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With the provisional title:

**Commercial Farming Adaptation to Drought as a Strategy for Stable Local Economic Growth
in Ugu District Municipality**

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I, Simiso Fisokuhle Nyandeni, would like to declare that I have read and understood the policies and rules of the University of Zululand pertaining postgraduate research. On that note, I would like to declare that I have complied with specific requirements. As a result, I have obtained Ethical Clearance Certificate (Ethical Clearance Certificate Number: UZREC 171110-030 PGM 2020/66) and I have complied with specific conditions set out in the certificate. I would further like to declare that this work is my own effort, and it is not being submitted for any examination purposes nor published elsewhere. Furthermore, I have complied with the University of Zululand's Plagiarism Policy; hence, the study has undergone text-matching and similarity-checking procedures to ensure that there is no plagiarism.

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Date: 01/02/2022

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Date: 01/02/2022

DEDICATION

This research project is dedicated to my late father, Agrippa Sithole, my granny uMaCele, my best friend who is a brother to me Sakhile Khuzwayo who has been there since the day one. Also,

I dedicate this work to my colleagues namely Dr Sunday Olawale Olaniran, Dr Olumuyiwa Kehinde (Kenny), and Dr Akweni Arindo who in one way or the other also mentored me.

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LIST OF ACRONYM AND ABBREVIATIONS

ANC	African National Congress
COGTA	Cooperative Governance and Traditional Affairs
DPLG	Department of Provincial and Local Government
IAP2	International Association for Public Participation
IDP	Integrated Development Planning
IGR	Intergovernmental Relations Framework Act
KPA	Key Performance Areas
MFMA	Municipal Finance Management Act
NDP	National Development Plan
NGO	Non-Governmental Organisations
PGDS	Provincial Growth & Development Plan
PSC	Public Service Commission
SALS	South African Legislative Sector
SASSA	South African Social Security Agency
UN	United Nations
WPLG	White Paper on Local Government
DPLG	Department of Provincial and Local Government
BFAP	Bureau for Food and Agricultural Policy
DPSIR	Driving Forces- Pressures- State- Impacts – Response
FOA	Food and Agriculture Organization
GDP	Gross Domestic Product
IPCC	Intergovernmental Panel on Climate Change
LEG	Local Economic Growth
NAP	National Adaptation Plan
OECD	Organisation for Economic Co-Operation & Development
SANAS	South Africa national Adaptation Strategy
SAWS	South African Weather Service

SIDS	Small Island Developing States
Stats SA	Statistics South Africa
UNFCCC	United Nations Framework Convention on Climate Change
WWF-SA Policy	World Wildlife Fund- South African Policy

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ABSTRACT

Agriculture is regarded as the sector that mostly relies on climate conditions for its productivity, yet in recent years this sector has been experiencing droughts. The study attempted to explain how commercial farming adaptation to droughts maybe be used as a strategy for stable Local Economic Growth (LEG) amongst commercial farms in Ugu District Municipality. This study situates the commercial farming adaptation to droughts within the theoretical framework of an Action Theory of Adaptation to climate change. The key finding is that commercial farmers in uGu district Municipality perceived drought coping strategies a difficult task if not impossible to manage without government's intervention. The majority of the participants admitted that drought has defeated their willingness to farm, and they were subjected to failure. The study recommends that the use of weather forecasting, vulnerability assessment, crops diversification, sustainable and efficient water management practice, cultivation of low water consuming crops, and systematic cropping pattern as some of the strategies which can mitigate the adverse effects of drought among commercial farmers.

Key Words: Climate Change (Drought), Commercial Farming, Economic Growth and Adaptation.

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1. Introduction and Background

Climate change and economic status of any country may seem to be a separate national phenomenon, but often, the former can affect the latter. Henceforth, agriculture as one of the major economic sectors is vulnerable to climate change effect. According to experts, low or high temperature, low rainfall or high rainfall have effects on agriculture and production of crops, livestock production among others. Mandleni (2011) affirmed that climate change is crucial to taking adaptation measures for livestock production.

Specifically, climate change has been reported to be affecting crop production mostly in Sub-Saharan Africa (Serdeczny, 2016). Putting together common crop production and data gathered from weather into a panel analysis, the result showed “a robust model of yield response to climate change for several key African crops” (Schlemker & Lobell, 2010:1) and that many crops yielded poorly due to heat. Even though agriculture is a broader term, this study focuses on commercial farming with a focus on crop production.

The negative effects of the above on economic growth of the farmers as well as on their society remain a challenge for many countries especially the developing ones to overcome. Awokuse and Xie (2015) found from their study that agriculture really matters for the developing countries as they reported agriculture as being a source of development in some countries.

Agricultural adaptation to droughts has been an issue of debate globally since the 19th century until now (21st century). Human activity has been polluting the atmosphere since the nineteenth century with, and in the twentieth century, many research have been conducted. For instance, studies by Revelle and Suess (1957) and MIT (1970, 1971) resulted on the founding of Intergovernmental Panel on Climate Change (IPCC) and United Nation body. The IPCC established the initial tasks to prepare for a comprehensive review and recommendation with respects to the state of knowledge on science of climate change. The social and economic impact of climate change has potential response strategies and elements for inclusion in a possible future international convention on climate. Drought, which is one of the products of climate change, is projected to constitute a significant role to food security and even on economic growth. Therefore, issues like poor economic growth and the increase in number of

people who live in poverty, being exposed to deadly diseases in many countries are most likely to be linked to climate change. Similarly, when adaptation actions that are to be taken by the agriculture sector is absent, there may be possible decline in GDP of many countries especially those that rely on agriculture for generating revenues. Due to the significance of climate change and its effects like drought, a new data set of more than 1700 published simulations to evaluate yield impacts on climate change and adaptation have emerged (Challinor, 2014). Adaptation is thus defined as “initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change (IPCC, 2012:72).

Adaptation has always been central to farming, and over millennia, farmers have generally been adapting agriculture to the ever-changing environment (Organisation for Economic Co-Operation and Development [OECD], 2012).

However, adaptation is the key factor that will shape severity of climate change impacts on food production. Relatively inexpensive changes such as shifting planting dates or switching to an existing crop variety although may moderate negative impacts. The huge benefit may likely result to be costlier measures including the development of new crop varieties and expansion of irrigation systems.

These adaptation strategies will require substantial investments by farmers, governments, scientists and development organisations, all who face many other demands that consume their resources. Prioritization of investments through the identification of “climate risk hot spots”, is therefore a critical issue but has received limited attention to date (Krueger, 2020). Subsequently, South Africa is expected to be one of the countries in the world to experience increase in temperature and declining rainfall patterns as well as increased frequency of extreme climate events such as droughts because of climate change (Nhemachena, 2000). Notably, some part of South Africa has experienced severe drought due to shortage of rainfall. According to South African Weather Service (SAWS, 2015), lowest rainfall over 112-year period was recorded from January to December 2015 as the period recorded on annual total of 403 millimetres of rainfall, and the government declared Mpumalanga, Limpopo, KwaZulu-Natal, Northwest and Free State as areas affected by drought. Similarly, the drought’s effects also affected some part of the Eastern Cape, Northern Cape and Western Cape.

Additionally, agricultural production has been affected by drought, and crop farmers were unable to plant their crops due to inadequate rainfall, and the government has urged farmers to

cut sizes of their herds as drought burnt the grazing land (Mballo, 2016). According to the data collected by community survey of 2016 about households practice agricultural production, farmers were not exposed to how they should adapt to climate variability.

Notably, agriculture is one of the two sectors (apart from mining) that that contributes immensely to economic development. The statistics shows that most of the world's poor and hungry people are rural communities due to their dependability on agriculture for living. Based on Agric-SA (2016), an estimated 1.2 billion people have been identified to be living in great depression (extreme poverty), and in that amount, it is estimated that 900 million of those people are living in rural areas. Statistics also shows that 750 million people rely on agriculture as a source of employment. Agriculture which is taken as the one of the main two sectors underpins the food system, and agricultural activities that constitute an indispensable pillar of sustainable development. In South African context, where economic, social and environmental opportunities of sustainable agriculture are yet to be fully exploited; over two decades' agriculture has been a subject to drastic economic and social evolution in the country and on the other hand, climate change is progressively and undeniably changing the environment, social and economic conditions affecting agriculture (Zwane and Montmasson-Clair, 2016). Importantly, climate change is progressively turning into an issue that has called for creating viable strategies of handling adaptation to climate change.

This study focuses on commercial farming adaptation to drought variability and climate change adaptation as the major strategy that can be used for stable Local Economic Growth (LEG). It also discusses a path for adaptation strategies farmers perceive as appropriate for the next generation of studies on strategies of adapting to drought variability and climate change.

1.2 Problem Statement

Adaptation refers to the process of adapting and the condition of being adapted (Phuong, 2011). Henceforth, Juhola (2012) also described adaptation as an adjustment, whether passive, reactive or anticipatory, that can respond to anticipated or actual consequences associated with climate change. Adaptation is a good tool in responding to the actual consequences associated with drought at Ugu District Municipality but some challenges/barriers that may limit this tool to function.

Three major barriers that limit the adoption of adaptation strategies in South Africa's agricultural sector including Ugu district municipality have been identified. They are namely and highlighted below.

(a) Financial problems: there is a clear lack of prioritization of funding to implement the proposed climate change adaptation response strategies.

(b) Information problems: the availability and dissemination of climate variability data, notably through extension services is not adequately addressed.

(c) Technological problems; most of the policies have proposed irrigation technologies suitable for different agro-climatic region, however, they failed to appreciate the context in which these schemes are to be designed and implemented. The problem statement for this study therefore would focus on the financial implications pertaining to commercial farming adaptation to drought in Ugu District municipality.

1.3 The Aim of the Study

The primary aim of this study is to explore commercial farming adaptation to drought as a strategy for stable local economic growth in Ugu district municipality.

1.4 Objectives of the Study

1.4.1 To investigate the effects of drought to local economic growth.

1.4.2. To examine barriers linked to production of drought resistant crops in Ugu District Municipality.

1.4.3. To recommend drought adaptation strategies that may be used by crop famers at Ugu district Municipality.

1.5 Research Questions

1.5.1 What are the effects of droughts to local economic growth?

1.5.2. What are the barriers linked to production of drought resistant crops in Ugu District Municipality?

1.5.3. What are the recommended drought adaptation strategies that may be used by crop famers to improve economic growth in Ugu municipality?

1.6 Contribution to the Study

Studies have been conducted on agricultural adaptation to climate change, but there are few studies that specifically use adaptation as the strategy to economic growth. Many reports have been published including reports from South African National Adaptation Strategy (SANAS), National Adaptation Plan (NAP) but they have mostly focused on the effects of climate change in economic growth and strategies to adapt to climate change.

Thus, recommendations of the study have potential to improve the adaptation strategies of commercial farmers, on how to respond to the effects of droughts in order to improve their produce and local economic growth. The Department of Agriculture in KwaZulu-Natal may also use the findings to help in improving farming adaptation financial assistance for commercial farmers to adapt to the effects of droughts.

1.7 Preliminary chapter division

- **Chapter One: Introduction**

This chapter focuses on the aims, motivation of the study and the objectives.

- **Chapter Two: Literature Review**

This chapter will review literature related to the study.

- **Chapter Three: Theoretical Framework**

This chapter discusses Action theory of adaptation for better understanding of how commercial farmers may adopt some of adaptation strategies.

- **Chapter Four: Research Methodology**

The part covers the research methodology and the design of the study. It discusses the qualitative approach and the interpretive research design, the study population, the sampling methods used, and data collection instruments used. The data collection procedures and analysis are also covered.

- **Chapter Five: Data Presentation and Analysis**

This chapter presents and analyses data obtained through interviews from participants involving in commercial farming.

- **Chapter Six: Summary and Recommendations**

This is the last chapter of the research report. It provides the summary, conclusions and recommendations based on the findings of the study. Suggestions for further research are also provided.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Chapter 2 is focuses on literature review. De Vos *et.al* (2011) refer to the literature review as collection of relevant and previous studies that have been published by different scholars on the similar subject. The benefits of literature review are to ensure that it builds understanding for the topic within the existing body of knowledge, by pointing out existing gaps in the conceptual framework (Gray, 2014). Literature review is important to expose the researcher to the methodological flaws of other completed research in a similar subject (de Vos *et.al*, 2011).

2.2 Challenges Faced by Agricultural Sectors in the 21st Century

According to Masud (2017), there are challenges faced by agricultural sectors in the 21st century necessitate the integration of economic, social and environmental pillars of sustainable development to meet the needs of the present without trading off the living standards of the future generation. Climate change however results in numerous adverse impacts on agricultural output and socioeconomic situations of farmers (Masud, 2017).

Al- Amin (2010) reveals the direct impacts on agricultural sector in Malaysia but in a broad context, which include (i) a decline in agricultural productivity; and (ii) increase food insecurity. According to the author, the above-mentioned direct impacts can lead to bad consequences including economic decline (because of the contribution made by agricultural sector to the GDP) and may result to poverty in many developing countries that particularly depend on agricultural sector for their livelihood (food security). It also appears in 2013 IPCC report that, all four dimensions of food security are potentially affected by climate change through their effects on agricultural production and the incomes of rural households, food prices and markets, and in many other parts of the food system (e.g., storage, food quality, and safety) (IPCC WGII AR5 Ch 7). Hence, Adaptation of current farming systems is one of the ways to avoid the severe effects of climate change and to protect livelihoods and local food security.

Additionally, farmers may recognize those climate change effects but the essential prerequisite for adaptation is also needed, and in order to implement appropriate measures and techniques, proper understanding for climate change is also necessary for farmers (Somda *et al.*, 2017). Farmers may have knowledge on appropriate measures and techniques on how they should adapt to climate change effects, however, there are constrains to climate change adaptation like

insufficient funding (which it going to be a further discussion in this literature), inadequate technological expertise, institutional capacity (Jones and Boyd, 2011). Lack of understanding of climate change issues is another effect (Gifford et al., 2011).

However, farmers' attitude towards climate change adaptation may denote the willingness towards adapting to climate change vulnerability but there is necessity of dealing with those adaptation constrains. Asseng and Pannell (2013) emphasize that farmers will adapt if and only if they anticipate benefits from adaptation practices.

Moreover, agricultural production is regarded as the sector most sensitive to climate change because it is highly dependent on climate condition which was especially true in early modern era when the technological level was low (Galloway, 1986). Also, Pei and Zhang (2016) state that an effectiveness adaptation determines agricultural vulnerability, especially in the pre-industrial era. The interaction between climate change and agricultural production however has long been conceived as an arena where only minimum level of technology is available overcome natural impacts (Lee and Zhang, 2016). As a result, most of the adaptation strategies need technological innovation in order to be achieved e.g. crop irrigation depends on technological innovation to extract water from the ground.

The food and agricultural sector uses machinery, networking technology and software systems significantly. Starting from farming, irrigation (as adaptation strategy), monitoring, yield mapping, cultivating, storage, food processing, delivery to consumption, application of technology in this sector have been enormous (AETW Group, 2006).

Moreover, there are many studies on agricultural adaptation to climate change. It is therefore, important for farmers to adopt adaptation measures in order to fight against climate vulnerability. Adaptation practices which include, crop diversification; diversification into alternative varieties of specific crops (drought-resistant crops, early maturing etc.); changing fertilization rate or amount or timing of irrigation; implementing shading and wind breaking measures; conservation agriculture (soil protection) and other strategies may be used especially when farmers are adapting to droughts or to those places that are high in temperature (Dasgupta et al., 2014: 638-640; Dell et al., 2014: 757-7592; Easterling et al., 2007: 294–295; Porter et al., 2014). In order to achieve the excellence in commercial farming adaptation to drought, farmers and all stakeholders of agricultural sector need to work in collaboration.

According to Awokuse and Xie (2015), anecdotal evidence and basic economic data from recent decades suggest that agriculture play a pivotal role in the national economy of

developing countries, and much of the countries with the poor growth record still have a relatively large share of their GDP coming from agriculture. For most African countries, agriculture account for over 20% of their GDP and that is why current analysis attempt to bridge the gap in the empirical literature on the dynamic interaction between agriculture and economic growth.

In addition, Johnston and Mellor (1961) observe that agriculture contributes to economic growth and development through five intersectoral linkages. The sectors are linked via (i) Supply of surplus labour to firms in the industrial sector; (ii) Supply of food for domestic consumption; (iii) Provision of market for industrial output; (iv) Supply of domestic savings for industrial investment; and (v) Supply of foreign exchange from agricultural export earnings to finance import of intermediate and capital goods. All these sectorial linkages are still functioning even in this era and that emphasizes the importance of considering agricultural adaptation to the effects of droughts as the strategy that can keep economic growth stable through the contribution makes by the agricultural sector.

