

UNIVERSITY OF ZULULAND



**INVESTIGATING THE IMPACT OF AND RESPONSE TO DROUGHT BY SMALL
SCALE FARMERS IN MFEKAYI, MTUBATUBA, KWAZULU NATAL.**

BY

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DECLARATION

I Ziphozethu Bukhosini declare that this research project: ***Investigating the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal*** is the product of my own work and effort. I have to the best of my knowledge and belief acknowledged all sources of information in line with normal academic conventions. This research project is original and has not been submitted for examination either in whole or in part for a degree at this or any other university.

Student's signature:

Student number:

Date:

DEDICATION

This research project is dedicated to my late father Mbongeni Victor Bukhosini and my cousin Aubrey Senzo Ndlovu for their valuable contribution to my life as a young man. I will forever cherish the love and support they gave to me through thick and thin. May their souls rest in immutable peace.

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LIST OF ABBREVIATIONS

ADM – African Drought Monitor
CO₂ – Carbon Dioxide
CWWG – Crop Weather Water Group
DARD – Department of Agriculture and Rural Development
DFID – Department for International Development
DFW – Department of Fish and Wildlife
EA – Eastern Africa
EWI – Early Warning Information
FEWSNET – Famine Early Warning System Network
FSA – Farm Service Agency
GDP – Gross Domestic Product
GGP – Gross Geographic Product
IDP – Integrated Development Planning
IKS – Indigenous Knowledge Systems
KZN – KwaZulu Natal
MASL – Mahaweli Authority of Sri Lanka
NAP – Non Insured Crop Disaster Assistance Programme
NDMC – National Drought Mitigation Center
NGO – Non Governmental Organisation
NRC – National Research Council
SSA – Sub-Saharan Africa
StatsSA – Statistics South Africa
UNCCD – United Nations Convention to Combat Desertification
USDA – United States Department Of Agriculture

ABSTRACT

The study investigated the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal between the periods 2014 to 2016. In order to achieve this, the study adopted a mixed method approach in the form of convergent parallel design. The results indicated that small scale farmers suffered numerous livestock deaths and crop failure as the impacts of persistent drought. Moreover, there were further challenges related to drought such as water shortage and low soil moisture. As such, small scale farmers realised low income during drought and this was worsened by the fact that most were unskilled and lacked resources. However, there were various measures taken by small scale farmers to respond to drought. These actions include buying expensive supplements and the application of indigenous knowledge such as livestock movement. There are further challenges experienced by small scale farmers in dealing with drought such as drought recovery costs, lack of information and further livestock deaths. On the basis of this, the study recommends government intervention and stakeholders support small scale farmers with the relevant equipment such as educational support and provision of proper resources for. In addition, the study recommends that the government should provide relief assistance and design a policy that specifically addresses small scale farmers concerns.

Key words: Drought, small scale farming, drought vulnerability, drought adaptation

CHAPTER ONE: INTRODUCTION AND ORIENTATION OF THE STUDY.

1.1. Introduction

Chapter one focuses on the introduction and orientation of the study, which lays the foundation of this study. This is achieved by discussing the background of the study, as well as the problem statement and the aim and objectives of this study. This chapter also outlines the structure of the whole thesis and the final part is the conclusion.

1.2. Background of the study

Drought is known to be the most extreme natural disaster that has a negative impact on social, economic and environmental conditions globally (Bell et al., 2018, Lei et al., 2016). The impacts of drought have been noticeable through farming practices that farmers engage in as a way of making a living worldwide (Keshavarz et al., 2017). Several countries in the Northern hemisphere like China and India have experienced drought. In Sub-Saharan Africa countries like Somalia, Kenya and South Africa are mentioned amongst the countries prone to drought and have witnessed acute water shortages (Khayyati and Aazami, 2016, Lei et al., 2016, Udmale et al., 2015). South Africa is a water scarce country (Ngaka, 2012).

This is because the country has suffered from many drought events in the past, such as those of 1982-83, 1992-93. More recently South Africa was devastated by the drought that effected the country between 2014 and 2016. This drought threatened farmers and their livelihood activities such as livestock rearing and crop farming in the whole of South Africa including KwaZulu Natal and Free State provinces (Shezi and Ngcoya, 2016). Eastern Cape and KwaZulu Natal are some of the coastal provinces that suffered under the long period of no rainfall during the years 2014, 2015 and 2016. A number of families in these areas were left vulnerable to poverty and hunger because of their dependency on farming as a livelihood strategy (Agriculture and Rural Development, 2015).

This drought left numerous livestock deaths in these provinces and some families are still recovering from this phenomenon (Agriculture and Rural Development, 2015). Half of the population in rural areas depend largely on small scale farming as the source of income and to feed their families (Shezi and Ngcoya, 2016). However, small scale farmers are still faced with a number of challenges (Agriculture and Rural Development, 2015) which are being further investigated in this study. On the basis of this, this study

focuses on investigating the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal.

1.3. Problem Statement

Drought is a widespread phenomenon in South Africa and KwaZulu Natal specifically. Several studies such as of Ngaka (2012) and (Khayyati and Aazami, 2016) have examined drought and its impact on small scale farmers in South Africa and other developing countries like India. Small scale farming is one of the major contributors to the standard of living for deprived rural communities and it is used as one of the tools to alleviate poverty (Spielmann et al., 2011). However, drought continues to be one of the key challenges in rural areas. KwaZulu Natal commercial farmers like those in areas around Hluhluwe have survived the recent drought between 2014 and 2016 because of the technological resources while on the other hand not so much is known about the effects of drought on rural communities and how they have responded to the phenomenon in the area under study (Agriculture and Rural Development, 2015). That being so, it needs emphasis that most rural subsistence farmers in Mfekayi, Mtubatuba, specifically and KwaZulu Natal in general depend on agriculture and livestock rearing as a livelihood strategy, however, drought remains the threat (Agriculture and Rural Development, 2015). On the basis of this, this study aims to investigate the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal.

1.4. Aim and Objectives

This study aims to investigate the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal.

In order to achieve the above aim, the study objectives are to:

- a) Examine the nature of small scale farming activities in Mfekayi.
- b) Assess the impact of drought on small scale farming in the study area between the period 2014 and 2016.
- c) Analyse small scale farmers' response to drought between 2014 and 2016.
- d) Assess government and other sources of support for small scale farmers in Mfekayi.

1.4.1. Research Questions

- a) What is the nature of small scale farming activities in Mfekayi?

- b) What is the impact of drought on small scale farming in Mfekayi?
- c) How do small scale farmers respond to drought in Mfekayi?
- d) How do government and other sources support small scale farmers in Mfekayi?

1.5. Significance of the study

The study should avail information regarding the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal. On the bases of this, it is anticipated that the findings of this study will benefit small scale farmers in Mfekayi, the Department of Agriculture and Rural Development, the local municipality and policy makers. They will use the necessary information to find possible solutions for small scale farmers' vulnerability to drought as well as make positive changes where required by implementing and improving adaptation strategies for these small scale farmers.

1.6. Outline of the study

This study is composed of six chapters.

Chapter 1: provides the foundation of this study by paying attention to the background, research problem and the significance of this study.

Chapter 2: discusses the conceptual framework on which this study is positioned.

Chapter 3: focuses on the literature review of this study.

Chapter 4: outlines the physical setting and the origin of the study area. This chapter further discusses the methodology followed in this study, which includes the research design, data collection and data analysis.

Chapter 5: focuses on data analysis and interpretation. This chapter presents findings using among others appropriate graphs and tables.

Chapter 6: outlines the conclusion and recommendations of this study. Where attempts at making careful generalisation were not successful the study proposes further research as a way forward.

1.7. Conclusion

This chapter discussed the background, problem statement, aim and objectives and the significance of this study. This chapter also outlined the structure of the whole study. The next chapter discusses the conceptual framework on which this thesis is based.

CHAPTER TWO: CONCEPTUALISATION

2.1. Introduction

This chapter discuss the conceptual frameworks that underpin this study. The rationale in doing this is to position and contextualise the research study within a particular view point. Accordingly, the first part defines the concepts and the second part propose a conceptual framework which is utilised in this study.

2.2. Definition of terms

The following are the terms which provide a foundation for this study: livelihood, response, impact, vulnerability, adaptation, drought, socioeconomic drought and small scale farming.

2.2.1. Livelihood

Livelihood is defined as the capabilities, assets and activities required for a means of living (DFID, 2000). A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (DFID, 2000). The concept of livelihood was used in this study to refer to activities people in the study area engage in, in order to make a living and how drought has impacted on these activities.

2.2.2. Impact

Impact is defined as the changes in people's lives. This might include changes in knowledge, skill, behaviour, health or living conditions for children, adults, families or communities. Such changes can either be positive or negative long term effects on identifiable population groups. The changes can be produced by a development intervention, directly or indirectly, whether intended or not. These effects can be economic, socio-cultural, institutional, environmental, and technological or of other types (Birilie et al., 2017). In this study, the concept impact was used to examine the consequences of drought on small scale farmers and their farming activities.

2.2.3. Response

Response is defined as the actions people take immediately or shortly after an incident has occurred (Heacock, 2009). In this study, the concept of response was utilised to

examine the actions taken by small scale farmers, government and other sources of support as a response to drought.

2.2.4. Vulnerability

Vulnerability is defined as the susceptibility of human beings to harm from events, processes and changes in their physical and social environments (Whittaker et al., 2012). Vulnerability usually reflects the extent to which a system is incompetent to cope with, and resist the adverse effects of a shock experienced (Ahmadalipour and Moradkhani, 2018). In this study, the concept of vulnerability was used to examine small scale farmers' level of exposure and sensitivity to drought (Buckle et al., 2000).

2.2.5. Adaptation

Adaptation is defined as the ability or the processes, actions and outcomes of a system in response to the repercussions (actual as well as potential) of climate change, stress, hazards, and risks or opportunities aimed at respectively neutralizing the adverse effects of the situation (Elasha et al., 2005; Smit and Wandel, 2006). In this study, the concept of adaptation was used to examine responsive measures to drought by looking at the actions taken (Elasha et al., 2005) by the small scale farmers, the government and other sources of support as a response to drought phenomena in the study area.

2.2.6. Drought

There is no single universal accepted definition of drought (Wilhite and Glantz, 1985; Gupta et al., 2011; Zarafshani et al., 2016). Drought is a creeping insidious natural hazard, which originates from precipitation deficiency over an extended period of time, and generally results in water shortage, loss of crops and livestock, socioeconomic disruption, ecological environmental imbalance, and even endangerment of human life (Tu et al., 2018). Drought is unique from other natural disasters because of the multiple impacts in society. There are different types of drought such as agricultural drought, meteorological drought, hydrological drought and socioeconomic drought (Tu et al., 2018).

Agricultural drought is based on the impacts to agriculture by factors such as rainfall deficits, soil water deficits, reduced ground water, or reservoir levels needed for irrigation (Wilhite and Glantz, 1985). Meteorological drought is based on the degree of dryness (rainfall deficit) and the length of the dry period while hydrological drought is based on the impact of rainfall deficits on the water supply such as stream flow, reservoir and lake

levels, and ground water table decline (Wilhite and Glantz, 1985). Although there are many definitions of drought, this study adopted a socioeconomic definition of drought. In this study, the concept of drought was used to examine the impacts of drought on small scale farmers by looking at the societal, economic disruptions and environmental impacts in the study area.

2.2.7. Socioeconomic drought

Socioeconomic drought is defined as the condition where water supply cannot satisfy demand, leading to societal and economic disruptions, as well as environmental impacts (Tu et al., 2018). Socioeconomic drought is based on the impact of drought conditions (meteorological, agricultural, or hydrological drought) on supply and demand of some economic goods (Wilhite and Glantz, 1985). The frequent occurrence of drought conditions has not only threatened agricultural lands but has also caused massive socioeconomic issues across the globe (Tu et al., 2018). The concept of socioeconomic drought was used to examine the impact of drought on the socioeconomic activities of small scale farmers in the study area.

2.2.8. Small scale farming

There are many definitions of small scale farming, for example (Kirsten and Van Zyl, 1998) defined small scale farming as farmers that need government assistance and who should be empowered to form part of a new and vibrant agricultural sector. Ortmann and King (2006); Spielmann et al. (2011) defined small scale farming in terms of the limited access to factors of production including credit and information. Furthermore, (Moeletsi et al., 2013) defined small scale farming as those farmers that do not have adequate resources to support sustainable production. Although these are the many ways to define small scale farming, this study adopted a definition by Waceke and Kimenju (2007) where small scale farming is defined as a form of production in which nearly all crops or livestock are raised to sustain the farmer's family and rarely producing surpluses to sell for cash or store for later use. In this study, the concept of small scale farming was used to examine livestock and crop farming activities in the study area.

2.3. Conceptual Framework

A conceptual framework can be defined as the system of concepts, assumptions, expectations, beliefs and theories that support and inform a research study (Miles et al., 1994, Kumar and Antonenko, 2014). In this study, the conceptual terms were used as

the assumptions and the building blocks which support the development of this study. These concepts are drought vulnerability and drought adaptation.

2.3.1. Drought Vulnerability

Drought vulnerability is defined as the conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards, including land degradation and desertification (Ortiz and Inomata, 2009). Ahmadalipour and Moradkhani (2018) further defined drought vulnerability as a complex concept that identifies the capacity to cope with drought, and reveals the susceptibility of a system to the adverse impacts of drought.

Ahmadalipour and Moradkhani (2018); Smit et al. (1999) states that understanding drought vulnerability should be a starting point to understanding the impacts of drought before implementing adaptation strategies to drought. There are many ways that can be used to measure vulnerability. The United States established the Natural Hazards Caucus in 2000 (Hayes et al., 2004) the aim was to measure and understand the increasing vulnerability to natural hazards including drought and offer mitigation plans. Hayes et al. (2004) states that drought can be measured by understanding its frequency, intensity, and duration. In addition, the spatial extent of drought occurrences and whether these factors are changing overtime can also be measured.

Furthermore, drought vulnerability can be measured by a systems adaptive capacity to drought and the potential of individuals to survive harmful events and extreme changes in their physical and social environment caused by drought (Ahmadalipour and Moradkhani, 2018). In this study, the notion of drought vulnerability was utilised to examine the susceptibility to and impact of drought on small scale farming activities in Mtubatuba, Mfekayi area by investigating the damage, exposure and sensitivity of small scale farming activities to drought between the period of 2014 and 2016. Livestock and agricultural activities were used as parameters to measure drought vulnerability as a result of drought as well as their exposure and sensitivity to drought between the period of 2014 and 2016 in Mfekayi area.

