

University of the Western Cape



EMS Faculty

Institute for Social Development

**THE IMPACT OF DROUGHT ON HOUSEHOLD FOOD SECURITY: A CASE  
STUDY OF NORTHERN TANZANIA**

A full thesis submitted in fulfilment of the requirements for the degree of Master of Arts in  
Development Studies in the Institute for Social Development, University of the Western  
Cape.

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## ABSTRACT

With changes in climatic conditions being increasingly noticed around the world in the past 2 decades, drought has been identified as one of the main causes of food insecurity. Given the inseparable nature of food security and poverty, it has been impossible for Africa to attain the poverty reduction Millennium Development Goal as most of the continent still suffers food insecurity. Impacts of the drought described as one of the worst droughts which occurred in West and East Africa between 2009-2011, are still felt in some parts of Kenya, Ethiopia, Somalia, Djibouti and parts of Northern Tanzania close to Kenya. With almost 70% of sub-Saharan Africa's population involved in agriculture, the occurrence of drought not only causes failure in food production but also negatively impacts food security and increases poverty. Understanding the impacts of drought on household food security is important for reducing household's risk of poverty.

Already available empirical studies on the impact of drought on food security have revealed mixed debates and are silent on gender consequences. Using the National Panel Survey, Wave 3 (2012–2013) dataset generated by the Tanzanian National Bureau of Statistics and the World Bank, this study employs both qualitative and quantitative techniques. It focused on examining the role played by drought on household food security status in Northern Tanzania-Arusha, Tanzania, Tanga and Manyara regions between 2012 - 2013. Stata 13 statistical software was used in analyzing the data set and a logistics regression model was applied to assess the impact of drought on food security. The results showed that, households in Northern Tanzania experiencing drought were 2.3 times more vulnerable to food insecurity than households not experiencing.

Following this the study proposes policies for reducing the impact of drought on food security and other policies that can ensure complete eradication of food insecurity.

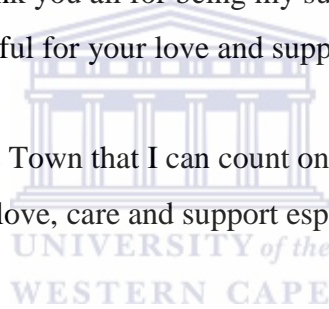
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Finally, to the one person in Cape Town that I can count on for anything, Chibuzo John Paul. I say a big thank you for all your love, care and support especially during this period of writing.



## DEDICATION

I dedicate this piece of work to Mr. Patrick Enow and to my nieces and nephew: Brenda, Blake, Billy, Bella and Baraka



## **DECLARATION**

I declare that “The Impact of drought on household Food security in Northern Tanzania” is my own work. It has never been previously submitted to obtain any degree in any other University. The sources I have used or quoted have been indicated and acknowledged as complete references.

Maria Goretti D. Ndzelen

Signed:



## LIST OF ACRONYMS AND ABBREVIATIONS

CIDA	Canadian International Development Agency
CDC	Centre for Disease Control
DFID	Department for International Development
EIU	Economist Intelligence Unit
ESRF	Economic and Social Research Foundation
ECDPM	European Centre for Development Policy Management
FAO	Food and Agriculture Organization
GHI	Global Hunger Index
IDRC	International Development Research Centre, Canada
IFAS	Institute of Food and Agricultural Sciences
IFRC	International Federation of Red Cross
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
TFSIT	Tanzanian Food Security Information Team
TNBS	Tanzanian National Bureau of Statistics
TNPS	Tanzanian National Panel Survey
TSH	Tanzanian Shillings
SSA	Sub Saharan Africa
TMAFSC	Tanzanian Ministry of Agriculture, Food Security and Cooperatives
UNFCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
US\$	United States Dollars
UK	United Kingdom
WB	World Bank
WFP	World Food Program

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# CHAPTER ONE

## INTRODUCTION

### 1 Introduction and Rationale

This section gives an introduction to the state of food security and the changing climatic conditions being faced around the world. It will concentrate on conditions in sub-Saharan Africa with specific references to Tanzania.

#### 1.1 An overview of the state of food security and climate change in the world

In recent years there has been greater action in creating a hunger-free world at the global, regional, organisational and individual levels. However, with increase in climate variability and extreme weather events, agriculture in SSA which is mostly rain-fed remains vulnerable to natural disasters such as dry spells (FAO, 2009).

With less than 400 days left before the target date for achieving the Millennium Development Goals (MDG), a stock-taking of where the world stands with regards to hunger and malnutrition reveals that, even though there continues to be an undisputed reduction in hunger at the global level, food insecurity remains a challenge that needs to be conquered (FAO, IFAD & WFP, 2014). Global trends indicate that the number of food insecure people has dropped from 870 million in the period 2010–2012 (FAO, 2012) to 805 million in 2012 – 2014 (Thompson, 2014). These figures, however, mask the disparities that exist between and within regions, as only a small proportion of the figures represent food insecure people in developed regions. Developing countries are home to 790 million undernourished people, with the sub-Saharan African (SSA) region alone accounting for more than 30% of the people worldwide who are food insecure (UN, 2013).

While Southern Africa is said to have the highest overall food security score in the region, countries in the East and North of Africa are identified with an overall Global Hunger Index (GHI) of 4.9. This is quite low when compared with Southern Africa's GHI of 18.2 (IFPRI, 2014). According to Paarlberg (1999), Africa's unpredictable weather patterns and poor soils do not support food production and agriculture as a whole. While this generalisation may not apply to some African countries, drought is seriously affecting household food security in

Tanzania, both directly through food production and through other livelihood preferences. This is confirmed by authors like Mbunda (2013) who points out that due to insufficient rainfall, Tanzania has been experiencing fewer periods of food production. While some areas of the country are only minimally affected by drought and its food insecurity impact, the north eastern regions of Manyara, Kilimanjaro and Arusha are severely affected and are in continual need of food assistance (IFRC, 2011; EIU, 2014).

### **1.1.1 Climate variability and Food production**

Climate variability and extreme weather events are a threat to many populations throughout many regions of the world. In some of these areas, like India in South East Asia, devastating floods in Mumbai present evidence of increasing variability in climate (Blunden & Arndt, 2012). The change in climate and weather regimes perhaps is more noticeable with the availability of water (Kundzewicz et al., 2007). With this threat posed around the world by extreme weather events and climate variability (Gutierrez, 2014), it is not surprising that the World Bank's (WB) '4 degree report' indicates that the severity of drought will increase in parts of Africa and the United States, amongst other areas. This indication is based on the notion that, drier regions will become drier and colder regions cooler. Thus, the WB indicates that, drought prone areas of Africa and the United States will be more adversely impacted by climate change. This will have adverse consequences on food security through a number of factors including reduction in arable land, evapotranspiration and extremely dry periods (World Bank, 2012a). The validity of these statements are further strengthened by ActionAid International's identification of some 12.4 million people in the East and Horn of Africa (e.g. Kenya, Ethiopia, Somalia, Uganda, Djibouti) and parts of Tanzania who are dependent on subsistence farming and who are desperately in need of food due to erratic or absolute lack of rainfall (ActionAid International, 2015).

Due to lack of sufficient investment in the agricultural sector in SSA, the sector remains vulnerable to natural disasters like dry spells because it relies on rainfall which is irregular and inadequate. This is compounded by the fact that the water supply at the regional level is not evenly distributed (FAO, 2009). Agriculture is most essential for the reduction of poverty and food security in SSA, but SSA countries have failed to adapt to these climatic changes, thus reducing the potential to tackle poverty and ensure food security (World Bank, 2008). Furthermore, Khan et al, (2009) emphasise that the occurrence of a water and climatic hazard

like drought only leads to a disaster if it meets a vulnerable population. A vulnerable population includes the elderly or sick people and people reliant only on their own farm produce and an inability to diversify livelihood. Holt–Gimenez & Patel (2009) are of the opinion that to manage the occurrence of a hazard and prevent loss to vulnerable populations, it is important to first identify the exact impact of the hazard; that is, what areas are likely to suffer from the occurrence, how they suffer and why, as well as the consequences of its occurrence on life and property.

This study will focus on investigating the effect that the dry period of 2012-2013 had on food security in Northern Tanzania. Drawing on secondary data, it will investigate the extent to which household food security in Northern Tanzania is affected by drought. The study also seeks to find out if and how resilience of households to drought enables them to recover from drought shock and maintain a food secure level. An attempt will be made to also investigate if there are any coping strategies employed by households to deal with food security and how effective these strategies are.

## **1.2 Background and Contextualisation of the Study**

Section 2 of this chapter focuses on an overview of food security and drought in Tanzania, showing with the help of maps and pie charts, the areas affected by drought in the country and highlights the other causes of food insecurity. A discussion of the regional rainfall distribution during the period under study will be made. This section also emphasises on the definition of drought as will be referred to in the rest of the study.

### **1.2.1 An Overview of Food insecurity in Tanzania**

The Tanzanian economy depends heavily on agriculture. The agricultural sector alone contributes 27.6% to the country's GDP while the other 73% is accounted for by industry and other services (AfDB, 2013). Despite this, rain-fed agriculture is still the backbone of its economy and the country remains one of five SSA countries with the highest proportion of undernourishment (Liwenge et.al, 2012), with about 35% of the Tanzanian population undernourished (World Bank, 2015).



Household food insecurity in Tanzania is described, depending on dietary intake over time, as being chronic or transitory in nature (MAFCS, 2006). Households with a continuous poor dietary intake (low diet diversity and highly food energy deficient) over time are experiencing chronic food insecurity while households with an improvement in at least one aspect of its dietary intake are experiencing transitory food insecurity (WFP, 2012). Chronic food security is more common in the Central Zone while parts of Northern Tanzanian like Arusha are currently experiencing transitory food insecurity. Food insecurity in the country has generally been associated with the instability of food production, household incomes and food prices (Mbunda, 2013).

**Figure 1.1: Tanzanian National Map, showing areas of transitory food insecurity.**



Source: Expert Africa 2014

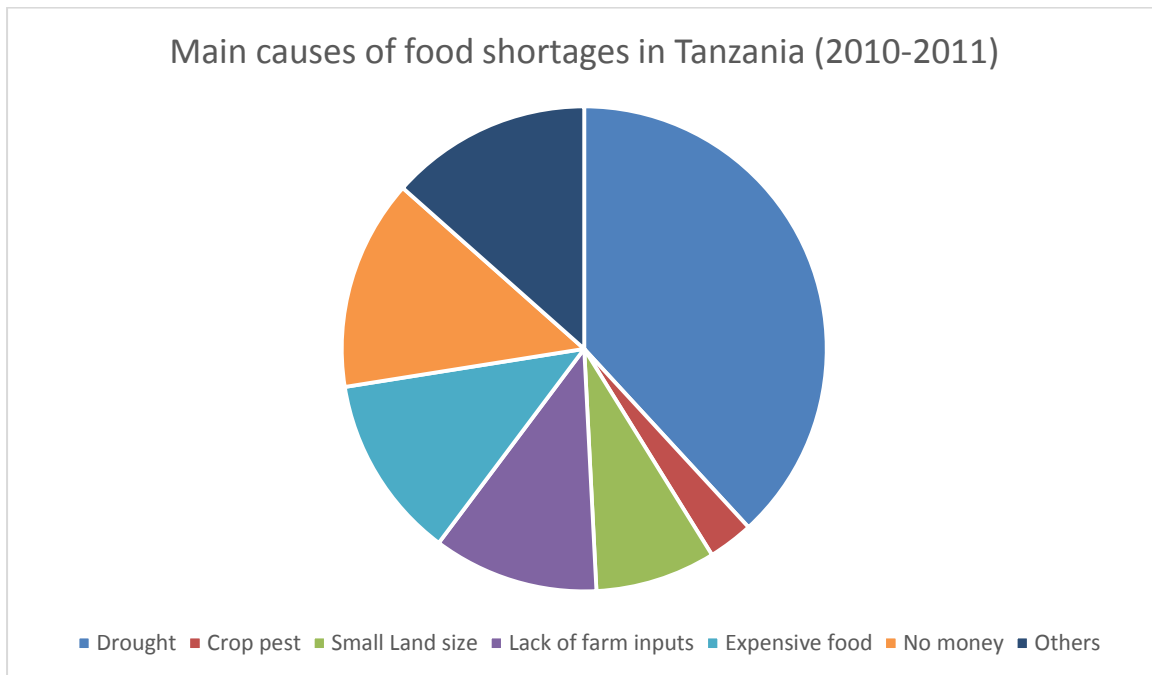
Figure 1.1 above shows the districts of central and northern Tanzania, characterised by chronic and transitory food insecurity. The central regions include Dodoma, Singida, Shinyanga, Tabora and the northern Tanzanian regions include Tanga, Arusha, Kilimanjaro, and Manyara.

Food insecurity in the country is said to have declined from 21.6% in 1991 to 15% in 2003 and was further projected to fall to 10% in 2010 (MAFCS, 2006). In 2010, however food security stood at about 20.1% in Tanzania (WFP, 2010). This massive discrepancy, amongst other things can be traced to the drought spell that hit areas of the country close to Kenya especially the Ngorongoro district in Arusha region (WFP, 2009). With regards to poverty and food insecurity, the International Federation of Red Cross (IFRC) in 2011 identified a big disparity between the country's urban and rural poverty for both food and basic needs. The poorest and most food insecure districts were Simanjaro, Same, Mwanza, Rombo, Longido, Ngorongoro and Monduli districts of Northern Tanzania. In addition, these 7 districts were described as accounting for only 9% of the total Northern Tanzanian region, but were the most geographically remote and most affected by drought spells.

According to WFP's CFSVA report of 2012, various parts of Tanzania have received both cash and kind food donations following a growing percentage of households experiencing food shortages Tanzanian as at 2010 (20.3%). Thus there has been an effort to tackle all aspects of the economy that may account for household food security. Responses to drought affected regions include the donation of 40,000 cattle, goats and sheep by President Jakaya Kikwete to 6,127 families in Monduli and Ngorongoro districts of Arusha region. These families had had their herds wiped out following harsh drought spells from 2009 through 2011. According to the Tanzania Daily News of August (2012), cattle replenishing initiative programs undertaken by the state and other private stake holders as an intervention in drought affected areas benefitted mostly the Northern Zone made up of pastoralists.

However, in addition to drought, the WFP CFSVA of 2012 identifies other factors that account for the mild or severe food insecurity of 15.7 million of the Tanzanian population. At the time of the Tanzania CFSVA (2010-2011) causes of food shortages included crop pest (3%), small land size (8%), lack of farm input (11%), expensive food (12.2%), no money(14%) (See Figure 1.2 below).

**Figure 1.2: Main causes of food shortages in Tanzania.**



Source: Adapted from WFP- CFSVA (2012)

Drought is represented by the largest portion of Figure 1.2 and accounted for the highest percentage of food shortages (38%) in 2010 – 2011. This finding conforms to the recognition by ActionAid International that, even though the drought is said to have primarily occurred on Somalia, Djibouti, Ethiopia and Kenya, parts of Tanzania which fall within the country’s bimodal zone were also greatly affected by drought. Drought in Tanzania has left well over 1 million people food insecure and it is expected that a total of 56 administrative districts in 16 regions will be experiencing acute drought-induced food shortages by the end of 2016. According to Canada’s IDRC (2010) the effects of the worst drought which hit East Africa 2009 will still be felt in the region for a long time.

In Northern Tanzania, the incidence of drought on food security has the tendency to further increase the risk of household food insecurity, especially given the fact that up to 70% of its population are involved in either crop farming or are pastoralists with few alternative means of livelihood (IFRC, 2011; Mhando, 2011). The resulting poor harvests in Northern Tanzanian regions following the drought caused a rise in food prices to record-levels, leaving agriculturist, pastoralists and petty hawkers without the ability to purchase food during the critical period (Act Alliance, 2012). Not only did low rainfall between 2009 and 2011

escalate hunger and poor harvest, but it also caused social problems between pastoralist and peasant communities, as they scrambled for grazing land and water resources.

This study thus, examines food security in Northern Tanzania using data collected between 2012 and 2013, that is, the period after the drought. It focuses on establishing the state of food security in the years that followed the periods of extreme dryness, especially amongst households that had been affected by drought in the preceding 3 years. Additionally, it is important to discuss household food security and resilience to drought shock amongst male and female households, to better understand if the gender of household heads influences their vulnerability to food insecurity as a result of drought.

### **1.2.2 Rainfall distribution and rainfall pattern in Tanzania (2012-2013).**

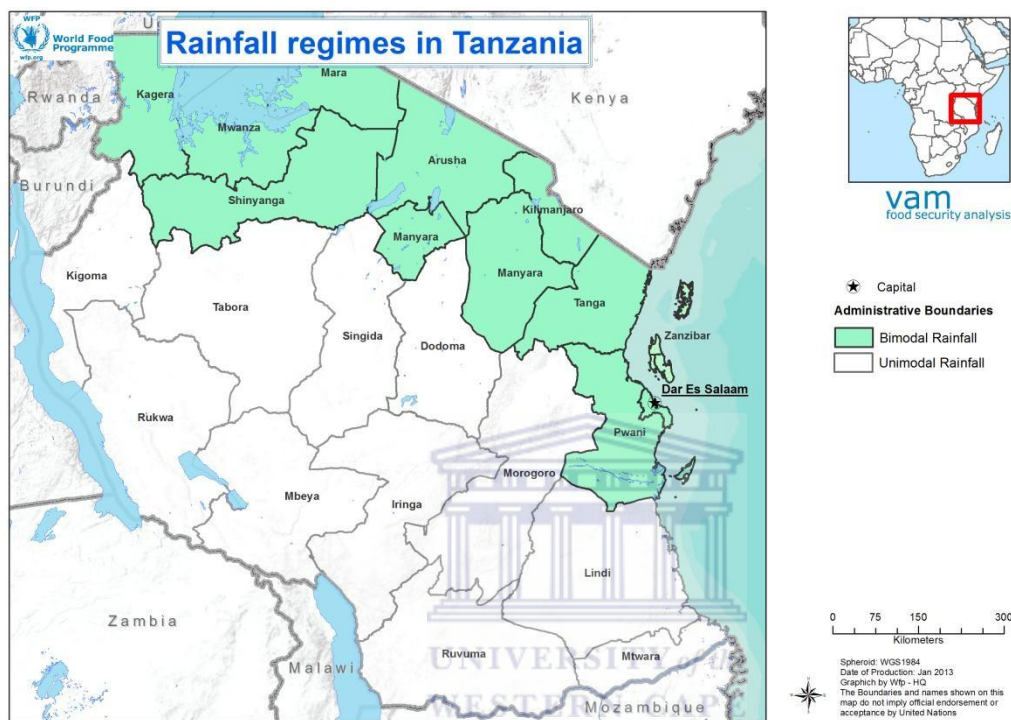
Meteorologically, drought is the prolonged deficiency of rainfall; that is if any region receives less than 75% of its normal rainfall during a particular cultivation season (Amaradasa, 1997). The scale and intensity of food scarcity have been exacerbated in a number of developing countries by natural and human-made disasters. Drought is one of the main causes of food insecurity and was the primary cause of African food insecurity in the early 1970's and the mid 1980's (John, 1995). With this background, it is important to include in this study, the rainfall regime in Tanzania, and the distribution of rainfall during the period under study (2012- 2013).

Tanzania's rainfall regime divides the country into 2 zones: unimodal zone (Central and Western Tanzania) which experiences a long rainy season from December to April (see areas marked white in Figure 1.3 below). Planting in this zone is done in November and harvesting in June and July. There is the bimodal zone (the North, East, Northern Coast and North West of Tanzania), represented on the map as the areas marked in green. This zone experiences short period of rain from October to December and harvesting occurs in July and August (WFP, 2012). According to Tanzania's 2004/2005 Rapid Vulnerability Assessment Report on

Drought Affected Areas in Tanzania, the Southern highlands of Tanzania, as well as some areas of the Central region are noted for experiencing normal and above normal rainfall, except sometimes from January to March where periods of dryness are being experienced (Tanzania Ministry of Agriculture and Food Security, 2005).

According to the Tanzanian Meteorological Agency weather review of the 2012/2013 cropping season, between May 2012 and May 2013, decreasing rainfall was observed in almost the whole of the country.

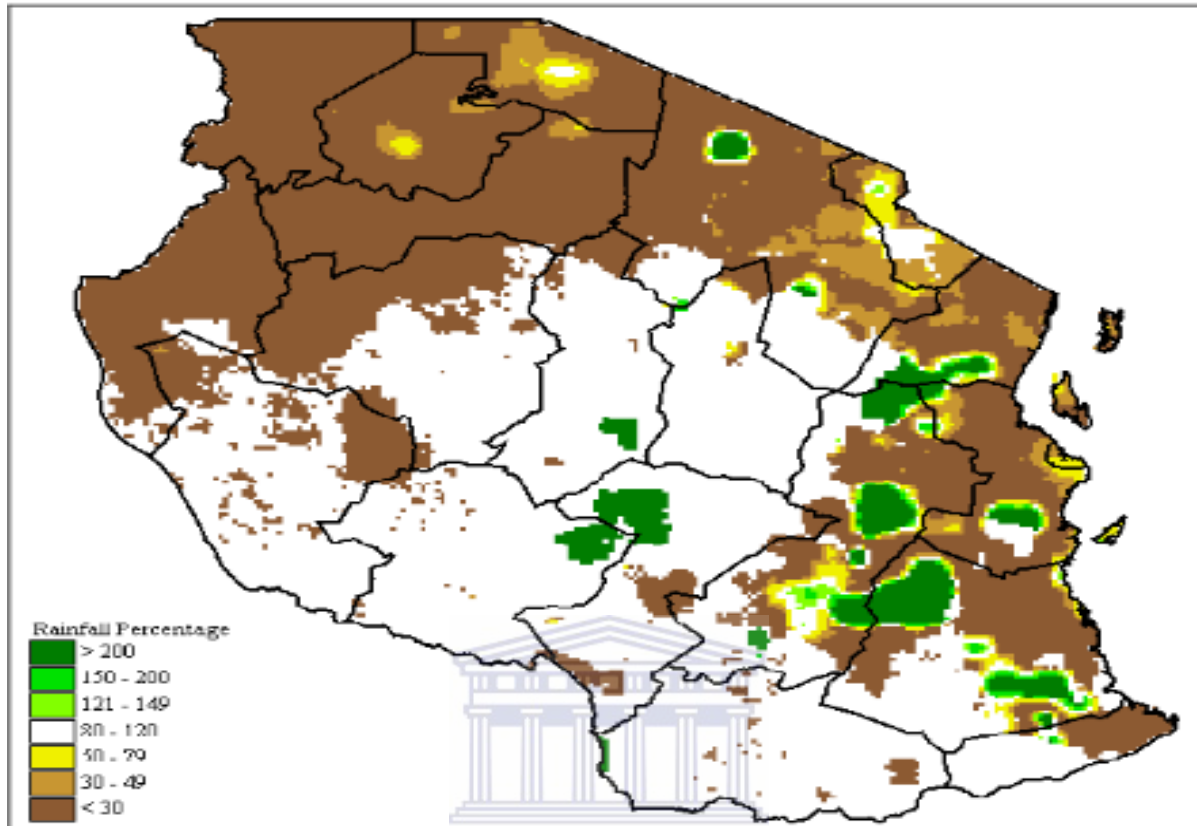
**Figure 1.3: Rainfall Regimes.**



Source: WFP CFSVA Report (2012)

The South Western Highlands however, was the only zone that recorded a high rainfall of 130mm. The second highest amount of rainfall was recorded in Dar es Salam (27.7mm) and Northern Regions like Tanga and Moshi came next with 14.2mm and 14.1mm respectively. Their review also noted that the other areas of the country received rainfall below 10mm. Figure 1.4 shows the distribution of rainfall in the country in 2012/2013, during the cropping season.

**Figure 1.4: May 2012/May 2013 Rainfall Distribution (mm).**



**Source:** Tanzanian Meteorological Agency, 2013

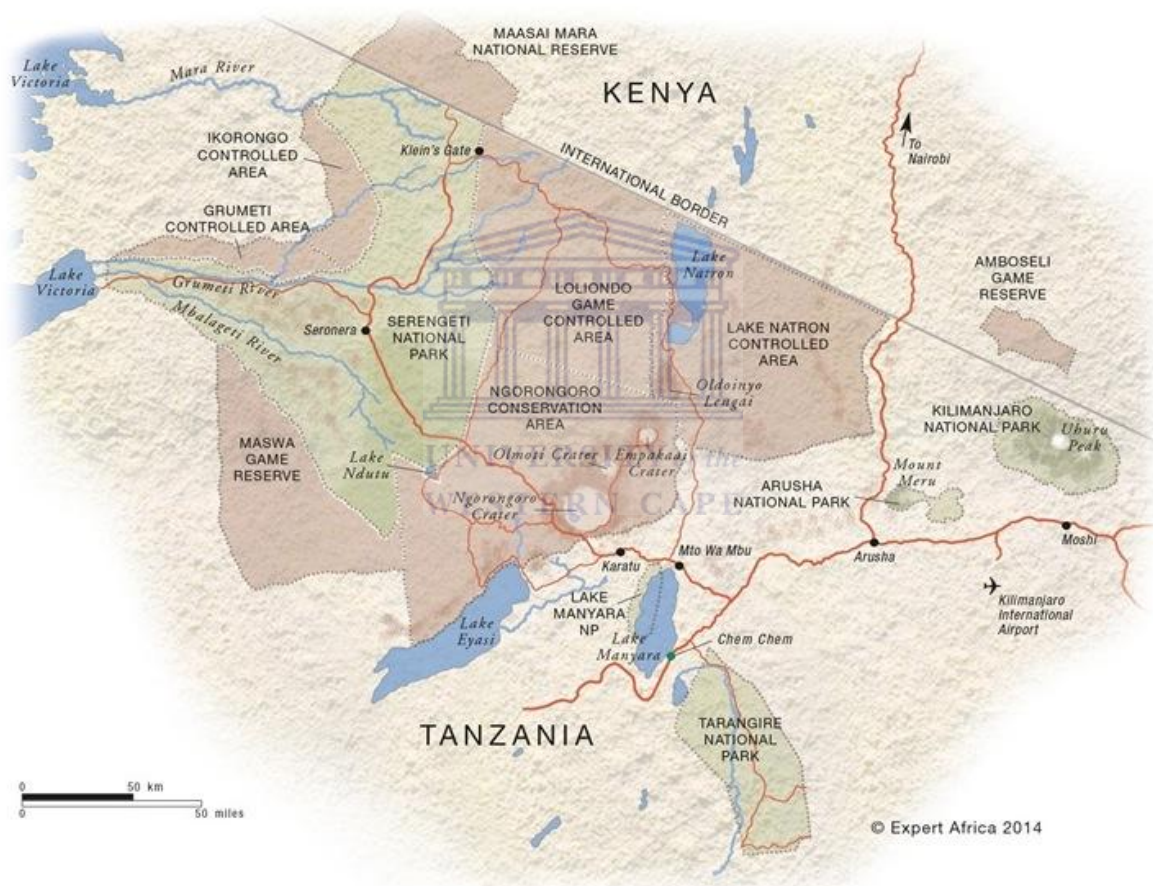
As observed, some various areas on Figure 1.4 above are denoted by with dark brown and yellowish brown. These colours represent areas of low rainfall mostly found in the Northern (e.g Arusha, Tanga, Manyara, Kilimanjaro), of the country and in parts of the central and south zones of the country. Between 2012 and 2013, much of the bimodal areas as recalled from above comprising of the Northern and Eastern zones, received below normal rains (less than 50%). The unimodal areas, Central and Western Tanzania, represented mostly in white and light green were seasonally dry as normal condition during this period. They received a rainfall of between 80% - 120%.

