MIDLANDS STATE UNIVERSITY

FACULTY OF ARTS

DEPARTMENT OF DEVELOPMENT STUDIES

RESEARCH TOPIC

AN ASSESSMENT OF CLIMATE CHANGE INDUCED IMPROVISATION STRATEGIES ADOPTED BY SMALL SCALE FARMERS IN ZHOMBE COMMUNAL AREA.

BY

MABUTO ADELINE

R145853M (PDP)

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE BACHELOR OF ARTS HONOURS DEGREE IN DEVELOPMENT STUDIES.

Table of Contents

MIDLANDS STATE UNIVERSITY

REALEASE FORM

Name of the student:	Adeline Mabuto
Registration Number:	R145853M
Degree Title:	Development Studies
Year:	2018

Dissertation Title

An Assessment of Climate Change Induced Improvisation Strategies Adopted by Small Scale Farmers in Zhombe Communal Area.

Signed……..

Date……..

APPROVAL FORM

The undersigned certify that they have read and recommended to Midlands State University for the acceptance a dissertation entitled: **An assessment of climate change induced improvisation strategies on Agriculture adopted by the small scale farmers in Zhombe Communal Area,** in partial fulfilment of the requirements of Bachelor of Arts Honours Degree in Development Studies.

Supervisor…… Date……..……

Chairperson…….. Date……..

DECLARATION

I Adeline Mabuto R145853M do hereby declare that the work that is contained in this dissertation is entirely the products of my original works and the information contained in this dissertation is properly acknowledged. I furthermore declare that this work has never been previously submitted and is being submitted in partial fulfilment of Bachelor of Arts Honours Degree in Development Studies.

DEDICATION

I dedicate this work to my family for their love and support that enabled me to sail through to where I am today. I also dedicate this work to the almighty God for his mercies and greatness experienced during this research.

ACKNOLEDGEMENT

I would like to thank God for strengthening me throughout my college life up until where I am today. My college life is truly a testimony of his mercies and faithfulness as I was confident that he who started a good thing in me will lead unto its completion.

Secondly, I would like to express my gratitude of my father and family members who supported me in pursuing my education career. Special gratitude goes to my brother C Mabuto and my sister Anna Mabuto as it could not be easy for completing my studies without their hands on. Thank you for your encouragement and financial support you have been giving me. I also take this opportunity to thank my friends Patience, Melissa and Nyasha who helped me and supported me throughout my study.

My last and deepest gratitude goes to my academic supervisor MrMakaye for his unwavering support during my research. Thank you for the companionship, supervision and your time that you invested in me in completion of my research and also the vision that you implanted in me in executing my work is incomparable.

ABSTRACT

Climate change has negative implications on small scale farmers in Zhombe Communal area as evidenced by the failure of agricultural production and poor rural living standards. The farmers within the area have adopted different improvisation strategies as a way of adapting to the climatic changes. The strategies include plant staggering, stream bank cultivation, irrigation farming, organic farming, conservation farming, harnessing IKS, and growing of small grain drought resistant crops and short season varieties. However, even if such methods have been adopted, the community still suffers the negative implications by climate change. Therefore the main objective of the study focuses on assessing the effectiveness of these improvisation strategies by small scale farmers evaluating their ability in coping up with the climatic situations at hand. In accessing the needed information, the research employed qualitative approach where the community gave vivid description on the severity of climate change, the adaptation strategies and the effectiveness of these strategies. The researcher used purposive sampling on interviews and questionnaire as well as the specific study area she wanted to focus on. Improvisation strategies by farmers were successful in coping with climatic changes though they are some few which are not effectively dealing with its impacts as being as being analyzed by the research. The research recommends for various actors to be employed for effective adaptation programming to take place within the community.

Key Words: Climate Change, Improvisation strategies, Small Scale Farmers

ACRONYMS

AGRITEX	Agricultural Technical Extension Support
EMA	Environmental Management Agency
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Products
IKS	Indigenous Knowledge Systems
IPCC	Intergovernmental Panel on Climate Change
SADC	Southern Africa Development Countries
UNCCC	United Nation Convention of Climate Change

LIST OF FIGURES

LIST OF TABLES

1 CHAPTER ONE: INTRODUCTION

1.1 Introduction

Climate change has become a serious problem affecting agro-based economies the world over down to the small global villages that depend on agriculture for survival. The impacts of climate change on agriculture are increasingly high in Zimbabwe especially on the small scale farmers who depend on rain fed agriculture due to lack of technology and resources to cope up(Bird and Busse, 2005**)**. This view has been supported by Lefton(2013) who stated that small holder farmers are mostly affected by drought and constitute large number of poverty due to lack of resources to cope up. The scholarly view also states that the increase on the susceptibility in Zimbabwe is aggravated by the shifting of seasons, high temperatures, low rainfall as well as high amount of rainfall being experienced**.**

Farmers have improvised strategies as a way of dealing with the effects of climate change. Thus, this research seeks to assess the effectiveness of the improvisation strategies on agricultureby small scale farmers as a way of adapting to climate change in Zhombe communal area. Focusing on how these strategies are contributing towards food security in the face of climate change. The chapter consist of the background to the study, problem statement, research objectives and questions as a guideline to the study, significance of the study, limitations and the lastly the ethical consideration.