2.3.2. Drought Adaptation

Drought adaptation is defined as the adjustments in ecological, social and economic systems in response to actual or extended climate stimuli, their effects and impacts (Knutson et al., 2011). Drought will continue to be the threat if there is still an imbalance

in vulnerability versus adaptation (Lei et al., 2016). Several policies have been implemented and developed by different countries as a way of monitoring and managing drought, some of these strategies have been successful and some have failed as a result of vulnerability dominating adaptation strategies (Gupta et al., 2011). In countries like Iran, access to extension information and supportive services is used as one of drought adaptation strategies where by farmers are enrolled in drought response plans to receive guidance on how to respond to drought (Etemadi and Karami, 2016). While in China, government and community leaders provide farmers with early warning and prevention information against drought. National Drought Mitigation Center in New Mexico and Nebraska introduced an overall risk analysis guide as one of the appropriate tools to quantify drought (Hayes et al., 2004). The aim was to help states and communities develop their own drought risk analysis on how to overcome drought by creating a bridge connecting theory and practice.

In addition, New Mexico and Nebraska established a committee that developed a mitigation and response matrix analyses (Hayes et al., 2004). The aim was to provide assistance to vulnerable communities with educational packets, public awareness and financial assistance. In this study, the notion of drought adaptation was used to examine the processes, outcomes and actions taken by agricultural and livestock farmers, government and other sources of support in Mtubatuba, Mfekayi area between the period of 2014 and 2016 as a way of responding to the adverse impacts of drought. Figure 2.1, below, summarises the utilisation of these conceptual frameworks in terms of providing a guide for this study. As illustrated in Figure 2.1, the concept of drought vulnerability was utilised to engage with objectives one and two of the study. This was done by examining the nature and extent of small scale farming activities in the study area. In addition, the impact of drought on small scale farmers, looking at the damage, exposure and sensitivity of human beings from harmful events, processes and changes in their physical and social environment caused by drought respectively was accessed. Furthermore, the notion of drought adaptation was employed in this study to engage with objectives three and four in terms of analysing and assessing the measures or actions taken by small scale farmers, government and other sources of support in response to drought in Mfekayi between 2014 and 2016.

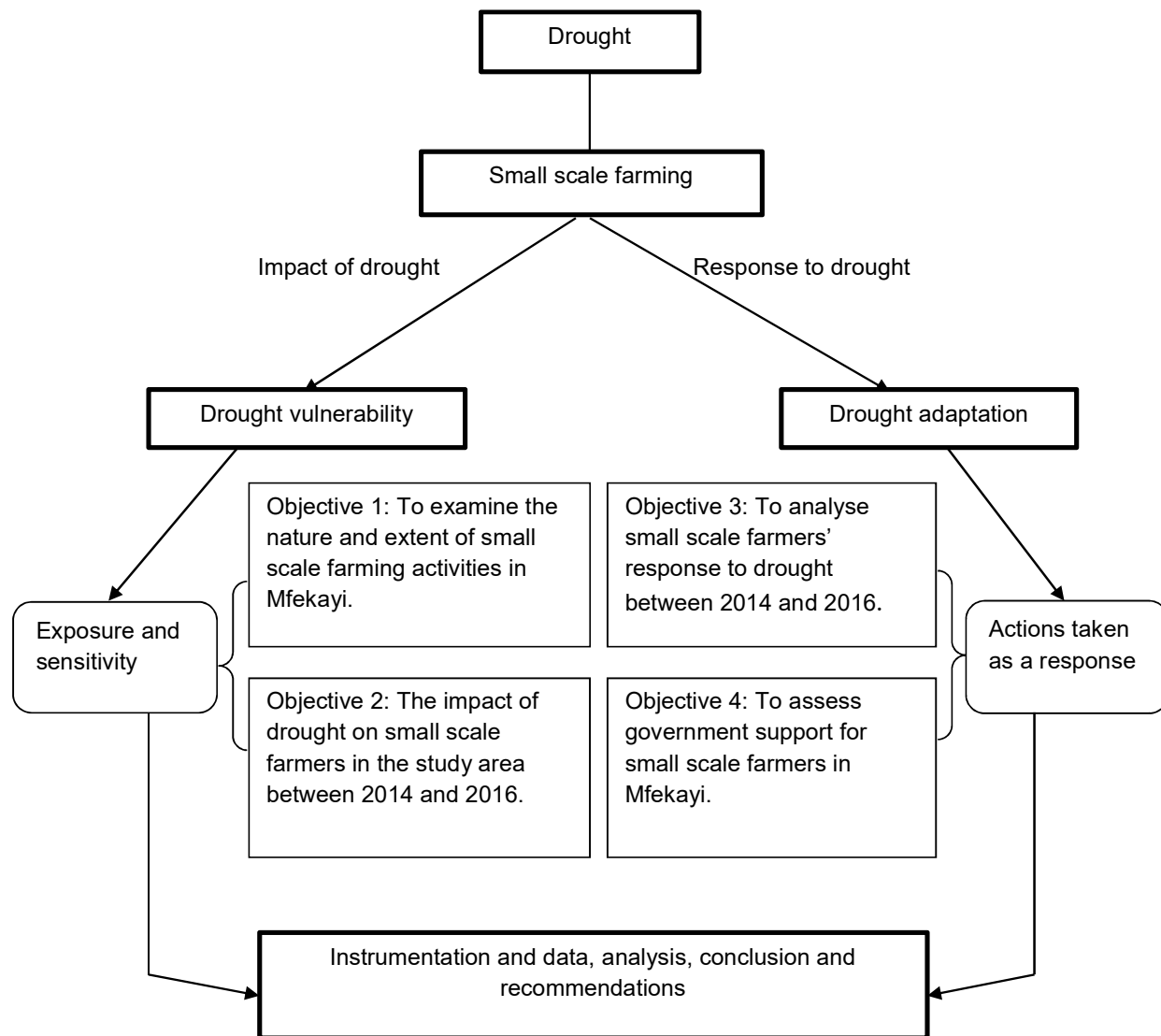


Figure 2.1: Linking the conceptual frameworks to the objectives of the study.

2.4. Conclusion

This chapter defined the main terms which are utilised in the study. This chapter also discussed the conceptual framework which guides this research. The next chapter therefore considers the literature review.

CHAPTER THREE: LITERATURE REVIEW

3.1. Introduction

This chapter focuses on the literature review of this study. The chapter begins by discussing the nature and the extent of small scale farming. This is followed by the impact of drought on small scale farming activities. The last two sections of this chapter discuss how small scale farmers respond to drought and how the government and relevant stakeholders assist small scale farmers to respond to the drought phenomena.

3.2. Causes of drought

The cause and impacts of drought vary from place to place because of the nature of occurrence. Causes of drought can be generally classified into two categories which are natural and anthropogenic causes although there is an overlap in these categories. This classification of the causes of drought is utilised for the convenience of the analysis (Córdoba-Machado et al., 2015; Hope, 2009; Kang and Banga, 2013).

3.2.1. Anthropogenic causes of drought

Recent studies such as those of (Haile et al., 2019) indicated that anthropogenic activities play a huge role in the massive increase in climate change and the occurrence of natural disasters like drought worldwide. These activities may include land use change, deforestation, water consumption, land degradation and wildfires (Haile et al., 2019). The largest percentage of the contributors to global warming comes from the human induced activities, especially the heavy industries from developed countries (Kang and Banga, 2013).

Greenhouse gases like methane, carbon dioxide and nitrous oxide are one of the harmful gases in the atmosphere intensifying climate change. These harmful gases lead to ozone depletion which results in the exposure of the earth's surface to direct sun rays (Hope, 2009). Burning of fossil fuels like coal, oil and natural gas, industrial production and cutting down of rainforest changes the atmospheric composition by increasing the amount of greenhouse gases in the atmosphere and thereby facilitating climatic change (Hope, 2009; National Research Council, 2011a).

Countries like China, India, Japan, the Russian Federation and the United States account for more than 50% of greenhouse gases released to the atmosphere. The United States is the largest emitter, accounting for around 20% of the total emissions

(Hope, 2009). With just 15% of the world's population, rich countries are responsible for 45% of carbon dioxide (CO₂) emissions. Sub-Saharan Africa on the other hand accounts for 11% of the world's population but represents less than 3% of global emissions (Hope, 2009).

Africa's carbon dioxide technical emissions are predominantly from the energy sector and transport industries, compared to rich countries emissions which are derived primarily from the burning of fossil fuels for industrial and other human activities. The largest share (approximately 95%) of carbon dioxide technical emissions from Africa emanates from only 15 countries including South Africa, Nigeria, Kenya, Zimbabwe, Sudan, Ethiopia, Angola and Ghana just to name a few (Hope, 2009). The recent droughts of 2014, 2015 and 2016 in Southern Africa may have occurred as a result of the ever-increasing global statistics of greenhouse emissions which have a major effect on the atmosphere and resulting in changes in seasonal weather conditions (Kang and Banga, 2013, Moeletsi et al., 2013).

3.2.2. Natural Causes of Drought

El Niño is also regarded as one of the causes of severe drought events (Córdoba-Machado et al., 2015). El Niño is a local warming of surface waters that takes place in the entire equatorial zone of the central and eastern Pacific Ocean of the Peruvian coast and which affects the atmospheric circulation worldwide (Córdoba-Machado et al., 2015). During the El Niño occurrences, the normal cycle of tropical precipitation and atmospheric circulation are disrupted, exacerbating extreme climate events around the globe such as droughts, floods and intensifying the frequency of hurricanes (Córdoba-Machado et al., 2015).

As a result of the natural and anthropogenic activities mentioned above, seasonal weather conditions vary accordingly, with some areas getting drier and some areas getting warmer (Hope, 2009; Kang and Banga, 2013). Figure 3.1 shows the drought status trend between 2012 and 2018 over the region of KwaZulu Natal.

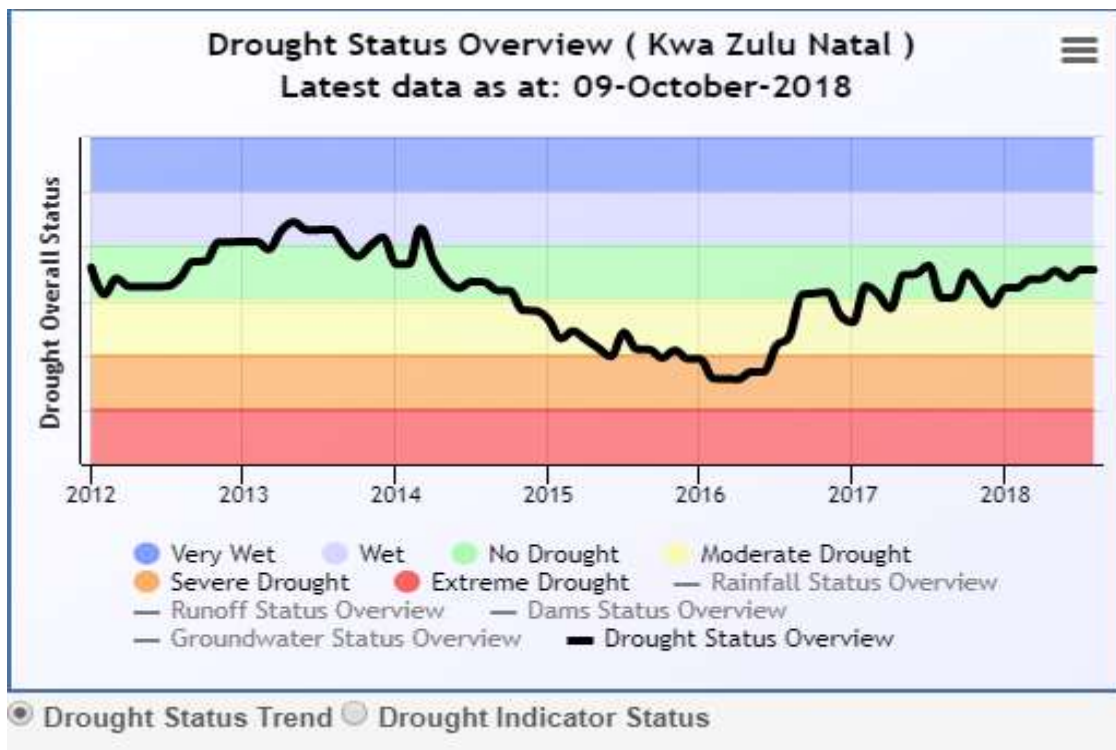


Figure 3.1: Drought status trend (2012 to 2018).

Source:

<http://niwis.dws.gov.za/niwis2/DroughtStatusManagement/DroughtStatusOverview>).

3.2.3. Effects of drought on agriculture

Drought is a threat to farming activities globally (Lei et al., 2016, Mohammed et al., 2018). Major changes in temperature and precipitation are projected to impact crop productivity, quality of produce, and land use worldwide (Bell et al., 2018, Kang and Banga, 2013, Keshavarz et al., 2017). Higher temperatures could benefit agriculture in temperate latitudes. Areas under cultivation would expand, the length of the growing period would increase, and crop productivity would see an upturn. In drier areas, climate models have predicted increased evapotranspiration and lower soil moisture levels. As a consequence, many cultivated areas might become unsuitable for farming and some tropical grass lands could become increasingly arid (Kang and Banga, 2013).

The frequency of drought occurrences has been increasing since the 20th century until today, with a severe impact especially on small scale farming activities in developing and third world countries. However, this is due to greenhouse emissions from human activities warming up the atmosphere (Khayyati and Aazami, 2016). The concern of

global warming in the 21st century has impacted negatively on rural livelihoods especially small-scale farming (Azadi et al., 2018, Khayyati and Aazami, 2016).

In South Africa, studies such as those of (Baiphethi and Jacobs, 2009, Mashamaite, 2014, Ngaka, 2012) indicated that small scale farming is a major contributor to food security and has potential to enhance the economic status of small scale farmers.

3.2.4. Small scale farming

In South Africa, small-scale farming is often equated with backward, non-productive, non-commercial, subsistence agriculture that we find in parts of the former homeland areas (Kirsten and Van Zyl, 1998). A small-scale farmer is one whose scale of operation is too small to attract the provision of the services he/she needs to be able to significantly increase his/her productivity. It is these farmers that need government assistance and who should be empowered to form part of a new and vibrant agricultural sector (Kirsten and Van Zyl, 1998).