According to South African Weather Service, 2015 was the driest year on record in South Africa dating back to 1904. The more there is drought, it is most likely that there will be a negative result on crop production, and it results in low yield, which can be bad for the farmers because of the loss in profit and 2015, droughts resulted negatively on South African GDP.

2.3 The Impacts of Drought on Commercial Farming

Studies to date suggest that climate change has reduced growth in crop yields by 1–2 percent per decade over the past century, and adverse impacts are projected to increase in the future (Gourdji et al 2013; IPCC, 2014). Nevertheless, understanding the magnitude of these impacts is complicated by the interaction of numerous biophysical and socioeconomic factors.

Agricultural sector is the most water consuming practice, and in order for its productivity to be high, there must be enough rainfall to make crops lives. Agricultural practices are also heavily impacted by climate change, either droughts or floods (Palazzoli, 2015). It also appears on Assessment Report 5, AR5 of Intergovernmental Panel on Climate Change (IPCC) that the effects of climate change on crop and food production are evidence in several regions of the world, and negative impacts of climate change trends have been more common than positive ones (IPCC, 2013).

Climate can thereby be referred to as one of the most influencing factors in agricultural productivity. This implies that climate change may have both negative and positive impacts on

quantity and quality of agricultural production varies on the location, climate zone, and crops (Babel, 2011). In commercial farming, farmers may benefit from the climate conditions and they can be negatively affected when the climate is unfavourable which may lead to poor crop productivity.

Adaptation can therefore be the option for farmers to escape and save their crop yields. Adaptation should move from being a theory to being practical in order to save crop productivity being vulnerable to climate change, and more specifically, to avoid effects of drought. In some cases, changing weather patterns are decreasing expected crop yields, and forcing to adapt the agricultural methods that have been reliable for generations (Schlenker and Lobell, 2010). In order to maintain food security and commercial viability, farmers are turning to agricultural training, inputs, and techniques designed to help them adapt their farming practices and keep their livelihoods sustainable in the face of climate change (Amsler, 2017).

Additionally, the development of effective strategies whereby agriculture can adapt to climate change over the coming decades requires farmers, agribusiness, crop scientists, and policymakers to understand potential climate risks posed by climate change (Howden et al., 2007). There are barriers to adaptation that need to be dealt with before adaptation is taken in action as agriculture is the most vulnerable economic sector under climate change, especially in developing countries like China. Different interpretations of climate change impacts on agriculture could lead to differences in a developing nation's strategy to address climate change (Chen and Xu, 2016). The nation's agriculture is believed to suffer from severe climate change, and it will be more likely to adopt an aggressive policy toward climate change mitigation. If instead, the belief is that climate change is not going to have negative effects, or even will be beneficial to the nation's agriculture, the nation's response to climate change will not be strong.

South Africa is also the main maize production hub in African (Agri-SA report, 2014). Studies contend that between the years 2014 and 2016, there was inflation caused by drought even on prices (Agbiz research, 2016). Notably, the agricultural sector is an important purchaser of the products and services of the other sectors such as the economic sector that is classified under the secondary sector that contributes massively to the county's GDP. Despite its declining contribution to South Africa's GDP over the past four decades, the agricultural sector remains the key player in the country's economy.

Essentially, monitoring climate and vegetation through weather station data and remote sensing data plays an important role in identifying and tracking drought intensity and extent. Currently, regularly updated near-real-time rainfall monitoring surfaces, as well as remote sensing products of vegetation, provide an overview of conditions over South Africa and the occurrence of drought (Malherbe, Dieppois and Maluleke, 2016)

While a decline in rainfall has led to an initial adverse physical impact on primary agricultural production, drought shocks also have a range of second-round effects given the strong linkages that exist between the agricultural sector and other sectors of the economy (Agri SA, 2016). Food inflation accelerated as the impact of droughts set in. Agricultural commodity prices were at the high levels on the basic right supplies caused by El Nino induced drought. (Stats SA and Agbiz research, 2016). Moreover, in 2016, South Africa did not import both maize and wheat, therefore a weaker Rand added inflationary pressure on soft commodity prices which in turn translated to the high food prices.

In addition, Agri-SA Drought Report for 2016 indicated a direct impact of drought situation on the agricultural sector followed by the projections pointed by general economic indicators illustrating an aggravated situation upstream economic activity whereby input providers have been hit so hard due to the lack of purchasing power in the agricultural sector. This situation is likely to worsen given the import propensity of suppliers and depreciating the local currency. Also, inflationary pressures inter alia resulted to a drastic increase in food prices, and thereby further increase the interest rates impacting negatively on the debt service cost of farming enterprises and further restricted access to credit in the sector (Agri-SA Drought Report, 2016). It has also been noted that rural communities most impacted by inflation due to price transfer as a result of costs incurred by a business to transport finished goods from agro processors to the retailers situated in rural areas. This contributed to the rural communities being the most affected by inflation (Stats SA, 2016).

2.4. The Challenges of Adapting to Climate Change

The challenges of adapting to climate change are greater especially in developing countries and as a result, it affects every part of their economy more especially agricultural sector which this study focuses on. Moreover, Biesbroek and Klostermann (2013) reviewed the results of those barriers and reviewed results show that barriers to adaptation have hardly been defined in the literature and there is no clear indicator existing to identify and assess them systematically. Limits to climate adaptation are endogenous and absolute, and therefore unsurpassable (Dow et al., 2013). Moser and Ekstrom (2014) define barriers as obstacles that make adaptation less efficient, less effective or may require changes that lead to missed opportunities or higher costs. Eisenack and Stecker (2012) also took a positive approach and argue for a precise specification of (1) the adaptations to which a barrier refers, and (2) the means necessary to implement these adaptations. The conditions that give reason to why these means are not employed for the specified adaptations are called barriers. This conceptualization emphasizes that barriers are relative to some specified adaptive actions that may be considered to the actors that may exercise them, and to the specific situation in which they may be taken.

Additionally, there are substantial impediments to the implementation of adaptation strategies to climate change. In the context of agriculture, there are number of factors hindering farmers' ability to cope with climate change such as social, technological, financial, institutional, informational and natural barriers to adaptation (Birkmann and von Teichman, 2010; Moser and Ekstrom, 2010; IPCC, 2007; Jones and Boyd, 2011; World Bank, 2010).

This study however found more interest on financial adaptation implications that hinder farmers from implementing climate change adaptation policies, though there are other barriers that have been mentioned which hinder climate change adaptation amongst South African commercial farmers. Most of the farmers around the globe have least knowledge on how they should adapt to climate change (drought) effects and that is the huge challenge even to economic sector. This may be caused by financial constrains (as it is underscored in the problem statement). If farmers have access to fund adaptation, it would be easy for them to come with the solutions concerning adaptation strategies. This seems to incapacitate farmers to adapt to climate change effects, which in turn results into negative economic improvement and absence of food security of the country (Enete et al., 2011).

Agricultural sector is mostly vulnerable to climate change and that shows the critical issue that need to be attended to immediately, because of this sector's contribution to food security and the GDP of South Africa. By letting drought effects to affect agricultural sector without taking necessary steps regarding adaptation initiatives, it may lead to poverty as many households depend on farming for their livelihood. Poverty is thereby regarded as the one of the main challenges of humankind in the 21st century (Enete, 2013). This is emphasized by the fact that one of the Millennium Development Goal of United Nations is to combat global poverty and halve the number of poor people by 2015.

2.5 Financial Implications of Climate Change

Developing countries often lack the resources such as financial resources good governance, infrastructure and information to adapt to climate change. According to WWF-SA Policy (2016), there is a clear lack of prioritisation of funding to implement the proposed climate change adaptation response strategies. Given the lack of national guidelines and financing mechanisms on which municipalities might draw to address climate change locally, it is not surprising that the institutional configuration and content of the municipal climate adaptation programmes are markedly different.

Adaptation literature has recognized financial constraints to municipal adaptation mainstreaming as municipalities frequently face financial limitations (Measham et al., 2011; Ziervogel & Parnell, 2012), partly due to the many responsibilities they have to carry out, as well as their lack of institutional autonomy (Measham et al., 2011).

One of the key barriers to climate change adaptation that have been noted in the climate change literature is the lack of financial resources to implement appropriate adaptation strategies (Antwi-Agyei and Stringer, 2014). Precisely, most of adaptation resources need more money in order to be functional.

Several studies have considered some barriers to adaptation which limiting the successful adoption of adaptation strategies, especially financial implications which is the lack of access to funds to implement adaptation measures for commercial farmers (Alam, 2017). A financial constraint impeding the assessment of adaptation options might result from an actor having failed to secure an appropriate budget (even though the municipality is in a healthy financial situation), or from a widespread financial crisis (Ekstrom and Moser, 2014).

To complicate matters, barriers are not static but change over time. For example, budget constraints can become more pressing over time, for example, due to a broad financial crisis or

local budgetary priorities given to other policy issues (Burch, 2010). At the same time, the current needs, options, and costs of adaptation depend on investment decisions made in the past (Hallegatte, 2009). Both past decisions and current barriers to adaptation may lead to path dependencies that constrain future action (Burch, 2010).

Moreover, financial support is the key channel that can be used as a tool to overcome other barriers because other adaptation strategies that can be used by farmers to adapt to climate change effects are very costly. For instance, irrigation process for crops (as it is well known that there is a shortage of rainfall, which lead to drought, therefore financial support is needed for technological innovation to drain water from the ground for crop irrigation). Long-term financial shortages may also give rise to and magnify other barriers such as those stemming from lack of information, inadequate interagency coordination and specific personal beliefs (Lehmann et al., 2013).

Climate Adaptation has notably advanced over the last decade, yet funding barriers have been found to be substantial (Finzi et al. 2012; Moser and Ekstrom 2012; Bedsworth and Hanak 2013; Ekstrom et al. 2017; Moser et al. 2018a). However, other scholars like Moser and Ekstrom (2010) in their framework of adaptation barriers introduced the concept of “legacy barriers” to point to the historical roots of many barriers, but deep adequate analysis to resolve financial barriers is required (Moser, 2019). Adaptation funding thereby plays a huge role to put adaptation into action; therefore, funding those resources that are necessary for adaptation makes adaptation to succeed especially in agricultural sector where adaptation is needed the most in order to make adaptation strategies to work efficiently e.g. funding resources for crop irrigation process (extraction of ground water).

Khan (2019) states some questions that can actually underscore deep analysis are required in order to resolve financial constraints, and Moser and Ekstrom (2010) asserted that those questions penetrate on how much finance should be provided to support climate change adaptation and by whom? How should it be allocated, and on what basis? As various actors have expressed their expectations of climate change and which of those expectations are being met and which are not; why, and which consequences?

However, it appears that UNFCCC and Kyoto protocol obligated those countries shall meet the costs of adaptation based on their vulnerability. There was a broad understanding of need for the prioritization of eligible countries based on vulnerability but G77 (2000), which is the

negotiating bloc of developing countries, but many never pursued this further because of political sensitivity (Khan, 2019).

Moreover, COP13 that was held in Bali in 2007 showed that the issues of funds were going to remain unallocated the way that most vulnerable groups prioritized; instead, some funding allocation formulae reflected donor interests more than the needs of vulnerable countries, other distributed funds by a Quota system with flat amounts across groups of nations (Ciplet et al., 2013).

Grasso (2010) also argues that both procedural and distributive justice in adaptation finance can be ensured through a “fair process which involves all relevant parties, of raising adaptation funds according to responsibility for climate impacts, and of allocating the funds raised in a manner that puts the vulnerable first”. In accordance with fairness distribution of funds to the relevant countries e.g. the most vulnerable countries to climate impacts are the developing countries because even especially in agricultural sector, Grasso sounds reasonable as it is the one of the most economic sector that contributes to their GDP and food security. Logically, insufficient resources and funding to adapt to climate change may negatively impact the economy.

Furthermore, it appears in the case of Small Island Developing States (SIDS) that more adaptation finance went to countries with good governance quality and low per capita incomes (Robinson, 2018a, 2018b; Robinson and Doman, 2017). This have appeared in several studies on distribution of adaptation finance, but they did not concretely establish that money was directed to the most vulnerable countries (Betzold and Weiler, 2017).

Meanwhile, climate change adaptation strategies and sustainable agricultural practices need to be mutually supportive (complementary). For instance, farmers’ current practices of adopting groundwater irrigation to cope with the growing water scarcity in the north-west region of Bangladesh has resulted in the drawdown of groundwater tables, land subsidence and tube wells failing during dry seasons (Adhikary et al., 2013).

2.6. Overcoming Climate Change Adaptation Barriers

Firstly, flexible approach is needed from those institutions that deal with challenges on climate adaptation. As a result, institutional failures are increasingly being exposed in practice in cities across the Global North and South through increasing experiences on floods and droughts in recent years, and many of which are unprecedented in magnitude and impact (Patterson and Huitema, 2018). Whilst climate change adaptation involves dealing with unprecedented new

risks, it also magnifies many existing socio-economic and environmental challenges (Kraas et al. 2016; UN-HABITAT, 2017). Scholars therefore recommend evaluation based on improvements in the capacity to govern climate change challenges (Bulkeley et al. 2014; Hildén, Jordan and Rayner 2014).

The approach presented opens up novel opportunities for studying institutional innovation, particularly for evaluating the ways in which “visible” institutional interventions influence governance systems. This is important because the complex and long-term nature of climate change responses means that evaluating adaptive based on material outcomes is very difficult (Patterson and Huitema, 2018).

Moreover, there are few studies on how these adaptation barriers may be overcome since this remains a challenge to individuals and stakeholders affected by droughts in these recent years. For instance, in commercial farming, crop production is being affected by failure to curtail these barriers of adaptation. There are only a few studies explicitly investigate how barriers perceived as problematic might be overcome (Moser, 2014).

According to Rouillard and Reeves (2012), other ways of overcoming these adaptation barriers are informal partnership, formal interagency working groups and other deliberative venues. Clear assignment of responsibilities and accompanying monitoring mechanisms can however overcome barriers and top-level involvement can also discourage local adaptation (Harries & Penning-Rowsell, 2011; Runhaar, 2012). As research on barriers to date indicates, many barriers have deep historical roots (Mukheibir, 2013) thereby making impossible to tackle within a short time. For instance, first steps are frequently driven and led by a few committed individuals (for example, a staff member or elected official) who create the necessary action space for other actors (Rotter et al, 2012). This can require enduring local leadership or stable support from higher governance levels (Rudberg & Swartling, 2012).

2.7. The Economic Impacts of Drought in South Africa

According to Schreiner and Mongantana (2018), the economic effects of drought can be divided into direct effect, indirect effect, and the induced effect (as mentioned by Garrido and Hernandez-Mora, 2013; Hayes and Widhalm, 2013; Diersen and Taylor, 2003). The direct effect of a drought captures the immediate or physical impacts of water supply shortages on production. In the agricultural sector for example, the direct physical impacts could manifest in the wilting of crops and crop losses. The indirect effect captures impact of the drought on sectors that are downstream or upstream of the primary production sector. The agricultural

sector, for example, has businesses that are located upstream (e.g. input supply) and downstream (e.g. the agro-processor). A drought that directly hits the primary agricultural sector will have implications on primary and secondary sectors along its supply chain, such as seed supplier, agro-processors, supermarkets, or the bio-energy industry. Lastly, the induced effect of a drought captures the impact on consumers and businesses further upstream and downstream. For examples, a drought that hits agricultural sector will impact on the welfare of maize consumers and of enterprises whose operations rely on outs from the agro-processor (e.g. retailers).

Moreover, farmers and agricultural industry organizations often stress the importance of the agricultural sector in the South African economy. According to SA stats and General Household Survey (2017), only 15.6 of South African households were involved in agricultural practices. Most crop production took place in backyard gardens and households involved in agricultural activities were mostly engaged in food production. SA Stats (2017) shows that agricultural sectors contributed 2.4% to Gross Domestic Product (GDP) after recovering from the worst droughts in recent history and the import value of agricultural products reached R86.86 billion in the same year, which was a decrease of 5% compared to 2016.

The review of past studies has also shown that most of the studies that have been conducted focussed on the agricultural sector and rural economy, however, only few studies have attempted to assess the economic impacts of droughts in South Africa. These include Bureau for Food and Agricultural Policy (BFAP, 2016), Agri-SA (2016), Hlalele Makhatle and Motlogeloa (2016), Mare` and Willemse (2016) and Pretorius and Smal (1992).

The main objective of BFAP (2016) was to evaluate the impacts of the current drought on the South African economy, on commercial and smallholder producers, and consumers. The study had the following specific objectives. (i) To determine the value of imports and exports of maize in South Africa, (ii) to determine the impacts of drought on farm/agricultural businesses, and (iii) to determine the price effect on drought induced production decline.