1.2 Background to the Study

Climate change is a major challenge to sustainable development, considering its negative implications on the environment, health, economic activities and food security. Africa is affected the most since it has limited adaptive capacity.Research has shown that there are

prolonged and intensified droughts in Eastern Africa; unpredicted floods in Western Africa; depletion rain forest in Equatorial Africa and an increase in ocean acidity around Africa Southern coast(Centre for International Governance Innovation, 2009). This proves beyond doubt that climate change truly exist in Africa.

The impacts of climate change in Africa are already felt in Zimbabwe as the country is more vulnerable to its effects, taking for instance the presents of drought, floods, and shift of the rain seasons which are being experienced. This has been supported by Brazier (2015) who stated that rainfall variability being experienced in Zimbabwe is lowering agricultural production as most of its farming depend on rainy fed. Zimbabwe Handbook on Climate Change (2007) states that, the climate change phenomenon in Zimbabwe is further accelerated by its reliance on major climate sensitive sectors like agriculture. The impacts of climate change are drastically affecting the economic development of the country owing to the fact that it is an agro based economy. Zimbabwe has witnessed the evidence of climate change as it had experienced global warming towards the end of the 20th century with the increasing mean temperatures of 0, 4°C(The National Climate Change Strategy, 2015).

Agriculture forms the back bone of the livelihoods in Zhombe communal area with little or no other economic activity thus, the area largely depend on farming in order to sustain their livelihoods. The area is facing food insecurity due to climate change and as a result farmers are struggling to develop climate change adaptation mechanisms so as to lessen the problematic situation. Zhombe communal is experiencing droughts and water shortages and it seems there have been shifts in the farming season/rainfall patterns making farming difficult. Climate change induced droughts has resulted in the people within the area to largely rely on food aid due to hunger within the vicinity. Women, the old aged and children mostly bear the

brunt of climate change effects as they are the most vulnerable groups in the society. This is due to rural-urban migration in search of employment as farming is no longer viable by young able bodied people especially men. The active population had migrated in nearby towns looking for jobs and most of them are employed in the mining sector in Kwekwe urban as well as Silobela.

Farmers within the district have improvised and developed many adaptation strategies and practices in a bid to cope with the effects of climate change as a community. Therefore, this research seeks to assess the effectiveness of improvised agricultural practices that are being done by small scale farmers in Zhombe communal area.

1.3 Statement of Problem

Climate change has exerted massive pressure on agriculture and rural livelihood especially on smallholder farming which is the back bone of rural livelihood. Yet, FAO (2006)notes that,75% of rural population in Sub-Saharan Africa rely on smallholder farming to sustain livelihoods. This is so noting its vast effects in Zhombe Ward 9 which include food insecurities due to decline in the production of the staple maize crop. There is a noticeable decrease in the amount of rainfall received annually, changes or shifting of the farming seasons, and increased outbreak of pests and pathogens for example the recent outbreak of army worm. Small scale farmers in Zhombe are also facing the death of livestock and drying up of perennial sources of water, this has increased the burden on women and children as they will have to travel long distances fetching water for gardening and household use. The occurrence of climate change has brought various perceptions on small scale farmers regarding its nature and effects.

Climate change in Zhombe communal area has forced the small scale farmers to improvise several climate adaptation strategies in a bid to lessen its impacts on rural livelihoods. However, no research has been done to assess the effectiveness of the agricultural improvised strategiesin the face of climate change as most of the studies are only focusing on the ways of adaptation only. Most of the previous researches were focusing on commercial farmers at the expense of small scale farmers and also literature proves that there is no research done yet concerning climate change in Zhombe communal area.

Therefore it is imperative for the current research to evaluate the effectiveness of the adaptation strategies/practices by small scale farmers in Zhombe communal area. This research takes a paradigm shift by focusing on small scale farming in rural community of Zimbabwe. The main venture of this research is to cover up this knowledge gap through exploring the efficacy of the agricultural improvisation strategies on small scale farming adopted in response to climate change in the community.

