UNIVERSITY FOR DEVELOPMENT STUDIES

THE EFFECTS OF DROUGHT ON THE LIVELIHOOD OF RURAL HOUSEHOLDS IN THE NANDOM DISTRICT OF THE UPPER WEST REGION, GHANA

BY

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AUGUST, 2017

DECLARATION

Student

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: ……. Date: ……

Name: Philip Awosi

Supervisor

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis/dissertation laid down by the University for Development Studies.

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ABSTRACT

Drought is considered the most threatening component of climate change and its impact is much felt in societies where there is heavy dependence on natural environment and its resources for survival with low coping strategies. The objective of this study was to examine the effects of drought on the livelihood of rural households and their coping strategies in the Nandom District. Descriptive research design was applied in the study. Questionnaires and Focus Group Discussions guides were the main tools and methods used to collect empirical data. Data analysis was both qualitative and quantitative. The quantitative data were classified into themes in line with the research questions and objectives and tables and graphs generated from it using Statistical Package for Social Scientists (SPSS) software and Microsoft Excel. The qualitative data were analyzed through narratives and descriptions. Simple random and quota sampling techniques was employed to select respondents. The results indicate that droughts experienced overtime in the district have devastating effects on the livelihood of rural households. Households resort to low paid jobs, migration, pito brewing, societal support systems, fuel wood and charcoal burning to cope with drought. Government through the District Assembly and NGOs in the District, though not effective, provide livelihood support programs to households. The study concludes that drought is a real phenomenon in the study area. The study recommends that integrated approaches must be adopted to tackle the problem of drought both in the short-run and in the long-run. Development interventions by national, international governmental and NGOs need to do need assessments that apply rural appraisal techniques to allow beneficiaries to include their real needs into the process.

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DEDICATION

To my lovely wife, Lucy Amangda, and parents for their financial support.

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ACRONYMS

CAPRI	Collective Action and Property Rights
EPA	Environmental Protection Agency
FAO	Food and Agricultural Organization
GLSS	Ghana Living Standards Survey
GSS	Ghana Statistical Service
IFPRI	International Food Policy Research Institute
MSD	Meteorological Service Department
MOFA	Ministry of Food and Agriculture
NGO	Non-Governmental Organization
USDA	United States Development Agency
UNEP	United Nations Environment Program
UN	United Nations
WFP	World Food Programme
WMO	World Meteorological Organization
WSP	Water Supply Projects

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Drought, as a climatic concept, is related to the reduction in the amount of precipitation received over an extended period of time, such as a season or a year (Wilhite, 1992). Drought is recognized as an environmental disaster and has attracted the attention of environmentalists, ecologists, hydrologists, meteorologists, geologists, policy makers and agricultural scientists. Drought occurs in virtually all climatic zones, such as high and low rainfall areas (Wilhite, 1992). Temperatures, high winds, low relative humidity, timing and characteristics of rains, including distribution of rainy days during crop growing seasons, intensity and duration of rain, onset and termination of rains, climate dynamics, all play a significant role in the occurrence of droughts. In contrast to aridity, which is a permanent feature of climate and is restricted to low rainfall areas (Wilhite, 1992), drought is a temporary aberration that may persist for months or even years.

Drought impacts both surface and groundwater resources and can lead to reduced water supply, deteriorated water quality, crop failure, reduced range productivity, diminished power generation, disturbed riparian habitats, and suspended recreation activities, as well as affect a host of economic and social activities (Riebsame, Changnon, & Karl, 1991). Droughts also affect water quality, as moderate climate fluctuations alter hydrologic regimes that have substantial effects on the lake chemistry (Webster, Kartz, Bowser & Adagnuson, 1996). Sediment, organic matter, and nutrients are transported to surface waters by runoff, a pathway that is interrupted during droughts.

Globally, the negative impacts of climate change are becoming increasingly evident today, including long term changes in average temperature and rainfall, changes in the intensity, timing, and geographic distribution of rainfall, an increase in the rate at which extreme events such as drought and flood, and sea level rise (IPCC, 2007; Verner, 2011). These impacts will have detrimental effects on agricultural productivity, biodiversity and ecosystem services. Although some crops in some regions of the world may experience gains, however, research by Keane, Page, Kergna, and Kennan (2009) and Nelson (2010) predict that the overall impacts of climate change on agriculture will be negative, threatening global food security.

Rural households in developing countries, many of whom are already food insecure, are likely to experience the most severe effects (IPCC, 2007) and are in greatest need of adaptation strategies and development assistance to cope with changing weather patterns (Keane et al., 2009). Yet, it is the vulnerable within these countries who have the least capacity or opportunity to prepare for the impacts of a changing climate giving their limited resources (Nelson, 2010), assets and eventually their general well-being.

Giesbert and Schindler (2010) found out that better-off households typically sell assets in order to maintain their consumption and livelihoods when facing shocks. In contrast, poorer households often reduce assets and consumption simultaneously. Distress sales of assets may cause households to forego future investments in health, nutrition, and education, including children in the household (Davies, 2010; Hoddinott, 2006; Hoddinott & Quisumbing, 2003).

Assets are paramount for rural households because they can help them cope better with shocks, including longer term impacts of climate extremes. In examining pathways out of poverty for the rural people, research on asset-based approaches to development and poverty

alleviation since the 1990s has shown that control over assets play a fundamental role in increasing incomes, reducing vulnerability, and empowering people to move out of poverty (Bebbington, 1999; Moser 2007; Sen, 1997; Sherraden, 1991). In the context of climate change, access to and control of assets can be particularly significant for the rural poor, where assets such as secured land and water rights, agricultural technologies, livestock, knowledge, and social capital can help individuals, both men and women, and households adapt to increasing variability of production.

A body of empirical evidence indicates that women experience poverty and deprivation in different ways from men (FAO, 2011) and can be differentially affected by shocks (Cohen & Young, 2007; Sabarwal, Sinha & Buvinic, 2010). Evidence also demonstrates that there are many differences in men's and women's access to and control over key assets. Women usually have fewer assets and rights than men. They are more vulnerable to loss of these assets and rights due to separation, divorce, or widowhood, and have less access to capital, extension, inputs, and resources for agricultural production (Antonopoulos & Floro, 2005; Deere & Doss, 2006; Deere & Leon, 2003; Peterman, Behrman & Quisumbing, 2010; Quisumbing, 2003; Quisumbing, 2009). Yet women's asset holdings often have positive effects on important development outcomes including household food security and human capital formation (Hallman, 2000; Smith, Ramakrishnan, Ndiaye, Haddad & Martorell, 2003; FAO, 2011).

The International Food Policy Research Institute [IFPRI] (2011) provides a useful framework for examining the differential impact and response of rural households to drought and for understanding the importance of information, livelihood resilience, institutions, and asset accumulation in terms of vulnerability to drought effects and adaptation responses. The

framework, a product of a project on enhancing rural poor's assets to manage risk during drought periods, is set against a vulnerability context that includes a set of interrelated factors such as user characteristics, biophysical characteristics, information and technology, and institutional arrangements [IFPRI] (2011).

User characteristics encompass the fact that some individuals or groups may be more vulnerable to drought impacts giving their livelihood activities, assets, socio-cultural norms, or cognitive ability. Biophysical characteristics describe the sensitivity of physical or ecological systems, for example, agricultural systems that individuals, households, or communities rely on for livelihoods. Information and technology refers to the access of actors to information about drought risks and appropriate responses, while institutional arrangements consider the markets, laws, policies, and socio-cultural norms that influence how different actors are affected by and respond to drought. Across these factors, a drought signal or extreme weather events may affect actors differently in terms of their assets and adaptation decisions or strategies (or lack thereof) in the adaptation arena, with different livelihood outcomes at different spatial and temporal scales.

Drought, as a global climatic phenomenon, produces a complex web of impacts that span many sectors of the society, including economy and may go beyond the geographical boundary. According to Kogan (1997), droughts are widespread phenomena; since about half of the earth's terrestrial surfaces are susceptible to them. More importantly, almost all of the major agricultural lands are located in the earth's terrestrial surface (USDA, 1994). Droughts as a natural hazard have had the greatest negative impact on human life within the 20th and 21st centuries (Bruce, 1994; Obasi, 1994). In recent years, large scale intensive droughts have been observed on all continents, affecting large areas in Europe, Africa, Asia, Australia, South

America, Central America, and North America (Le Comte, 1995) and high economic and social costs have led to increasing attention to droughts (Downing & Bakker, 2000)

In Africa, climate change has affected the rainfall pattern such that longer and more persistent drought periods are being experienced (IPPC, 2007). Drought has a negative impact on agricultural activities which are the mainstay of most rural people in Africa south of the Sahara. The severity of the impact of drought on African farmers was underscored by the Intergovernmental Panel on Climate Change (IPCC, 2007: 435) when the panel pointed out that although "African farmers have developed several adaptation options to cope with current climate variability (example drought)… such adaptations may not be sufficient for future changes of climate." All African farmers suffer the consequences of climate change, but the rural poor are more affected because their livelihoods almost entirely depend on agricultural activities. Hendy (2001) maintained that northern Kenya experiences drought periodically which affects crop production, and Little (2006) added that drought negatively affects livestock production among the poor in Ethiopia.

The frequent drought periods are not only limited to Africa, south of the Saharan countries, but also in other developing countries (World Bank, 2000). Arku (1993) indicated that drought has become a normal phenomenon in Ghana since 1983 and it occurs at least once in every 3 years in northern Ghana.

Ghana is subjected to series of drought periods. From 1982-1983, Ghana experienced a particularly large drought followed by a less intense one in 2004. The major complaint was that the total rainfall on a yearly basis seems to not be changing significantly but, the patterns with which these storms arrive are causing the farmers distress. The rains, in recent years, are late and then when they do arrive are shorter, more intense rainstorms (Alfredo, 2007).

According to the Ghana Statistical Service (2007), the Northern Regions of Ghana are more rural than the south relying heavily on farming for survival. For this reason, predicting rains is crucial to their existence. Ghanaian precipitation patterns, however, are not easily predicted with years of drought being followed closely by years of flooding, both equally as destructive to crops and both leaving a wake of famine and reliance on foreign aid. In 1999 and 2007, the Northern Region of Ghana was devastated by flooding (Alfredo, 2007). The flooding in 2007 was preceded by months of drought with June and July being especially dry so that when the rains finally arrived in August, ephemeral streams occurred instead of percolation into the soil. This delay and heavy onset of rain washed away healthy crops and also caused loss to those who planted early (Alfredo, 2007).

While the frequent occurrence of drought as a result of climate change is well documented, the effects of drought on rural households women and men have not been included (Dankelman, 2008; IPCC, 2007). According to Mohammed (2013), unfortunately in the case of Ghana very little has been done aimed at assessing the interrelationship of the occurrence of droughts on assets holding and their consequential impact on agricultural and energy activities that may affect the livelihood of the rural dweller. Such information will fill the knowledge gap of which great significance will be put to droughts effects in the planning and management of water resources. The intent of this study therefore is to assess the impact of droughts on rural dwellers. The research will also highlight the indigenous management strategies during droughts and the effect of the coping strategies adopted on their workloads.

According to Alfredo (2008), the livelihood of the people of Nandom District before and after the 2007 droughts seems to suggest a downward trend in the general well-being and depletion of the assets of the inhabitants. This is subject to investigation.

1.2 Problem Statement

Rural communities of developing countries have historically been challenged with the lack of infrastructure and social services due to harsh economic conditions. Northern Ghana which is largely rural is noted for its persistent harsh economic conditions (Long, 1977). There is notable poverty in this area as a result of limited resources and economic opportunities (Kocher, 1973). This situation has contributed to a continuous migration of the labour force from northern Ghana to the southern parts of the country in places such as Accra and Kumasi (GSS, 2005). The net-migration of male labour from the northern regions in 1960 stood at -89,000 (Songsore, 2003). Food insecurity is also a problem as rural poverty increased from 37% in 1998/99 to 50% in 2005/06 with Upper West recording the highest incidence of poverty from 84% in 1998/99 to 88% in 2005/06 (GSS, 2007). Low level of education is one of the problems that exacerbate the development gap between the north and southern part of Ghana. As of 1998, a greater percentage of residents (80%) of rural northern Ghana were non-literates with Northern Region recording the lowest rural literacy rate of 8.9%, followed by Upper East with 12.4% and Upper West with 15.2% compared to Volta, Eastern and Western Regions which had a rural literacy rate of 55.7%, 51.9% and 51.4% respectively. It is clear that northern Ghana lags far behind other regions in terms of education (Songsore, 2003)). Also, child labour and teenage pregnancy are rife in the northern regions of Ghana (Mohammed, 2013).

The notable industry that has engaged majority of the youth and the general populace in the northern parts of Ghana is agriculture mainly due to the abundance of arable land (FAO, 2011). Agriculture offers many opportunities to the people of the north, men and women alike, and Ghana as a whole. The agricultural industry has always been underexploited. This

means that the agricultural industry contributes less when it comes to supporting the economic growth of the north and the subsequent arrest of the food insecurity across the country especially during the lean season when almost all food stuffs become scarce across the West African Sub-Region (FAO, 2011).

The agricultural industry is an energy driven industry. Large quantities of energy, time, water, financial resources and physical exhaustion are highly expensed (FAO, 2011). The farming processes are inefficient leaving farmers with substantial annual losses due in part to inadequate rains as a result of the erratic climate dynamics coupled with the conspicuous absence of irrigation dams across these regions. As a result, basic human needs such as clean water, education, health, etc, are hardly being met in many rural communities (GSS, 2007). It is expedient therefore to examine whether drought has any effect on the rural dweller and the possible management strategies and innovations that could be adopted for the improvement of the lives of many across these communities.

The Nandom District has experienced some interventions in the form of relief and coping strategies by government and non-governmental organisations, with some research work done on the impact of climate change on the lives of rural households. For instance, the impact of irrigation dam interventions on the livelihoods of farmers in the Upper West Region by Lingnule (2010). There is little information on the effects of drought on the livelihood of rural poor households, and their coping strategies in the Nandom District. It is within this context that this study seeks to examine the effects of drought on the livelihood of rural households in the Nandom District.

1.3 Main Research Question

What are the effects of drought on the livelihood of rural households in the Nandom District of the Upper West Region?

1.3.1 Sub-Research Questions

i. How does drought affect the collection of assets in the Nandom District of the Upper West Region?
ii. What are the coping strategies adopted by the rural households during drought periods?
iii. How do the coping strategies adopted by rural households during drought periods affect their workloads?
iv. What are the interventions to mitigate the adverse impacts of drought on rural households in the study area?

1.4 Main Research Objective

The priority of the research is to study how drought affects the livelihood of rural households in the Nandom District of the Upper West Region.

1.4.1 Sub-Research Objectives

Specifically, the study seeks to:

i. Assess the effects of drought on assets collection in the Nandom District of the Upper West Region.
ii. Investigate coping strategies adopted by the rural households during drought periods.
iii. Assess the effects of the coping strategies adopted by rural households during drought on their workloads;

iv. Assess the interventions from governmental and non-governmental institutions that seek to mitigate the adverse effects of drought on rural households.

1.5 Significance of the Study

The disastrous effects of change in climatic conditions on the lives of rural communities coupled with their extreme poverty conditions cannot be ignored. The empirical material of this study was based on current drought impact data and interviews with households, individuals, institutions in rural communities and local stakeholders from the Nandom District of the Upper West Region. By examining the effects of drought and predicting future adaptive capacity and constraints of the district, this study outlines the ability of rural households to cope with the future likely drought impacts.

This study provides knowledge about drought occurrences and the effects it has on rural communities in the Nandom District of the Upper West Region of Ghana. It is anticipated that the results generated from this study would be relevant to other areas of the country with similar climate problems and socio-economic structures. Institutions that are into provision of relief and supporting livelihoods of rural dwellers will have the ability of promoting the choices that are resistant to drought and other climatic impacts. Communities will develop effective disaster risk reduction strategies with district assemblies preparing and implementing locally developed disaster preparedness plans. The promotion of management strategies in the social setting can be achieved especially for the protection of the rural dwellers.

This research has determined the effects of drought on the livelihood of rural households and its influence on economic competitiveness. This is particularly important to the Meteorological Service Department in the Nandom District on issues of drought.

1.6 Organization of the Study

The study is organized in five Chapters. Chapter one (1) which is the introductory chapter looks at the background of the study, the specific problem to be studied, the research questions and objectives, and the significance of the study. Chapter two (2) consists of review of relevant literature. Chapter three (3) discusses the approach and methodology of the study. The empirical results that were obtained from the study were presented and discussed in Chapter four (4). Chapter five (5) covers the major findings, summary, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter deals with literature from both social and natural sciences that are relevant to the study to facilitate a clear understanding of the problem. The chapter is divided into four main parts; part one deals with the concept of livelihood and drought concept (drought classification, drought as a natural disaster, drought identification, and causes of drought); the second part focuses on differentiated impacts of drought around the globe (North America, Europe, Asia, Australia, Africa and Northern Ghana); the third part deals with a conceptual framework for "enhancing rural household's assets to manage risk during drought periods"; and the fourth and final part dealing with coping strategies and adaptation, and discussion of the literature review in a broader form.

2.1 The Concept of Livelihood

While there are many definitions and complex systems developed to explain the concept of livelihoods, livelihood in the context of household adaptation to drought effects basically "comprises the capabilities assets (including both material and social) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Carney, 1998).

The International Institute for Sustainable Development (2003) in the publication dubbed "Livelihoods and Climate Change" explained that the resilience of households to vulnerability is the idea of livelihood assets. These are the means of production available to a given individual, household or group that can be used in their livelihood activities. These assets are

the bases on which livelihoods are built and, in general, the greater and more varied the assets are the higher and more durable the level of sustainability and security of their livelihoods.

Livelihoods in recent times are seen as fundamental to poverty reduction approaches around the world. The emergence of livelihoods approaches has led to new understandings on how poverty, and the ability to move out of poverty, reflects the (lack of) capabilities and assets available to the poor. This includes material assets such as land, other natural resources, financial and capital and credit, tools and inputs into productive activities and others. It also reflects human capabilities (the knowledge and skills of the family), social and political factors such as contact networks and the openness of government institutions and, critically for the purpose of this study, the capability to withstand the effects of shocks such as drought. For most households, and especially for poor people, these assets are deployed in a series of livelihood activities: the means through which a household gains an income and meets its basic needs. This include paid employment, but for poor people in particular it includes the ability to farm and to exploit common property such as livestock, fishing, gathering fuel wood and many other things. Reliable and secure access to these resources, to land, water, and biotic resources, is fundamental to the livelihoods of rural households. Indeed, in many ways this is what climate change impacts are all about: changes to resource flows critical for livelihood sustainability (IUCN, 2003).

According to IUCN (2003), there are generally five forms of livelihood assets identified in most approaches. They are natural capital, social-political capital, human capital, physical capital, and financial capital. Taken together, these livelihood assets determine to a large extent how livelihoods work, and in particular are the basis for understanding how people will respond to climate-induced vulnerabilities. This in turn means they are (or at least should be)

the basis for the development of coping strategies. All of these assets are important, but for the poorest and most vulnerable of the world (especially the rural poor), natural resources are of particular significance. Therefore, for the livelihoods to be sustainable, the natural resources must be sustained (Rennie & Shaw, 1996).

According to Akudugu, Dittoh and Mahama (2012), climate change affects the different types of "capital" assets upon which households draw to build their livelihoods. Rural households in particular whose livelihoods depend greatly on these capital assets become very vulnerable.

The Nandom District depicts a typical rural economy dominated by the agriculture sector with commerce and industrial sectors least developed. Agriculture alone accounts for about 86% of the labour force while commerce/service and industry account for 13% and 1% respectively (MTDP, 2014). The main farming and cropping systems in the district are mixed farming and cropping based on bush fallowing and compound farming. This research is designed to probe and answer questions relating to livelihood assets available to rural households and the extent to which these assets provide security against drought hazards.

2.2 The Concept of Drought

NDMC (2000) of Australia has noted that, the word 'normal' makes it difficult to define drought. In many areas, normal situations generally mean conditions that do not deviate from long-term averages; however, averages themselves do change with time. Differences in hydro-meteorological variables and socioeconomic factors as well as the stochastic nature of water demands in different regions around the world have become an obstacle to having a precise definition for drought. Widely different views of drought definitions are one of the major obstacles to investigations of droughts (Yevjevich, 1967). Wilhite (1987) went further to assert that when defining a drought it is important to distinguish between conceptual and

operational definitions. Conceptual definitions as they are stated in relative terms (for example, a drought is a long dry period), whereas operational definitions, on the other hand, attempt to identify the onset, severity, and termination of drought periods. Operationally, defined droughts can be used to analyze drought frequency, severity, and duration for a given return period (Mishra, Singh & Desai, 2007).

Some of the common conceptualizations of drought include: drought as a sustained, extended insufficiency in precipitation (WMO, 1986); drought as 'the means of naturally occurring phenomenon that exists when rainfall has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems' (UN Secretariat General, 1994). The Food and Agriculture Organization (FAO, 1983) of the United Nations define drought hazard as 'the percentage of years when crops fail from the lack of moisture'. The Encyclopaedia of Climate and Weather defines a drought as 'an extended period – a season, a year, or several years – of insufficient rainfall relative to the statistical multi-year mean for a region'; drought as 'the smallest annual value of daily stream flow (Gumbel, 1963), and drought as 'a sustained period of time without sufficient amount of rainfall' (Linseley, Kohler Jr & Paulhus, 1959).