With this knowledge, it is evident that during the period under study, different parts of Tanzania still experienced a decline in their rainfall with Northern Tanzania below 50%. Thus, even though there are indications that the periods of severe dry spell ended in 2011, the information above still qualifies Northern Tanzania as having been affected by drought given the definition of drought above.

### 1.3 Introducing the case study: Northern Tanzania.

Tanzania is made up of 5 geographical zones, one of which is the Northern Zone which is divided into 4 regions namely Arusha, Kilimanjaro, Manyara and Tanga regions (Melamari, 1995). Northern Tanzania has an estimated population of 6,804,739 people and covers a surface area of about 1,22,015Km<sup>2</sup> further divided in 30 districts found (TNBS, 2012).

**Figure 1.5: Map of Northern Tanzania.**



Source: Expert Africa (2014)

The Northern Tanzanian zone is famous for its game reserves and national parks as can be seen on Figure 1.5. It is home to some of the well-known tourist attractions in East Africa such as Mount Kilimanjaro, the Ngorongoro conservation area and the Serengeti National Park. These areas account for the highest number of tourist that visits East Africa every year (Expert Africa, 2014). According to the 2014 tourism report, about 12 million tourists visited

these areas in Northern Tanzania accounting for 56 billion TSHS (2,613,3520USD) of earnings for that year (NBS, 2015).

It is important to note that 60% of the population of this zone is involved in agriculture, of which 40% are pastoral farmers. The other percentage of the population is involved in non-agricultural activities such as tourism (Melita, 2014). Northern Tanzania, however, falls under the country's bimodal zone which is characterised by longer periods of short rains and more periods of dryness (WFP, 2012). Given that some regions in this area like Arusha and Manyara share the same ecological zone with drought prone areas of East Africa, this Tanzanian zone suffers from drought for the most part of the year, thus causing food prices to rise (Act Alliance, 2012). Consequently, Northern Tanzania accounts for 40% of the total food insecure population of the country (Mhando, 2011) as a result of severe drought (IFRC, 2011).

Given the importance of this zone to the Tanzanian economy as a whole and the importance of agriculture to the inhabitants of this zone, it is important to study and understand the specific effects of drought on food security. Thus this study will focus on analysing drought and food security in the area, in order to identify areas for policy interventions to promote adequate food production and security in the future.

## **1.4 Research Problem and aims of the study**

### **1.4.1 Problem Statement**

Empirical studies, to understand the effect of drought on food security had begun surfacing since the mid-1990s e.g. John (1995), Amaradasa (1997), Wickremaarachchi (2000) and Devereux, (2007). These studies have always ended up with the conclusion that drought necessarily causes food insecurity. In recent years there have been disputes that resilient households and households involved in multiple livelihood activities apart from agriculture are able to maintain a food secure level in the midst of drought. The validity of this latter claim has not been extensively proven.

Moreover, in addition to the fact that very few studies evaluate the impact of drought at household level, studies that exist on drought and food security, omit the examination of



coping strategies employed by households affected by drought. Recent studies carried out show that, coping strategies have the ability to reduce household capability of building resilience drought and other weather shocks. The WFP (2012) came up with a method for analysing the effectiveness of household coping strategies based on an overall score called coping strategy index (CSI). It is in view of this that this study was carried out to respond to these gaps enumerated above and contribute to broadening the frontier of research on livelihood diversification and household food security.

### **1.4.2 Importance of the study**

In addition to contributing to broadening of the frontier of research on drought and food security, this research will be important in:

- Understanding how drought or periods of dry spells impact food security especially amongst male and female headed households.
- Information produced through this study will enable the Tanzanian government, households and other decision makers to know where they are in terms of the state of food security in the Region.
- It will also assist in decisions taken with regards to improving food security in Northern Tanzania.

### **1.4.3 Research Questions**

Based on the gaps identified above and using the conceptual framework as a guide, the research will attempt to answer the following questions:

1. What other shocks in addition to drought are specific to Northern Tanzanian household and to what extent does drought affect households across the different regions?
2. Does the adoption of coping strategies by household influence their resilience to shocks and stresses?
3. How available and accessible is food to Northern Tanzanian households and how is this observable between male and female households?

4. What is the extent of food insecurity in the region and what coping strategies are adopted?

### **1.5 Objectives of the study**

The objective of this research was to draw on the Tanzania National Panel Survey (2012/2013) to assess the extent to which drought impacts on household food security in Northern Tanzania. Specifically the study aims at:

- Identifying some of the shocks and stresses in Northern Tanzania that contribute to food insecurity
- Examining secondary data collected after the 2 years of severe drought spell (2009-2011) in Northern Tanzania to establish if there has been any improvement to household food security following years of the drought
- Establish the relationship adoption of coping strategies on the household resilience against stresses and shocks.
- Establish the impact of drought on household food security in Northern Tanzania
- Present findings and make recommendations based on findings, of what can be done, at national, zonal, regional and household level to ensure food security for households in drought prone regions and Northern Tanzania in particular.

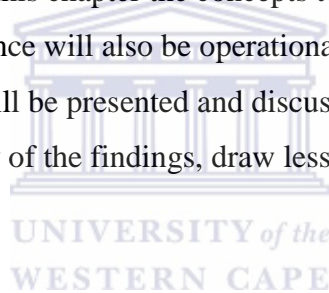
### **1.6 Structure of Thesis**

This thesis is structured into 5 main chapters; each chapter serves as a prelude to subsequent ones. Chapter one gives a general background to the study by introducing the state of food security in the world and the climate changes occurring in various regions especially SSA. This section also uses maps to look at food security and drought in Tanzania as a whole, and gives an idea of the rainfall pattern and distribution of rainfall in Tanzania. In these discussions on the state of food security in Tanzania, reference is made to Northern Tanzania

and an attempt is made to establish the meaning of a drought. The chapter ends with a brief socio-economic and geographical background of the case study-Northern Tanzania, and states the research problem, questions, objectives and the importance of the research.

Chapter two presents a review of literature relevant to the study and subsequently contours the theoretical and conceptual underpinnings for the study. This is followed by an attempt to provide an understanding of global food security, by capturing historical and current perspectives, as well as current trends and causes. Further, an understanding of the concept of drought is also provided as a phenomenon on its own, then as a cause of food insecurity. From this review, the disaster management cycle which formed the basis for the study is introduced parallel to the conceptual framework used for the study.

Chapter three presents the research design and methodology, describing the data set used for the study and the sample size. In this chapter the concepts to be measured in the study, drought, food security and resilience will also be operationalized. In Chapter four, the findings from the data analysis will be presented and discussions of the findings made. Chapter 5 will present a summary of the findings, draw lessons and make conclusions.



## CHAPTER TWO

### DROUGHT AND THE GLOBAL FOOD SECURITY AGENDA

#### 2 Introduction

This chapter gives a detailed presentation of global food security and examines the contribution of drought to food insecurity, both theoretically and practically. Firstly, the underlying concepts of the study – drought and food security are defined. This is followed by a discussion on the conceptual origin of food security bringing to the fore varying paradigm shifts, pre and post 1970. As part of examination on present day perspective of food security, current global food (in) security trends highlighted and further narrowed to capture trends in SSA and some experiences are incorporated from Asia and Latin America.

Furthermore, contestations surrounding the notion of food sovereignty are highlighted. This chapter also outlines the concept of resilience and spells out how resilient households respond to weather shocks and how households can build resilience over time.

Drawing on the Disaster Management Approach by Himayatullah and Asmatullah Khan and Laura Vasilescu, the last part of this chapter presents the theoretical framework of the study. This is followed by a conceptual framework developed based on the above approach. This forms the basis for investigating the impact of drought on household food security in Northern Tanzania. The study hypotheses are thus presented from this.

#### 2.1 Definition of Key Concepts

##### 2.1.1 Household Food Security

There have been varying definitions of food security put forward by different institutions and authors across different geographical contexts. According to IFPRI about 200 definitions and 450 different indicators for explaining the food security phenomenon have already been documented. This is not surprising for a number of reasons, one of which includes the fact that food security is perceived from different levels- individual, household, community, regional, national and global. In addition, according to Maxell & Smith 1992, the varying definitions and indicators for the concept is attributed its complex and eclectic nature.

An early definition of food security, regarded as the baseline definition for food security is the 1975 definition by the United Nations, which defined food security as the “availability at all times of adequate world supplies of basic food-stuffs ... to sustain a steady expansion of food consumption ... and to offset fluctuations in production and prices” (Maxwell 1996:156). The Food and Agriculture Organization in 1996, realizing that this definition reflected more of food availability than access, tabled a more comprehensive definition. They advanced that, food security “exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (Ivers & Cullen, 2011:1740S).

The Community for World Food Security (2012) in an attempt to put forth the apparent importance of health and nutrition concerns developed a definition which claimed that “food and nutrition security exists when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life” (Page 2013:4-5)

There have also been other divergent but principally similar definitions offered by other authors. For example, according to Maxwell & Smith (1992: 8) “food security is secure access at all times to sufficient food”. Pinstrup-Andersen (2009: 8) relates these definitions to the household level by postulating that “a household is considered food secure if it has the ability to acquire the food needed by its members to be food secure.” In other words, if a household is unable to access food in their right proportion and quality, the household is food insecure. From the above definitions, this study adopts the definition of WFP as found in the Tanzanian 2012 CFSVA report, which principally, hinges on the FAO’s 1996 definition. This definition combines “diet diversity, frequency of consumption and the relative nutritional importance of different food groups” to capture food insecure households – ‘either severely or moderately’ (WFP, 2012: 2).

### **2.1.2 Drought**

Definitions of drought can be traced right back to the late 1940s when Klages (1947) described it as a deficiency in moisture that interferes with the normal life process of plants. The interference that takes place is such that the balance of nutrition is shifted far enough to

any unfavourable direction to result in a material reduction of yields. Drought was also referred in the 1980s to a period where, due to lack of rainfall, crops fail to mature and established human activities cannot be supported by the level of precipitation (Meriod, 1989). Similarly, Warren and Agnew (1988) and Abu Sin (1991) saw drought as a deficiency of 10% - 20% or more below the normal rainfall. The last definition has been commonly used as basis for establishing the occurrence of a drought and subsequently analysing its effect on food security. According to the ISDR (2009) of the United Nations, however, defining drought is difficult and different definitions are required to describe each situation. Monroe (1999) similarly argues that it is important to understand the local perception of a drought is in any society because, culturally, the existence of a drought depends on local perception. For example, after experiencing a run of ten years with above average rainfall, a society may become used to the wetter conditions and perceive a year of average rainfall as a drought, whereas a society which experiences rainfall every 5 years may not regard this situation as drought (Ramamasy & Bass 2007:9). As Passioura (2006) also notes, the concept of drought in today's technological and scientific world, in addition to its meaning of there being little rainfall or water, has gained many other meanings. Depending on their scales of interest at the time, different practitioners such as farm managers, agronomist, plant psychologists, perceive the occurrence of drought in different ways (Araus et al., 2007).

In exploring the potential impact of drought on a society Miller et al, (2006) identify some connotations associated with drought which include: severe financial hardship among farmers in rich countries, malnutrition and famine among farmers in poor countries.

FAO (2002) classified drought into 2 main types-: atmospheric drought and agricultural drought. Atmospheric drought was said to be characterized by low relative humidity, lower precipitation, high temperature and strong winds. On the other hand 'agricultural drought' is characterized by deficiency in rainfall with respect to crop production. Khalafallah (2002) further subdivided these into "permanent drought" which described a situation where precipitation is never sufficient to meet the needs expressed by potential evaporation. The second subdivision – "contingent drought" was referred to as a situation where there are variations in precipitation from year to year. 'Seasonal drought' described the occurrence of inadequate precipitation in one season only and Invisible drought referred to inadequate precipitation to satisfy crop needs from month to month.

### 2.1.3 Resilience to shocks

According to Adger (2002) resilience is commonly referred to as the ability of communities, groups or households to cope with external stresses that result from environmental, social or political changes. A household that is drought-resilient will also be hunger-resilient, as the same social and physical determinants are associated both with food security and drought resilience (Khalafallah, 2002). Similarly, Turnbull et al (2013) refer to a resilient community as one that has the capacity to withstand any disruption to the community and restore itself to its normal life without negatively affecting the future quality of life of community members. According to the FAO (1998), drought and other natural disasters, have the capacity to render households food insecure, but the availability, access and asset base can ensure food security for a household or community in the midst of any shock. Government and private sector empowerment of local farmers in a community through subsidies and other assistance is likely to lead to greater farm produce and contribute to building community resilience against food security shocks (Twigg, 2009). In addition the ability of households to access affordable and quality health care and educational facilities increases their resilience to shocks and stresses.

According to Ghimire (2014), food security is an important characteristic of a resilient community/household. A resilient household is a food secure household. A drought resilient society translates to a society that is able to absorb and recover from the negative effects of drought without compromising long term prospects. As resilience declines, a progressively smaller external event can cause catastrophe. A household with low resilience may maintain its functions and generate resources and services thereby seeming to be in good shape but when subject to disturbances and stochastic events, it will exceed a critical threshold and change to a less desirable state. The application of the concept of resilience to household food security therefore seems promising.

Drawing from writings on food security and resilience, I deduce resilience in the context of food security to mean the ability that a household has to maintain a certain level of food security by withstanding any shocks and stresses. Looking at resilience this way, takes into consideration both ex-post actions (actions that enable a household to cope following a crisis) and ex-ante actions (actions that reduce the risk of a household becoming food insecure).

## **2.2 Framing the food security concept: Past and present day perspectives of the concept**

Even though the construct of 'household food security' dates back to the early 1980s, concerns about food security can be traced to the 1930s, when food security started being a concern at world level (Smith et al 1992). The meaning of food security, in the last 75 years has been broadened and extended to include various aspects.

### **2.2.1 Evolution of the Food Security concept**

The concept of food security can be first traced back to the writings of Sir John Boyed Orr in his writings to the health division of the League of Nations in the early 1930s in which he stressed the importance of food for good health (Simon, 2012). These writings prompted the first ever account of the extent of hunger and malnutrition in the world and have also been recognized as the first introduction of the world food problem into international political arena (Shaw, 2007:6). In addition to this, historical traces of the food security concept are evident with the establishment of the United Nations FAO following growing concerns about the food problem during the Second World War. However, food security at this time (1930-1945) was perceived as a concept that implied secure, adequate and suitable supply of food for everyone as governments were only concerned about increasing food supply during the period of war (Napoli, 2011). Jooserand (2007) in his writings on the historical view of food security, notes that, North American and European governments used information generated from early studies on hunger carried out by FAO and the League of Nations mainly to increase the food supply of their countries.

Other peculiar characteristics of the concept in earlier year (1946-1970) include the fact that it was treated at a global and national level rather than individual and household level. Emphasis was placed on the quantity of food available for a country rather than the quantity and quality of food consumed by individual households (Mensah, 2014). This view is evident in the actions of organisations like the FAO that carried out a global food survey in 1946 to find out if there was enough food and calories available for everyone in the world (Shaw, 2007). However, even though not over emphasized, the period from 1946 to 1970 saw the introduction of studies on additional aspects of food security like the energy level of food or macronutrients (calories) (Simon, 2012).



The year 1952 saw the introduction of certain terms frequently used in modern food security like food aid. Food aid was conceived after a study by FAO on the effect of surplus agriculture produce. It was established then that surplus agricultural produce can be sent to countries experiencing food shortages as food aid. Some of the principles governing food aid as were established during this period are still being used today in the food security discourse while others have been dropped or revised (Mensah, 2014).

### **2.2.2 Food Crises and Drought in Africa**

Between 1970 and 1990 there were some major additions to the food security discourse but food security was still regarded as the supply of food. Thus efforts to solve any food crisis still concentrated on increasing food supply. Availability of food was still paramount and food security was still evaluated at a macro level.

Unlike the earlier periods noted above, where food insecurity was brought about by war, by 1972, food crisis became associated with adverse and abrupt climatic conditions in several regions of the world (FAO, 2003). Between 1972 and 1991, the former USSR and many developing countries experienced one of the worst droughts, causing them to become food importers. A series of other actions were taken by different countries to increase the food available in their countries. The period between 1970 and 1990 in the history of the food security discourse is peculiar for the formal introduction of the term “Food Security” which was first used at the first UN World Food Summit in Rome in 1974 (FAO, 2003). It was at this conference that food security was recognised as a common concern for all nations. However, the concept during this conference was still defined with emphasis on supply as indicated above (see section 2.2.1.)

Ilaria, (2009) identifies the years between 1985 and 1992 as periods of drought and hence food insecurity in Africa due to unfavourable climatic conditions. Central African countries like Chad experienced a drying up of their main water supplies. Lake Chad for example, a shallow lake which was used for watering of crops dried up completely in the 1980s and early 1990s. It is not surprising then that, this period saw some of the first interventions to solve the problem of drought and its effect on food interventions are still being used today in drought and food insecurity situations.

### ***2.2.2.1 Discussion on Sen's Entitlement Approach and the introduction of the access dimension in the food security debate***

More important to the period between 1970 and 1990 of the food security discourse is the new debates that emerged following research carried out by the Amartya Sen in 1981. Following his research, Sen recommended an "Entitlement approach" suggesting that every person has an "entitlement set" which is a range of goods and services that a person can acquire by converting his assets and resources into what they need (Devereux, 2001:246). In analysing the impact of droughts and floods on food security, Devereux (2007) used Sen's entitlement approach in Malawi to show that, weather shocks like drought can trigger a sequence of "entitlement failures" which in turn leads to food crisis if there is no public action to mitigate these impacts. Sen (1981) argued that the food crisis and famine that people had been facing in the years before 1981 was not as a result of lack of food, but rather due to people's inability to access food as a result of disruption of their entitlement set (Devereux, 2001; Young et al 2001; Yaro, 2004; Mensah, 2014). For Sen (1981), food crisis and famine only occur after the occurrence of a weather shock, if nothing is done to ensure that people still have the means (income and transport) to access food from other places.

Thus, Sen's entitlements approach amongst other things, introduced the dimension of **access** in the food security debate. He also introduces the idea of "individual" food security which stresses that if an individual's entitlement set is limited such that they do not have access to adequate food, they are likely to face food insecurity. While the above discussion highlighted the measurement of food security at the macro level, Sen introduces the 'demand' aspect of food security and looks at it at a micro level, involving individuals. The introduction of the access and individual dimensions strengthens the definition of food security. Availability of food does not guarantee everyone's access to food. Other factors such as food prices and distance to food sources influence the availability of food to everyone. Secondly, looking at food security at a macro level may be misleading, as individuals have different dietary needs that influences their ability to be food secure. Food may be available in a country's food supply, but this does not necessarily mean the attainment of food security because individuals in that same society may not have access to the supplies due to their limited entitlements (Devereux, 2001). However, the methodology Sen put forward is still far from being fully utilized. Nonetheless, in 1983, inspired by Sen's work, the FAO in a food security conference adopted a resolution on World Food Security which stated that "the ultimate objective of

world food security should be to ensure that all people at all times have both physical and economic access to the basic food they need” (FAO, 1983 cited in Simon 2012:18).

Despite the insight Sen’s approach provided to the food debate, his approach has been subjected to critical scrutiny. In addition, the access dimension was only formally introduced at the 1996 World Food Summit in Rome and was put into practice by food security practitioners only after the 2005 Niger crisis and the 2008 world food prices crisis. According to Shaw (2007), the main reason why it took a long time for Sen’s approach to be formally used was because food security was a concern for the international community but there was no perceived need to utilize new tools and change the approach that was being used at the time.

#### ***2.2.2.2 Criticism of Sen’s Entitlement Approach.***

According to Devereux (2001), Sen’s approach fails to recognize that individuals are members of households and communities. His approach failed to incorporate the possibility of food shortages being directly caused by economic shocks or natural disasters such as droughts, floods and not only as a result of entitlement failures (Mensah, 2014). This criticism brings us to another perspective on drought and food security which posits that the incidence of drought increases household’s vulnerability to food insecurity (UNISDR, 2007). The development of the Drought-Risk Reduction approach, like Sen’s entitlement approach, so far has proven to be most successful in emergencies and in famine situations like in Tanzania (Simon, 2012). Sen’s perspectives, despite their limitations, have contributed to a great deal to understanding the impact of drought on food security.

#### **2.2.3 The Golden Years of Food Security: (1990 – 2005)**

The period from 1990 to 2005 were regarded as the golden years of food security partly due to 15 high level international conferences being held and appropriate recommendations made. Some of these conferences included the FAO and WHO’s 1992 International Conference on nutrition and the 1996 World Food Summit Conference organised by the FAO in Rome (Shaw, 2007). Ultimately, however, this period was referred to as the golden years of food security because the approach to food security was increasingly being characterised by its multidisciplinary dimension (Simon, 2012).

The 1996 World Food Summit is said to be the “major milestone in the history of food security” (Shaw 2007: 347). This conference is recognised for the new definition of food security which recognised the multidisciplinary approach of food security as well as its interrelated causes (Smith et al., 1993). Food security was defined during the conference as: “Food security exists when all people, at all times, have physical, [social] and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life” (FAO, 1996).

This definition, which had the word ‘social’ added to it in 2002, has since formed the basis from which other definitions of food security are derived. Gentilini (2002) points out that even though he identified about two hundred and five definitions of food security, the most widely recognised and commonly accepted definition during this period remained the FAO’s 1996 definition of food security.

This period not only saw a firm use of Sen (1981)’s access dimension to food security, but also an emphasis of the need to treat food security not at a global level but a country level. This emphasis was expressed through FAO approving an Action Plan requiring the government of each individual nation to adopt strategies that are consistent with their individual capacities and resources. However, emphasis was also placed on regional and international cooperation between countries to ensure the organisation of collective solutions to global issues of food security (Shaw, 2007; Simon 2012). This plan of action included a resolution to reduce the global number of malnourished people in the world by half by 2015 (FAO, 2013).

This period is also important because in 2000 the UN Millennium summit approved 8 Millennium Development Goals which grouped food security and hunger together (WFP, 2006). Despite this and other efforts to ensure food security, the “World Food Summit + 5” held in Rome in 2002, presented disturbing statistics regarding the number of undernourished people. Worldwide, estimates of undernourished people stood at 840 million between 1998 and 2000, of which 799 million were found in developing countries (FAO, 2002).

The WFP (2009) Hunger series entitled “Hunger and Markets” highlights an issue relating to “economic access dimension of food security” first identified during the golden years of food security (Simon, 2012:21). The 2005 food crisis in Niger, for example, was mainly due to an

increase in the prices of basic cereal commodities. The crisis was not due to the inadequate availability of food; rather food was available as the harvest had been decent. The principle reason was the economic decisions that had been taken in neighbouring Nigeria which led to an increase in the prices of basic cereal in Niger. This resulted in the inability of most of the Nigeriens to afford food. This portrays the idea conferred by Sen (1981) in his entitlement approach and the access dimension present in the 1996 FAO definition of food security. Most importantly it brought in another concern into the food security discourse about the effect of decisions in one country on the food security of the other. This concern since then became an important aspect in food security considerations.

## **2.3 Present Day Perspectives on Food Security**

### **2.3.1 Introduction**

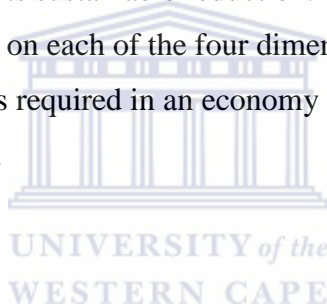
As noted by Maxwell & Smith (1992) food security, remains today a complex concept, making it one of the highly contestable strands of development both in theory and practice. In recent years, the concept has been studied alongside equally important development themes such as climate change and sustainability (see Sanchez, 2005; Lawrence, Lyons & Wallington, 2010; Foresight, 2011), urbanization (see Maxwell et al., 2000; Satterthwaite, McGranahan & Tacoli, 2010) and Livelihoods (see Webb & Rogers, 2003; Hanazaki, et al., 2012). In addition other fields such as gender are being incorporated into the food security discuss.