1.4 Conceptual Framework

Below the researcher is going to define and specify on certain terms that may need clarification on their use in the writing. This section contains the explosion of major terms within the research topic. In this case the major variables are climate change, agricultural improvising strategies and also small scale farmers. The researcher is aiming to provide their conceptual meaning as well as their operational meaning in the study.

1.4.1 Climate Change

Climate change can be referred to as the changes on the weather patterns induced by natural and human activities such as industrialisation and the emission of greenhouse gases and

aerosols resulting in weather changes. One can note that climate change has no singe definition as Grains Research and Development Cooperation (2008-2013) defined it as long term trend in climate averages such as global warming that have been observed over the past century and long term changes in variability. Climate changes involve changes on the weather thus, temperature, wind and rainfall and the changes took place on a gradual manner it could be years, decades or centuries. This shows that the changes cannot be experienced overnight but rather it takes time to be noticed. Climate change has negative implications on agricultural production particularly on small scale farmers due to minimum coping capabilities. The evidence of climate change within Zhombe Communal area can be noted on the:

- Onset of rainy season which is no longer predictable.
- The changes in the distribution patterns.
- Changes on the amount of rainfall now being received.
- The mid- season droughts
- Prolonged dry spells
- Extreme temperatures.
- Hail storms and violent winds.

Climate change has resulted in water stress, environmental degradation and has threatened agricultural production thereby resulting in food insecurity to a greater magnitude. Its effects are mostly felt in Africa due to lack of technology and its dependence on rain fed agriculture as the back bone of its economies.

1.4.2 Improvisation Strategies

Improvisation strategies are ways in which communities increase their ability to cope with the uncertainties or any emerging problem. In this case, this means taking appropriate action

and making adjustments and changes in ways farming used to be done to reduce the negative impacts of climate change. World Bank (2008) defines it as adaptation ways which involves more resilience infrastructure, broader disaster relief and preparedness measures and new agricultural technologies to counter the increased climatic risky.

The improvisation practices on crop farming are mostly centred on crop timing, production locations and on input usage. Small scale farmers used to adopt only traditional coping methods but climate change is eroding those methods by extreme climate intensity and frequency never experienced before. This has resulted in farmers adopting or improvising new or additional strategies in trying to challenge the extreme climate change being experienced. Thus, the newly improvisation strategies are not the usual methods the community used to implement. The strategies include plant staggering, growing of short season varieties, drought tolerant crops, stream bank cultivation, zero tillage (timbaudge) to mention just a few. They have improvised such strategies due to the severe impacts of climate change being experience in the country. Most of the farmers nowadays are busy with these strategies as climate change is dragging farming back thus; improvising strategies is the only way out.

1.4.3 Small Scale Farmers

Mutekwa (2019) defined small scale farmers as those marginal and sub marginal households that own or cultivate less than 2.0 ha of land and constitute 78% of the country's farmers. The term small scale refers to their limited resources endowments and technology as compared to other farmers in the sector. Small scale farmers usually rely on rain fed agriculture due to their lack of resources and technological backward. Small scale farmers are rural producers predominantly in developing countries who rely on family labour and the produces used for

family consumption as well as the source of income. Cultivation or ploughing is usually done using cattle or even hoes and most of the households own an average of 8 cattle. Usually they possess land which is infertilewhich call for more farming improvising practices to meet their targets.

1.5 Research Objectives

- To outline the indicators/ evidence of climate change in Zhombe Communal area.
- To determine the severity of the impacts of climate change on small scale farmers in ward 9, Zhombe communal area.
- To identify the improvising strategies being implemented by the small scale farmers in ward 9, Zhombe communal area.
- To assess the effectiveness of climate change improvising strategies being implemented by small scale farmers in ward 9,Zhombe communal area.

1.6 Research Questions

- What are the indicators of climate change in Zhombe communal area?
- What are the major impacts of climate change on small scale farmer in ward 9, Zhombe communal area?
- Which improvising strategies are being implemented by the small scale farmers in ward 9, Zhombe communal area?
- How effective are the agricultural improvising strategies being implemented by small scale farmers in addressing climate change impacts in ward 9, Zhombe communal area?

1.7 Significance of Study

The main objective of this research is to assess the relevance or effectiveness of the improvising strategies by the small scale farmers in Zhombe communal area. The research is proposed to mainstream climate change effectson agricultural production in ward 9, Zhombe communal area. Thus, the research will help policy makers in spelling out sustainable livelihood strategies through improvised practices in Zhombe ward 9 to suit the climate change being experienced. Findings from this research are going to assist development officers on accelerating future economic development through farming. The findings of this research study may also provide opportunities for further studies within climate change discourse which will enable sustainable livelihoods on agriculture in Zimbabwe. Limited research has been done to explore adaptation strategies to climate change impacts especially on small scale farmers in Zhombe communal area. Thus, this research will expose research gaps for future researches to be conducted.The research will also benefit the local community, small scale farmers in particular, in enhancing food security through the use of improved climate change adaptation strategies.