From the various definitions outlined above, drought is said to be an extended period of months or years when a region suffers a deficiency in its water supply as a result of long period of no rainfall which increases crops failure due to insufficient moisture (WMO, 1986; FAO, 1983).

2.2.1 Drought as a Natural Hazard

A natural hazard is a threat of a naturally occurring event that will have a negative effect on people or the environment and drought is a kind of natural hazard which is aggravated by

growing water demand. The reasons for the occurrence of droughts are complex, because they are dependent not only on the atmosphere but also on the hydrologic processes which feed moisture to the atmosphere. Once dry hydrologic conditions are established the positive feedback mechanism of droughts sets in, where the moisture depletion from upper soil layers decreases evapo-transpiration rates, which, in turn, lessen the atmospheric relative humidity. The lesser the relative humidity the less probable the rainfall becomes, as it will be harder to reach saturation conditions for a regular low pressure system over the region. Only disturbances which carry enough moisture from outside the dry region will be able to produce sufficient rainfall to end drought conditions (Bravar & Kavvas, 1991). Droughts rank first among all natural hazards when measured in terms of the number of people affected (Obasi, 1994; Hewitt, 1997). Droughts differ from other natural hazards in several ways (Wilhite, 1998). First, the onset and the end of a drought are difficult to determine, the impacts of a drought increase slowly, often accumulate over a considerable period and may linger for years after termination. Therefore, a drought is often referred to as a creeping phenomenon. Second, it is difficult to define a drought which leads to confusion for not having a universal definition of drought. Third, drought impacts are non-structural and spread over large geographical areas than damages that may result from other natural hazards. In contrast to floods, hurricanes, earthquakes, and tornadoes, drought affects water bodies, water resources structures and it seldom results in structural damage. For this reason, the quantification of the impact and the provision for relief are far more difficult for droughts than for other natural hazards (Wilhite, 1992). Fourth, human activities can directly trigger drought unlike other natural hazards, with exacerbating factors such as over farming, excessive irrigation, deforestation, over-exploiting available water, and erosion, adversely impacting the ability of the land to capture and hold

water. Bryant (1991) ranked hazard events based on their characteristics and impacts. Key hazard characteristics used for ranking included the degree of severity, the length of event, total areal extent, total loss of life, total economic loss, social effect, long-term impact, suddenness, and occurrence of associated hazards. It was found that drought stood first based on most of the hazard characteristics. Other natural hazards, which followed droughts in terms of their rank, are tropical cyclones, regional floods, earthquakes, and volcanoes.

2.2.2 Classification of Droughts

Droughts can be grouped into four categories based on their definitions [American Meteorological Society, 2004, which include: Meteorological drought, hydrological drought, agricultural drought, and socio-economic drought]. However, this study would place emphasis on agricultural drought since agriculture is the mainstay of the people within the study area.

2.2.2.1 Meteorological Drought

Meteorological drought is defined as a lack of precipitation over a region for a period of time. Considering drought as precipitation deficit with respect to average values, many studies have analyzed droughts using monthly precipitation data (Gibbs, 1975).

2.2.2.2 Hydrological Drought

Hydrological drought is related to a period with inadequate surface and subsurface water resources for established water uses of a given water resources management system. Stream flow data have been widely applied for hydrologic drought analysis (Dracup, Lee & Paulson, 1980; Sen, 1980; Zelenhasic & Salvai, 1987; Frick, Bode & Salas, 1990; Mohan and Rangacharya, 1991). From regression analyzes relating droughts in stream flow to catchment

properties, it is found that geology is one of the main factors influencing hydrological droughts (Zecharias & Brutsaert, 1988; Vogel & Kroll, 1992).

2.2.2.3 Agricultural Drought

Agricultural drought, usually, refers to a period with declining soil moisture and consequent crop failure without any reference to surface water resources. A decline of soil moisture depends on several factors which affect meteorological and hydrological droughts along with differences between actual evapo-transpiration and potential evapo-transpiration as a result of continues heating up of the earth surface. Plant water demand depends on prevailing weather conditions, biological characteristics of the specific plant and stage of growth, and the physical and biological properties of soil. Several drought indices, based on a combination of precipitation, temperature and soil moisture, have been derived to study agricultural droughts (Rachelle, 2006).

2.2.2.4 Socio-economic Drought

Socio-economic drought which is similar to the agricultural drought is associated with failure of water resources systems to meet water demands and thus associating droughts with supply of and demand for an economic good, which is water, (American Meteorological Service, 2004). Socio-economic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply. This will increase the price of such good (water) and its related commodities and eventually it is the rural poor who suffer most. Poverty and low living standards sets in times like this and need be for investigation (Rachelle, 2006).

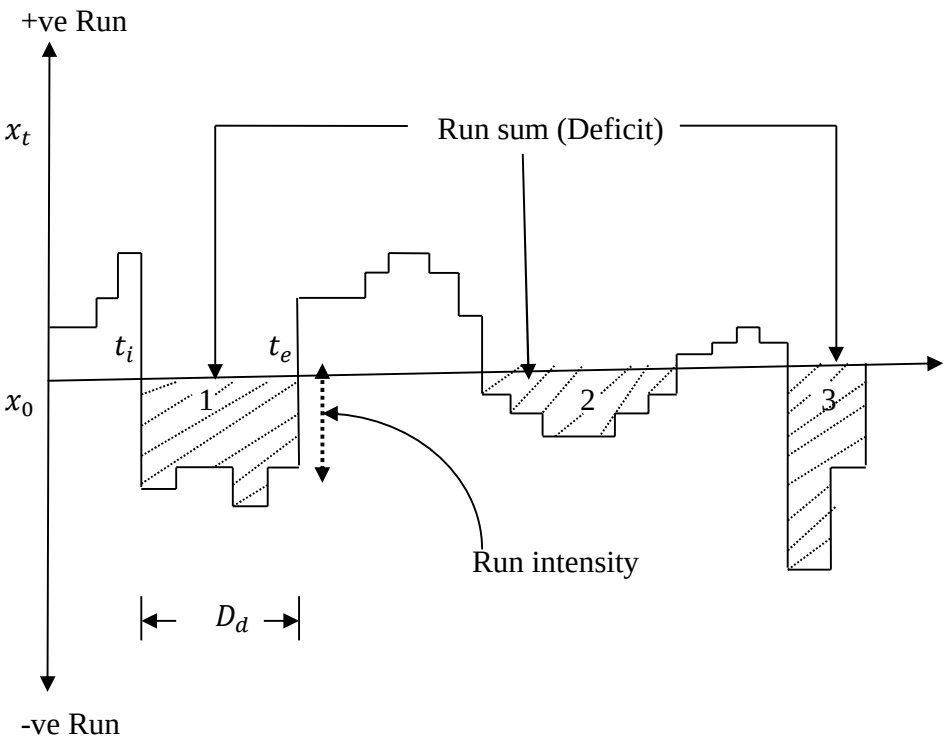
Several studies have discussed these four types of drought, however it will be useful and important to introduce ground water drought as a fifth type of drought which has not been included in the classification of droughts. To date, little research has been done on the occurrence and propagation of droughts in groundwater (Rachelle, 2006). When groundwater systems are affected by droughts, first groundwater recharge and later groundwater levels and groundwater discharge decreases. Such droughts are called groundwater droughts and generally occur on a time scale of months to years (Van Lanen & Peters, 2000). For groundwater, the total amount of water available is difficult to define. Even if it can be defined, in most groundwater systems, negative impacts of storage depletion can be felt, long before the total storage is depleted (van Lanen & Peters, 2000; Calow, Robins, Macdonald & Nicol, 1999). Therefore, most often a groundwater drought is defined by the decrease of groundwater level (Chang & Teoh, 1995). However, groundwater storage, or groundwater recharge or discharge (Peters, Van Lanen, Bradford, Cruces de Abia, & Martinez Cortina, 2001) can be and has also been used to define or quantify a groundwater drought.

2.2.3 Drought Identification

This section discusses the method used for identification of drought properties based on a particular drought index (a prime variable for assessing the effect of a drought and defining different drought parameters, which include intensity, duration, severity and spatial extent). Yevjevich (1967) proposed the theory for identifying drought parameters and investigating their statistical properties: (a) duration, (b) severity, and (c) intensity. The most basic element for deriving these parameters is the truncation or threshold level, which may be a constant or a function of time. A run is defined as a portion of time series of drought variable x_t in which all values are either below or above the selected truncation level of x_0; accordingly it is called

either a negative run or a positive run. Figure 2.1 represents a plot of a drought variable denoted by x_t which is intersected at many places by the truncation level x_0`, which can be a deterministic variable, a stochastic variable, or a combination thereof. Various statistical parameters concerning drought duration, magnitude and intensity at different truncation levels are much useful for drought characterization.

Figure 2.1: Drought Identification



1. Drought with the highest severity;
2. Drought with the longest duration;
3. Drought with the highest intensity.

Source: American Journal of Hydrology (2010)

A drought event has the following major components (Dracup et al., 1980) as derived from figure 2.1 which include: (a) Drought initiation time (t_i) which is the starting of the water

shortage period that indicates the beginning of a drought. (b) Drought termination time (t_e) which is the time when the water shortage becomes sufficiently small so that drought conditions no longer persist. (c) Drought duration (D_d), expressed in years/months/weeks, etc., during which a drought parameter is continuously below the critical level. In other words, it is the time period between the initiation and termination of a drought. (d) Drought severity (S_d), indicates a cumulative deficiency of a drought parameter below the critical level and (e) Drought intensity (I_d), which is the average value of a drought parameter below the critical level. It is measured as the drought severity divided by the duration. The run theory has been applied in several drought models and analyzes (for example, Dracup et al., 1980; Mishra, Desai & Singh, 2007).

This theory is therefore important for assessing the impact of drought on the livelihood of rural households in the study area because it will help the researcher identify the various drought parameters that took place within the context of drought intensity, duration, severity and spatial extent.

2.2.4 Causes of Drought

Generally, the causes of droughts are easily understood, but hard to prevent. Depending on the location, crop failures, famine, high food prices, and deaths can occur. One of the scariest parts of a drought is the onset time. Unlike other forms of severe weather or natural disasters, droughts often develop slowly (Rachelle, 2006).

Droughts are caused by a depletion of precipitation over time. Unlike a dry spell, prolonged lack of rain will cause regions around the world to slowly dry out. Because of the slow onset of droughts, their cost is often only estimated. Frequently, droughts are “billion dollar weather

events" and are one of the top three threats to population in the world along with famine and flooding (Rachelle, 2006).

Sometimes drought takes decades to develop fully and predicting droughts is difficult. The frequency of droughts in the United States is literally every year. In other words, somewhere in the US in any given year, a drought is occurring. Droughts are completely natural, but their devastation can be far-reaching and severe. Atmospheric conditions such as climate change, ocean temperatures, changes in the jet stream, and changes in the local landscape are all culprits in the long story of the causes of droughts (Rachelle, 2006).

Because drought is defined as a deficit in water supply, it can be caused by a number of factors. The most important one though relates to the amount of water vapour in the atmosphere as this is what creates precipitation. More rain, sleet, hail, and snow can occur where there are moist, low pressure air systems. If there is an above average presence of dry, high pressure air systems instead, less moisture is available to produce precipitation (because these systems cannot hold as much water vapour). This results in a deficit of water for the areas over which they move.

Same can also happen when winds shift air masses and warm, dry, continental air moves over an area as opposed to cooler, moist, oceanic air masses. El Nino, which affects the ocean's water temperature, also has an impact on precipitation levels because in years when the temperature cycle is present, it can shift the air masses above the ocean, often making wet places dry (drought prone) and dry places wet (Rachelle, 2006). Finally, deforestation for agriculture and/or building combined with the resultant erosion can also cause drought to begin because as soil is moved away from an area it is less able to absorb moisture when it falls.

2.2.5 Impacts of Drought

Despite the current interest in impacts of drought, little empirical information is available. The bulk of the available information comes from self-published literature by international organizations, non-governmental organizations, and private foundations, as well as aid and disaster relief organizations. A smaller but slowly growing body of academic literature is looking into this area, especially in development and environment related journals, with publications starting 1990 (Annecke, 2002; Denton, 2002; Hemmati & Rohr, 2009). While some publications provide a broad overview for navigating drought impacts in the context of climate change, a majority of these are case studies that are specific to a certain area due to the highly contextual nature of the subject. According to Arrora-Johnson (2011), literature about drought impact has so far been written mainly to advocate for a people's perspective within international politics, and that it has been marred by a lack of data and evidence. This signals that caution is necessary when examining evidence for drought impacts on rural households to ensure that claims are supported by sound findings and data, and not merely based on assumptions, projections, or speculations.

Drought as a climatic concept produces a complex web of impacts that span many sectors of the society, including economy and may go beyond the geographical boundary of the drought. According to Kogan (1997) droughts are a widespread phenomenon, since about half of the earth's terrestrial surfaces are susceptible to them. More importantly, almost all of the major agricultural lands are located in the terrestrial surface of the earth which is being affected by droughts (USDA, 1994). Droughts as a natural hazard have had the greatest negative impact on human life within the 20th and 21st centuries (Bruce, 1994; Obasi, 1994). In times past, large scale intensive droughts have been observed on all continents, affecting large areas in

Europe, Africa, Asia, Australia, South America, Central America, and North America (Le Comte, 1995 & Le Comte, 1994) and high economic and social costs have led to increasing attention to droughts (Downing & Bakker, 2000**).** The impact of droughts on different continents around the globe is now being discussed.

2.2.5.1 The impacts of Drought in North America

From the 1980s, the impacts of droughts in the United States have increased significantly with an increased number of droughts or an increase in their severity (Wilhite & Hayes, 1998; Changnon et al., 2000). For example, the impact of the 1988 large area drought on the US economy was estimated at $40 billion, which is 2 to 3 times the estimated loss caused by the 1989 San Francisco earthquake (Riebsame et al., 1990). Based on the data available from the National Climatic Data Centre (2002), nearly 10 percent of the total land area of the United States experienced either severe or extreme droughts at any given time during the last century. Over the years 1980 to 2003, in the United States as a whole, droughts and other heat waves accounted for 10 of the 58 weather-related disasters. Droughts alone accounted for $144 billion (41.2%) of the estimated $349 billion total cost of all weather-related disasters (Ross & Lott, 2003). Hence, in economic terms alone droughts are costliest natural disasters to strike the United States (Cook et al., 2007). Although most regions of Canada have experienced droughts, the Canadian Prairies (and to a lesser extent, interior British Columbia) are more susceptible mainly due to their high variability of precipitation in both time and space (Environment Canada, 2004). During the past two centuries, at least 40 long-duration droughts occurred in Western Canada. Over much of the Prairies, several consecutive seasons of below average precipitation have led to one of the most severe prairie droughts on record, devastating many water dependent activities in 2001 and 2002 (Environment Canada, 2004).

In 2001, the aggregate level of the Great Lakes plunged to their lowest points in over 30 years, with Lake Superior and Lake Huron displaying near record lows (Mitchell, Tanner & Lussier, 2007).

2.2.5.2 The Impact of Drought in Europe

The drought situation in many European regions has already become more severe (Demuth & Stahl, 2001). For example, Lehner, Doll, Alcamo, Henrichs and Kaspar (2006) presented a continental, integrated analysis of possible impacts of global change on future flood and drought frequencies for Europe. The global integrated water model, Water GAP, was evaluated regarding its capability to simulate high and low flow regimes, which was then applied to calculate relative changes in flood and drought frequencies. The results indicated large 'critical regions' for which significant changes in flood or drought risks might be expected under proposed global change scenarios. The regions that are most prone to a rise in flood frequencies are northern to north-Eastern Europe, while southern and South-eastern Europe shows significant increases in drought frequencies. Increase in average precipitation and its variability is expected for northern regions, suggesting higher flood risks, while less rainfall, prolonged dry spells and increased evaporation may increase the frequency of droughts in southern areas (Watson et al., 1997; EEA, 1999; Voss, May & Roeckner, 2002). Because of their large scale characteristics, droughts should be studied within a regional context (Demuth & Stahl, 2001; Tallaksen, 2000; Mishra & Singh, 2009). It is observed that from 1975 to 2000, Europe has been affected by a number of major drought events, most notably in 1976 (Northern and Western Europe), 1989 (most of Europe), 1991 (most of Europe), and more recently, the prolonged drought over large parts of Europe associated with the summer heat wave in 2003 (Feyen & Dankers, 2009). The most serious drought in the

Iberian Peninsula in 60 years occurred in 2005, reducing overall EU cereal yields by an estimated 10 per cent (UNEP, 2006). Since 1991, the yearly average economic impact of droughts in Europe has been €5.3 billion, with the economic damage of the 2003 drought in Europe amounting to at least €8.7 billion (European Communities, 2007).

2.2.5.3 The Impact of Drought in Asia

According to a recent IPCC study, production of rice, maize and wheat in the past few decades has reduced drastically in many parts of Asia due to increasing water stress, arising partly from increasing temperature, increasing frequency of El Niño events and reduction in the number of rainy days (Bates et al., 2008). For examples, during 1999–2000, up to 60 million people in Central and Southwest Asia were affected by a persistent multi-year drought, one of the largest from a global perspective (IRI, 2001), with Iran, Afghanistan, Western Pakistan, Tajikistan, Uzbekistan and Turkmenistan experiencing the most severe impacts. In another example, frequent severe droughts in 1997, 1999 to 2002 in many areas of northern China caused large economic and societal losses (Zhang, 2003). In 2000, agricultural areas affected by droughts were estimated to exceed 40 million hectares. Because of droughts, water shortage, desertification, and dust storms accompanied the drying climate in both rural and urban areas. For instance, during 1972–1997, there were 20 years during which the Yellow River experienced drying-up (zero stream flow) episodes, and the earlier start time and longer periods of the drying up have become more frequent since the early 1990s. The severe drought of 1997 in northern China resulted in a period of 226 days with no stream flow in the Yellow River, which is the longest drying-up duration on record. It is also observed that there has been an increased risk of droughts since the late 1970s, as global warming progresses and produces both higher temperatures and increased drying (Zou, Zhai & Zhang,

2005; Dai, Trenberth & Qian, 2004). India is amongst the most vulnerable drought-prone countries in the world; drought has been reported at least once in every three years in the last five decades. What is of concern is its increasing frequency. Since the mid-nineties, prolonged and widespread droughts have occurred in consecutive years, while the frequency of droughts has also increased in recent times (World Bank, 2003).

2.2.5.4 The Impact of Drought in Australia

Drought is a frequent occurring phenomenon in Australia, with the most recent, the so called 'millennium' drought, now having lasted for almost a decade (Bond, 2008). This severe drought has affected most of Southern and Eastern Australia and is regarded as one of the worst in the region since European settlement (Murphy & Timbal, 2007), with many rivers experiencing record low flows over this period (Murray- Darling Basin Commission, 2007). For example, the Australian Bureau of Agriculture and Resource Economics estimates that the 2006 drought reduced the national winter cereal crop by 36 percent and cost rural Australia around AUD $3.5 billion, leaving many farmers in financial crisis (Wong, Lambert, Leonard & Metcalfe, 2009).

2.2.5.5 The Impact of Drought in Africa

Since the late 1960s, the Sahel−a semi-arid region in West Africa between the Sahara desert and the Guinea coast rainforest− has experienced drought of unprecedented severity in recorded history. The drought has had a devastating impact on this ecologically vulnerable region and was a major impetus for the establishment of the United Nations Convention on Combating Desertification and Drought (Zeng, 2003). While the frequency of droughts in the region is thought to have increased from the end of the 19th century, three long droughts have

dramatic environmental and societal impacts upon the Sahel nations. Famine followed severe droughts in the 1910s, the 1940s, and the 1960s, 1970s and 1980s; although a partial recovery occurred from 1975–1980. While at least one particularly severe drought has been confirmed in each century since the 1600s, the frequency and severity of the recent Sahelian drought stands out. Famine and dislocation on a massive scale -from 1968 to 1974 and again in the early and mid-1980s−was blamed on two spikes in the severity of the 1960-1980s drought periods (Batterbury & Warren, 2001).

