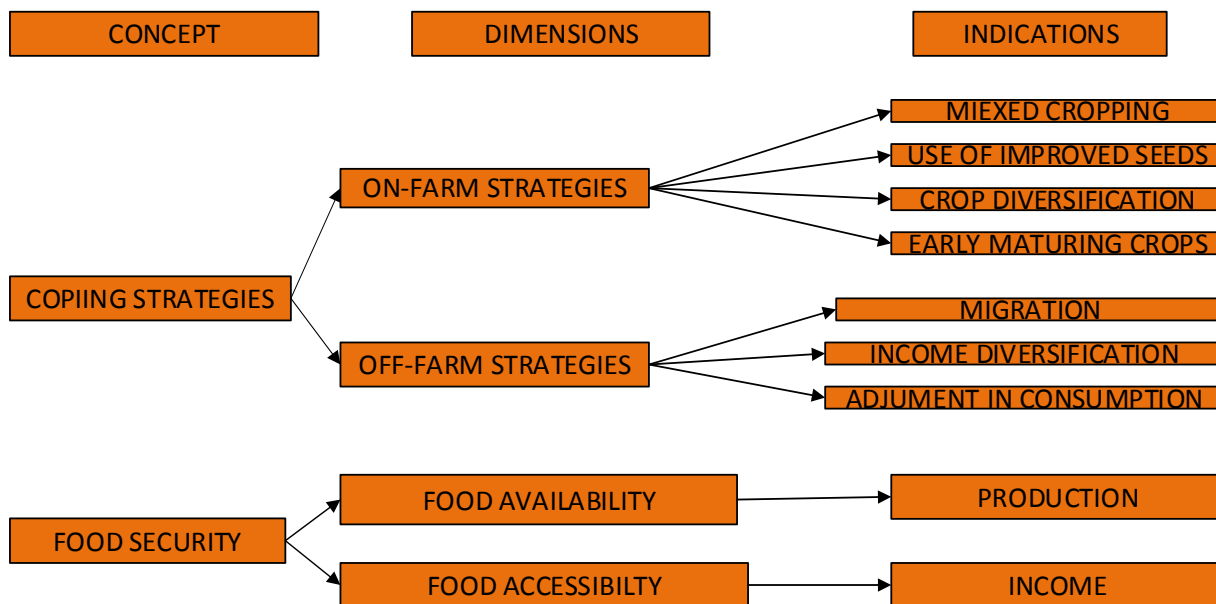


Figure 2 Operationalization of coping strategies

(Source: Author's construction, 2018)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter of the research has to do with the methodology and the type of research design used in the study. It includes the sample size, sampling techniques, research instruments, data collection procedures, data analysis and ethical considerations.

3.2 Study Area:

The research was conducted in the Tolon district of Northern Ghana. The district lies between Latitude 9° 15' and 10° 02' North and longitude 0° 53' and 1° 25' west. It shares boundaries with Kumbungu district, West Gonja district, and Sagnarigu district. The district has a population of 72,990 with males constituting about 36,360 and female, 36,630 (PHC, 2010). PHC (2010) further indicated that majority of the people in the district living together in what can best be described as the household system (98.4%) with an average household size of 9 which is higher above the regional average of 7.8. Tolon has 97% of its population been employed in the private informal sector, 2% employed by the public sector (government) while 1% is employed by others sectors. The district lies within the Guinea Savanna ecological zone characterised by grassland and drought resistant and economic trees like the shea trees and '*dawadawa*' trees. The district has only one rainfall season starting in late April with little rain drops and gets to its peak by July-August and stops in October. The dry season sets in from November to March with daytime temperature ranging from 33°C-39°C and night temperatures ranging from 20°C-26°C. The mean annual rainfall is between 950mm-11200mm with occasional storms, floods and droughts.

The research was specifically conducted in Worubogu farming in the Tolon Kumbungu district. Selecting Worubogu was based on the fact that the community is earmarked as one of the worst affected drought communities where over 95% of the people in the community are engaged in peasant farming as their main economic livelihood. According to the district director of MoFA, there are similar characteristics of the rest of the other communities in the district hence the outcome or findings of the research would be applicable to the rest of the communities in the district.