In response to BFAP's second objective (to determine the impacts of drought on farm/agricultural businesses), BFAP (2016) established that more than 1.2 million individuals were affected by drought, which inevitably had significant impact on maize yields and also gave rise to food insecurity. However, commercial farmers can be negatively affected by droughts because they have to pay for irrigating their crops in order to improve crop production and also they can benefit on drought because of production demand (rising of food pricing can

make them to recover in terms of money they used for crop irrigation and make even more profit). On the other hand, consumers can be negatively affected by rising of food prices.

Lastly, in response to BFAP's third objective (to determine the price effect on drought induced production decline), BFAP (2016) established that the price of the staple food basket increased by approximately 19% from 2015 to January 2016 with further increase of 10% in quarter one of 2016.

The main objective of Agri SA (2016) was however to meaningfully contribute to the national discussion on South Africa's drought as it pertains to the agricultural sector. The specific objectives were (i) to outline the effects of South Africa's drought crisis on the agricultural sector and (ii) to present proposals on actions to effectively support farmers as they recover from the crisis.

In response to Agri SA's first objective (i.e. to outline the effects of South Africa's crisis on the agricultural sector), Agri SA (2016) found that droughts resulted in reduced planting of the summer cash crops, particularly in the Western region. It was found that South Africa moved from being a net exporter of maize to a net importer of the same crop as the drought also led to an increase in import of wheat from 1.8 million tons in 2014/15 to 2 million tons in 2015/16 at a cost of approximately R5.5 to R6 billion. Similarly, drought increased the financial liability of farming enterprises to the extent that relief efforts are introduced and thereby was put a strain on fiscal resources.

In response to Agri SA's second objective (i.e. present proposals regarding necessary actions to effectively support farmers as they recover from the crisis), Agri SA (2016), proposed a drought relief package for the state to implement. The first sub-objective of the proposed drought relief package is to assist farmers in severe financial distress to survive the current drought conditions while the second sub-objective seeks to facilitate drought recovery for other distressed farmers in disaster-declared areas.

The main objective of Hlalele et al. (2016) was however, to alert South Africa government authorities of the prevailing conditions of droughts impacts for possible relief assistance. The specific objective was to assess the economic impact of current drought disaster on agriculture dependent formal and informal businesses in Free State. Hlalele et al. (2016) further found that

about 80% of the businesses lost above 50% of their employees due to drought in Free State. Moreover, about 87% of these businesses lost over 50% of their revenue.

Mare` and Willemse (2016) also established that the cost of the basic food basket was likely to increase by 30%. This increment may elevate the burden on consumers, as unemployment and inflation are at the highest level, which makes people with limited resources more vulnerable to food insecurity. The severe economic climate in South Africa (i.e. the high and growing unemployment rate), the slowing economy, and expected increases in interest rates are putting consumers and economy under unbearable pressure (Mare` and Willemse, 2016), and this was coupled with a devaluation of the Rand to the US Dollar by 45% over the past 12 months.

Furthermore, the economic contribution of farmers declines as production declines due to the drought effects. Equally, due to the drought, the cost of a basic basket food for consumers is expected to increase by 30%. This increases the burden on consumers, many of whom are unemployed in relation to food shortages and escalating inflation. Consequently, consumers change their spending and eating habits as they move away from luxury items and spend more on basic food.

Pretorius and Smal (1992) used the macro-econometric model of the South African Reserve Bank to simulate the effect of the 1992 drought on the following macro-economic variables: economic growth rate, investment, the current account of the balance of payments, inflation and employment. Following their simulations, Pretorius and Smal (1992) show that drought inhibits growth in real GDP, and it might have been as much as 1.8 percentage points lower, as many as 69,000 job opportunities may have been declared redundant, while average inflation rate could have been approximately 0.8 percentage points higher, and the current account balance of payments could have suffered a negative effect of about R1, 200 million.

2.8 Conclusion

Chapter 2 presented the literature review of the study. It has explored the challenges faced by agricultural sectors in the 21st century, the impact of drought in the agricultural sector, focusing on commercial farming as well as the challenges of adapting to climate change. Furthermore, the chapter reviewed how financial constrain implicates the implementation of climate change adaptation strategies on commercial farming. It also discussed the aspect of overcoming climate change adaptation barriers and the economic impacts of drought on agricultural sector in South Africa. The next chapter discusses the theoretical framework of the study.

CHAPTER THREE: THEORETICAL FRAMEWORK

3.1 Introduction

An Action Theory of Adaptation to climate change is aimed at clarifying the concept of adaptation in a way that it enables it to be applied in an adaptation assessment (Eisenack, 2010). This opens a new view on adaptation that also shed light on other concepts often used in adaptation research. Secondly, it provides frame to analyse re-appearing decision and governance structures for adaptations and allows the systematic deduction of meaningful about barriers to adaptation. Therefore, this theory is giving the clarity to commercial farmers and all stakeholders within the agricultural sector on what they should do to fight against drought. Another role that it plays is to give amicable solutions to the barriers of adaption (Somda. et al, 2017)

Eisenack and Stecker (2011) state that this theory puts more emphasis on the purpose of adaptations, and on the implications that can be linked to the following. (i) Stimulus, which is defined as a change in biophysical variables associated with climate change, which can be either floods or drought effects. (ii) Exposure units, which is characterized by “who or what adapts”, in other words exposure units identify the sectors that are vulnerable to the stimulus and what those sectors adapt to. (iii) Receptor, which refers to the victims of the stimulus (e.g. farmers within the agricultural sector) that affected exposure units. (iv) Operator, which can be both public and private sectors that can provide means (resources, knowledge and financial support) in order to put adaptation into action. However, the question “How does adaptation occur?” requires a description of how means and purpose (“adaptation to what?”) are interlinked and whether only processes, or even actions are considered.

Smith’s (2000) analysis pinpoints that adaptation is derived from centre of the proposed framework because there have always been adaptations to climate conditions that offer a starting point for identifying specific adaptations to deal with climate change. Therefore, exposure units should be identified in order to know where adaptation measures could be needed to tackle the stimulus effects. For instance, adaptation measures applications differ in terms of exposure units’ type. For example, agricultural sector as the exposure units affected by climate conditions (stimulus) needs climate adaptation measures to tackle its effects.

Additionally, in order to adequately analyse the crucial components of adaptation, climate disturbances that affect a system under consideration need to provide the reason for adaptation because both the characteristics of biophysical disturbance and of the affected system are relevant for adaptation (Eisenack, 2010). Adaptation is therefore a response to climate change, which can be environmental change or human action (Dang, 2018). In this study, the adoption of adaptation measures by commercial farmers (human actions) is a response to drought effects in Ugu District municipality. Therefore, by putting adaptation into practice, the result may positively help in crop production, and in turn lead to a stable GDP and local economic growth.

3.2 The Impact of an Action Theory of Adaptation to Climate Change

The climate change and its impacts on agricultural sector specifically on crop production have raised more concerns in South Africa because of its economic impacts. Adaptation acts as a key resolution to climate influences, therefore, adaptation has always been central to farming, and over millennia, farmers have generally been adapting agriculture to the over-changing environment (Organization for Economic Co-Operation and Development [OECD], 2012).

Wallthall (2012), also emphasizes the importance of climate change adaptation especially in agricultural sector. Likewise, O'Brien and Selboe (2015, p.311) argue that “adaptation to climate change is unlikely to have long-term effects if it is treated as technical problem”. Adaptation must address and challenge the ‘drivers of risk and vulnerability’, including various social, political, economic systems and structures. Similarly, adaptation should come with positive results in terms of tackling the effects of droughts, but all stakeholders should be engaged in decision-making to come with amicable solutions in those droughts’ effects.

There is a broad set of theoretical literature that reflects on the relation between adaptation, vulnerability and resilience, however, adaptation to climate change remains a target at changing contextual conditions or reducing the damage of drought effects (Eisenack, 2010). An action theory of adaptation to climate change identifies the important concepts that may stand as reason why there is the limitation to the implementation of adaptation. Masud (2016) mentions some results that may result to the barriers of commercial farming to climate change adaptation, and these include age, educational level, farm income, farm experience, limited access to agricultural extension, lack of credit facilities, limited access to agricultural markets, farm sizes are factors which have significant impacts on agricultural practices.

Nevertheless, adaptation strategies are vital in tackling the adverse effects of climate change, but there are substantial impediments to the implementation of adaptation strategies to climate

change. Meanwhile, in the context of agriculture, there are number of factors hindering farmers' ability to cope with climate change such as social, technological, economical, institutional, informational and natural barriers to adaptation (Jones & Boyd, 2011; World Bank, 2010).

Moreover, in order to tackle the above-mentioned adaptation barriers, it should be established that institutional and economical (financial) barriers have the major impacts on resulting or leading to other barriers. To give adequate analysis in the context of an action theory of adaptation to climate change, stimulus refers to drought that results negatively to commercial farming (exposure units) which affect commercial farmers (receptors) and in order to tackle these droughts effects, funding (finance) for adaptation resources and knowledge, technological innovation etc. (means to tackle the effects of climate change) is needed, and yet institutions such as public and private sectors (operators) are responsible for providing funding and means of adaptation in order to assist commercial farmers to use to adaptation strategies effectively.

Notably, climate change adaptation can be challenging when farmers encounter natural barriers such as unpredictable weather, which many farmers do not have adequate information about. This may be called informational barriers (Masud, 2016). Other adaptation barriers such as social and technological barriers are caused by the lack of prioritization of adaptation by the institutions (both public and private sector). This implies that there should be prioritization of adaptation funding to implement technological innovations for the farmers to tackle climate effects. Decision making by all stakeholders together with farmers is thereby encouraged. de Wit (2014:57) argues that, although climate change adaptation realized by international donors seems to be only viable option for survival but what is missing the most is solidarity among countries in trying to pass the information for holistic development. Given that example, which adaptation concepts and goals would be most appropriate and how should the growing funds for climate change adaptation be spent?

3.3. Analysis of Core Concepts of Action Theory Adaptation

From the Intergovernmental Pannel on Climate Change's (IPCC) definitions and the analysis of Smit et al. (2000), adaptation is a response to (potential) environmental stimuli that affect given entities, subjects or systems. Adaptations are processes within entities and systems, or adjustments made by human systems. In this study, the approach is more specific by referring only to human systems, individuals and collective actors. This lends to the following outline

of the action theory that can partially be built around established concepts (see Fig. 3.3.1). It implies that action requires an intention and actors. The intention is directed towards an impact of climate change. Furthermore, adaptations require the use of resources as means to achieve the intended ends. This outline is detailed and qualified in the following.

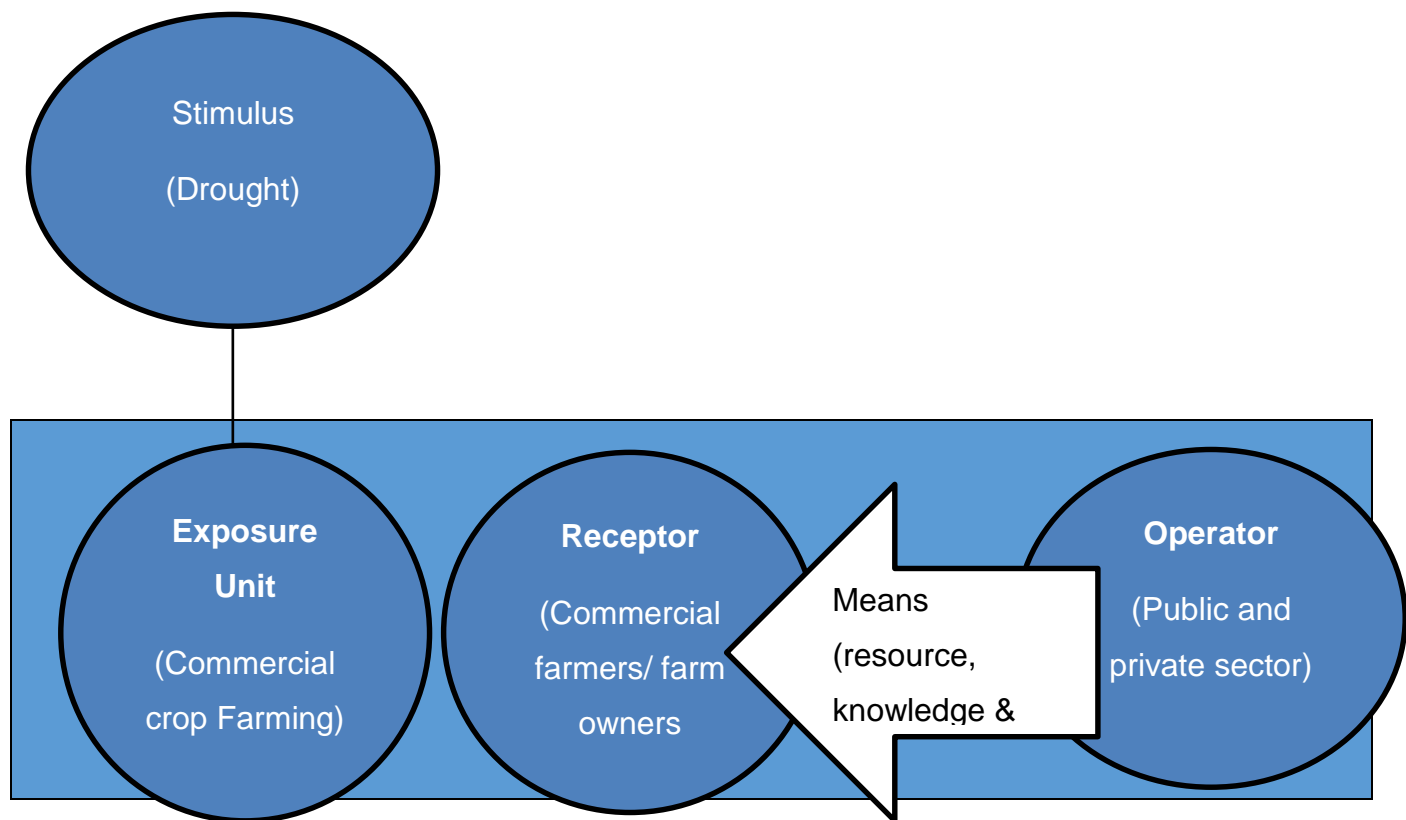


Figure. 3.3.1: Schematic representation of some core concepts of the action theory of adaptation. Exposure unit, receptor, and operator can be actors. They are not necessarily identical. (Further explanations in the text.)

(i) Stimulus

A stimulus is a change of biophysical (meteorological) variables triggered by climate change. Precisely, this must be distinguished from weather events, which can be either drought or floods. Climate change is no more a distant problem, but a change people experience overtime. Henceforth, those experiences of change in climatic variables, such as rising temperature, variable rainfall, frequent droughts, hurricane and typhoons result to lot of vulnerabilities (Lobell et al., 2012; Auffhammer et al., 2011).

Adaptation actions are necessary in order to reduce drought effects on commercial farming as climate change continues to rise upon the livelihoods and agricultural sector. Many developing and developed nations need to understand and prioritise adaptation at the sub-national scale which areas and communities are most vulnerable (Parker, 2019). A stimulus is only relevant for adaptation when it influences an exposure unit. For instance, stimulus (drought) results crop to run dry because of the shortage of rainfall need by crops.

In relation to this study, drought (stimulus) has the negative impacts on commercial crop farming (exposure unit). Necessary adaptation measures or actions are thereby needed as this theory emphasises that stimulus is only relevant for adaptation when it influences an exposure unit (Eisenack, 2011). Sujakhu (2019) insist that adaptation action refers to an action of individual or collective in response to stimuli effects by using the relevant resources.

(ii) Exposure Unit

The latter term broadly refers to all those actors, social, technical or non-human systems that depend on climatic conditions, and are therefore exposed to stimuli (IPCC, 2001). It is outlined in action theory of adaptation to climate change that it is not strict exposure units for human systems, but it can be non-human systems among others.

By seeing the impact of climate change, we understand a combination of stimulus and an exposure unit. It can be a set of stimuli with an associated set of exposure units (Eisenack and Stecker, 2011). In relation to this study, affected crop farming (exposure units) due to less rainfall or drought effect (stimulus) is an impact. Nevertheless, agricultural sector requires enough water consumption in order to achieve high productivity, but having such water also

requires enough rainfall. Importantly, having either droughts or floods is heavily impacted by climate change (Palazzoli, 2015).

(iii) Operator

In the DPSIR-Framework (OECD, 1993, EEA, 1999), the stimulus refers to the state (S). An adaptation in this context is the social response by an individual, an individual or an organization in the broadest sense. The (collective) actor that exercises the response is called the operator. Hence, those collective actors have powers to implement adaptation measures. Agricultural systems that are used for adapting to climate change is therefore a multifaceted endeavour for scientists, farmers, and policy makers who may work together to minimize adverse and harness beneficial changes (IPCC, 2014a).