1.8 Limitations to the Study

These are challenges and setbacks that the researcher is likely to encounter during the course of the study. Those constraints are likely to impact on the objectivity and dependability of the results as follows:

- This kind of research requires more time interacting with small scale farmers in the field yet; the time frame for research is very limited. This might compromise research findings.In this case the researcher is also going to utilise the vacation and do some of the field work.

- Some of the respondents might fail to understand and complete the questionnaire due to illiteracy and this may cause low response rate. In this regard the researcher will make use of research assistance to interpret the questionnaire for the respondents.
- The research might also face a challenge of lack of return of questionnaires and this might compromise research findings. The researcher is going to do follow ups to minimise such instances.
- Some of the participants may refuse to divulge their personal information due to confidentiality. The researcher has to respect such decisions
- The sample size chosen might be too small and not representative. The researcher might be forced to increase the sample size but might also be constrained financially.

1.9 Ethical Considerations

When doing a research, it implies ethical considerations. Below are some ethics the researcher is intended to consider during the course of the research.

No Harm to the Participant

The researcher considered using a decent way of asking questions to the participants as some issued seems to be much more sensitive. This could avoid respondents feeling provoked and left in pain. The respondents has to be assured that the information they provide will be only be used for research purposes and it is not going to be revealed for other purposes. This in turn enables the respondents to give information needed without any form of fear or shyness and enables the achievement of research goals and objectives effectively.

Voluntary Participation

The participants have to be informed that their participation is free and voluntary. They have the right to withdraw if not feeling comfortable and can participate as there are not being charged for that. The participants also has be to assured that there is no risk or cost involved and also told the research objectives and be rest assured of absents of any form of harm.

Privacy and Confidentiality

The researcher is going to ensure participants' confidentiality and the anonymity during the study. Some participants do not want to be exposed and would want their identity to be anonymous therefore the researcher intends to protect the privacy of participants who agree to provide you with data for your research. This can be achieved by avoiding the use of names on questionnaires. The privacy of respondents can also be achieved by the researcher through upholding their autonomy.

Permission Seeking

Every society is governed by its own rules and principles directs their behaviour and that are to be adhered to by anyone be it a stranger or who is already a member of the society. The researcher is going to seek permission to carry out the research from the local councillor, chief and the village heads from the chief before meeting members of the community.

Consent

There is need for the participants to know that the researcher is carrying out a research on them, the challenge comes in conceptualising the purpose of gathering them, they should first understand the purpose of your research, and therefore it is always important that there is an agreement between the researcher and the respondent before the beginning interviews.

1.10 Chapter Breakdown

Chapter 1

The first chapter consist of the introduction of the study, background of the study and the conceptual framework. It also contains the statement of problem, objectives and questions of the research, limitations and delimitations to the study and significance of the study.

Chapter 2

This chapter has literature review and theoretical framework. The researcher is going to give relevant literature concerning climate change and the improvising strategies. Theoretical framework is going to be discussed so as to guide the study.

Chapter 3

Chapter 3 consist of research methodology. The researcher in this case employs many methods in carrying out the study and different data collection techniques and instruments will be implemented and presented.

Chapter 4

The chapter focuses on data analysis, presentation and the research findings. Information gathered from the field study will be analysed in this chapter in a bid to meet the research objectives and questions.

Chapter 5

Chapter 5 focuses on the conclusion to the study as well as the suggested recommendations. The recommendations are to be directed to the stakeholders being affected by climate change in the agricultural sector.

1.11 Chapter Summary

In conclusion one can note that, this was an introductory chapter as it introduced the background, significance of the study, problem statement, research objectives and questions. The key terms were also conceptualised as well as mentioning the limitations and delimitations to the study. Thus, an important chapter as it manage to show the significance parts of the study.