2.2.5.6 The Impact of Drought in Ghana

Ghana is subjected to series of drought periods. From 1982-1983, Ghana experienced a particularly large drought followed by a less intense one in 2004. The major complaint was that the total rainfall on a yearly basis seems not to be changing significantly, but the patterns with which these storms do arrived cause farmers distress. The rainfall patterns in Ghana of late do start late and then when they do arrive, they are shorter couple with intense rainstorms (Ghanaian Chronicle, March 14, 2008:7)

The northern regions of Ghana are more rural than the south relying heavily on farming for survival (GLSS, 2007). For this reason, predicting the rains is crucial to their existence. Ghanaian precipitation patterns, however, are not easily predicted with years of drought being followed closely by years of flooding, both equally as destructive to crops and both leaving a wake of famine and reliance on foreign aid (Ghanaian Chronicle, March 14, 2008:7). In 1999 and in 2007, the northern region of Ghana was devastated by flooding. The flooding in 2007 was preceded by months of drought with June and July being especially dry so that when the rains finally arrived in August, ephemeral streams occurred instead of percolation into the soil. The delay of the rains and their heavy onset washed away healthy crops and also caused

a loss to those who planted too early (Ghanaian Chronicle, March 14, 2008:7). The livelihood rural households in northern Ghana during droughts suggest a downward trend in the living standards of the inhabitants (Ghanaian Chronicle, March 14, 2008:7)

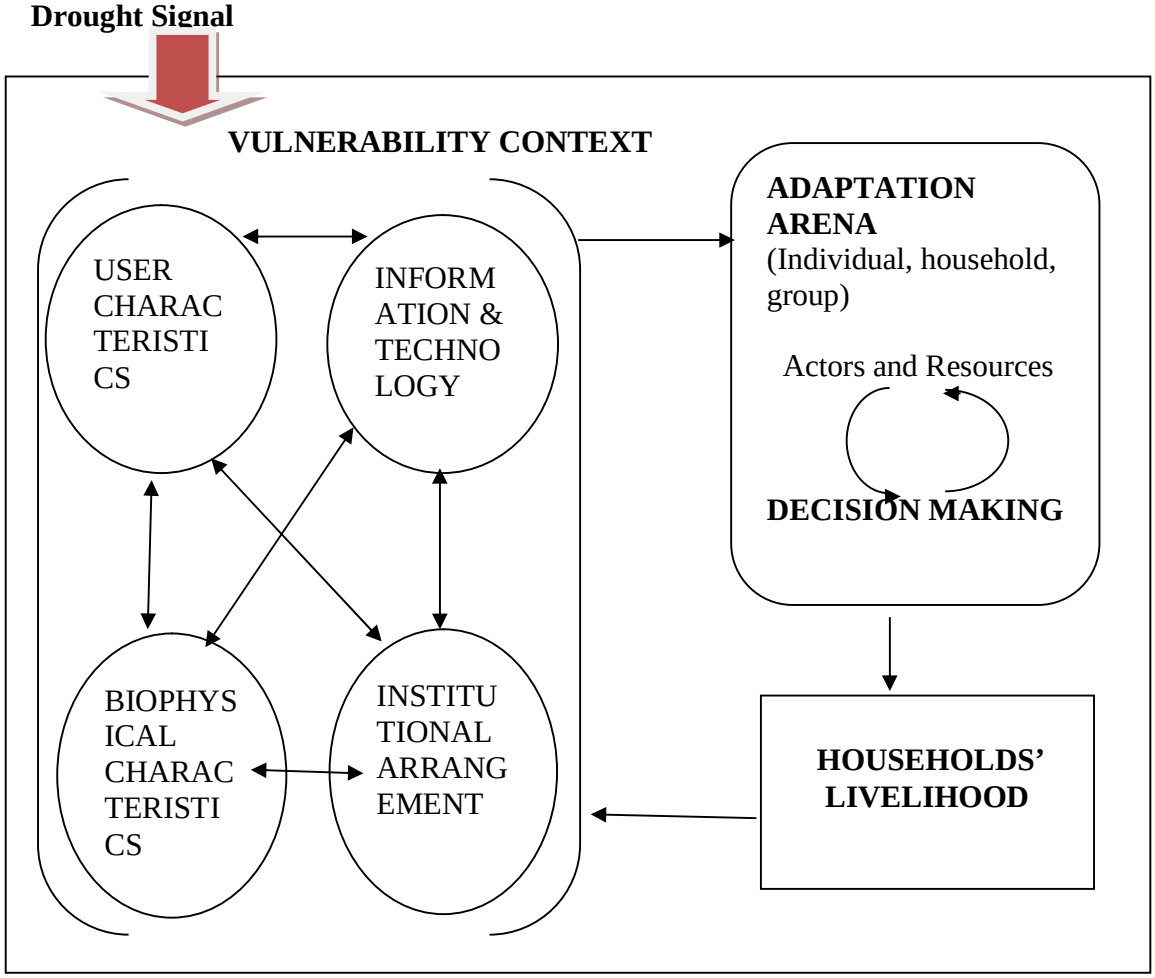
The northern and coastal savannah grasslands which can become the granary of the country is under-utilized owing to some deep-seated problems, one of the most serious of which is the inadequate water supply and drought (Ofori-Sarpong, 1983).

People in the Nandom District lamented so much over the 2011/2012 droughts because it had many devastating impacts in their lives. Since agriculture is the mainstay of the people, farmers were worried as food crops were withering (Graphic Communication Group Limited, May 19, 2006:11). Below are sample pictorial views of drought effects in Ghana.

Figure 2.2: Drought Effects in Ghana

Source: Ghanaian Chronicle, March 14, 2008:7

Figure 2.3: Conceptual Framework for Enhancing Rural Households to Manage Risk during Drought Periods.



Source: (IFPRI, 2011)

In examining the impacts of drought within this framework, a hypothetical example may be that drought occurs in a rural agricultural environment resulted in crops (biophysical characteristic) failure. The failure of subsistence crops may compel women to sell off assets such as small livestock or seek other means of generating income to provide for the family. Men's larger involvement in crop production and waged labour may mean that they would lose wages when crop fail, or they may temporarily migrate to other areas in search for jobs.

These impacts demonstrate different user characteristics between women and men in the vulnerability context. A smaller income base due to crop failure may cause a household to decrease consumption or deplete their savings as coping strategies, affecting the livelihood of the members of the household, but with gendered subtleties. Women and children may suffer more food insecurity than men, children may drop out of school when school fees cannot be paid, and more women may become heads of households when their husbands migrate in search of work, which may increase their burden. Another impact of the drought may be that women have to travel longer distances in search of water for household consumption or for irrigation, which further contributes to their "time poverty", a concept Bardasi and Wodon (2006) used to describe individuals' lack of time for rest and leisure after taking into account the time spent in working, whether in the labour market or in domestic work.

In terms of the adaptation arena, households with a larger asset base, access to information or institutional support (institutional arrangements in the framework) may be able to change farming practices or diversify their crops to better withstand drought conditions. However, the ability to adopt these adaptation strategies may differ from women to men depending on access or control of assets and the socio-cultural context, which determines their rights, roles, and responsibilities. Many factors may influence how drought affects the livelihood of rural poor women and men. For example, in most households power dynamics between men and women would influence their responses to climate shocks differently (Carr, 2008). The interdependencies, expectations, entitlements, and livelihood strategies that are established between women and men, among women, and among individuals within a community that play out in various contexts also cast influence on the impacts of drought (Demetriades & Esplen, 2008; Nielsen & Reenberg, 2010). Additionally, social structures such as ethnicity,

race, religion, and caste (see Ahmad & Fajber, 2009) or demographics such as age, education, wealth, and size of household (Deressa, 2009) further intersect with the gender dimension. These factors constitute the institutional arrangements that women, men, and communities engage in, which may also affect the way they perceive, understand, value, or respond to drought in the adaptation arena (Roncoli, Crane & Orlove, 2009).

To help achieve the objectives of the study − to assess the effects of drought on assets collection, to investigate coping strategies adopted by rural households during droughts, to assess the effects of the coping strategies on their workloads − this study provides a review of literature on the impacts of drought in the following five "impact areas," with a focus on rural communities: impacts related to agricultural production; impacts related to food security; impacts on health; impacts related to water and energy sources; and impacts from drought-related migration and conflict. These impact areas identified were drawn from a scoping study by Brody, Demetriades and Esplen (2008), who map linkages between gender and drought impact. In each impact area, this review evaluates how the evidence relates to women and men affected by drought, and which types of assets are affected. The objective of this review is to focus specifically on drought-related shocks placing much emphasis on how drought affects women and men in the short-term.

2.2.6.1 Impacts Related to Agricultural Production

Increased climate variability especially in the case of drought lowers agricultural production, with different impacts on women's and men's natural, physical, social, and financial capital (IFPRI, 2012). Increasing climate variability poses a lot of obstacles for agricultural production. Diminishing crop yields as a result of growing climate variability can affect women's and men's assets in different ways, demonstrating the connection between user and

biophysical characteristics in the vulnerability context as shown in the conceptual framework. Quisumbing, Kumar and Behrman (2011) investigated the impacts of drought shocks on wives' and husbands' assets in Bangladesh and Uganda and hypothesized that the impact depends on involvement in agricultural production and exposure to weather risk. They observed that drought had a negative effect on wives' non-land asset holdings, but no significant effect on jointly held or husbands' non-land assets. Drought produced no significant impact on husbands', wives', or joint land accumulation. In Bangladesh, drought shocks had a negative impact on husbands' non-land assets (mostly agricultural and consumer durables) but no significant impact on wives' non-land assets. No significant impact was found for drought on husbands', wives', or joint land accumulation. The authors suggested that a lack of impact from these covariate, agriculture-related shocks on wives' assets in Bangladesh may reflect the lack of direct exposure to agricultural risk because the women rarely cultivate land independently, as well as the low level of women's ownership and control of agricultural assets (IFPRI, 2011).

Some studies on women's ownership of livestock during times of drought provide mixed results where some women gained increased control of assets in the form of livestock, while others were at risk of losing access to natural capital in the form of rangelands for livestock grazing. Kristjanson (2010) found out that repeated droughts in Niger strengthened women's control over livestock because they were able to invoke a cultural norm that made men responsible for household food security, with the result that men had to sell their livestock before women's. This led to an increase in women's relative control over livestock. However, in another study, the same authors found that many women in the Sahel felt that they would

lose traditional access to resources if competition for rangeland and other livestock resources increased due to increasing climatic vagaries (IFPRI, 2011).

Income losses from drought impact on agriculture may also affect women and men differentially in terms of financial and social capital. For example, Buechler (2009) found that changes in climate and associated depletion of water resources in Sonora, Mexico, increasingly jeopardize women's livelihoods and social connections. He observed that women were less able to earn and control income from processing certain fruits and vegetables such as plums, apricots, figs, and olives due to warmer temperatures and water scarcity and also eroding their social connections. Also in Mexico, Biskup and Boellstorff (1995) found that a prolonged drought caused the greatest economic stress to unmarried and widowed women with children who were severely resource-limited. Under these severe circumstances, some of these women resorted to selling their small livestock, which ultimately reduced their financial capital. Information on how the drought specifically affected men's assets or control of assets was not apparent. But the authors allude to the fact that in the study area, a woman's inheritance is solely hers (whether it is land or livestock) and the husband must ask permission before he uses them.

These examples show that crop losses and diminishing agricultural production influenced by climate variability may lead to asset and livelihood losses for both women and men, but the effects are varied in different contexts. Ownership of land may influence women's and men's degree of exposure to climate shocks, while cultural norms may help some women gain increased control of assets such as livestock. Although this increased control of assets by women may seem like a positive outcome, a loss of men's assets may also weaken the overall economic viability of the household, and as such may increase the household's overall

vulnerability to climate shocks. Income losses from crop failure negatively affect the social support systems (a source of social capital) and financial capital of some women, but force other women to resort to distress sales of livestock.

Increased climate variability causes women and men to spend more time and human capital in agricultural production, but women are particularly affected. Women and men are changing their cropping practices in response to climate variability, with different impacts on well-being for both sexes. Nelson and Stathers (2009) found in Tanzania that variations to the mix of crops grown changes men's and women's access to and control of the income from crop sales, as well as their respective workloads. The overall picture is mixed: increased marketing of food crops (for example, sorghum, millet, and maize), which are grown by women, increase women's workloads despite the fact that they do not benefit from the profits. Conversely, the increased sale of groundnuts, round beans, and cowpeas−traditionally sold by women−provided women with more access to and control of income. The introduction of sesame and sunflower led to more household income, but household members did not always share control of this income equally and these crops led to more weeding work for women. The study also reports that many farmers (no gender disaggregation) had to replant annual crops. Crops such as bulrush millet and groundnuts had to be replanted more often, as rains were "unpredictable, coming and then stopping abruptly", which meant that time and seeds were wasted, and the quality of the crops affected.

Droughts cause both women and men to spend more time planting and diversifying their crops, but women's workload increased as they had to look for food for their families (Bynoe, 2009). Roncoli, Ingram & Kirshen (2001) found that due to drought, farmers in Burkina Faso became more interested in short- and medium-term sorghum varieties and women played an

important role in the diffusion of these varieties through farmer to farmer exchange. However, the shift in cropping practices entailed costs and risks because these varieties were more vulnerable to weeds, pests, and water stress, and less productive than longer duration varieties. Although maize plantings increased among farmers to shorten the hunger season, the drought caused the crop to fail. Also, an unusually heavy rain that followed the drought triggered a high proliferation of weeds that farmers could barely remove and replanting was not possible due to lack of time.

These examples demonstrate connection between user and biophysical characteristics in the vulnerability context. Women and men respond to climate signals by diversifying their crops, which requires additional human capital investments in the form of time and labour. This may be due to the unfamiliarity of dealing with new types of crops in comparison with crops that had been planted regularly in the past, or that more diversified farms require more labour and time to operate as different types of crops may require different treatment. These tasks contribute to the time demands of women and men, causing greater difficulties for women who have to deal with other household chores at the same time (Bynoe, 2009). Women may sometimes find opportunities to increase their control of income through crop diversification, but this is context-specific and cannot be generalized.

Women and men have different access to information (human capital) and agricultural inputs that are increasingly necessary with perennial droughts. Access to information and technologies are paramount when it comes to managing drought risks for agricultural production. As such, they establish connections between three components in the vulnerability context: user characteristics, biophysical characteristics, and information and technology. Some studies revealed that men are more likely to have access to these resources and the skills

and power to use them and therefore may be better equipped to adapt compared to women (see CARE International 2010), while others (see Malhotra, Kanesathasan & Patel, 2012) found that information and communication technologies increasingly transform the economic opportunities available to poor and low-income women.

In terms of drought specifically, two examples are interesting to note, where women had less access to climate forecast information. Archer (2003) found in South Africa that women in farming communities did not have the same access as men to climate forecast information. Men preferred the radio as a medium of dissemination whereas women preferred seasonal forecasts provided through extension officers, in a "teach-in" situation. The women expressed this preference because they "like to ask questions", and because "their time is not flexible enough to be able to sit and listen to a radio program at a fixed time". Men, in contrast, said that they had no problem scheduling a regular time to listen to a radio broadcast.

These findings suggest that constraints on women's time and spatial mobility may limit their access to timely weather information. In another study, Roncoli, Crane and Orlove (2009) found that gender, as well as ethnicity and politics, profoundly shaped the way that drought information gained from participatory workshops was shared and accessed in Burkina Faso. Most of the workshop participants (93.4 percent) were men. In one village, male village leaders did not invite women to the workshop so that they would not have to reduce the number of places reserved for male farmers. Since the women in this village could not approach the male participants to ask for information, many women failed to get the climate forecasts even by second hand.

In Jamaica, Vassell (2009) found that farmers have abandoned native seed varieties and are becoming more dependent on new hybrid seeds for crops that require more water and

fertilizer, yet drought makes it difficult for them to grow such crops. The high cost of agricultural inputs such as fertilizers and women's lower income status means that women are less able than men to afford the cost of fertilizers and water that are essential to produce high yields.

Taken together, literature in this section shows that increasing drought periods tends to lower agricultural production, with different impacts on women's and men's livelihood and assets, including land, livestock, financial and social capital. Both women and men also spend more time and labour in agricultural production as a result of increasing drought periods, but women experience a heavier workload due to other domestic chores they perform. Also, literature elsewhere already shows that women tend to spend disproportionally more time than men in agricultural labour and household work (see, Bardasi & Wodon, 2006; Nellemann, Verma & Hislop, 2011; Onta & Resurreccion, 2011). The women in these examples also have less access to agricultural technologies and inputs and this may place them at a greater disadvantage in terms of drought impacts.

2.2.6.2 Impacts Related to Food Security

Lower agricultural production resulting from increased climate variability can lead to lower incomes. This leads to decreased food consumption, which could have gendered human capital outcomes (IFPRI, 2012). Drought may lead to food insecurity and malnutrition in households, with different human capital impacts for men, women, and children. These impacts relate to different user characteristics and how they interact with socio-cultural norms in the vulnerability context. Hoddinott and Kinsey (2000) found in rural Zimbabwe that the 1994–95 droughts had adverse effects on the body mass of women, but not men. However, these effects were not evenly distributed among all women. Wives and daughters experienced

adverse effects but daughters-in-law of the household head experienced no effects. The authors suggested that daughters-in-law may have access to resources outside the household such as remittance income that offsets the impact of drought. Their results also show that the accumulation of livestock may protect women against the adverse consequences of drought shock, as household holdings of livestock were associated with higher measures of Body Mass Index (BMI) for wives. A follow up study by Hoddinott (2006) found out that adult women who were adversely affected by the drought in terms of BMI recovered relatively faster, but very young preschoolers (12–24 months) lost growth velocity. While children who lived in relatively well-off households eventually recovered this lost growth velocity, children from poorer homes did not. This suggests that drought can present short-term impacts for women's health, but-long term impacts for children's growth and development in asset-poor households.

Because women are the main providers of food and meals for their families, women may bear a greater burden to fulfil this task when droughts occur. Jungehülsing (2010) assesses the impacts of hurricanes Mitch and Stan leading to flooding in Chiapas, Mexico, and found that while men lost income from remunerated work on farms, women lost the fruits, vegetables, chickens, and ducks from their home yards. These losses seriously affected women's ability to feed their families since they previously obtained a significant portion of their daily food from their own yards. Similarly, Angula (2010) finds in Namibia that during droughts, out of their submissiveness to their husbands, women first explore other means of ensuring food security before discussing the matters of food shortage with their husbands. Women were also first to diversify their livelihoods through basketry, processing nuts and oil, or through sales of their livestock such as chickens, pigs, or goats to raise money to buy food.

In Burkina Faso, Roncoli, Ingram, and Kirshen (2001) found that heads of household (gender not explicitly stated) take diverse measures to cope with food shortages due to severe drought. These include reducing the number of women cooking and charging one woman to cook a common meal rather than allowing each woman to cook separately, supervising women more strictly in how they handle grain for cooking, using a smaller container to measure grain or extending the time between grain allocations to women, and relying on women's contributions of grain from their own fields or bought with their own money. The authors also found out that food management strategies entailed a combination of control, conflict, compliance, and cooperation among men and women, young and old, within the household. When households had exhausted all resources and strategies to obtain food, they pawned their crops, borrowed money, and women resorted to selling cloth, utensils, and jewellery that they had set aside for their daughters' weddings. Goats and sheep that women own were sold in distress sales. In some cases women volunteered these sales and in others the heads of household seized the animals and sold them. It is not apparent in that study if men specifically parted with their own assets or households sold off jointly owned assets to cope with the drought, and there is also no specific mention of the household types, although the authors allude to the fact that there were some monogamous and polygamous households.

Women may suffer disproportionately in terms of food intake in periods of drought, but men also face negative consequences due to food shortages. In examining the impact of droughts in agro pastoralist communities in northeast Kenya, for example, Serna (2011) found out that when food shortage was prevalent, a common practice, especially among women, was to reduce meal intakes. This increased women's health problems as well as that of children and lactating mothers. Men turn to other means of earning income by collecting and selling bush

products like gum and resin or by cutting trees for firewood and charcoal, but also report weakness because of low quantities of food intake whilst doing hard manual labour.

Examined together, these examples show that drought may affect the food security of men, women, and children in different ways, but women and children often suffer more in terms of health and growth and development which form part of human capital. During drought periods, women in particular are more hard-pressed to provide meals for their families since they are primarily responsible for household food security and, as evident here, reduce their food intake so others may eat, or part with assets such as jewellery and small livestock or take on additional work to smooth consumption.

2.2.6.3 Impacts Related to Health

Drought periods affect the human capital of women and men differently in the form of mortality and in terms of their physical and psychological health, some of which are indirectly related to food insecurity (IFPRI, 2012). Very little empirically data are available on the impacts of drought on women's and men's physical health, and most have been conducted in developed countries. Although drought impacts in developed countries are not the focus of this study, the examples provided here point to some possible impacts that may also occur in developing countries which remain understudied. The effects of heat waves show that women in Europe are more at risk of dying (WHO, 2009), in both relative and absolute terms, (Kovats & Hajats, 2008), with an increased risk for elderly women owing to physiological reasons (Havenith, 1998). In the United States, elderly men seem to be more at risk in heat waves than women, as was seen in the Chicago heat wave of 1995, likely due to social isolation among elderly men (Semenza, 1996; Whitman, 1997).

A more severe climate impact, in this case drought, on health may occur for women and children due to the indirect effects of malnutrition, which make them additionally susceptible to diseases—and this may be especially evident in poor developing countries. Reyes (2002) examines the effects of the 1997–98 El Nino phenomena in Peru and explained that gender inequalities in food distribution and consumption within households were common. Even during periods where households appeared to have sufficient food, women and children seemed to have a lesser share of the food (CGIAR, 2012). Widespread malnutrition during the El Nino floods and landslides further exposed these women and children to epidemics such as acute respiratory and diarrheal infections, malaria, dengue, and cholera (IFPRI, 2012). Pregnant women were also recorded to have a higher risk of contracting malaria, which causes serious complications during pregnancy.

The psychological impact of climate variation may also affect women and men differently. For example, Coelho (2004) found out that in general women in drought affected area are more anxious and emotionally distressed than men. This may be due to difficulties women face to execute their roles as producers and providers. Mitchell, Tanner, and Lussier (2007) came across similar findings in the Ganga river basin in India, where psychosocial effects of flood were more pronounced for women who, in addition to their distress and losing their support networks, had to cater for other family members.