Operators (institutions) can be the major constraints to climate change adaptation because institutions are one of the decisive factors which enable, constrain and shape adaptation to the impacts of climate change, variability and extreme events (nevertheless, institutions are responsible at providing those adaptation resources). Currently, the understanding people have concerning institutions in adaptation situations is fragmented across the scientific community due to diverge evidence, and also that cumulative learning beyond single studies is limited (Oberlack, 2016).

Moreover, an operator can thus be for instance a private household, a firm or a government. Operators need to be a social entity so that machines, artefacts and natural systems are ruled out to be an operator (Eisenack, 2011). Nevertheless, farmers and agricultural producer groups typically reduce climate related risks for their farms and utilize business opportunities, while policy makers and government officials are committed to devote their resources to public interests (IPCC, 2014a). Not all activities of an operator are actions as only those activities with a **purpose** qualify for this term. The operator may therefore try to achieve intended ends that are associated with (other) actors, social or non-human systems (Eisenack and Stecker, 2011)

In relation to this study, operator is responsible for the implementation of adaptation measures (means) and provides financial support in order for commercial farmers to gain a capacity to adapt to drought effects. Institutions can provide the pivotal coordination devices through which communities, organisations, and societies can develop, and make use of their knowledge, skills, technology, infrastructure, financial and other needed resources for adaptation (Yates, 2012).

(iii) Receptor

The actor or system that is addressed by the purpose of an adaptation is called the receptor. Receptors can be both biophysical entities (e.g. the crops of a farmer) and social systems (e.g. the farmer household), depending on the objective of analysis (Eisenack and Stecker, 2011). It is further not required that the receptor of an adaptation is an exposure unit at the same. Although farmers may recognize those climate change effects but the essential prerequisite for adaptation is needed. However, in order to implement appropriate measures and techniques, proper understanding for climate change is also necessary for farmers (Somda et al., 2017).

Additionally, farmers' attitude towards climate change adaptation may denote their willingness towards adapting to climate change vulnerability, but there is necessity of dealing with those adaptation constrains. Asseng and Pannell (2013) emphasize that farmers will adapt if and only if they anticipate benefits from adaptation practices. This is illustrated with the early warning system example. The operator is a public body that runs the system. It collects weather forecast and transmits them to the public in an accessible way. For instance, the purpose of that adaptation is to reduce vulnerability to commercial farmers or farm owners under Ugu District municipality (that might use other forms of adaptation to cope with droughts effects in the case of a warning). It is however necessary to assess how agriculture adapts to climate change, based on practical experiences (Zhang, 2015). The intention is to change attitude of commercial farmers or farm owners towards adapting to droughts effects, thus making them the receptors.

Nevertheless, public body is not the relevant exposure unit (as it is not affected by drought effects), but the receptors of the early warning system are exposure units. It is stated that many African governments, including that of South Africa are concerned and eager to take are

concerned and eager to take collective action to address climate change risks. This is particularly critical given that agricultural development is considered as the most effective strategy that can be used to boost economic growth in the continent of Africa (FAO, 2010).

The emphasis on the purpose of an action requires further comment. There are of course, many social phenomena that are not purposeful. In this case, they are not called by actions, but mere **processes**. **Processes** are sequences of events in time that may occur to a biophysical, technical or social entity or system. They can be framed as linked through causality or in a mechanistic way. Actions are a special case of social processes that additionally have a teleological component (cf. Weber, 1922).

In relation to this study, commercial farming (specifically crop farming) under Ugu District municipality may need more attention and proper adaptation actions since it is one of the major economic sector that is vulnerable to droughts effects. Farmers therefore need more support through funding and resources in order to make adaptation to be more adequate.

- **Means (resources, knowledge, and power)**

In order to put adaptation into action, the operator needs resources called means. This can be access to financial or other material resources, legal power, social networks, knowledge and availability of information. However, there are barriers that hinder the adaptation process and necessary action need to be taken in order to achieve adaptation sustainability (Eisenack and Stecker, 2011).

Financial status of farmer household is another important factor that influences farmers' adaptation (Guodaar, 2015). Finzi Hart et al. (2012) also postulate that funding for adaptation has been an issue especial to farmers. This may show the lack of prioritization of adaptation funding by the public sector or private sectors that leads to adaptation barriers (institutional barriers).

Furthermore, action is shaped by constraints and resources that cannot be controlled by the operator. These are called the conditions (cf. Parsons, 1937). Eisenack and Stecker (2011) also argue that some means involved are the public funding and the education of the people running the system, but these are not channelled to those who are vulnerable to climate change (farmers). Hence, it may be useful to engage all stakeholders, farmers, scientists, and policy makers in decisions making when there is an attempt to cope to climate vulnerabilities.

In relation to this study, funding and other resources that may enhance adaptation strategies to cope to droughts effects are much required. As adaptation capacity varies with money (funds) that farmers willing to spend on adaptation practices, there must be the prioritization of adaptation means/resources by government or public sectors, in order for farmers to achieve adaptation and to enhance the local GDP with high productivity.

3.4 Analysis of Barriers to Adaptation

Climate adaptation strategies for a country refer to a comprehensive program of actions to address the hostile effects of climate change. At the present climatic change scenario, adaptation strategies are important for agricultural sectors (Masud, 2017). However, adaptation strategies are hindered by many constraints and those constrains need be dealt with immediately.

Jone and Boyd (2011) state that those are constraints to climate change adaptation are due to insufficient funding, inadequate technological know-how, institutional capacity and lack of understanding of climate change issues (Gifford et al., 2011). In addition, farming communities around the globe have been identified as the most vulnerable community to climate change due to their dependency on agricultural production for their livelihoods (Sajakhu, 2019)).

Eisenack and Stecker (2011) use action theory of adaptation concepts to give an adequate analysis to identify the causes of those barriers to climate change adaptation. By mapping adaptation situations by means of the action theory helps to identify those barriers and their underlying reasons that might be addressed through successful rules and institutions. This analysis may be compared to generic barriers to adaptation proposed by Füssel (2007a), and by the economic analysis of Lecocq and Shalizi (2007):

- **The Necessary Means are not Available as an Operator**

Even though the problem or climate effect seems to be crucial to commercial farmers (receptors) because of the stimulus effects (drought) to exposure unit (commercial farming practice), there are major challenges that may be the cause, both institutional capacity and or budget constraints have potential to hinder appropriate adaptation (Finzi Hart et al. 2012; Ekstrom, 2017; Moser et al. 2018a). All these challenges can be caused by the lack of prioritization of adaptation funding/resources as one of the solutions that can help farmers to be less vulnerable from droughts effects. The challenges can be overcome through avoided or reduced individual or collective action with concerted effort, creative management, changed ways of thinking, political will, and reprioritization of resources, land uses and institutions (Eisenack and Moser, 2014). Many developing countries that are disproportionately exposed to climate change and already have limited capacities to cope with other severe stresses. (IPCC, 2012) state that in developing nations have experienced relatively higher level of negative impact from climate extremes over the year and this trend is likely to continue in the foreseeable future as well.

Moreover, another outlined variant of this situation in this theory is when the legislative framework limits adaptation; that is, when motivated operators do not have the legal power to act (Eisenack, 2011). Similarly, low level of awareness about problem at the local level is sometimes traced back to a low priority for adaptation at higher institutional levels (Lehmann, 2013). In other instances, it results from unclear responsibilities for adaptation at the local level (Mukheibir, 2013). Missing leadership, as well as dominant leadership by certain actors can also lead to an absence of appropriate decision-making routines (Burch, 2010; Pechan, 2014). Furthermore, a lack of local leadership is frequently explained by missing top-down support, but too much involvement from higher levels can also discourage local leadership (Harries, 2011).

- **Means are not Sufficiently Employed Although there is an Operator to Whom the Necessary Means Are Available**

When an adaptation has positive externalities for other actors, the operator may choose to under-adapt if he or she considers that other exposure units benefit from the adaptation are not contributing their share to the means. Conversely, it might happen that an operator over-adapts when the action has negative external effects on other exposure units. There are also moral

hazard situations where perverse incentive enrages actions that increase the impacts of climate change.

In relation to this study, commercial farming practice, specifically, crop farming (exposure unit) may be (re)built in areas where there is a high risk of drought (stimulus) or done in areas with less precipitation by commercial farmers (receptors). This implies areas that are not using means of adaptation while there is an availability of means to adapt to droughts effects, and they are expecting to receive compensation from a public agency (as operator) in the case of a disaster. The roots of this type of barrier lie in misaligned economic incentives.

- **There is no Operator Due to Ignorance of Impacts**

In this case, not even the necessary means for adaptation are taken into consideration. There might be a vague awareness that a problem exists although, adaptation is hindered by missing means in terms of individual or collective knowledge about impacts, or due to conditions (such as incomplete or faulty information, or rigid social habits and normative standards) that prohibit understanding of the underlying stimulus. This hinders adaptation, though action is not constrained by limited available means.

- **The Network of Exposure Units, Operators and Receptors is too Complex to come to Decisions**

Since climate change has very diverse effects, which are relevant for many exposure units in different ways, there are likely to be many decision conflicts. This might be amplified by established institutional arrangements that are not tailored to the new type of adaptation challenge (Reckien et al., 2018). Barriers have been noted to arise from three sources namely the actor(s) who is or are making adaptation-related decisions; the context (for example, social, economic or biophysical) in which the adaptation takes place; or through the system that is at risk of being affected by climate change (called ‘system of concern’) (Moser, 2014). Economically speaking, all these problems raise the transaction costs of information collection, monitoring and enforcement. They also in turn increase the necessary means and can result in a shortfall of available means.

3.5 Proper Planning for Adaptation

In order to achieve a goal of adaptation to climate change, farmers should be able to use adaptation strategies to a relevant stimulus (climate conditions). Moreover, the most relevant crop adaptation strategies usually implemented by farmers when adapting to climate change include changing planting dates, crop varieties, fertilizer types, irrigation, shedding and nets etc. (Abid, 2016). Farming education, farming experience, access to agricultural extension, weather forecasting and marketing information equally play a significant role on farmers' adaptation decisions (Abid and Scheffran, 2016). This can result into high crop productivity and in turn lead to stable GDP, economic growth, improved farmers' profitability (economic status) and food security.

Meanwhile, in order to review the impacts of action theory of adaptation, there should be the linkage in some other established concepts of adaptation and vulnerability research (Eisenack, 2010). For instance, a proper planning for adaptation requires more collaboration and effort especially to those economic sectors that are vulnerable climate effects in this study.

Fussel (2007a) claims that planned adaptation refers to the usage of information about the future conditions. Nevertheless, as it was mentioned in the literature that all stakeholders within the agricultural sector together with farmers are responsible for proper planning and decision-making in order to achieve adaptation goals. In order for adaption process to be just and transformative therefore, anything that may be lot due to climate change as well as the trade-offs between different values and needs should be clear and explicit through active public engagement on the different values, discourses, and potential loses involved (Schlosberg, 2017).

3.6 Adaptation as Resilience

An action theory of adaptation to climate change reveals the link from adaptation to resilience, and that linkage can be used in tackling the climate vulnerability (Nelson et al. 2007). In the 21st century, discourses on adjustment to climate change have increasingly moved away from the cancel. With this linkage, they define adaptation as decision-making process and actions that enhance adaptive capacity (Eisenack, 2011).

Nevertheless, other scholars insist that adaptation and resilience have the same meaning but their features vary. For instance, adaptation refers to the process of adjustment to actual or expected climate and its effects (IPCC, 2014)). In addition, Sagun (2009) defines climate adaptation as the adjustment in natural or human systems in response to actual or expected

climate stimuli or its effects, which moderates harm or exploits beneficial opportunities. Resilience as a concept is defined as the capacity to recover quickly from difficulties or climate change effects. According to IPCC (2012:72), resilience is seen as the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change. Adaptation however refers to dealing with the negative impacts of climate change, which might eventually enhance resilience or decrease climate change vulnerability (Adger et al., 2007).

Essentially, definition of resilience presented by IPCC put more emphasis on positioning adaptation as a sub-set of resilience (Pelling, 2011). In this study, adaptation to drought may come as an aspect of resilience in terms farmers' capacity to adapt to climate effects in order for crop productivity be in stable or better condition to contribute to the local GDP and local economic growth in Ugu District Municipality.

In a vision of adaptation as resilience, Pelling (2011) emphasise that resilience seeks to protect those activities perceived by an actor to be beneficial for human wellbeing and ecological sustainability but threatened by contemporary or future pressures associated with climate change. Adaptation also seeks the same vision as resilience, and adaptation seeks to protect commercial farming (activity) that is perceived as the one of the economic sectors, which contribute much to South Africa's GDP. This feat is made by farmers and the stakeholders (actors) within the agricultural sector, and as a result, it should be protected from the climate change (specifically, from drought as this study is directed to droughts effects).

The vision of adaptation as resilience is to support the continuation of desired systems functions into the future through enabling changes in social organisation and the application of technology (Pelling and Taylor, 2011). In this vision, there must be consistency in ensuring that the barriers at enabling those social changes and application of technology are tackled in immediate effect in order for the vision to succeed. This suggests that social organisation defined as the institutional zones where decisions making about adaptation actions are considered, and the application of technology need to be considered as one of the vital resources (means) in tackling climate change effects and the institutions should consider it where decisions about climate change adaptation are taken.

3.7. Conclusion

This chapter discussed an action theory of adaptation to climate change in order to analyse adaptation from practical perspective and by the use of terminology of the operator, receptor and exposure unit to map more complex actor networks. The chapter also revealed the potential barriers to adaptation and what cause those barriers, and the chapter described the ways on how farmers should overcome those barriers.

The chapter also indicated that those action theory concepts postulate that in order for farmers to achieve adaptation as a strategy for local economic growth in Ugu District Municipality; there should be some resolution from those challenges that may hinder the adaptation. Notably, adaptation has short-term and long-term goal, therefore, collaboration of all stakeholders within the agricultural sector, farmers, scientist (researchers), policy makers and the institutions (both public and private sector) is vital especially in decision making to ensure achievement of those adaptation goals.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1. INTRODUCTION

Research design according to Kumar (2014) explains how data will be gathered from the participants, how one will select the respondents, how the data will be analysed, and how findings will be communicated. This chapter presents the research methodology that was used to explain how commercial farming could best adapt to droughts. This study employed qualitative research as its research design. Furthermore, this chapter describes the data collection procedure, the frame of reference on research methodology, and justifications of selected research paradigm, research philosophy and research approach which were considered suitable for this study.

4.2. Research Paradigm

The term paradigm is from the Greek word (paradeigma) which denotes pattern as first used by Kuhn in 1962 to explain a conceptual framework, which helped a community of scientists solve research problem. A paradigm is a well-formed research custom in a particular field (Mouton, 1996, in Voosloo, 2015). According to Lather (1986a: 259) paradigms in research indicate people's perceptions about the world they live in or wanted to live. As such, research paradigm suggests a pattern, approaches, values, framework and assumptions of the study. This study adopted the interpretivism research paradigm,

4.2.1. Interpretivism

This study used an interpretive research paradigm that is anchored on a belief that the reality entails people's experiences of the outside world which influence the adoption of epistemology and the ontological and inter-subjective belief, which is constructed socially. The reality perceived by commercial farmers about the impacts of drought in their produce was based on what they have experienced. The reality was constructed based on their exposure and circumstances they have confronted in their farming profession. It is not the interest of this research paradigm to create new theory but to assess, elaborate and estimate interpretive

theories. Hence, De Vos et al (2011) elaborate that an “interpretive approach is suitably used for phenomenological studies that intend to understand people”

4.3. Research Design and Methodology

4.3.1. Research Design

This research adopted qualitative method to explore how the commercial farming adaptation to drought is related to being a strategy for stable local economic growth in Ugu District Municipality. This research design seeks to provide deep perceptions into research participants' experiences, meanings and interpretations. In a simplest form, the qualitative research deals with inductive meaning and not numbers. Relatedly, qualitative research design has data that cannot be evaluated numerically because the data expressed in words. According to Williams (2011), qualitative study relies on careful description of words meaning, concepts and variables development, and manipulation of interrelationships among them. This is necessary as variables or concepts such as loyalty, happiness, diligence, poor application of methods, etc. are not easy to measure despite that they are real and identifiable. Notable data in qualitative data include minutes of meetings, literary texts, observation notes, transcripts of the interview, and documentary videos. Furthermore, in qualitative research, data rely heavily on researcher's interpretation and assessment, which may not be impartial (Williams, 2011).

Research Approach

This research undertook exploratory research to understand how commercial farming adaptation to drought among commercial farmers can be used as a strategy for stable economic growth in Ugu District Municipality. Exploratory research questions do not directly give final and conclusive solutions to existing problems (Dash, 2019). This type of research is normally conducted in order to study a problem that has not been clearly defined yet. The study therefore explores the use of commercial farms as a strategy for staple local economic growth.