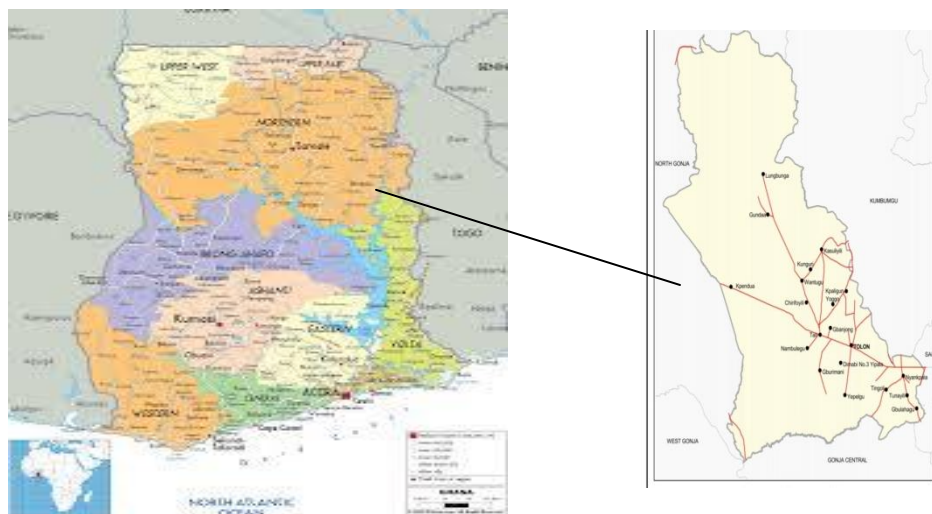


Figure 3 Study area map

Source Ghana Statistical Service (2010)

3.3 Research Design:

The research design is based on a qualitative research method, because the researcher wanted to understand coping strategies of farmers. Therefore the researcher used semi-structured interviews and focus group discussion for data collection to gain understanding. According to Susan (2011) qualitative research becomes ideal when a researcher wants to understand, explore or identify an underlying motive, opinion or insights to a particular phenomenon. Secondary data was collected in the library by reviewing journals and articles through desk study on the research topic. Through literature review, the researcher was able to design his conceptual framework, operationalized his key concepts into dimension and indicators that guided him to formulate his sub-research questions which were later administered on the field.

3.4 Sampling process:

A household list of 150 house numbers was presented to the researcher by the assembly man of the area. Upon receipt of the list the researcher wrote down the house numbers on pieces of papers and folded them in a bowl and randomly picked 30 house numbers representing 20% of the entire household. Researcher thought that 20% of household would be representative for all households in Worubogu. Households in the community were the unit of analysis for the research but the household heads were the focal persons for the research. The reason for selecting the household heads was based on the fact that in northern Ghana, household heads are considered as the most decision makers and are also those who most often farm to take care of the home hence they were considered very relevant for the study. The research sample was made up of 27 males and 3 females. The low number of females is to be understood by the fact that it is very uncommon for females to head their homes as family heads. Researcher took all the 3 existing female headed households into the research to find out if there would be any differences between gender. An interview has been held with all 3 female headed households.

From the 30 household, 15 were used for semi-structured interviews and 14 for focus group discussions (2*7), and 1 key informant who was also a household head.

3.5 Data collection process (strategy):

Checklist of questionnaires was prepared and pretested to the assembly man before administering in the field. This was to see to it that all forms of ambiguities were eliminated before administering them to respondents on the field. Prior to field data collection, a community entry was made to Worubogu for the researcher to introduce himself to the chief and people of Worubogu. As part of his data collection, the researcher used qualitative research methods like key informant interview, household interview and focus group discussions with open ended questions. Data collection was done using a mobile phone device to record the interview as respondents were answering to the questions. All interview questions and responses were asked and responded to in *Dagbani*, which is the language of the community.

3.6 Data Collection Techniques

Household interviews:

A Semi-structured interview was conducted for 15 household heads using open ended questions at the homes of respondents because the researcher wanted to have a close interaction with his respondents and to also understand the feelings and body language of respondents. Interviews are purposely used to gather data of life experiences of respondents which can also be done through face-to-face or through a telephone conversation. (Opdenakker, 2006; Kvale, 1983) All interviews were conducted in '*Dagbani*' which was the local language in the community. Yin (1994) argues that for people to fully express themselves during interviews, semi-structured and unstructured questions are suitable since they provide respondents with the flexibility and ease of responding to interview questions. The researcher spent 45 minutes on each of his interviews.



Figure 4 Household interview July, 2018

Focus Group Discussion:

Two Focus group discussions were held at two separate venues with each group of 7 memberships at different dates. The members were not already separately interviewed. All interviews were conducted under a tree using the local language of the community *Dagbani*. The researcher facilitated the discussions. Focus group discussion was used because the researcher wanted to gain different perspective after conducting the household interviews. According to O Nyumba et al (2018), the purpose for focus group discussion in a qualitative research is to collect an in-depth data from selected group of individuals with similar or same

characteristics rather than using statistical representation. Moreover, because the research was conducted in the planting season, it was ideal to assemble farmers to gather at a location, at the end of the afternoon. Also people who were not selected joined the discussion. Researcher didn't know these extra people before.