Additionally, perceptions of illnesses caused by drought among the rural poor are interesting to note, although many of these claims require further investigation. Agwu and Okhimambe (2009) in Nigeria found that malaria, hypertension, ulcer, diarrhoea, asthma, and diabetes were the ailments that women and men perceive to be “ushered in” by the changing climate, with malaria being the most widespread. The community reported that thirty years ago, they

could rely on local medicinal herbs for treating illnesses; now they have to go to substandard clinics for treatment. This in some way reflects that the natural resources that communities once relied on for treating ailments were no longer easily available.

On the whole, the differential impacts from drought on women's and men's physical health are not very distinct in the literature, but in one example (Reyes, 2000), the indirect effects of malnutrition place women and children at higher risk from contracting diseases in post disaster situations. The psychological and emotional toll of climate events appears to be heavier for women as they are unable to carry out their tasks and roles, especially to provide care for their children and other family members. In this section, there is limited evidence of differential impacts of drought on men's and women's physical, psychological, and emotional health, all of which are aspects of human capital. But women do seem to suffer more, as evident from the literature, likely due to factors such as their physiological make-up, their roles as primary caregivers, and their lack of access to food and nutrition. These factors are illustrative of different user characteristics in the vulnerability context.

2.2.6.4 Impacts Related to Water and Energy Resources

Drought periods drive the increasing scarcity of natural resources, which mostly affects women's human capital in the forms of health, time, and labour, due to their traditional roles as water and food collectors for the household (IFPRI, 2012). In many developing countries, cultural traditions make women responsible for collecting water, even when this involves long hours performing heavy physical labour or travelling long distances. Rural women in most developing countries are also responsible for sourcing fuel such as wood, charcoal, and agricultural wastes that are needed for household activities such as cooking, boiling water, or for keeping warm. Annecke (2002) observed that there is now a great deal of knowledge

about the struggles of women to obtain fuel and the social impacts of the continued reliance on biomass or low-grade fuels. She said that in southern Africa, qualitative and quantitative research has documented distances women walked to collect wood and the implications of wood collection on women's health and well-being. By examining the total amount of time individuals spend working, whether in the labour market, in domestic chores, or in collecting water and wood, Bardasi and Wodon (2006) found in Guinea that the total working time is higher for women than for men in urban areas as well as in rural areas. With drought as well as other anthropogenic environmental degradation, there is the likelihood that natural capital such as water, wood, and other fuels used for energy generation may become scarcer in some regions of the world. In the case of some developing countries, women are likely to spend more time and labour on these collection tasks. These tasks contribute to their time poverty, and bring negative consequences to their health and standard of living.

Women have to collect water from water sources that are farther and farther away as each drought take its toll. Women are also more severely affected by water shortages than men, largely due to their role as water collectors for the household. Women had to travel farther in search for water, as well as spend more time checking different wells for water availability during drought periods (Dankelman, 2008).

Difficulties in accessing fuel sources are often indirect impacts of drought. A study by Leduc (2008) found that decreasing snowfall in the past six years in Nepal is largely due to longer dry season, which decreases crop production and increases famine. This has prompted income-driven deforestation by the community, which has severely reduced the availability of trees for fuel wood. Women have to walk much farther to obtain fuel wood, and this was viewed as a dangerous task on steep slopes that took about six hours every three days.

Water and fuel shortages caused directly and indirectly by droughts pose considerable time and labour burdens for women, more so than for men, as the examples in this section show. The longer the women spend searching for these natural resources, the less time and energy they likely have for performing other household tasks, indicating an increase in time poverty. The differential impacts of drought are evident here due to the distinct role of women to source and secure water and fuel for the household, which may also negatively impact women's and girls' health (human capital) and living standards in the longer run. The examples also point to women's vulnerability in connection with biophysical characteristics that is largely due to their roles as compared to men. Hannan (2011) further explained that an increase in women's work load and burdens as a result of drought may mean that they have to forego opportunities that are important for their economic empowerment, such as education or training and income-generating activities. In some cases, women are forced to take their daughters from school to assist them with work on the farm or in the household, which has long-term detrimental effects on the empowerment of these girls (Hannan, 2011).

2.2.6.5 Impacts Related to Migration and Conflict

Drought induced migration has different impacts for women and men in terms of human capital and income (IFPRI, 2012). Men are more mobile and more likely to migrate to areas unaffected by climate events in search of employment, whereas women are less mobile and more likely to stay back in the affected area to care for the family and household (IFPRI, 2012). Increasing rates of male outmigration as a consequence of drought signals may bring consequences for households. During the dry season, temporary migration of men to urban areas result in women being left alone to take care of the household (Agwu et al, 2009). Women may engage in small buying and selling to supplement income from the men. In most

cases, girls and young boys also get involved through street hawking of commonly required household items like tomatoes, pepper and drinking water. In other communities, temporary male migration is found to increase the workload of the women and expose them to physical and sexual abuse as they scrambled for depleting commodities or entered into early marriages. Unpredictable rainfall, declining soil fertility, and increased incidence of crop pest and diseases are leading to more frequent crop failure and increased yield variability in Tanzania, prompting an increase in seasonal migration by men (Nelson & Stathers, 2009). Men are reported to engage in unprotected sex outside the marriage while away from their wives, and this contributed to the spread of HIV/AIDS as they pass it on to their innocent wives (Babagura, 2010). This can result in increased number of orphans as a result of the death of men and women from HIV/AIDS.

Although households may benefit from remittances sent from male migrants, the case is not always straightforward among very poor households. Men with few skills to take up work in the urban sector and few resources to pay for living expenses in towns may be ill-prepared to deal with the challenges posed by migration, and may have little means to remit their income (Babagura, 2010).

The social impacts of migration may also affect women and men differently (Kartiki, 2011). While men often managed to find work under a government sponsored food for work program, women from these households reported losing access to whatever limited livelihood options they previously enjoyed. Women migrants may suffer lack of privacy and poor access to proper sanitation facilities in the few, overcrowded shelters. Many households also suffer tension between the migrants and receiving communities over resources including water and employment.

Drought induced scarcity of natural resources may precipitate conflict, with different impacts for women and men in the forms of increased mortality and the loss of physical assets and rights. Omolo (2011) found that in Northern Kenya, climate variability and change have led to increased droughts and floods which have increased poverty and competition over scarce resources, leading to conflicts particularly in the form of armed livestock raiding. Men were more likely to die in such conflicts, resulting in an increase in female-headed households. Women are particularly vulnerable to insecurity and conflict because they are responsible for their children and thus cannot flee during raids, and also because they have poor customary rights to land, wells, and livestock (Omolo, 2011).

2.3 Adaptation and Coping Strategies

Adaptation to drought and other components of climate change includes all adjustments in behaviour or economic structure that reduce the vulnerability of society to changes in the climate system. Adaptation takes place at all levels, from changes in global systems through changes at national or regional levels to adaptations made by local communities and individuals. The development of adaptation strategies needs to recognize this and define the appropriate mix of actions at these different levels (Smith, Burton, Klein & Street, 1999).

One key role for adaptation and the reduction of such vulnerabilities hold according to Ellis (2000), the diversification of livelihoods. The diversification of rural livelihoods is defined as the process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to raise their standard of living (Ellis, 2000). The increase of a livelihood portfolio, in other words, the attempt to multiply the sources of income like off-farm labour, remittances from migration stays, etc., might be an outcome of a livelihood adaptation process, but diversification is not necessarily the only way of adaptation.

Intensification, which is referring to existing income sources that are used more intensively to guarantee a higher income, is another option.

It is worth acknowledging that there is a general rise in temperature level due to drought as revealed by literature for this research work. The impacts of drought have affected livelihoods in so many ways and continue to pose challenges to developmental goals and objectives. Despite these challenges, poor people are mostly adopting several strategies to cope with these changes. The agricultural economic activities in the Nandom District are a justification to this assertion.

2.4 Drawing Inferences from the Literature Review

Examining the literature across the five impact areas, one can make several observations of how drought affects the livelihood of rural women and men. Evidence is limited, patchy, varied, and highly contextual in nature. The nature of the literature makes it challenging to draw any strong conclusions, and to effectively compare and contrast between various studies. Available studies that do examine gender-differentiated climate impacts offer information that is not surprising, and is largely consistent with the assumption that drought has a relationship with assets or the livelihood of people in rural communities and that there are management strategies adopted by rural dwellers during droughts as well as potential governmental and or non-governmental interventions during droughts. The findings are also consistent with the conceptual framework in this study, which shows that different users (that is, men and women) are affected differently based on varying contexts of vulnerability. Even if the general observation is such that women are often more negatively affected, there are some exceptions to the pattern. Men may be more negatively impacted by drought because they own land (Quisumbing et al., 2011), or because women are able to invoke cultural norms that make men

responsible for household food security (Kristjanson, 2010). Among women, differential drought impacts may also occur depending on their marital status, relationship to the head of household or family situation. Single women, single mothers, women who are not first wives, and other female members of the household may have less access to resources and assistance during drought shocks, as was seen in the case of food distribution in Pakistan (IDMC, 2011), and in the distress sales of livestock owned by widowed mothers in Mexico (Biskup & Boellstorff, 1995). Societal structures such as caste may also determine the vulnerability of both women and men, as seen in India, where lower caste people are shunned from evacuation shelters (Ahmad & Fajber, 2009). Men may also experience negative impacts as in the case of the drought in Kenya (Serna, 2011), where they have little energy to perform the hard labour required of them in the pursuit of alternative livelihood options, or in the case of higher mortality for men in the wake of Hurricane Mitch (Bradshaw, 2004).

These exceptions signal that the differentiated impacts of drought are not always rigid, straightforward, or predictable. These impacts vary among individuals depending on context and may be mediated by a host of other socio-cultural, economic, ecological, or political factors, as indicated by institutional arrangements in the framework. Women cannot be treated as a monolithic group when looking at their vulnerability to drought periods. It was explained that the tendency has been to conceptualize women everywhere as a homogenous, subjugated group, “the poorest of the poor”. Such representations are problematic on multiple accounts, particularly in their failure to account for the complex interactions between gender and other forms of disadvantaged based on class, age, race, ethnicity, and sexuality. Climate change research that “abstracts women from their social realities eclipses the relational nature of gendered power and the interdependency of women and men, and paints a different picture of

women's vulnerabilities, choices and possibilities" must be cautioned (IDMC, 2011). There is the need to communicate men's vulnerabilities where they do exist, and to recognize the positive contributions that men can and are making to gender equality and sustainable environment goals (Demetriades & Esplen, 2008).

There were several instances in the literature where it was difficult to compare and contrast between the impacts experienced by women and men or to understand if there were any differences at all because the literature either focused more on women (and less on men) or was based on data and observations that were not disaggregated by gender. In this respect, a key research need is systematically and empirical studies on how drought impacts women and men, separately and jointly, in terms of their vulnerabilities, well-being and assets, and also to understand the contextual factors that mediate these impacts and the ensuing responses. A larger base of such knowledge and the availability of gender-disaggregated datasets would not only help researchers to discern the impacts of drought and climate change in general, but also to identify common themes, gaps, and needs (if any) across studies. A better integration of social sciences with natural sciences to better understand the differences in the way that drought affects women and men could also present a more holistic, nuanced picture of how gender intersects with various other factors (such as biophysical, institutional, technological factors) in different settings.

In this respect, Roncoli (2009) explains that ethnographic fieldwork and participant observation can provide a distinctive lens into the dynamics of drought and culture, and illuminate how local communities are perceiving, understanding, valuing, and responding to drought. Such an approach may be helpful to fill the knowledge gaps in understanding the gender dimension of drought impact. A study of the impact of the 1998 Hurricane Mitch in

Honduras (Paolisso, Ritchie & Ramirez, 2002) lends further support to this approach and offers important insights for understanding impacts of drought. The study shows that men and women reported similar impacts of the hurricane on agriculture and their homes but they valued these impacts differently, depending on whether the impact falls within or outside their gender roles and responsibilities. Men ranked impacts that affected their agricultural and income-generating work as high-impact areas while women ranked impacts related to food production and household domestic work as high-impact areas. The authors propose that the gender division of labour is an important cultural filter that in conjunction with physical and economic criteria defined how men and women perceived the impacts of the hurricane, and provides a cultural framework within which to access disaster impacts on social relations and to design mitigation strategies. Further, the study demonstrates that understanding the complexity of local agricultural systems−the gender division of labour, temporal factors (such as timing and cycles of crops being planted), spatial dimensions (such as local topography) and economic factors (such as which crops are used for income and which crops for subsistence)−is key to capturing the heterogeneity of disaster impacts. Likewise, for a more holistic understanding of the gender dimension of drought, each component (user characteristics, biophysical characteristics, information and technology, and institutional arrangements) within the conceptual framework must be considered by drawing expertise and methodologies from different disciplines (for example, crop science, economics, social science, meteorological science). Explaining how gender intersects with each of these components will be key to understanding the performance of individuals, groups, and communities in the adaptation arena and hence to design interventions for drought adaptation that are well suited to different contexts and that account for the gender dimension. This

knowledge will also be crucial for informing climate change mitigation efforts and providing a stronger foundation to discuss gender concerns in climate change discourse and policy, which shows that different users (that is, men and women) are affected differently based on varying contexts of vulnerability.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

Different methods and techniques have been adopted to carry out this research. Data collection entailed primary and secondary sources. The choice of appropriate tools and techniques has enhanced the generation of adequate and representative data to meet the requirements of the study. The view of what constitute a methodology and what circumstances a research model becomes a methodology as well as the number of methodologies that deserve a place in the context of social research is a contentious issue (Sarantakos, 1998). He therefore looks at methodology in at least two ways. One, it is identical to a research model employed by a researcher in a particular project, including basic knowledge related to the subject and research methods in question and two, the framework employed in a particular context.

Panneerselvam (2004) defined research methodology as a system of methods, procedures and techniques used to find the results of a research problem. The methodological approach that has enabled me investigate the problem on how drought periods impact rural poor's livelihood activities was built on the definitions above. A detailed explanation of the research approach and process, research design, background of study area, sources and techniques/methods of data collection, sampling procedure and techniques, and data analysis are in the sections that follow. The research approach will now be discussed in the next section.

3.1 The Research Approach

The two main approaches to data collection and analysis are qualitative and quantitative (Osuala, 2005; Twumasi, 2001).The researcher's methodological approaches are always

informed by his/her theoretical and philosophical position and the objectives of the study. According to Neuman (2006), though qualitative and quantitative approaches may differ, they can be used to complement one another and this study seeks to combine the two. While quantitative research mainly involves surveys and experiments for data collection and mathematical analysis and interpretation of issues in the form of percentages, tables and distributions etc, qualitative research is more explanatory and descriptive (Sarantakos, 1998).

As to the type of research approach to use opinions are divided. Proponents of the quantitative approach say that human behaviour in the social sciences, just as in the physical sciences, is quantifiable in attributes and subject to generalization that have universal applicability (Bacho, 2001). A quantitative approach is one in which the researcher primarily uses post positivist claims for developing knowledge – that is cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories (Creswell, 2003). The aim here is to determine the relationship between an independent variable and a dependent variable(s) in a population. According to Brown (1996), where the research issue is clearly defined and the questions set to require unambiguous answers, a quantitative approach is required.

A qualitative approach is one in which the finder often makes knowledge claims based primarily on constructive perspectives− the multiple meaning of individual experiences, meanings socially and historically constructed, with an intent of developing a theory of pattern (Creswell, 2003). The quantitative researcher looks through a narrow lens at a specified set of variables while the qualitative researcher looks through a wider lens, searching for patterns of interrelationships between a previously unspecified set of concepts (Bonye, 2007). It is imperative to note that there are probably no ideal situations of exclusively

"quantitative" and "qualitative" data. One might use qualitative data to clarify quantitatively derived findings; or, one could quantify demographic findings or, use some form of quantitative data to partially validate one's qualitative analysis (Strauss & Corbin, 1990)

Based on the above arguments it is safer for a researcher to combine the two approaches without completely ignoring one. This is what this study has done to achieve a fair representation of the study results from different background of respondents. The research process that will be used in the study will now be outlined.

3.2 The Research Process

The research process starts with the identification and definition of the research problem which premised that drought impacts the livelihoods of rural poor. With this, the research questions and objectives are shaped along this path. Critical review of relevant literature was done taking into cognizance the research question and objectives. This is followed by the research design which informed the choice of study-survey. Subsequently, data collection was conducted in three phases: reconnaissance phase, main survey phase and an in-depth survey phase. This paved way for data analysis and presentation, and lastly conclusions and recommendations for policy considerations.

3.3 The Research Design

A research design according to Bryman (2008) provides a framework for the collection and analysis of data. Many authors have categorized research design as either descriptive or causal. Descriptive studies are meant to answer the question of who, what, where, when and how. Causal studies on the other hand are undertaken to determine how one variable affects another (Walonick, 1993). The selection of an appropriate research design is crucial in order

to arrive at valid findings. Hence, the research design that has been adopted for the study is the non-experimental descriptive research design (Brown, 1996; Yin, 1993). This is the most common method of gathering information in the social sciences (Bryman, 2008; Babbie, 2007). Descriptive research studies both large and small populations to discover the relative incidence, distribution, and interrelations of variables. It relies upon the questioning of a selective group (sample) of a population and analyzing data in order to answer a hypothesis or describe set characteristics (Babbie, 2007; Saunders et.al., 1997; Walonick, 1993).

Some of the advantages in using this research design as underlined by Brown (1996) are: the collection of large amount of data is quick and cheap; can be used to acquire retrospective information; generalization of data to the population is possible; it is possible to make comparison of individuals and assessment of relationships of variables and data is also collected from a large cross-section of respondents which would have been difficult to collect by other methods. It is in the light of the above that the descriptive approach was used in this study.

3.4 Profile of Study Area (Nandom District)

The study area covered the political administration of the Nandom District, location and natural resource environment, socio-demographic characteristics, development partners in drought related issues and gender analysis in the Nandom District.

3.4.1 The Political Administration of the Nandom District.

The research was carried out in the Nandom District of Upper West Region of Ghana. The Nandom District is one of the few districts created during the fourth Republic of Ghana from

the Lawra District in 2011. Currently, Nandom District is one of the 11 districts that make up the Upper West Region with Nandom as its capital.

3.4.2 Location, Size and Natural Environment

The Nandom District lies in the north western corner of the Upper West Region of Ghana between Longitude 2°25 W and 2°45W and Latitude 10°20 N and 11°00 S. It is bounded to the east and south by the Lambussie and Jirapa Districts respectively and to the north and west by the Republic of Burkina Faso. The total area of the District is put at 567.6 square km. This constitutes about 3.1% of the region's total land area (DEP, 2006: GSS, 2010).

The District is constituted by 84 communities with 86% of the inhabitants living in rural areas. The population density is about 89 per square kilometre. It is the most densely populated District in the region. Below is a map showing the location of the District in Ghana. Its closeness to Burkina Faso offers it a strategic location for international interactions and exchanges. It however poses a challenge related to the influx of Fulani herdsmen into the district from the Sahel.

Figure 3.1: A Map of Ghana Showing the Location of Nandom District

Source: District Profile of Nandom (2014)

The ecological zone to which the study area belongs is generally referred to as 'Guinea savannah wood land. Kees (2004) described the ecological area as 'Orchard bush land', 'tree savannah', 'Sudanese parkland', 'savannah woodland', and 'interior savannah zone'. Kees therefore argue that, the area is covered with savannah grasses, shrubs and scattered trees. The vegetation is characterized by the guinea savannah type with scattered drought resistant trees such as the Shea, the baobab, the locust bean (dawadawa), ebony and torn. Kees agreed with Nsiah-Gyabaah (1994) that generally the density of trees decreases where population density increases. GSS (2007) assert that, the heterogeneous collection of trees provides all domestic

requirements for fuel wood, charcoal, construction of houses, cattle kraals and fencing of gardens which serve as sources of livelihood to the people. The shorter shrubs and grass provide fodder for livestock. Thus, the assertion that man depends on nature for his survival is true.

The climate of the district is that of tropical continental with the mean annual temperature ranging between 27^{oc} and 36^{oc} for the period between February and April is the hottest. Between April and October, the tropical air mass which blows over the area gives it the only wet season in the year which is common to the rest of northern Ghana (Bacho, 2001). Bacho (2001) therefore assert that, there are two seasons in the year – the dry and wet seasons. The dry season commences from early November to late March, with cold and hazy Harmattan winds particularly during the nights and early morning and high temperatures by mid-day.

Table 3.1: Major Environmental Concerns

No	Nature of concern	Causes	Environmental effects	Poverty interventions
1	Depletion of wood lots	Bush burning Tree felling	Climate change	Afforestation programs
2	Poor soil fertility	Bad farming practices. Bush burning	Climate change Poor quality of underground water Over flooding of river banks	Introduction of new farming techniques. Sensitisation programs
3	Land degradation	Sand winning	Climate change	Afforestation

Source: District Profile 2014

3.4.3 Socio-Demographic Characteristics of the Nandom District

According to the 2010 population and housing census, the Upper West Region has a total population of 702,110 out of which 48.6% (341,182) are male and 51.4% (360,928) are female. This forms the lowest (2.8 %) in the country as against Ashanti Region with 19.4 percent of total population. The 2010 National Population and Housing census results put the Nandom District's population at 46,040 with a growth rate of 1.9% which is below the national growth rate and an average household size of 4.1. This comprises 21,915 males and 24,125 females representing 47.6% and 52.4% respectively (GSS, 2012). By estimation, however, the population of the district was about 48,740 in 2013. With 83 inhabitants per km2 in the year 2010, their population density is above the national average even though there are no large centres in the territory (Kees, 2004). When calculated over the 'usual resident population' the population density in the year 2010 amounted to 90 and 34 inhabitants per km2 for the district and region respectively. The rest of the people live in rural areas and are largely dependent on the natural environment for their livelihood. The people of the district are predominantly subsistent farmers as about 84% of them are employed in agriculture and its related work (GSS, 2014).