Henceforth this study is conducted in order to determine the nature of the problem of drought and stagnation in the economic growth of commercial farms in Ugu Local Municipality, whilst providing conclusive evidence will assist in better understanding of the problem. When conducting exploratory research, the researcher ought to be willing to change his/her direction because of revelation of new data and new insights (Saunders and Thornhill, 2012).

4.3.4. Research Philosophy

Research philosophy in most cases under qualitative mode are underpinned in either epistemology or and ontology. This study on commercial farming adaptation to drought among the commercial farms in Ugu District Municipality employed epistemology as its research philosophy. Epistemology is a branch of philosophy that concerns with the origins of knowledge, and specifically, it concerns with knowledge's origins, nature, possibilities, and limitations in a particular field of study. In other words, epistemology can be described as the investigation of the yardsticks that the researcher categorizes what constitutes and what does not constitute the knowledge (Hallebone and Priest (2009). In short, epistemology is the way of thinking opposite about ontology as it focuses on truth, or what is believed to be true. Nevertheless, ontology speaks to reality, and in qualitative research, ontology says there is no single reality but multiple realities. This implies that the effects of droughts may emanate from lack funding or low rainfall caused by the change in climate.

According to Dudovskiy (2018), epistemology has several offshoots, which are constructivism, essentialism, progressivism, rationalism, historical perspective, idealism, rationalism, empiricism, among others. In this study, both empiricism and rationalism which is a philosophical basis. While the former is connected with personal experiences gotten from the senses, feelings, and observation, from knowledge, the latter is based on empirical findings gotten through measurable, reliable and valid knowledge (Dudovskiy, 2018). As a practice, epistemology- the researcher's view of what is acceptable as knowledge in this study is linked to interpretivism-and thus helps in focusing on the situation details concerning the commercial farming adaptation of drought among the commercial farmers under investigation, as well as a reality for these details, and there possible meaning. This shows that there are no effective strategies for adapting to droughts in commercial farms under Ugu District Municipality.

4.5. Sampling Method

Purposive sampling was selected as a sampling strategy for the study. This sampling method focuses on a judgmental, selective sampling in which the data collection relies on the deliberate judgment when choosing members of the population to participate in the study. Moule and Goodman (2014) pinpoint that in purposive sampling, the investigator uses his/her own judgement and knowledge of the potential participants in the recruitment of the participants. This research approach seeks to provide deep understanding of participants' experiences,

meanings and interpretations. In a simplest form, the qualitative research deals with inductive meaning and not numbers.

4.5.3. Sample Size

The sample size calculation was based on the number of commercial farmers operating in four municipalities as the total population of the study area. This study used the purposive sampling method to select commercial farmers. Hence, the sample size of 12 commercial farm (n=12) was drawn from the study within the population of 80 registered commercial farms in Ugu District Municipality.

The target population for this study was the commercial farmers. The inclusion criteria stipulated commercial farmers with farming experience ranging from less than 10 years to over 20 years of farming practice experience in Ugu District Municipality. The farmers must have been affected also by droughts for the past years. The target population was not limited by gender, race or educational qualification of commercial farmers. It was however limited in terms of getting the whole sample size of 12 commercial farmers due to personal issues of some commercial farmers, and other Farmers' Associations denial. The researcher ended up getting 10 commercial farmers who participated in this study.

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4.5.3 Data Collection Tool

Data collection process procedures and data collection instruments are explained. Semi-structured interviews were used to collect data for this study.

4.5.3.1 Semi-structure Interviews

This study used semi-structured interviews for data collection from commercial farmers. The interviews were conducted to elicit in-depth information on the research problems as the respondents are given time to freely express themselves, and thereby providing in-depth and different forms of information in relation to the topic under study. Similarly, semi-structured interview was adopted for this study to delve deeper into the objectives of the research as it gives a diverse means to probe a case and avoiding responses that are vague or unnecessary questions (Welman, Kruger and Mitchel, 2005).

4.5.4 Pilot Study

A pilot study is defined as a small-scale study that is conducted before administered an actual study, its purpose is to reveal defects in the research plan (Noori, 2018). Pilot study was conducted in the proposed study after permission to conduct it was obtained from another

district municipality. Only three interviews were conducted to see whether the questions the interview schedule were suitable or not. The aim was to test the feasibility of the interview schedule, to improve flaws and strengthen the content based on the outcomes from pre-test.

The outcomes of the pilot study were that interviews lacked probing questions, and to mitigate that probing questions were added. Another flaw was that some words were interchangeably used but they meant different meaning, thus it created confusion to the respondents, but this was also corrected. Lastly, the pilot study revealed the need to debrief the participants before the actual interviews should take place. This was done to make sure that respondents have clear understanding.

4.6. Data Management

The study ensured that the data was managed daily after its collection and some of it was recorded and given its identification to ensure that there was no misinterpretation. Furthermore, the researcher made notes to record some core points of the interviews

4.7. Data Analysis

Thematic analysis was employed to give meaning to respondents' views or perceptions on commercial farming adaptation to drought. Importantly, qualitative analysis involves responses to research questions through which interpretations are given to data and to arrive with a specific meaning (O' Conner and Gibson, 2003; Maree, 2007). Doing the above means that the research employs thorough inductive analysis to pinpoint categories and themes that are emerging from respondents' views.

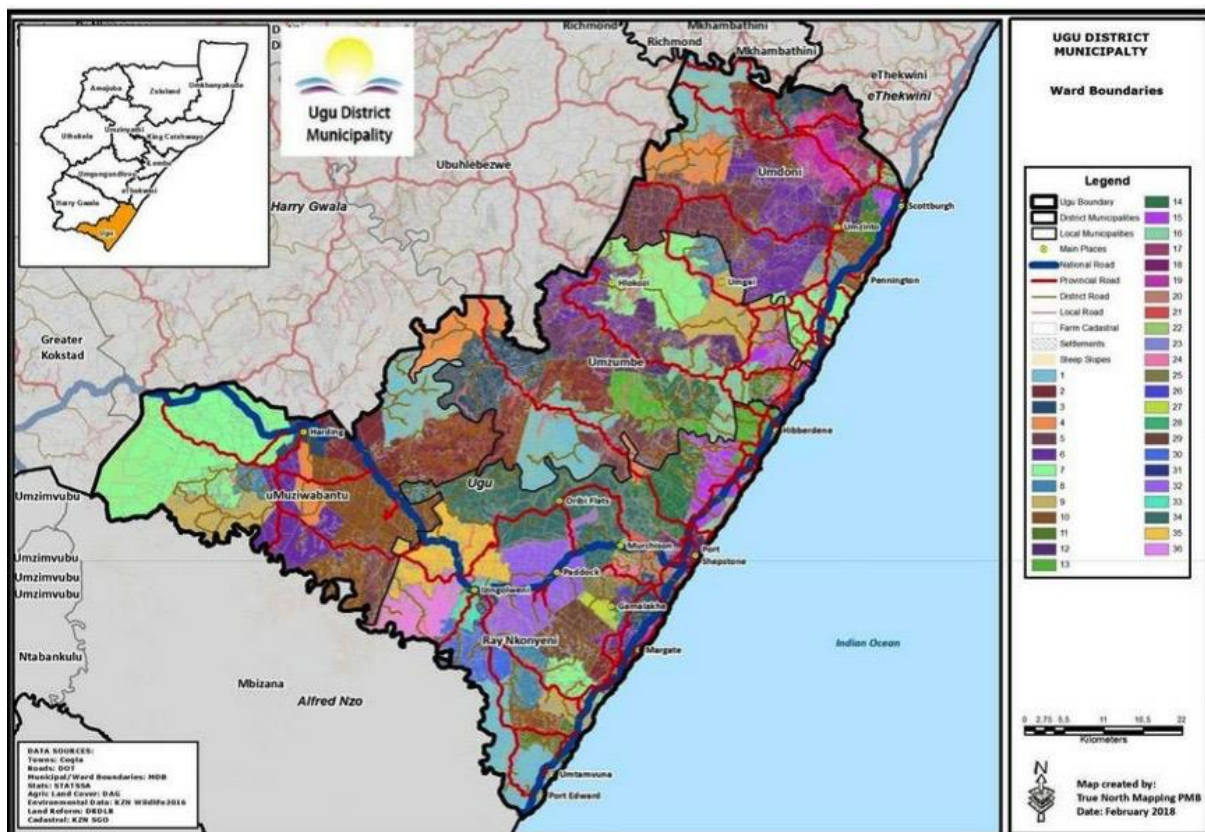
In this study, the analysis of the research data involves qualitative approach because the researcher is engaged in the interpretation of the information supplied by the participants (commercial farmers). Notably, thematic analysis was employed because the collected data deals with expressions in form of concepts, conversations, words and interactions with the participants concerning their experiences or views on how commercial farming adaptation to drought can be used as a strategy for local economic growth.

4.8. Study Setting/ Demarcation

The Ugu District Municipality is a Category C municipality situated in the far south of KwaZulu-Natal. It lies south of Durban, bordered by a coastline of 112km (Ugu District Survey, 2016). The district comprises four local municipalities: Umdoni, uMzumbe, Ray Nkonyeni, and Umuziwabantu, all of which have played a critical role in the cultivation of the district's economy. The Ray Nkonyeni Municipality is the ultimate economy booster due to its

location. Commercial agriculture in the district produces one-fifth of all bananas consumed in South Africa, with numerous companies successfully exporting these and other products to some of the most exclusive packers in the United Kingdom. The Ugu District is the proud owner of Blue Flag Status beaches, which serve as tourism centre and as a major economic cultivator.

Figure 4.8.1: Ugu District municipality in a Regional Context



Source: <http://ugu.gov.za/Documents/IDP/20192020%20UGU%20DM%20FINAL%20IDP.pdf>.

4.9.1 Trustworthiness

Trustworthiness means the study findings provide evidence from the results of the participants and demonstrate soundness of the results and that the argument made based on the results is strong (Kumar, 2014). The study maintained high trustworthiness by using qualitative research

approach. Trustworthiness of interpretations and findings are therefore dependent on being able to demonstrate how participants were reached.

4.9.2 Credibility

According to Lincoln and Guba (1989), Credibility of the study is determined when core-researchers or readers are confronted with the experience, they can recognize it. This study ensured that the researcher obtained credible data, all data processed, analysed, and interpretations addressed as the focus of the study. The researcher conducted prolonged engagement, persistent observations, peer debriefing and member checking. Doing the above was aimed at ensuring accuracy, achieving internal validity, and demonstrating that the study was conducted to ensure that the subjects have been correctly identified and described (de Vos et al, 2011). Semi-structured interviews allowed the researcher to observe how participants form their social reality during interviews.

4.9.3 Transferability

The study has potential for transferability that is after finishing the study, there will be publications especially in literature part and also conducting workshops and attending conferences to present the findings of this study.

4.9.4 Dependability

This entails that the researcher asks whether the research process is logical, well documented and audited. At the centre of dependability is whether the research will produce the same results if it is repeated in the same setting and same participants (Lincoln & Guba, 1999). Dependability was ensured in this study. The researcher submitted the collected data to two different researchers for examination, and to check its correctness. Care was also taken by the researcher to make sure that the research process is logical, precise, and well-documented in a good manner by giving a detailed account of the research process. Lastly, to ensure dependability, the researcher conducted follow-up interviews at the end of the study, for the participants to have a say in the research findings.

4.10. Ethical Considerations

The study was based on the code of research ethics in the University of Zululand. The researcher ensured that the study was conducted ethically by observing the ethics discussed below. Gardner (2011) asserts that ethics must be observed, and individuals should be treated fairly, sensitively, with dignity, and within an ethic of respect and freedom from prejudice regardless of age, gender, sexuality, race, ethnicity, class, nationality, cultural identity, partnership status, faith, disability, political belief, or any other significant variable. The ethics have guided the researcher against the act of plagiarism, harming, violating the rights of others who are directly and indirectly affected by the research.

4.11.1. Permission

The University of Zululand (UNIZULU) Research Ethics Committee, Department of Anthropology and Development Studies granted the Permission to a researcher to conduct a study. The researcher also wrote a letter to request for permission to conduct the study from Ugu District Municipality in KwaZulu-Natal to the head or District Manager. In the application letter, the researcher gave the outline and objective of the study. The researcher obtained permission to conduct the study from the Head of Farmers' Association under Ugu District Municipality (see appendices). A letter explaining the purpose of the study and objectives was given to the chairperson of the Farmers' Association. The researcher did not convince the prospective participants to participate in the study. The researcher clearly insisted that every participant should participate voluntarily, and it was aimed at collecting data for the purposes of academic use only.

4.11.2. Inform Consent

Informed Consent is a process not a written paper only for the participants' capacity to consent by asking questions and be given answers regarding the study. The researcher provided the participants with information concerning their participation and willingness to participate in the study. The researcher also gave participants a clearly written and understandable informed consent. The researcher also did not convince the participants to participate in the study. Participants, who voluntarily participated in the study, signed an informed consent after they carefully read the main purpose and objectives of the study. All participants were willing to

participate, and they voluntarily filled in the consent agreement and submitted it back to the researcher.

4.11.3. Privacy, Confidentiality, and Anonymity

In quantitative and qualitative research, privacy and confidentiality are more imperative. Since the study was qualitative, face-to-face interviews in their nature make identification of participants inevitable. Participants' names were not recorded on the sheets and their personal details were kept confidential. The researcher ensured that names and personal information of participants in the research could not be traced and identified. During interviews, names of participants were not revealed and associated with their views.

4.11.4. Avoiding Harm or Unfair Discrimination

The term beneficence refers to maximising the benefits and reducing harm to the respondents. Beneficence therefore involves ensuring the safety of the research participants and providing them with information and knowledge that would remain valid after the conclusion of study (De Vos et al., 2011).

The researcher ensured that the study did not cause any harm to the participants nor harassed them on the basis of their beliefs, culture, gender, language, ethnic group, marital status, pregnancy, race, colour and socio-economic status. However, a study had no other possible harm that could affect the participants, even though the researcher ensured that the study did not cause harm or distress to the participants. The researcher avoided asking embarrassing, personal or sensitive questions during the face-to-face interview, which was going to give bad impression about the study.

4.11.5 Limitations of the Study

The study had the numerous limitations, and they are discussed as follows. First, the issue of Covid-19 affected the process of data collection as the researcher was restricted to spend enough time with the participants. Subsequently, some participants refused to participate in the study; hence, 10 participated instead of 12 participants. Additionally, the commercial farmers were not under the supervision of the Department of Agriculture under Ugu District Municipality, but they have their Farmers' Associations where they take orders, and from which the researcher have to take permission before data collection. The use of semi-structured interviews was also a limiting factor, as one could have used focus group to elicit more

information. Lastly, the limited funds restructured the researcher in terms of accessing resources that are essential during the study.

4.12. Conclusion

This chapter has discussed the methodological framework of the study. It also discussed the research paradigm, the research approach and research design of the study. The chapter has also discussed the measures of trustworthiness of qualitative research. It furthered explicated the measures that the researcher has taken to ensure participants are protected from the possible harm. The chapter has put the methodological framework of the study into context as to ensure that the research process is successfully implemented. The next chapter focuses on interpretation of results and data analysis.

CHAPTER 5:

DATA ANALYSIS AND INTERPRETATION OF RESULTS

5.1 Introduction

The chapter presents the analysis and interpretation of results. The chapter is subdivided into sectioned in A and B. Section A discusses the biographical data of the respondents that are profiled in the study. Section B presents the thematic analysis of the data gathered from the participants to make meaningful findings. Literature analysis shall be applied to the advantage of constructing an empirically debate and to support the findings from relevant literature.

5. 2. Section A: Biographical Data

Biographical data in qualitative research is significance due to the following rationale: Firstly, it paints a vivid picture of the participants' socio-economic profile. Secondly, it orientates the field experts. Nwachukwu (2014) who concurs with the above assertion claims that biographical data of participants is essential to ensure that the researcher knows that the participants selected from the population possess required attributes to be representative and informed about the subject under investigation.

Table 5.2.1. Gender of the participants

Gender		
Male	5	50.0
Female	5	50.0
Total	10	100.0
Age		
18 - 35 years	2	20.0
46 - 55 years	1	10.0
Above 55 years	7	70.0
Total	10	100.0
Race		
Black	10	100.0
Black	10	100.0
Educational Status		
Non-educated	4	40.0
Educated	6	60.0

Total	10	100.0
Disability		
Valid	No	10
Total	10	100.0
Experience of participants in the farming sector		
Less than 10 years	4	40.0
10 to 20 years	3	30.0
Over 20 years	3	30.0
Total	10	100.0

Source: Researcher's Field Data

In Table 5.2.1. Reveals the gender of respondents, hence 50.0% were males and 50% were females, this implies that there has been balance in terms of gender representation in the study. Nwachukwu (2014) states that women need to be considered into developmental studies to ensure that their voices be heard in the process of decision-making.