FAO & IFAD (2014), highlight four dimensions of food security: availability, access, stability and affordability. These dimensions were easily extracted from the 1996 WFS definition of food security. Unlike the 1974 definition of food security which overlooked the demand side of food security, food security today is defined in many different ways which incorporate demand. Smith et al., (2009), for example, look at food security as an arrangement whereby people are assured of an adequate minimum supply of food in both periods of normal and poor harvest. This definition brings out the stability and availability dimensions of food security. For Pinstруп-Andersen (2009), a household is considered food secure if it has the ability to acquire the food needed by all its members to be food secure. This definition covers the access and utilisation dimensions of food security. Thus, modern food security does not only focus on access, utilisation, stability and availability, but it also

incorporates aspects of household and individual food security. From Pinstrup-Andersen's (2009) definition, food insecurity exists when an individual or a household is unable to access food in their right proportion.

### **2.3.2 The four Dimensions of Food Security and their measurements.**

To obtain a more nuanced picture of the state of food security in a population affected by drought like those in Northern Tanzania, it is necessary to comprehensively analyse the four dimensions of food security. Each of these dimensions can be measured by a set of indicators, which can provide detailed information on the food security situation in a country or region based on specific characteristics (FAO, IFAD & WFP, 2014). Research efforts on the state of food security in a country/region that employ these indicators in analysis have been acclaimed for leading to the formulation of informed and targeted policies to tackle food insecurity and to pave the way to its sustainable reduction. Different economies will require different degrees of concentration on each of the four dimensions to ensure food security. The degree to which each dimension is required in an economy will depend on the characteristics of the economy at any given time.



#### **2.3.2.1 Availability**

In the WFS 1996 definition of food security, it refers to the term 'sufficient'. According to WFP (2009), availability is defined as the amount of food that a country or area has through all its forms of food production, which may be domestic production, food stocks, food aid or imports. Thus, the availability of food is not only defined in terms of what a country has, but also what is available in villages and households (Simon, 2012). This is quite a shift from the early perspectives of food security that considered all aspects in terms of what was available in the country.

Despite efforts made during the FAO founding conference in 1943 to stress that hunger and malnutrition are the first causes of poverty, food security has still for a long time been considered as synonymous with the availability of food (Simon, 2012). This conviction of food security and the availability of food, especially amongst rural households in developing countries, normally results in the belief that increasing food production of any kind of food increases food security which is not always the case (Du Toit, 2011). However, in the past

three decades, there has been increased effort by researchers, practitioners and teachers to demonstrate that food security is not simply a question of availability of food (Shaw, 2007; Simon, 2009). Literature reviewed in the early parts of this chapter indicates that agricultural production is growing more quickly than population growth. The amount of food commodities available on earth is sufficient to feed the current world population and more, yet some people do not have access to food (Simon, 2012).

WFP (2012) identifies 2 indicators of food availability. These are food production and whole-sale price.

**Food production** is regarded as an indicator of food availability that gives an estimation of the harvest of staple foods. Staple food production in agricultural-based economies is mainly rain-fed and is often affected by changing weather conditions. In countries that experience more than one rainy season, the impact of low or erratic rainfall on food production could be more severe in the first rainy season and less severe in the second or vice versa. Seasonality is a basic condition for rain-fed agriculture. Thus, in using this indicator to estimate household food availability, it is advised that not only production estimates at a particular time should be reported but that the outlook of the coming harvest and household food stocks should also be reported. It is likely that food availability and in some cases food security, may likely deteriorate after a harvest. In countries with one agricultural season, the most critical period is in the months before the next harvest. Food production estimates can be obtained from ministries of agriculture or through a study carried out in the area of interest.

**Whole-sale prices:** Food availability is also indicated by whole-sale prices of staple foods. When considering wholesale prices as a proxy indicator for availability, it is also important to consider factors that impact availability such as production, imports and food aid. This is because monitoring food prices alone to determine food availability provides very little insights on food security.

In analysing the state of food security in 2013 and 2014, FAO, IFAD & WFP used the quantity, quality and diversity of food to analyse food availability in the world. These indicators of food availability were first introduced in 2013. The measurement of food security was done using FIES, an analytical tool developed by the FAO to fill the gap in global food security monitoring. In 2014, their analysis found that food availability had considerably improved over the past two decades as more food was available than ever

before. The increase reflected in improved adequacy of dietary energy and higher average supplies of protein. Furthermore, these studies established that for economies that are just beginning to develop, that is, economies where food, income and rural employment mainly come from domestic agriculture, availability of food from domestic production is key. It is thus important to increase the agricultural productivity of the economy at this stage as this in turn will improve the access of subsistence food producers to food (FAO, IFAD & WFP, 2015). Thus it is right to conclude based on evidence from chapter one that Tanzania and most other countries of SSA fall in this category due to the dependence of not less than 70% of their rural population on agriculture. In such economies, however, increasing productivity may only favour subsistence food producers. For other vulnerable groups of people and net food buyers, targeted policy interventions may be required to ensure food security such as strengthening safety nets and social protection (FAO, IFAD & WFP, 2014).

### **2.3.2.2 Access**

As economies move away from being dependent on food and agriculture, availability of food is no longer as important as access to food. Access to food becomes increasingly important for achieving food security (FAO, IFAD & WFP, 2014). Specific policy interventions, however, are needed for vulnerable populations in these economies that still have difficulties in accessing food. Sen (1980) first presented the access dimension in his work. Emphases were only adequately placed on access from the 1996 WFS where it was referred to in his work as "...have physical, economic and social access..." (FAO, 1996: 7). The WFP (2009) defines food access as the ability of a household to regularly acquire an adequate amount of food through a combination of purchases, food assistance, barter or borrowing.

Since the Niger food crisis of 2005 and the 2008 world food prices crisis, there has been a tendency to limit the scope of the access dimension to an economical and financial dimension. However, Shaw (2007) and Simon (2012) identify three elements in the access of food, namely, physical, financial and socio-cultural. These authors describe the food security access dimension as one that deals with logistics. It involves aspects like proximity to food, the area where food is produced. The WFP (2012) further point out that in the case of food security, a household is food secure if they are at a location where food is available, that is, if they can access available food. For example, in a situation where food is being produced in a country in one region, but in another region there is limited or no transport facilities between



both regions and lack of information, the latter region is likely to suffer food insecurity. In the ‘State of Food Security’ report, FAO, IFAD & WFP, (2014) supports the 3 elements of the access dimension identified by Shaw (2007) and Simon (2012). The report identifies the physical aspect to be represented by indicators such as railway and road density, the economic access element to be represented by the domestic food price index; and the prevalence of undernourishment.

In its technical guidance sheet (2), the WFP (2012) identifies four indicators of food security – food consumption, coping strategies, terms of trade, and price analysis.

**Food consumption** encompasses dietary diversity which specifies the food consumed by a household over a specific reference period of time and food frequency provides information about the number of days in which a particular food group is consumed over a reference period. The FAO, IFAD & WFP, (2014, 2015), in their analysis on the state of food security, employed the Food Insecurity Experience Scale (FIES), a methodology developed by FAO (2013) for assessing the access dimension at the individual and household levels. The above studies, in using this methodology, used a Food Consumption Score (FCS) devised by WFP (2012). The FCS uses the dietary diversity, food frequency and nutritional importance of food groups consumed as a proxy for food access. Findings on the food consumption indicator and other indicators of food access such as terms of trade and price analysis revealed that Sub-Saharan Africa faces the greatest food security challenges. There has been slow progress in improving access to food, sluggish income growth, high poverty rates and poor infrastructure, which hampers physical and distributional access. According to the Food and Nutrition Technical Assistance (FANTA) of USAID & FHI (2005) and the WFP (2012) food security monitoring guidance sheet, data used to indicate household food consumption should include the types of food consumed, the frequency of consumption of items which are of the same food group and the main source(s) of food.

The WFP(2009) Comprehensive Food Security and Vulnerability Analysis Guidelines describes the food access indicator – coping strategies as the various activities that people resort to in order to obtain food, income or other services when they experience a disruption in their normal means of livelihood. In addition, the guideline identifies coping capacities of household members to be a generally large determinant of household food security. Household coping strategies can be determined by the level of consumption to mitigate

shocks, the ability of the household to diversify its sources of income, physical assets, income, consumption and levels of food production (WFP, 2012). The impact of a coping strategy on food security can be felt either in the long term or in the short term. Illegal actions like prostitution and child labour; and other actions like migration and begging are considered coping strategies as they may tend to lessen the impact of food security in the short term. However, WFP (2009) and Shaw (2007) argue that, these actions, in the long run, weakens **household resilience** as they disrupt household assets and resources. For example, households whose members resort to eating just once a day may suffer from malnutrition in the long run. This will affect their ability to work and engage in other livelihood activities to restore to normal life. Coping strategies employed by households that will have a long run impact on food security include eating less preferred/expensive food, borrowing food, relying on help from friends or/and relatives and reducing the number of meals eaten in a day FAO (2008).

In a study analysing the impact of coping strategies on household food security in Umbumbulu village in KwaZulu Natal, Mjonono et al. (2009), used the coping strategy index (CSI) to analyse coping strategies employed by households and as a proxy indicator for food access. WFP (2012) indicates that the CSI reveals how effective the coping strategies employed by households to manage shortfalls in food consumption are. Their study used a sample size of 200 and the CSI was acquired by obtaining the frequency of the coping strategies employed. To obtain the required results for the study, the determinants of household coping capacities listed earlier in this section were correlated with the CSI. The results obtained indicated that households in Umbumbulu employed short-term consumption coping strategies to mitigate the incidence of food shortages. However, contrary to the opinion of Shaw (2007) and WFP (2012) that short term coping strategies will affect household resilience, the coping strategies employed by households in the Umbumbulu community indicated resilience to shocks in the long term. Most of the coping strategies employed by households were effective in mitigating the food insecurity situation. Some of the coping strategies employed by households in this study were also described as reversible. By this the authors were referring to the fact that they were not detrimental to livelihoods and the future food security situation of the households. Some of the coping strategies, like reducing the number of meals to 1 per day were irreversible meaning that they were detrimental to the livelihoods and future food security situation of the households.

Similarly, in another study carried out by Senefeld & Polsky (2007), secondary data was used to understand coping strategies employed by chronically ill (CI) households in rural Zimbabwe to ensure food security. The CSI measures frequency and severity of a household's coping strategies for dealing with shortfalls in food supply. Data are weighted according to frequency and perceived severity of behaviour determined by community members in focus groups. The study involved a sample of 1625 households. Based on writings of authors like Maxwell et al. (1999) it used CSI developed by CARE International to provide a cumulative measure of the degree of coping and, thus, a measure of food insecurity. It employed a two stage random sampling method. Unlike the study by Mjonono et al. (2007) which found coping strategies to be effective for solving food security within their study population, this study showed otherwise. The results obtained indicated that, coping strategies employed by chronically ill households did not solve food security. The chronically ill households were actually food insecure because they used coping strategies that involved not taking in the right quantity and quality of food as required by their health conditions. Similar studies carried out in six countries in the Greater Horn of Africa have proven that the CSI is an accurate indicator of household food security (Christiansen & Boisvert, 2013).

It is worthy of note that, access to food has improved significantly in Eastern and South-Eastern Asian countries that have experienced rapid overall economic progress. Access has also improved in South Asian and Latin American countries with adequate safety nets and other forms of social protection. Food access, however, is still a challenge in SSA, where income growth has been sluggish, poverty rates are high, and rural infrastructure remains limited and often deteriorated.

### ***2.3.2.3 Measurement of Household Food Access and Availability using household food consumption level as indicator***

In addition to the indicators of food availability and food access outlined by WFP (2012) above, a single indicator referred to as the household Food Consumption Level (FCL). It is described as a proxy indicator for measuring both food availability and food access. A household's FCL is determined by its Food Consumption Score (FCS). The FCS combines dietary diversification, frequency of consumption (the number of days each food group is consumed) and the relative nutritional importance of different food groups. The composite

scores obtained for each household are used to classify the household either as having a borderline food consumption (moderate access and availability to food), poor food consumption (inadequate access and availability to food) or acceptable food consumption level (adequate access and availability to food).

This method of measurement is adopted by this study due to its simplicity and also given that all the variables required for calculation of the FCS are available in the data set.

#### **2.3.2.4 Utilisation**

The third dimension of food security is the utilisation dimension. According to the 1996 WFS definition of food security, food utilisation is referred to as “safe and nutritious food which meets dietary requirements” (Simon 2012:7). With the pace in which dietary habits are changing, even in traditional societies, it is not sufficient for food to be available and accessible but also it is important for ‘safe and nutritious’ food to be available and accessible to households. This dimension of food security, establishes the link between food security and nutrition. Conte, (2002) present an observation made by WFP of the living population. They observed that there are populations in the world where food is available and people have full access to food, but they still suffer from malnutrition. In addition, a number of elements intervene in food utilization, namely, the selection, conservation and preparation of food commodities and the absorption of nutrients. It is linked to clean water, sanitation and health care. Thus, utilization not only refers to nutrition but also to other elements that are related to the use, the conservation, the processing and the preparation of the food. Proietti, (2009) further explains that this relation discussed above between utilization and other aspects of food show how closely related food security and nutrition are and confirm that it will not be useful trying to talk about food security in isolation of nutrition or vice-versa. An illustration of the linkages that exist between food security and utilization can be illustrated within the SSA region. Evidence indicates that very limited progress has been made in improving people’s access to safe drinking water and providing adequate sanitation facilities. Challenges are also being faced in improving the quality and quantity of diets particularly among the poor. As a result, food utilization in sub-Saharan Africa remains a major concern as there is high prevalence of stunting and underweight, particularly amongst children under 5 years of age (FAO, IFAD & WFP, 2014).

The WFP (2009) identifies three indicators of food utilization: Mid Upper arm circumference (MUAC), Body Mass Index (BMI) and Disease prevalence. According to WFP (2009) MUAC is used to indicate possibility of death as a result of macronutrient malnutrition. MUAC is used mostly in detecting risk of child mortality and risk of unborn babies being born underweight. UNICEF & WHO (2009) describe MUAC as a tape measurement that measures the length of the upper arm from the tip of the shoulder to the tip of the elbow, dividing the measurement in half and then measuring the width of the arm at that level. Data collected using MUAC is usually done at household level, among women and children. The Centre for Disease Control (CDC) defines the BMI as a measure of weight adjusted for height, calculated as weight in kilograms divided by the square of height in meters ( $\text{kg}/\text{m}^2$ ). In their definition of BMI they stress that contrary to popular perception that BMI is an indicator of body fatness, it is actually an indicator of excess body weight rather than excess body fat. Similarly, the WFP (2012) defines BMI as a nutritional status indicator that combines height and weight and can be used to identify both underweight and overweight in individuals. As indicated by the CDC, data on BMI when carrying out a survey can be obtained by taking the weight of the sample population in kilo-grams and dividing by their heights in square metres. Depending on the population under study, results obtained from the division of weight and height will indicate either severe, moderate, mild or normal under-nutrition or the results may indicate overweight or obesity (WFP, 2009). As an indicator of food utilization, very low BMI for adults generally denotes malnutrition and increased risk of mortality. High BMI indicates risk of weight associated diseases like hypertension and diabetes. When the BMI becomes very high, there is high risk of mortality as a result of these chronic diseases. In both situations of very low and very high BMI, there exists food insecurity. As an indicator of food utilization, **disease prevalence** in a population can be looked at as the proportion of people with diseases in a population to the proportion that are healthy. FAO (2014) regards disease prevalence as a food utilization indicator in food security that can be used to provide information about the public health system of an area and help in determining the underlying causes of malnutrition. Data on disease prevalence can be collected both at household level through the household surveys or at community level through health care centre reporting systems (WFP, 2009).

For the purpose of monitoring the state of food security, FAO, IFAD & WFP (2014) divided the utilization dimension into two groups. In their studies to determine the state of food security in the world in 2014 and 2015 they used two sets of indicators. Indicators that

determine the ability to utilize food, that is indicators of access to water and sanitation, and indicators that focus on the outcomes of poor food utilization (e.g. wasting, stunting and underweight in children under five years). In their 2014 studies they also used four additional indicators of food utilization which were mainly indicators of micro nutrients in a population. These are the prevalence of anemia and iodine deficit amongst pregnant women and the prevalence of anemia and lack of Vitamin A among children under five. In analysing the study data, it was discovered that improving food availability, access and stability alone will not guarantee food security. According to their analysis, compromised food utilization resulting from poor hygiene can lead to nutrition failures manifested in high levels of stunting and wasting. Additionally, as established by CDC (2009) above, diets that are inappropriate can lead to obesity and other diet related diseases. Their findings after employing the MUAC in sub Saharan Africa indicated that, there was high prevalence of stunted and underweight children under the age of five. Indicators of access to water and sanitation determined that in SSA very little progress had been made in providing adequate sanitation facilities and improving access to drinking water. As at 2014, it was estimated that 358 million people in SSA lack access to clean water and about 600 million people lack access to proper sanitation facilities (One Foundation, 2014). In South Asia, where food utilization was also a problem as in SSA, low food utilization mainly also resulted from inadequate sanitation facilities and poor hygienic conditions.

#### **2.3.2.5 Food Stability**

According to the WFS (1996) definition of food security, food stability refers to the phrase “at all times” Simon (2012:8). By this definition, it is clear that, food security is supposed to be a situation that does not occur at one particular moment or for one season, but its occurrence needs to be permanent and sustainable. It will therefore mean that a household is food secure if all the other 3 dimensions of food security are stable at all times. Thus, if one’s intake of food is adequate today, they may still be considered food insecure if there is inadequate access to food on a periodic basis, risking a deterioration of nutritional status. Devereux (2006), in his writings on the stability of food in the food security discourse, refers to chronic and transitory food insecurity. Some SSA countries, like Tanzania, face both chronic and transitory food insecurity, where there is either a long-term, persistent inability to meet minimum food requirements (Chronic food insecurity) or there is a short-term or temporary food deficit (Transitory food security).

The stability dimension of food security is divided into two groups. The first group is made up of factors that measure exposure to food insecurity risk with a diverse set of indicators such as the cereal dependency ratio, the area under irrigation, and the value of staple food imports as a percentage of total merchandise exports. The second group covers incidence of shocks such as adverse weather conditions, domestic food price volatility, fluctuations in domestic food supply, and political instability (FAO, IFAD & WFP, 2014). For food stability to occur, the four dimensions need to be in place simultaneously. To be food secure, a population, households or individuals must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks such as an economic or climatic crisis or cyclical events such as seasonal food insecurity. The concept of stability can therefore refer to both the availability and access dimensions of food security (Dilley & Boudreau, 2001).

The stability dimension can be affected by crisis on other dimensions of food security. The state of food security in the world 2010 showed how crises such as the price hikes on the international food market in 2007 – 2008 and 2010 triggered prolonged crises. This went to show the need for safeguarding the stability dimension of food security. Studies in SSA show that food supplies in the region have deteriorated mainly as a result of political instability, war and strife (WFP & FAO, 2010; FAO, IFAD & WFP, 2014). Of the four dimensions analysed in these studies, evidence showed that the least progress has been made in stability, reflecting the effects of growing political instability and increase weather shocks.

## **2.4 Contestations of Food Security**

Despite its importance, the concept of food security still faces contestations (Page, 2013). Given that food security deals with the production, distribution and consumption of food at individual/household level, it is a difficult concept to measure (Napoli 2011:9). Thus there is a ‘measurement problem’ (Mensah 2014:7). There is lack of consensus in food security analysis with regards to the indicators, methods used and instruments for collecting data (Carletto & Banerjee, 2013). Recognizing that there is no one single method that can be used for measuring food security, Maxell (2001) draws on authors like Goldstein (1991), Frankenberger & Goldstein (1991), and Swift (1989) who prefer measuring food security at the household level, while, others like Gittinger et al., (1990 cited in Maxwell, 2001) prefer to

use individuals as the measurement unit. Despite the reasons that have been put forward for measuring food security either at household or individual level, Pinstrup-Anderson (2009:6) points out that:

“Estimates of household food security, combined with individual estimates for each member of the household, and a thorough understanding of household behaviour provide a powerful input into the design and implementation of policies and programs to improve nutrition.”

While there are also arguments that household measurement of food security is an oversimplification of the phenomenon, and that food security should be measured at individual level, Pinstrup-Anderson (2009) makes a valid proposition that a food security indicator that combines both household and individual measures at any one time can be more informative to food policies, both locally and internationally.

Caulibaly & Sissoko, (2007) also argue that it is not only about the ability to have access to any kind of food. Most important is the ability for people to define their own agricultural system and have access to culturally appropriate food, produced through ecologically sound and sustainable methods. This contestation reflects another concept referred to as “food sovereignty” (Schanbacher, 2010). This will be discussed in detail in the section that follows.

Despite these contestations, however, in recent years, the multi-dimensional nature of food security has contributed extensively to poverty reduction around the globe (FAO & IFAD, 2014). At the global and national level, efforts have been made to create and strengthen environments for food production to meet growing needs. These have included both physical interventions to transform harsh natural environments, food assistance schemes and the diversification of livelihood (Napoli, 2007). According to John (1995) and FAO (2011) the occurrence of drought has become more frequent and severe in recent years and the numbers of areas affected by drought are projected to increase in extent.

#### **2.4.1 Is food sovereignty paradigm an alternative or a complement to food security?**

Some of the strongest criticisms of food security have been made by civil society organisations. The term food sovereignty paradigm was first adopted in 1996 by members of the international peasant movement otherwise known as La Via Campesina following its



criticisms of the food security concept (Wittman, 2011). This organization regarded the definition of food security as shallow and barely incorporating political dimensions of the global food system. In addition, deducing from the 1996 World Food Summit definition of food security, Simon (2012:17) notes that there are elements that are not included in the four dimensions of food security as described above. This includes aspects like “Food preferences for an active and healthy life”. In addition to these, The elements related to “food preferences” could be the object of some further thinking and research, which, at the household and individual level, could be comparable to what food sovereignty is at the country level.

Proponents of food sovereignty argue that food security will not exist until an environment is created where communities and nations actively participate in decisions that results in food production, food access, and food utilization (Patel, 2009). For La Via Campesina, a focus on ‘the right to food’ alone is insufficient to guarantee food security. Food sovereignty as advanced by this organization means “the right of each nation to maintain and develop its own capacity to produce the staple food of its people, respecting their productive and cultural diversity” (Menezes 2001:29). The food sovereignty attempts to reconstruct the entire global food regime by representing a sharp break away from how food security has conventionally been perceived.

Some authors, however, stress the importance of not substituting food sovereignty for food security, but rather, use food sovereignty as a framework to solidify the concept of food security (Menezes 2001). Maxell & Smith (1992:50) add that the mere definition of the food security concept is over simplified, making it possible for pertinent issues such as questions of sustainability, cultural acceptability and self- perceived security to be left out.

## **2.5 What can be said of Food aid?**

From earlier discussions in this chapter on the work of Sen (1981) and the concept of food security in the years described as the ‘golden years of food security’, food assistance emerged as an essential addition to the food accessibility dimension. With increasing recognition that besides ensuring improved and sustainable food availability, food assistance has been at the forefront of global policy actions that are aimed at addressing food security and malnutrition. In the Food Assistance Convention, food assistance is described as generally seeking to

improve the nutritional status and reduce hunger for the most vulnerable populations as well as save their lives and improve food security (UN, 2012).

Several other reasons form the basis for food assistance programs which in effect remain the core of food security policies. According to Barret (2002), food assistance programs are an important tool used by national governments of developing countries in particular to address food shortages and the effects of malnutrition. The food stamps scheme, originally introduced by the US government in the 1930s, is one popular food assistance program (Mensah, 2014). Today, different versions of this initiative are being implemented in some developed and developing countries. In addition to this, Barret (2002) also recognizes that divergent food assistance procedures have evolved over the years. Some of them include micro-nutrient fortification, food subsidies, food price stabilization, food-for-work schemes and early warning systems. Food subsidies and food price stabilization have been recognised as the least preferred food assistance programs. However, supplementary feeding programs have become popular in domestically initiated food assistance programs in SSA. An example is the implementation of School Feeding Programmes in Tanzania initiated in 2010 and other SSA countries like Ghana. From an international perspective food assistance programs are usually in response to crises like wars, or natural disasters. They come in the form of food aid. This is evident in the case of food aid from international organisations like Oxfam and ActionAid International to Ngorongoro dwellers in Tanzania, after long dry spells in 2009. Donations from these organisations are rightly referred to as food aid as food aid has been described as “the international provision of food commodities, usually surplus from the donor, for free or on highly concessional terms” (Barret 2002:45). Moore & Stanford, (2010) food aid is traditionally given to low-income countries by rich economies for various reasons including environmental and national security, humanitarian, economic and moral reasons.

However, there have been questions on the effectiveness of food assistance programs as indicated by Barret (2002) that food aid driven primarily by surplus disposal and geopolitical concerns tend to generate negative effects for receiving countries. Food aid to low income countries in particular tends to force domestic prices down as a result of increase in the supply of food, this undoubtedly discourages local food production. Moore & Stanford (2010) validate the assertion of Schultz (1960) by summarizing that food aid disrupts local food producers' livelihoods, a situation which contradicts stipulations in the Food Assistance Convention (Moore & Stanford, 2010). However, their assertion has contradicted the findings

of Lavy (1990), Tschirley et al. (1996), and Bezuneh et al. (2003). Further, food aid has sometimes been criticized as a mismatch of food need. That is, it does not always reflect the priorities of the receiving country. Some other shortcomings of food aid as identified by Barret (2000) include inefficiencies and poor targeting.