The age structure of the district's population is largely youthful. The age cohort of 15 -64 years constitute 54.7 % of the population which indicate an age dependency of 82% or 1 active person is expected to take care of 0.83 inactive people. Though the age dependency looks so remarkable depicting a dependent society, it should be noted that the categorization of the working class from the age of 15 is misleading as compared to the reality. Most members of this working class are school going children and as such the actual dependency rate in the district is higher than what is quoted based on the standard formula. The planning

and provision of social facilities and services in the district will also have to take into consideration the age distribution of the population. For instance a significant child population of 18,179 will require pre-schools and basic schools. More income generating opportunities will have to be created to provide job opportunities for the teeming and high youthful populace.

Table 3.2: Age Structure of the Population of Nandom District (2013)

Age Group	Both Sexes	Male	Female
All Ages	48,740	23,721	26,114
0-14	18,179	9,258	8,901
15-64	26,653	12,403	14,268
65+	3,898	1,538	2,370
Age–dependency ratio	82.8	87.0	79.0

Source: GSS, 2014

Traditionally, the district is diverse as shown by the number of people who live in the area. The main ethnic groupings, however, have formed the basis for delineating between the cultural units at the districts' level as shown in Table 3.3. The most predominant tribe in the District is the Dagaaba. They are however with dialectical variations. There are other minor tribes such as the Waala, Hausa, Mossi and Sissala. Though there are diverse religions at play in the district, the district experiences an absence of religious disputes and conflicts. There exists a very peaceful co-existence among all groups. There is therefore social stability for investment consideration.

Table 3.3: Ethnic Groups in the District

District	Ethnicity	Population	Average Percentage
Nandom	Dagaaba	91,341	90.5
	Sissala	303	0.3
	Waala	1,514	1.5
	All others	7771	7.7
	Total	100,929	15.2
Total Population of UWR		576,583	100

Source: Computed and compiled from GSS (2014)

The Nandom District in terms of religion reflects the three main religions in Ghana with Christianity (85.7 percent) dominating, followed by Islam (6.6%) and African Traditional religion and no religion taking the bottom with 5.7 and 2.0 percent respectively.

Table 3.4: Religious Composition of Nandom District

Religion	Number	Percentage
No religion	975	2.0
Christian	41,770	85.7
Islam	3,217	6.6
Traditionalist	2,778	5.7
Total	48,740	100.0

Source: GSS, 2014

3.4.4 Development Partners in the Nandom District.

In addition to the efforts of Government to push forward the development of the district, there are active development partners operating in the District. Though minimal in their numbers, these development partners complement and bridge the gap in Government's development efforts. Their fields of operation range from water and sanitation, education, health, agriculture, gender inclusiveness, peace and land disputes among others. The District Assembly recognizing this key role played by these partners has put in place measures to create an enabling environment for them to operate. Environmental Protection Agency, Forestry Department, and Ministry of Food Agriculture are among the governmental organizations operating in the district.

Table 3.5 shows the development partners and their fields of operation in the Nandom district.

Table 3.5: Development Partners in the Nandom District

Organisation	**Area of Operation**
PRONET	Water and Sanitation
NANDOM AGRIC PROJECT	Agricultural Extension Services
WFP	Health and Nutrition
CARE	Gender, Water and Sanitation, Climatic Change
CIKOD	Environment
WINROCK	Water and Sanitation
SNV	Water and Sanitation
PLAN-Ghana	Education
CARD-Ghana	Gender
ADPO	Water and Sanitation

Source: GSS (2014)

3.4.5 Gender Analysis in the District

Women constitute about 52.4% of the district's population. The setting of the district depicts a clear distinction between men and women in their day to day activities. Relations between men and women are devoid of mutuality. There is a display of a clear superiority in the relationship between men and women. Women in the district are relegated to subordinate positions in terms of decision making, education, leadership roles, resource ownership and control.

Culturally, ownership of capital assets is by men. Women are supposed to enjoy in the utilisation of those assets but cannot owe them. Female children do not share in the inheritance of their parents. Ownership of land is the reserve of men. A woman's access to land directly depends on the willingness of a male relation to lease it to her for use. Leadership is supposed to be exercised by men and women are supposed to be followers. Chiefs and their subjects are mostly men with a representative from the women group.

In the area of politics, very few women in the district are involved in the local government. Currently, statistics shows that out of the 38 assembly members, 32 are men and only 6 are women. Out of these 6 women, 4 are appointed by the government and only 2 elected. With respect to administrative positions, there are very few women occupying low ranking positions as cleaners, receptionist, typist and a few occupying senior staff positions in the District Assembly.

Economically, poverty is very pronounced in the District but women are the most affected. They are the poorest of the poor. This is as a result of their inability to own property that can be used to make economic gains. The labour market in the districts is not also favourable for women. More often than not, women are given the less earn jobs and even if they do equal

work with men, they earn less due to the cultural setting. Thus, there still exist a superior-inferior relation between men and women in the economic setting in the district.

3.4.5.1 Reasons for the Difference in Gender

Socio-politically, leadership is the preserve of men and this has been the norm of the society. This has been accepted by both men and women and that difference is a normal occurrence. Politics is mostly competition for power. One enters a competition with the possibility of losing or winning. Resources are invested into a competition though its results cannot be predicted. This therefore makes politics a risky venture. Women in nature and in their orientation are not risk takers and as such shy away from politics. Men are known and accepted to be risk takers and as such are mostly in the front lines of politics.

It is a societal accepted norm in the district that women should be in the kitchen and handle domestic issues. Men are accepted to do the white collar jobs and jobs that has higher economic returns. This has therefore created the clear difference in gender in the districts.

Culturally, women are to be seen and not heard. They should be servants to their male counterparts. Women do not own land, houses and other large properties which could serve as collateral to support them in their ventures. Men have ownership of these properties and even perceive women as part of their property.

Historically, the concept has been that men are the decision makers and women should be in the background. There are very few educated women in the districts due to the negative attitude towards girls' education. These reasons have all contributed to the clear difference that exists in gender disparity in the districts.

3.5 Sources of Data Collection

There are two main sources that can be applied in social research data gathering (Miller, 1991). These are the primary and secondary sources. However, the selection of a particular source to collect data depends on the individual, one's research problem and objectives of the study, the resources available and the skills of the researcher. That apart, it is also important to take note of the socio-economic and demographic characteristics of the study population. That is to say, the type of people one is dealing with, the nature of the social situation, the mood of the social environment and the psychology of the people (Grady, 1998).

It is also paramount for a researcher to use more than one source in collecting data. In view of this, the study aimed at gathering both primary and secondary data from the field to address the research questions and subsequently the objectives. Grady (1998) defines data as those facts that any particular situation affords or gives information or impressions to an observer. Grady (1998) went further to categories data into primary and secondary. Primary data he defines as "the data that lie closest to the source of the Ultimate Truth underlying a phenomenon". Beyond the region of primary data lies secondary data he added. This study agrees with his assertion by discussing below the sources and tools and techniques that were applied to collect my data.

3.5.1 Primary Data

The research relied on primary data which became the main sources of data and are mainly community level surveys and observations. Primary data can simply be defined as data collected for a specific purpose. Survey according to Grady (1998), means "to look or to see over or beyond" the casual glance or the superficial observation. Neumayer (2009) concludes that, generally, surveys are methods of data collection in which information is gathered

through oral or written questioning. In-depth interviews were conducted to gather information of this kind. Kumekpor (2002) sees in-depth interviews as relatively fewer questions considered to be of greater importance to the object of study selected and pursued in much greater detail, both intensively and extensively. This study therefore used this technique extensively to collect data from single and married women and men regarding the impact of drought and their coping or adaptation strategies during these periods. Interview involves two people; the interviewer and the interviewee in which the latter is the expert with vested knowledge in the subject matter, while the former is considered the investigator who attempts in using leading questions to ascertain the truth. Women were separated from their husbands to allow them that freedom to express themselves without fear of victimization in giving out information on the issue at stake. Questionnaires were administered to officials of the Wa Meteorological Station and the Agricultural Sub-Stations in the Nandom District. Interviews were carried out on face-to-face basis.

3.5.2 Secondary Data

Relevant data both on drought relative to households' livelihood in rural communities as well as the study area were collected. With this data, both qualitative and quantitative data methods were applied which enabled the researcher gather information on the study. The profile of the study area became a source of data where information was extracted. However, other documents such as those related to drought management in the form of journals, reports, among others were reviewed as qualitative data for the purpose of the study. These secondary data sources provided a contextual background of the study, a theoretical and conceptual review of the existing literature and above all justified the choice of the approach and

methodological tools and techniques used in this research. This study therefore focused on the impact of drought on the livelihood of rural households and how they cope with this.

3.6 Data Collection Methods

Two main research instruments – questionnaires and interviews - were used to collect the data. Questionnaires were administered to household members (both male and female), formal institutions (MOFA, MSD) and other individuals on issues relating to drought impacts. In-depth interviews were conducted on non-formal institutions. One-to-one interviews were used to clarify some issues discussed during the focus group sessions.

Apart from that participant observation was however, selectively applied in the data collection.

3.6.1 Questionnaires

Questionnaire is a written list of questions, the answers to which are either recorded by the respondent or the interviewer depending on the kind of questionnaires. Questionnaire is an efficient method of data collection since several respondents can be reached within a short time (Twumasi, 2001). They are often also the only feasible way of reaching out to a number of reviewers large enough to allow statistical analysis of results. Saunders, Lewis and Thornhill (1997) argued that the choice of using a questionnaire depends on a variety of factors including the type of information needed and the available resources for the investigation.

In the light of the above, the choice of questionnaire method was made based on the fact that some of the target respondents are literate. Therefore, self-administered questionnaires were used to elicit information from heads and staff of formal institutions such as MOFA and MSD

who have expert knowledge on drought related issues. On the other hand interviewer-administered questionnaires were conducted on the non-literate respondents who are mainly community members.

3.6.2 Household Questionnaires

The structured and semi-structured questionnaires were administered to 100 sampled individuals in order to assess their main economic activities, time spent on both productive and reproductive activities during drought periods and non-drought periods, coping strategies adopted during drought periods, vulnerability levels, and how the negative impacts of drought could be minimized. This among other issues helped identify periods of stress, hazards, diseases, hunger, debt and vulnerability, examine the trends and changes overtime, and identify coping strategies and adaptive capacity currently being used to address drought impacts. Fifty-six (56) women and forty-four (44) men were selected for the study making a total of 100 households that were interviewed

3.6.3 Relevant Institutional Questionnaires

This method was used to solicit data from organizations and institutions that are considered to have an in-depth knowledge, experience or record of intervention on climate issues and livelihood promotion in the district. The organizations and institutions included the District Assembly where the district profile was sort to indicate the resource availability and distribution in the district which provided a solid grounding for the assessment of drought impacts and livelihoods areas of interest. The Ministry of Food and Agriculture (MoFA) office in the Nandom District supported this study with data on trends of crop production and animal population in the district for the analogy of the yield levels of livelihood activities of

most of the rural households in order to establish a relationship between output of livelihood activities and the vulnerability levels of rural dwellers in the district. The Ghana Meteorological Service Department in Wa also supported the study with rainfall and temperature figures ranging from 2011 to 2015 for the region and district in order to determine the trend in the influence of those factors on the major livelihood activities as well as the adaptive capacities of rural poor in the district.

3.6.4 Focus Group Discussion

Focus group discussion (FDG) involves the selection of particular group of people that the researcher thinks has the requisite knowledge in a specific subject matter he or she intends investigating for interaction. Here, the researcher has an explicit objective to achieve at the end and therefore moderately moderates the line of conversation. FDGs are deep interactions with people of similar group of between 5 and 12 persons which will enable the researcher to obtain information in a particular area of interest that would have been difficult if not impossible to obtain using other methodological procedures (Kumekpor, 2002). Indeed, the advantages of FDG are captured by Family Health International (2005). It allows one to gather large amount of information within a relatively short time and because it seeks to illuminate group opinion, the method is suited for socio-cultural and behavioural research that will be used to develop and measure interventions that meet the needs of a given population (Family Health International, 2005). FDG is a good method for assessing groups' viewpoints and perceptions heightening (Family Health International, 2006). In this study, two (2) focus group discussion sessions were conducted with married women and men and with single women separately, making a total of nine (6) focus group discussions. Women were separated from men to make the women comfortable to speak without shy or fear. Each focus group

discussion sessions was conducted with five (5) participants. The participants were at least twenty (20) years old. Issues discussed during the focus group discussions included the main economic activities of the participants, time spend on both productive and reproductive activities during drought periods and non-drought periods, coping strategies adopted during drought periods, and how negative impacts of drought could be minimized.

3.7.0 Sampling

3.7.1 Sample Frame

Out of the 84 rural communities in the study area, ten rural communities were randomly selected for the study. That is, all the 84 communities were listed and kept in box and 10 were then drawn randomly. This was to allow room for all the communities to stand the chance of being selected. This presented equal opportunities to all out of which the ten sampled communities were drawn. The communities included the following: Brutu, Danko, Kogle, Toyaga, Biiregangn, pofien Naadegaun, Munyupeli, Piiri, Basebele and Duotange. Ten households were then randomly selected from each community as respondents to the questionnaire. This gave opportunity to assess responses from different categories of poor rural communities with different livelihood activities affected by drought and hence varied coping strategies. The difference in the livelihood activities and their coping strategies of both male and female was found to be worth investigating. A total of 100 households were interviewed.

3.7.2 Sample Size

The estimated total population for the district in 2010 was 46,040 people, with an average number of persons per household (household size) estimated as 7 (GSS, 2014). This gives an

estimated 6,577 households representing the sample frame. The sample size is obtained using the mathematical formula below;

$$n = \frac{N}{1+N(\alpha)2}$$

Where n = sample size, N = target population (6,577) and α represents the margin of error which is 0.1 with a confidence interval of 90%.

By substitution, $n = \frac{6,577}{1+6,577(0.1^2)} = 99.5 = 100$

Therefore the sample size for the survey is 100 household respondents. Justifiably, the sample size chosen was highly dependent on the stipulated period of time, the size of the district, the number of communities in the district, and the estimated number of households in rural communities.

3.7.3 Sampling Procedure/Techniques

Different sampling techniques were used in collecting the data. The study employed simple random and purposive sampling techniques to select respondents for the study. According to Manheim (1997), a sample is a portion of people drawn from a larger population. Manheim (1997) also said a sample is a part of the population which is studied in order to make inferences about the whole population. In view of this, both simple random and quota sampling techniques were employed to select respondents for the study. Apart from these, purposive sampling was also used to select rural poor households among the selected households in the sampled communities. These techniques are described below.

3.7.3.1 Simple Random Sampling

This method is a procedure in which a sample unit is selected on a random basis. Here, every unit is given equal and non-zero chance of being selected (Sarantakos, 2005). This method was appropriate for selecting men and women that were included in the community field surveys because it eliminates sampling bias. Since the method is about obtaining a collection of elements by drawing randomly from a study area, the sampling process involved listing all the 84 communities into a box and communities were drawn randomly thereof until the tenth community was drawn. This gave all the communities equal opportunity of being selected. Again, out of the 10 sampled communities from the district that were taken, 10 households were then randomly selected from each community. In all, 100 rural women and men were randomly selected for the study. This gave the researcher the opportunity to assess responses from different categories of people with different livelihood activities affected by drought and hence varied capacities of coping and adaptation. The interview depended on the availability and willingness of the people who participated at the time of the enumerator's visit.

3.7.3.2 Quota Sampling

Quota sampling technique was used to ensure that out of the 10 households selected from each community at least 5 were female and at least 4 were male headed. This provided the opportunity for the assessment of the vulnerability of female headed households' vis-à-vis male headed ones since livelihood activities and coping strategies vary. Women have little access to some resources such as fertile lands for farming and are basically involved in Shea nut picking, Shea butter production, dawadawa production, firewood gathering, and petty trading and with little involvement in farming, animal rearing, charcoal burning etc. The

difference in the livelihood activities and their coping strategies of both male and female was found to be worth investigating.

3.8 Data Analysis

The analysis of data was done using both quantitative and qualitative techniques. There is the need to reiterate that data according to Neumann (2006) are the empirical evidence of information that one gathers carefully according to rules or procedures which can be quantitative -expressed as numbers or qualitative –expressed as words, pictures, or objects. These data after collection was synthesized using the appropriate tools and techniques to address the issues under study. This is supported by Pannerselvam (2004) who asserts that "after data is collected, proper tools and techniques should be used for classification and analysis of that data." The study employed both descriptive in the form of narratives, and deductive tools and techniques for the presentation and analysis of the results. According to Osuala (2005), descriptive research is that which specifies the nature of given phenomena which can be complex or simple.

In view of the above, qualitative data was analyzed during the data collection process and after the overall data collection was completed. This goes a long way to support the view that data analysis should not be a separate step coming after data collection but a continuous and simultaneous process. In data collection process, qualitative field notes that were captured on the daily basis on historical events, conversations, interviews and stories on drought impacts among women and men and information during focus group discussions and interactions with relevant organizations were analyzed after every day's work. The rationale was to keep track of important events/issues that will crop up in the days work and to be able to prepare very well for the next day. It was also to look for consistencies and inconsistencies between

knowledgeable informants and to find out why informants agree and disagree on important issues on the subject matter.

Statistical Package for Social Science (SPSS) was used to analyze the quantitative data. This statistical tool (SPSS) seemed appropriate because, it gives one a variety of computer software options to enable one process data, transform and manipulate them. Similarly, imputations of quantitative data from questionnaire were done weekly on the field while a statistical analysis of data was done upon return from the field. The analysis drew correlations and other statistical relationships between variables in the structured questionnaires used specifically. This brought clarity in expressing quantitative relationships between variables in the forms of graph, frequencies, percentiles, cross-tabulations among others. The data was explored to detect possible data problems resulting from either recording or inputting errors and an eventual generation of a final output in the form of tables, percentages, graphs or charts. The overall data analysis was a combination of two approaches – qualitative and quantitative.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.0 Introduction

The study determines how drought affects the livelihoods of rural poor in the Nandom District of the Upper West Region. 100 households from 10 communities and 2 officers, one each from the Wa Meteorological Service Department and Nandom MOFA office were interviewed. The study communities included the following: Brutu, Danko, Kogle, Toyaga, Biiregangn, pofien Naadegaun, Munyupeli, Piiri, Basebele, Duotange. Giving the different sets of data in the report, the term 'respondents' is used to refer to the views expressed by poor women and men in the Nandom district.

In order to ensure comprehensive and logical output, this chapter presents the findings of the study in six sections. The first part contains trend analysis of available data on climatic factors and shows the impact of drought on the livelihood of rural poor households in the Nandom District. It combines both quantitative and qualitative data on the trends of precipitation and temperature, and extreme weather changes. Section two presents respondents' characteristics such as sex, age, and educational status. Section three investigates the effects of drought on assets collection in the Nandom District of the Upper West Region. Section four looked at coping strategies adopted by the rural poor during drought periods in the Nandom District of Ghana. Section five assesses the impact of the coping strategies adopted by rural poor during drought on their workloads. Section six looks at the impact of interventions from governmental and non-governmental institutions that seek to mitigate the adverse effects of drought on rural poor in Nandom and section seven discusses the results in brief.

4.1 Rainfall trends in the Nandom District from 2011 to 2013

High variability of seasonal rainfall, related to onset and offset of the rainy season and occurrence and length of dry spells within the rainy season, is another important climate facet of vulnerability. For example, household seed supply in semi-arid systems often experience bottlenecks, given the practice of serial re-sowing of crops as a hedge against an uncertain onset of the rainy season. This situation strains seed supplies and results in poor and uneven crop establishment, which is a significant contributor to the productivity gap in dry land agriculture. Dry spell duration and timing can have a strong influence on food production; for example dry spell longer than 15 days that coincide with sensitive crop growth stages can cause substantial yield reductions. Increased seasonal rainfall variability (including longer dry spells between rains) and higher temperatures that increase evaporative losses from the system are very likely to occur under future climate change, thus magnifying current risks in rain fed crop production. These kinds of risks could even occur in areas where mean annual precipitation increases.

Figure 4.1 shows meteorological data of rainfall pattern which indicate the trends in climatic conditions and occurrence of extreme climatic events (in this case drought) in the district. Generally, the amount of rainfall on annual basis has been undulating. Some of the cases that are much pronounced and still fresh in the minds of respondents is the 1982/83 drought which devastated livelihoods and compelled people to feed on many plants and animals that were traditionally branded as taboo. The large fluctuations in rainfall between 2011 and 2013 explain that drought could happen in a particular year and excessive rainfall in another year. Coping strategies to these instances are lesser as adaptation is one sided with support from social networks such as the extended family system. All livelihood options that could not cope

with these disasters were affected worsening their vulnerability and weakening the coping strategies of the already vulnerable (women, children, peasant farmers, the aged, landless people etc).