Each of the two focus group discussions lasted for about 1 hour.



Figure 5 Field data focus group July, 2018

Key Informant Interview

1 Key informant interview was also used for data collection. The key informant was chosen because of his long stay in the community and the secondly because he was a community leader, the researcher was of the opinion that his contributions to answering his research questions was very vital. The interview was conducted in two separate sessions, on different dates, with each session lasting about 45 minutes. Researcher did two separate sessions, because of interventions during the first session. Some questions were not answered. So an extra appointment for an interview was made.

3.7 Data Triangulation:

According Miller & Brewer (2003) triangulation is the combination of different methods used in a social science perspective. In the study, different methods were used during the data gathering process. They were; (interviews, observations and Focus group discussions) Using these array of qualitative methods or techniques, enabled the researcher to answer his research question(s).

3.8 Data Analysis and Presentation:

Since data was collected using mobile phone device, the recording was listened to and transcribed from Dagbani to English language. Because data was in a form of descriptive narrative, the data was sorted into codes as certain regular patterns started to emerge and they were categorized into themes with meanings assigned to these themes or categories.

3.9 Ethical Consideration

The researcher made it known to respondents before the interview the purpose for the study and also informed them that they were at will to end the interview or decline to a question if they felt they were not comfortable in responding to a question.

3.10 Research Limitation

The study was conducted in the planting season therefore majority of them were always in hurry to go to their farms this in a way affected the researcher's daily schedules pertaining the number of interviews he had scheduled to conduct. The other challenges that confronted the researcher was that some respondents were expectant to be given a token considering the fact that the researcher was coming from a foreign student from the Netherlands. Another challenge was that because questions were design in English and

respondents had to respond to the questions in the local Dagbani dialect, there were challenges with respect to transcribing exactly what they said to still carry the same meaning in terms of weight and magnitude. Another limitation was that women presentation was very little because the researcher could not find enough women beyond the 3 women that were used.

CHAPTER FOUR

RESEARCH FINDINGS

4.0 Introduction:

This chapter deals with the main findings from the respondents who participated in the interviews and focus group discussions. Results or the findings are presented in accordance with the research questions.

4.1 Demographic characteristics of respondents

All the respondents used for the study were all peasant farmers who were at the same time the head of for their households. Respondents were made of 27 men and 3 women.

4.2 On-farm and Off-farm coping strategies in Worubogu

Results from the findings shows the some of the on-farm and off-farm coping strategies that were identified to be used by farmers in Worubogu.

On-farm coping strategies

Planting early maturing crops:

When respondents were asked to give account of how they were coping with drought to improve on their food production, it was found out that 52% of respondents said that they resorted to early planting using local seed variety. When they were further probed why they did that, some respondents said that they planted early because by the time their food stocks will finish, the early planted crops might have also been ready for them to harvest and feed. This was what one of the respondents said during the interviews (*"Yes, What I now do is to plant early maize between April and May when the raining season is about to start then in late July, I will harvest them and we will feed on them while preparing for the main planting season."* (Household interview. July, 2018). However from the focus group discussion, 1 respondent said that the reason that made him plant early with the local seeds was that he often did that as a way of experimenting with the rain. According to him, if he gets a good harvest, then it will mean that drought would be less that year but if he gets poor harvest then drought would be severe.

Late planting:

Research findings also emerged that while some respondents resulted to early planting, 19% of the respondents on the other hand resorted to late planting of their crops as a way to respond to drought. According to them they did so because through their own observation, the rain in recent time for the past five years comes late hence they thought it wise to also plant in accordance with the rainfall trend. This was what one of the respondents said *"Our elders have a saying that if the sound of the drum changes, the dancer must also conform by changing his dance. Therefore when the rainfall pattern changes from raining early to raining late, then I must also change to plant late."* (Focus group discussion. July, 2018)

Mixed cropping:

It also emerged that 43% of the respondents resorted to planting different sets of crops as their strategy to mitigating drought. According to those who planted two different crops especially maize and groundnuts, it emerged that the reason why they did that was because they wanted to reduce their risk of total crop failure as a result of drought. Furthermore, they will keep some crops as food while selling the other crops for money. Findings also made it known that groundnuts were more tolerant to drought as compare with maize

hence the reason why they were practicing mixed cropping. This was what one of them said: *"I decided to plant maize and groundnut to avoid the disaster of last year. With the two crops on different farms I am able to reduce my risk as compared to if I had planted only maize because groundnut is more tolerate to drought than maize. Another reason why I did that is that when the maize fails me, I can sell the groundnut and buy maize from the market."* (Household interview. July, 2018). Same reasons were given from the focus group discussions.