Despite the above criticisms, Barrett (2002) and Moore & Stanford (2010) still maintain that there are some food assistance programs that have successfully increased household food security level. Programmes that targeted the elderly, limit their vulnerability to over-weight and depression (Kim and Frongillo, 2007). There are some food assistance programs that encourage local purchase. In particular, the joint implementation of the Purchase from Africans for Africa initiative by the FAO and WFP with funding from the Government of Brazil holds high prospects of positive contributions from food assistance. This initiative targets five countries in SSA - Ethiopia, Malawi, Mozambique, Niger and Senegal and seeks to purchase cereals and legumes from smallholder farmers, which are then supplied to local school feeding programmes (FAO, 2013). The advent of such initiatives increases markets for locally produced food thus guarding the livelihoods of smallholder farmers in particular.

In addition to food assistance to pastoralists and farmers in Northern Tanzania, discussed in chapter 1, households severely affected by drought within this the zone received food assistance from humanitarian organisations like Act Tanzania, from 2011 to the end of 2012. Act is an organization made up of International Christian organisations working in Tanzania. As part of examination of the impact of drought on the state of food security in Northern Tanzania, food aid to will also be referred to. Based on results obtained from the analysis, an attempt will be made to draw conclusions on the effectiveness of these food assistance programs.

## 2.6 Drought and Food Security

In developing countries, drought ranks as the single most common cause of severe food shortages. It represents one of the most important natural triggers of malnutrition and famine and affects the four dimensions of food security: - availability, stability, access and utilization.

There have been attempts to create an understanding between drought and food security. Drought affects the four dimensions of food security – availability, stability, access and utilization (FAO, 2011:1). Some recent definitions of drought are quite similar to earlier description of what a drought is. As much as Simon (2012) notes that the **availability of food** does not simply translate to food security, food insecurity can be caused by the unavailability of food. The impact that climate change has on the ability to produce food is as a result of factors such as increased drought, increased flooding, and changes in freshwater supply (White et al., 2010). The American Natural Resources Defense Council (2014) notes that, in addition to fuelling out of control wild fires which can destroy crops, changes in precipitation and water availability could have serious consequences for agriculture leading to low crop yields and food insecurity. Based on literature reviewed so far by the WFP (2012) and others, low crop yields translate to a fall in food production which will affect the availability dimension of food. In addition, this view on drought and food security is further supported by insight provided by the African Studies Centre in Leiden. In an article on ‘Food (in) security in Africa’, it was clearly stated that the first pillar of food security (food availability) has collapsed in the Horn of Africa. Food availability was described as FAO - food availability caused by prolonged drought within the context of climate change (ASC, 2013).

Through the increased frequency and duration of adverse weather events such as drought, floods and cyclones, agricultural productivity and the viability of agricultural support industries can be reduced. These climate impacts can affect food yields, household livelihoods and food prices, which influence dietary habits, not only through food availability but also through food affordability (Friel et al., 2014). When food is unaffordable, it becomes inaccessible to people, thus affecting the *food access* dimension of food security. Karl et.al, (2009), establishes that, during periods of drought the amount and quality of water available decreases, thus impacting people's health and food supplies. As temperatures rise and precipitation decreases, water quality is significantly jeopardized. Shrinking amounts of water

can concentrate contaminants such as heavy metals, industrial chemicals and pesticides, and sediments and salts. During drought, drinking water supplies are susceptible to harmful algal blooms and other microorganisms. Recalling from the above discussions on food access and utilisation Simon (2012) and WFP (2012) stress the importance of access not just to food but to adequate quantities of safe and high quality foods. Thus food utilisation is negatively affected by the quality of water that is available during droughts.

A review of prices in a drought economy shows that the reduction in food production caused by low rainfall has an affect not only on whole-sale prices but also on retail prices. The unavailability of food leads to increase of prices of food commodities, making a variety of nutritious food inaccessible to low income earners. It is possible that exposure to drought may exacerbate the food and mental health relationship via potential negative impacts on the availability, livelihoods, food price and consumption of nutritious food, thereby creating acute and chronic stress (Friel et al, 2014).

While food price increases are detrimental to consumers, farmers most definitely benefit from food price increases, especially during periods of droughts that are not severe like the 2012 drought that was experienced by more than 55% of the USA (Walsh, 2012). An interview is presented by “SPY GHANA” on 3<sup>rd</sup> March 2015, with a banana seller in Northern Tanzania, where the seller recognizes that increase in banana prices following the drought has led to an increase in his income. Similarly, increase in prices of food, boosted farmers per bushel income, at least for the farmers who had any crops they had harvested. Singh (2012) also identifies the benefit of drought on the growth of certain heat tolerant crops like sorghum which is the staple food for most SSA countries. In periods of drought the growth of this crop is said to multiply.

Inspite of the above benefits which seem to be most noticeable in agriculture and food production, the FAO at the Drought Emergency meeting in Rome on the 25<sup>th</sup> July 2011, outlined that the effect of drought on agriculture and life stock are severe and its damages include but are not limited to crop losses, lower yields in both crop and livestock production, increased livestock deaths, increased prices commodity prices, increases in insect infestation, plant and animal diseases, damage to fish habitat, forest and range fires, land degradation and soil erosion (FAO 2011:1).

The government of Tanzania has no doubt sought to improve the food insecurity situation. Over the years, there has been policy formulation to increase food production, as well as intervention in the country in the form of food assistance programs (TMAFSC, 2015). But given that different regions and districts have different characteristics and are affected at differing levels by drought, studies and policies applied at national level may not have the same desired impact in all regions and districts. This again highlights the importance of the study which examines food security and its relation to drought in Northern Tanzania.

## **2.7 Contestations of the Idea that Drought necessarily causes food insecurity**

It is no doubt that, food insecurity may result from drought, and that much of the chronic and acute hunger in the world today is associated with high variable rainfall, with hunger peaking in times of drought. However, Khalafallah (2002) argues that the common interpretation that drought causes food shortage is not just simplistic but also ignores most of the important dynamics of rural economies - those associated with hunger. He argues that cross country regression analyses show that variability in malnutrition rates is caused by extreme poverty. Furthermore, Smith & Haddad (2002) established that a rise of \$1,020 in per capita income across a number of countries was associated with a 7.4% reduction in child mortality. Thus, the state of food security improves with income just as its ability to cope with drought will improve. Compared with poorer societies, richer societies have more resilience that is they have more options to secure livelihood. Despite the correlation between food available in the market and food security, their relationship is not absolute (Khalafallah, 2002). There are many other factors which act to determine whether an individual can purchase the food, can prepare it, eat it and utilize it efficiently. Studies carried out on child malnutrition between 1970 and 1995 showed that increased food availability accounted for only about one quarter of the global reduction in child malnutrition (Smith and Haddad, 2000). Scherr, (2003) again notes that food production is necessary but not sufficient to eliminate food insecurity. Studies carried out by WFP (2015) conform this claim, by identifying India as home to 1/3 of the world's hungry despite its large wheat surplus from year to year.

Drought may be a major determinant of food security. It can immediately affect smallholder agricultural households through crop loss, but its effects are often indirectly felt, for example when the market price of food increases as it becomes scarcer. In the rural economy of poor countries, the production of food is a major engine and drought will always have a

widespread effect. Households that depend on farm work or any other food related activity, lose income when food production is affected by drought.

## **2.8 Department for International Development (DFID), Disaster Resilience Framework**

This study draws from DFID's Disaster Resilience Framework, based on the arguments of authors like Smith & Haddad (2002) that the resilience level of a community influences its ability to cope with drought. Even though this framework was developed mainly to study resilience, its relevance in this study is based on the fact that it enables analysis of the reaction of households to stresses and shocks like drought, based on their capacities at any given time. This framework is a fairly recent development which first came to light in June 2011 as the UK government's response to humanitarian emergencies.

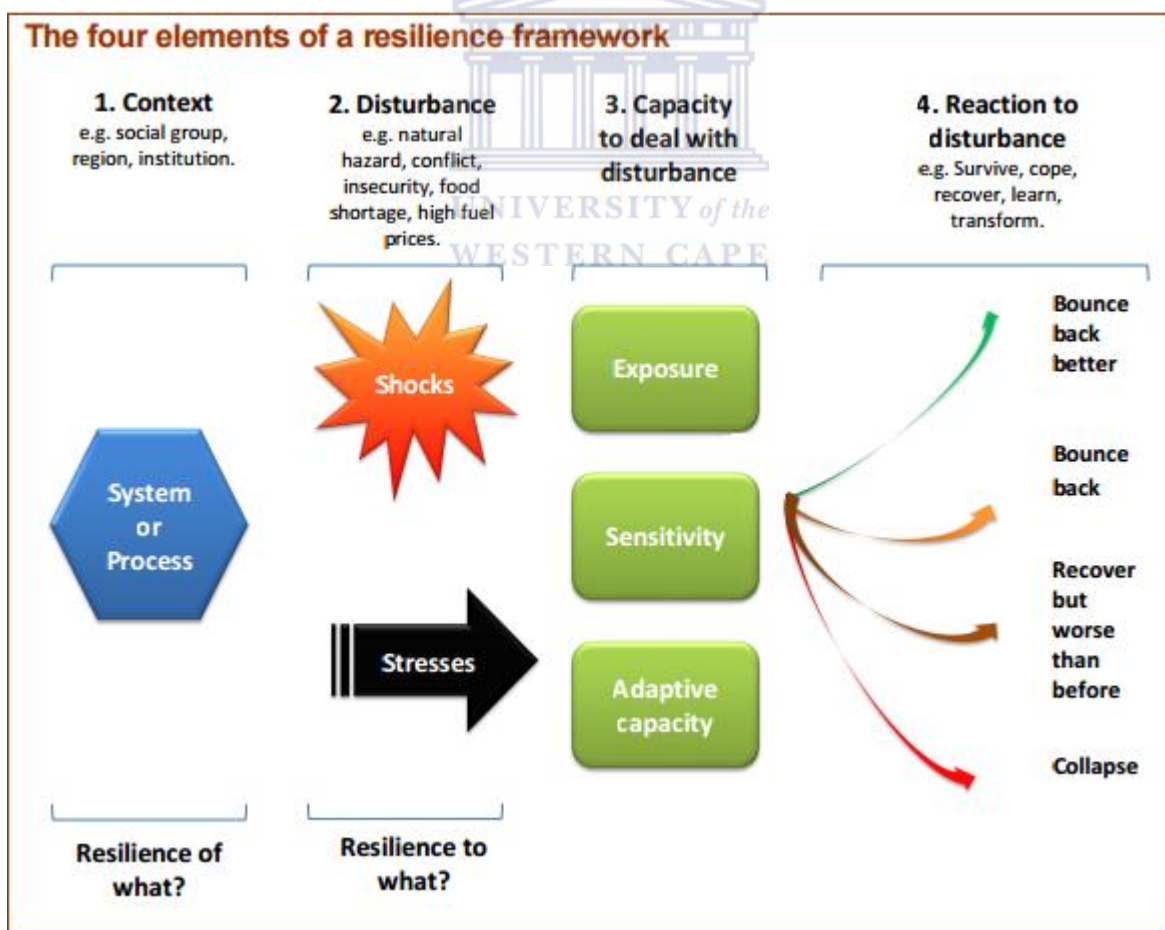
It was developed based on this government's humanitarian policy of saving lives, preventing suffering and building resilience (DFID, 2011). As also noted by the Canadian International Development Agency, the framework responds to the desire of humanitarian organisations to have an approach of addressing to both man-made and natural disasters that puts resilience at the center. Relying on resilience seems a common-sense reaction to mounting humanitarian needs in a world where many humanitarian crises are created. These are not created by short-term emergencies that swiftly pass, but by long-term stresses that develop to other disturbances like food insecurity. Six countries and territories were among the top ten recipients of international humanitarian assistance, particular food assistance for at least nine years during the decade 2000–2009 (Pain & Levine, 2012). Concentrating on resilience is the obvious answer when emergency response is so often used to react to crises which were predicted and (perhaps) preventable, and where it is increasingly hard to make a sensible distinction between chronic and acute problems.

Further, shocks and stresses are distinguished in this framework based on their duration of occurrence. Shocks are described as sudden events that impact on the vulnerability of a system and its components while stresses are referred to as long-term trends that undermine the potential of a given system (WFP, 2012). Thus natural disasters like droughts and earthquakes will fall in the category of shocks, while urbanization, political instability and economic decline are stresses. However, they both constitute disturbances and the ability of

households to deal with them depends on its exposure level, its sensitivity level and adaptive capacities.

In a normative sense, addressing the challenge of disasters like drought, particularly in the developing world is hugely dependent on building household and community resilience (Mensah, 2014). Thus attempts to reduce the negative effects that drought will have on food security should be approached from the lens of building disaster resilience. This, according to (DFID, 2011:6) constitutes “the ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses – such as earthquakes, drought or violent conflict - without compromising their long-term prospects”. A key feature of the resilience framework is the Four Elements which can be used as a tool for practical application of the approach (see Figure 2.1 below).

**Figure 2.1: Disaster Resilience frame work.**



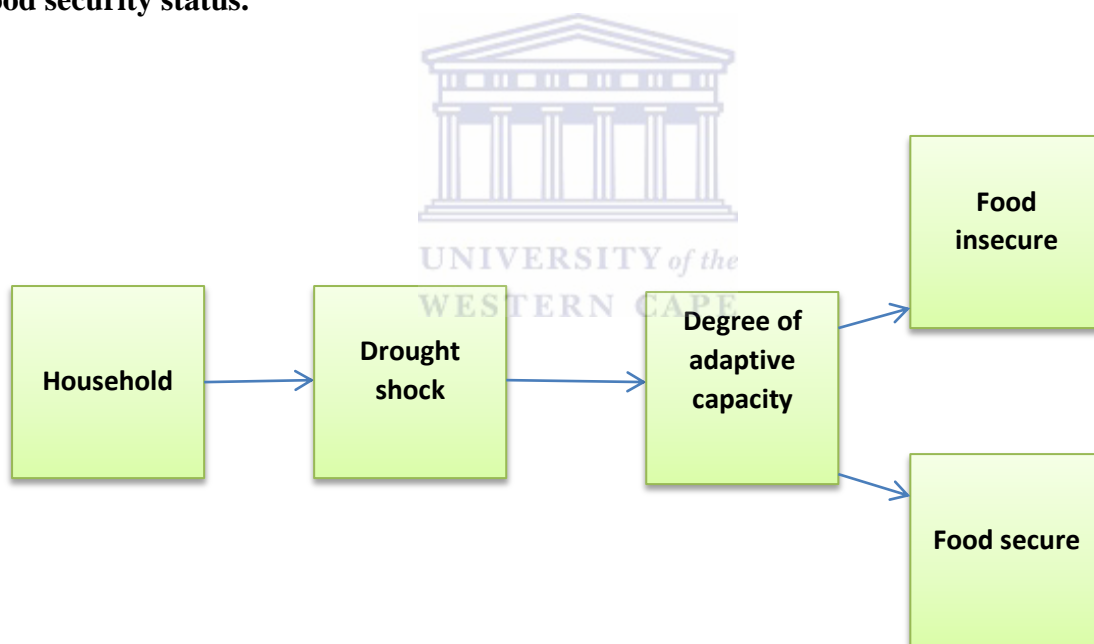
Source: DFID Approach Paper, (2011)



As a framework like the sustainable livelihood framework applied in a variety of development themes, the disaster resilience framework has not been extensively used since its development in 2011 (Pain & Levine, 2012). However, DFID has committed to integrate this framework into all their country programs on climate change and development themes like food security and conflict prevention by the end of 2015 (UNDP, 2014).

Recognising that the search for a framework for understanding the link between drought and food security is still at a developmental stage, Figure 2.2 below was adopted as a direct framework for demonstrating the effect of drought on food security. The framework below which will be used as a guide for analysis, focuses on the four elements as presented in Figure 2.1 above.

**Figure 2.2: Conceptual Framework for understanding the effect of drought on house food security status.**



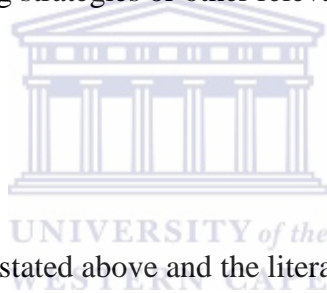
Source: Author's construct

The framework above begins with an indication that the study is carried out in the context of households. As indicated earlier in chapter 1, households, especially in SSA remain susceptible to a variety of vulnerabilities - shocks and stresses. In the case of Northern Tanzania, households are vulnerable to drought as the regions in this area received less than normal rainfall between 2009 and 2011 (IFRC, 2011). Also the focus of this study is on the effect of drought on household food security. Depending on the degree of adaptive capacity

of the household, that is its ability to adjust to a disturbance- drought, its ability to moderate potential damage, its ability to recognize opportunity in the midst of the shock and cope, the household either ends up food insecure or food secure. The adaptive capacity of this household, drawing on literature from DFID (2011) can otherwise be referred to as resilience.

Notice on Figure 2.1 that the third element-capacity to deal with disturbances has three components. This study chooses to adopt only the adaptive capacity due to the irrelevance of the other two components to the study. However, in analyzing household resilience to drought shock and its subsequent impact on food security, the study incorporates the sensitivity component which analysis with regards to systems. That is, an attempt is made to establish if male or female headed households are more resilient to drought shock. Consequently, it is anticipated that, drought will cause food insecurity, but only for households that do not have adequate adaptive capacity to cope with this shock. Households that are able to adopt shock coping strategies or other relevant mechanisms will be food secure.

## **2.9 Study Hypothesis**



Guided by the research questions stated above and the literature reviewed, the study sort to test the following hypothesis:

1. The occurrence of drought reduces household food security levels
2. Households adoption of shock coping strategies is associated with household resilience

The literature reviewed so far has revealed linkages between drought and household food security. In addition, the literature review provided information on the indicators to be used in the study methodology, the specific data needs and the data analysis method to use. These are presented in detail in the chapter that follows.



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## CHAPTER THREE

### RESEARCH DESIGN AND METHODOLOGY

#### 3 Introduction

According to Rajasekar et al. (2006), research methodology is the science of how a project is to be carried out. It can also be described as a systematic way to solve a problem. It refers to the procedures by which researchers explain, describe and predict phenomena to ensure that knowledge is gained. The research design and general methodology for this study were determined by inferences drawn from chapter one and two. This chapter will give a detailed description of the research design and the methodology adopted for this study. It will provide details on how the concepts of drought, household food security and household resilience were operationalised, introduce the Tanzania National Panel Survey data set mainly by highlighting its objectives, give an outline of the sampling procedure used and the method of data collection. The NPS data set covered 21 regions from the 6 zones of Northern Tanzania, including Zanzibar. However, the methodology which is adopted is discussed with recourse to the 4 regions of the Northern Zone – Arusha, Kilimanjaro, Manyara and Tanga.

#### 3.1 Research Design

Deciding on a research design is similar to deciding on what kind of house one wants to build. Thus it is important for a researcher to consider what the objectives of a research are and how applicable the research design is. In their classical book on research methodology, Stelltiz et al., (1965:50) in Mouton & Marais (1996:32), and Blanche et al., (2006) define a research design as “the management of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure”. According to Van Wyk (2014:4), a research design is the “overall plan for connecting the conceptual research problem to the achievable empirical research”. Similarly, Mulugeta (2014) describes a research design as not just being a work plan, but an overall plan from which a work plan will flow. For Yin (1988:29) and de Vaus (2001:6), a research design deals with a ‘logical problem’; in other words, it follows a logical structure for conducting a particular study.

A research design plays a critical role as a bridge between the research questions and the execution of the research. Research projects begin with a research question or enquiry. The research design that is adopted needs to be able to answer this question (Babbie & Mouton, 2001). After the development of a research design that will answer the research question(s), the research is conducted and findings are written up. Blanche et al., (2006) show a link between a research design and the execution of a research project. From their demonstration, a research design can be seen as a link between the research question and the execution of the research. It contains information on how the study will be executed. In developing a research design, it is most important that, the design should be in accordance with scientific principles so that the findings of the project carried out will withstand criticism. The question “What research design am I employing?” should be at the back of any researchers head when carrying out a study (Ashcroft & Parker, 2003).

Within the social science research enterprise, four key design types are identified: field research, experiments, surveys and secondary sources. These can be categorised into quantitative and qualitative designs (Abbott & Mckinney, 2013).

### **3.1.1 Quantitative, Qualitative and Mixed Designs**

According to Newman & Benz (1998), quantitative and qualitative research designs should not be seen as opposites of each other because they both represent different ends of a continuum. Some studies may be more qualitative than quantitative as well as there are some that tend to be more quantitative than qualitative. The mixed method incorporates elements of both quantitative and qualitative method, thus it can be described as being in the middle of quantitative and qualitative research.

Creswell (2007) describes qualitative research methodology as a means of understanding and exploring meanings ascribed to a problem. This method employs an inductive style, focuses on individual meanings and places importance on rendering the complexities of a situation. The research procedure generally will involve coming up with procedures and questions, collecting data from the participants in a sitting, analysing the data by building from particular to general terms and writing a report with a flexible structure (Creswell, 2009).

Quantitative research method on the other hand examines the relationship between variables in order to test objective theories. Quantitative researchers employ a deductive style, build protection against bias and are able to generalise and replicate findings (Creswell, 2009). The variables in the study can be analysed using instruments so that numbered data can be analysed using statistical tools. Unlike a qualitative design, the final report of a quantitative design has a set structure consisting of 5 different major headings as outlined in this paper. It is for this reason, among others, that this study employs a quantitative research method. This method is used in this study because the study seeks to examine the relation between variables like drought and household food production, drought and household resilience. It seeks to protect against bias, generalise and replicate findings. Thirdly, it will be difficult to employ a qualitative research technique in my study as the data used is secondary data making it impossible to draw any conclusions based on perceptions.

According to Creswell (2009), a mixed research method as the name implies, is an approach to inquiry that involves the use of philosophical assumptions and the use of both qualitative and quantitative research techniques. A study that employs a mixed method tends to be stronger than a study that employs just either of the studies above because, in using the mixed method, both approaches are used in tandem.

### **3.1.2 Secondary Data Analysis.**

To this end, by relying on a cross-sectional data collected for the Tanzanian National Panel Survey in Northern Tanzania, this study adopts a secondary data analysis. Cross-sectional study designs are relevant for secondary data analyses (Abbott & Mckinney, 2013), they are normally deeply rooted in explanatory approaches, allowing for causal inferences (Vaus, 2001).

Secondary analysis which is increasingly being used by many researchers in recent years is not a new approach; it dates back to the early 19<sup>th</sup> century (Smith, 2011; Vartanian, 2011). In the social sciences, secondary data analysis can be the re-analysis of data that had already been analysed for the same or different purpose or the analysis of data that was obtained primarily for sharing with other researchers (Cordray, 2001). It involves reporting data that was originated by someone else, but with a different focus or research objective (Smith et al, 2011). With current technological advances, it is possible to collect, compile, archive and

access vast amounts of data for research (Johnston, 2013). Thus, in the social sciences, secondary data analysis is increasingly becoming a useful approach (Smith, 2011; Mensah, 2014; Vartanian, 2011). This analysis can take the form of administrative records, population census, government surveys or longitudinal studies.

Compared with primary data analysis, secondary data analysis increases the access of researchers to a wide variety of sophisticated data sets which may not have been possible to obtain through primary data (Smith, 2008). Additionally, secondary data analysis saves time, is more convenient and economical (Keicolt & Nathan, 1985; Olsen & St George, 2004; Smith, 2008; Smith et al., 2011). Hinds, Vogel & Clarke-Steffen (1997), Sandelowski (1997), and Szabo & Strang 1997 contend that secondary data analysis can be used to develop new hypotheses, support existing theories, and generate new knowledge. It automatically permits the development of new research trajectories while relying on a data set that had already been used. For a student like me, using secondary data analysis is more convenient and has reduced the cost and time of carrying out my research.

However, methodologically, secondary data has its limitations. It is difficult to find the particular data needed; thus, there is often the need to manipulate data to suit the research being under taken (Keicolt & Nathan, 1985; Olsen & St. George, 2004). Besides these, the researcher was not present during the data capturing, thus he/she may not be actually aware of the limitations of the data. There is also the problem of obtaining reliable data. Data sets obtained from government organisations and some organisations with political interest are susceptible to manipulation. In some instances, the use of secondary data may require consultation of the primary researcher to investigate the circumstances of the original data generation and processing. This may be time consuming. Regardless of these deficits, Church (2001) and Olsen & St George (2004) contend that secondary data analysis is flexible and can be utilised in several ways and there exist some organisations where quality data can be obtained form. Thus this study used a data set from a reliable organisation. To overcome some of these limitations like the problem of a reliable data set, the data used for this study was collected by the World Bank and Tanzanian National Bureau of Statistics.

### 3.2 Operationalisation of Key Variables.

Operationalization is a process of defining the measurement of a phenomenon that is not directly measurable, though its existence is indicated by other phenomena. It is the process of defining a fuzzy concept so as to make the theoretical concept clearly distinguishable or measurable, and to understand it in terms of empirical observations. It involves defining the concepts abstractly in theoretical terms. The specific study concepts were operationalized as follows

**Drought at household level:** Drought within this study is measured using the Drought Vulnerability Index (DVI) which serves as a proxy indicator for quantifying household exposure to dry conditions. Within the NPS (2012/2013), it is captured as household drought index (HDI). The index is classified as follows,

Less than or equal to 2.9	Extreme dry conditions
3-4.9	Severe dry conditions
5-5.9	Mildly dry conditions
6-6.9	Incipient dry conditions
Greater than or equal to 7	Water available to house

The Indices with the data set range from 0.89 – 8. This study will group households with indices of 6.9 and below as households exposed to dry conditions (dry). As per the definition of drought used in this study, drought is experienced when there is even a tiny fall in the amount of water received at any given time.