2 CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

On this section, the researcher gives a review of literature surrounding the concept of climate change and the improvising strategies mainly focusing on revealing the left gaps that justifies the research. Thus, the researcher acquaints herself with what the scholars have been saying concerning climate change and improvising strategies guided by the key objectives of this research with the main objective of assessing the effectiveness of the agricultural improvisation strategies. It reviews literature on the view of other scholars concerning the effectiveness of the improvisation practices. The literature will be focusing on the impacts of climate change in Zimbabwe, climate change and improvising strategies, small scale farmers and climate change improvising strategies in Zimbabwe as well as identifying gaps left by other scholars,. This chapter ends by the theoretical framework guiding this study. Thus this chapter will help to identify gaps which the previous scholars leftand shows how the research is intending to address such gaps thus, justifying the research. It also helps to assess the effectiveness of the climate change improvising strategies in Zhombe, ward 9

2.2 Impacts of climate change in Zimbabwe

It has been noted that Africa will be hit the hardest by climate change because of limited adaptive capabilitiesZimbabwe with no exception. This is so noting its wide range of impacts that are already felt in the country. Its impacts include changes in rainfall patterns, droughts, floods, decline in water shortages, reduction in agricultural productivity, increase in heat waves and climatic disasters, all these intensifies climate change in Zimbabwe as it is an agro-based economy with 70% of its population residing in rural areas depending on rainy fed agriculture(Machingauta 2013). Chagutah (2012) noted that Zimbabwe is now experiencing about three droughts every ten years mainly due to the changes in the sea level

and EL-Nino. The impacts of climate change have posed negative effects to the development of the country as most of its development is from agriculture.

Quinch (1999) noted that, Zimbabwe temperatures have increased as evidenced by the reduction in the number of days with minimum temperature of 12℃ and a maximum temperature of 32℃. This is affecting agriculture negatively as the country is experiencing water shortages for both crop farming and livestock production. This view has been supported by the IPCC Synthesis Report (2007) which stated that, the rise of temperature will increase transpiration and evaporation of water from beneath the ground by 4-20% across the SADC region which also includes Zimbabwe. Brazier (2015) noted that Zimbabwe has been subject to excruciation extreme temperatures ranging from 35℃. She also goes on to say that the country has experienced a number of heat waves a number of years and the surface temperature has increased by 0.4℃ in the country. In addition to the impacts of climate change in Zimbabwe is the decrease of the annual rainfall (Moyo 2012). He also noted the changes within the rainfall patterns which are ever changing with the average rains occurring at the beginning of the seasons that is in October and less rainfall in January to March. There will be a 38% decline in the national per capita water availability by 2050 (Braizer (2015; 34).

The literature shows the presents or evidence of climate change in Zimbabwe as well as its vast impacts on agriculture largely as the country as an agro based economy which depends on rainy-fed agriculture. Masiiwa et al (2012) noted that, in the south western parts of the country, sorghum and maize will become increasingly vulnerable to the effects of climate change and cotton less vulnerable. This is so noting the shift of natural regions boundaries in the country. According to Moyo (2012) region 2 has shrunk by 49% andregion 3 shrunk

by14% and this has resulted in region 4 expanding by 5.6% and region 5 by 22.6%. This shows how climate change is impacting Zimbabwe as the country is now experiencing a reduction in food production thus food insecurity (Mugandani et al, 2012). This shows that the major shifts happened in regions 4 and 5 which have become drier than what was being experienced years back. According to this one can note that climate change is impacting agriculture negatively in Zimbabwe to a greater extent. Masiiwa et al (2012) noted that, rainfall patterns and crop production progressively deteriorate from region 1 to 5. He gave a good example of Chinhoyi and Chibero which had shifted from natural region II to region III and Kwekwe from region III to region IV.

2.3 Climate Change Induced Improvisation Strategies

Farmers have responded to the effects of climate change by improvising their farming methods and technics. This is so noting the improvising strategies such as conservative farming, drought resistant crops, inter cropping, plant staggering, irrigation, mixed cropping, organic farming to mention just a few.This view has been supported by Muzari et al (2014) who noted that technologies adopted by small holder farmers such as maintenance of local genetic diversity, soil organic matter enhancement strategies like crop rotation, composting, green manure, cover crops and conservation farming are ways of adapting to climate change effects by farmers. Farmers have switched to drought resistant crops such sorghum and finger millet in a bid to meet the current climate change that is being experienced. Chazovachi (2012) argued that such crops are not only drought resistant, but they are also resistant to pest and diseases that may threaten them. One can also note that these small grain drought resistant crops can endure long periods without rainfall and can also grow on poor soils with les fertility. Moyo (2012) noted that despite dwindling rainfall patterns of less than 250mm experienced in most parts of the country, communities have managed to maintain bumper

harvest of about 1000- 1200 kg per ha of cow peas and sesame. This has resulted in food security as research carried out by health expects has found out that drought tolerant crops have high nutritional value. This is valid largely as IntendedNationally Determined (INDC) (2016), states that the long term adaptation strategies for Zimbabwe's most vulnerable districts include introducing drought resistant crops.