Small scale farmers in communal South Africa have limited access to factors of production including credit and information. Markets are often constrained by inadequate property rights and high transaction costs (Ortmann and King, 2006). Moeletsi et al. (2013) and World Bank (2016) indicated that small-scale farmers are those farmers that do not have adequate resources to support sustainable production.

They are compelled to lower their production potential because of resource shortages that impose sub-optimal use of inputs in order to minimize costs. Farmers face significant challenges because of the lack of proper support to sustain their livelihoods and adapting to drought (Kang and Banga, 2013; World Bank, 2016). Based on the above literature, the aim of the study is to investigate the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal and this provides a context for engaging with the objectives of this study as discussed below.

3.3. The nature and the extent of small scale farming activities.

Small scale farming activities plays a fundamental role in improving the standard of living for urban and rural dwellers especially in developing and under developed countries worldwide by ensuring that a farmers family has enough food and necessary resources

for survival (Baiphethi and Jacobs, 2009, Bell et al., 2018, Mashamaite, 2014, Murendo et al., 2011, Song, 2016, Wong et al., 2017). Rural households depend largely on small scale farming activities while urban households rely greatly on purchasing (Baiphethi and Jacobs, 2009). About 1.2 billion of the world's population is extremely poor, 75% resides in rural areas and depend on small scale agricultural activities like crop farming, forestry, fisheries, livestock rearing and other rural related activities for survival (Anriquez and Stamoulis, 2007).

Small scale farming practice has a potential to boost the rural economy and remain the backbone for rural population worldwide by ensuring that households have sufficient resources for the present and future generations under the prevailing social, economic and environmental conditions (Bell et al., 2018, Etemadi and Karami, 2016, Murendo et al., 2011). In Southern China, more than half of the population depends on various farming activities to feed their families and ensure continuous food production (Song, 2016). Small scale farmers rely primarily on preserved seeds for landraces and on markets for hybrid seed. Women do the selecting and saving of seed for all types of crops and the preserved seeds are later used for planting and this practice increases harvesting potential (Song, 2016).

This procedure increases crop production and has the potential to enhance small scale farmers' livelihood activities in the Southern Chinese villages (Song, 2016). A different approach is used in Australia whereby small scale poultry (SSP) production is commonly practised as part of a mixed farming systems, which allows farmers to use resources efficiently, spread risk and protect against shocks (Wong et al., 2017). Small scale poultry production is the type of farming systems where by small scale farmers raise chickens, birds and ducks to feed and maintain their families and sell some for extra cash (Wong et al., 2017). This approach is practised as one of the poverty eradication strategies in the rural spaces of Australia to improve the standard of living for rural households and ensure that they have enough food to feed their families.

Australian farmers adopted the idea of small scale poultry to strengthen income, diet, nutrition and food security of the poor households (Wong et al., 2017). However, there is a different scenario in India whereby agriculture, forestry and ecosystems play a vital role in enhancing the standard of living for small scale farmers (Udumale et al., 2015). Agriculture contributes about 14.62% of India's gross domestic product (GDP) and the huge population depends on agriculture as one of the primary resources for food

security. Udmale et al. (2015) states that livestock rearing, crop farming and unskilled agricultural labour activities are the dominant small scale farming activities, a large population of India is engaged in these activities as the primary source of food for their families and sell some for extra cash.

There is a huge dependency on agricultural activities in India (Udmale et al., 2015). Of the 54.6% total work force, 24.6% were regarded as agricultural farmers while 30% were engaged in agricultural activities as agricultural labourers in 2011. The type of farming practised in India does not only contribute to a farmer's family but it also generates multiple jobs for unskilled labour (Charoenratana and Shinohara, 2018). However, small scale farming in Sub-Saharan Africa is common and predominantly practiced in rural areas to secure food security (Bedeke et al., 2019; Mohammed et al., 2018). Small scale farmers are challenged and characterized by low illiteracy, inadequate technology, poor production, lack resources, small holdings land and poor access to markets to strengthen their potential (Mapfumo et al., 2016).

Several countries such as Kenya, Sudan and Ethiopia are engaged in small scale farming activities like crop production and livestock rearing as means of making a living (Mohammed et al., 2018, Wossen et al., 2017). Maize production is the most common type of farming in Sub-Saharan Africa and it is also one of the major food supplies and economic backbone for several countries in Africa supporting more 300 million people on the continent (Wossen et al., 2017). However, decisive constituents like poor access to markets, weather information and natural disasters like drought have major implications on the nature and the extent of small scale farming activities (Bedeke et al., 2019). African agriculture is prone to seasonal drought, creating present and future yield losses (Aniah et al., 2019).

In Ghana, small scale agriculture is regarded as the most vibrant sector generating about 57% of employment opportunities to the Ghanaian families especially to rural population (Aniah et al., 2019). Small scale farming agriculture further strengthens the economy of Ghana by contributing to the country's Gross Domestic Product (GDP) and the foreign exchange (Aniah et al., 2019, Wossen et al., 2017). In the Gadaref region in Sudan, small scale agricultural farming is the most prevalent activity providing employment and livelihood to about 80% of the population and significantly contributes to the regional gross domestic product (Mohammed et al., 2018).

Small scale farming agriculture in Gadaref region depends primarily on rain-fed agriculture. Waceke et al. (2007) indicated that there are two major forms of small scale agriculture in Kenya (primitive and intensive agriculture). Primitive subsistence farming is mainly practiced in marginal areas and it includes shifting cultivation, slash and burn, and pastoral monadic farming while intensive subsistence farming is mainly practised in potentially arable land, where land is scarce and farmers have to maximize food production on small fields (Waceke et al., 2007).

Studies such as of (Makhado et al., 2014) indicated that approximately 70 percent of rural poor individuals in Sub Saharan Africa own livestock. Livestock plays a vital role in sustaining a farmers and their families by ensuring food security and as a source of income. In South Africa, the nature and the extent of small scale farming is known to serve as a source of income and to ensure food security especially in rural spaces (Mashamaite, 2014, Shezi and Ngcoya, 2016). South Africa is one amongst the several countries with the rural population making a living through farming activities (Baiphethi and Jacobs, 2009). The practice of farming activities like crop farming and livestock rearing in provinces like KwaZulu Natal plays a vital role in addressing rural poverty for poor households (Shezi and Ngcoya, 2016).

Small scale farming is most common and dominant in South Africa and has potential to generate a number of job opportunities for poor individuals and contribute to poverty reduction and unemployment in several ways (Kirsten and Van Zyl, 1998, Mashamaite, 2014, Ngaka, 2012). These small scale farming activities are valuable and practiced by most people including the urban individuals and rural households specifically (Agriculture and Rural Development, 2015, Ngaka, 2012). Small scale farming activities are considered as the greatest contributor to household's income, contributing up to 40 percent of the income in developing countries (Mashamaite, 2014).

This income gives households purchasing power and help them to meet their daily food needs. In Limpopo province, small scale farming agriculture contributed about 15.7% of gross geographic product (GGP) to ensure household food security in rural areas (Mashamaite, 2014). Additionally, Eastern Cape and KwaZulu Natal are one of the provinces dominated by small scale crop farming and small scale livestock farming as

the primary activities to secure food security and provide economic opportunities for small scale farmers (Shezi and Ngcoya, 2016). Based on the above literature, this section assisted this study to engage with the first objective of this study, which was to examine the nature and extent of small scale farming activities in Mfekayi.

3.4. The impact of drought on small scale farming activities.

Drought continues to challenge small scale farming activities and food security (Haile et al., 2019). Globally, there is a noticeable decline in farming activities including agricultural lands due to adverse impacts of drought on farming while on the other side the global population is doubling (Haile et al., 2019). The issues concerning the impacts of drought have become a worldwide concern and the prolonged impacts of drought have been observed in three dimensions (Etemadi and Karami, 2016, Gupta et al., 2011).

The impacts of drought are known to threaten social, economic and environmental conditions worldwide (Aniah et al., 2019, Bell et al., 2018, Gupta et al., 2011, Keshavarz et al., 2017, Lei et al., 2016, Ngaka, 2012, Udmale et al., 2015). The impacts of drought have become widespread and prolonged over the past decades (Tortajada et al., 2017). These impacts are directly and indirectly effecting the society and resulting in socio-economic and environmental disturbances (Aniah et al., 2019; Haile et al., 2019). The impacts of drought are huge and most commonly visible through agricultural production and food insecurity at a local, regional and global scale (Tortajada et al., 2017).

The impacts of drought enhances small scale farmer's level of vulnerability to all sorts of hazards because they lack effective drought management strategies and basic knowledge (Hannaford et al., 2019, Ngaka, 2012). Drought has substantial effects on small scale farming activities and rural poor households especially in developing countries. Drought influences small scale farmers' livelihood activities in various ways because of the high dependency on rain-fed agriculture (Azadi et al., 2018).

In many Sub Saharan African countries, major drought impacts have been recorded from agricultural systems, losses in crop yields and livestock production (Azadi et al., 2018, Mapfumo et al., 2016). Several studies such as of Mapfumo et al. (2016) and Azadi et al. (2018) have predicted agricultural losses in Sub Saharan African countries due to

prevailing harsh climatic conditions. Mapfumo et al. (2016) indicated that small scale farming agriculture is expected to decline by 10 – 50% by 2050 while Azadi et al. (2018) indicate that agricultural system may decrease by 10 to 25 percent by 2080 if global warming is not addressed through proper adaptation strategies. Azadi et al. (2018) indicate that a socio-economic drought definition comprises of health challenges, loss in income, low quality of life, alternative income, educational challenges and access to social support.

All these elements are as a results of drought and they tend to put economic pressure on the small scale farmer's family (Azadi et al., 2018). Based on the study by Azadi et al. (2018), economically drought threatens livelihood security, environmentally drought causes land degradation and biodiversity loss while social impacts of drought include public safety, health issues, water conflicts, low quality of life, and inequality in resource allocation.

Drought is one of the most common and extreme natural disasters affecting the global population in various ways (Shezi and Ngcoya, 2016). The impacts of drought are direct and indirectly affecting millions of individuals in the Sub Saharan Africa (SSA) (Makhado et al., 2014, Masinde, 2015). As reported by Mohmmmed et al. (2018) drought is the key variable in the development and the distribution of crops. During drought period, small scale farmers are faced with numerous issues like water scarcity, low rainfall, loss of fertile lands, low agricultural production as well as livestock death (Khayyati et al., 2016). All these factors lead to food insecurity and diseases associated with it (Keshavarz et al., 2017).

In the Sub Saharan Africa, numerous livestock deaths, crop failures and human losses have been recorded over the past decades as a result of extreme drought (Haile et al., 2019). Over 10 million individuals experienced poverty and hunger in the Horn of Africa due to livestock deaths (Mohmmmed et al., 2018). Over 450 000 deaths were recorded in Sudan and Ethiopia between 1984 -1985, over 325 000 deaths were recorded in Sahel between the year 1974 - 1975 and 100 000 deaths in Mozambique, while over 250 000 deaths were recorded in Somalia between the year 2010 - 2011 (Haile et al., 2019). Over 13 million people experienced 8 drought events in the last sixteen years in Eastern Africa. The impacts of drought on small scale farming activities left a number of farm

families vulnerable to hazards such as malnutrition, food insecurity, death and outbreak of diseases (Azadi et al., 2018, Haile et al., 2019, Hannaford et al., 2019).

Kenya, Somalia and Ethiopia are amongst countries living under extreme hunger and poverty as a result of severe drought occurrences. Moreover, the impacts of drought are associated with the increasing food prices, poor crop production and food insecurity (Haile et al., 2019, Mohammed et al., 2018). These effects of drought are more visible on small scale farmers. In Somalia, chronic poverty, malnutrition and famine are major challenges of small scale farmers and has led to an estimated number of 258 000 deaths (Haile et al., 2019). In Ethiopia, over 30 drought events have occurred in the last nine centuries resulting in acute water shortages, negative social consequences, economic losses and loss of life (Haile et al., 2019).

However, in Kenya, more than 10 drought occurrences have been experienced by Kenyans since 1970 leading to poor crop production and numerous livestock deaths (Haile et al., 2019). This is however due to insufficient rainfall to support farming activities, low irrigation potential, lack of technological support and increasing population (Haile et al., 2019, Mohammed et al., 2018). South Africa is one amongst several countries that have witnessed recent droughts between 2014 and 2016 (Agriculture and Rural Development, 2015, Shezi and Ngcoya, 2016).

Drought is also evident in South Africa and threatens small scale farming activities (Makhado et al., 2014, Ngaka, 2012, Shezi and Ngcoya, 2016). The impacts of drought are extreme and have multiple effects like low job opportunities, increasing food prices and food insecurity especially in the agricultural sector (Makhado et al., 2014). South Africa is said to be one amongst several countries prone to drought in the Sub Saharan Africa (SSA). Over 60% of the population is classified as vulnerable to drought while 30% is highly vulnerable (Ngaka, 2012). This is due to the fact that a large percentage of South African population resides in the arid and semi-arid regions where natural disasters like drought and floods are dominant (Ngaka, 2012).

Small scale farmers in rural areas of South Africa are highly vulnerable to drought, this is due to high dependency on rain-fed agriculture, ineffective adaptation strategies such as application of indigenous knowledge systems to detrimental impacts of drought (Ngaka, 2012, Makhado et al., 2014, Masinde et al., 2015). Drought is evident

particularity in the field of farming (agricultural and livestock farming). Small scale farmers in particular are experiencing difficulties when it comes to adopting relevant adaptation strategies to natural disasters like drought phenomena and this has a major effect on their food security and livelihood activities (Shezi and Ngcoya, 2016).

The impacts of drought in provinces like Free State, Eastern Cape and KwaZulu Natal are prominent and have significant challenges on crop production and livestock (Ngaka, 2012, Shezi and Ngcoya, 2016). Recent studies such as (Agriculture and Rural Development, 2015) indicate an extreme increase in the number of small scale farmers who lost their livestock due to severe drought. Agricultural crop growers could not produce sufficient and nutritious food for their families because of the shortages in water and low precipitation during the 2014 and 2016 drought events (Shezi and Ngcoya, 2016).

Ngaka (2012) suggested that there are variations in terms of livestock loss across farming categories, on average small scale farmers experience more livestock deaths than large scale farmers. This is highly influenced by the lack of technical support, low levels of education or and geographic location of farmers (Ngaka, 2012, Makhado et al., 2014). Most small scale farmers especially in the developed counties lack farming skills, education or public knowledge, technological advancement and financial support. Based on the above discussion, the literature review assisted this study to engage with the second objective of this study which was to assess the impact of drought on small scale farming in the study area between 2014 and 2016.