Increase in farm size:

Further revelation from the research findings also pointed out that 10% of respondents resorted to increasing their farm size as way of coping with the drought. According to them they could no more rely on the food produced from their two acre farm due to the decline in their maize yields hence have decided to increase their farm size by adding an extra acre to compensate the declined yield conundrum. This was what a respondent said to that effect *"Previously, I was farming on two acre land but I have decided to increase it to four acres. Though I will use more fertilizer and seed but my production will also increase at the same. This will enable me produce enough food and still have surplus to sell and make money."* (Household interview. July, 2018).

Crop diversification:

Results also indicated 33% of respondents completely shift from maize cultivation to the cultivation of other food crops such as soya bean, groundnuts, and cow pea and sorghum despite the fact that maize played an important role as the staple food or consumed grain in the community. According to respondents maize could not withstand drought and secondly the cost of fertilizer was too expensive. Therefore they rather resorted to cultivate different crops and later on sell them to buy maize. This was what one of them said in the interview *"I decided not cultivate maize again despite the fact that it was the most consumed food in the house. Instead, I decided to plant only groundnuts and soya beans because they are easy to manage since they can still perform well without fertilizer. Another reason is one can always sell groundnut or soya beans to buy maize so it does not matter"* (Focus group discussion July, 2018) This was in line with what was found in the other interviews.

Off-farm coping strategies

When respondents were asked about some of the activities they had engaged themselves doing to get income to support themselves and their families besides farming, it was found out that they had engaged themselves in different arrays of activities. These were some of the responses to the question:

Animal rearing:

Findings revealed that 100% of respondents had either a chicken or a guinea fowl while 40% of respondents owned both a livestock and a bird. It emerged from the findings that these animals often were reared or kept purposely to support farmers during food crises like crop failure and hunger periods. These animals are often times converted to liquidity by selling them, exchanging them with food or using them as collateral to borrow money from friends or family members. Further findings revealed that because farmers in the community did not have access to bank loans they use animals as a form of investment which often times is either a goat or a sheep. This was what some respondents said about animal rearing as a coping strategy. *"These animals are very helpful especially the goats. My father use to call them "Poor man's cow" because they easily multiply and they have a good price when you sell them. Anytime there was no food in the house, I remember that my father will catch a goat sell and pick some of the money for my mother to go to the market to buy food. Many families sell out their sheep, goats or guinea fowl to buy fertilizers for their farms, hire laborers or purchase*

food and sometimes even use it to exchange for food, a very common practice in the village here "(Household interview. July, 2018). Findings from both key informant and focus group discussion, responded in a similar manner.

Migration

Migration response was identified as another coping strategy used by households in the community. It was emerged that in the lean season, young men and women embark on temporal migration to Southern Ghana where the females work as head porters known in the Ghanaian parlance as " *kayaye*" where they labour and send money home to support their families back home. Findings also indicated that it was a common practice for both men and women to travel to find work to support their families back home. It was discovered that, while *kayaye* meant female migration to Southern Ghana, male migration to Southern Ghana was equally termed as "*Djoa*". According to the respondents, most of them have a sister, a son, a daughter, an uncle or a wife who has currently migrated to work and support their families' home. Findings reveals that they temporarily migrate to Ejura where according to them there is good rainfall with little or no drought conditions where they are employed to either work in cocoa farms by either helping in cocoa harvesting, weeding or spraying . Through that they are able to send money home to buy food. This is what one of the respondents said. *"I also know that immediately after planting, some of the young men and women in the village travel to other places to find work and use the money to support their families back home to buy food. Immediately after planting, most of the young ladies in the various houses will go on 'Kayaye" or "Djoa"* (Key informant. July, 2018) .The same responses was gotten from both the household interview and the focus group discussion.

Income diversification:

From the findings it was discovered that in the dry season when there is less or no farm activities some respondents resorted to finding other avenues that they could use to generate extra incomes to support their homes. Shear butter processing, working in as laborers in construction sites, petty trading, and hunting were among some of the income diversification activities in the community. This is what one of the respondents said *"Every farmer in this village knows that the rains have affected our food production and we don't have enough food stocks, because of that everyone has a way of dealing with the situation in order to survive. With the shear nuts that I picked, I processed them into shear butter and sell it to buy other foods like yam and beans to augment the little maize I produced from the farm last year"* (Household interview. July 2018). This was confirmed through observation and also from focus group discussion and from key informant interview.

4.4 Most used and preferred coping strategies

Because respondents had different coping strategies which ranged from on-farm and off-farm coping strategies, the researcher asked the respondents to come out with three of the most used coping strategies for both on-farm and off coping strategies and out of that come out with the most preferred coping strategies for each. The result of the finding is presented below in table.(Focus group discussion July, 2018) The same response was gotten from the interviews.