The data shows that age of participants was categorised into three intervals namely 18-35 years which is 20.0%, 46-55 years which is 10.0%, and 70% were those who are 55 years (this means majority of participants were pensioner). This study establishes Nxumalo's (2019) findings that young people are less active in agriculture activities in rural communities. This is because they are more concerned about social activities if not political participation. Such implies that local municipalities have to bridge the gap that exists between young people and participation in agricultural initiatives in their local communities.

Supported by the Super's theory of process, young people are either exploring or still finding themselves to settle down, while people at age 55 to 60 are either maintaining if not declining in life. The concern at late years were more likely to be tailored towards doing practical and providing essential needs such as food security, investment on natural resources and availability of career maturity and identity, they have knowledge of their own interests and value their career as compared to those at earlier stages of life.

Table 5.2.1 presents race of the participants. The data shows that all the participants (100%) were blacks. It is undebatable that non-blacks dominate the majoring of land and commercial farming in South Africa. In this study, the focus is only on the black commercial farmers as means for advancing empowerment and redress for HDI.

This informed by the nature of the research aim, which it purposefully focused on the small-scale farmers' location where only blacks are actively involved. Masuku (2017) states that in order to ensure food security in rural communities, it is important that there is structural support of black farmers through research and development.

In Table 5.2.1., educational status of the participants is presented. The study shows that most of the respondents were well educated and have professions in agriculture. Various scholars in literature have established conceptions around the implication of educational status in participation in agricultural projects. Sahoo (2012) argues that farmers' educational level can play huge and positive role on agriculture productivity, therefore, in order to achieve this, there should be a strong case for the intervention of both government and NGO to encourage investment in farming education. This show how crucial is farmers' education especially commercial farmers who should be engaged in decision-making for matters that touch adaptation to climate change.

Table 5.2.1 also shows participants' disability status. The data reveals that all the participants (that is 100%) had no disability. Disability is a worrying issue for association for people living with disability in South Africa. In November 2020, a month dedicated for people living with disability; a radio interview for an unidentified speaker stated that people living with disability have been alienated from the processes of decision-making, hence the government structures and development projects do not reflect nor meet their needs. Notably, commercial farming in rural areas is among the most challenging and physical demanding activities, and it is still difficult for people who live with disabilities to participate.

Table 5.2.1 presents experience of participants in the farming sector. Farming experience is an important variable in determining the amount of knowledge that the participants hold and can be contributed to the study.

The participants with less than 10 years in the farming sector were 40.0%; those with 10 to 20 years were a 30.0%; and those with over 20 years were 30.0%. The majority of the participants were above 10 years of experience in the farming sector.

As the first section discussed the biographical information of participants, the second section provides the main discourse of data analysis and the applicability of the findings of the inquiry in the study

5.3 Section B: Commercial Farming Adaptation to Drought as a Strategy for Stable Local Economic Growth in Ugu District Municipality

Thematic analysis was used to analyse qualitative data gathered from interviews. Braun and Clarke (2012) state that thematic analysis should be seen as a foundational method for qualitative analysis.

Sub-themes were developed under each main theme as to construct knowledge contribution through imploring literature in relation to data. Data will be analysed through constructing collected and analysed the data through themes (Braun and Clarke 2012).

5.3.1. Theme 1: Understanding the Nature of Drought in Commercial Farming

The following sub-themes emerged during interviews. Firstly, the impact of drought on commercial farmers, the coping strategies during drought, and the impact of drought on commercial farming and also establishing perceptions of farmers in the phenomena of commercial farming and intensiveness of drought.

5.3.1.1. Impact of Drought on Commercial Farmers

Participants indicated being aware of about the nature of drought in the context of commercial farming. The majority of participants associated drought with prolonged period of no rainfall. Participant number 1 indicated that:

“Lack of water due to absence of rain is drought and the problem drought has been continuously bothering farmers and affecting them negatively”.

Drought is categorized as a problem that local farmers have experienced over the years. However, some of the participants during interviews have admitted that farmers have gathered to attend the problem and responded to the situation to seek resilient strategies.

Participant 4 stated that:

“Drought is seen when dam levels start to drop and soil dries up 3 or 2 months of no rain decreases the level of water in the rivers, devastation of production”.

The impact of drought is seen through the decreasing dam levels, water levels, storage of water. “Soil degradation, poor water flow from rivers has to reduce production in commercial farms. It has emerged in the study that commercial farmers have not yet established coping strategies to adopt into climate change and effects such as drought. The study also shows that poor development of coping with drought lead to bankruptcy and other loss in production due to absence of water.

Wayne (2018) establishes that impact of drought is associated with serious problems in agriculture, leaving families vulnerable and farmers bankrupt. The prolonged periods without rain, contributes to poor agriculture production, which in turn increases the level of food insecurity and high food prices. As a result, vulnerable communities and commercial farmers are at risk.

Knutson et al. (1998) believe that South African government policies have the potential to reduce the negative effect of drought, however, National Adaptation Plan (NAP, 2016) emphasises that there should be the prioritization in terms of providing enough adaptation resources to ensure equitable adaptation actions by those the victims of climate change effects. Furthermore, Wayne (2018) states that in South African context, farmers understand the importance of the knowledge of drought management

Droughts are known to have a long-lasting effect on crop production in world. Wayne (2018) however stated that understanding and managing drought risks is somewhat poorly implemented. The South African government working together with farmers have tried to deal with the problem of drought in commercial farms. The impact of drought has brought negative effects on the mind-set of farmers. Some farmers think that there is no action they can undertake in such instance due to lack of enough resources to fight drought effects. Subsequently,

inequalities within the agricultural sector have been identified in the study as a key hindrance to cope with problem of drought. Financial inequalities imply that some farmers can afford strategies, but others cannot.

Participant 9 has been in industry for more than 10 years and the participant mentioned that:

“I have been noticing decline on the quantity of crops since 2008, the production of crops has been adversely affected by drought such as it leads to some farmers surrendering their crops or selling them for less”,

Further to that, some farmers have sold their plots to others or leasing their plots to others. This happens for not having enough adaptation resources to enhance adaptation to drought effects, therefore, they believe selling their plots to those who can afford adapting to drought effects as a good idea to bring their investments back. In essence, the problem of drought in the study is seen as a matter that is affecting farmers and agriculture as a whole. This is also resulting to poor quality of crops and low supply of food,

5.3.1.2. Commercial Farmer’s Coping Mechanisms

Coping mechanisms linked with climate related disasters are essential to reduce the vulnerability and the risk. This can be done by developing resilient coping mechanisms such as crop diversification, drought-resistant crops, use of shade nets, built of dams, boreholes among others. In the context of this study, the participants indicated some few coping mechanisms that they have perceived to be working to cope with the effect of drought. Some of the respondents claimed that they have been coping with drought by harvesting earlier to ensure that before the drought becomes stronger their crops are already ready for harvest

According to Participant 2, “I have been coping with drought through harvesting earlier to ensure that before the drought becomes stronger my crops are already ready for harvest”, similarly with Participant 6 who indicated that

“To ensure that I avoid drought I have to harvest before time to protect crops from drying up before the sun becomes hot”.

Level of resilience among participants differed in the study, as the majority of participants perceived drought as a catastrophic situation that has caused economic failure that lead to poor production of crops. Others seemed to have been trying to cope with different mechanisms to work hard in some of the conditions. Participant 6 for instance pointed out that:

“Coping with disaster needs preparedness and these plans must be implemented with costs, I feel the government does nothing to build capacity for commercial farmers in this area to be prepared and have adequate resources to cope with climate change conditions”

In essence, the majority of the participants indicated that limited knowledge of the concept of coping with drought is still a serious problem in the area. Participant 3 said, “I don’t think that farmers in our area have adequate capacity and knowledge to cope with current conditions of drought, the absence of rain means that there will be reduced food production”.

It is noticeable in the study that farmers do not have adequate knowledge. Secondly, they are hopeless. Thirdly, they seem not to have exposure to professional coping mechanisms such as crop desiccation, extracting water from the ground through boreholes, using alternatives such as kennel and crop desiccations that are indicated in literature. The majority of the participants have agreed that they have been hit by the problem of drought at least more than once in their farming experience.

In this study, the participants indicated that commercial farmers could use different strategies to reduce vulnerability of drought; however, lack of resources is an issue. For instance, lack of money, loans and other savings have been an issue that has led to poor budgeting preparedness. Different alternatives can however be used to reduce the impact of drought on farmers. The participants emphasized that it is impossible to develop farming coping strategies and adjustments without adequate resources. Adequate resources mean that people have coping capacity that is considerable in terms of responding into the adverse of drought.

Furthermore, this study shows that plants during drought dry up and where some produce poor crops, some die instantly before they can yield, hence, it becomes expensive to replant. This indicate that drought is costing farmers more money due to replanting. Participants indicated that drought leaves a very devastating effect on crop productions. Such climate change has resulted to poor production of crops and low quality of crop supply.

Participants have indicated that one of the effects of drought is associated with drop in productivity which result to high demand, which causes food prices to rise. However, participants admitted that the farmers to cope with the drought could control the effect of drought if there are proper resources, knowledge and capacity.

Additionally, under-resourced farmers feel the effect of drought more due to their lack of capacity to respond to drought, such as boreholes, crop desiccation and other ways of storing water and provision of water alternative. This developed a perception that less-privileged farmers feel the effects of drought more than the ones who are well equipped.

5.3.2 Theme 2: Barriers Linked to Production of Drought Resistant Crops

Few participants indicated establishing barriers, which participants expressed in terms of producing drought resistant crops; while the majority of the participants indicated that production of drought resistant crops require knowledge and resources which many farmers have insufficient capacity and skills to cope with drought. The key concerns or gaps that participants acknowledged to be hindrances of overcoming barriers linked to production of drought resistant crops. The study reveals that farmers lack irrigation resources, absence of support and intervention from government entities.

5.3.2.1 Lack of Commercial Farming Resources

Absence of adequate resources to manage drought is commonly a barrier to farmers, and in the context of the study, participants have demonstrated interest and willingness to participate on farming drought resistant crops. The lack of irrigation resources and other alternatives was however identified as a key issue in the study.

Participant lack of knowledge of farming resources and having limited access to modern farming ways serve as barriers being experienced by these farmers. In this study, the effect of drought has been seen as a widespread crop failure. Drought, further leaves devastating situations on commercial farming by decreasing water availability and food shortages. Nevertheless, Chandra (2017) states that the lack of resources to cope with drought leaves stress on farmers; it has also caused lot of anger, anxiety, agitation, aggressiveness due to failure to make production.

Meanwhile, a distinction between physical vulnerability and social vulnerability is often drawn in terms of strategies to cope with drought management (Hallegatt, 2020). The farmers expressed the exposure to stress and crises as a result of drought as a physical hazard, this means there is a lack of capacity to adapt per individual farmer and the farming community to respond to the impact of drought through the available resources.

This strategy can be divided into categories; and the first category is agriculture or technical adjustment where farmers usually use technical adjustment or agriculture adjustment to compensate for crops such as buying irrigation equipment, resistant species, and draft drilling (Wahid *et al.*, 2007).

Another category is none agricultural practice such as production of handcraft trade. The participants in the study expressed that drought periods are obligating them to borrow money to buy food and others end up having to sell their land or other belongings to friends, neighbours or relatives that may aid them to have a drought relief measures. However, farmers in the study have not experienced relief from drought, or getting grants or loans from the government, or securing general employment for hazard victims to initiate public projects.

The farmers in this study have shown that drought has exposed them to devastating conditions due to lack of financial resources, lack of financial resources means there is less availability of cash to pay for expenses such as salaries of the employees in the farm. Another important point raised by the participants is that the attitude and behaviour of government entities as well as the farmers does not create conditions for successful behavioural management among these parties. An income inequality plays a role in determining sources of vulnerability. Hallegatt (2020) indicated that poor people tend to have more exposure to environmental risks than wealthy people do.

In addition, farmers who have less tools and implements are likely to plough and plant late compared to those who have. It has been noticed in the study that the farmers who participated are less resourced and they are vulnerable to drought compared to farmers who are more resourced.

The study has established that lack of resources has a negative effect on the sustainability and the growth of the farming industry among black farmers in rural areas.

5.2.3.2 Climate Change

Climate change has been internationally accepted as a crisis and one of the problems to economic development and social-ecological systems. Subsequently, climate change is associated with environmental barriers that have direct socio-economic impact (Von Hase, 2013). Chappel (2018) states that there is a need for crop producing farmers in semi-arid regions, such as Onesi, to adapt their farming practices in order for climate vulnerability can be reduced and enhance food security.

Some participants indicated barriers associated with poor adaptation to drought resistant crops. Participant 1 stated that:

“Climate change in Ugu District has caused a major barrier into developing adaptation for crops who are resistant to droughts “.

“Lack of knowledge on how to adapt to climate change as farmers under Ugu District has cause lot of damages in our production”

Participant 7 and 8 indicated that they have poor knowledge about how to plant crops that are drought resistant”. The participants were asked about alternatives strategies to adaptation to crops that are resistant to droughts, and they indicated that they lack adequate information and knowledge about adaptation practices. Hegga et al. (2016) state that the primary reason preventing farmers from changing their practices. Furthermore, indicated that change structure due to hotter climate and soil erosion are among major hindrances inhibiting planting of crops that are resistant to drought. The lack of understanding and knowledge by farmers makes it difficult for them to seek alternative strategies to cope with drought conditions through planting crops, which are drought resistant.

Participant 9 pointed out that “land is infertile and poor cultivation due to draught, there is low water retention water, planting crops that need less water still is an issue “. A study conducted by Crawford and Terton (2016) indicated that commercial farmers are faced with predicaments such as land under cultivation is considered marginal, the soil is characterised as having low water retention and low fertility.

Climate conditions have negative effects on strategies to cope with drought. Climate change affects alternative crop farming in terms of rainfall capacity those crops requires. Furthermore, Palazzoli (2015) urges that agricultural sector is the most water consuming practice and in order for its productivity to be high; there must be enough rainfall for all crops. This sector is however suffering from either droughts or floods that are mostly caused by climate change. A study conducted by Chappel (2018) established that climate change should train farmers to develop sustainable climate adaptation strategies and build resilience among communities as to promote adaptation practices.

Impacts of climate variability and climate change directly and indirectly affect crop production through flood and soil erosion; increased pests drying out of crops; and decreased soil fertility; which all lead to decrease in food security (IPCC, 2012). Participants indicated that there are different conditions that needs to be resolved to create and an enabling environment for developing strategies to adopt to droughts. The barriers to adaptation practices such as farming drought resistant crops are connected to climate change.

Overall, the participants indicated that climate change has caused vulnerabilities to rural commercial farmers in the area of study, leaving their businesses devastated. Such ugly incident is due to higher dependency on rainwater which in turn leads to limited capacity to devise strategies for adaptation to droughts. A study by Angula and Kaundjua (2016) indicated that throughout the Southern African region, crop farmers in there are inherently vulnerable to climate change. This shows that crop farmers have not been exposed to adaptation knowledge. Hence, it may be the lack of adaptations resources as the problem statement of this study addresses such, that there is a lack in prioritization in terms of equitable distribution of enough adaptation resources by the state. This vulnerability is linked to high dependence on rain fed agriculture, limited income to strengthen the farming system.

5.3.2.3 Governmental Support for Commercial Farmers

The role of agriculture in ensuring sustainable economic growth and food security cannot be overemphasized. Government spheres are held accountable and responsible to support agricultural development. According to Mdungela, Bahta and Jordaan (2017), commercial farming vulnerability and limited adapting capacities of farmers is correlated to inability access to land, water, finance, market and timely information.

Notably, the participants have associated barriers of planting drought resistant crops with lack of financial resources, poor knowledge of copies strategies such as crop breeding, crop diversification and lack of mitigation to reduce drought. Subsequently, the participants indicated is the lack of support from the provincial, district and local government agencies. The participants strongly expressed that government support programmes can improve the strategies to mitigate risks and reduce the vulnerability to drought. Participant 1 and 5 indicated

that coping with drought require training, knowledge and information about planting drought resistant crops to that we can improve the current conditions.

In addition, Participant 5 established that “we do not have knowledge, skills on applying modern farming methods, we still use traditional methods of farming which are very limited in terms of building resilience during drought years”.

Findings of Mdungela et.al (2017) established that in South Africa, there is a necessity for policy adjustments with regard to drought effects and lack of coping capacities. Such policies need to be reviewed to ensure that commercial farmers have capacity, knowledge, skills and relevant training to ensure that coping strategies are effectively developed to reduce the impact of drought on the commercial farming sector.

Some participants expressed discontentment in the nature of government support towards building an enabling environment to ensure that commercial farmers have capacity and knowledge of adapting to drought. Ncube (2016) states that South Africa does not have a harmonized drought response for agriculture, especially in the provision of water for agriculture. In such scenario, adaptation strategies such as irrigation use during drought periods are mostly reactive instead of being proactive.