One can also note that climate change has resulted in the introduction of conservation farming. Erenstein (2003) refers conservation farming as the type of farming that seeks to achieve maximum yields, taking advantage of the resources but while protecting the environment. This method seems to be effective as Nzabi (2002) noted that, in Kenya, it produces higher yields of 2.6t/ha as compared to 1.8t/ha produced with conventional farming. According to Govet et al (2013), conservation farming is much concerned with the construction of ditches, pits and furrows to capture and store rain water. In most parts of Zimbabwe this method is known as 'Dhiga Udye or Timba Udye'. Irrigation is another improvised method being implemented by farmers. World Bank quoted in Brazier (2015) states that irrigation system will help in dealing with the water scarcity in the country. This is so noting the expected decline in rainfall by 12% and 16% by 2050.Mixed farming is also another improvised method by farmers to deal with the impacts of climate change as itwill reduce the problem of food insecurity caused by reduced, sporadic rainfall of less than 250mm as argued by Moyo (2012).

The use of Indigenous Knowledge Systems (IKSs) is another way farmers are improvising their agriculture in a bid to meet the climatic changes being experienced. Mugabe et al (2010) defines IKS as the traditional methods that have been developed by communities over years in dealing with the natural environment. This is helpful as the weather patterns are no longer

predictable due to climate change hence IKS will help farmers predict weather they will be a lot of rainfall or not and decide which type of crop varieties to grow.Thus, the literature shows the improvising strategies that are being implemented in the country in dealing with climate change. Mutekwa (2009) noted that most of small scale farmers depend on the traditional coping methods which are based on the experience accumulate over the years and transmitted from generation to generation,

2.4 Small Scale Farmers and Climate Change

Small scale farmers seem to be affected more by the effects of climate change as compared to commercial farmers. Small holder farmers constitute 70% of the entire population as according to FAO (1998) and this shows that they are the majority in the agricultural sector. FAO (1999) noted that in most African countries including Zimbabwe, it is the rural communities that tend to suffer from the effects of climate change most of whom are rural small holder farmers who re dependent on agriculture for survival. The small scale farmers tend to be more affected due to their dependency on rain fed agriculture (Muzari et al, 2014).Mugandani et al (2012) also noted that small scale farmers tend to be affected more due to lack of technology to do away with the effects of climate change. Taking for instance, lack of the equipment for irrigation which enabled drip irrigation suitable for managing little rainfall received. This view has been supported by Mutekwa (2009) who noted that small holder farmer's tent to be affected more due to their marginal location, low levels of technology and lack of essential farming resources.

Literature also shows that small scale farmers in Zimbabwe are affected by climate change in a big way. Chazovachi (2012) noted that poor access to technologies, infrastructure and institutions that deals with climate change has resulted in the reduction of crop production by

small scale farmers. This is so noting the factor that due to their location small scale farmers tend not to have access to information on climate change as a result they will not be aware and cannot plan in advance. Hence they are affected largely by the effects of climate change due to their ignorance (Mutekwa 2009). The study went on in identifying that 53% of smallholder farmers in Murowa Ward seem to be ignorant about climate change while 47% seem to be noticing the change taking place. Mugiya and Hofisi (2017) noted that small scale farmers are struggling to cope with climate change due to resource constraints lack of access to credit and inputs. Musiyiwa (2014) also noted that reliance mostly on erratic and low rainfall and a low resource base makes the smallholder sector vulnerable to climate risks.

However, literature also shows that small scale farmers contribute a lot to food security in the country. This is so noting Musiyiwa (2014) who noted that small holder farmers contribute significantly to the economy of Zimbabwe as evidenced by their contribution to the country's GDP. Besides being more vulnerable to the effects of climate change, small scale farmers are improvising their farming methods to deal with the climate change. This is so noting the study carried by Mutekwa (2009) in Zvishavane, Murowa ward proves that such farmers are adapting through strengthening and improving indigenous land and water management practices growing drought resistant crops and improving indigenous animal breeds.

2.5 Justification to the study

There are a plenty of literature that have been documented on climate change and improvised strategies but, it is paradoxical that while there is voluminous literature, the available does not pin point on the effectiveness of climate change and agricultural improvised strategies in Zhombe but rather on other communities like Chivi, Zvishavane and Muzarabani. Most of studies have shown that, the researches on climate change and agricultural improvising

strategies mainly focus on commercial faming leaving out small scale farming of which they constitute a larger percentage of farmers. WIEGO (2013) had noted that they constitute 78% as noted earlier. This research however takes a paradigm shift by focusing on small scale farming in rural community of Zimbabwe. The main venture of this research is to cover up this knowledge gap through exploring the efficacy of the agricultural improvised strategies on small scale farming adopted in response to climate change in the community.