Table 2 Field data 2018

Most used coping strategies	Preferred coping strategies	
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On-farm strategies	On-farm	
Planting of early maturing crops	Using improved / drought resistant seed	
Migration		
Petty trading		
Off-farm strategies	Off-farm	
Animal rearing	Animal rearing/Keeping	
Using improved seeds		
Changing of consumption pattern		

Influence of on-farm coping strategies on household food availability in Worubogu

Using improved seeds:

When the researcher asked for the reasons why respondents preferred using improved seeds by name “Komnaaya” translating to mean hunger is now over. Findings revealed 100% respondents preferred the use of the improved seeds but only 28% of respondents were using the seeds to plant. According to the respondents who used the seed, they said that it had a good yielding rate per acreage as compared to the local seed variety and for that reason they were able to marginally increase their production more than the local seed. They also said that the improved seeds had a very short maturity period of about 85 days from the date of planting to the date of harvesting while some respondents also stated that the seeds could still perform even if there is drought while some said that they had seen an increase in their food stocks and incomes when they switched from the use of the local seeds to that of the improved seeds. This is what one of them said *“In life every good thing is expensive and so are the seeds. The first time I used the improved seeds, I was surprised with my harvest. With the local seeds I used to get 9 bags of maize but when I was introduced to the improved seeds, my production jumped from 10 bags to 15 bags and so I sold 6 bags while I kept the remaining for our feeding”* (Focus group discussion. July, 2018).

Influence of off-farm coping strategies on-household food accessibility Worubogu

Animal rearing:

When respondents were probed as to why they preferred animal rearing over the other off-farm coping strategies, respondents said that they preferred animal rearing because according to them it was the fastest way they could easily use to find money to augment their food stocks when they are about running out. It was also found out that some respondents used animals as collateral to borrow money from family and friends to purchase food from the market when their stocks run out. Aside the fact that animals could be used for collateral, findings also reveals that households did not save their monies in the bank but rather resorted to investing their monies in buying either a goat or sheep and often sell them during food crises in their in their homes. This is what one of the respondent said *“left to me alone I would prefer animal rearing*

especially sheep to anything else because when my crops fail me the other time, I had to resort to depend on my animals by selling some sheep to buy food continuously until it was time for another planting season. Food prices were high though but I was still able to enough food for the house” (Focus group discussion. July, 2018).

Challenges in coping with drought in Worubogu

When respondents were asked about challenges they were confronting for which reason could not adequate cope to increase their food production and also enhance their incomes respondents said that improved seed was very expensive for them to afford on their farm for which reason they were still compel to use the local seeds with very low output. While some respondents said that they lacked the needed started up capital and animals as collateral to secure financial assistance that would make them expand their petty trading activities that would make them cope efficiently in the event of food shortage as a result of drought. This was what one of the respondents said *“I am just depending on the farm and nothing else though I am a trader but I don’t have money to start my trading activities to support myself and the children during the off-farm season”* (Household interview. July, 2018)

CHAPTER 5

DICUSSION OF RESEARCH FINDINGS

This chapter will discuss the main findings of the study presented in Chapter 4. The discussion will compare the findings from the study with literature and draw meanings to how each of the sub-research questions was been responded to.

5.2 On-farm and off-farm coping strategies for resilience in Worubogu

Results from the study revealed that farmers in Worubogu have developed various coping strategies as a way of reducing their vulnerability.

On-farm coping strategies in Worubogu

Findings from the study revealed that farmers in Worubogu are using various coping strategies to respond drought in Worubogu. As part of improving their food production, farmers used strategies like mixed cropping, changing of planting dates of crops, using drought tolerant seeds, cultivating different crops varieties, and shifting from traditional maize cultivated crops to different crops. This agrees with that of Laube et al (2012) when they stated that farmers in the upper east region of Ghana have resulted to cultivating crops with varying dates as a way to reduce their vulnerability to drought and to a large extend with Fadina and Barjolle (2018) when they reported that as part of their quest to cope with drought, farmers in Benin have resorted to practicing mixed cropping and intercropping. This is also in line with Antwi-Agyei et al (2014) when he said that farmers in the upper east of Ghana coped with drought by cultivating early maturing maize and also plant to conform the rainfall pattern. However during the research findings one interesting discovery that was found but could not be cited in any of the literature review was the fact that a respondent said that he coped with drought by planting early maturing maize and that if the maize performs well by producing higher yields then it would mean that the coming year was going to come with good rains but if the yield is poor then it meant that the rains were going to be bad and so he will limit the number of acreage he would have cultivated in order to minimise his losses.