3.5. Small scale farmers' response to drought.

Recent studies such as that of (Bell et al., 2018, Burchfield and Gilligan, 2016, Keshavarz et al., 2017, Ngaka, 2012) indicated that farmers, especially small scale farmers have been struggling to adapt and respond to the impacts of drought worldwide because of the lack of relevant information about drought (Haile et al., 2019). In general, small scale farmers depend primarily on indigenous knowledge and local information via social networks in order to respond to natural disasters like drought (Mapfumo et al., 2016). Various adaptation strategies have been adopted by small scale farmers in arid and semi-arid regions globally (Chen et al., 2014) however, drought remains the

challenge hence small scale farmers are resource poor and lack effective responses to drought (Bell et al., 2018, Makhado et al., 2014).

One of the major global challenges for small scale farmers is that they struggle on how to overcome, facilitate present and predict future outcomes of drought and other natural disasters (Etemadi and Kamari, 2016). Lei et al. (2016) states that drought adaptation practices can be classified along different types of action, actor or by spatial scale. In China, small scale farmers adopted several ways as a response to drought. This includes the practise of changing crop production inputs, adjusting harvesting time, adjusting crop irrigation times and the volume of water used, changing cropping patterns and purchasing crop insurance to reduce the loss caused by drought (Lei et al., 2016). In addition, small scale farmers had to draw irrigation water from the nearby rivers to avoid costs associated with purchasing and transporting water.

Coping strategies such as farm's asset base, labour capacity, community resources and management knowledge may help reduce droughts impact on agriculture (Knutson et al., 2011). In Southern China, drought occurrences cause economic losses almost every year and some of the farmers fail to adapt to drought (Chen et al., 2014). Nevertheless, in Southern China, choice of cropping patterns and diversifying crop varieties are some of the several adaptation strategies used by small scale farmers (Chen et al., 2014).

In the Sub Saharan Africa, small scale farmers deploy almost similar drought adaptation strategies such as changing planting calendar, crop variation and preserving seeds (Makhado et al., 2014; Masinde et al., 2015). However, Mohammed et al. (2018) indicated that changing to non-farm activities during drought period in Eastern Sudan is one of the measures practiced by small scale farmers as a response to drought. Several adaptation strategies have been employed by farmers to respond to drought and maintain their livelihoods (Murendo et al., 2011) however, there is limited understanding of drought impacts and how to apply relevant responses by small scale farmers (Ngaka, 2012).

Ethiopia adopted an approach whereby new crop varieties, altering planting dates and seasonal migration is used as one of drought adaptation strategies. Ethiopian small scale farmers had to sell small livestock including (goats, sheep and chicken), household equipment (radios, television and furniture), agricultural equipment (plough, sickles), and

forestry products (wood, timber and charcoal) to generate income in order to cope with drought, rainfall shocks. In addition, the population had to reduce food consumption during drought episode (Murendo et al., 2011).

However, this approach suggests that small scale farmers are trapped in a poverty cycle because of the expenses farmers go through trying to survive and escape drought impacts. Murendo et al. (2011) further uncovered that in Ethiopia, small scale farmers or rural households' use informal networking to share drought risks by supporting each other through moral and financial support. This process includes twenty-four religious groups, nine business groups and five groups each for youth, elderly and women (Murendo et al., 2011). Such informal gatherings deal specifically with common drought impacts in developing countries like Ethiopia, Kenya and Somalia because they have weak institutions that deal with such natural disasters.

Furthermore, small scale farmers in Ethiopia keep crop residues to feed livestock during drought season (Murendo et al., 2011) other farmers switched livestock types and prefer the ones more resistant to drought. Irrigation, soil and water techniques are the dominant practises used by small scale farmers in maintaining runoff and improving water infiltration into the soil (Murendo et al., 2011). The same approach could be adopted by small scale farmers especially in arid and semi-arid regions because of the adverse climatic conditions in these areas (Gupta et al., 2011).

In the South Africa, KwaZulu Natal is one of the provinces highly vulnerable to unfavourable climatic conditions like drought (Shezi and Ngcoya, 2016). Recent studies such as of (Ngaka, 2012, Makhado et al., 2014, Masinde et al., 2015) indicated that small scale farmers highly depend on indigenous knowledge to response to drought.

Small scale farmers use Indigenous Knowledge Systems (IKS) approaches to drought. In the Free State and Eastern Cape Province, small scale farmers assess the size and shape of the moon, monitor the behaviour of birds, animals or reptiles, and also the daily weather patterns as indigenous knowledge systems for forecasting drought (Ngaka, 2012). This strategy is primarily used by small scale farmers in deep rural areas as an indicator of the current and upcoming weather events (Ngaka, 2012). The behaviour of animals and the shape of the moon can also be used to indicate the extent or the

expected impacts of drought. Furthermore, Makhado et al. (2014) also noted that indigenous knowledge systems are a vital component for small scale farmers when measuring and predicting the future impacts of natural disasters (Ngaka, 2012; Makhado et al., 2014; Masinde et al., 2015).

These indicators include assessing variation in the timing and sound of winds, the quality and appearance of fur on livestock, appearance of termites and their mounds, the appearance of certain species of birds and the colour of their feathers, the absence of mole hills, the flowering of certain trees, the appearance and size of stars, and higher than normal temperatures (Makhado et al., 2014). However, indigenous knowledge adaptation strategies may not be sufficient to combat the impacts of drought. Collaborating indigenous knowledge and technological equipment may be the key for the current and future impacts of drought (Makhado et al., 2014; Masinde et al., 2015).

Some approaches to cope with drought in South Africa include movement of livestock to better grazing conditions, purchasing remedies, particularly vitamin A supplements, fetching water for livestock and weaning calves earlier than expected. Small scale farmers are also forced to sell livestock at low prices because of the drought and risks associated with drought like the outbreak of diseases (Ngaka, 2012).

Makhado et al. (2014) indicated a variety of drought adaptation strategies adopted by small scale crop farmers in southern Africa. These strategies incorporate seed storage and preservation of granaries, planting of drought tolerant crops, predicting future weather conditions by elderly people, shifts in cropping, intercropping, mulching to retain soil moisture, rainwater harvesting and storage in water tanks, re-use of water and adding of compost manure (Makhado et al., 2014). Additionally, small scale livestock farmers drought adaptation strategies incorporate loaning livestock to relatives, culling livestock, reducing the number of livestock, buying of forage and water, rotation grazing and farming with livestock that is resistant to drought (Ngaka, 2012; Makhado et al., 2014).

However, each of the above mentioned strategies have their own advantages and disadvantages and to some extent could not address the anticipated extreme future drought events. This may lead to combining indigenous and technological practices for

effective response to drought (Makhado et al., 2014). Studies such as of Ngaka (2012) suggests that there is a high correlation between small scale farmers' level of education and drought impacts or drought adaptation. Small scale farmers often struggle to overcome drought and to maximise their production because of the absence of proper resources, basic education and the relevant knowledge support from the government and other sources (Mashamaite, 2014). On the basis of this, this section assisted this study to engage with the third objective of this study which was to analyse small scale farmers' response to drought between 2014 and 2016.

3.6. Government and other sources of support on small scale farming.

Incorporating relevant stakeholders like public service organisations, Non-Governmental Organisations, aid agencies, donors and community organisations is essential in challenging the impacts of drought and reducing the susceptibility of individuals to the drought phenomena (Haile et al., 2019). Designing an integrated and active approach is essential for drought coping strategies (Haile et al., 2019, Song, 2016). Integrated and active approaches can be systematically implemented at a national, regional and international level for effective drought management strategies to tackle natural and anthropogenic impacts of drought (Haile et al., 2019, Tortajada et al., 2017).

Coping, adapting and responding effectively to drought phenomena requires an understanding of comprehensive and integrated approaches at the an initial planning phase and the same approach should be applied across regions globally (Burchfield and Gilligan, 2016, Knutson et al., 2011, Lei et al., 2016, Song, 2016, Tortajada et al., 2017). Drought is examined as the harmful natural disaster that arises in four interactions including reduced reservoir storage (hydrological drought), reduced soil moisture (agricultural drought), reduced rainfall (meteorological drought), and reduced water access caused by political power (socioeconomic drought) (Burchfield and Gilligan, 2016). However, regions have different responses to drought phenomena.

Responses to drought include good governance and management, informed decision making, information availability and access, and environmental justice at all levels in order to absorb shocks caused by drought (Burchfield and Gilligan, 2016, Song, 2016). Chinese small scale farmers are provided and guided with the basic knowledge on the type of crops and the suitable season for planting by the Chinese government (Song,

2016). California experienced the prolonged drought between the period of 2011 to 2016 (Tortajada et al., 2017) nevertheless, California was still able to supply water to as many users as possible including households in the far rural areas and to stabilise the economy of the country.

This was however achieved through the integrated approach inclusive of policy, extensive research, legislative, institutional, infrastructure and financial responses (Gupta et al., 2011, Tortajada et al., 2017). Drought policy responses from the California state government focused mainly on four areas; water supply, emergency response, water conservation and environmental protection (Tortajada et al., 2017).

Policy responses include smooth functioning of drought related projects, adoption of water recycling requirements, habitat restoration projects, 25% reduction in urban water use compared to previous years. In addition, installation of Delta salinity barriers, suspension of certain provisions of the state water code, expand authorised use of recycled water, and increased penalty amount for illegally diverting water during drought experience were some of the responses. Even the department of fish and wildlife authority was forced to close water to fishing entities as a response to drought conditions and also increased the penalty authority for local public entities to enforce water conservation (Tortajada et al., 2017).

Furthermore, the policy states that water should be made available on urgent basis and initiates funding for the provision of safe drinking water, water recycling projects, emergency food, and water aid in most drought prone, disadvantaged communities as well as improve agricultural water use efficiency (Tortajada *et al.*, 2017). The Department of Fish and Wildlife (DFW) authority in California imposed penalties on water diverters and created an office of sustainable water solutions to assist communities to apply for state and federal funds to help clean up drinking water and to have greater access to treatment technologies (Tortajada et al., 2017).

The policy executive order in California prioritises temporary water rights permits, water quality certifications, waste discharge requirements and conditional waivers of waste discharge requirements. This is done to accelerate approvals for projects to enhance the ability of local communities to capture high precipitation events for local storage

consistent with water rights priorities and protection for fish and wildlife (Tortajada et al., 2017). Further responses to drought were confirmed by the former United States president Barack Obama when he announced that Federal government would provide funding to support farm workers, and small scale farmers effected by drought in rural communities (Tortajada et al., 2017), the funding was set to mitigate short and long term effects of drought.

The Farm Service Agency (FSA) under the United States Department of Agriculture (USDA) announced several programmes to help California farmers cope with drought (Tortajada et al., 2017). These programmes included Non-insured Crop Disaster Assistance Programme (NAP) that provides financial insurance to producers of non-insurable crops due to natural disasters, the Emergency Farm Loans Program that provides emergency loans to help farmers restore and replace property, production costs during disaster years and refinancing of debt and living expenses for producers in all counties in California. There is also the Disaster Set-Aside Programme that provides producers who have existing loans allowance to delay their schedule payments up to one year from the original schedule, and the Tree Assistance Programme which provides financial assistance to tree growers to replant or rehabilitate licenced trees, bushes and vines damaged by drought (Tortajada et al., 2017).

In Sri Lanka, the government implemented the national irrigation programme that draw water from the largest river Mahaweli Ganga through a process of centrally managed reservoirs and hydropower plants (Burchfield and Gilligan, 2016). In the 1970s, the government implemented a new programme called Mahaweli Authority of Sri Lanka (MASL), which aimed at monitoring irrigation systems for farmers in Sri Lanka and facilitates government owned plots of land (Burchfield and Gilligan, 2016). Farmers who were resettled were allocated 2.5 acres of flooded land and 0.5 acres of homestead. By the end of 2012, over 166 000 families had benefited from 250 000 acres of irrigated or wet lands to survive drought. This has contributed not only to the rural livelihoods of Sri Lankan farmers but has also played a vital role in the economy of the country (Burchfield and Gilligan, 2016).

Moreover, India has various drought institutional mechanisms that play a vital role in the drought management cycle like the Council of Agriculture Research and International

Crops Research Institute which provide various aspects of drought management (Gupta et al., 2011). Community participation is one of the approaches used by the Indian government to effectively engage with the community from the local to regional level, regarding the challenges encountered by the community at large during drought periods (Gupta et al., 2011).

The early warning system is carried out by the Inter-Ministerial National Crop Weather Watch Group (CWWG) which monitors monsoon's agricultural operations and recommends measures to possibly minimize impacts of drought (Gupta et al., 2011). Lei et al. (2016) indicated that the Chinese government adopted two major approaches to assist farmers at different levels during drought, the first approach being providing early warning and prevention information against drought, and the second approach is to provide farmers with technical, physical and financial support.

The early warning and prevention information is normally communicated through farmers meetings organized by village leaders, township officials, broadcasts, media managed by government, texting messages to farmers cell phones and issuing urgent disaster documents across all government spheres and further to the village community (Lei et al., 2016). The main objective of the early warning and prevention information is to emphasize how farmers can minimize or prevent potential losses during a drought period by giving them relevant information and appropriate adaptation measures to reduce losses (Lei et al., 2016).

The financial, technical and physical support is mainly to help farmers cope and recover from the drought experience (Lei et al., 2016). This approach basically aims to teach farmers how to adopt engineering and non-engineering measures such as teaching them how to create and maintain their own infrastructure. The Chinese government also provide farmers with material, especially the small scale farmers since they cannot afford some of the expensive material (Lei et al., 2016). The material includes water saving facilities, drought resistant seeds, fertilizers and pesticides.

Additionally, Lei et al. (2014) noted that some farmers are still facing further challenges because of issues of power and personal connections between small scale farmers and their relatives working for the government and this results in uneven distribution of

resources. There is almost a similar mode of governance pertaining responses to drought globally (Gupta et al., 2011, Haile et al., 2019, Lei et al., 2016, Tortajada et al., 2017). However, drought responses should incorporate short and long term responses against drought impacts (Haile et al., 2019).

In Sub Saharan East African countries, several drought management policies and strategies have been implemented based on the existing conditions. Ethiopia is one amongst several countries that have implemented drought adaptation program aiming to assist small scale farmers to respond effectively to drought (Haile et al., 2019). Ethiopia implemented Productive Safety Net Programme. The programme aims to assist rural poor individuals living under chronic poverty to access food and improve their agricultural activities. Furthermore, the Kenyan's government supplies food to communities vulnerable to drought while working on sustainable long-term drought solutions such as water resource development scheme to reduce dependency on rainfall (Haile et al., 2019).