Mudzonga (2010) focused her study on farmer's adaptation to climate change in Chivi district and the factors that influence their decision to do so. The study tested the hypothesis that factors such as the education of a household head, farm household size, exposure to climate change information and access to credit influence the decision by farmers to adapt to climate change. The research has some loop holes as it was only focused on the adaptation and the reasons behind adaptation and does not take note on the effectiveness of those implemented adaptation practises. This research therefore seeks to interrogate on this loop hole and go further on assessing the effectiveness of those strategies and practises implemented by farmers to reduce the impacts of climate change in Zhombe. Thus, the research is intended to fill up the gap left by the previous researchers with the need of reducing the impacts of climate change in Zimbabwe.

Research has shown a number of previous literatures on climate change. Taking for instance, a study by Mutekwa (2009) on climate change impacts and adaptation strategies carried out in Murowa ward in Zvishavane on small holder farmers. On the study, the researcher's aim was to identify the evidence of climate change in the area as well as the adaptation by the community. He noted that, small scale farmers are vulnerable to the effects of climate change due to low levels of technology, their marginal location as well as lack of resources. Farmers

in Murowa indicated that, they were affected by prolonged wet, hot and dry weather conditions within their area. Adaptation strategies within the area include improving indigenous animal breeds, water management practises and growing drought resistant crops. This has drawn the researcher's attention and need to research more on the severity of climate change to the small scale farmers as one of the objective of this study. This is so because the literature failed to determine the severity of climate change effects on such a group of farmers. The research is also intended to measure the severity of the impacts of climate change to small scale farmers in Zhombe communal area.

Nelson et al (2007), Smit et al (2001) and Brooks (2003) brought an interesting view on climate change adaptation. This is so noting the view of distinguishing actual adaptation and adaptation capacity. This means that many farmers have the potential to adapt but that does not necessarily mean they can improvise their farming practises. This is an important point as the researcher will be assessing the improvised strategies being implemented in Zhombe. The literature shows that actual adaptation is based on the technological advancement, availability of finances, institutional arrangements and information exchange. This is much significant to this study as most of small scale farmers lack technological advancement as well as finances to purchase needed resources for them to improvise their farming methods and practices.

According to De Jonge (2010) adaptation or mitigation is effective in reducing the human and natural environmental system risk to climate change. Avoiding greenhouse gas emissions will not result in direct stabilization rather than adaptation which are the best response to climate change as according to Chagutah (2010). Thus without agricultural improvising strategies, climate change will be detrimental to agricultural sector. This makes the jest of this study in

assessing the effectiveness of the improvised strategies as several literatures are indicating the effectiveness of the improvised strategies as a way of reducing climate change on small scale farmers.

The Zimbabwe National Climate change Response Strategy talks of sustainable intensification and commercialising agricultural sector and also strengthening the early warning systems. It also talks of mechanising agriculture and encouraging adoption of indigenous and improved livestock breeds that are tolerant to climate change. When talking about commercialising the agricultural sector, the literatures seem to be ignoring the small scale farmers who are practising their agriculture in their small communal areas. Thus, the study has left out small scale farmers hence the need to involve the in this study as they are the most vulnerable group when it comes to climate change due to low level of development.

2.6 Theoretical framework

This research is based on the Crisis Decision Theory by Sweeny (2008). The theory tries to explain how people respond in case of negative events with regards on what decision processes occur when people respond to negative events and the factors that predict response choices. In the case of Zhombe communal area, Crisis Decision Theory gives an essential basis on the effects of climate change and a framework of assessing the effectiveness of the implemented agricultural improvising strategies. Thus, the theory is relevant in evaluating the effectiveness of the improvising strategies.

In its explanation, the Crisis Decision Theory points out three stages which people or communities undergo in case of negative life events. The stages include: assessing the severity of negative response, determining response options and evaluating response options.

The researcher sought to undertake an assessment of the agricultural improvising strategies being implemented in Zhombe Basing on the assumption of this theory.

On its first stage, the Crisis Decision Theory talks of assessing the severity of negative response. At this stage communities will be using many different types of information that is, information about causes, comparative and consequences. At this point the research will be basing on the causes of climate change and comparing how other communities who were in such similar situation responded to it and the information is taken into cognisance in relating to their crisis. The information on how other communities who were in such similar situations is important as it provides the background information of the study.

The second stage of the Crisis Decision Theory is on the determination of the response option. Communities will be trying to come up with the response mechanisms to the identified problem. It is important as people will start to come up with improvisation strategies to deal with the effects of climate change in Zhombe. According to Sweeny (2008) at this stage people will be deciding on what to do with the identified problem. Communities will be evaluating their resources to determine their coping strategies to the problem of climate change they are facing thus, coming up with the improvised strategies.