Off-farm coping strategies in Worubogu

Other coping strategies adopted by households to improve food accessibility by increasing household income included strategies like selling of sheep, goats, guinea fowl and chickens. This findings support the idea by UNEP (2002) when it stated that during drought periods, households resort to selling their animals to purchase food to feed. It was also found out some households resorted to reducing the quantity of food they cook, this was to ensure that their stocks last longer. This finding agrees with Masandeke et al (2013) when they stated that as part of the coping strategies of some households in Zimbabwe during food shortages in drought conditions, households have resorted to reducing number of their daily meals or cut down their food quantity. Another important coping strategy cited in the study was that of migration as a coping strategy. It emerged that in their quest to seek resilience and provide food for their households, some household members either relocated to farm elsewhere in Southern part of Ghana, or resorted to migrating to look for employment opportunities that and remit money to support their families back home. This finding is in tandem with FOA (2006) when it mentioned that during food shortages in the households, migrating to seek

for opportunities and remit money to support families back home was among the coping strategies of some vulnerable households.

5.3 Preferred coping strategies.

When respondents were asked to rank the most preferred coping strategies for that of on-farm coping strategies and Off-farm coping strategies, most respondents said that animal rearing was the most preferred coping strategies and that of On-farm coping strategy was that of using improved seed or drought resistant seeds. This implies that for respondents to cope with drought in Worubogu community, animal rearing alongside the usage of improved seeds is what the farmers would prefer. This findings to a large extent agrees with MoFA (2012) and FOA- ADAP(2011) when they stated that people living in drought prone community find livestock keeping and along crop production as a lucrative coping strategy as one of the best strategies to cope with drought.

Influence of on-farm coping strategies on household food availability Worubogu

Findings from the researcher indicated that despite the numerous coping strategies that households were using to increase their food production, it was noted that not all the strategies had the same influence in terms of increasing their production. It was found out that the use of drought resistant seed variety such as *Komnaaya* was very effective way to increase farmers' productivity because of the advantages associated with the use of the seeds. Respondents said that the seeds were having low maturity date, could still survive under drought conditions and also yield higher output per acreage. The findings is in line with MoFA (2012) when they argued that for farmers in to be able to effectively enhance and improve their food productivity, increase their food stocks and increase their incomes, farmers in the northern Ghana would have to shift from local seeds to improved drought resistant seeds.

Influence of off- farm coping strategies household food accessibility Worubogu

The study identified that migration, income diversification and animal rearing were among some of the strategies used by households to generate income to buy food when their food stocks when their food stocks are to run-out. Findings showed that households in Worubogu preferred though did indicate the importance of some the coping strategies but then it was found out that the animal rearing was been considered as been effective coping strategies for households during the off-farm season. Animals are used as source of savings in the community, source of wealth, collateral for loan or could be used as barter exchange for food. It was also found out those respondents preferred large animals such as goats and sheep to smaller animals like guinea fowls and birds. This findings agrees with UNEP(2002) and Masendeke et al (2013) when they said that during food shortages households sell their animals and use their incomes to purchase food for their household households and that they only use smaller animals but switch to sell larger animals when the situation gets worse.

5.4 Challenge in coping with drought in Worubogu

Findings from the research indicated that lack of money was one of the major challenges that influence the coping strategies of households in Worubogu. The findings indicated that one of the reasons why some households were still using local seeds but not the improved seeds was because of the high cost of the improved seeds that made it very difficult for most farmers to change from local seeds to improved seeds despite the fact that they knew that it had the ability to increase their production. It was also discovered that the reason why some households completely diversify from maize production to the production of other

food crops was due to the fact that they could not afford to the price of fertilizer coupled with the high cost that involved in purchasing of the seeds. Findings also revealed that though animal rearing was considered as very prestigious in the Worubogu and was also ranked high as the most preferred coping strategy, the fact still remains that not everyone can afford to buy a sheep or a goat. Findings also suggest to a large extent that start-up capital for households to invest in other income diversification activities was a serious challenge that affected households ability to rely on different sources of accessing food their crops fail.

CHAPTER 6

CONCLUSION

The study was aimed at identifying drought coping strategies in Worubogu that were used by farmers to improve their food security. After doing the research, writing the findings and discussion the research questions can be answered.

a. What are the on-farm and off-farm coping strategies used by farmers in Woribogu?

Research findings in Worubogu identifies that on-farm coping strategies that farmers use to respond to drought were:

On-farm strategies

Mixed cropping crop diversification

Using drought resistant seeds

Changing planting dates of planting to conform to rainfall

Planting early maturing maize

Increasing their farm size

Crop diversification

Why farmers resorted to on-farm coping strategies was because they wanted to improve their food production under drought conditions.