The HDI is developed from 14 indicators of household dry conditions, identified along with their weights. Indicators that directly impact drought are assigned a weight of 1 and indicators that indirectly impact drought are assigned a weight of (0.5). Adding up the weighted score on the 14 indices gives the overall household score. This method was first used in Northern Nigeria, in an attempt to assess the vulnerability of households to drought (Leary, 2008)

**Household Food Security:** Household food security is measured using household food consumption score (FCS). The food consumption score has been leveraged over the years as



a proxy indicator for quantifying food security at the household level- using a single indicator to measure both food availability and food access. Within the (2012/2013) NPS dataset, data has been captured on the number of days a week; a household has consumed different food items (frequency). The data further categorises these items into food groups. FCS combines diet diversity, frequency of consumption and the relative nutritional importance of different food groups. Proceeding to calculate household FCS (household food security) these food groups are given nutritional weights from 0-4, based on the density of nutrition obtained from the food consumed as follows. The FCS for households is obtained by multiplying the weights by the consumption frequency (number of days consumed in a week). A score between 0-21 implies poor food consumption, 22-35 implies borderline food consumption and more than 35 implies an acceptable level of food consumption (WFP, 2012).

**Household Resilience level:** It should be recalled from above that, resilience measures the ability of a household to withstand and recover from difficulties, shocks and stresses, food shortages included. Following DFID's description of resilient household's and Oshaug's classification of resilient households, an ordinal variable measuring households loss of income or assets is generated. Households that had not recovered from shocks and stresses they experienced on the past 12 months were assigned a value of 1 – fragile households. The values 2 and 3 were assigned to those households that had partially recovered (moderately resilient) and completely recovered (resilient households).

### **3.3 The Tanzanian 2014 Wave 3 National Panel Surveys (NPS) data set: Description of sampling design and data captured.**

#### **Introduction**

The Tanzania NPS (2013/2014) is a nationally representative household survey that collects information on the living standards of the Tanzanian population. As the description of the survey implies, it follows the original sampled population over time - (NPS 2008/09) and (NPS 2010/11) to track the evolution of its living conditions in Tanzania. It is Wave 3 in a series of surveys carried out as part of the World Bank Living Standards Measurement Survey in collaboration with the Tanzanian National Bureau of statistics. The report was published in 2014. The whole project was financed by the Poverty Eradication Division,

Ministry of Finance, European Commission (EC), World Bank / Gates Foundation and UNICEF.

Following the nationwide survey between 2012 and 2013, the 2014 NPS report provides insight on some welfare aspects in all zones of Tanzania including Zanzibar. These include household food security, household consumption, agricultural production, non-farm income activities, socioeconomic characteristics and income generating activities. Given the focus of this study, the dataset for the Northern zone, made up of 4 regions is used. The reason why this data set was chosen over other data sets is because it contains the relevant measures for the proposed study. Additionally, its timeliness and its relevance to this study made it suitable over other data sets. The data collected in this series for Wave 2 was also used by the WFP in 2012 for the CFSVA; this proves the reliability of the data. The sampling procedure is presented below.

### **3.3.1 Data Captured in the NPS**

The NPS study used households as the unit of observation and a stratified, multi-stage cluster sample design was employed. Given the advantages of probability it was appropriate to use this sampling technique for the NPS study as it was carried out in the whole of Tanzania. According to Sandefur (2009), NPS sample design had the objective of producing the most reliable possible estimate of the population mean of some indicators like household consumption, within a given budget constraint for the survey. The multilevel or clustered sampling was attractive to use because there were presumably high fixed cost to be incurred. In choosing the sample design, the researchers noted that the disadvantage of using clustered sampling is that it increases the size of the standard errors for any statistics produced by the sample.

The list from which the probability sample was selected (sampling framework) was the Tanzanian 2002 population and housing Census – the National Master Sample Framework, which is a list of all populated enumeration areas in the country. The sample design explicitly recognised 4 analytical strata - : Tanzanian Urban and Rural Mainland which contain all Tanzanian Zones including Northern Tanzania, Dar es Salem and Zanzibar. Within each stratum, clusters were selected randomly as the primary sampling units with the probability of selected clusters proportional to their population size. In urban areas, clusters matched the

2002 census enumeration areas, while in rural areas, clusters matched villages. It was required that households that had taken part in the first and second wave of the NPS be tracked to participate in the third wave.

For household members to be eligible to participate in the study they were required to be at least 15 years old. If a person was not considered a household member, that person will, however, be listed in the household roster but will not answer any questions from the enumerator. According to the NPS Wave 3 (2012 – 2013) report, the protocol of following all individuals listed in the household roster of the NPS 2010/11 ( Wave 2) meant that some individuals tracked for the 2012/13 study, most likely were not considered members of that same household in the NPS 2010/11. This, by itself did not constitute any problem, a problem, however, arose when these people not considered are the only persons that linked the household in both rounds. This happened where the household members split from their original households and none of those considered household members in the previous surveys moved out with them, or if none of those considered household members were contacted again. Thus, the sample did not include these cases because they are not deemed to be panel households. The NPS 2012/13 also tracked and included in their sample, individuals who were members in the NPS 2008/09 but were not found in NPS 2010/11, these comprised of 81 households.

In the three waves of the NPS survey, a household was considered to be successfully tracked, if across 2 consecutive rounds of the survey, at least one person considered a household member in the previous round is considered a household member in the current round. In wave 3, which will be used for this study, 96% of the wave 2 households were tracked. The attrition rate was reported to be 3.9% and it was identified to be highest in Dar Es Salam (10%) and lowest in other urban and rural mainland (2%). The reason for household attrition was attributed to the inability to find any person of that household rather than their refusal to participate in the third round of the survey.

### **3.3.2 Sampling Procedure**

The sample design for the NPS series was chosen taking into consideration the budget estimate/limitations of the survey. This made the clustered sampling an attractive technique to be used in the Survey as high fixed costs were expected to be incurred. It however,

increased the size of the standard errors, for all statistics produced by the sample. The variables in the model used for calculation of the sample designs were derived using the 2001/2002 Tanzanian Household Budget Survey (HBS) which comprised of a sample population of 22,176 households. The HBS was used because, at the time, this was the most recent available nationally representative data source for household consumption in Tanzania. The final formulae used in the model for calculating an optimal group size within a given budget was:

$$n^*(c, \tau^2, \sigma^2, B) = \frac{\sigma \sqrt{c}}{\tau}$$

Where  $n^*$  = optimal cluster size

$C$  = cost of additional cluster

$B$  = Budget constraint

$\sigma^2$  = the variance of the household specific component ( $w_{ij}$ ) of the error term

$\tau^2$  = the variance of the common group element ( $v_j$ ) of the error term

The sample design used across all 3 waves of the NPS was determined in 2009, with slight changes being made for the 2010/2011 and 2012/2013 studies to accommodate the demands of the surveys. The sample was selected using probability sampling techniques. A two stage stratified cluster sample design was used for the NPS. The survey was conducted in mainland Tanzania and Zanzibar. On the mainland, the survey was conducted in all the regions of Tanzania including the regions of the Northern Tanzanian zone which is the focus of this paper. The first stage of the two stage cluster sampling, involved the selection of clusters which was stratified along two dimensions. The first stage stratifying of the sample was motivated by the need to produce estimates for sub-populations like particular zones. In the first dimension of the first stage sampling, a well-defined model was used, and basing estimates on the 2000/2001 Household Budget survey, a sample share by strata to equalise standard errors was arrived at.

Using the HBS to calculate, the following estimates were used  $T = 9,531.6$  and  $\sigma = 15,785.1$ . Furthermore, it was assumed in the calculations that the cost of an additional cluster is equivalent to ten extra households, that is  $c=10$ . In Table 3.1 below, this optimal cluster size

can be seen from a group of other sample designs. The optimal cluster size is illustrated as the sample design with the lowest Standard Error of Mean Consumption.

**Table 3.1: Alternative Sample designs for the same total Survey Budget**

n = no. HHs/cluster	J = no. clusters	N = total no. HHs	Standard Error of Mean Consumption		Standard Error of Mean Log Consumption	
			Model Prediction	Simulation using HBS	Model Prediction	Simulation using HBS
24	193	4,625	724.8	731.7	0.4623	0.0310
20	218	4,368	687.8	699.5	0.4606	0.0300
16	252	4,032	649.9	697.6	0.4484	0.0287
12	298	3,574	612.2	682.1	0.4402	0.0264
10	328	3,276	594.5	624.0	0.4535	0.0263
8	364	2,912	578.9	609.1	0.4530	0.0238
6	410	2,457	568.6	583.7	0.4586	0.0234
5	437	2,184	567.5*	564.7*	0.4658	0.0229
4	468	1,872	572.1	605.3	0.4517	0.0229
3	504	1,512	587.4	677.7	0.4326*	0.0228*
2	546	1,092	628.2	610.2	0.4714	0.0248
1	596	596	755.6	622.9	0.5116	0.0282

Source: Sandefur, 2009

Table 3.1 above shows different possible sample designs, represented by each row. The need for computation of alternative sample designs was to establish the sample design with the least standard error of mean consumption. With the survey budget available at the time (B) and assuming that  $c=10$ , the optimal number of clusters included 5 households per cluster and 437 clusters on the mainland. However, based on a compromise with other logistical constraints on the survey team such as fatigue and travel, a larger number of 8 households per cluster was chosen instead of 5. Thus 437 clusters were randomly selected. The Northern zone which is the case study of this research represented 16.3% of these clusters. The second dimension of the first stage sampling involved the stratification of Zanzibar into equal proportions of 2 strata- rural and Urban Zanzibar. At this stage, there was also the stratification of the mainland comprising of the 6 zones into rural and urban areas and Dar Es Salam.

The second stage sampling involved selecting households within a given cluster. At this stage, the number of clusters for the Household Budget Survey was used as a guide for arriving at the number of households for the NPS. On the mainland (rural and urban), a total

of 350 primary sampling units comprising of 2800 households were interviewed. In Zanzibar, 410 primary sampling units comprising of 3280 households were interviewed. This is illustrated on the table below.

**Table 3.2: An Over View of the NPS Sample Design (Households)**

	HBS Clusters		Total Sample	
	PSUs	HHs	PSUs	HHs
Mainland				
Rural	140	1,120	228	1,824
Urban	60	480	122	976
Total	200	1,600	350	2,800
Zanzibar				
Rural	..	..	30	240
Urban	..	..	30	240
Total	..	..	60	480
Grand Total	200	1,600	410	3,280

Source: Sandefur, 2009

Table 3.2 above shows the HBS Clusters and Households and the new NPS PSU and HH. The non-HBS sample at this point was obtained from the 2008 population census. Within the clusters that are non-HBS clusters, a simple random sample of households was drawn while a stratified random sample of households was drawn from within HBS clusters to create a panel of HBS Households. The sample panel aimed at drawing a sample that both links the HBS and provides a representative cross-section of the 2008 population. In order to solve some of the anticipated problems that they may be faced with like the fact that, some households may be both in the HBS and the 2008 population they adopted some procedures. This involved conducting a new listing thereby creating an updated sampling frame work of all households. They however maintained the idea of selecting 8 households per cluster. Their selection of households within the various regions was as follows:

**Table 3.3: An Overview of Mainland Sample by Region**

	Region % of total pop	Rural % of regional pop	Region % of NPS sample	NPS Clusters		Of Which:			
				Total Rural	Total Urban	HBS Rural	HBS Urban	Ag Census Rural	"New" Urban
Arusha	4.1	68.4	3.7	8	5	5	2	3	3
Dar es Salaam	7.9	5.5	20.0	9	61	3	30	6	31
Dodoma	5.5	86.3	3.1	9	2	7	1	2	1
Iringa	4.8	81.8	4.6	11	5	9	2	2	3
Kagera	6.6	93.4	4.3	14	1	8	0	6	1
Kigoma	5.4	82.0	3.7	10	3	4	2	6	1
Kilimanjaro	4.5	78.0	3.7	10	3	6	2	4	1
Lindi	2.5	82.6	5.4	16	3	6	2	10	1
Manyara	3.4	83.9	2.9	8	2	5	1	3	1
Mara	4.5	80.5	2.0	5	2	5	1	0	1
Mbeya	3.4	90.3	5.4	17	2	10	1	7	1
Morogoro	5.8	71.7	4.0	9	5	7	2	2	3
Mtwara	3.7	79.4	7.1	19	6	7	3	12	3
Mwanza	9.5	79.3	4.6	11	5	9	2	2	3
Pwani	2.8	76.9	2.3	6	2	6	1	0	1
Rukwa	3.7	82.4	3.1	8	3	5	2	3	1
Ruvuma	3.6	84.8	4.9	13	4	6	2	7	2
Shinyanga	9.0	90.4	4.9	15	2	11	1	4	1
Singida	3.6	84.8	2.0	6	1	5	0	1	1
Tabora	5.7	86.5	4.0	12	2	7	1	5	1
Tanga	5.3	81.6	4.3	12	3	9	2	3	1
Total	100		100	228	122	140	60	88	62
				350		200		150	

Source: Sandefur, 2009

Table 3.3 above, gives an overview of the mainland sample by region as recorded for the first wave 2010/2011. For the 2012/2013 studies the percentages represented by each region slightly changed. The percentage for the four regions of Northern Zone the changes were as follows; Arusha's percentage dropped from 3.7% to 3.1% , Kilimanjaro from 3.7 to 2.59%, Manyara from 2.9% to 1.89% and Tanga dropped from 4.3 to 2.39.

### 3.3.3 Sample size for Northern Tanzania

Table 3.4 below shows a determination of the number of households that were involved in the study from the Northern Zone based on the information provided above.

**Table 3.4: Sample Size for Northern Tanzania for the NPS 2012/2013**

<b>Region</b>	<b>Region Percentage(%) of NPS sample</b>	<b>Number of households from region</b>
Arusha	3.13	151
Kilimanjaro	2.59	130
Manyara	1.89	95
Tanga	2.39	166
<b>Sample Size (Total)</b>	<b>10</b>	<b>542</b>

Source: Authors construct from Sandefur 2009

As seen on Table 4 above, the number of households from Northern Tanzania used in the study was approximately 542 households. According to the Tanzanian National Panel Survey, Wave 3 report published in October 2014, the total sample size changed from 3265 at the time of determination of this sample size to 5010 in Wave 3 which is the data used in this study.

### **3.4 Data Analysis**

In analysing the data, Version 12 of the Stata statistical software is used to clean the data and carry out cross examination with valid literature backings. Descriptive statistics which include frequency tables, graphs and measures of central tendency are used in describing the demographic and socio-economic trends of the population and in other areas of the analysis needed. Before performing any statistical test, a test for normality is carried out to establish what statistical test should be used to prove the relation between variables.

### **3.5 Limitations of the Study**

Given that, the Tanzanian Wave 3 National Panel survey was conducted for the year 2012/2013, results from this study may not necessarily be representative for earlier years, or the years 2014/2015.

However, this dataset was used to carry out this study due to its appropriateness based on the study objectives outlined in chapter one and subsequent literature review of this paper. All the relevant indicators and variables that were needed to carry out this study were captured in



the data set using a relevant research methodology. The results obtained from the Tanzanian NPS dataset and the methods that were used for analysis are presented and discussed in the chapter that follows.



## **CHAPTER FOUR**

### **STUDY RESULTS AND DISCUSSIONS**

#### **4.1 Introduction**

In this chapter, results from the analysis of data will be presented and discussions of these results will be done. Descriptive analysis of the 542 Northern Tanzanian households from the Tanzania NPS 2012/2013 dataset is provided. This comprises of characteristics of households such as the education level of household heads, their gender and ages. The chapter further looks at the shocks and stresses that households perceived they severely suffered from between 2009 – 2013 (these include the years of the harsh dry spell). In order to answer some of the research questions, special reference will be made on the extent to which drought affected households. An attempt is also made to understand how widespread the shocks identified by WFP (2012) in its Tanzania CFSVA are.

Subsequently, the chapter provides an analysis of household resilience levels to external shocks. The data is examined using relevant statistical test to find out if there is a relationship between household resilience and the adoption of shock coping strategies. Recall from chapter 2 that shock coping strategies refer to the activities adopted by households after the occurrence of a shock to maintain their welfare.

This chapter also evaluates household food consumption level within the four regions of Northern Tanzania in an attempt to find out how accessible and available food is to households within the regions. Analyses are made with reference to literature to support the possible outcomes. Furthermore, computation of the difference in food consumption levels between households classified as drought households (DAH) based on their Drought Vulnerability Indices and non-drought affected households (NDAH) is done. At this point, issues relevant to food access and utilisation, which include food expenditure and sources, dietary diversity, periods of food shortages and the corresponding coping strategies adopted are also analysed. The food insecurity phenomenon will further be examined through some key determinants such as poverty and wealth.

## **4.2 Socio-demographic and Socio-economic characteristics of farm households**

Table 4.1 below, gives the socio-economic and socio-demographic characteristics of the 542 households sampled within this study. The aim of this section is to provide a background of the population under study.

### ***4.2.1 Gender of Household Heads***

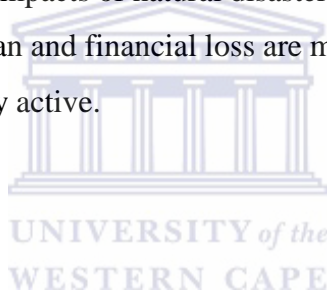
Male headed households (MHH) make up 69%, over two times the percentage headed by females (FHH) which stands at 31%. The percentage of FHH is about 6 times greater than the national average of 24.4% as calculated by World Bank (2010). This implies that, within the study zone, it is not uncommon to find a woman as the head of the family. This can be associated to several factors including the fact that there are more widows (85.23%) than widowers (14.77%) in the population. In addition, there is a higher rate of divorce amongst females than males. As the sample shows, all the divorced household heads (100%) were women and 0.00% of men. Howland & Koenen, (2012) explain that in their study on divorce and polygamy in Tanzania, Muslim and Masai Northern Tanzanian women tend to file for divorce or separate from their husbands after marriage with their realisation that they cannot cope with the polygamous culture.

While the phenomenon of females heading the households after the passing of their husbands may be an African cultural practice and is characteristic of regions in Tanzania, the welfare implications maybe deep especially for FHH. According to ADB (2009), based on a study carried out on the gender adaptive capacities to drought and floods, women generally are more vulnerable and have lower coping abilities than men. They are more susceptible to the negative effects of drought like food insecurity.

#### **4.2.2 Age of Household Heads**

The mean age of households head is 49. An examination of the age of household heads (HH) revealed that 23.4% of HH were between the ages of 35 and 44, while 22.32% were aged between 25 and 34. As expected just about 15% of household heads were 65 years or older and 2.7% of the household heads were aged 24 or below. In the Northern Tanzanian region, specifically within the 'Sukuma' ethnic group, it is common to find a household head as young as 15 years. This is explained by the fact that following a shock like the death of household head, the youngest male of the family assumes responsibility of the household as soon as he turns 15. Households that are very keen on tradition, respect this tradition while majority of the households ignore it (Howland & Koenen, 2012).

The welfare implication of fewer old people (65+) heading households is that, there are more household heads within the working age group able to provide for their families. According to Gabero & Mutarak (2011) the impacts of natural disasters like droughts and floods on a household - both in terms of human and financial loss are minimal for households whose heads are young and economically active.



#### **4.2.3 Household Sizes**

A look at the sizes of households within the sample as can be observed on Table 4.1 below showed that the average household size was 5 people which is slightly greater than the national average of 4.8 people (UNFPA, 2012). About 54.5% of the household comprised of 1-3 people, 10.08% were made up of 7-9 people while 32.24% had 4-6 people. Exactly 7 houses each had sizes of 16, 17, 18, 19, 20 and 21 people respectively. An average household size of 5 indicates that, household sizes within Northern Tanzania are relatively small compared with the sub-Saharan average household size of a household of 6 people. The nature of household sizes within the case study zone can be explained by the fall in fertility rates in the past 10 years, due to the high prevalence of STDs like HIV/AIDS which is mainly prevalent amongst younger people and people of child bearing age. According to the United Nation's department of economic and social affairs, the average size of households in regions of Northern Tanzania is likely to keep falling as a result of increased popularity of contraceptives and the education of girls (WFP, 2012). In the event of a shock like drought,

Sen (2008) notes that food prices tend to rise. With small sized households the burden of buying large quantities of food at high prices is reduced.

**Table 3.5: Socio-Demographic and Socio- economic Information of Respondents**

Characteristic of household		Frequency (n=542)	Percentage (%)
Gender of household head	Male	378	69.74
	Female	164	30.26
Age Category (years)	< 24	15	2.77
	25-34	121	22.32
	35-44	127	23.43
	45-54	119	21.96
	55-64	74	13.65
	65+	86	15.87
Marital Status of household head	Monogamous	253	46.68
	Polygamous	75	13.48
	Living together	34	6.27
	Separated	35	6.46
	Divorced	17	3.14
	Never Married	40	7.38
	Widow(er)	88	16.24
Education of household head	Attended School	418	77.12
	Never Attended school	124	22.88
Occupation of household head	Agriculture/livestock	344	63.47
	Fishing	4	0.74
	Mining	6	1.11
	Government	15	2.77
	Parastatal	2	0.37
	Private sector	65	11.99
	NGO/Religious	5	0.92
	With employees	11	2.03
	Without employees	67	12.36

	Unpaid family work	6	1.11
	Disabled	14	2.58
	No Job	3	0.55
Household size (persons	1-3	54.51	
	4-6	32.44	
	7-9	10.08	
	10-13	2.52	
	14 <sup>+</sup>	0.44	

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

#### 4.2.4 Occupations of Household Heads

Appendix 1 shows employment between MHH and FHH which reveals that as compared to 66.77% of unemployed FHH only 33.33% of MHH are without employment; this has welfare implications. In addition to these, these statistics are a reflection of the access women have to education, land and to other livelihoods in Tanzania (World Bank, 2012). As will be presented in the next subsection, there are more educated MHH than FHH. Illiteracy limits the ability of FHH to gain employment, as well as their inability to access reasonable sizes of land to carry out agriculture. It will not be surprising, therefore, if it is found out in later sections of this chapter that FHH are poorer or more food insecure. These are the negative household welfare implications of HH unemployment. Unemployment limits the ability of the HH to provide adequate basic needs for the household including food.

Table 4.1 above presents further examination of HH occupations which shows that more than half of the household heads are involved in agriculture/livestock (63%) and a small proportion are fishermen. Thus a total of not less than 65% are involved in farming. In areas of Tanzania where agriculture is mostly traditional and rain-fed, the occurrence of a drought will have deep implications on the welfare of these communities. Erratic or no rainfall translates to low agricultural production which will lead to increase in food prices.

The table also reveals that less than 1% of household heads are unemployed. Other household heads are employed in various public and private organisations. The small proportion of

household heads being unemployed can be traced to the growth of tourism in this area over the years. With touristic attractions like the Kilimanjaro Mountain in this zone, more people are getting involved in the tourism sector. There has been the creation of more vocational training colleges like the Keyfield Career Centre to train professionals of all ages either as tour guides, waiters and waitresses, cooks and receptionists for hotels and game reserves (TNBS, 2014). Jobs are also created in other sectors as a result of growth of tourism like in the transport sector and the financial sectors.

#### **4.2.5 Dependency Ratio**

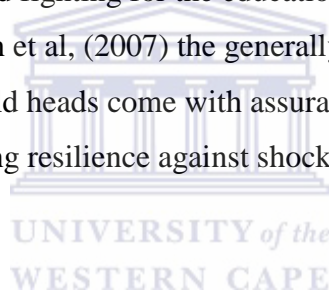
The dependency ratio of the entire sample, tells us the proportion of the population not in the work-force who are dependent on those of working-age. For this sample, the dependency ratio calculated was 0.8 which is slightly less than the national dependency ratio of 0.9 (World Bank, 2013). Within the population, there is a lower old age population (4.79%) and a comparatively lower number of people below 15 years (40.52). This brings the total dependent population to 45.31% as opposed to a proportion of 54.69% within the working age. However, the dependency ratio maybe higher/lower as the measure done here relates the active population to the inactive population and is not based on the economically active population. A low dependency ratio, like that calculated for the sample (0.9) presupposes that not everyone within the working population has the responsibility of supporting at least one person within the household (that is those below the age of 15 and above 65). With the dependency ratio low, households have a higher propensity to withstand household shocks and stresses.

#### **4.2.6 Educational Level**

From Table 4.1, it can also be observed that 77.12% of the household heads had attended some level of education while a minority of 22.88% had never been to school. According to Nelson et al., (2007), education is one important way individuals acquired knowledge, skills and competence that could directly or indirectly influence their coping capacities in time of crisis. From a cross tabulation of gender of household heads and education status, 65.5% of MHH were educated as compared to only 21.68% FHH.

Education has been identified as a driver of employment and income, because with education, household heads can diversify their livelihoods and not rely only on rain fed agriculture for income. Thus, as far as the educational system is concerned from all the findings this far, it is important to strengthen the education system in Northern Tanzania to increase the number of female (girls) in schools. The implication of more FHH with no education increases their vulnerability to unemployment and access to other forms of livelihood.

This also reveals a certain bias with regards to education amongst household heads particularly across gender lines. With about 80% of FHH with no form of education, this can be explained by a number of factors which include the patriarchy which had dominated Northern Tanzania in the past (World Bank, 2012). The education of boys in the early days was more important than the education of girls. This has, over the years been identified as a critical developmental challenge particularly in rural areas, with many developmental organisations like the Malala Fund fighting for the education of girl children. Based on literature from writers like Nelson et al, (2007) the generally high educational attainment levels recorded amongst household heads come with assurances, especially in assuring the welfare of households and building resilience against shocks.



### **4.3 Description of Agriculture in Northern Tanzanian**

This section describes agriculture in the zone of interest. The rationale for a section on agriculture alone is because a greater proportion of households are involved in agriculture. Secondly, the proposed direct impact that drought has on agriculture in Africa due to its rain-fed nature makes the inclusion of this section vital.