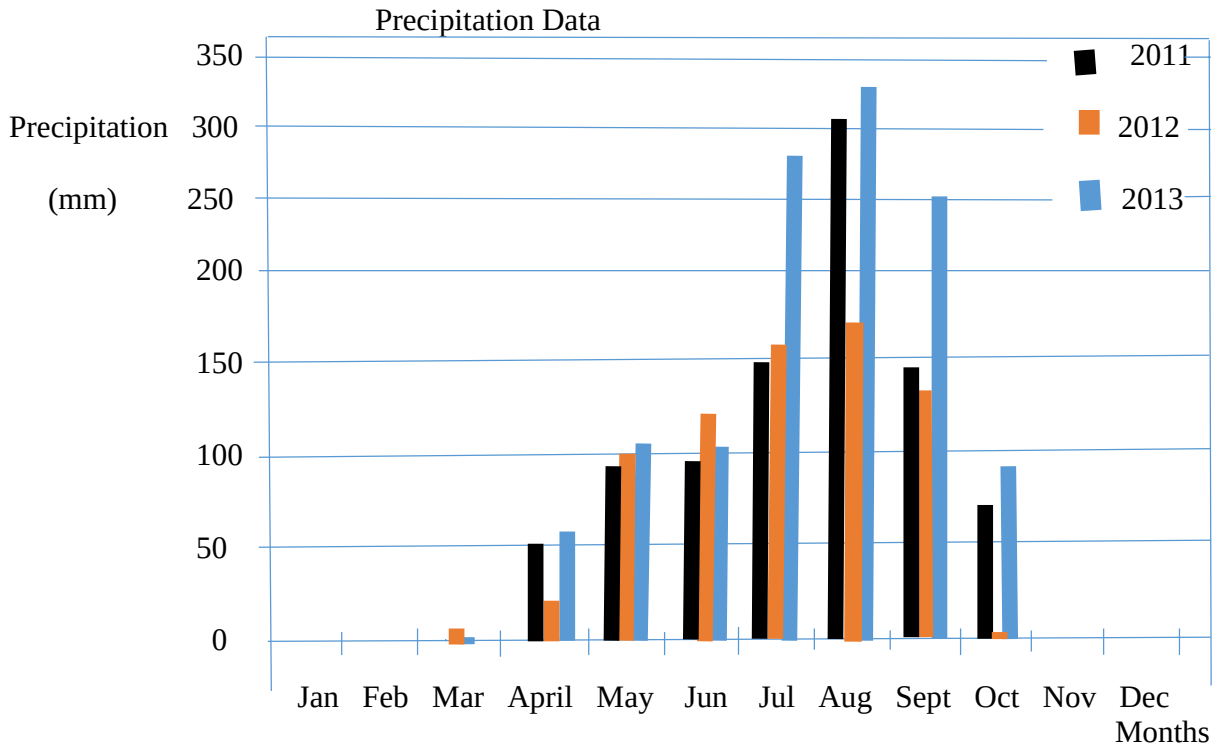
Table 4.1: Annual Rainfall for Three Years

Year	Rainfall (mm)
2011	919
2012	478
2013	1246

Source: Ghana Meteorological Service Department (2014)

From table 4.1 above and figure 4.1 below, it is observed that there was high rainfall in 2013 than in 2011. However, 2012 recorded the lowest rainfall within the period (2011 - 2013). This clearly indicates that 2012 would have recorded more droughts due to the low rainfall and high temperatures than in 2013 and 2011.

Figure 4.1: Precipitation Trend for Three Years (2011 - 2013)



Source: Field Survey, 2015

4.2 Temperature Trends in the Nandom District from 2011 to 2015

Temperature indicates a seemingly negligible and unnoticeable but there has been a gradual increase in temperature levels with some fluctuations between 2011 and 2015 as shown in table 4.2. This observation also reflects yearly recordings for each month. The temperature levels have strong correlation with rainfall and to a large extent determinant of planting season for specific crop types to engineer proper maturity and good harvest. The gradual increase in temperature levels also means that livelihood options should be resistant to high temperatures. High temperatures are believed by the local people of Nandom District to promote good fruition of the Shea trees which is an advantage to women who are largely into picking, processing and selling of Shea nuts.

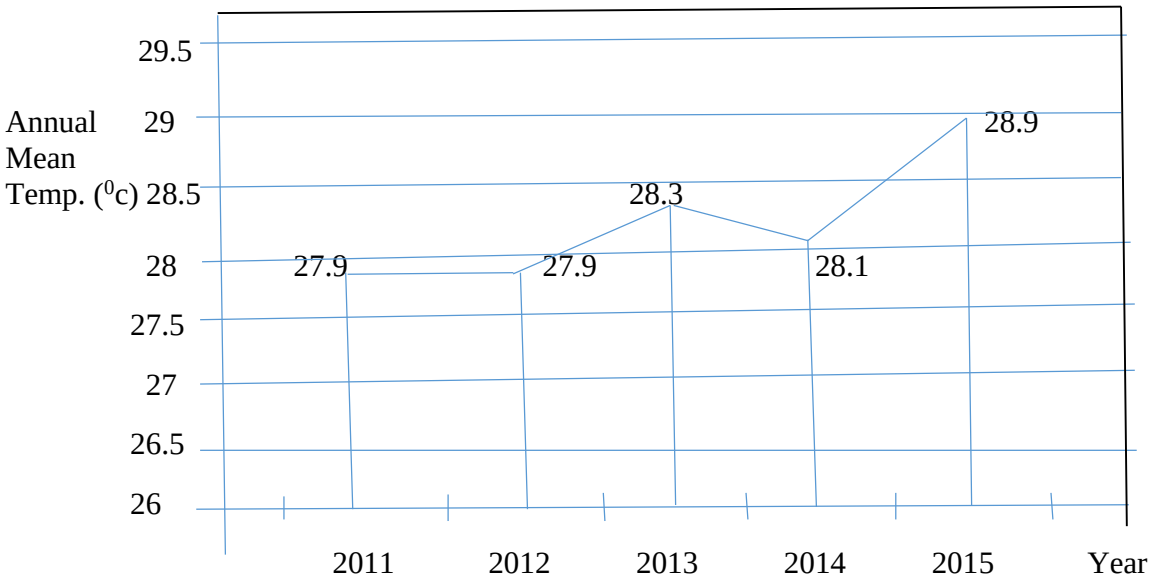
Table 4.2: Five Year Mean Monthly Temperatures (Degree Celsius, 2011 – 2015)

Year	Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
2011	28.1	29.5	31.7	30.9	27.7	27.7	25.9	25.1	25.2	27.8	27.9	26.9	27.9
2012	28.5	31.4	31.3	30.5	26.6	27.9	26.1	25.6	26.5	27.3	27.5	25.3	27.9
2013	27.2	28.9	31.2	31.3	29.3	27.5	25.9	25.8	26.3	28.5	29.3	28.4	28.3
2014	28.6	27.7	31.3	30.8	29.0	27.1	26.2	26.1	26.0	27.7	29.1	27.1	28.1
2015	29.0	31.8	32.9	31.2	29.6	28.2	27.0	26.4	26.4	27.5	29.3	28.0	28.9

Source: Ghana Meteorological Services Department (Wa), 2014

A critical examination of table 4.2 above and figure 4.2 below, shows that temperatures increased gradually from 2011 to 2015 with some fluctuations in the monthly temperatures. This greatly influenced the duration and intensity of drought in the study area as high temperatures sometimes triggers drought situations.

Figure 4.2: Annual Mean Temperature for Five Years (2011 - 2015)



Source: Ghana Meteorological Services Department (Wa), 2014

4.3 Socio-Demographic Characteristics of Respondents

This part of the work presents the demographic characteristics of respondents who participated in the study, in terms of age and other relevant socio-demographic data. This information is very important for the interpretation of the results emanating from the analysis made in respect of drought and its effects on rural poor in the Nandom District in the Upper West Region of Ghana.

4.3.1 Sex and Marital Status of Respondents

Table 4.3 shows the sex category of respondents for the study. On sex, females dominate as compare to males. In all, 100 households were covered. They comprised of 56 women (representing 56%) and 44 men (representing 44%). They were selected from 5 communities across the Nandom District. The study also reveals that 40% of the respondents were married whilst 60% were either single or widowed. Out of this, 25% of males were married and 35%

of females were married and 19% and 21% males and females respectively were either single or widowed (See Table 4.3).

Table 4.3: Sex and Marital Status of Respondents

Marital Status	Sex of Respondents		Total
	Male	Female	
Married	25.0	35.0	60.0
Single/widow	19.0	21.0	40.0
Total	44.0	56.0	100.0

Source: Field Survey, 2015

4.3.2 Age and Sex Distribution of Respondents

From the study, data on age distribution revealed that 12.0 percent of the respondents were between the ages of 20 and 29 years, 42.0 percent were between the ages of 30 and 39 years, 36.0 percent were between the ages of 40 and 49 years, 6.0 percent were between the ages of 50 and 59 years, and 4.0 percent 60+ years. Clearly, majority of the respondents are in the active working group, 30-39 years of age (See Table 4.4).

Table 4.4 also shows that 2 males and 10 females representing 12% aged between 20-29 years, and 18 males and 24 females representing 42% were between the ages of 30-39. Also, 18 males and 18 females representing 36% aged 40-49 whilst 3 each of males and females representing 6% where between the ages of 50-59. Furthermore, 3 males and 1 females representing 4% of the respondents aged 60 years and above. It further indicates that a greater percentage both males and females are within the age brackets of 30-39 and 40-49 and that females dominate in all the various age groups under study.

Table 4.4: Age and Sex of Respondents

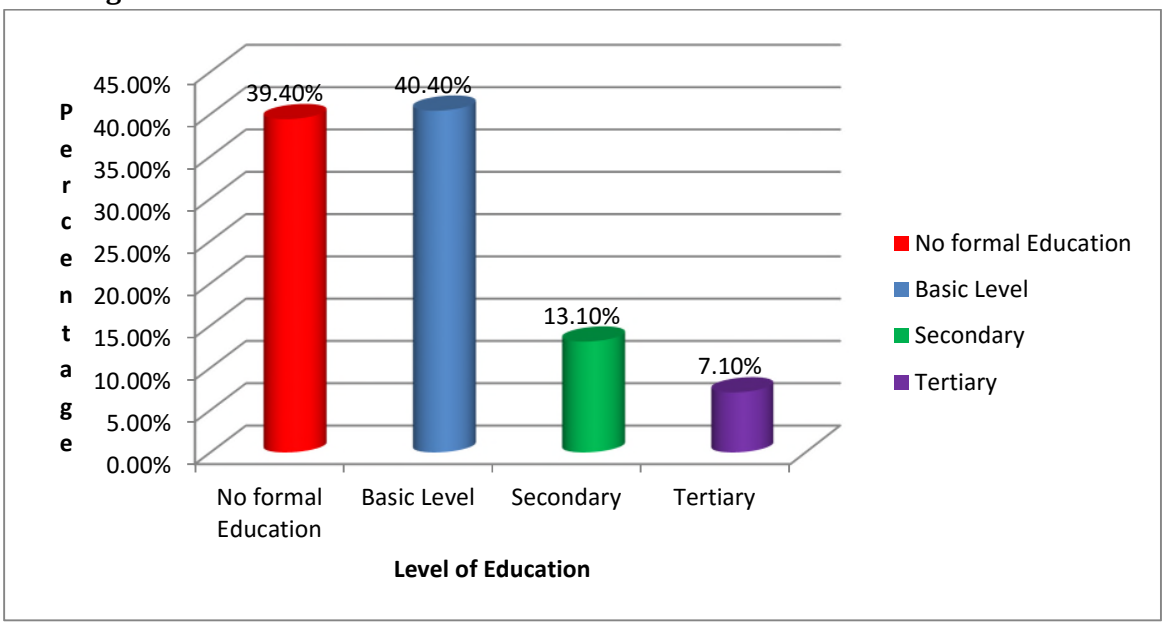
Sex	Age					Total
	20 – 29	30 - 39	40 - 49	50 - 59	60+	
Male	2	18	18	3	3	44.0
Female	10	24	18	3	1	56.0
Total	12.0	42.0	36.0	6.0	4.0	100.0

Source: Field Survey, 2015

4.3.3 Level of Education and Main Occupation of Respondents

It is assumed that successful development of any community depended on the level of literacy of the people. As captured on figure 4:3, 39.4 percent of respondents did not have access to formal education. 7.1 percent of the respondents had their education to the Tertiary level, 13.1 percent had their education up to SHS, 40.4 percent of the respondents had their education to the Basic level and 39.4 percent of the respondents had no formal education (figure 4.3). The gender disaggregation of the figures is more revealing as it epitomizes the gender disparity that characterized the study area and the north in general (Bruce, 1994). Comparing the levels of education between male and female respondents, it was revealed that only 4 female respondents (4%) went beyond secondary level whereas 18% of males achieved same level (figure 4.3).

Figure 4.3: Level of Education



Source: Field Survey, 2015

From table 4.5, the main occupation of the residents of Nandom District is farming with few of them engaging in trading and government work. Out of the 100 respondents, 57 (representing 57%) were farmers, 22% engaged in trading, 7% in government work, and the rest (14%) were engaged in other menial jobs such as masonry, carpentry, hairdressing, seam stressing.

Table 4.5: Occupation of Respondents

Occupation	Frequency	Percentage
Farming	57	57.0
Trading	22	22.0
Government worker	7	7.0
Others	14	14.0
Total	100	100.0

Source: Field Survey 2015

Table 4.6 indicates that only 7 people representing 7% who had tertiary education are government workers. In terms of trading, 5 had secondary education, 12 ended at the basic level and 5 had no formal education. Farming as the main occupation revealed that 8 of them went to school up to secondary level, 19 had basic education and 29 had no formal education. Also, 9 and 5 respondents who had only basic education and no formal education respectively said they were doing other menial jobs such as carpentry, masonry etc as a major source of living.

Table 4.6: Level of Education and Main Occupation of Respondents

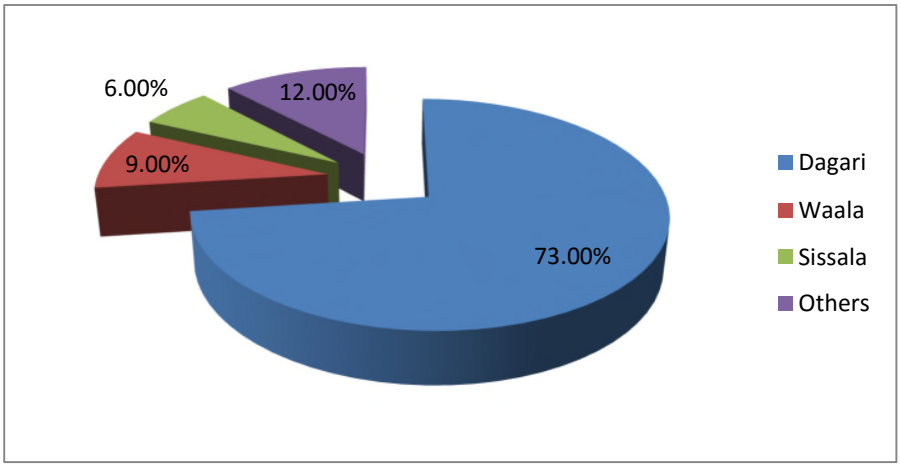
Level of Education	Main Occupation				Total
	Farming	Trading	Government worker	Others	
Tertiary	0	0	7	0	7.0
Secondary	8	5	0	0	13.0
Basic level	19	12	0	9	40.0
No formal Education	29	5	0	5	39.0
Total	56.0	22.0	7.0	14.0	99.0

Source: Field Survey, 2015

4.3.4 Ethnic Grouping of Respondents

From Figure 4.4, majority of the respondents 73 (representing 73%) are Dagabas, 6 of them (representing 6%) are Sissalas, 9 (representing 9%) are Waalas, and 12 (representing 12%) are from others tribes across the country. This clearly shows that Dagabas dominate compared to all other tribes in the Nandom district.

Figure 4.4: Ethnicity of Respondents



Source: Field Survey, 2015

4.3.5 Religious Inclination of Respondents

As captured in table 4.7, 3 (representing 3%) indicated that they were loyal to the traditional African Religion; 11 (representing 11%) said they were Muslims, most of whom were Waalas; 86 (86%) said they were Christians, most of whom were Dagaabas. Surprisingly, no respondent from the study belong to any other religion apart from the three main religions in Ghana. This confirms the general belief that most communities in the study area are now dominated by foreign religions: Christianity and Islam.

Table 4.7: Religious Inclination of Respondents

Religion	Frequency	Percentage
Muslim	11	11.0
Christian	86	86.0
Traditionalist	3	3.0
Others	0	0.0
Total	100	100.0

Source: Field Survey, 2015

4.3.6 Household Annual Income Size of Respondents

As captured in table 4.8, the household annual income of majority of the respondents falls within the upper and lower poverty lines as categorized by the Ghana Living Standard Survey (GLSS, 2006). Out of the 100 respondents, 79 (representing 79%) had an annual income size between 101-400 Ghana cedis. Very few of them (10%) who were mostly government workers had an annual income size above 1,000 Ghana cedis. Also, very few (4%), had an annual income size falling below the lower poverty belt (GH¢288.00).

Table 4.8: Household Income Size of Respondents

Amount (GH₵)	Frequency	Percentage
0 – 100	4	4.0
101 – 300	41	41.0
301 – 500	38	38.0
501 – 1000	7	7.0
1000^{+}	10	10.0
Total	100	100.0

Source: Field Survey, 2015

4.4.1 Effects of Drought on Assets Collection

Understating drought and its impact on asset collection is very critical in assessing the effects of drought on the livelihood of rural poor. This section seeks to provide an overview of assets being collected and how drought affects their collection in the study area.

The discussions would focus on the findings regarding the main household occupation of respondents, assets collected and valued during drought periods, how easy it is to collect

assets during drought and non-drought periods, and coping strategies adopted by rural poor during drought periods. In the process the study will continue to disaggregate the date by sex where necessary in order to analyse the gender dimensions that are woven in the community system.

4.4.2 Main Household Occupation

As captured in table 4.9, the main household occupation of the people of Nandom is farming (61%) with few of them engaging in trading (23%), government (7%) work and other livelihood supporting activities such as pito brewing, handicraft, carpentry, masonry comprising of 9.0 percent. A closer look at the gender disaggregated figures reveals that most of the people who indicated that they are farmers are men. Of the 44 men respondents, 34 (or 34%) are into farming as their main occupation. 7 (7%) are engaged in trading whiles 3 (3%) are government workers. This contrasts sharply with the female respondents who have 27 (27%) of them engaged in farming, 16 (16%) in trading, 4 (4%) being government workers, and 9 (9%) into others activities to earn a living.

Table 4.9: Household Occupation and Sex of Respondents

Main Occupation	Sex of Respondent		Total
	Male	Female	
Farming	34.0	27.0	61.0
Trading	7.0	16.0	23.0
Government worker	3.0	4.0	7.0
Others	0.0	9.0	9.0
Total	44.0	56.0	100.0

Source: Field Survey, 2015

4.4.3 Type of Assets Collected during Drought Periods

From Table 4.10, majority of the respondents (46%) indicated that they collect natural assets/capital such as land, water, livestock, trees etc. They said natural capital serves as the bedrock to their survival and well-being since farming is the main occupation of the area. Others though indicated that they collect physical (23%), 16% of them collect human/social capital, few (15%) collect financial capital, no one had interest in political capital. Probably, the high illiteracy rate of the study area shows how nobody had interest in political capital. This could be attributed to ignorance or the socio-cultural setting of the people.

Table 4.10: Sex and type of Assets collected during drought

Types of Assets Collected	Sex of Respondent		Total
	Male	Female	
Natural Capital	19.0	27.0	46.0
Physical Capital	8.0	15.0	23.0
Human/social Capital	9.0	6.0	15.0
Financial Capital	8.0	8.0	16.0
Total	44.0	56.0	100.0

Source: Field Survey, 2015

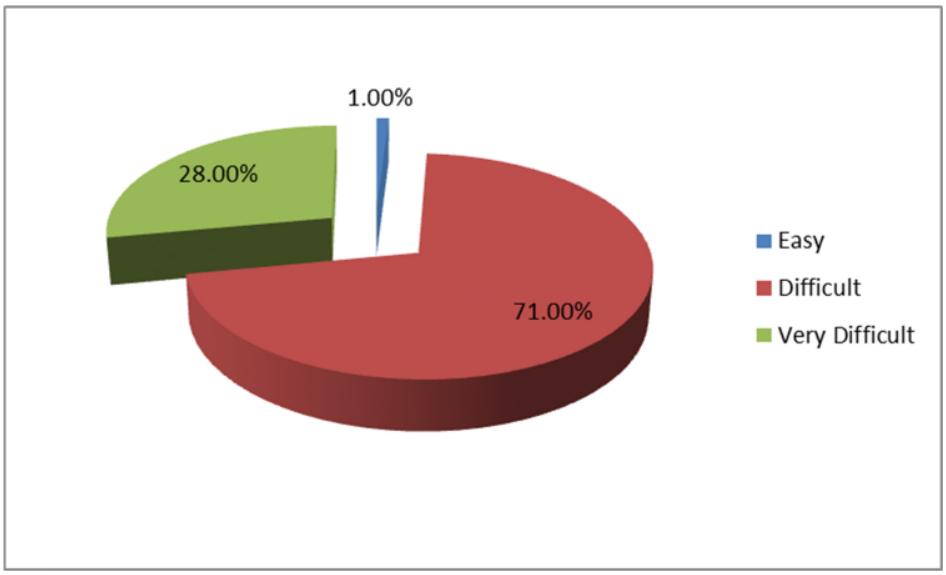
The indication is that both men and women have interesting in collecting natural and physical assets. However, women (27 out of 46) dominate in the collection of natural assets compared to their male counterparts (19 out of 46). Same applies to both physical and financial capital except social capital where men dominate. On assets valued, the analyses show that people

collect assets they value most and thus the figures in table 4.10 represents the trend of assets valued by the respondents. `

4.4.4 Easiness of Collecting Assets during Drought and Non-Drought Periods

Respondents were also asked to indicate how easy it is to collect these assets during drought periods. 90 percent of the respondents said it was very difficult to collect these assets during drought periods and the rest of the 10% said it was difficult to do same in such periods. The bottom line here is that it is not easy to collect these valuable assets (natural, physical, financial and social capital) during drought periods. However, they were quick to add that it was not very difficult gathering these same assets during non-drought periods (see figure 4.5).