Combating drought impacts through environmental rehabilitation is also a key approach in Eastern African countries. The practice of environmental rehabilitation involves agroforestry, reforestation, afforestation, area closure and water conservation (Haile et al., 2019). Adopting these adaptation measures such as crop variation, agroforestry, early warning, building society's resilience, short-term relief, long-term relief and capacity building could be more effective for agricultural farmers. These measures could be accompanied by remote sensing data for effective drought management practices (Haile et al., 2019).

Providing relevant information about drought is primary and vital in Eastern African countries. Different organisations are providing information to the society, stakeholders and the governments based on the existing conditions (Haile et al., 2019). To mention a few, Famine Early Warning System Network (FEWSNET) provides drought forecast based on existing conditions and African Drought Monitor (ADM) provides statistical and timely drought predictions. The information is distributed locally, nationally and sub-regional with the aim of alerting farmers to take precaution measures against drought. Based on the present experience of drought in southern Africa, small scale farmers are in need of assistance and technological driven practices as a response to drought

(Makhado et al., 2014). Ngaka, (2012) state that the South African government has introduced several drought relief schemes to assist farmers (large, medium and small scale) cope with extreme drought events.

In the province of KwaZulu Natal, the Department of Agriculture and Rural Development has proposed a drought relief scheme of R114 million to monitor and assess the impacts of drought across KwaZulu Natal (Agriculture and Rural Development, 2015). The relief project aims to ensure food security for small scale farmers and prevent job losses. The relief is structured into four interventions. The interventions are as follows in sequential order: hay for livestock and water harvesting (whereby registered small scale farmers will receive livestock feed and Jojo tanks to store water), aggressive deworming of livestock across KwaZulu Natal (approximately 409 000 livestock were expected to be dewormed), approximately 62 borehole drilling and 75 dam scooping were proposed and use of state land for grazing (Agriculture and Rural Development, 2015).

The main purpose of the scheme is to help small scale farmers respond to drought (Ngaka, 2012), the government purchased and supplied fodder at subsidised rates to farmers. Farmers sharing common property such as land were further provided with water infrastructures such as earth dams and repair of boreholes. During the 2007/2008 drought period, the South African government spent R285 million on drought relief schemes with R20 million and R25 million allocated to Free State and Eastern Cape provinces to assist farmers cope with drought's unfavourable conditions (Ngaka, 2012).

The South African Weather Service also plays a crucial role in assisting small scale farmers with early warning information (EWI) which informs farmers decision making (Ngaka, 2012). The aim of this approach is to inform farmers about the upcoming events so that they can prepare themselves. Furthermore, there are still challenges in the way information is distributed (Ngaka, 2012). Therefore, the literature review in this section assisted to engage with this study's fourth objective, which was to assess government and other sources of support for small scale farmers in the study area.

3.7. Conclusion

This chapter discussed the literature review of this study, this was achieved by gathering literature around drought impacts and small scale farmers' response to drought. The

main aim of this chapter was to gain an understanding of the existing research around the concept of drought and small scale farmers.

CHAPTER FOUR: PHYSICAL SETTING AND METHODOLOGY

4.1. Introduction

This chapter focuses on the physical setting of the study and the methodology followed to achieve the aim and objectives of this study. The first part of this chapter describes the physical setting of the study with the aim of spatially locating the study area and providing a brief background. The second part of this chapter outlines the methodological steps followed in this study.

4.2. Profile of UMkhanyakude District Municipality

UMkhanyakude District Municipality is located in the far Northern region of KwaZulu Natal province in South Africa. Its absolute location is -27.622242 S and 32.014489 E. The District Municipality covers the total area of 12 818 km² with the population of 625 846 (StatsSA, 2016). Compared to the size of its neighbouring Zululand District Municipality, it is the second largest District in KwaZulu Natal. UMkhanyakude District also has the World Heritage Site known as Isimangaliso Wetland Park which encompasses an entire coastline of more than 200 km. The District Municipality consists of 4 local municipalities as follows: UMhlabuyalingana Municipality, Jozini Municipality, The Big 5 Hlabisa Municipality and Mtubatuba Municipality. The District is located in Mkhuze and has the Republic of Mozambique to the North, the Indian Ocean to the East, the King Cetshwayo District Municipality to the South, the Zululand District Municipality to the West and the Kingdom of Swaziland to the North West (UMkhanyakude District Municipality, 2018).

4.3. Profile of Mtubatuba Local Municipality

Mtubatuba Municipality is one of the four local municipalities under UMkhanyakude District and it is situated along the coastline of south eastern UMkhanyakude District. Mtubatuba Municipality is located at -28.416667 S, 32.183333 E and covers a total area of 76.22 km² (29.43 square miles). It is roughly 200km north of Durban and 55km north of Empangeni/ Richards Bay along the N2 national route (UMkhanyakude District Municipality, 2018). Mtubatuba Municipality has 20 ward communities with the total population of 202 176 (StatsSA, 2016). Mtubatuba Municipality has a total number of 41 792 households comprising of 31 439 formal housing, 1 843 informal housing and 7 442 traditional housing (StatsSA, 2016).

The town of Mtubatuba is named after the Zulu chief Nkosi Mtubatuba of the Mkhwanazi clan. Chief Mtubatuba was one of the long serving chiefs in the Zulu nation. The land area of Mtubatuba is not very large in comparison with the dispersed nature of the other four local Municipalities within the UMkhanyakude District, which are also more rural in nature (UMkhanyakude District Municipality, 2018). In Mtubatuba there is an intense competition for its scarce land resources, particularly in the south, where most of the human settlement has occurred. Much of the competition for land has intensified because of the land needs of the Park, the communities and above all for the facilitating sound economic growth and job creation. Mtubatuba Municipality offers various land use categories including residential, industrial, commercial, agricultural, military land, smallholdings and natural/ protected areas (Municipality, 2011).

4.4. Spatial delimitation of the study

Mfekayi area is located in the north of KwaZulu Natal in UMkhanyakude district under Mtubatuba local municipality (Figure 4.1). Mfekayi consists of four ward areas including wards 8, 9, 10 and 11. It is located at 28° 13' 40" S and 32° 16' 36" E, the study area is within walking distance and easily accessible from the N2 road (Mtubatuba, 2011).

4.5. Climate of the study area

The climate in Mtubatuba is warm and the annual temperature is 21.7 degrees, and the average annual rainfall is 967 mm. The rainfall in Mtubatuba is significant with precipitation even during driest month (UMkhanyakude District Municipality, 2018). Climate Change threatens the potential of the flora and fauna in Mtubatuba and whole of UMkhanyakude District, this is often mentioned as the consequence of human negligence on the one hand but on the other hand it is more often than not the intentional individual or collective actions that have put economic gains of utmost importance (UMkhanyakude District Municipality, 2018).

The consequences of climatic events like lower rainfall, higher temperatures, increased hydrological risk and uncertainty, high incidence of extreme rainfall days, drying of top soils, less water for drinking, sanitation and irrigation, less water in the soil for plants and increases in irrigation requirements for crops have adverse impacts

on small scale farmers' livestock and agricultural activities in Mtubatuba and the entire District (UMkhanyakude District Municipality, 2018). Hence, community educational workshops have been suggested as one of the possible solutions to mitigate and adapt to the impacts of natural disasters like drought and floods.

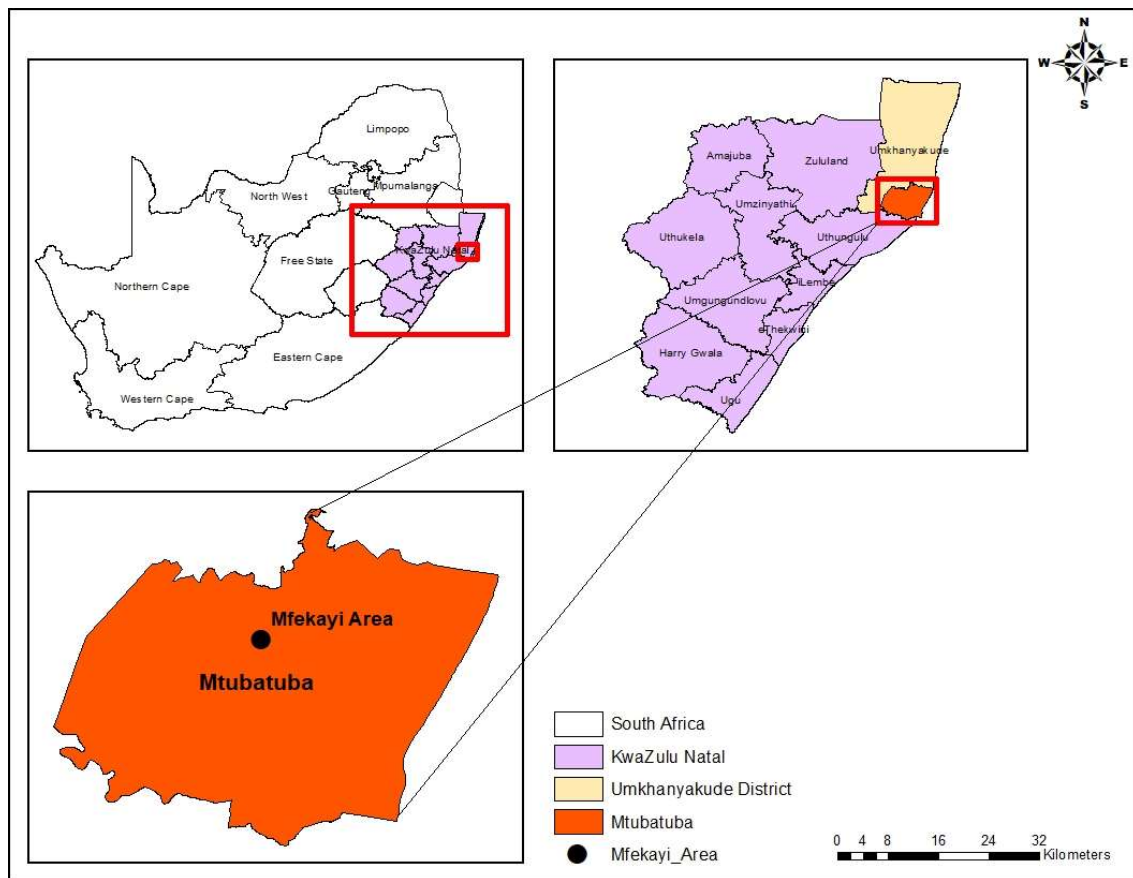


Figure 4.1: Location of the study area

4.6. Land Use in Mfekayi

The land in Mfekayi is under the traditional authority of INkosi Mkhwanazi. Nearly 70% of Mtubatuba local municipality's population are rural dwellers and many households including in Mfekayi rely partially on small scale farming, mainly crop farming and livestock rearing as the dominant agricultural practises to meet some of their food requirements (UMkhanyakude District Municipality, 2018). However, the most recent climate projections for the country suggest that rain-fed agriculture in UMkhanyakude is likely to be negatively affected due to lower annual rainfall, higher temperatures, increased hydrological risk, increased rainfall variability, drying of top soils, less water

in the soil for plants, and increased irrigation requirements. Such a change may have serious implications for food security and livelihoods locally and nationally (UMkhanyakude District Municipality, 2018). Only a few individuals from Mfekayi population are engaged in non-farm activities like brickmakers and tuck shopkeeping as a way of making a living (UMkhanyakude District Municipality, 2018).

4.7. Overview of small scale farming

Nearly 70% of Mtubatuba area is said to be rural, constituting of middle and low class. Half of the rural population makes a living through a variety of small scale farming activities, including crop farming, poultry, and livestock rearing such as goat and pig rearing. All these activities serve as the major livelihood activity for the small scale farmers. Small scale farmers feed their families from the agricultural produce and sell to make extra cash. These people have been making a living from these activities for years despite the unfavourable natural disasters (UMkhanyakude District Municipality, 2018).

4.8. Research Design

A research methodology considers and explains the logic behind research methods and techniques (Kumar, 2019). Nieuwenhuis (2007) defined research design as a guiding framework or skeleton to achieve the researcher's aim and objectives. Nieuwenhuis (2007) further defined research design as a strategy moving from the underlying philosophical assumptions to specifying the selection of respondents, data gathering techniques to be used and the data analysis to be done. Terre Blanche and Durrheim (2004) argued that once the researcher has made up their mind about the mode of inquiry, it is essential to explain why a specific method has been chosen and to briefly describe the entire research strategy and tactics. This study followed a mixed method approach. A mixed method approach involves the collection of both qualitative (open-ended) and quantitative (closed-ended) data in response to research questions or hypotheses (Creswell, 2014).

It includes the analysis of both forms of data and the two forms of data are integrated in the design analysis through merging the data, connecting the data or embedding the data (Creswell, 2014). A mixed method is defined as a procedure for collecting, analysing and combining both qualitative and quantitative methods at some stage of

the research process within a single study or a series of studies to understand a research problem more completely (Creswell and Clark, 2017). Qualitative research relies on linguistic rather than numerical data and uses meaning based forms of data analysis rather than statistical forms of data analysis (Maree, 2007). Quantitative research on the other hand can be defined as a systematic and objective process of using numerical data from only a selected subgroup of a population to generalise findings to the population being studied (Maree, 2007).

The mixed method has three types of design namely; the explanatory sequential design, the exploratory sequential design and the convergent parallel design. Convergent parallel design is a form of mixed method in which a researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem (Creswell, 2014). In the convergent design, the investigator typically collects both forms of data at the same time and then integrates the information in the interpretation of the overall results (Creswell, 2014). This is achieved by comparing and contrasting them to produce well validated conclusions (Creswell and Clark, 2017).

Explanatory sequential design is one in which the researcher first conducts quantitative research, analyses the results and then builds on the results to explain them in more detail with qualitative research (Creswell, 2014). It is considered explanatory because the initial quantitative data results are explained further with the qualitative data. It is considered sequential because the initial quantitative phase is followed by the qualitative phase (Creswell, 2014). Exploratory sequential design is the reverse sequence of explanatory sequential design. In this approach, the researcher first begins with a qualitative research phase and explores the views of participants (Creswell, 2014). The data is then analysed and then the information used to build into a second quantitative phase. The qualitative phase may be used to build an instrument that best fits the sample under study, to identify appropriate instruments to use in the follow-up quantitative phase, or to specify variables that need to go into the follow-up quantitative study.