On-farm coping strategies that were identified in Worubogu that farmers use to respond to drought were:

Migration

Income diversification

Animal rearing

Adjustment in their coping strategies

b. What is the influence of on-farm coping strategies to household food availability in Worubogu?

Through research findings, it was established that over 100 % of respondents who participated in the research identified the use of improved seeds as the most proffered on-farm coping strategies. The reason behind their decision according to the respondents was that improved seeds are able to withstand drought, short maturity, higher output per acreage hence increases their food stocks with some amount of surplus to sell for extra incomes.

- c. What is the influence of off-farm coping strategies to household food accessibility in Worubogu?

Research findings emerged that over 97 % of respondents preferred animal rearing as the most preferred off-farm coping strategies in Worubogu. According to respondents the reason why animal rearing was one of the fastest ways household could easily use to raise income by the household. Animals can be converted into liquidity, used as collateral to borrow money to purchase food when food stocks are about depleting. It also emerged that animal rearing was a means by which farmers saved their monies

However it was found out that despite the fact that of the respondents preferred using improved seeds and animal rearing, it was emerged that only few respondents could afford money to buy improved seeds because many of the respondents said that both the improved seeds and animals especially livestock such goats and sheep were very expensive to come for many of the household to afford.

Based on the sub research questions the main question is been answered.

CHAPTER 7

OBJECTIVES OF RESEARCH

The reason for which the research topic and venue was based upon the request of the District Director of Agriculture where I am also a working staff. The district director of agriculture is the commissioner who requested for the research. According to him it was very vital to the Tolon District Department of Agriculture and the Tolon District Assembly. This was after an earlier discussion I had with him during the research proposal stage. According to the commissioner, the Tolon district for some time now has been experiencing recurrent drought due to poor and erratic rainfall pattern. Because of that, farming households in the district were faced with food shortages especially in the lean season which often occur between April to August coinciding with the planting or cropping season.

Worubogu was chosen because it was a typical farming community with no any form of formal employment that farming households could rely to support themselves in the lean season with food shortages. I therefore found it appropriate to use the community for my study due to the vulnerability they were exposed to. According to the commissioner, the plans are under way for government to support farmers in the district to cope with drought but lacked the knowledge on their coping strategy. Government intention is to design a programme to request funding from its development partners and to do that, MOFA as a stakeholder used the opportunity to ask me to undertake the research. Personally as a professional staff of MOFA, and a master's student for that matter, this thesis will not only benefit the commissioner as the problem owner, but I also see it as adding knowledge to the existing literature about coping strategies of drought.

The objective for the researcher was to identify coping strategies used by farmers in Worubogu during drought period in the wake of reduced rainfall and recurrent drought. Findings were to be given to the commissioner who is the District Director of Agriculture in Tolon. To this effect, recommendations would be made to him as how the ministry and other stakeholders can support farming households in Worubogu to improve their coping strategies to drought as this could reduce their vulnerability and improve their food production and accessibility.

CHAPTER 8

8.1 RECOMMENDATIONS TO THE COMMISSIONER

Based on the research findings of the coping strategies used by farmers in Worubogu, the researcher hereby propose the following recommendation to the commissioner Tolon District Director of Agriculture. With this recommendation MoFA can design programmes that would help make farmers in the Worubogu and other communities in the district more resilient and can cope better with drought. This will lead to improved on their food production and food accessibility during drought periods.

1. Research findings indicated that most respondents proffered animal rearing to have a positive influence on the household food security in the drought in Worubogu since they can easily be converted into liquidity or cash which they can use to purchase food in the market. Furthermore, they it was also found out that animal such as goats and sheep were mostly preferred because they could easily be used as collateral to borrow money from family and friends to purchase food and later pay or use these animals for barter trade. Because of the influence livestock have on household food accessibility in terms of drought, I recommend that MoFA should assist farmers by arranging for loans from financial institutions to purchase livestock because of the importance they play in the household during drought.
2. MOFA in collaboration with the District Assembly should see to it that farmers they are able to subsidize improved seeds to enable farmers be able to afford it as this has the potential to increase their food production and food stocks as well as improve their incomes. The researcher realised that most of the respondents preferred using the improved seeds to plant because of the positive influence it had on farmers' food production. Why they preferred the improved seeds than the other on-farm coping strategies were that the seeds were tolerant to drought, it has a good yield or output which increase also increase their income through the sale of surplus food and furthermore because of its short maturity period.

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Appendices

Interview Checklist for individual household heads

Background Information

Name of household head -----

Name of community-----

Research Questions:

Guiding questions on coping or respond strategies to drought

Household interview.