Figure 4.5: How easy is it to collect Assets during Drought Periods



Source: Field Survey 2015

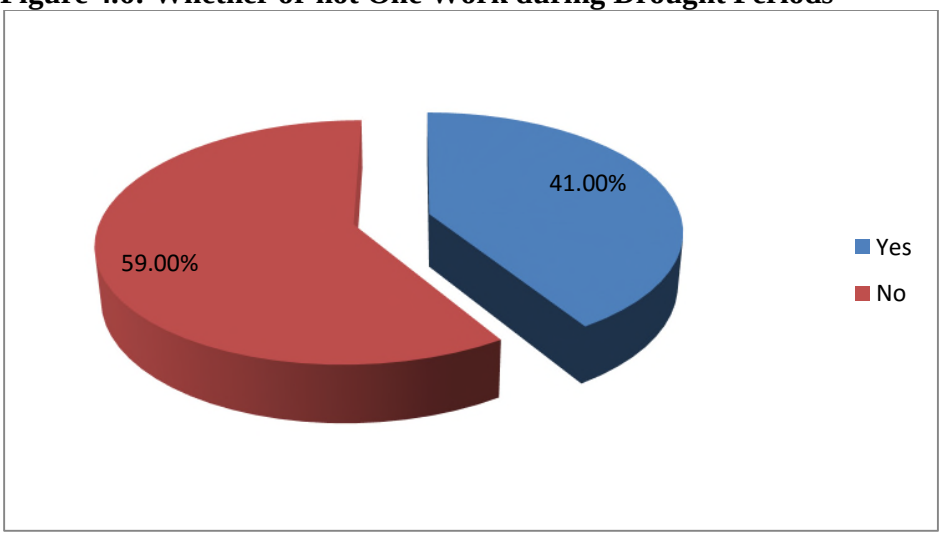
4.5 Coping Strategies Adopted by Rural Households during Drought Periods

Coping strategies are important component of this research. This area will thus focus on whether or not one work during drought periods, type of work done during drought period, causes of drought, local early warning signals of drought, assessment of droughts over the years, reasons (if any) for drought changes over time, effects of changes in drought on respondents' livelihood and copying strategies of respondents during drought periods, livelihood resilience during drought periods, and ultimately how drought affects the well-being of respondents.

4.5.1 Whether or not One Work during Drought Periods

As captured in figure 4.6, 59 percent of the respondents indicated that they did not work during drought periods. However, 41 percent of them said they did minor jobs such as pito brewing petty trading, hairdressing and seams tress in the case of married and single women or carpentry, masonry, or travel to the cities to look for menial jobs in the case of married and single men. Most of the respondents said in a focus group discussion that the drought period really leaves them with no choice than to engage in this kind of little reward jobs (Table 4.11).

Figure 4.6: Whether or not One Work during Drought Periods



Source: Field Survey, 2015

4.5.2 Type of Work done during Drought Period

Table 4.11 indicates that trading (19%) is the major type of work done during drought periods in the study area. Apart from the trading, and other menial jobs (38.1%) done, 16.7% of respondents travel to other places such as Accra and Kumasi in such of jobs. The sex disaggregated figures shows that it's the women (26% out of 42%) who work during drought periods as against their male (16% of 42%) counterparts. The few men who actually work during drought only travel to the cities in such of menial jobs.

Table 4.11: Sex and Type of work done during drought periods

Type of work done	Sex of Respondent		Total
	Male	Female	
Trading	5.0	14.0	19.0
Travel to other places for jobs	6.0	1.0	7.0
Others	5.0	11.0	16.0
Total	16.0	26.0	42.0

Source: Field Survey, 2015

4.5.3 Causes of Drought in the Nandom District

Respondents were asked to indicate the causes of drought in the study area over the years and the local early warning signals for drought occurrence. Of 100 respondents, 68 (representing 68%) said the droughts in the area could be attributed to bad environmental practices and one person said it was the spirits of the land that cause these droughts. Whilst 29% said they could not tell the cause of the perennial droughts in the area, two respondents maintained that it was

due to lack of safety measures. They generally attributed this to bad farming practices which do not help the natural environment (see table 4.12).

Table 4.12: Causes of Drought

Cause of drought	Frequency	Percentage
Bad environmental practices	68	68.0
Spirits of the land	1	1.0
Lack of safety alerts	2	2.0
Don't know	29	29.0
Total	100	100.0

Source: Field Survey, 2015

4.5.4 Local Early Warning Signals of Drought

When respondents were asked to indicate the local early warning signals of drought in the Nandom district, 45% and 28 % of them said low rainfall pattern and short rainy period respectively serve as an early warning signal of an impending drought. However, 18% of the respondents said drought could be notice by an irregular rainfall pattern compared to other years. Other local warning signals presented by respondents include early or late showing of food crops (4%), early stop of rains (4%), and one person said she could tell what the early warning signals of drought. This means that the local people have their own way of identifying the occurrence of an impending drought (see table 4.13).

Table 4.13: Local Early Warning Signals of Drought

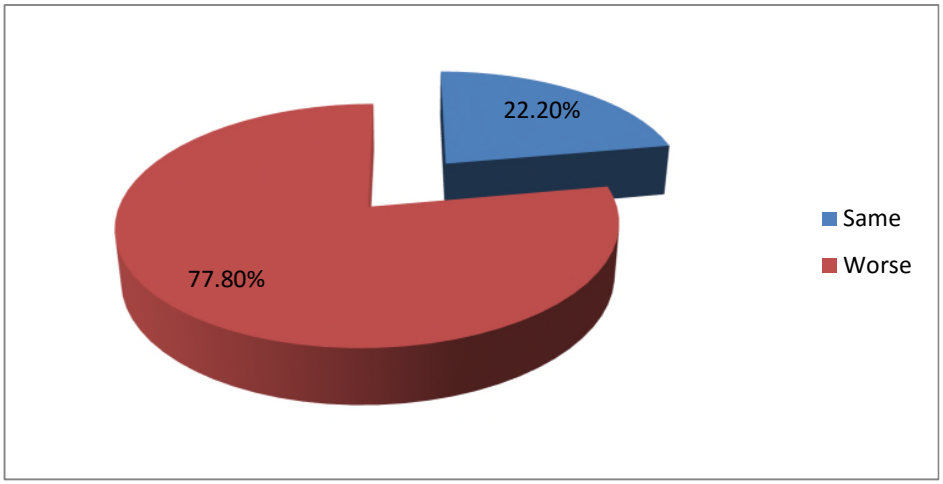
Signal	Frequency	Percentage
Early or late showing	4	4.0
Early stop of the rains	4	4.0
Can't tell	1	1.0
Irregular rainfall pattern	18	18.0
Low rainfall pattern	45	45.0
Short rainy period	28	28.0
Total	100	100.0

Source: Field Survey, 2015

4.3.5 Assessment of Droughts over the Years

As indicated in figure 4.7, twenty percent of the respondents maintained that drought in the study area over the past 20 years had remain the same; majority of the respondents (77.80%) conceded that drought was getting worse over the years. This was attributed to natural or bad environmental practices or bad farming practices such as indiscriminate cutting of trees for charcoal or fuel wood, bush burning etc. Others, though few, said drought could be attributed to socio-cultural and political factors. When they were asked to indicate the early warning signals of drought in the study area, irregular rainfall pattern topped followed by short rainy season as some of the things that tell them of an impending drought.

Figure 4.7: Drought Assessment over the Years



Source: Field Survey, 2015

Table 4.14 shows that the reasons for the changes in drought occurrences and its effects over the years are mostly attributed to negative environmental practices (41%) and negative farming methods. Some of the respondents (9%) attributed it to negative attitude on the part of residents. Five of the representing 6.4% said charcoal burning brings about changes in these perennial droughts whilst 3.9 % could not tell how these changes come about.

Table 4.14: Reasons for Drought Changes over Time

Reasons for Drought Changes	Frequency	Percentage
Negative Attitude	9	11.5
Negative Environmental Practices	32	41
Charcoal Burning	5	6.4
Negative Farming Practices	28	35.9
I can't Tell	3	3.9
Natural Factors	1	1.3
Total	78	100

Source: Field Survey, 2015

4.5.6 How Drought affects the Livelihood of Respondents

From table 4.15, sixty-five percent of the respondents indicated that the drought periods affect their livelihoods negatively as poverty gets worsen and standard of living reduces. Farming which is the main occupation of the people comes to a standstill with the onset of drought since irrigational facilities are unavailable for dry season farming. Respondents said they have to sell off assets to maintain diet levels and majority (65%) of them who did not have assets to sell go impoverished.

Table 4.15: How Drought Affects the Livelihood of Respondents

Effect	Frequency	Percentage
Low standard of living	21	27
Inability to feed	1	1.3
Increased poverty level	46	59
Worse standard of living	1	1.3
Worsen poverty level	9	11.5
Total	78	100

Source: Field Survey, 2015

Many said their livelihood activities either become poorly resilient (39%) or not resilient (60%) as indicated in table 4.16. When asked if they had any future drought risk management/investment plan for their households, the answer in totality was in the negative and that they either rely on family relations or household reserves.

Table 4.16: Livelihood Resilience during Drought Periods

Resilience	Frequency	Percentage
Very resilient	0	0
Resilient	1	1
Poorly resilient	39	39
Not resilient	60	60
Total	100	100

Source: Field Survey 2015

From table 4.17, eighty-four percent of respondents said they rely on family relatives to survive during drought periods. 5% who were mostly government workers seek external support in the form of loans. Also, 3% and 7% of the respondents rely on household reserves and other livelihood supporting activities like mason, migrate to cities, petty trading, and travel to cities respectively.

Table 4.17: Coping with Drought Danger during Drought periods

Coping Strategy	Frequency	Percentage
Rely on relatives	84	84
Seek external support	5	5
Rely on household reserves	3	3
Seek divine intervention	1	1
Others	7	7
Total	100	100.0

Source: Field Survey, 2015

As captured in table 4.18, fifty-five of the respondents representing 70.5 percent said their poverty level increases as the drought situation in the study area becomes worse. Also, 28.3 percent said an increase in drought brings about low standard of living whilst 1 percent said over the years it has been difficult to feed during drought periods.

Table 4.18: Effects of Changes in Drought on Respondents' Livelihood

Effect	Frequency	Percentage
Inability to feed	1	1.3
Increased poverty level	55	70.5
Low standard of living	22	28.3
Total	78	100

Source: Field Survey 2015

4.6 Impact of the Coping Strategies Adopted by Rural Households on their Workloads

This section seeks to outline the findings in respect to the impact of the coping strategies being adopted by rural poor on their workloads. This discussion would focus more on the time spent during drought periods and non-drought periods by men and women in the study area.

4.6.1 Time spent on Work during Drought and Non-Drought periods

During focus group discussion, women reported spending more hours working (reproductive and productive) daily than men, both during drought and non-drought periods. Single and married women spent between 12-15 hours working during non-drought periods, while men spent only 7-10 hours working during the same period. Men spent fewer hours working during drought periods than non-drought periods. Thus during drought periods, men spent only 4-6 hours working daily compared to 6-10 hours during non-drought periods. However, the situation is different for women. They spent more hours engaging in reproductive and productive work during drought periods. Single and married women spent between 13-16 and 12-15 hours respectively, working daily to support their households during drought periods. In a nutshell, it was reported that the coping strategies adopted by rural poor during drought period has a greater impact on their workloads. However, women's workloads are more compounded during drought periods as compared to their men counterparts.

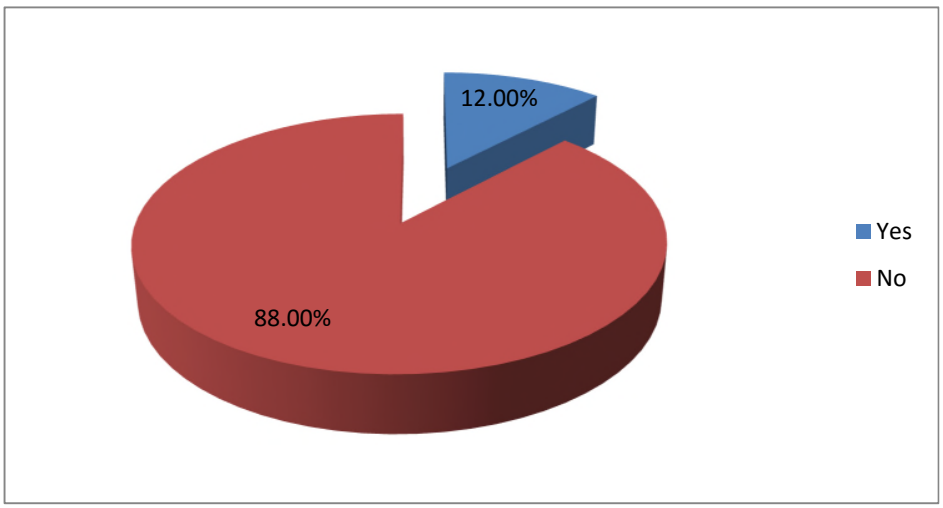
4.7 Development interventions by government or NGOs during drought periods

This section analysis the development interventions by government or non-government organizations to mitigate the adverse effects of drought in the study area, the kind of interventions being put in place, the target group of the interventions, their effectiveness, their appropriateness to the needs of the respondents.

4.7.1 Whether or not one receive support during drought periods

From figure 4.8, 88 (representing 88%) indicated that they have not received support or any form of help from anywhere during drought periods. This clearly shows that both government and non-governmental organizations are doing very little when it comes to drought mitigation measures.

Figure 4.8: Whether or not one receive support during Drought Periods



Sources: Field Survey, 2015

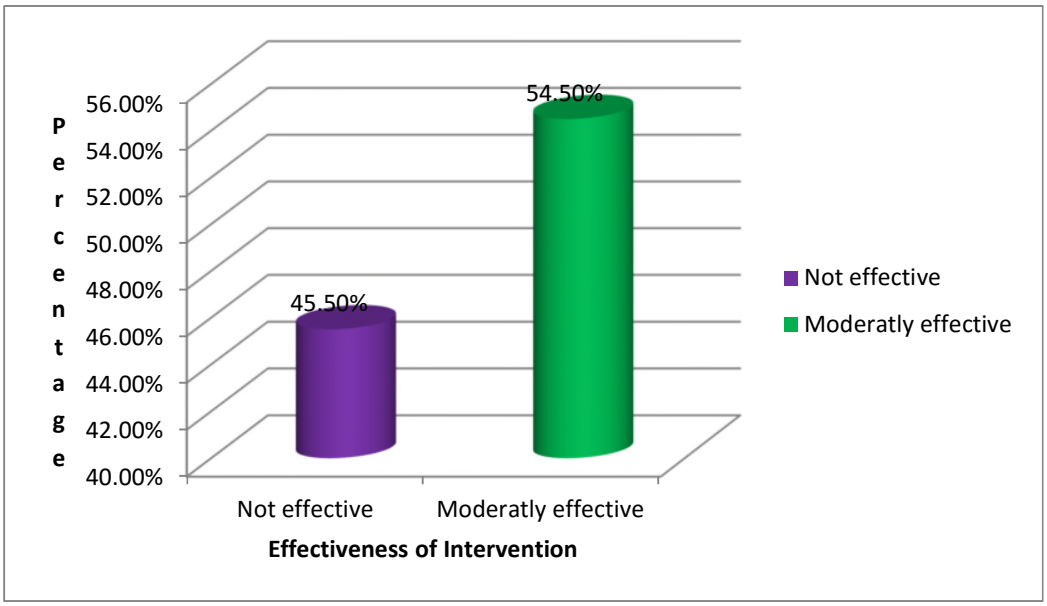
4.7.2 Target Group of Development Interventions during drought periods

Even the few (12%) who admit that they had received or are receiving support from either government or NGOs said the help was only in the form of material items which were basically targeted at the very poor or poor (see figure 4.9).

4.7.3 Effectiveness of Development Interventions during Drought Periods

As shown in figure 4.9, the development interventions undertaken by either government or NGOs are moderately effective (54.5%) or not effective at all (45.5%). Also, all the respondents eluded to the fact that government or NGOs are not providing the appropriate measures during drought periods. They said irrigation components which could have enhanced their economic activities and well-being in the dry season are not added to the water supply projects by these organizations. This puts their livelihood on the line during drought periods thus development interventions do not meet their immediate needs.

Figure 4.9: Effectiveness of Development Interventions during drought periods

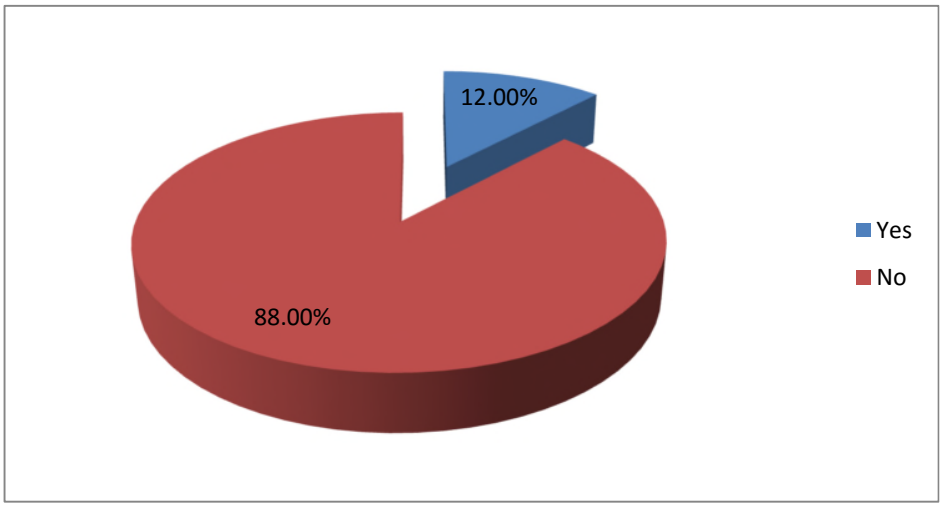


Source: Field Survey, 2015

4.7.4 Government/NGOs Providing Mitigation Measures during Drought Periods

The 12% in figure 4.10, who said they received support from NGOs and government agreed that the measures provided by these bodies are not appropriate as they target their immediate needs and are not sustainable (see figure 4.8). When asked in their own opinion what is/are the appropriate measure(s) that government or NGOs must put in place to mitigate the adverse effects of drought in the Nandom district, they (90%) pointed to provision of irrigational facilities of irrigated dams in every community in the Nandom district. They also said their livelihood resources are not safe during drought periods.

Figure 4.10: Whether or not Government/NGOs Provides the Appropriate Measures during Drought Periods



Sources: Field Survey, 2015

4.6 Discussion of Results

Farming within rural communities of Africa loses prominence during drought periods because it is rain fed. As farming, the main economic driver, comes to a halt, other livelihood opportunities have to be sought for survival during drought periods. While rural livelihood

support systems may vary among countries and between genders, the influence of gender in choosing coping strategies during periods of drought is apparent. Evidence from this study shows that women and men resort to different coping strategies during drought periods. Women engage in petty trading, hairdressing and seam stressing while on the other hand men often migrate to the cities to do manual work to support their families through remittances in the absence of opportunities to work as masons and carpenters within their communities. Although women and men largely make dissimilar choices about the type of alternative sources of income to pursue during drought periods, both genders seem to find trade more accessible so more women feature as seam stressors, hairdressers and traders, and some men as carpenters and masons. This finding suggests that rural farmers in Africa south of the Sahara need other skills in addition to that of farming to cope with persistent droughts.

Cleaver (2002) noted that women are powerful agents of change, adapting more quickly to new situations than men, and more easily finding alternative means of survival. Evidence from this study confirms women's commitments to explore their immediate environment to support the needs of their households during drought. Women's adaptation to the impact of drought through their engagement in a variety of economic activities which do not require them to migrate to cities with their children is a reflection of rural women's attachment to their communities and interest in keeping their families together. Although rural women can also migrate to the cities to work, settling temporarily in a new environment can be challenging, more especially finding affordable housing and schools for their children. Thus, women's roles as child minders can limit the potential opportunities that they can explore outside their locality to cope with drought. However, it is unclear why most men resort to out-migration during drought periods. Perhaps men migrate to the cities because carpentry and

masonry are less marketable within their communities or out-migration enhances their socio-economic status.