However, this study followed a convergent parallel mixed method approach in order to achieve the objectives of this study. This is because this approach allowed the

researcher to collect both quantitative and qualitative data at the same time, analysed them separately and compared the results to see if the findings confirm or disconfirm each other (Creswell, 2014).

4.9. Research Sample

4.9.1. Quantitative Sampling

This followed a probability sampling technique. The researcher used the Cochran's (1977) sampling formula to derive the sample size. According to Israel (1992), the smaller the size of the population, the smaller the sample size, because a given sample size provides proportionately more information on a small population than on a bigger population. The following formula was used to arrive at a sample size:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where:

n_0 = Cochran's sample size recommendation number

n = Sample size

N = Population size

Therefore,

$$n = \frac{385}{1 + \frac{(385 - 1)}{285}}$$

$$= 164$$

The population size of small scale farmers in Mfekayi area was 285 and the Cochran sampling method was used to determine the sample size, however the simple random sampling method was used to acquire crop farmers and livestock rearing small scale farmers within the study area.

4.9.2. Qualitative Sampling

The study followed a non-probability sampling technique (Creswell, 2014). Purposive sampling is the only type of non-probability sampling that was used. Purposive

sampling was used to select characteristics that are of interest to the research topic at hand (McMillan and Schumacher, 2001). Patton (2002) further argued that the logic and power of purposive sampling lies in selecting information rich cases. Based on the purposive sampling technique described above, one official was interviewed from the Department of Agriculture and Rural Development (DARD) at UMkhanyakude District office using a semi structured interview. This is because these are the relevant offices that deal specifically with the farming practices and rural development. The responsibility of these portfolios is to ensure that the needs and wants of a community are met. The aim of the interview was to find out what is it that is done by the local government in order to support small scale farmers in Mfekayi area and its vicinities.

4.10. Data Collection

Vithal and Jansen (2004) argued that more than one strategy or method could be appropriate for the collection of data for a specific research question. This study used both primary and secondary data collection methods. The proposed instruments and mode of collection were utilised to find out about the impact of and response to drought by small scale farmers in Mfekayi.

4.10.1. Quantitative Data Collection and Instrumentation

Based on the simple random sampling technique described in the previous section above, the sample size of small scale farmers in Mfekayi area was 164. However, the researcher only managed to interview 50 participants. Hence 50 structured questionnaires containing both closed-ended and open-ended questions were distributed to small scale farmers to explore the impacts, challenges and responses taken by small scale farmers to drought and to collect demographic and numerical data from the small scale farmers. The data was collected from livestock farmers and crop farmers.

4.10.2. Qualitative Data Collection and Instrumentation

A semi structured interview was used as qualitative data collection instrument. One semi structured interview was held with the Department of Agriculture and Rural Development (DARD), as a form of primary data collection to find out about their adaptation and response strategies to the impacts of drought on small scale farming activities in the rural areas of Mtubatuba. This is because this is the office that deals

specifically with agricultural practices and farming activities within rural areas of UMkhanyakude District. The aim was to find out how the existing policies are helping the small scale farmers to adapt and respond to natural disasters like drought. The government documents, previous reports and papers were used as secondary data tools to gather data on the impact of drought on small scale farming activities for previous years especially 2014 to 2016. This is the period when the whole country, including KwaZulu Natal province was experiencing drought.

4.11. Data Analysis

4.11.1. Quantitative Data Analysis

Quantitative data was analyzed using quantitative data analysis techniques. The researcher utilized quantitative data process as follows: researcher started by validation the data to ensure that the delivery of data is clear and makes sense, the second step was data editing incase respondents' filled questionnaire fields incorrectly. The data was then coded according to themes and entered into the statistical package for the social sciences tool (SPSS). This was done in order to analyze quantitative data from the questionnaires and to display descriptive statistics with the use of relevant graphs, pie charts and tables.

4.11.2. Qualitative Data Analysis

Qualitative data was analyzed following the strategies of qualitative data analysis. The data gathered from formal interview with the Department of Agriculture and Rural Development (DARD) was analysed following qualitative data analysis as stipulated by Creswell (2014). The data analysis process was done as follows: the researcher prepared and organized raw data for data analysis, read through the data, coded the data using computer, created themes from the coded data and then interpreted the meaning of themes. Figure 4.2, below summarises the methodology of this research project and how each objective was achieved.

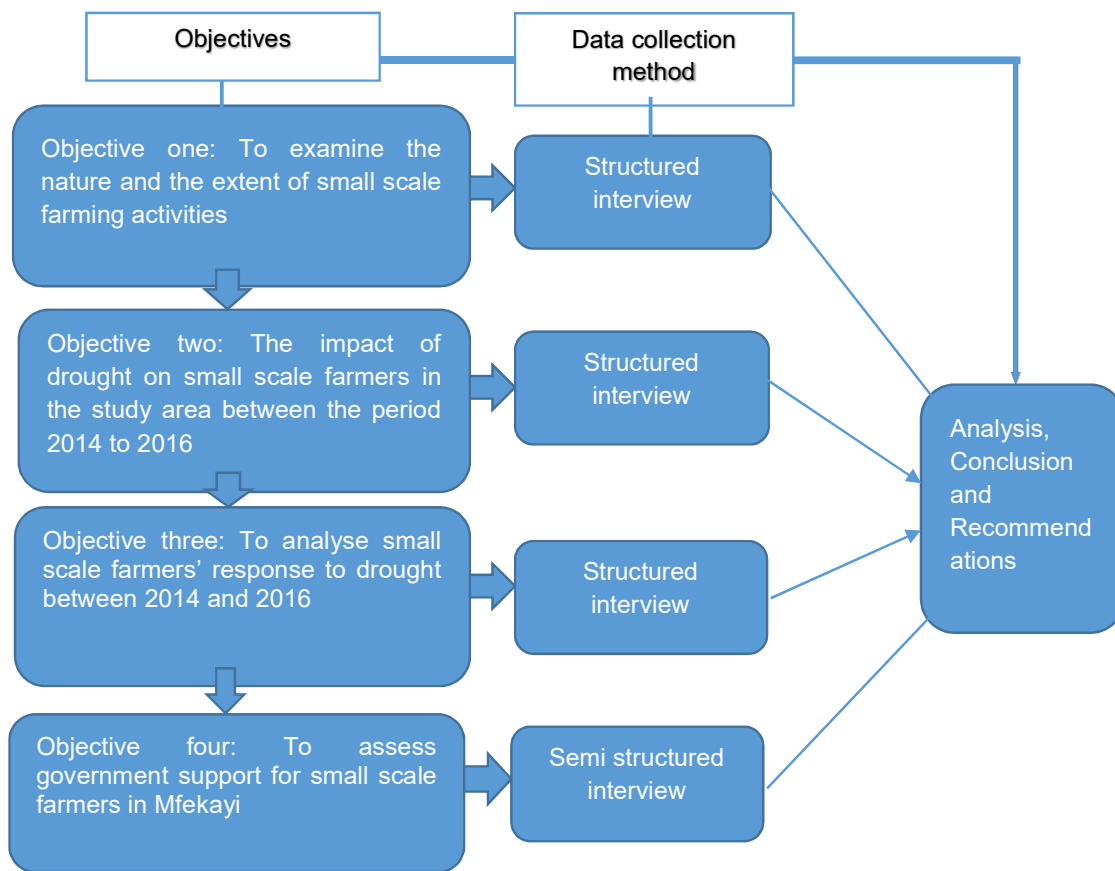


Figure 4.2: Summary of research methodology

4.12. Ethical considerations

I read the University's policy and procedures on research ethics and its policy and procedures on managing and preventing acts of plagiarism and I understood its content. No participant was forced to participate in this study; all participants were made comfortable and provided with sufficient information about this research. Confidentiality of participants was maintained through the protection of participant's identities, letter of consent and obtaining permission to interview. All the information acquired from this study will be disclosed with the permission of the participants.

Munro (2011) defined ethics as a set of moral principles which is suggested by an individual or a group, is subsequently widely accepted, and which offers rules and behavioral expectations about the most correct conduct towards experimental subjects and respondents, employers, sponsors, other researchers, assistants and

students. In this study, I undertook to:

- a) Respect the dignity, safety and well-being of others, including the graffiti writers, and unless express written permission is given, I respect anonymity and confidentiality.
- b) Consider and be sensitive to different cultures, languages, beliefs, perceptions, and customs of persons who participated in or are affected by my research.
- c) Ensure that the research is relevant both to the broad legal and development needs of the country and to the individual needs of those who may be affected by my research.

4.13. Conclusion

This chapter outlined the physical setting of this study and this was intended to provide a brief background of the study area. This chapter also discussed the methodology of this study in terms of explaining the research design as well as data collection and analysis strategies. The next chapter focuses on analysis of data.

CHAPTER FIVE: DATA ANALYSIS AND INTERPRETATION

5.1. Introduction

This chapter focuses on data analysis and interpretation with the aim of discussing the collected data to address the objectives of this study. This was achieved by the use of relevant graphs, tables and pie charts to display the findings as this chapter builds up from the previous chapters.

5.2. Demographic characteristics of respondents.

5.2.1. Gender of participants.

The results in Figure 5.1 below indicate that the majority (60%) of the participants were females and the minority (40%) were males. These results suggest that more females are engaged in farming activities because some families are female headed and in other families the females stay at home to look after the family while the males either work or seek for job opportunities in urban areas. Moreover, all participants in this study were Africans and originally born in the rural area of Mfekayi. These findings confirm a study by Kirsten and Van Zyl (1998) which states that small scale farming is associated with black farmers residing in rural areas.

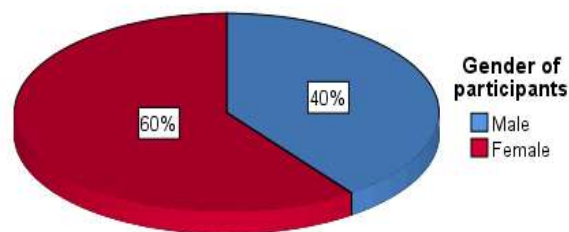


Figure 5.1: Gender of participants.

5.2.2. Participants' marital status.

Figure 5.2 below indicate that majority (50%) of participants are single, 44% were married, only 4% were divorced and minority (2%) were widowed. These results suggest that the majority of participants (single, divorced and widowed) have a bigger responsibility to provide and feed their families compared to the married group having both partners present and sharing family responsibilities. Furthermore, it appears in

this study that majority (64%) of participants have a family size of between 5 – 10 members, 22% have a family size of 11 and above while a minority (14%) has a family size of 1 – 4.

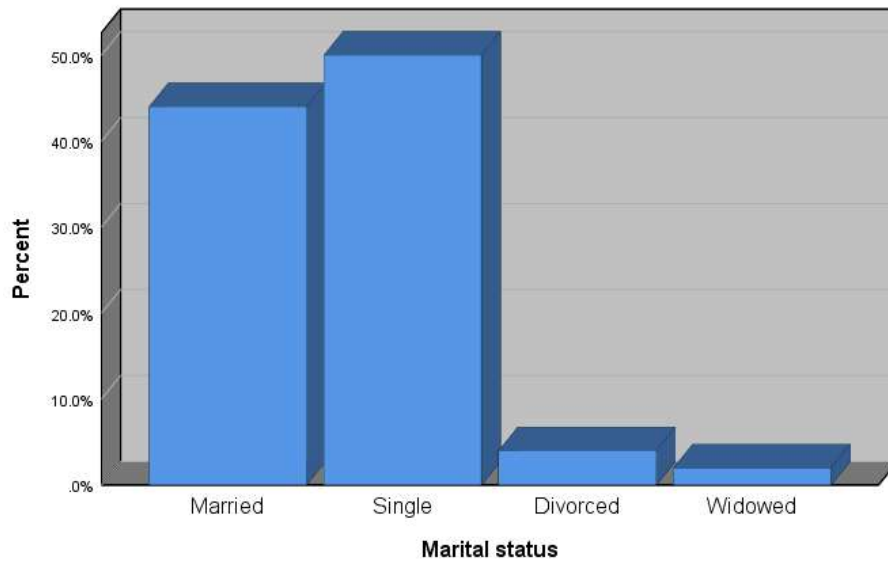


Figure 5.2: Participants' marital status.

5.2.3. Age of participants.

Many (32%) participants in Figure 5.3 below indicated that they are at the age of 60 and above, few participants (18%) are between the age of 18 – 31 while other participants indicated that they are between 31 – 45 (24%) and 46 – 59 (26%). These results suggest that the age group of farmers above 60 years are the ones who are more engaged in farming because most of them are retired individuals, others have the responsibility to lead and provide food as the elder member of the family. Regarding the minority group (18 – 31), the results suggest that these are young and active individuals most of them seeking job opportunities and studying. This group of participants do not have much time to engage in farming activities while the average group between ages 31 – 59 are participants who are perceived to be working, holding seasonal jobs or unemployed. As a result, they also get time to engage in farming activities.

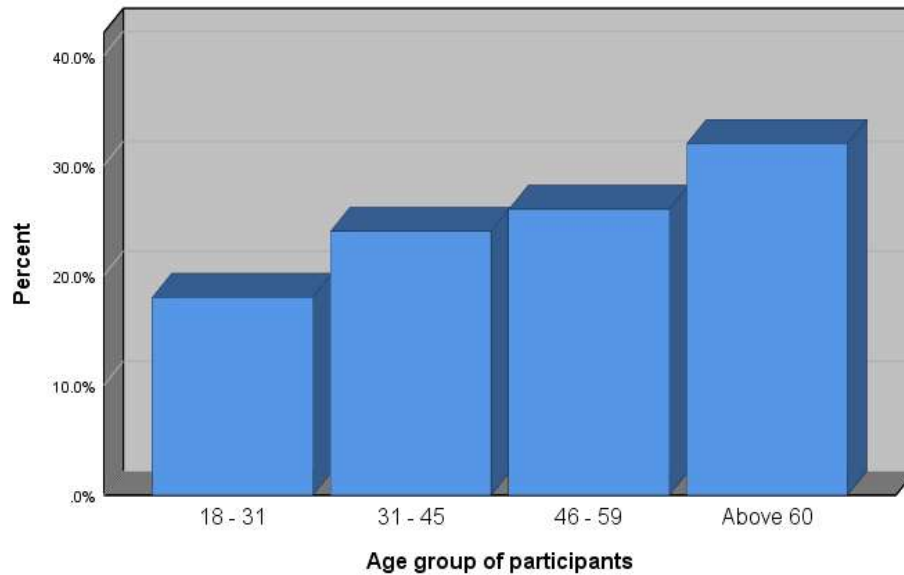


Figure 5.3: Age group of participants.