1. Could you please introduce yourself to me?
2. How often do you experience drought in the community?
3. Do you have any measures you put in place to reduce the effect of drought on your production?
4. Could you please share with me some of these measures?
5. How effective are these measures?
6. Have you ever experienced food shortage as a result of drought?
7. Could you please share with me how you cope in such circumstances?
8. Are those measures effective? Explain.
9. Do you have other sources of income? Explain
10. What do you think should be done to make you improve on your food production and your other income activities? Explain

Focus group discussion

1. What are the major effects of drought on your farming operations?
2. What are some of the measures that you have put in place to improve on your farming food production in the community?
3. How effective are these measures in increasing your production?
4. What do you do during period of food shortages?
5. Do you have other sources of income aside farming?
6. How effective are these strategies?
7. Why do you think you are not able to adequately cope with droughty?
8. What do you think should be for you to make you be able cope with drought ?
9. Could you mention to me the most used strategy to fight drought by farmers?

10. How effective are these strategies?

Observation Guide:

1. What is the nature of their homes?
2. What type of crop (s) is cultivated in the community?
3. What type of asset is found in the house?
4. How do they use these assets?
5. What other income activities are available in the community?
6. What other activities do other household members engages in?
7. What is the

Interview Guide:

Interview Guide for Key informant

1. What are the strategies that farmers use to improve on their production during drought?
2. Which of the coping strategies is mostly used by farmers to improve their production?
3. How do people in the community cope during periods of food shortages at the household level?
4. What challenges do farmers in the community encounter that limit them from effectively coping with drought?
5. What do you think government should do to help make farmers cope better to improve their resilience with drought?

Summary Table of Interview Transcript

<i>Socio-demographics</i> <i>Characteristics of respondents</i>	<i>Effects of drought on food security</i>	<i>Coping Strategies</i>	
Respondent A Age : 43 yrs Sex: Male Occupation : Farming Farm size: hectares. Marital status: Married Educational status : No Household size: 6	Destruction of food crops. Shortage of food. Lowers crop yields. Hunger and less food intake.	Borrowing food from family and friends. Skipping of daily lunch Planting of early maturing maize Relocate and farm in Ejura.	
Respondent B Age: 55 yrs Sex: Female Marital status: Widow Educational status: No Household size: 8 Occupation: Farming & Trading.	Lose of investment. Reduces crop yields. Lose of income. Shortage of food. High cost of food.	Use of early maturing seeds. Plant seeds according to rainfall pattern. Crop diversification. Remittance from family member. Trading of shear butter.	
Respondent C Age: 52 yrs Sex: Male Occupation: Farming Farm size: 4 hectares Marital status: Married Educational status: No	Destruction of crops. Reduces maize yield. Hunger. Poverty. High food prices	Increase farm size. Increase production. Selling of animals	

Household size: 10			
Respondent D Age: 50 yrs Sex: Female Occupation: Farming Farm Size: Educational status: No Household size: 6 Marital status: Widow	Brings about hunger Causes food shortage Causes poverty Threatens farmers' livelihood Causes poverty	Reduced their food consumption. Selling of shear butter Selling of vegetables in the garden. Remittances from daughter. Crop diversification Engaging in off- activities for extra income. Rearing of goats. Increase their farm size	
Respondent E Age : 57 Sex: Male Occupation: Farming Farm Size: Education status: N Household size: 9 Marital status: Married	Brings about hunger. Causes poverty. Food scarcity. Food becomes expensive. Inadequate food intake	Children taking off farm income activity. Selling of firewood. Selling of guinea fowls	
Respondent F Age: 51 Sex: Male Occupation: Farming Farm size: 4 acres Family size: 9 Educational status: No Marital status: Married	Reduced crop yields Inadequate food storage. Lose of investment	Crop diversification Rearing of animals Delay planting to conform with the rain Use of improved seeds	

Respondent G Age: 47 Sex: Female Occupation farmer & Trader. Farm size: 2 acres Family size: 6 Educational status :No Marital status: Divorcee	Causes hunger Poverty Starvation Destroy food crops. High food prices.	Selling of cloth Request food from family members. Diversification of crops Food exchange trading	.
Key informant Age: 60 yrs Sex: Male Occupation : Farming Farm size: 5 acres Educational status: Yes Household size:11 Marital status: Married	Food shortage Inadequate food intake Hunger Poverty	Selling of animals Food borrowing Engaging in off-farm activities. Women selling their cloths Remittances from family members Use of improved seeds Increase their farm size	Rearing of animals by men. Trading by women Migration of family members. Engaging in off-farm activity.
Respondent H Age 57 Sex: Male Occupation: Farming Educational status: Married Household size: 7 Marital status: Married		Use of improved seeds selling of selling firewood. Going on temporal migration	