The literature maintains that women normally spend more time in reproductive (maintaining men, children, and extended family members) and productive work than men (Wilhite, 2000). It was also evident from this study that women worked longer hours than men during drought periods. Wives spent daily average time of 13-16 hours working compare to 4-6 hours for husbands. Also, during non-drought periods wives and husband spent between 10-14 hours and 6-10 hours respectively. Thus, generally women continue to be responsible for making sure that children are fed, healthy and educated by working longer hours than men during both drought and non-drought periods. Interestingly, Whitehead (1999) argued that the fact that women work longer hours than men does not necessarily mean that men are lazy. The gender division of labour, which is informed by cultural values, in the study area is such that reproductive work is for women and yet women take part on aspects of farm work (planting, harvesting, processing, and marketing of farm products) as well as non-farm-productive work, including hairdressing and sewing. Similarly, Rahman (2008) maintains that within the agriculture sector in parts of Nigeria, women harvest and market the farm produce, and Gawaya (2008) indicates that women are not only harvesters, but also the processors of farm products in Mozambique.

Generally, it is perceived to be customarily wrong for wives in the study area to either ask or challenge husbands to engage in reproductive work to lessen their workload. The researcher observed in the study area that culturally, women are the ones who mostly buy and sell in the local market, and are responsible for household chores. In some cases, when the extended family including parents of a man become aware that he is not being fully served by his wives

and he engages in reproductive work – cooking meals and collecting water -, they either ask the wife to leave her matrimonial home (divorce) or get him a second wife. This they say will let the first wife work hard. Whitehead (1999) also observed among rural Zambians that 'women's reproductive and domestic burden is non-negotiable'.

In the same way, most of the manual work on the farm, such as land preparation for crop planting is culturally men's role. Extended family members of a wife can take a woman from her matrimonial home to live with them if a husband allows his wife to clear the land for farming because to them this is considered too difficult work for a woman. A man who commits such cultural crime is looked on as not being responsible enough to care for a woman and really do not deserve a woman.

Some men in developing countries often turn a blind eye to women taking on a disproportionate share of household maintenance work (Bilgil 1998). However, men in this study area demonstrated recognition of women's workload by admitting that women spent more time working both during drought and non-drought periods than they do. Such affirmation validates a move towards development interventions to lessen women's daily workloads, especially in times of drought.

The extent to which men who migrate contribute resources to support the needs of the households they leave behind during drought periods is questionable. Moser (2007) maintains that men in search of green pastures migrate to the cities for odd jobs and send money and food to women and children they leave behind. However, according to Harris (1981), men as household heads are incapable of meeting the needs of the household because their interest may not lie within the households to which they belong, due to social and political reasons. In evidence of this assertion, women in this study said their husbands find new concubines or

partners when they migrate to the cities, spend their incomes on these new relationships and lack interest in supporting their families back home. The situation suggests that rural men migrating to urban centres to work during drought periods may put women and children at risk of depending on the meagre incomes of mothers.

Not only can men's seasonal migration be economically unfavourable to their rural households, but it can also pose health risks. Migrant men, through unhealthy sexual practices, can contract HIV/AIDS and other sexually transmitted diseases which can in turn be transmitted to their innocent wives on their return. Therefore, an alternative to migration that would allow rural men stay and work within their communities during drought periods is most likely to benefit women and their children and rural people at large.

Irrigation facilities that support all-year farming are certainly needed in rural farming communities that experience drought. It was not surprising that women in this study were quick to ask for irrigation facilities to remedy drought situations. The women emphasized that the sale of vegetables cultivated on irrigated lands during drought periods can produce more income and enable their households to have three square meals daily. Though, the government and few NGOs have provided clean water to most of the communities but had not offered irrigational facilities to these communities. In the absence of irrigation, the rural people are left to fend for themselves during drought periods.

Other factors such as general economic hardships and inadequate storage facilities in rural communities in Ghana hinder rural economic development. During non-drought periods, farmers get good harvest and may have to sell some of their food crops immediately after the harvest when prices are cheap in order to purchase other basic needs. This is partly because they lack processing and storage facilities. The middle women and some men buy the farm

products at such low prices, store them and resell to these same farmers when food is scarce at cut-throat prices.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the summary of major findings, conclusions and recommendations of the study. The study examined the impacts of drought on the livelihood of rural households in the Random District of the Upper West Region of Ghana.

5.1 Summary

The livelihoods of the majority of people especially in the rural communities of Random District are dependent on drought sensitive sectors such as agriculture. The perennial droughts experienced over the years have had a very high negative impact on the livelihoods of the rural households in Nandom District.

The fluctuations in annual levels of precipitation, gradual and persistent rise in temperature levels in the Nandom District with more frequent occurrence of drought and other extreme climatic events eventually affect the livelihood of rural households who do more of crop cultivation as a source of livelihood.

The study shows that majority of the respondents (46%) indicated that they collect and value most natural assets/capital such as land, water, livestock, trees etc. They said natural capital serves as the bedrock to their survival and well-being since farming is the main occupation of the area. Similarly, the study find out that 90 percent of the respondents said it was very difficult to collect these assets during drought periods.

The study also found that 84% of respondents said they rely on family relatives to survive during drought periods. 5% who were mostly government workers seek external support in

the form of loans. Also, 3% and 7% of the respondents rely on household reserves and other livelihood supporting activities like mason, migrate to cities, petty trading, and travel to cities.

The findings of the study show further that married and single women spend more time working during drought periods to meet basic needs of their household members as compare to their male counterparts. It was revealed that women work between 12 – 14 hours a day whilst men work between 6 – 10 hours per day during such periods. Both single and married women said they are able to meet the basic needs of their households during non-drought periods; however, they are unable to do so during drought periods. This is because farming which offers them reasonable incomes comes to a halt in such periods. The study also indicates that the income that the men earn from working in the cities during drought periods largely benefits the men.

The study reveals that 88% of the respondents indicated that they do not receive help from anywhere during drought periods. Even the few (12%) who admit that they had received or are receiving support from either government or NGOs said the help was only in the form of material items which were basically targeted at the poor or very poor.

The study further reveals that the development interventions undertaken by either government or NGOs are moderately effective or not effective at all and alluded to the fact that government or NGOs are not providing the appropriate measures during drought periods. They said irrigation component which could have enhanced their economic activities and livelihoods in the dry season is not added to the water supply projects by these organizations. This puts their livelihood resources in unsafe positions during drought periods and thus the various interventions not being beneficial to them.

5.2 Conclusion

Based on the data collected and analyzed, the study draws the following conclusions.

It was established that the people collect and value most natural assets/capital such as land, water, livestock, trees etc. Similarly, the study concluded that it was very difficult for them to collect these assets during drought periods. They said natural capital serves as the bedrock to their survival and livelihood since farming is the main occupation of the area.

It could be concluded that households in the Nandom District rely on family relatives to survive during drought periods. However, some few households, who were mostly government workers, seek external support in the form of loans. Also, some of the residents rely on household reserves and other livelihood supporting activities like mason, migration to cities, and petty trading.

The main economic activity of married and single women in the study area is farming, petty trading, seam stressing and hairdressing, while married and single men engage in farming, carpentry, and masonry. During drought periods, almost all the women engage in more than one economic activity to help meet the basic needs of their households: they engage in petty trading, seamstress, or hairdressing. Even though women do not work on the farm during drought periods, they go to the farm areas to collect firewood which is used to boil water for bathing (especially during haematin) and to prepare meals. Only a few men worked as either carpenters or masons to earn meagre income to support their households during drought periods. Some of the men reported that they travelled to cities like Kumasi and Accra to do manual work in order to bring money/or food home

The study further concluded that residence in the district receive very little help during drought periods, and those who admit receiving support from either government or NGOs said the help was only in the form of material items which were basically targeted at the poor or very poor. Though there has been gradual effort to improve the livelihood interventions and strategies by government and non-governmental organizations and agencies especially on agriculture, the lack of irrigational facilities in the area to ensure an all-year round farming leaves the rural households with worsening living conditions.

5.3 Recommendations

Giving the frequency of droughts in Ghana and their impacts on rural people of Nandom District, the implementers of Water Supply Projects should have included irrigation component. This is because even though the Water Supply Projects help in reducing time spent in collecting clean water, it is not meeting the reality of lives of the beneficiaries; they need irrigated lands as well.

The lack of irrigation services to these communities could partly be attributed to the fact that women, who are largely interested in irrigation farming, were not part of the planning and implementation process of the project. Thus, development interventions initiated by both national and international governmental and non-governmental organizations need to begin with need assessments that apply rural appraisal techniques such as matrix scoring and group mapping to allow beneficiaries, both women and men, to include their real needs into the process. This process can enable both women and men to benefit equally from development interventions (Sweetman, 2001). Also, development projects, and in this case the WSPs, need to be evaluated periodically – perhaps every four years – to determine and address other emerging real needs of the beneficiaries.

Rural people's financial obligations towards an irrigation project can be a barrier to their well-being. Giving that farmers in the study area produce on a small-scale, and sell only surpluses, it might be almost impossible for them to contribute 5% of the investment cost of an irrigation project which would require a larger capital investment than the clean water project. Hence, the Government of Ghana and the NGOs should contribute part of the residents' portion of the project cost and the residents' contribution could be a combination of cash and kind – labour.

The potential benefits of having an irrigation facility in coping with drought are vast. When women focus on farming during drought periods, they are likely to spend fewer hours working. As well, the dangers of contracting and transmitting HIV/AIDS including other sexually transmitted diseases through migration and men abandoning family responsibilities could be reduced.

The District Assembly should incorporate drought occurrence into their Medium Term Development Plan, and promote the coordination of relief and livelihood support initiatives both from government and non-governmental organizations. For instance, the government social intervention such as Livelihood Empowerment against Poverty could work well with the Food Security and Agricultural Recovery Management project of CARE International in the District if the two organizations coordinate.

Dissemination of weather information in the local languages using local radio stations and information vans regarding the ideal time to cultivate crops, the duration of the season, the occurrence of drought in particular, the coping strategies people should adopt should be given priority.

Maximum but efficient use should be made of water resources available for the dry season gardening to promote livelihood sustainability beyond the rainy farming period per season every year. Traditional and effective water harvesting approaches such as digging large wells on water paths or placing large containers where rain falls etc should be adopted by all communities. This will ensure support water availability for gardening and animal rearing in the dry season.

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APPENDIX I: QUESTIONNAIRES

UNIVERSITY FOR DEVELOPMENT STUDIES

THE EFFECTS OF DROUGHT ON THE LIVELIHOOD OF RURAL HOUSEHOLDS IN THE NANDOM DISTRICT OF THE UPPER WEST REGION, GHANA

The researcher is a graduate student at the Graduate School of the University for Development Studies, Tamale, pursuing MPhil in Development Studies. All responses are mainly for research purpose (preparation of dissertation) and would be treated with the highest degree of confidentiality. This questionnaire is intended to generate data on the impact of drought on the livelihood of rural women and men in the Nandom District of the Upper West Region of Ghana.

Your cooperation is most solicited.

Thank you.

Part one: A Household Questionnaire on the Effects of Drought on the Livelihood of Rural Households.

Section one: Socio-Demographic Characteristics of Respondents

1. Sex: a. Male [ ] b. Female: [ ]
2. Marital status: a. married [ ] b. single [ ] c. widower [ ]
3. Main occupation: a. Farming [ ] 2. Trading [ ] 3. Government worker [ ] 4. Other (specify).....
4. Ethnic Origin: a. Dagarti [ ] b. Waale [ ] c. Sissala [ ] d. Other [ ]
5. Level of Education: 1. Tertiary [ ] 2. Secondary [ ] 3. Basic level [ ] 4. No school [ ]
6. Age: a. 20 – 29 [ ] b. 30 – 39 [ ] c. 40 – 49 [ ] d. 50 – 59 [ ] e. 60^{+} [ ]
7. Religious Affiliation: a. Muslim [ ] b. Christian [ ] c. Traditionalist [ ] d. No religion d. Other (specify).....
8. Household annual income size (GH¢) 1. 0 – 100 [ ] 2. 101 – 300 [ ] 3. 301 – 500 [ ] 4. 501 – 1,000 [ ] 5. $1{,}000^{+}$ [ ]

Section Two: Assets Collected and How Drought Affects their Collection?

1. What is the main household occupation? 1. Farming [ ] 2. Trading [ ] 3. Government worker [ ] 4. Other (specify).....
2. What are your other livelihood supporting activities? 1. Carpentry [ ] 2. Masonry [ ] 3. Pito brewing [ ] 4. Handicraft [ ] 5. Other (specify)....

3. Which of these type of assets do you collect during drought periods? a. Natural capital e.g. land, water, trees, genetic resources, livestock, soil fertility [ ] b. Physical capital e.g. agricultural inputs, business equipment, houses, consumer durables, vehicles and transportation, water supply and sanitation facilities, and communications infrastructure [ ] c. Human/Social capital e.g. education, skills, knowledge, information, health, nutrition, time, labour [ ] d. Financial capital e.g. savings, credit, and inflows [ ] e. Political capital citizenship, enfranchisement, and effective participation in governance [ ]
4. Which among the assets mentioned in 3 above are most valued by your family members? a. Natural capital [ ] b. Physical capital [ ] c. Human/Social capital [ ] d. Financial capital [ ] e. Political capital [ ]
5. How easy is it to collect these assets during drought periods? a. very easy [ ] b. easy [ ] c. difficult [ ] d. very difficult [ ] e. not able at all [ ]

Section three: Copying Strategies during Drought Periods

1. Do you do any work during the dry season or drought periods? a. Yes [ ] b. No[ ] **(if No, Go to 3)**
2. What type of work do you do during drought periods? a. Irrigation [ ] b. trading [ ] c. travel to other places for jobs [ ] d. other (specify).....
3. What are your other livelihood supporting activities? 1. Trade [ ] 2. Animal rearing [ ] 3. Pito brewing [ ] 4. Handicraft [ ] 5. Farming [ ] 6. Other-specify.....
4. What do you think has been the cause(s) of droughts in the community? a. Bad environmental practices [ ] b. Spirits of the land [ ] c. Lack of safety alerts [ ] d. I don't know [ ] e. Other (specify).....

5. What are the local early warning signals for droughts? .....
6. How do you assess the drought of this area over the past twenty years? 1. Same [ ] 2. Better [ ] 3. worse [ ] **(if same, Go to 9)**
7. What reasons account for these changes? .....
8. What are the effects of these changes on your well-being activities? .....
9. How resilient are your livelihood activities to drought disaster? 1. Very resilient [ ] 2. Slightly resilient [ ] 3. Poorly resilient [ ] 4. Not resilient [ ]
10. Do you have any future risk management/ investment plan for your household? 1. Yes [ ] 2. No [ ] **(if No, Go to 12)**
11. What form is the plan? .....
12. How do you cope with danger in terms of drought in the community? 1. Rely on relatives [ ] 2. Seek external support [ ] 3. Rely on household reserves [ ] 4. Seek divine intervention [ ] 5. Other (specify).....

Section four: Development Interventions to Mitigate the Adverse Impacts of Drought on Rural Households.

1. Do you get help during drought periods? a. Yes [ ] b. No [ ] **(if no, go to 6)**
2. Who provided the intervention? 1. Government [ ] 2. NGOs [ ] 3. Private individuals [ ] 4. Others (specify).....
3. What form was the intervention? a. Cash [ ] b. Material things [ ] c. other (specify) …….

4. Which group of people did the intervention target? 1. The very poor [ ] b. the poor [ ] c. the middle income [ ] d. the rich e. everyone [ ]
5. How effective was this intervention? 1. Very effective [ ] 2. Effective [ ] 3. Moderately effective [ ] 4. Not effective [ ]
6. Do you think government or NGOs are providing the appropriate measures during periods of drought? a. Yes [ ] b. No [ ] **(if no go to 8)**
7. In which ways does this mitigation measures help you during drought periods? ……
8. In your own opinion what do you think is/are the appropriate measures that government or NGOs must put in place during drought periods?

   .....
9. How save are your livelihood resources from drought effects? 1. Very safe [ ] 2. Safe [ ] 3. Not safe [ ]
10. Have you benefited from any intervention in response to a drought situation? 1. Yes [ ] 2.No [ ]

Part Two: Institutional Questionnaires – Ministry of Food and Agriculture, Nandom District.

This questionnaire is intended to generate data on the effects of drought on the livelihood of rural women and men in the Nandom District of the Upper West Region of Ghana. The data generated will be used for the preparation of a dissertation.

1. Name of respondent.....
2. Position .....
3. Do you have past and present data on the effects of drought on the production level of the district? 1. Yes [ ] 2. No [ ] **(If yes, attach documents)**
4. Do you sensitize communities on climate impact on their livelihoods? 1. Yes [ ] 2. No [ ]
5. Are there functional local drought management plans being implemented in the district and communities? 1. Yes [ ] 2. No [ ] **(If yes, attach documents)**
6. Do you work in collaboration with the District Assembly and other partners? 1. Yes [ ] 2. No [ ] **(if No, Go to 8)**
7. Describe the support you are getting from the District Assembly, other partners and the communities.....
8. Describe the success rate of your intervention relative to drought impacts.....
9. Any other information related to the subject matter? .....

Part Three: Institutional Questionnaires– Meteorological Services Department– Wa

This questionnaire is intended to generate data on the impact of drought on the livelihood of rural households in the Nandom District of the Upper West Region of Ghana. The data generated will be used for the preparation of a dissertation.

1. Position.....
2. Do you have data on precipitation and temperatures in the Nandom district? 1. Yes [ ] 2. No [ ] **(If yes, attach documents)**
3. Do you sensitize communities on drought impact on the livelihood of residents? 1. Yes [ ] 2. No [ ]
4. Are there functional local drought management plans being implemented in the District and communities? 1. Yes [ ] 2. No [ ] **(If yes, attach documents)**
5. What are they? ……..…
6. Do you work in collaboration with districts especially Nandom District Assembly and other partners? 1. Yes [ ] 2. No [ ] **(If No, Go to 8)**
7. Describe the support you are getting from the District Assembly, other partners and the communities.....
8. Describe the success rate of your intervention relative to drought impacts.....
9. Any other information related to the subject matter? .....

APPENDIX II: FOCUS GROUP DISCUSSION – CHECK LIST

UNIVERSITY FOR DEVELOPMENT STUDIES

THE EFFECTS OF DROUGHT ON THE LIVELIHOOD OF RURAL HOUSEHOLDS IN THE NANDOM DISTRICT OF THE UPPER WEST REGION, GHANA

A. MARRIED WOMEN

1. What is the main economic activity of women during drought periods**?** a. Farming [ ] b. Petty trading [ ] c. government worker [ ] d. other (specify) ……..

2. What is the main economic activity for living during non-drought periods**?** a. Farming [ ] b. Petty trading [ ] c. government worker [ ] d. other (specify) ……

3. How many hours do women spend working during drought periods? a. 1-3 [ ] b. 4-7 [ ] c. 8-12 [ ] d. 13-16 [ ]

4. How many hours do women spend working during non-drought periods? a. 1-3 [ ] b. 4-7 [ ] c. 8-12 [ ] d. 13-16 [ ]

5. What do you think government or non-governmental organizations can do to support your efforts during drought periods? .....

6. What coping strategies do you adopt during drought periods to earn living? ……

7. What would you grow on an irrigated farm if you had one? ……..

8. How do you think negative impacts of drought (if any) could be minimized? .....

FOCUS GROUP DISCUSSION – CHECK LIST

B. MARRIED MEN

1. What is your main economic activity for your livelihood during drought periods**?** **.....**
2. What is your main economic activity for your livelihood during non-drought periods**?** **.....**
3. How many hours do you spend working during drought periods? a. 1-3 [ ] b. 4-7 [ ] c. 8-12 [ ] d. 13-16 [ ]
4. How many hours do you spend working during non-drought periods? a.1-3 [ ] b. 4-7 [ ] c. 8-12 [ ] d. 13-16 [ ]
5. What do you think government or non-governmental organizations can do to support your efforts during drought periods? .....
6. What coping strategies do you adopt during drought periods to earn living? .....
7. What would you grow on an irrigated farm if you had one? .....
8. How do you think negative impacts of drought (if any) could be minimized? .....

FOCUS GROUP DISCUSSION – CHECK LIST

C. SINGLE WOEMN

1. What is your main economic activity for your livelihood during drought periods**?**

   .....

2. What is your main economic activity for your livelihood during non-drought periods**?**

   .....

3. How many hours do you spend working during drought periods? a. 1-3 [ ] b. 4-7 [ ] c. 8-12 [ ] d. 13-16 [ ]

4. How many hours do you spend working during non-drought periods? a. 1-3 [ ] b. 4-7 [ ] c. 8-12 [ ] d. 13-16 [ ]

5. What do you think government or non-governmental organizations can do to support your efforts during drought periods?

   .....

6. What coping strategies do you adopt during drought periods to earn living?

   .....

7. What would you grow on an irrigated farm if you had one?

   .....

8. How do you think negative impacts of drought (if any) could be minimized?

   .....