Description of farm sizes and main staple crops cultivated will be looked at. It should be recalled from above that, within this sample over 60% of households are headed by farmers. From table 4.2, agriculture is mostly practised on a small scale with about 78% of households cultivating an area of 5 acres or less than 5 acres. More people are turning from relying solely on agriculture to other sectors like tourism. Also agriculture is mainly for home consumption and 47% of agriculture in Northern Tanzania is livestock amongst the Masai ethnic group (WFP, 2012). This explains why we find higher percentages of farmers cultivating small pieces of land, as livestock farmers keep a small number of livestock. 8.43% of farmers cultivate medium-size farms while 13.08% large – scale farmers cultivating more than 10



acres of land. For each category of farm size, MHH dominate the proportion of households involved. Generally from the sample, more males seem to be involved in agriculture attributed mainly to the difficulty faced by women in acquiring land for cultivation. Based on the argument of ADB, (2009), men have better coping capabilities than women during crisis like drought. Thus if more men are involved in food production, this should have a good bearing on the community.

**Table 3.6: Farm Size cultivated by households (n=344)**

Farm size	Frequency	Percentage (%)
Smallholders(<5 acres)	270	78.49
Medium (6-10acres)	29	8.43
Large (>10)	45	13.08
<b>Total</b>	<b>344</b>	<b>100</b>

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

However, the average FHH's cultivate 1.4 acres of land as compared to 1.3 acres cultivated by male. This can be explained by the increase efforts of the government of Tanzania and other stakeholders to achieve gender-equal access to land. This has included creating an enabling environment (female farmer access to loans) for more women to practice large scale agriculture (WFP, 2014). In addition to this, regions of Arusha and Manyara are characterised by informal female associations for women in agriculture. They create these associations to support each other by making short and long term loans available to everyone thereby increasing their ability to purchase land.

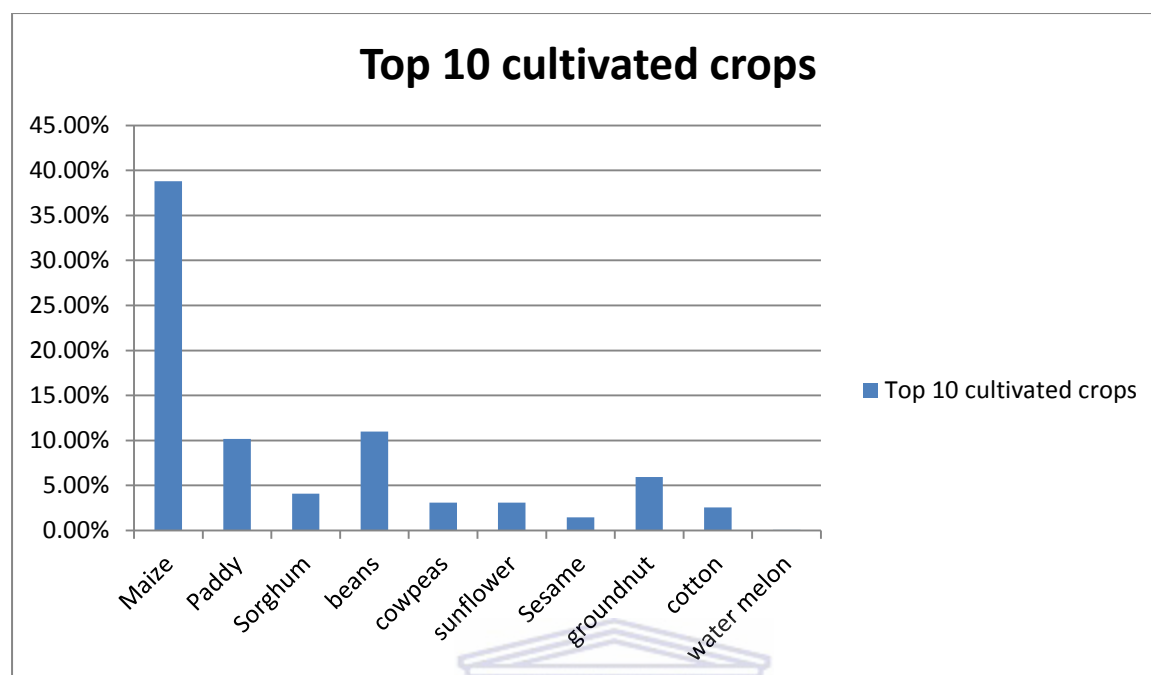
### **4.3.1 Major crops cultivated in Northern Tanzania and their levels of drought tolerance**

The main staples cultivated in Tanzania are maize, sorghum, millet, rice, beans, cassava, potatoes, banana and plantains (UNESCO, 2010). Figure 4.1 below shows the 10 most cultivated crops from the sample. Maize and beans are the most cultivated crops/staple foods with 31.81% and 10.38% of households cultivating these crops respectively. In addition to the facts that maize is a staple food of the region and it is widely cultivated it also has a variety of uses. Maize is not only consumed in the form of flour referred to as ‘onga ya ogali’, but also dried and used to make a local meal of corn and beans known as “cornchaff” eaten mostly by the ‘Sukuma’ tribe of Northern Tanzania. Also, maize is used for making a local alcoholic drink known as “Pombe” which is consumed by many in local fast food joints called ‘Mama’ntiliye”.

Also, the introduction of 3 drought tolerant maize varieties in Tanzania in 2013 will only increase the number of households involved in maize cultivation especially in areas like Northern Tanzania prone to drought. However, because their seeds are more costly, very few percentages of households cultivate drought tolerant crops like sorghum (4.08%), millet (0.95%) and grain legumes like cow peas especially which is not only drought tolerant by helps to restore soil fertility.

The implication of fewer households cultivating drought tolerant crops is that, they are vulnerable to poor harvest in time of drought and also to a fall in income, for households that sell. Poor harvest will also impact the amount of food and food prices available in the market negatively which will in turn have a negative impact on food security.

**Figure 4.1: Most Cultivated crops in Northern Tanzania (n=344).**



Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

It is also noticed that, not many households are involved in the production of export cash crops like cotton and coffee where only 2.57% and 0.01% of households respectively produce these crops. Also it was interesting to find out that, no households were involved in the production of tea which is one of Tanzania's major export crops (see appendix 4). The reasons for this are numerous including the water requirements for these crops. Tea and coffee plants, for example are described as 'water lovers' requiring ample water and humidity (WFP, 2012). They mostly use up surface water and are rain fed crops. These requirements are 'luxuries' which Northern Tanzanian, with a semi-arid nature cannot provide. Cotton on the other hand, does not require a lot of water but constantly moist soils and regular rainfall. Because of these it is there understandable to find very few households involved in the cultivation of these crops.

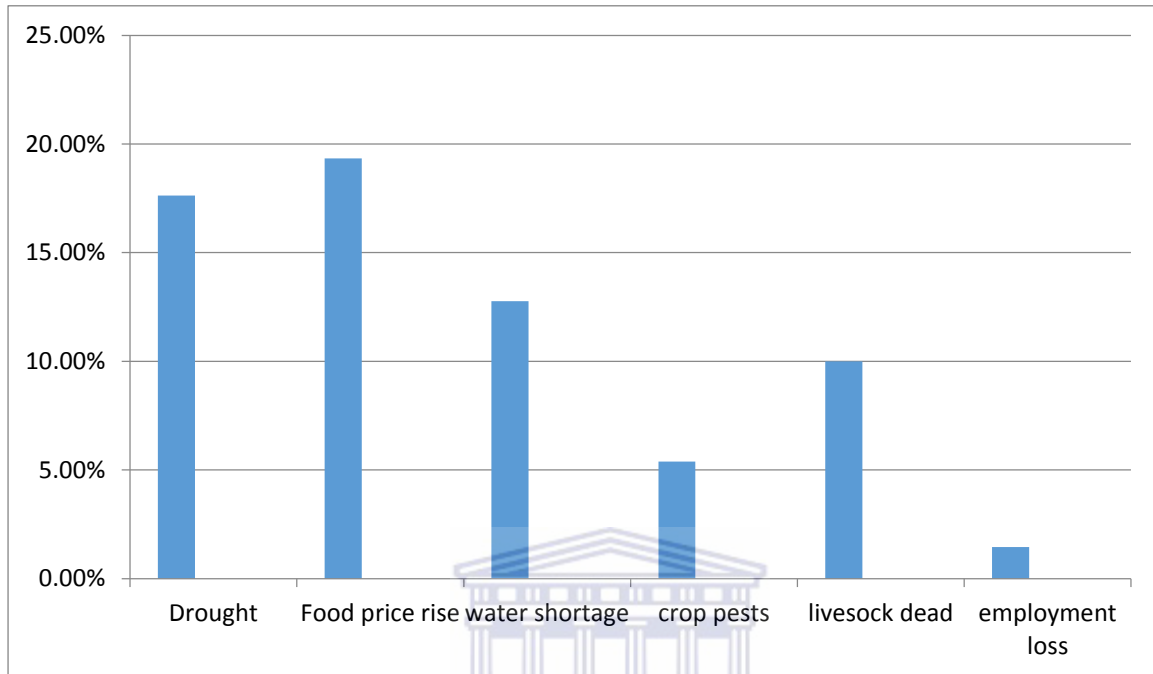
#### 4.4 Shocks Affecting Households in Northern Tanzania

As indicated by the WFP (2012) in its CFSVA, apart from drought, households in Tanzania experience other environmental as well as socio economic disturbances which directly or indirectly impact their welfare including food security. This section discusses the shocks and stresses that are experienced by households and in so doing answers research question 1- “what shocks in addition to drought are specific to Northern Tanzanian households and to what extent does drought affect households across the different regions?”

Figure 4.2 below displays some of the difficulties perceived by households as shocks that disrupt their welfare including their ability to be food secure. All the households within the sample had experienced 1 or more of the 19 shocks and stresses common to households. Compared to other shocks and stresses experienced by households, increase in food prices and the drought shock were the 2 difficulties faced by most households. Within the sample, 19.34% of households admitted to be stressed by increase food prices while 17.63% were experiencing drought. This conforms to the Tanzania CFSVA classification of shocks that cause food shortages the most in Tanzania. The report showed that drought contributed most to food shortages followed by expensive food. The reason for high food prices can be associated to a number of factors. With the occurrence of adverse weather conditions like drought, high food prices result from a fall in the supply of food and increased demand due to low harvests. Increase demand will result from farm households which originally cultivated their own food being forced to buy food as a result of insufficient farm output. Other factors that caused high food prices included generally slow growth in the agricultural sector and devaluation of the dollar during the period of study (WFP, 2012).

In addition to these 10% of households involved in rearing livestock experienced the death/theft of livestock, 12.76% experienced water shortages and about 2% of households in experienced the loss of employment of a household member. All of these shocks have welfare implications. For example, the loss of employment of a household member means a fall in the household income if the member was gainfully employed. Based on literature examined in chapter 2, the food access and food utilisation dimensions of food security will be negatively affected for households experiencing water shortages. This is because water shortages reduce their access to drinkable water and thus their ability to consume sufficient water

**Figure 3.2: Shocks and stresses that affect Farm Households (multiple responses apply n=542).**



Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

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In addition to these difficulties, households experienced other difficulties like loss of land, fire, break-up of the household and severe illness. These difficulties all disrupt wellbeing and have the potential of generating negative consequences for household welfare. Just like loss of employment, the death of a working household member leaves the household with the challenge of meeting up with its basic needs, including food.

#### **4.4.1 Drought Shock within the sample**

Based on household Drought Vulnerability Index as captured by the data, households were grouped into 5 categories – those that experienced extreme dry conditions, severe drought, mild drought, incipient dry conditions and wet conditions. The first four categories of households are further classified as drought affected households (DAHH) based on the definition of drought in this study which sees drought as any form of dryness. The fifth category will be referred to as non-drought affected households (NDAHH). Table 4.3 shows the percentage of households in each category. As at the time of collection of this data, a total

of 18.82% of households had indices that classified them as DAHH as compared to 81.82 for NDAH. This is higher than the national figure of households affected by the drought which is 10.86 (Evans et al., 2011). The difference between the national figure and figure for Northern Tanzania can be explained by the zone's proximity to Kenya and other severely drought affected areas in East Africa. The total figure of DAHH which stands at 18.82 is also just 0.52 less than the percentage obtained above for households that perceived drought to have affected their households, indicating similarity between results obtained.

**Table 3.3: Categorising household drought within the region**

Category	No of households	Percentage (%)
Extreme drought	13	2.40
Severe drought	41	9.96
Mild drought	31	5.72
Incipient drought	17	3.14
Wet Conditions	440	81.18
<b>Total</b>	<b>542</b>	<b>100.00</b>

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

The table also shows that a greater proportion of households (5.72%) were severely affected by drought. While there is not much difference in the terminologies "extreme" and "severe", the figures indicate that only 2.40% of households experience utmost dry conditions (extreme). The rest of the drought categories indicate some level of access to water, except for severe drought which may be just as serious as extreme drought.

A further look at drought and agriculture (see appendix 3) indicated that more than half of the DAHH were households involved in agricultural production (56.86%), while the rest of the 16 different occupations accounted for 43.24% of the DAHH. This confirms arguments highlighted in this paper by WFP (2012) that farm households are more affected by drought in countries in SSA because agriculture is mainly rain-fed. A cross tabulation of farm sizes and drought, presented by Table 4.4 shows that 81.03% of the farmers experiencing dry conditions were smallholder farmers. The least percentage of farmers that experienced were farmers that cultivated medium size farms (3.44%).

**Table 3.4: Cross Tabulation of farm sizes and drought (n=343)**

Household Drought Category	Farm size			Total
	Small	Medium	Large	
DAHH	47 (81.03)	2 (3.44)	9 (15.51)	58 (100)

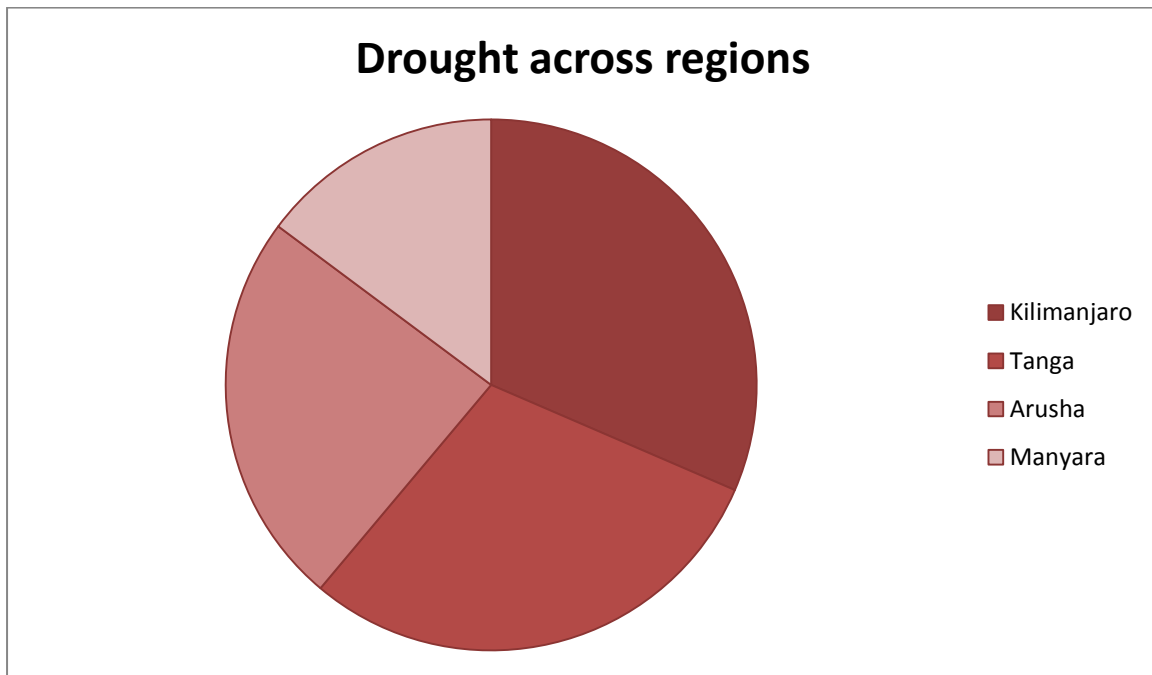
Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

More smallholder farm households were affected by drought as observed in Table 4.5 above. About 81.03% of smallholder farmers were affected while only 15.51% of farm households cultivating large size farms were affected. This implies that smallholder farmers tend to be more affected by drought than farmers cultivating medium and large scale sizes. This to an extent conforms to arguments made by Pandey, (2009) that smallholder farmers are more affected by drought. However, the results in the table do not tally with his arguments that the negative effect of drought reduces with farm size as there is no clear cut relationship shown from the table.

To test if there is a relationship between drought and farm size statistically, a chi square test between both variables was performed revealing a p-value of 0.2. This implies that there is no significant relationship between drought and farm size.

Of the four regions within this Northern Zone, Kilimanjaro region has the highest percentage of DAHH - 31.48%. This could be explained by the fact that, this region, which is Tanzania's most populated region (KilimanjaroHope, 2014), has its densely inhabited areas located in the leeward side of the Mount Kilimanjaro, thus it experiences dry and semi-arid conditions. The lowlands of Kilimanjaro region are less populated, but also generally warm and dry and receive an annual rainfall of less than 800mm. Thus dry conditions will be experienced.

**Figure 3.3: Proportion of households affected by drought across regions (n=102).**



Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

Figure 4.3 also shows that, Arusha and Tanga followed Kilimanjaro in terms of the proportion of households experiencing drought with 24.61% and 29.63% of households each and Manyara had the lowest proportion, 16.42%.

#### **4.5 Coping Strategies adopted by households and household resilience to shocks and Stresses**

In the sections preceding, there has been a look at other disturbances which may interrupt household welfare and, looking in depth at the drought shock. This section analysis coping strategies adopted by households and establishes how resilient households are to shocks. In an attempt to answer the second research question – “Does the adoption of coping strategies by households influence their resilience to shocks and stresses?”. Statistical test are also carried out to investigate any possible relationship between household adoption of coping strategies and resilience to shock.



### 4.5.1 Coping Strategies

To cope with the different disturbances, households adopted some coping strategies. It is important to note that coping strategies discussed in this section constitute a broader scope and are not specific to food shortage coping strategies. Food shortage coping strategies are examined under the food (in) security section of this chapter which is still to follow. The coping strategies analysed here may otherwise be referred to as responses of households after they experience shocks and stresses to restore their formal welfare. Table 4.5 below presents the most common coping strategies adopted by household to deal with the shocks and stresses they experienced

**Table 3.5: Most Common responses to difficulties (n=542)**

<b>Coping Strategies adopted following a difficulty</b>	<b>Percentage</b>
<b>Relied on savings</b>	8.00
<b>Changed eating patterns</b>	1.60
<b>Look for employment</b>	1.60
<b>Migration</b>	1.60
<b>Sent children to other towns</b>	0.80
<b>Engaged in spiritual efforts</b>	0.80
<b>Sale of livestock</b>	4.68
<b>Help from relatives</b>	6.50
<b>Did not do anything</b>	69.60
<b>Total</b>	100.00

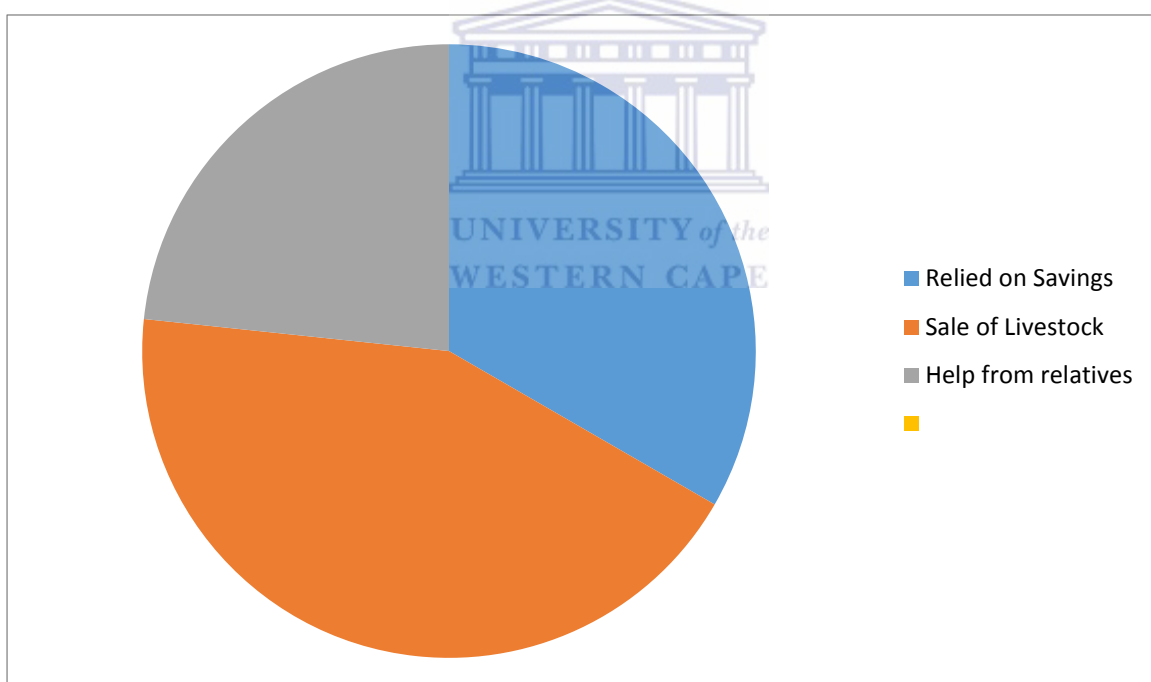
Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

It is revealed from above that, only about 40.40% of households had adopted a coping strategy to deal with shocks or stresses that affected their households. It was also interesting to find out that 69.60% did nothing in response to these shocks to restore their welfare. This can be traced to the fact that following the drought which affected Northern Tanzania in

2011, the area received extensive intervention both from the government and other organization like Action Aid. The intervention was in the form of food assistance, cash assistance and agricultural input (Nyange, 2013). This may have been reasons why households did not need to respond to any shocks and stresses by themselves.

It was also observed that unlike NDAH within the sample that rely mostly (13%) on their savings in the event of a shock or stress, 10.40% of DAHH tend more to sell their livestock as a means to regain their welfare. For DAHH this is a reasonable coping strategy to prevent a loss – loss situation. With the occurrence of drought, cattle may tend to die due to unavailable food. So selling them is advantageous for the households.

**Figure 3.4: Most common coping strategies adopted by DAHH (n=102) (multiple responses apply).**



Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS

Relying on savings was the second most popular strategy undertaken by households. In addition to this, the fact that more DAHH chose to sell cattle more than any other coping strategy is an indication that more pastoralist are affected by drought. A higher percentage of households relying on savings can be associated to the presence of the Savings and Credit

Cooperatives (SACCO) Organisation which has affiliates all over Tanzania, particularly in rural areas. This organization aims at encouraging savings amongst households and it characteristically has a high percentage of urban farmers among their members while the other percentages are urban middle income earners. Other common coping strategies adopted by households to deal with shocks and stresses included engaging in spiritual efforts, migration to other parts of the country, reduced spending on health and changing eating patterns (see appendix 4).

#### 4.5.2 Household resilience

Table 4.6 below shows that households within the sample were either classified as fragile households or moderately resilient households based on their ability to recover from shocks. There are no households recorded as resilient households. It should also be recalled that all households within the sample experienced at least 3 or more shocks. Within the sample, 16.8% of households that do not adopt coping strategies to deal with shock were classified as fragile households (had not recovered from shocks) while 17.60% of households that adopted coping strategies were fragile households.

**Table 3.6: Comparison of the resilience of drought affected households that adopted coping strategies and those that did not**

<b>Recovery from difficulties</b>	<b>Households that adopt coping strategies (n=165)</b>	<b>Households that did not adopt coping strategies (n=377)</b>
Fragile households	17.60	16.80
Moderately resilient Households	82.40	83.20
Resilient Households	0	0
Total	100.00	100.00

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

Also, 83.20% of households categorised as moderately resilient households did not adopt any coping strategy while 16.80% adopted coping strategies to deal with shocks. Comparatively,

the table reveals that, households that do not adopt coping strategies tend to be more resilient than households that adopt coping strategies. This supports the claim made by Shaw (2007) and WFP (2009) that adopting coping strategies disrupts household assets and resources thereby weakening household resilience. The results obtained from above justify this claim. To test statistically if there is a relationship between household resilience and coping strategies, a chi square test was applied (where households that adopted coping strategies=1 and households that did not=0). The generated a value of 21.6847 and a P-value of 0.006. Based on these results, it can be concluded that there is a significant relationship between household resilience and adopting coping strategies, even though this results do not give the direction of the relationship. Thus we reject the null hypothesis that resilience and coping strategies are independent of each other.

#### **4.6 Household Income and expenditure pattern.**

This section looks at the household income and expenditure pattern, basically as a means to establish the prevalence of poverty in the case study zone. The rationale for a section on poverty is based on literature reviewed earlier from WFP (2012) that states that the negative effect of weather shocks on food security is amplified by household poverty. In addition, examining the poverty situation will help to analyse the food (in)-security pattern in later sections of this chapter.

The income realised by households in this study can be categorized into three broad sources; rental payments (85.41%), private or government pensions (4.1%) and other payments (8%). Other payments included income from savings, real estate sales, gambling, agricultural and non-agricultural asset sales. Even though the mean annual income is TSH24,754 (US\$15.63, where TSH1.00 equals to an average annual income of US\$0.00063 for the period under study 2012/2013) for all households within the sample, Table 4.8 shows that the average for DAHH and NDAH are TSH20,845.77 and TSH26,037.58 respectively. This implies that, the average income earned by NDAH is about 20% higher than that of DAHH. This loss is traceable to the fact that DAHs comprise mostly of agricultural households (80.59%). About 64% experienced a fall in annual income in the year under study as a result of fall in sale prices of crops, a rise in agricultural inputs, severe water shortages and dead of livestock. It can also be observed from the table that on average households generally spend about 2 times what they make annually. For DAHH the mean annual income is slightly less than the

mean annual income for NADHH (TSH44309 equivalent to US\$27.99) and (TSH49486 equivalent to US\$31.26) respectively. In addition to this, further examination of data revealed that, households generally spend more on food than any other expenditure item.