Even with a Drought Response Plan Policy of 2005, it has been revealed by different scholars that the policy has failed to reduce vulnerability of drought to as 246 245 farmers were affected by drought since year 2016 in South Africa as country (Biazin *et al.*, 2011, Mdungela *et al.*, 2017).

The participants in the study indicated that poor implementation of policies and the local government has overlooked initiatives that are targeting support for commercial farmers. Lack of resources such as modern methods of cropping for commercial farmers have been reported as areas that government needs to intervene in order to create an enabling environment for sustainable commercial farming.

According to Ncube and Lagardien (2015), lack of timely and coordinated approaches for responding to drought have made farmers to receive assistance too late. This implies that they

receive assistance after they have already lost their crops. The problem of lack of adequate training and skills in commercial farming is directly associated with poor capacity to develop adaptive strategies to reduce the impact of drought for farmers. Subsequently, there is a need for reviewing policies, approaches and strategies that can be implemented in South Africa to ensure that there is national drought response strategy.

5.3.3 Theme 3: Drought Adaptation Strategies that may be used by Crop Farmers to Improve Economic Growth

In this study, the commercial farmers in Ugu District Municipality have indicated interest on drought adaptation strategies. There are multidimensional strategies that can be used to adapt to drought but all depends on capacity building for commercial farmers in ensuring that there is adequate information and knowledge in terms of building resilience during drought.

5.3.3.1 Multidimensional Strategies towards Drought Adaptation.

Different scholars in response for coping with climate change and droughts in particular have established strategies that can be used to adopt to drought. Shackleton et al. (2015) have established that coping strategies form at many different stages of adaptation and can overlap and interact across different spatial or temporal scales, which create complex adaptation challenges such as not having the knowledge of how to adapt, lack of prioritization in terms funding etc.

South Africa has been documented in various studies whereby participants have indicated that there are limitations in terms of building resilience during drought (Moser and Ekstrom, 2014). Some participants indicated that there are multidimensional strategies that farmers may adopt and such strategies depend on financial, technological and institutional resources (Ahmadalipour, 2018). Such coping strategies enables farmers to make changes to farming practices.

5.3.3.2 Information Provision

Information-based strategies refer to the extent of awareness about the nature of climate change. The study reveals that there is a need for knowledge about climate change and types of adaptation practices suitable for the soil structure will help reduce vulnerability of drought

to farmers. This strategy is therefore set to bridge the knowledge gap between farmers. Nena (2015) acknowledges that knowledge and information for adopting new practices in Southern African countries is one of the strengths for farmers in coping with drought. Information provision is the factors, which is associated with building capacity for sustainable farming methods. This is similar to suggestion by Antwi-Agyei et al. (2015) that scientific information is important in assisting commercial farmers to initiate early warning systems and time of planting should be swiped.

In this study, Participant 8 pointed out that:

“Farmers need to be educated about climate change and ways they can possibly cope with drought.”

Muller and Shackleton (2014) in research conducted in the province of Eastern Cape state that education is the main differentiating variable between farmers who adapted to climate change and those who did not. Nevertheless, some scholars have pointed out that low levels of Information are associated with the illiteracy levels and have made suggestions about the use of modern scientific practices for crops farming (Gbetibouo, 2009). Subsequently, in this study, lack of formal education in participants was another major barrier, which was explained in Section A of this chapter.

5.3.3.3 Provision of Institutional Support

Earlier in this chapter, poor government interventions programmes to support the commercial farmers in Ugu District Municipality was uncovered. To mitigate the existing effect of lack of this support, the participants in the study indicated that provision of institutional support could help mitigate the existing risk of drought conditions in their farming practices. Participant 5 said that:

“We need organizations that can educate people about climate change and how to overcome conditions associated with drought instead of giving up.”

Biesbroek et al. (2013) elaborate that institutional support involves the provision of formal support from government departments and non-governmental organizations which ensures that

there is collaborative effort by the governance structures that is set to assist in the commercial farmers in trying to cope with drought. Moreover, Biesbroek et al (2013) state that climate change adaptation is a low priority to developing countries such as South Africa, due to the presence of many other pressing societal issues.

One of the participants maintained that' the problem of drought in our lives is a complex situation that requires different stakeholders to ensure that there is adequate support for farmers. It has been however revealed earlier in the study that there is lack of government spheres support for farmers. Mdungela et.al (2017) indicate that policies development and institutional interventions regarding a good strategy can improve efficiency of commercial farmers.

5.3.3.4 Provision Financial Support

Lack of financial resources and access to financial credit is among key barriers for farmers to cope with drought. Alternative crop diversification, irrigation systems and other interventions are effective but unaffordable for the farmers in Ugu District Municipality. Furthermore, the majority of the participants indicated that limited financial resources is among major factors that contribute to the lack of drought coping strategies. One participant indicated that that:

“We do not have enough money to provide for funding of irrigation system or boreholes for water supply, rain is the only source of water. “.

Provision of financial resources to farmers is seen as a strategic and can create opportunities to reduce the impact of drought in the study area and positively enhance the local economic growth. Participant 5 stated that:

“If water and tunnels, boreholes, JoJo tanks can be available we can then try to plant water less demanding crops such as, potatoes and butternut”.

The cost associated with drought resistant crops are expensive for farmers in the study. For example, the cost of purchasing drought resistant varieties of groundnuts in Ghana prevented farmers from using improved seeds to adapt to decreasing rainfall (Peterson, 2013). Provision for financial assistance do not only mean money, but creating enabling environment for

opportunities for funding and to ensure that there is a knowledge on acquiring financial credit and knowledge for doing business plans.

Meanwhile, perceived lack of financial opportunities that will accrue from adopting a new practice may also act as a barrier if they are not worth the capital input (Gruère and Wreford 2017). In addition, provision of financial resources can trigger strategic response in terms of building resilience during drought.

5.3.3.5 Technological Innovation

Solving the current environment problems in agriculture sector requires developing and defusing technologies (Shang, 2021). Another strategy to ensure that commercial farmers have adaptation capacity through use of technological infrastructure. However, the concern of these commercial farmers was found to be lack of financial resources to access modern technology to cope with the current trajectory of the drought conditions.

A study by Hayati, Yazdanpanah, and Karbalaee, (2010) established that the first category is technological innovation by farmers to ensure the daily use of agricultural or technical adjustment to compensate for crop such as, buying of irrigation equipment, resistant species and shaft drilling.

One participant explicated that:

“We need modern technology to detect if there will be enough rain to ensure that we plant crops that are resistant to the effects of that climate condition, such will prevent us from losing due to unknown climate conditions.”

OECD (2001) also states that use of technological infrastructure in agriculture is essential. Great investment in technological infrastructure remains fundamental for increasing agricultural productivity and promoting of strategies to cope with drought.

One participant indicated that:

“We need modern technological innovation to improve the farming conditions”.

Adoption of technological innovation is important competitive agricultural practices and sustainable productivity of crop diversification. Antwi-Agyie et al., (2015) postulate that the

use of technological innovation and knowledge in crop production is important. Technological development helps in early warning systems, new crop varieties and water harvesting technology, all of which build resilience to climate change. In OECD countries, much of the water used in agriculture is carried to fields by pipes; but technical efficiency could still be improved through greater application of technologies. The application of technology such as precision fertilisation is able to combine more accurate dosage of fertilizers according to actual crop needs. Similarly, technological innovation is an essential strategy that commercial farmers perceived to be sustainable to build resilience during drought conditions in this study.

The theoretical framework of the study established that there are core concepts of adaptation in this theory. The first aspect is a stimulus, which is drought in this current study. Drought becomes exposed to commercial farmers through the aspect of exposure unit. Drought becomes triggered by climate change (Lobell et al. 2012). This theory thereby requires a collaborative effort from all the units in the process of adaptation, and for the commercial farmers who are receptors, they must take responsibility to ensure that there is enabling environment like the change in attitude towards climate change may affect the implementation of strategies from the institutional point of view (Asseng and Pannell, 2013). Receiving in the context of the study are financial support, technological innovation provision, social, cognitive and institutional development depends entirely on the willingness and readiness for receptors (commercial farmers) to implement the strategies. Oberlack (2016) establishes that operators can be institutions (NGOs, Government Agencies, AgriSA or Government spheres representatives) which are obliged to implement policies and drive change for reducing impact of drought through adaptation practices.

Importantly, adaptation strategies are needed to reduce effects of drought to commercial farming. The impact of drought is seen through absence of rain, poor soil structure, degraded crops conditions and soil erosion (Palazzoli, 2015).

5.4. Conclusion

The chapter has presented data analysis and interpretation of results for the study. It firstly established the narrative of the biographical information of participants in the study. Second section provided an explanatory data on the nature of interview schedule/guide that was used

on data collection, thematic analysis was used to discuss the research results. The chapter revealed that participants were faced with various predicaments of drought, which has an effect on sustainable livelihoods.

Furthermore, the discussion of results indicated that there is limited information on strategies that are a prerequisite to cope with the current effects of drought. The participants seemed to be clear about probable strategies that could help mitigate the existing droughts conditions in the region. The discussion of the multidimensional strategies that participants perceived to be desirable as adaptive measures to cope with drought conditions was compatible with the theoretical framework of the study. The theoretical assumption indicated on how the best strategies can be implemented to reduce the effects of drought on the current trajectory of commercial farmers' practices.

CHAPTER 6: SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

6.1 Introduction

The chapter presents the summary of findings, conclusions, and recommendations of the study. This chapter explores the nature of the research findings based on the literature and primary findings of the research. Based on the qualitative research results, the fundamental aim of the study was to investigate the phenomenon of commercial farming adaptation to drought as a strategy for stable local economic growth at Ugu District Municipality. In this chapter, the recommendations on how commercial farmers in Ugu District Municipality can adapt to drought will be offered.

6.2 Discussion of Primary Findings from the Study

The discussion of the research findings is carried out based on the research objectives of the study. Literature synthesis is used to critically discuss the research findings. Each research objective reflects the discovered finding in order to ensure that each research question is answered.

6.2.1. To Investigate the Nature of Droughts Affecting Crop Farmers in Ugu District Municipality.

The study has established different perceptions about commercial farmers in relation to the nature of drought in the Ugu District Municipality. Firstly, the study found that the participants have been socially affected by the drought; some exhibited some attributes of anxiety and shock. The study established that the participants have been economically affected by the prolonged absence of water, change in soil structure and excessive heat, which have negative effect on the quality of their crops.

The study has discovered that the current nature of drought has led to demotivation of farmers to continue with commercial farming due to lack of mitigating strategies and drought coping mechanism. One of the key findings was that participants have no plans or any knowledge on the response strategies to disaster, instead they give up or resort to planting less crops. The study also established that there is poor resilience to drought by the commercial farmers in Ugu District Municipality. Commercial farms have increased food prices to recover what they have lost due to the economic disruptions caused by drought.

The participants indicated that drought has put so much pressure on them and they have resulted to premature harvesting. The fact that they have no other coping strategies that they can implement in order to reduce the vulnerability of crops to drought is reduced.

Another key finding is that commercial farmers in Ugu district Municipality perceived drought coping to be difficult task if not impossible to manage without government's intervention. Instead of developing strategies at individual capacity, the majority of participants admitted that drought has defeated their willingness to farm, and they have been subjected to failure. In addition, lack of coping strategies have developed negative perceptions about success of own farming and such have negatively affected the production of crops in the area of study.

6.2.2. To Examine Barriers Linked to Production of Drought Resistant Crops in Ugu District Municipality

The study found that lack of resources to commercial farmers is a key barrier to adaptation to drought. The study found that lack of irrigation equipment, proper boreholes, windmills and water kennels was a common barrier among participants to farm drought resistant crops.

Moreover, lack of resources was directly linked to poor knowledge and training on the suitable

crops that can resist drought. Furthermore, participants indicated that drought have caused financial stress on the livelihoods of commercial farmers to an extent that they have exhausted all their savings facilitates so that could relief themselves from drought. Meanwhile, lack of resources was reported as a source of all barriers, which has resulted into agitation, aggressiveness, and anger.

Another key finding was the lack of financial resources and access to financial credit. The participants indicated that there is poor availability of institutional help, knowledge and skills that can help them produce crop that needs less water. The study found that climate change has created many damages to the soil structure, leaving the soil degraded and with poor quality. A proportion of the participants indicated that they tried to diversify crops, but they have experienced loss due to high level of temperature that easily damaged crop growth, which left them devastated. According to the participants, climate change does not only mean absence of water but also other environmental conditions that have negative effect on crops production like snow in winter and hail in summer.

The study found that farmers in the area are faced with adverse bad climate change, which has created soil erosion, increasing pest's attacks and excessive floods in some occasions. Farmers indicated that such incident has led to poor food supply and have decrease food security in local communities.

The participants have associated barriers of planting drought resistant crops with lack of financial resources, poor knowledge of coping strategies such as crop breeding, crop diversification and lack of mitigation to reduce drought. The participants also indicated there is lack of support from the provincial, district and local government agencies.

The participants exhibited strong discontentment on the level of support from government sphere in ensuring that there is production of crops. The study established that government support could help reduce the vulnerability of drought and create a sustainable environment for adaptation to drought. The study found that commercial farmers in Ugu District Municipality lack institutional and government towards developing strategies to cope with the nature of drought. Lack of government support was linked to the poor knowledge and training on how to use drought resistant crops and other strategies by farmers. This, however, can easily be resolved if government can engage all stakeholders including farmers in decision making in

order farmers to have more knowledge about the whole process of adaptation.

6.3. Conclusions of the Study

Adaptation to drought has been revealed as a challenging situation to cope with in uGu District Municipality. It can be concluded however that the nature of drought affecting crops is clearly comprehending as a complex socio ecological system, which has ecological, economic, environmental and social effects on farmers.

Barriers to adaptation to drought are related to lack institutions support, lack of financial resources, social obstacles and lack of technological infrastructure to advance the implementation of strategies to adapt to drought.

In Ugu District Municipality, water supply, and related provisions have been affected by drought and climate change. Government spheres have not made reviewed existing policy response to the current trajectory of drought. One of the conclusions of the study is that commercial farmers have no adequate knowledge and information about crop diversification, breeding and planting of drought resistant crop. There is a gap between the government policies implementation and the needs of the commercial farmers.

The existing problem of climate change has had effects on the quality of life of commercial farmers. This also negatively affect local economic growth and increasing the rate of unemployment in Ugu District Municipality. Commercial farmers are faced with adverse conditions such as lack of financial resources, limited access to markets and poor harvesting of crops.

In sum, commercial farmers perceived that adaptation strategies such as financial support, technological innovation, institutional development and economic development could act as strategies that can be implemented to mitigate drought.

Water supply problems in Ugu District Municipality is worsen by the climate change resulting in higher temperatures, increased evaporation and drought which will lead to greater demand and less availability of water in the farms.

6.4. Recommendations for the Study

Drought adaptation strategies used in different regions of the world are not similar. It is recommended that uGu District Municipality adopts the application of drought adaptation

strategies cope with indigenous and highly technological innovation to ensure that mitigation process of drought is in adequate position.

It is recommended that the use of weather forecasting, vulnerability assessment, crops diversification, sustainable and efficient water management practices, cultivation of low water consuming crops and systematic cropping pattern as some of drought adaptation strategies which can mitigate the adverse situation.

It is recommended that the government must assist commercial farmers through investment on irrigation systems, equipment such as water supply boreholes and windmills. Additionally, farmers need to be trained about climate change adaptation strategies such as crop diversification and crop breeding.

Essentially, there is a need for the government and the local communities to cooperate in responding to drought, and towards strategic arranging that manages continuous change (climatic and something else) and vulnerability. There is additional evidence (in spite of the normally traditionalist nature of agriculture) of transformation and receptiveness to change which offers open doors for building and continuing proactive and practice-situated support services and projects that oblige future situations.

6.5. Recommendations for Future Research

Future studies must focus on the factors that influence the adaptation strategies in commercial farmers. Future studies that focus on the socio-ecological responses to climate change can also make some much-needed impact in agricultural sector in South Africa.

Quantitative studies that evaluate impact of drought on crop farming are recommended. In addition, future studies that explore that use of Indigenous Knowledge Systems as mechanism to adapt to drought in rural communities are recommended.

6.6. Summary of the Chapter

The chapter have answered all research questions of the study in terms of identifying the main challenge (problem statement) and barriers that constrains adaptation to droughts by commercial farmers and posed solutions on how it should be tackled. Furthermore, the effects

of droughts on commercial farming were identified and how they affect the local economic growth. Chapter 5 have explored the nature of drought adaptation strategies. In the process of answering the research questions, it was revealed that the effects of droughts have turn commercial farmers into victims of low farm productivity, and further negatively affecting their contribution to local economic growth. There is existence between policy imperatives and the practice of commercial farming. Farmers have decided to abandon their farming due to drought, and there are no adaptation strategies that have been put in place to reduce the impact of drought in uGu District Municipality. Some recommendations were suggested in order to improve the current conditions in uGu District Municipality. In summary, commercial farmers do not have adequate knowledge and understanding of drought adaptation.