5.2.4. Employment status and income level.

In Table 5.1, the majority (76%) of participants stated that they were not working while the minority (24%) stated that they were working. In addition, Table 5.1 below also indicates that the majority (90%) of participants earn less than R5000 a month from the type of farming they practice, 6% earn between R6000 – R10 000 a month, and a minority (2%) earn between R11 000 – R15 000 and another 2% earn above R15 000. These results suggest that the majority of participants are unemployed and they realise low income (less than R5000) from the type of farming they practice. This poses a challenge as the farmer cannot fully afford basic needs of the family, relevant farming resources and expensive supplements in order to adapt to drought. Furthermore, participants earning less than R5000 could be participants without proper resources to respond to drought hence their production is declining leading to less income. As it appears, the findings in this study disconfirm studies such as those of (Aniah et al., 2019; Mohmmmed *et al.*, 2018; Wossen et al., 2017)) that concluded that small scale agriculture is the most vibrant sector generating employment opportunities in rural areas and contributes significantly to the gross domestic product.

Moreover, it is evident in Table 5.1 below that the majority (90%) of participants earn less than R5000, this could be influenced by the significant number (54%) of

participants who were unskilled, 12% were semi-skilled, 24% were skilled individuals and the minority (10%) were professionals. These results suggest that participants lack skills to be employed in the formal sector in towns and cities and as result they may be forced to resort in farming, although they realise low income. These findings support a study by Mashamaite (2014) that established that small scale farmers lack relevant farming skills and basic information.

Table 5.1: Employment status versus participants' level of income.

Employment status		Level of income				
		Less than R5000	R6000 - R10 000	R11 000 - R15 000	Above R15 000	Total
Yes	24%	45	3	1	1	50
No	76%					
Total	100%	90%	6%	2%	2%	100%

5.2.5. Level of education.

The results in Figure 5.4 below indicate that the minority (8%) of participants have university education, 24% have college education, 22% have secondary education, and another 24% have primary education while another 22% have no schooling. These results suggest a fall back in the level of education with majority of participants holding no education, while primary and secondary education indicating low illiteracy level. This means that these farmers are not educated enough and as result they are semi-skilled or not skilled at all to compete for better paying jobs in urban areas. These results confirm a study by Ngaka (2012) which suggested that small scale farmers were characterised by low illiteracy level.

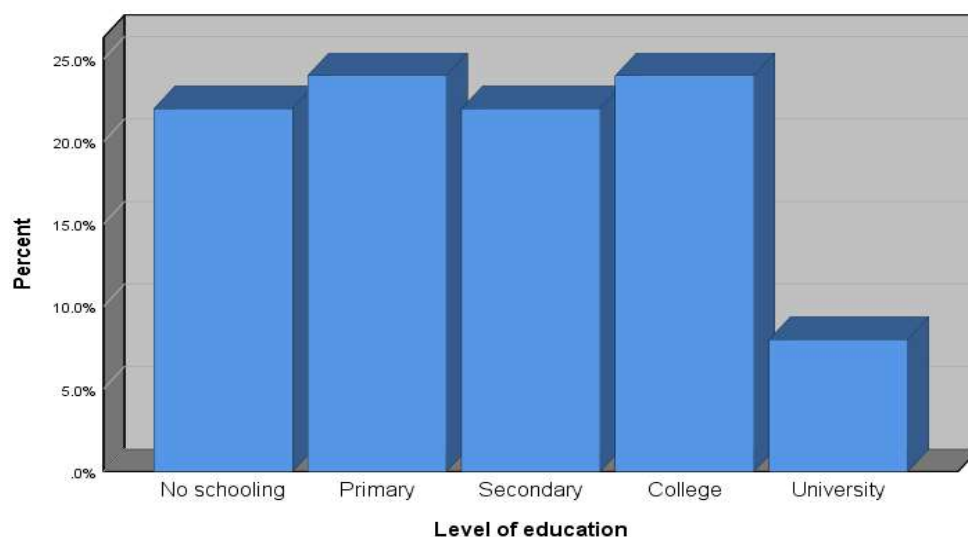


Figure 5.4: Participants' level of education.

5.3. Nature of small scale farming activities in Mfekayi

5.3.1. Type of farming.

The results in Figure 5.5 below indicate that 40% of small scale farmers' practice livestock farming, 36% are engaged in both crop farming and livestock farming while 24% are engaged in crop farming only. These results suggest that livestock farming is the dominant farming activity in this area followed by people engaged in both livestock and crop farming. These findings confirm a study by Makhado et al. (2014) that established that approximately 70% of rural poor individuals own livestock. Based on the data collected by a structured interview (August, 2019) from the government official at UMkhanyakude District Office, Department of Agriculture and Rural Development (DARD), there are various small scale farming activities in Mfekayi. Farmers involved in crop farming produced a variety of field crops such as maize, beans, cassava, groundnuts, sugar cane production and vegetable crops such as onions, spinach, cabbage, tomatoes, beetroot and sweet potatoes for household consumption and sold some surplus to hawkers. Those involved in livestock domesticated beef cattle, indigenous goats and indigenous chickens for both household consumption and for sale. In addition, other farmers were involved in fruit production like avocados and mangos. All small scale crop farmers have different sizes of plots of land. Approximately, 4.5 hectares of land was recorded as the largest area for farming while the majority of farmers have less than 2 hectares of land. During the drought period,

some crop farmers switch from farming to non-farming activities like roadside craft work because of the unsuitability of land for farming.

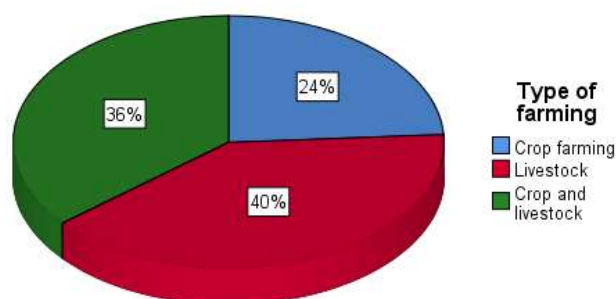


Figure 5.5: Type of farming.

5.4. The impact of drought on small scale farming activities.

All respondents in this study suggest that the 2014 – 2016 was their worst drought period because they suffered losses as a result of drought. The results in Table 5.2 below indicate that 22% participants suffered livestock deaths as the impact of drought, (8%) of the participants suffered livestock physical body weight loss, 24% suffered crop failure and many participants (46%) suffered from all above mentioned impacts of drought. These results suggest that the majority of small scale farmers suffered from numerous livestock deaths and crop failure as the major impacts of drought. These findings confirm several studies such as of Ngaka (2012), Mapfumo et al. (2016), Khayyati et al. (2016) and Haile et al. (2019) that suggested that livestock deaths and crop failure are the key impacts of drought on farming activities.

Table 5.2: Impact of drought on farming activities.

Impact	Frequency	Percent
Livestock deaths	11	22%
Livestock physical body weight loss	4	8%
Crop failure	12	24%
All of the above	23	46%
Total	50	100%

In addition, according to DARD (2019), the recorded impacts of drought in Mfekayi comprise low yields in biomass and crop failure. Drought has detrimental

consequences on food and nutrition security. The majority of farmers have been forced to abandon their fields especially sugarcane due to high crop establishment and maintenance costs.

5.4.1. Challenges related to drought.

Table 5.3 below shows the challenges related to drought. For instance, (44%) participants mentioned water scarcity as one of the major challenges, (4%) of the participants mentioned low soil moisture, (10%) mentioned less grazing lands, and (42%) experienced all the above challenges related to drought. These results suggest that water scarcity is the major challenge related to drought. These findings confirm studies such as that of Kang and Banga (2013) and Khayyati et al. (2016) that indicated that high evapotranspiration, water scarcity, less grazing areas and low soil moisture are some of the challenges related to drought. In addition, small scale farmers are exposed to livestock diseases during drought, their livestock is effected by extreme ticks, and they realise less income because of water shortages and unsuitable land for production and grazing. These findings confirm studies such as of (Azadi *et al.*, 2018, Haile et al., 2019, Hannaford *et al.*, 2019) that suggest that small scale farmers are vulnerable to hazards such as malnutrition, outbreak of diseases and low income causing poverty.

Table 5.3: Challenges related to drought.

Related challenges	Frequency	Percent
Water scarcity	22	44%
Low soil moisture	2	4%
Less grazing lands	5	10%
All of the above	21	42%
Total	50	100%

These environmental challenges (Table 5.3) lead to societal challenges such as acute shortage of water and the outbreak of diseases because people do not have water for their daily household needs such as cooking, drinking and hygiene. Furthermore, people end up sharing the available water with the animals. In this study, participants are vulnerable to drought because they do not have water, they are attacked by diseases, and they also suffer from livestock deaths and crop failure. They are faced

with decline in grazing lands and they are without drinking water for livestock and irrigating crops. All these highlight the impacts and challenges of drought, they suggest that small scale farmers are vulnerable to drought and this speaks directly to the drought vulnerability conceptual framework used to guide this study. The conceptual framework suggests that drought has multiple impacts on small scale farmers thereby increasing their vulnerability level to natural hazards and creating economic, social and environmental imbalances as discussed in chapter two sub-heading 2.3.1 of this study. However, some participants have responded and survived the harsh impacts of drought as discussed in sub-heading 5.5 below.

5.5. Response to drought by small scale farmers.

Table 5.4 below indicates the actions taken by participants as a response to drought. For instance, 20% of the participants stated “none” of the actions were taken to respond to drought except switching from farming to non-farming activities such as craft during drought periods. These findings confirm studies such as that of Mohammed et al. (2018) which established that small scale farmers’ switch from farming to non-farming activities during drought. Another (14%) of participants indicated that they bought livestock supplements, 6% indicated that they changed grazing lands.

Table 5.4: Responses to drought by respondents.

Response	Frequency	Percent
Livestock movement	2	4%
Changing grazing lands	3	6%
Livestock supplements	7	14%
Buying water	3	6%
Crop variation	1	2%
Loan	2	4%
None	10	20%
All of the above	22	44%
Total	50	100%

In addition, other adaptation actions include buying water for basic human needs and livestock to drink, applying for and accessing loans to cover drought expenses, selling livestock at cheaper prices, crop variation, using pump engines and travelling long distance to fetch water as a response to drought. These results suggest that, there are multiple ways by which small scale farmers respond to drought. However, these actions are not effective enough hence there are further challenges encountered (these challenges are explained in the following part below). These findings further confirm studies such as that of Ngaka (2012) which concluded that small scale farmers move livestock to better grazing areas, change grazing lands, purchase livestock supplements and fetch water as some of drought adaptation strategies in response to drought.

Based on the findings of this study, some participants were able to survive and adapt to the adverse impacts of drought because of the actions taken such as moving livestock to better grazing areas, buying supplements and water, and accessing loans and government support. The actions taken by small scale farmers speaks directly to the drought adaptation conceptual framework used to guide this study that states that there are various adjustments to economic, environmental and social systems in response to actual climate stimuli, their effects and impacts. However, there are further challenges encountered (Table 5.5) by participants when dealing with drought hence their level of affordability is not the same.

5.5.1. Challenges when responding drought.

The results in Table 5.5 below show the challenges encountered by small scale farmers when dealing with drought. Many (40%) participants indicated drought recovery costs as the major challenge in dealing with drought. This includes the costs of buying water, livestock feed, moving livestock to other better grazing areas, and purchasing expensive crop and livestock supplements. The other 16% participants indicated lack of information, 6% indicated further livestock deaths, 8% indicated long distance to get water and 30% suffered from all of the above challenges in dealing with drought.

Table 5.5: Challenges when responding drought.

Challenges	Frequency	Percent
Further livestock deaths	3	6%
Drought recovery costs	20	40%
Distance to get water	4	8%
Lack of information	8	16%
All of the above	15	30%
Total	50	100%

These results suggest that even though small scale farmers have responded to drought, they continue to experience drought impacts because their response measures are not effective enough. Many participants experienced drought recovery costs because of the expensive supplements. The majority of participants are not working and the majority make less than R5000 a month from the type of farming they practice which is not enough to meet all the basic needs of a farm family. These findings confirm studies such as those of (Bell et al., 2018, Burchfield and Gilligan, 2016, Keshavarz et al., 2017, Kirsten and Van Zyl, 1998, Moeletsi et al., 2013, Ngaka, 2012) that established that small scale farmers struggle to respond to the impacts of drought because they are characterised by lack of relevant information, lack effective responses to drought as they are resource poor hence they fail to sustain production.

According to DARD (2019), mitigating and adapting to climate change and natural disasters such as drought is a challenge in Mfekayi because most farmers are resource poor in terms of inputs for production. Small scale farmers' further face social challenges such as stray livestock destroying produce, high unemployment level, stock theft, lack of drinking and irrigation water, and undocumented farmers who make it difficult for the government to reach out with assistance.

5.5.2. Small scale farmers' needs.

The results in Table 5.6 below indicate the needs of small scale farmers from the government. The results indicate that the majority (44%) of participants proposed provision with resources and infrastructure, these include roads, fencing, proper irrigation system, pump engines, building and rebuilding existing dams, and crop

supplements. Moreover, 14% of the participants mentioned that they need crop and livestock supplements, 22% mentioned that they need educational support and 20% mentioned that they need all of the relevant support to farming. These results suggest that participants lack relevant farming resources hence they are struggling to respond effectively to the impacts of drought. These findings support studies such as those of Kirsten and Van Zyl (1998) and Moeletsi et al. (2013) that small scale farmers needs government assistance and should be empowered to form part of new and vibrant agricultural sector.

Table 5.6: Small scale farmers' needs.

Needs	Frequency	Percent
Educational support	11	22%
Supplements (crop and livestock)	7	14%
Resources and infrastructure	22	44%
All of the above	10	20%
Total	50	100%

5.6. Government support on small scale farming activities concerning drought.

5.6.1. Government support

Findings in Table 5.7 below indicate government support and the type of support received from the government by participants. A significant number (32) of participants indicated that they do not receive support from the government while few (18) indicated that they receive government support. Out of the 18 participants receiving government support, only 2 participants mentioned that they receive tools such as tractors for land preparation, 6 participants mentioned that they receive material such as crop supplements and livestock supplements, 3 participants indicated that they receive the above mentioned tools and material, and 7 participants mentioned that they receive all three kinds of support from the government such as tools, material and educational support to provide knowledge on farming practices and adaptation strategies to drought. Section 5.5.2 above discussed the needs of participants, these needs included educational support, supplements, irrigation system, fencing, roads and building and rebuilding existing dams. However, many participants could not get what they requested from the government and the few individuals that received the

support highlighted that it was not enough. According to DARD (2019), budget constraints and undocumented farmers are the primary reasons why the needs of the participants have not been met as requested in Table 5.6 above.