**Table 3.7: Summary Statistics for Selected Household Income and Expenditure indicators**

Variable	All Households(n=542)	DAHHS(n=102)	NDAHHS(n=440)
Average annual household income	TSH24,754	TSH20,845.77	TSH26,037.58
Mean income from rental payments	TSH64,981.55	TSH62,313.43	TSH65,854.84
Mean income from private or government pensions	TSH6,642.07	-	TSH8,823.53
Mean income from other payments	TSH2638.38	TSH223.88	TSH3431.36
Mean monthly household expenditure	TSH48,206	TSH44,309	TSH49,486
Mean share of total expenditure on food in total household expenditure	39.17%	38.14%	39.38%

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

An observation of the incomes for DAHH and NDAHHS also reveals that households affected by drought generally receive less income from all 3 categories than NDAHHS. A spearman correlation test was performed to find out if there is any significant relationship between household income and drought. This revealed a weak negative relationship (-0.1501) at the 1% significance level. Implying that, household income reduces with the occurrence of

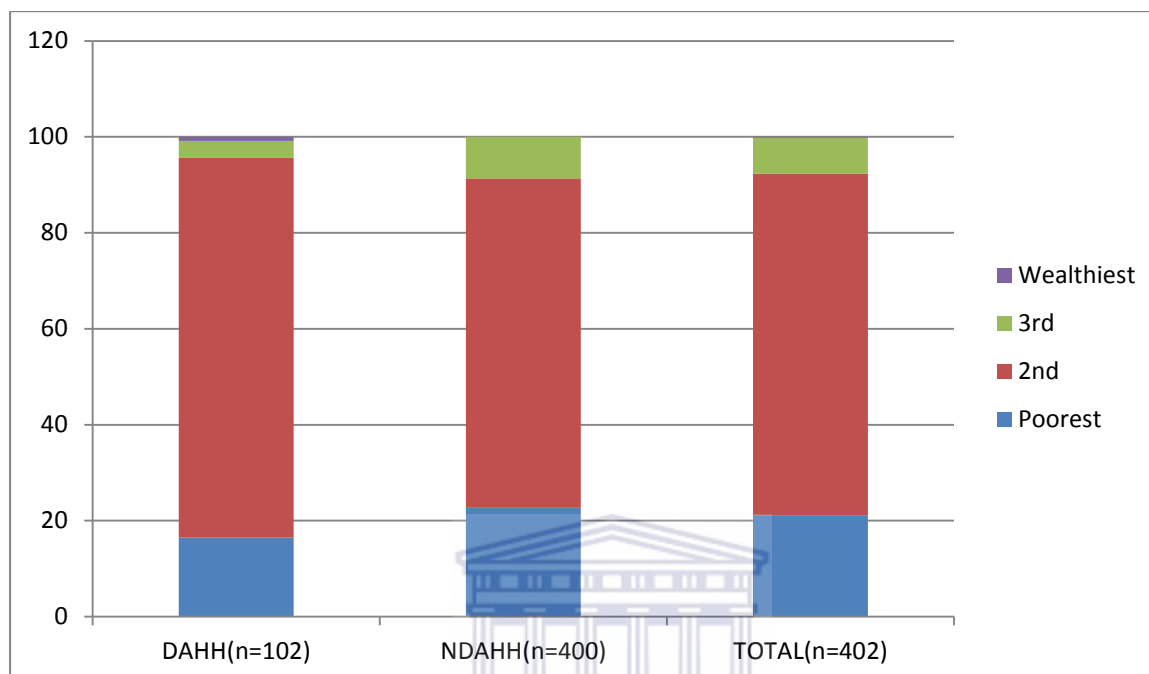
drought. Across the board, household expenditure on food accounted for about 38% of total household expenditure. This is slightly lower than the national average of 42% (Beegle et al, 2009). The difference between the national average and the average computed in this study may be as a result of the fact that, this sample comprises more of agricultural households who mainly grow crops for their own consumption, thus making their expenditure on food a little bit less.

The implications of a situation like this, where households spend more on food may be detrimental in the event of a rise in food prices or fluctuations. This will mean that, households will have to cut down on other vital expenditures like health and education in order to secure food. This may lead to serious food insecurity problems.

#### **4.6.1 Poverty Prevalence amongst households.**

According to the World Banks guide on measuring household poverty, various methods are used for estimating household poverty. These are generally classified as monetary and non-monetary methods. At national, regional and district level, various approaches are used for estimating household poverty. These include the consumption-based poverty measures, the asset-based poverty measure and subjective perceptions approach. The latter can be obtained by asking households their perceived situation on having enough (World Bank, 2009). The consumption-based approach is generally preferred; however, within the context of this study the subjective perceptions approach is preferred because data for its computation is available within the data set.

**Figure 3.5: Household Poverty by drought Status.**



Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

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Figure 4.5 disaggregates households into DAHH and NDAHH. For each subpopulation, households are divided into 4 quintiles, regarded as “wealth quintile”. According to the Tanzania NPS (2014) report, the poor make up the first and second quintiles

In total, 92.38% of households belonging to the two poorest quintiles as shown on Figure 4.5 are poor. It is relevant to note here that, this figure includes absolute and relatively poor households. The figure (92.38%) is significantly higher than the national figure of 68.9% (Tanzania NBS, 2013). Also, worthy of note here is that the national figure represents households that live below the poverty line only, which is below \$1.25 a day.

The disintegration between DAHH and NDAHH showed that 95.66% of DAHH are poor as compared to 91.32% of NDAHH. However, there was no NDAHH that was found in the wealthiest quintile, while 1 DAHH was found in the wealth quintile. Even though the difference of the poverty incidence for DAHH and NDAHH differs only by 4.43%, it indicates a wealth disparity between DAHH and NDAHH. It implies that poverty prevalence amongst DAHH is higher than for households that are not affected by drought. This can be

linked to several factors including fall in income of DAHH that rely on agriculture for income.

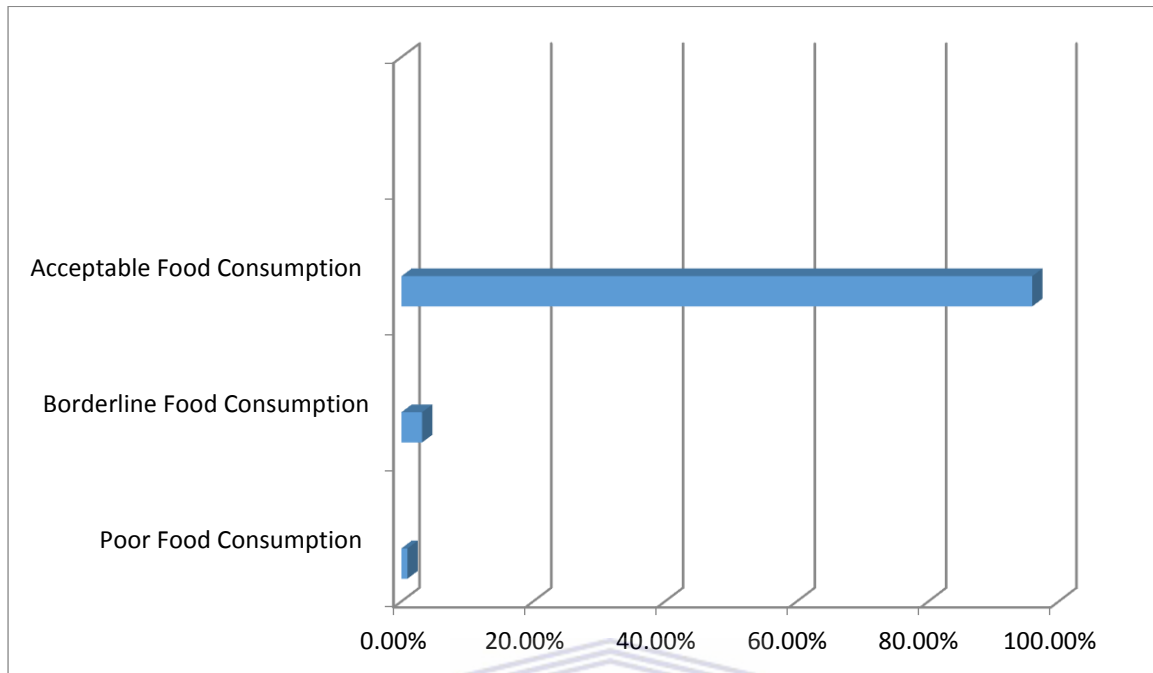
To establish whether household experience of poverty is statistically linked to drought, a value of 1 was assigned to poor households (households within the first and second quintiles) and a value of 0 was assigned to wealthier households (3<sup>rd</sup> and 4<sup>th</sup> quintiles) resulting in a dummy variable. Using a Spearman correlation test, this revealed a somewhat weak relationship (0.1633), even though positive at the 5% significance level. Nonetheless, the results confirm the view that drought and poverty are related (Thurlow, 2009; Kuwornu et al., 2005; WFP, 2012).

#### **4.7.0 Examination of Food availability and access amongst Households**

Recall from chapter 3 that household food consumption level is used as an indicator of both availability and access to food (WFP, 2012). This section analyses food consumption level at zonal, regional and household level and then across gender. Based on their food consumption scores, households are grouped into poor, borderline or acceptable food consumption levels. These three categories represent a poor access and availability of food, a borderline access and availability of food and adequate access and availability of food respectively. This section will be answering research question 3- “How available and accessible food is to households?”. Figure 4.6 below summarises an analysis of the food consumption score.



**Figure 3.6: Northern Tanzanian household food access and availability (Food Consumption Level).**



Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

Contrary to existing literature, suggesting generally low levels of household food consumption, Figure 4.7 shows that they are generally high. About 95.94% of households have an acceptable food consumption level(FCL), meaning that food is adequately accessible and available to them. The average food consumption score(FCS) is 128.2 which is an indication of adequate access and availability of food, given that the minimum acceptable FCS is 35. This average is higher than the national average of 92.6 (WFP CFSVA,2012). 3.14% of households are at a borderline food consumption level while only 5 households experienced poor food consumption (0.92%).The generally high levels of food consumption in Northern Tanzania can be explained by increased implementation of modern agricultural practices in the region since 2011. With an increasing number of households getting involved in large scale farming, agricultural techniques are becoming more sophisticated in the area involving the use of irrigation infrastructure. Additionally, following acute levels of food insecurity in the past decade, it has received a lot of attention in terms of food help both at national and international level (ActionAid, 2014).

Across gender within the sample, comparatively more MHH fell within the category of adequate food access and availability. A proportion of 67.34% of MHH had an acceptable level of food consumption as compared to about 30% of FHH, revealing a disparity across gender lines of access and availability of food. This can be traced to several factors including the low level of education amongst women heading households, low earnings resulting from limited participation in wage employment. Still with regards to farming, the male ‘Masai’ normads, characteristicly move out of the region, usually towards Dar Es Salam to sell their livestock and purchase food from other regions (WFP, 2012). In some cases, they return home with the cash sales.

#### 4.7.1 Situational Analysis of Household Food Availability and Access across Regions

To further understand the access and availability dimensions of food security in this zone, the food consumption level was examined at regional level. The comparism of the patterns across region also involves an examination of regional average food scores and possible reasons for these patterns will be advance. Table 4.8 displays the distribution of households within the 3 FCL across the 4 regions of Northern Tanzania

**Table 3.8: Proportion of households different FCL categories by region**

<b>FCL</b>	<b>Arusha</b>	<b>Kilimanjaro</b>	<b>Tanga</b>	<b>Manyara</b>	<b>Total</b>
Poor	0.55	0.00	0.37	0.00	0.92
Borderline	0.74	0.55	0.74	1.11	3.14
Acceptable	26.57	23.43	29.52	16.42	95.94
Total	27.86	23.99	30.63	12.53	100.00

Source: Authors own computations from WB and NBS Tanzania’s 2012/2012 Tanzanian NPS. (figures are in percentage)

From Table 4.8 Tanga region is seen to have the highest proportion of households who have adequate access and availabilty of food. When compared with Kilimanjaro and Manyara regions, Tanga’s proportion of households in the poor and borderline FCL categories are slightly higher. For Arusha, these categories are slightly lower or the same. However, the proportion of households in the lower FCL categories, is generally low for the whole sample. The low proportions in the poor and borderline categories is expected given the results

obtained from the Zonal level above. Eventhough Manyara is one of the two regions with no households in the category of poor FCL, it has the lowest proporation of households (16.42%) with adequate access and availability to food. This can also be traced to the fact that, the sample population comprises of fewer households (17.53%) from Manyara region. Kilimanjaro, is the most populated region in Tanzania, known for receiving annual rainfall of less than 800mm. Interestingly, this region, like Manyara recorded no household experiencing poor FCL. Only about 0.55% of households, representing 3 households of its 130 households involved in the survey had borderline FCL. Like all the other 4 regions in this sample, the proportion of households in the category of acceptable FCL was highest. Arusha region follows Tanga with the second highest proportion of households with adequate access and availability of food. The proportion of households in the other 2 categories are higher than the proportion in these categories for the other 3 regions.

The adequate access and availability of food to households in Tanga can be traced to the fact that, Tanga was one of the first Northern Tanzanian regions to experience chronic food shortages, and inadequate access to food between 1991 and 1992. As a result, it is generational that farmers in Tanga are able to make the right decision when it comes to planting, harvesting and storing of crops due to their previous experiences with food shortages. They consistently make the right decisions about when to farm, how to rotate crops to cope with dry conditions and how to rotate crops to maintain soil fertility (Khisa, 2014). Households in Arusha have adequate access and availability of food because of the presence of international organisations in the region like the UNICTR and the EAC, comprised of high income earners and spenders. Their presence has opened up the region to small businesses and earning opportunities. Locals have opportunities to earn incomes and be able to cater for their basic needs, food inclusive. Manyara region and Kilimanjaro region are both geographically closest to Arusha than Tanga. These 2 regions are similar in that, they are both touristic destinations in Tanzania. Kilimanjaro is home to Africa's highest mountain and Manyara is known for its wild animal and game reserves. These attractions contribute to government revenue through spending. Thus these regions have received attention from the government and international committee in the past 3 years following high levels of food insecurity in 2011.

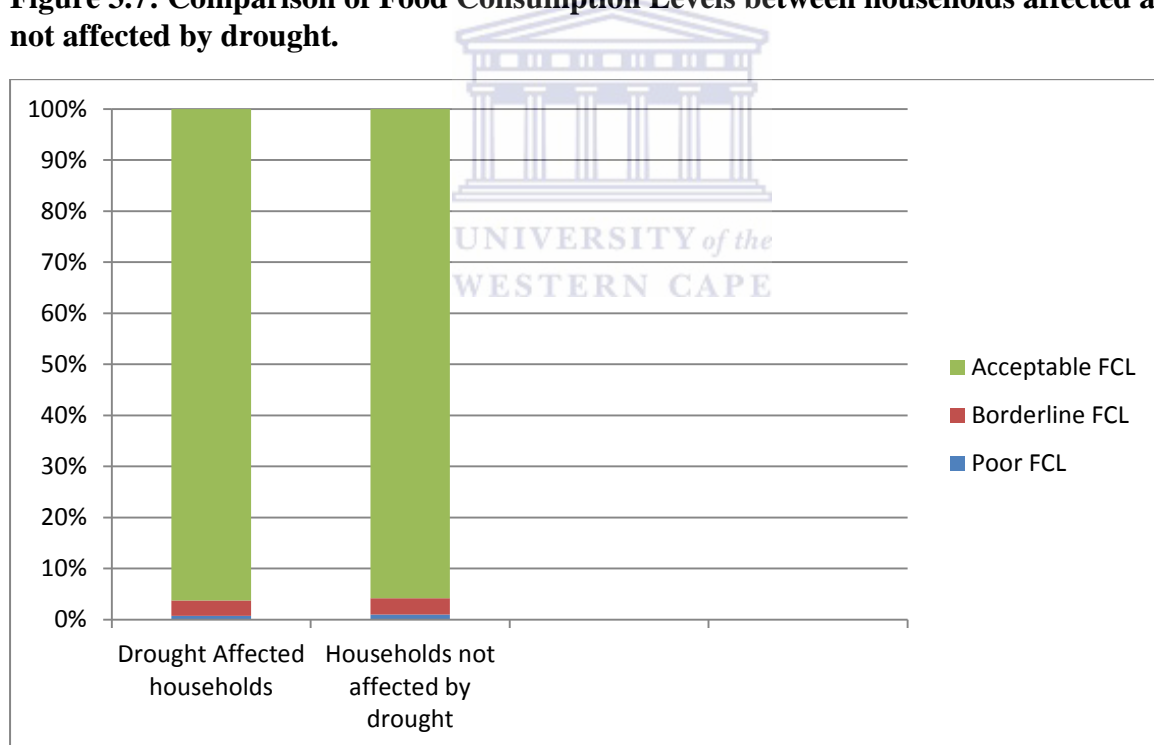
A computation of the individual means of the FCS showed that the average scores for Arusha and Manyara a slightly lower than the zonal average of 128.22. The table below present this

results (see appendix 5). Despite the averages being lower than the zonal average, they are all greater than the national FCS average of 92.6. To avoid duplication, the statistical relationship between drought and Food Consumption will be done in later sections when discussing food security and drought

#### 4.7.2 Examination of Food Access and Availability between households affected and not affected by drought

The household food consumption levels do not differ much for DAHH and NDAH. As expected, DAHH have an average food consumption score of 128.5 which is slightly lower than that NDAH. It is important to recall here that there are more households in the sample that do not experience the drought shock compared to the number that are affected by drought.

**Figure 3.7: Comparison of Food Consumption Levels between households affected and not affected by drought.**



Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS

As observed from Figure 4.7, 96.27% of DAHH had adequate access and availability of food. This proportion was slightly higher than that of NDAH (95.83%). This goes to confirm the assertions of Smith and Haddad (2002) that a drought does not necessarily cause

a fall in the four dimensions of food security. 0.75% DAHH have poor food consumption levels, while 0.98% NDAH fall in the same category. 3.19% of households not affected households fall in the borderline category as compared to 2.99 of households affected by drought.

The resilience of households to drought and other shocks also account for their ability to maintain good levels of food consumption. Also, responses to drought shock is another factor that influences their high FCL. The food consumption levels in this region, in general are quite high given that more households have adequate access and availability of food.

#### 4.8 Food Security Status amongst Northern Tanzania households

Incidence of food insecurity amongst households in Northern Tanzania is low - 3.77%, which is almost half of the national figure of 8.3% (WFP, 2012). By definition, food insecure households are either severely food insecure or moderately food insecure, where their food consumption level is classified as poor or borderline in terms of both quantity and quality (dietary diversification and nutritional value). The 4.60% of food insecure households includes households that are only mildly food secure.

**Table 3.9: Incidence of food security amongst farm households in Northern Tanzania**

Food Security Status	DAHH % (n=102)%	NADHH % (n=440)
Food Insecure	9.48	2.50
Food Secure	90.52	97.50
<b>Total</b>	<b>100.00</b>	<b>100.00</b>

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS

Table 4.9 presents a further disintegration - the incidence of food insecurity by households experiencing and not experiencing drought revealed some significant differences. The food insecurity incidence for NDAH 2.50% is almost 4 times less than the incidence for DAHH (9.43%). Of the 102 households classified as households experiencing dry conditions, 90.27% of them are food secure as compared to 97.50% of households not affected by

drought. What this implies is that for households experiencing dry conditions, their risk of food insecurity is higher than households having relatively more water available. To test this statistically, a chi squared test was computed yielding p-value of 0.000. This is interpreted to mean a significant association between food insecurity and drought.

Consequently, eventualities or other shocks and stresses like poverty can exacerbate the food insecurity situation for households who are vulnerable to drought. Beyond drought, other factors relevant to the discussion of food insecurity amongst households in the case study zone are examined in the sections that follow.

#### **4.8 Understanding the Food security status: exploration of underlying factors that influence food security in Northern Tanzania.**

As discussed in preliminary chapters, WFP(2012) identifies other factors that can influence food security. These factors mostly have a negative effect on the availability and access to food causing food shortages amongst households. In the light of this, some of these factors are discussed below using contingency tables and correlation test. Table 4.6 displays results from a cross tabulation of household wealth quintiles and food security status. It can be observed that, 8% of food insecure households find themselves in the poorest category while no household falls within the wealthiest quintile.

##### **4.8.1 Food Security and household poverty**

**Table 3.10: Household Poverty and Food security status**

<b>Food Security Status</b>	<b>Poorest N=100</b>	<b>2<sup>nd</sup> N=266</b>	<b>3<sup>rd</sup> N=35</b>	<b>Wealthiest N=1</b>	<b>Total N=402</b>
Food insecure	8%	3.57%	0.00%	0.00%	4.24%
Food secure	92%	96.43%	100%	100%	95.76%
Total	100%	100.00%	100.00%	100.00%	100.00%

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS

In the second quintile, food insecurity is comparatively higher than the 3rd and the last quintile. Given these, some level of relationship is revealed between household wealth and food insecurity. As the results presented indicate, poorer households have the tendency to be more food insecure than wealthier households. Notice that, as one moves from left to right, across the different quintiles of household wealth, food security increases while food insecurity falls.

To statistically verify these findings, the Spearman correlation test was applied to investigate if there was any relationship between poverty and food insecurity by creating dummy variables (where poor households=1 and wealthy households=0; food insecure=1 and food secure=0). This yielded a somewhat weak positive relationship (0.1009) at a 5% significance level. Thus the poorer a household the more food insecure it is likely to be.

#### 4.8.2 Gender and Food Security

Across gender, the study also revealed that, while 96.56% of MHH are food secure, 94.51% of FHH are food secure. There is only about a 2% difference in the incidence of food insecurity between MHH (3.44%) and FHH (5.49%). This validates various claims including that of the IF Coalition (2013) that FHH tend to be more vulnerable to food insecurity than MHH.

**Table 3.11: Incidence of food insecurity by gender of household head**

<b>Food security status</b>	<b>Male(n=378)</b>	<b>Female(n=155)</b>	<b>Total(n=542)</b>
	<b>%</b>	<b>%</b>	<b>%</b>
Food secure	96.56	94.51	95.94
Food insecure	3.44	5.49	4.06
Total	100.00	100.00	100.00

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS

To test this statistically, a Phi-correlation test was implemented where FHH =1 and MHH=0; food insecure=1 and food secure=0. This revealed a which revealed a fairly weak positive

(0.2635) relationship between FHH and food insecurity. However, it is appropriate to say the FHH are more food insecure than male headed households.

### 4.8.3 Smallholder farming and Food Security

Due to the challenge of converting the varying measuring units used for the many food crops captured in the NPS 2012/2013 study, household farm sizes, categorized by this study into smallholders, medium and large farming households was used to determine the relation between the size of area cultivated and food insecurity. The inclusion of this section is due to the high proportion of farm households that make up the sample (344) and also given the direct effect the drought has on rain fed agriculture. Table 4.12 below, shows the status of food security amongst households cultivating different farm sizes.

**Table 3.12: A cross tabulation of farm sizes and food insecurity**

<b>Food security Status</b>	<b>Smallholder farming Households n=336 (%)</b>	<b>Medium farming households n=34(%)</b>	<b>Large scale farming households n=171(%)</b>
<b>Food Secure</b>	96.13	97.06	98.00
<b>Food insecure</b>	3.87	2.94	2.00
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS

It is observed from above that the incidence of food insecurity for smallholder farming households is 3.87%, which is slightly higher than the figures for medium farming households (2.94%) and large farming households (2%). In summary, food security increases as the area of land cultivated by farm houses increases. On the other hand, food insecurity decreases as the area of land cultivated increases. This implies that, increased food production results from increasing the size of land cultivated by farm households. This allows households to increase shares of food obtained from their own production. In addition to increase in shares of household food, cash resources are also likely to increase due to increased production resulting from improved access to cultivable land. With increase in cash resources, households involved in agriculture are able to access variety of nutritious food and also invest in other non-agricultural activities. Thus in the event of a drought they will not suffer the effects of loss of income. This goes to underscore Malthus' food availability

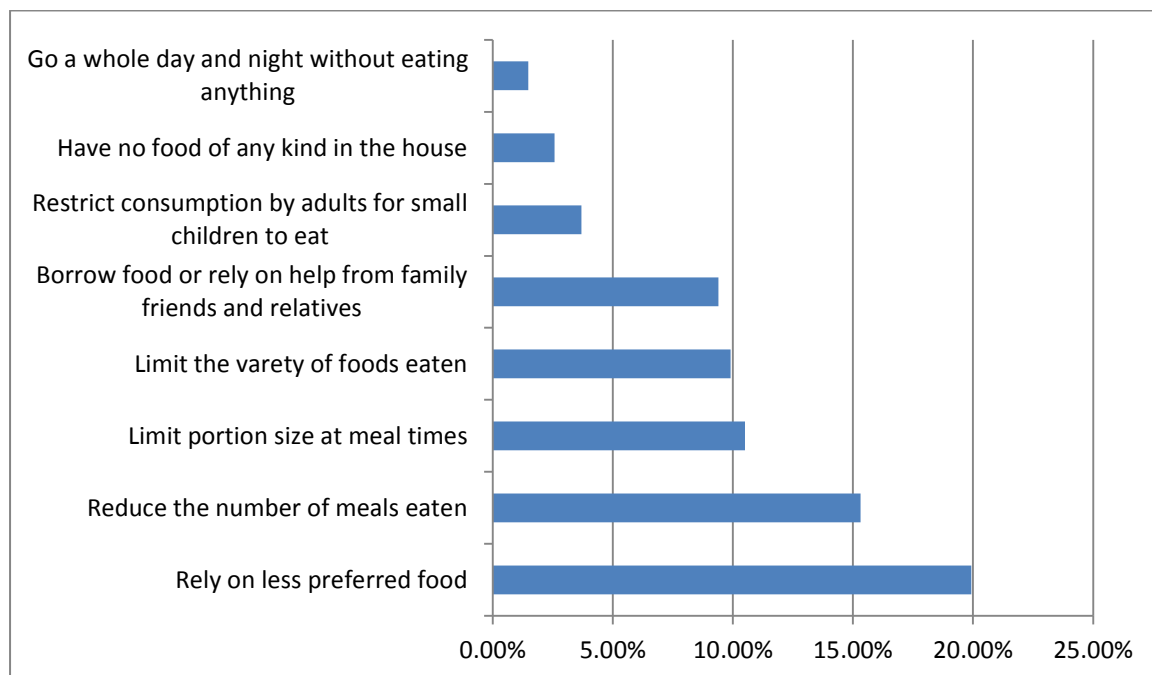


perspective (Greenland, 2005) and remains core to basis of the food sovereignty paradigm as discuss earlier. A further statistical test of a percieved relationship between farm sizes(categorised), and food insecurity revealed the contrary. Results from a chi-square test gave a value of 2.2956 at a p-value of 0.862, upholding the null hypothesis that the two variables are independent.