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Appendices

APPENDIX A: PERMISSION TO CONDUCT A STUDY

UNIVERSITY OF ZULULAND



RESPONDENT INFORMED CONSENT DECLARATION

INFORMED CONSENT DECLARATION

(Participant)

Project Title: Commercial Farming Adaptation to Drought as a Strategy for Stable Local Economic Growth in Ugu District Municipality

..... **(name of researcher/person administering the research instrument)** from the Department of, University of Zululand has requested my permission to participate in the above-mentioned research project. The nature and the purpose of the research project, and of this informed consent declaration have been explained to me in a language that I understand. I am aware that:

1. The purpose of the research project is to
2. The University of Zululand has given ethical clearance to this research project and I have seen/ may request to see the clearance certificate.
3. By responding in this research project I will be contributing towards

.....
(state expected value or benefits to society or individuals that will arise from the research)

4. I will respond in the project by
(State full details of what the respondents will be doing)

5. My responding is entirely voluntary and should I at any stage wish to withdraw from participating further, I may do so without any negative consequences.

6. I will not be compensated for responding in the research, but my out-of-pocket expenses will be reimbursed. **(Should there be compensation, provide details)**

7. There may be risks associated with my responding in the project. I am aware that

a. the following risks are associated with my responding:
(state full details of risks associated with the participation)

b. the following steps have been taken to prevent the risks:

c. there is a% chance of the risk materialising

8. The researcher intends publishing the research results in the form of

..... However, confidentiality and anonymity of records will be maintained and that my name and identity will not be revealed to anyone who has not been involved in the conduct of the research. Research Ethics Guide: Senate Approved on 27 November 2013. Ref: S1217/13 Page 9 of 19

9. I will not receive feedback/will receive feedback in the form of regarding the results obtained during the study.

10. Any further questions that I might have concerning the research or my participation will be answered by..... **(Provide name and contact details).**

11. By signing this informed consent declaration I am not waiving any legal claims, rights or remedies.

12. A copy of this informed consent declaration will be given to me, and the original will be kept on record.

I, have read the above information / confirm that the above information has been explained to me in a language that I understand and I am aware of this document's contents. I have asked all questions that I wished to ask and these have been answered to my satisfaction. I fully understand what is expected of me during the research.

I have not been pressurised in any way and I voluntarily agree to participate in the abovementioned project.

.....

Respondents Signature

Date

APPENDIX B: IFOMU LOKUSHICILELA

UNIVERSITY OF ZULULAND



IFOMU YOKUZIBOPHEZELA

(kumphenduli)

Ucwaningo lwezolimo lazwelonke ekujwaleni ukuphila ngaphansi kwesimo sokuguquka kwezulu ukuze kuzoba iqhinga elizithuthukisa umnotho umnotho wesizinda Ugu District municipality

..... (igama lomcwaningi/umuntu ophethe ithuluzi lokucwaninga) ovela ku Mnyango wezifundo zobuciko nezentukho e-University of Zululand ube nesicelo semvume yokuba ngizibandakanya kulolucwaningo olulotshiwe ngenhla.

Imvelaphi kanye nenhloso yalolucwaningo, nalolu lwazi nophawu lokwamukela ukuzibophezela ngichazeliwe ngalo ngolimi lwami engilizwayo.

Ngियाqonda ukuthi:

1. Inhloso yalolucwaningo uku.....

2. Inyuvesi yakwaZulu inikeze ngemvume kubenzi balolu cwaningo ukuba benze loluhlelo futhi ngiyibonile leymvume/ngingacela ukubona isitifiketi semvume.
3. Ngokuphendula kulolucwaningo ngizonikezela iqhaza ngoku
..... **(yisho inani elilindelekile noma izinzuzo emphakathini noma kubantu abazovela ocwaningweni).**
4. Ngizophendula kulolucwaningo ngoku.....**(yisho imininingwane egcwele yalokho umhlanganyeli azokwenza).**
5. Ekuzimbandakanyeni kwami angizukubheka nzuzo futhi akukho lapho engizotholakala ngihoxa ocwaningweni, umakwenzeka ngeke kube nemiphumela emibi ocwaningweni.
6. Mina angizikunxephezela ngokuzimbandakanya kwami kulolucwaningo, kodwa izindleko eziphume kwelami iphakethe zizokhokhelwa. **(uma kukhona isinxephezelo nikeza imininingwane).**
7. Kuzoba nezimo ezibucayi ekuzimbandakanyeni kwami kulolucwaningo, ngiyaqonda ukuthi:
 - a. Lobu bungozi obulandelayo kuxhumene nokuzimbandakanya kwami
:..... **(yisho imininingwane egcwele yezingozi ezihambisana nokuphendula).**
 - b. Lezi zitebhu ezilandelayo zithathwe ukuzivikela ubungozi:.....
 - c. Angu% amathuba okuvela kobungozi.
8. Umcwaningi uzoshicilela imiphumela yalolucwaningo ngohlelo lwa....., Nokho, ubhalomfihlo, nofihlo-gama lwemininingwane izobe igciniwe nokuthi igama lami nobutho kwami angeke kubonakaliswe kunoma yimuphi umuntu obengeyona inhlangotho yocwaningo.
9. Angeke ngiyamukele imiphumela/ngizoyamukela imiphumela engaloluhlelo lovukhuluma kwami..... emayelana nemiphumela etholakale ngesikhathi sesifundo.
10. Eminye imibuzo ephathelene nalolucwaningo noma mayelana nokuphendula kwami ingaphendulwa ngu.....**(bhala igama neminingwane yokuxhumana).**

11. Ngokusayina lamafomu angiqubuli ubuthi noma amalungele kwezomthetho
12. Ikhophi enolwazi oluphelele nophawu lokwamukela ukuzibophezela kwami ngizonikezwa, bese okungungqo kuyasayinwa.

Mina,.....ngikufundile lokhu okubhalwe ngenhla/ngiyavuma ukuthi ngiyakuqonda okuqukethwe nokubhaliwe. Ngiyibuzile yonke imibuzo engifuna ukuyibuza, futhi yaphendulwa ngendlela engenelisayo. Ngiyayoqonda kahle ukuba kulundelekile ini kimi kulolucwaningo. Angiphoqwanga nakancane ukubamba iqhaza kulolicwaningo.

.....

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Isishicilelo kumphenduli

usuku

APPENDIX C: THE RESEARCHER OBTAINED PERMISSION TO CONDUCT THE STUDY FROM THE HEAD OF FARMERS' ASSOCIATION UNDER UGU DISTRICT MUNICIPALITY.



THE PERMISSION TO COLLECT DATA UNDER UGOU HISTORIC I

To whom it may concern:

Dear Sir/Madam,

As the UGU BOARD works towards **Simiso Asakunle Niyawani**, the Commission is called to work under Ugu Districts on commercial remote farms.

Should you have a query, please contact the Executive Director, Ugu Districts on 0785001515 or Secretary Adeniyi Oluwalana on 006193367.

Yours faithfully,

Melchior Mkhlas



[SECRETARY]



University of Zululand
Municipal officials Interview schedule

**Commercial Farming Adaptation to Drought as a Strategy for Stable Local
Economic Growth in Ugu District Municipality**

Researcher : SF Nyandeni
Supervisor : Dr IS Nojiyeza
University : University of Zululand

Note to interviewees:

- What you say in this interview will remain private, confidential and it will be reported anonymously.

How to respond to the interview?

- Please answer the questions as honestly as you can.
- If you do not feel comfortable answering a question, you can indicate that you do not want to answer.
- For those questions that you will answer, your responses will be kept confidential.

CONSENT

I (Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I voluntarily participate in this research project. I am aware that I have a right to withdraw from the research project at any stage, should I feel so.

.....

...../..... /2020.....

Signature of participant

Interview questions

SECTION A: BIOGRAPHIC DETAILS

- 1) Name of the sub-ward/ voting district (_____)
- 2) How long have you been farming:

- 3) May you please state your age:
- 4) May you please state your race:

- 5) What is your marital status?.....

- 6) Do you have any Disabilities?

1. As a commercial farmer, what is your understanding on drought and its effects on commercial crop farming?

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2. So far in your farming experience, how many times have you been exposed to drought and how did you cope with it?

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3. What do you think is drought adaptation? Or what does it mean to you as a commercial farmer to adapt to droughts?

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4. How can you describe the type or nature of droughts that have affected or affecting your crop farming?

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5. Do you know that some crops may resist droughts? If yes, name them.

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6. What are the barriers that can be linked to how often you produce some crops that may resist droughts?

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7. What are the barriers that can be linked to how often you produce some crops that may resist droughts?

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8. Is there any means/support provided by government to commercial farmers that is adequate to overcome those barriers to commercial farming adaptation to drought?

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9. Why commercial farming adaptation to drought by commercial farmers is necessary for local economic growth?

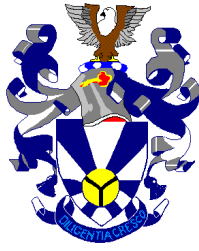
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10. Which adaptation strategies do you think commercial farmers may adopt to ensure that they adequately beat droughts and add to local economic growth?

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Thank you for your participation

APPENDIX E: ISIZULU INTERVIW GUIDE



University of Zululand

Uhlaka lwemibuzo eqondene nabalimi abasesigabeni esiphakeme

Ucwaningo lwezolimo lazwelonke ekujwaleni ukuphila ngaphansi kwesimo sokuguquka kwezulu ukuze kuzoba iqhinga elizithuthukisa umnotho umnotho wesizinda Ugu District municipality

Umcwaningi : SF Nyandeni

Umsizi womcwaningi : Dr IS Nojiyeza

Isikhungo semfundo : University of Zululand

Okumele kuqhashelwe ozophendula imibuzo:

- Konke ozokusho la kuzogcinwa njengemfihlo futhi ngeke kuvezwe ukuthi kuvela kubani.

Uphendula kanjani kuloluhla lwemibuzo?

- Sicela uphendule imibuzo ngokuthembeka.
- Uma ungazizwa kahle ngokuphendula umbuzo, uyakuveza ukuthi ngeke ukwazi ukuwuphendula.
- Kuleyo mbuzo ozoyiphendula, izimpendulo zakho zizogcinwa njengemfihlo.

Okumele Uqinisekise ngokukugcwalisa

Mina (Amagama agcwele obuzwayo) ngiphumela obala ukuthi ngiyakuqonda konke okukuleli dokodo kanye nokungusiko lwalolucwaningo, futhi ngokwemvume yami ngiyazibophezela kulolucwaningo olwenziwayo. Kusobala kimi ukuthi nginelungelo lokubuya nganeno kulolucwaningo noma kusiphi isigaba uma ngizwa kunjalo.

.....

...../...../2020.....

Faka isishicilelo

usuku

Uhla lwemibuzo

ISIQHEPHU A: Imininingwane yakho ngokugcwele

- 1) Igama lefamu _____
- 2) Igama lesigungu ovotela kuso/ ohlala kuso _____
- 3) Sekuyisikhathi esingakanani ungumlimi/ ukwezolimo? _____

4. Ungathi mingaki Iminyaka yokuzalwa? _____

5. Yisho Uhlanga lwalho: _____

6. Maqondana nobuwena/Ubudlelwane? _____

7. Kukhona ukukhubazeka onakho? _____

ISIQEPHU B: Imibuzo emayelana nocwaningo

1. Njengomlimi osemthethweni futhi owaziwayo, ikuphi okuqonda kabanzi ngesomiso kanye nomthelela waso ezitshalweni ezilinywayo?

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2. Kuze kube manje eqhazeni osubenalo kwezolimo, zingaki izikhathi lapho uke waba kwisomiso futhi waphila kanjani kuleso simo sesomiso?

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3. Ikuphi okucabangayo makukhulunywa ngendlela yokuphila Ngaphansi kwesomiso? Okukanye kusho ukuthini kuwena njengomlimi owaziwayo uma kukhulunywa ngendlela yokuphila ngaphansi kwesimo sesomiso?

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4. Ungaluchaza ngakusiphi isigaba isomiso esike salimaza izitshalo zakho noma uhlobo olunjani lwesomiso?

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5. Ubunalo yini ulwazi ngaphambilini ukuthi sikhona izitshalo ezihambiselana nesomiso noma ezingalimizwa isomiso? Uma uthi yebo, veza lolohlobo olwaziyo.

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6. Ngabe iziphi izihibe ocabanga ukuthi zivamise ukuba khona uma ukhiqhiza izitshalo esingahambelana nesomiso?

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7. Ngabe kukhona yini imizamo noma usizo uluke lwanikezelwa ngu Hulumeni kunina njengabalimi abaziwayo ekulwisaneni nezihibe ezinivimbela ekutheni nilwisane nomthelela wesomiso kwenikulimayo?

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8. ngokucabanga kwakho kungani ukulwisana nemithelela yesomiso kwezolimo ezisegabeni esiphezulu kubalulekile ikhakhulukazi kubalimi abasesigabeni esiphakeme uma kubandakanyeka umnotho wesigaba sesifundazwe?

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10. Iziphi izindlela zokuphila Ngaphansi kwesimo sesomiso njengomlimi ocabanga ukuthi abalimi abasesigabeni esiphezulu bangazisebenzisa ekulwisaneni nomthelela wesomiso kwezolimo ziphinde futhi zithuthukise nomnotho wasizinda Ugu district municipality?

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Siyabonga ngokuzinikezela ukuba yingxenye yalolucwaningo

APPENDIX F: LETTER REQUESTING PERMISSION FOR DATA COLLECTION



University of Zululand

PO Box X1001

KwaDlangezwa

3886

14 October 2020

Dear Ms/Mr

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

I am a registered as a master's student in the Department of Anthropology and Development Studies at the University of Zululand. My supervisor is Dr Nojiyeza

The proposed topic for my research is: Commercial Farming Adaptation to Drought as a Strategy for Stable Local Economic Growth in Ugu District Municipality.

Aim of the study:

The primary aim of this study is to explain how commercial farming adaptation to droughts maybe be used as a strategy for stable Local Economic Growth (LEG) amongst commercial farms in Ugu District Municipality.

The objectives of the study are:

- 1. To investigate the nature of droughts affecting crop farmers in Ugu District municipality*
- 2. To examine barriers linked to production of drought resistant crops in Ugu District Municipality.*
- 3. To recommend drought adaptation strategies that may be used by crop famers to improve economic growth in Ugu municipality.*

Should you require any further information, please do not hesitate to contact me or my supervisor. Our contact details are as follows:

Supervisor's email address: Nojiyezal@unizulu.ac.za Cell: 035 902 6272

My email address: sfsithole2015@gmail.com Cell: 079 942 1933

Upon my completion of the study, I undertake to provide you with a bound copy of the dissertation.

Your permission to conduct this study will be greatly appreciated.

Yours Sincerely,

Simiso Fisokuhle Nyandeni

Student No: 201501297

APPENDIX G: EDITORS LETTER

Writing Splendour Services & Consultancy

(A Subsidiary of Oaks- Executive Consult)

L13b, Off Boardwalk Inkwazi Shopping Centre, Richards Bay, South Africa.

Tel: +27604037323 Email: myfreelancewritingbiz@gmail.com

writingsplendour247@gmail.com

Website: www.writingsplendour.simplesite.com

Income Tax Number: 1064112236



April 19, 2021

To Whom It May Concern

EDITING AND PROOFREADING OF A DISSERTATION

This is to certify that I, (Olumuyiwa A. Kehinde) edited and proofread Mr Simiso Fisokuhle Nyandeni's dissertation titled: **Commercial Farming Adaptation to Drought as a Strategy for Stable Local Economic Growth in Ugu District Municipality.**

Specifically, I commented on the grammatical anomalies in MS Word Track Changes and review mode by the insertion of comment balloons prior to returning the document to him. Corrections were made in respect of grammar, punctuation, spelling, syntax, tense and language usage, sense and flow, syntactic and semantic cohesion, clarity of expressions, appropriate use of reference style, typing format and layout.

Currently, I am keen on a PhD programme. I have a Master's degree in English, Bachelor of Arts in English Studies, Diploma in Communication Science, and Teachers' Grade II Certificate. I have been teaching Advanced English Courses for the past 8 years. I also teach English for IELTS and TOEFL examinations. Furthermore, I have been regularly editing and proofreading academic, research dissertations, theses, articles, and other documents for the past 6 years in different disciplines for publishing /editing firms, schools, and individuals.

I trust that the document will prove acceptable in terms of editing, formatting and proofreading criteria.

Thank you.

Yours sincerely,

Mr O.A. Kehinde

Writing Splendour Services & Consultancy

Strictly The Best For Business & Academic Writing, & Editing Services