These findings confirm a study by Mashamaite (2014) that recorded that small scale farmers lack support from the government and relevant stakeholders, as it appears in this study that many small scale farmers lack government support hence they are resource poor and struggling to increase or sustain their production.

Table 5.7: Government support and the type of support.

Government support		Type of support			
		Tools	Material	Tools and material	All of the above
Yes (18)		2	6	3	7
No (32)		0	0	0	0
Total	50	2	6	3	7

Nevertheless, the DARD is responsible for providing extension support, veterinary services and value adding (processing of agricultural produce). In the previous years and previous drought, the DARD has provided livestock feed (hay bales) in 2015/16 financial year, seed starter packs for household gardens, seed cane demonstration plots for sugarcane growers in 2017. The DARD has also provided mechanization support at the start of the planting season since the 2017/18 financial year. DARD further provided tractors for land preparation, planting of dry beans to individuals and farmer groups. However, there are challenges that hinders government support, like budget constraints which affect implementation of infrastructure projects and shortage of transport for extension practitioners to reach farmers. Further challenges comprise illegal afforestation, thus contravention of Conservation of Agricultural Resources Act which requires a permit for new afforestation, unreliable contractors for mechanisation services and cane haulage which yields low efficiency and delays. These findings confirm a study by Ngaka (2012) that has examined government support schemes that deal specifically with small scale farming activities and their adaptation to drought.

5.7. Conclusion

This chapter outlined the findings of this study. This was achieved by analysing and interpreting the data collected for this study following the order of objectives. This chapter also discussed the demographic characteristics of participants as it forms essential part of findings. The next chapter provides a concluding summary and the recommendations for this study.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This study consisted of six chapters. Chapter one provided the foundation of this study by discussing the background, research problem and orientation to this study. Chapter two analysed the conceptual framework within which this study is positioned. Chapter three critically discussed the literature relevant to the present research study. Chapter four described the physical setting, research design and the methodology that was followed in conducting this research study. The study was based in Mfekayi, one of the rural areas under Mtubatuba Municipality. Chapter five provided a critical analysis and interpretation of data in response to the objectives of this study. In line with the analysis, the following concerns emerged, which are summarised in the concluding chapter.

6.2. The nature of small scale farming activities.

This research established that there were various farming activities in Mfekayi which small scale farmers were engaged in for both household consumption and selling. The dominant activities include livestock rearing and crop farming. These activities are the source of livelihood for many families in the study area. This means that when drought strikes, there are serious economic and socio-political consequences as discussed in this study (see Section 5.4 of chapter five) and as summarised in the following sections.

6.3. The impact of drought on small scale farming.

Drought has detrimental impacts on small scale farming activities. These includes livestock deaths and crop failure. These impacts of drought lead to social, environmental and economic disturbances for small scale farmers. Small scale farmers experience more challenges during drought periods compared to the normal seasons. This is because of various challenges linked to the impacts of drought such as water shortage, low soil moisture, disease outbreak, reduction in grazing lands and financial predicaments affect small scale farmers as they have to spend more money on adaptation measures such as buying expensive supplements.

6.4. Response to drought by small scale farmers.

This study suggested that there are various adaptation strategies used by small scale farmers to respond to drought. However, it was noted in this study that there are further challenges in dealing with drought such as lack of resources, poor access to information, drought recovery costs and further livestock deaths. Based on the findings, actions taken by small scale farmers are not effective enough to respond to drought because they lack relevant information and proper adaptation strategies. For instance, adaptation strategies are taken late after the drought has occurred and not before. Although other small scale farmers might have resources but they are not sufficient to problems of drought. The costs of drought such as in livestock supplements and crop supplements are expensive while the majority of small scale farmers cannot afford them and others are forced to opt for cheaper material. In addition, not so much is known by small scale farmers about various adaptation strategies, this is because of the majority of small scale farmers lack skills and have low illiteracy.

6.5. Government and other sources of support on small scale farming.

The study indicated the primary needs of small scale farmers (see section 5.5.2 of chapter five). These needs include educational support for small scale farmers. For instance, teaching farmers about good farming practices such as landscape management. Moreover, small scale farmers need resources that are relevant to their problems like proper irrigation systems, and livestock and crop supplements. However, not so much has been done by the government and relevant stakeholders to address the needs of small scale farmers. As such, this creates gaps in terms of the provision and distribution of resources to small scale farmers. These gaps emanate from budget constraints, undocumented farmers and shortage of transport for extension practitioners to reach farmers.

6.6. Recommendations

Based on the findings of this study in chapter five, the study recommends the following:

6.6.1. Recommendations to small scale farmers:

- a. The study recommends that small scale farmers should practice both farming and non-farming activities such as craft, sewing and other small businesses

that do not rely heavily on natural resources like rainfall. This will benefit small scale farmers by realising more income to feed and sustain their families.

- b. Small scale farmers should also practice joint farming where by those with enough land for ploughing should form co-operatives with other farmers. This strategy could benefit farmers and enhance their production because of the shared knowledge and responsibility from land preparation, buying expensive tools and supplements, and application of proper material.
- c. Small scale farmers should also practice mixed farming where by different type of crops can be ploughed in one area at the same time.
- d. Based on small scale farmers' response to drought, this study recommends that small scale farmers should adopt a collective approach to understanding indigenous knowledge systems that are cheaper to apply and respond to the adverse impacts of drought. This can be achieved by small scale farmers holding village meetings to share knowledge about various adaptation measures. This method could benefit all nature of farmers from youth to old people through exchanging ideas.
- e. Moreover, small scale farmers should opt for more cheap methods to respond to drought like using same water many times. For instance, bathing water can also be used for irrigating vegetable crops. To these methods farmers can further incorporate actions such as removing calves from their mothers at an early stage to allow the mother to gain strength and survive harsh challenges.

6.6.2 Recommendations to NGOs:

- a. The study recommends that the Non-governmental Organisations (NGOs) should work hand in hand with the government to uplift and unlock small scale farmers' potential. This can be done by raising awareness campaigns and educational support based on various types of farming activities, impacts of natural disasters such as drought and their adaptation measures.
- b. NGOs should provide emergency support to small scale farmers in cases of unforeseen circumstances such as the outbreak of natural disasters.
- c. NGOs should design policies that specifically deal with the impacts of natural disasters such as drought on small scale farmers in deep rural areas

6.6.3 Recommendations for the government (DARD):

- a. The study recommends that small scale farmers should be introduced and made aware of other various types of farming practices that can withstand harsh weather conditions such as the type of livestock and the types of crop suitable for certain type of soil.
- b. Regarding the impacts of drought on both crop and livestock farming, this study recommends that small scale farmers should be provided with crop supplements and livestock supplements such as multi-vitamins, vaccines, fodder and deworming.
- c. Government should design an insurance policy where by those small scale farmers that have lost so much during drought can be compensated for their loss. For instance, farmers that have lost many livestock during drought.
- d. Lack of information was identified as one of the challenges in dealing with drought. As such, the government should provide early warning systems on the upcoming weather or seasonal events using cheaper and common variables such radio, community meetings and newspapers so that farmers can prepare themselves in advance.
- e. Concerning the government and relevant stakeholders support, the study recommends that small scale farmers should be provided with financial support to incorporate short term and long term developmental needs such as proper irrigation schemes and water infrastructure such as boreholes and building and rebuilding existing dams.
- f. In addition, this study recommends that the government should develop an integrated approach to collecting data of small scale farmers at all levels (national, provincial and local), this will however benefit policy makers to gather necessary information on drought disaster and enable them to design a proper drought disaster impact assessment.
- g. The study also recommends that government should design a drought management scheme that specifically addresses the needs of small scale farmers.

6.7. Suggested areas for further research.

This study was limited to the four objectives of this study as outlined in section 1.4 of chapter one. However, there was interesting information that could not be explored further. Therefore, it is suggested that future research could explore the following:

- a. Issues of access to land and ownership. Small scale farmers own unequal plots of land, those with small plots realise low production because of land as the limiting factor while those with sufficient land have a greater potential to realise more production and income. It would be interesting to find out the extent to which access to land and/or land ownership implicates on small scale farming in the study area.
- b. The role of Non-governmental Organisations (NGOs) and Civil Society Organisations (CSOs) in alleviating the impacts of drought. Research could focus on the different types of roles that these organisations play in drought mitigation and/or adaptation and the efficacy of these.

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APPENDIX A: ETHICAL CLEARANCE

**UNIVERSITY OF ZULULAND
RESEARCH ETHICS COMMITTEE**
(Reg No: UZREC 171110-030)



RESEARCH & INNOVATION

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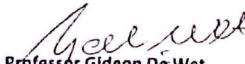
ETHICAL CLEARANCE CERTIFICATE

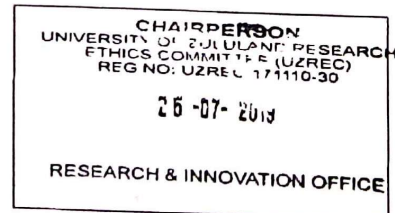
Certificate Number	UZREC 171110-030 PGM 2019/28				
Project Title	INVESTIGATING THE IMPACT OF AND RESPONSE TO DROUGHT BY SMALL SCALE FARMERS IN MFEKAYI, MTUBATUBA, KWAZULU NATAL				
Principal Researcher/ Investigator	Ziphozethu Bukhosini				
Supervisor and Co-supervisor	Dr I. Moyo				
Department	Geography and Environmental Studies				
Faculty	Arts				
Type of Risk	Med Risk – Data collection from people				
Nature of Project	Honours/4 th Year	Master's	☒ x	Doctoral	Departmental

The University of Zululand's Research Ethics Committee (UZREC) hereby gives ethical approval in respect of the undertakings contained in the above-mentioned project. The Researcher may therefore commence with data collection as from the date of this Certificate, using the certificate number indicated above.

- Special conditions:
- (1) This certificate is valid for 1 year from the date of issue.
 - (2) Principal researcher must provide an annual report to the UZREC in the prescribed format (due date-24 July 2020)
 - (3) Principal researcher must submit a report at the end of project in respect of ethical compliance.
 - (4) The UZREC must be informed immediately of any material change in the conditions or undertakings mentioned in the documents that were presented to the meeting.

The UZREC wishes the researcher well in conducting research.


Professor Gideon De Wet
Chairperson: University Research Ethics Committee
Deputy Vice-Chancellor: Research & Innovation
25 July 2019





Faculty of Science and Agriculture

Department of Geography and Environmental studies

APPENDIX B: INTERVIEW SCHEDULE

The information to be collected in this study: ***Investigating the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal*** is to be used strictly for academic purposes. The purpose of this study is to investigate the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal. Participants are allowed to terminate their participation at any time should they feel uncomfortable and all information collected will be maintained confidentially.

**Interview guide: Department of Agriculture and Rural Development
(UMkhanyakude District Office)**

1. What are the primary small scale farming activities in Mfekayi?
2. What was the impact of drought on small scale farming activities in Mfekayi?
3. What are the environmental problems faced by small scale farmers in Mfekayi?
4. What are the social problems faced by small scale farmers in Mfekayi?
5. What actions have been taken by the municipality in assisting small scale farmer's to respond to drought?
 - 5.1. Policy of municipality on small scale farming activities?
 - 5.2. Role of municipality on small scale farming activities?
 - 5.3. Are there any challenges encountered by the municipality specifically in assisting small scale farmers?



Faculty of Science and Agriculture

Department of Geography and Environmental studies

APPENDIX C: QUESTIONNAIRE

The information to be collected in this study: *Investigating the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal* is to be used strictly for academic purposes. The purpose of this study is to investigate the impact of and response to drought by small scale farmers in Mfekayi, Mtubatuba, KwaZulu Natal. The researcher requests your honest assistance through the completion of this questionnaire. Participants are allowed to terminate their participation at any time should they feel uncomfortable and all information collected will be maintained confidentially.

SECTION A: DEMOGRAPHIC CHARACTERISTICS

WARD:

RESPONSE DATE:

- | | | |
|------------|-------------|-------------|
| 1. Gender: | Male [] | Female [] |
| 2. Age: | 18-30[] | 31-45[] |
| | 46-59[] | above 60[] |
| 3. Race: | African [] | Whites [] |

- Coloured [] Indian []
4. Working: Yes [] No []
5. Income: less than R5000 [] R6000-R10 000[]
 R11 000- R15 000[] above R15 000[]
6. Level of education: Primary [] Secondary []
 College [] University []
 No schooling []
7. Occupation: Professional [] Skilled []
 Semi-skilled [] Unskilled []
8. Marital status: Married [] Single []
 Divorced [] Widowed []
9. Place of birth: Urban [] Rural []
10. Family size: 0-4members [] 5-10members []
 Above 11members []

Section B: Nature of small scale farming activities in Mfekayi?

11. (a) When were you affected by drought in this area?

.....

(b) What type of farming do you practice?

Crop farming 01

Keeping livestock 02

Both crop farming 03
and livestock
keeping

(c) Please quantify the losses that occurred during last drought?

.....
.....

(d) Anything you wish to share on the causes of drought in this area?

.....
.....
.....

Section C: The impact of drought to small scale farmers in Mfekayi.

12. What was the impact of drought on your type of farming?

.....
.....
.....

13. What are the challenges related to drought?

.....
.....
.....

14. Is there anything that you wish to share related to the effects of drought?

.....
.....
.....

Section D: Response to drought by small scale farmers in Mfekayi.

15. How did you respond to drought?

.....
.....
.....

16. What challenges did you face in dealing with drought?

.....
.....
.....

17. What kind of developments do you wish to see as a response to drought?

.....
.....
.....

Section E: The government support of small scale farmers to drought.

18. Do you receive any support from the government?

YES NO

19. What kind of support do you receive from the government?

Financial

Transport

Material

Educational support

Please specify if other:

.....
.....
.....

20. Please state or list the things that have been provided by the government in this area.

.....
.....
.....

21. Is there anything that you wish to share with the researcher concerning government support?

.....
.....
.....
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