#### 4.9 Food Shortage Coping Strategies

During periods of food shortages, households in Northern Tanzania resort to a series of spontaneous responses, known as coping strategies. These coping strategies are not carefully thought strategies but largely depend on the intensity of food scarcity. Out of the 8 coping strategies shown in Figure 4.8 below, households preffered relying on less preferred foods (19.92%) and reducing the number of meals eaten (15.10%). These are immediate responses taken by households where they adjust their food consumption behaviour by opting for foods that are less expensive and less nutritious or reduce their calorie intake. In conformity with Young et al., (2001), that households commonly change their diets or reduce food intake when faced by food shortages, these two coping strategies are less drastic and they have no adverse effect on household physical resources and cash.

**Figure 3.8: Household Food Coping Strategies.**



Source: Authors own computations from WB and NBS Tanzania’s 2012/2012 Tanzanian NPS

Other coping strategies common to households included limiting portion sizes(10.15), and the variety of foods eaten(9.9%). While these two strategies may not have a negative implication on household cash and physical resources, they reduce the households access to adequate and nutritious food intake.

Household heads affected and their dependents do not consume a balanced diet, increasing their vulnerability healthrisk to obesity and cancers (Curinga, 2015). Further a small percentage of households tend to adopt more radical coping strategies such as having no food in their household (2.58%) and going a whole day and night without eating anything (1.48%). Also these have serious health implications as articulated by Sen (1981) that, a complete disruption of households physical, social, financial, natural and human endowments is likely to have serious health consequences and possibly death. This justifies the assertion of WFP, that contrary to common thinking that AIDS, malaria or tuberculosis are more deadly, hunger and starvation are the number one causes of death. Thus for such households, food aid/assistance is necessary to limit their usage of such strategies. In addition to the above 5 mentioned household adjustments to food shortages, households also restrict consumption by household for small children to eat (3.69%). They do this in an attempt to satisfy the food consumption requirements of children within the household. Some households borrow food, or rely on help from friends and relatives (9.40). This tends to affect household resources mildly.

The examination of coping strategies to determine household access to food using their universal severity weights(USW) as assigned by WFP also reveals that households generally have access to food indicating adequate food consumption levels. The USW indicates the severity of a coping strategy, where a strategy with a smaller USW is a less severe strategy than one with a bigger USW. Results above show that, most households adopted the coping strategy of relying on less preferred foods and less expensive food which carries a UCW of 1. Only 3.69% of households adopted strategies with high severity weight like restricting adult food consumption for children to eat – which carries a weight of 3. WFP (2012) articulates that, household adoption of more severe coping strategies increases their coping strategy index (CSI) which indicates food insecurity and deteriorating household resilience.

#### 4.10 Assessing the impact of drought on household Food Security

In this section, an attempt is made to establish the actual impact of drought and household resilience on household food security by carrying out a logistics regression using the logistics regression command in STATA. A detailed presentation of the variables included on the model) is first presented. This is followed by a presentation of the regression results and an interpretation.

#### 4.11 Definition of Household variables used

In order to carry out the logistics regression, variables four variables were used, food security, drought and gender . These variables are defined in the table below.

**Table 3.13: Definition of variables**

Variable	Definition
Food Security(FS)	Dummy for household food security (0=food insecure, 1=food secure)
Gender (GN)	Dummy for gender of household head (Male=1, Female=0)
Drought (DR)	Dummy for household drought (DAHH = 1 and NDAHH=0)
Farm Size(FS)	Area cultivated by household in survey year (acres)
High Food Prices	Dummy for high food prices (HH experiencing high food prices=1; households not experiencing high food prices =0)
Age (AG)	Age of households in years
Poverty	Dummy for Poverty (Poor=0 and wealthy =1)

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS

Based on the above table, the logistics regression expression in STATA was implemented as follows:

*logit FS DR GN FS HFP AG*

Table 4.14 below shows results from this regression model. Of the 542 households observed, 447 were included in the overall regression estimates.

**Table 3.14: Results from the Logistic Regression Model**

FOOD SECURITY STATUS						
Explanatory Variables	Coefficients	Standard Error	Z	P>/z/	95% conf.Interval	
<b>Drought Score</b>	2.32914	.520723	4.47	0.000	1.30854	3.349739
<b>Farm Size</b>	-.1276917	.2556253	-0.50	0.617	-.628708	.3733247
<b>Male</b>	-.3051604	.459646	-0.66	0.507	-1.20605	.5957292
<b>High Food Prices</b>	1.2560358	.5024536	0.51	0.610	-.7287551	1.240827
<b>Age</b>	-1.026597	.1230545	0.19	0.850	-.2178461	.22645185
<b>Poverty</b>	1.291799	.298843	-3.51	0.00	-1.60064	-.4525547
<b>Constant</b>	4.631264	1.682519	2.75	0.006	1.333586	7.928941

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS

The Likelihood Ratio (LR), chi square (27.36) test that at least one of the predictor regression coefficients in the model is not equal to zero. The null hypothesis is that, all of the regression coefficients in the model are equal to zero. In other words, it is the probability of obtaining the chi-square statistic, in this case 27.36, if there is no effect on the predictor variable. Also,

because of the small P-value for the LR test (0.001), it can be concluded that at least one of the regression coefficients is not equal to zero. Hence the model is statistically significant. From Table 4.10, farm size, gender (being male), high food prices and age were found to be insignificant predictors of household food insecurity. For instance, while being a household that experienced high food prices increases food insecurity by 1.2 it is not statistically significant. This is interpreted to mean that for households who experience increases in food prices, their food insecurity level increases by 1.2 places (downwards) given a food insecurity indication of similarly, the age variable failed to exert a significant effect on food consumption despite yielding a coefficient of approximately 1.03.

It is also observed from table 4.10 that, drought and poverty demonstrated the expected effects, all at the 5% significance level. Being a poor household yielded a coefficient of 1.3 on the average, meaning that being a poor household increases the food insecurity level by 1.2 more. This confirms the results obtained in earlier parts of this chapter.

As expected, being a DAHH (drought score), exerted the strongest pull on household food insecurity. With approximately 2.3 points *ceteris paribus*, which is about 6.8% out of the optimal food insecurity threshold of 34.5 in this study. What this implies is that, a fall in the drought score by 1 brings about a fall in food security by 2.3 points or 6.7% to households at the 5% significant level.

Based on the analysis done so far for the four regions of Northern Tanzania, the incidence of food insecurity seems to be low, and most prevalent amongst FHH and smallholder farmers. Drought as illustrated exerts the strongest pull on household food insecurity. Thus there is need for adequate measures to be taken by the Tanzanian government and other stakeholders to reduce the negative impact of drought on household food security.

## CHAPTER FIVE

### SUMMARY OF KEY FINDINGS, RECOMMENDATION AND CONCLUSION

#### 5.1 Introduction

This chapter touches on the findings and obtained from the descriptive and inferential statistics carried out in chapter 4. This will include socio-demographic characteristics, shocks that affect households, the extent to which the drought shock affects households, shock coping strategies adopted by households, household resilience to shocks and stresses and it highlights the state of food security and other underlying factors. Further, a verification of the study hypotheses is done. The last section of this chapter gives policy suggestions based on findings in chapter 4.

#### 5.2 Summary of key findings

From the data analysis carried out in chapter 4, 5 key lesson-learning findings were brought to light. Some of these lessons which have crucial policy implications are outlined below.

##### 5.2.1 *Socio-Economic and Socio-Demographic characteristics*

In Northern Tanzania, majority of the household heads are married (60.16% either in a monogamous or polygamous marriage). Households are characterised by relatively small families with an average household of 4.8 persons and headed by older persons with mean age of 49 years. In time of drought and food scarcity, small size houses tend to be favourable, as there are fewer mouths to feed. Even though the educational level attained by household heads is generally low, majority of household heads (77.12%) have some level of formal education, and more MHH are educated than FHH. As a result of lower educational attainment amongst FHH, they tend to be more involved in occupations like agriculture and fishing which do not require any formal educational attainment. There by limiting their livelihood options.

With regards to occupations, households are involved in both public service, religious service and a total of 63.47% of households are involved in agriculture and livestock farming. The major crops cultivated in the area are maize, paddy, sorghum, beans, cowpeas, water melon and groundnut.

### ***5.2.2 Drought and other shocks that affect households***

All 542 households have suffered some kind of shock or stress in the previous two years. The most common 2 shocks faced by Northern Tanzania households are increase in food prices which affects 19.34% and the drought shock affecting 17.63%. Other difficulties experienced by households included water shortages, crop pests which destroyed crops and reduced harvest, the dead of livestock and loss of employment. Of 542 households, 18.82% of them experienced dry conditions exhibited by inadequate water available for their households. Majority of the households experienced severe drought (40.19%) while only like 16.67% experienced a milder form of drought.

The study also revealed that, up to 56.86% of households involved in agriculture experienced dry conditions with mostly households involved in agriculture with small holder farmers being affected the most. Across the four Northern Tanzanian regions, Kilimanjaro region had the highest number of households experiencing dry conditions -31.58 while Manyara region recorded lowest with only 16.42%. Arusha and Tanga recorded 24.61% and 29.63% respectively.

### ***5.2.3 Shock Coping Strategies Adopted by households***

As compared to 69.60% of households that respond to shock in order to restore their welfare levels, 40.40% of households engage in at least one strategy in an attempt to rectify the effect of a shock that they experience. Most households, especially households that did not experience the drought shock (13% of them) turn to rely on their savings while others migrate to neighbouring towns and villages or ask help from family and friends, and livestock owners sell their livestock, mostly found amongst the drought category.

The study also revealed that, households that did not adopt coping strategies are more resilient to shocks and stresses (83.20%) than households that adopt coping strategies (82.40). A chi-square test applied to test for a relationship between resilience and coping strategies yielded a P-value of 0.006, confirming the null hypothesis that a relationship exist between both variables.

#### ***5.2.4 Household Income and Expenditure***

Three main sources of incomes are categorised for households: rental payments (85.41%), private and h=government pensions (4.1%) and other payments (savings, real estate sales, gambling, agricultural and non-agricultural asset sale) (8%). Average annual income for DAHH (TSH20,845.77) is slightly less than the average annual income for the total population TSH24,754 (US\$15.63, where TSH1.00 equals to an average annual income of US\$0.00063 for the period under study 2012/2013). On the other house average annual income for NDAH is slightly higher (TSH26,037.58) than that of the total population. DAHH, generally receive less income than NDAH. Drought and income have a weak negative correlation of -0.1501 at a 1% level of significance.

The most expendable household food item is food, with a share of 39.17% of total household expenditure. The incidence of poverty is 91.32% for NDAH and 95.66% for DAHH, indicating a disparity in terms of wealth for DAHH and NDAH. Poverty and drought are correlated; 0.1633 (5% level of significance).

#### ***5.2.5 Food Access and Availability***

Households in Northern Tanzania generally have adequate access and availability of food. This is exhibited by majority of households (95.94) having a food consumption score of greater than 35, while only 4.06% are below 35. The average FCS stands at 128.2, higher than the national average of 92.6. However, the proportion of FHH with adequate access and availability of food is half the proportion of men (67.34%), also indicating a staggering disparity in terms of wealth.



Across the four regions of Northern Tanzania, the incidence of food availability and access is greatest for Tanga region – 29.52%, and lowest for Manyara region – 16.42%. For Kilimanjaro and Arusha, which are geographically close to each other, the incidence stands at 26.57% and 29.52% respectively. Various reasons account for this difference in figures across all four regions. The percentage of DAHH that have adequate access and availability to food is higher than that of NDAH (95.83) by 0.34%.

### ***5.2.6 Food Insecurity Status of households within the zone***

The food insecurity incidence is high amongst DAHHs, about 9.48% as compared to 2.50% for NDAHs. Across the board, 3.77% of households in Northern Tanzania are food insecure. Also, 11.57% of households that fall amongst the poorest category are food insecure. A Spearman's correlation test revealed a weak positive relationship between food insecurity and poor households at a 5% level of significance. Majority of the food insecure households are FHH which account for 5.49% of food insecure households as compared to 3.44% of MHH. A Phi correlation test revealed a value of 0.2635 indicating a positive relationship between FHH and insecurity about 3.87% of smallholder farmers are food insecure compared to 2.94 medium size farmers and 2.00 large scale farmers.

During periods of food shortages, the most common food coping strategies adopted by households include reliance on less preferred foods (19.92%), reducing the number of meals eaten (15.10%), limiting portion sizes (10.15), limiting the variety of foods eaten ((9.9%). Other strategies included forgoing adult consumption for children, reliance on casual labour for food, asking help from friends and relatives and purchase of food on credit. On the extremes, some households go for a whole day without eating, do not buy food for their households and feed working household members at the expense of household members that do not work.

### ***5.2.7 Impact of drought on household food security***

Household poverty and drought, significantly demonstrate positive impacts on household food security at a 5% significant level. Gender, high food prices, farm size and age were found to be insignificant predictors of household food security/insecurity.

### 5.3 Verification of Hypothesis

Drawing from the Tanzania NPS (2012/2013) survey, precisely on the data on Northern Tanzania, the study sought to investigate three main hypotheses

#### *Hypothesis 1: The occurrence of drought reduces food security levels*

By using food consumption score as a proxy for modelling food security and the drought vulnerability index as a proxy for quantifying drought, the study found that, As expected, being a DAHH (drought score), exerted the strongest pull on household food insecurity. With approximately 2.3 points, this is about 6.8% out of the optimal food insecurity threshold of 34.5 in this study. What this implies is that, a fall in the drought score by 1 brings about a fall in food security by 2.3 points or 6.7% to households at the 5% significant level.

#### *Hypothesis 2: Household adoption of shock coping strategies is associated with household resilience*

Using household recovery rate from difficulties as a proxy for resilience and a dummy variable created for households that adopted coping strategies (where households that adopted coping strategies=1 and households that did not=0), a chi square values of 21.6847 was obtained at a P-value of 0.006. Based on this findings, the hypothesis that households' adoption of coping strategies and households resilience levels is validated

### 5.4 Key Lessons and Policy Recommendations

In this section, implications of the key findings outlined above will be examined by proposing policy actions that important for reducing the food insecurity effect of drought.

- Drought is one of the most common shocks that affects households in Northern Tanzania, affecting more households in Kilimanjaro region than Arusha, Tanga and Manyara
- Households that are affected by drought (household with lower drought scores) tend to be more vulnerable to food insecurity than households not affected by drought.

- In addition to drought, other factors like high food prices and poverty account for the incidence of food insecurity in the zone. Thus, efforts at tackling food insecurity across the four regions should not only concentrate on reducing the effect of drought.
- Food consumption levels in Northern Tanzania are generally, with Tanga region having the largest proportion of households what have adequate food availability and access.
- While food consumption levels are generally high in Northern Tanzania, there is need for households involved in agriculture to diversify livelihoods and be more involved in other livelihood activities

#### **5.4.2 Policy Recommendations for eradicating food insecurity in Northern Tanzania**

Based on the findings of this study, food insecurity levels in Northern Tanzania are generally low as exhibited by household food consumption scores. Drought accounts for 6.7% of food insecurity. This section will make policy recommendations that will be necessary for reducing the effect of drought on foods security and eliminating food security in general.

##### **National Efforts at improving drought conditions**

This study indicated that not less than 60% of households in this zone are involved in agriculture with smallholder farmers making up majority of the farmers who mostly rely on rainfall for the growth of their crops. The government of Tanzania should concentrate on investing in the soil in this area and on managing the availability of water. This strategy was successfully implemented in countries of the Limpopo river basin. It be done through improved development and management of fragile catchment areas and river basins, including small-scale irrigation. Improving water management could also be done through integrated catchment management, focusing on holistic water use, with a balance between all land uses, including plantation forests, efficient irrigation systems, safe drinking-water, water for cattle, and water harvesting. There is also need from the government in reviewing and assessing the appropriateness of current crop production patterns and possibilities in support of more intensified crop diversification policies. This kind of government support will increase crop productivity. Aside from the benefits that would accrue to households, increased crop productivity resulting from such support would assure increased food availability at the national level as well.

## **Rehabilitation of rangeland**

This study also revealed that most households experience the household shock of the dead of cattle due to animal pest and lack of grazing land. Thus there is need for the government and households in the region to concentrate on the introduction of sustainable livestock management, group and individual title to land. There is also need for some areas in various regions of the zone to be declared as 'zero grazing area' in order to make use of them during times of drought.

## **Creating an environment that induces non-farm employments**

Most importantly, in this region were most households are involved in agriculture; there is the need for the government, non-governmental and the private sectors to create the right environment. In rural districts of this region like Karatu in Arusha region were the incidence of food insecurity is most felt, their accesses to infrastructure like electricity, markets, roads and schools is limited. This inability to access infrastructure serves as a disincentive for private sector investments. Thus it prevents households of the opportunity to gain non-farm employment. Thus, it is important for the government with the support of the private sector to improve infrastructure in the rural districts of Northern Tanzania.

## **Improving local employment opportunities.**

From this study, unemployment is generally low, with many more female unemployed than male. In addition to this, the non-farm activities which households engage in are livestock production. According to the WFP (2012), tourism is a growing industry in Tanzania who's potential has not yet been fully explored. If there are continues efforts by the Tanzanian Tourism Authority and other relevant stakeholders to fully explore the potential of this sector, it will induce households to take up more employment opportunities in this sector. Thus creating an environment for livelihood diversification, increase food consumption levels and improve the development of enterprises in the area. Thus, there should be efforts at facilitating the development of local employment opportunities.

## **Safety nets for vulnerable households**

For households that fall in the poor category and in addition are affected by drought, it may be challenging for them to cope with food insecurity. It is recommended that there should be increased food assistance schemes by NGOs and the government be implemented.

### **5.4.3 Expanding the frontier of research in livelihoods and food security**

- \* There is need for similar studies to be carried out in regions of Tanzania like the Lake regions which are also close to drought affected areas of East Africa-Kenya and Somalia. This could reveal useful trends that could be compared with Northern Tanzania.
- \* This study attempted to examine drought and food security across gender. There is need to carry out more in depth that aims at understanding the effect the gender dynamics of drought and food security.
- \* Also, given that most households in this zone were farm households and apparently the most food insecure and most affected by drought, there is need to carry out a study that analysis the effect of drought only on farm households. In addition to unravelling key limiting factors, such a study will also will make way for the proposition of relevant solutions for increasing farm household participation in non-farm employment activities.
- \* The study also revealed that, food assistance programs and programs implemented may be playing a key role on reducing the incidence of food insecurity in the region. It is thus important to further research on how food assistance programmes in general impact on household food security in Northern Tanzania.

## 5.5 Conclusion

Drawing from data collected from Northern Tanzania, for the Tanzania National Panel Survey, Wave 3 (2012/2013), this study demonstrated the extent to which drought amongst households in Northern Tanzania impacts household food security. The results obtained showed that, reducing household drought score by 1 impacts food security negatively, demonstrating the importance of improving household vulnerability to drought.

Moreover, the study has shown that, in addition to drought there are other factors that influence households food insecurity such as poverty levels. Also household food insecurity is likely to be linked to high food prices and age. In effect, the study showed that in policies on food security, food availability is an important aspect that cannot be compromised. In addition, there are indications from the study of the need for households to engage in other non-farm activities as farm households easily fall prey to the food insecurity effect of drought. Policy makers, especially in SSA and Northern Tanzania, need to take note of this, and strike a balance in their efforts to reduce poverty.

Given that this study has generated new perspectives to understanding the relationship between drought and food insecurity, it is envisaged that the policy recommendations will give support to both local and international policy makers in their effort to support households vulnerable to drought

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## APPENDICES

### Appendix 1: Cross Tabulation of gender of household heads and unemployment MHH and FHH employment

Occupation Status	Gender		Total
	Male	Female	
Unemployed	33.33%	66.67%	<b>100</b>

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

### Appendix 2: Cross Tabulation of gender and highest grade of formal education

Gender of Household Head	Highest Level of Formal Education			Total
	Primary	Secondary	University	
Male	272 (65.5)	36 (8.7)	4(0.96)	312 (75.18)
Female	90 (21.68)	12 (2.89)	1(0.24)	103(24.81)

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

### Appendix 3: Drought across occupation

droughtcat	What was [NAME]'s main occupation for the past 12 months?											Total
	AGRICULTU	FISHING	MINING	GOVERNMENT	PARASTATA	PRIVATE S	NGO/RELIG	WITH EMPL	WITHOUT E	UNPAID FA		
1	4 0.74	0 0.00	0 0.00	0 0.00	0 0.00	2 0.37	1 0.18	0 0.00	6 1.11	0 0.00		13 2.40
2	18 3.32	1 0.18	0 0.00	2 0.37	0 0.00	10 1.85	1 0.18	0 0.00	5 0.92	1 0.18		41 7.56
3	21 3.87	0 0.00	0 0.00	2 0.37	0 0.00	3 0.55	0 0.00	0 0.00	4 0.74	0 0.00		31 5.72
4	15 2.77	0 0.00	0 0.00	0 0.00	0 0.00	1 0.18	0 0.00	0 0.00	1 0.18	0 0.00		17 3.14
5	286 52.77	3 0.55	6 1.11	11 2.03	2 0.37	49 9.04	3 0.55	11 2.03	51 9.41	5 0.92		440 81.18
Total	344 63.47	4 0.74	6 1.11	15 2.77	2 0.37	65 11.99	5 0.92	11 2.03	67 12.36	6 1.11		542 100.00

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

### Appendix 4: Strategies adopted by households to maintain welfare level

What did your household do in response to this [SHOCK] to try to regain your for	Freq.	Percent	Cum.
RELIED ON OWN-SAVINGS	56	8.46	8.46
RECEIVED UNCONDITIONAL HELP FROM RELATI	43	6.50	14.95
RECEIVED UNCONDITIONAL HELP FROM GOVERN	3	0.45	15.41
RECEIVED UNCONDITIONAL HELP FROM NGO/RE	2	0.30	15.71
CHANGED EATING PATTERNS	12	1.81	17.52
EMPLOYED HOUSEHOLD MEMBERS TOOK ON MORE	2	0.30	17.82
ADULT HOUSEHOLD MEMBERS WHO WERE PREVIO	9	1.36	19.18
HOUSEHOLD MEMBERS MIGRATED	3	0.45	19.64
REDUCED EXPENDITURES ON HEALTH AND/OR E	6	0.91	20.54
OBTAINED CREDIT	1	0.15	20.69
SOLD AGRICULTURAL ASSETS	1	0.15	20.85
SOLD LAND/BUILDING	2	0.30	21.15
SOLD CROP STOCK	2	0.30	21.45
SOLD LIVESTOCK	31	4.68	26.13
INTENSIFY FISHING	2	0.30	26.44
SENT CHILDREN TO LIVE ELSEWHERE	3	0.45	26.89
ENGAGED IN SPIRITUAL EFFORTS	28	4.23	31.12
DID NOT DO ANYTHING	433	65.41	96.53
OTHER (SPECIFY)	23	3.47	100.00
Total	662	100.00	

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

## Appendix 5: FCS means for various regions

Table 5.5 Average Food Consumption Scores

Region	Average
Arusha	126.36
Kilimanjaro	133.34
Tanga	131.11
Manyara	119.11

Source: Authors own computations from WB and NBS Tanzania's 2012/2012 Tanzanian NPS.

## Appendix 6: Crosstab of gender by Marital Status (Household Heads)

Gender of Household head	Marital Status of household Heads							Total
	Monogamy	Polygamy	Living Together	Separated	Divorced	Never Married	Widow(er)	
Male	246(45.39)	54(9.96)	325.90	9(1.66)	0(0.00)	24(4.43)	13(2.40)	<b>378(69.74)</b>
Female	7(1.29)	21(3.87)	2(0.37)	26(4.80)	17(3.14)	16(2.95)	75(13.84)	<b>164(30.26)</b>
Total	253(46.68)	75(13.84)	34(6.27)	35(6.46)	17(3.14)	40(7.38)	88(16.24)	<b>542(100)</b>

Source: Authors own computations from 2012/2012 Tanzanian NPS. Note that the values in brackets are percentages

**Appendix 7: Cross Tabulation of gender and highest grade of formal education**

Gender of Household Head	Highest Level of Formal Education			Total
	Primary	Secondary	University	
Male	272 (65.5)	36 (8.7)	4(0.96)	<b>312 (75.18)</b>
Female	90 (21.68)	12 (2.89)	1(0.24)	<b>103(24.81)</b>

Source: Authors own computations from 2012/2012 Tanzanian NPS. Note that the values in brackets are percentages