The last third stage of Crisis Decision Theory is the evaluation of the response option. At this stage people or communities will be assessing the effectiveness of the response mechanism implemented on its ability to reduce the problem being faced. Thus, an important guide to the assessment of climate change improvised strategies by small scale farmers in Zhombe. As according to this theory, the researcher is able to evaluate the improvised strategies being implemented in Zhombe basing mainly on the information provided on the last third stage.

The last stage provided the heart of the research as the researcher's main objective is to ted to find out whether the improvised practices are effective or not. This proves beyond doubt that the Crisis Decision Theory provides a firm foundation on the assessment on the agricultural improvised strategies being implemented in Zhombe by small scale farmers.

2.7 Chapter Summary

This chapter discussed literature on issues to do with climate change in Zimbabwe showing its vast impacts in the country, climate change and the improvising strategies and also literature on how climate change is impacting small scale farmers. The chapter went on identifying the gaps left by other scholars which therefore justify this study. Theoretical views as a guideline to the study was also done on this chapter.

3 CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter will be focusing on how the research was conducted and the approaches the researcher employed in doing the research. It consists of methods and technics used in the study. Irny and Rose (2005) defined research methodology as a path to systematically address the research problem. The data collection methods used are going to be explained below which includes sampling and sampling technics used to select participants. The chapter explores different research designs, population and data gathering technics, data sources and research instruments used to collect data. Ethical considerations, data analysis and presentation techniques are also highlighted in this chapter. Different data collection methods such as interviews, questionnaire and observation were used to collect information concerning climate change improvising strategies in ward 9, Zhombe communal area.

3.2 Research design

The researcher used the qualitative approach during the study of assessing climate change improvising strategies by small scale farmers in Zhombe. This is so because; qualitative approach is directed at obtaining views and opinion of a group of people or individuals as it examines people's feelings, emotions and behaviours towards phenomenon under study. In this research, qualitative is the ideal approach as it gives an in-depth description of how people are experiencing the effects of climate change and how they have responded to it(Echoed and Tuwksbury, 2009). The qualitative approach will help the researcher to unearth the opinions, beliefs and attitude the community has towards climate change being experienced.

Hancock (2002) stated that qualitative research dwells more on coming up with explanations of social phenomena. This approach can be used to gather data that is directly accessible and prone to some stunning explanations as it is subjective, interactive and systematic approach credible and pertinent to narrative life experiences. Bryman (2012) stated that, qualitative method is relatively fit for studies that are based on human ideas with their activities and those tend to understand the existing psycho-sociological issues. The researcher chose this method as the information acquired through qualitative method is rich, informative and offers better understanding of the phenomenon under study. Qualitative research implies that the data is in form of words rather than numbers (quantitative) and are usually reduced to themes or categories and assessed subjectively. Thus, the researcher will have an insight on the severity of the effects of climate change as well as the improvised practises adopted by the small scale farmers in Zhombe communal area.

3.3 Description of the Study Area

Zhombe communal area is found in the central part of Zimbabwe in the Midlands province in Kwekwe specifically. The area lies within the agro- ecological region 3 and 4. Zhombe receives very low, erratic rainfall of about 450-600mm and experiences cold dry winters and hot summers which will become wet in November with the a little amount of rainfall (Mupaso et al 2014). This has made the communal area being more vulnerable to the effects of climate change.

Agriculture remains the dominant economic activity in the area basing on rainy fed farming thus; the community relies on farming to sustain their rural livelihoods. The area is characterised by small scale farmers who struggles to cope up with the effects of climate

change through improvising their farming methods. The small scale farmers within the area include mostly the old aged and children due to rural- urban migration of the active population in search of a better living. This has worsened the situation and makes the area more vulnerable to the effects of climate change.

Zhombe ward 9 was selected through purposive sampling technique as it is the only ward that consist of small scale farmers who are still agricultural vibrant. The farmers in the area had adopted several improvisation strategies over the years in a bid to reduce the effects of climate change at a community level. The main objective of this research is to assess the effectiveness of these adaptation strategies being implemented by these small scale farmers. That is, evaluating their effectiveness in ensuring the coping abilities in the face of climatic changes being experienced.

3.4 Population Sampling

The research used purposive sampling technique in choosing participants who will provide information on this study. Bird and Busse (2005) argued that a sample is a subdivision of a larger population used where it is not feasible to include everyone in the research. Marimba and Moyo (2012) defined sampling as the process of choosing a few representatives from a larger group and gives rise to sample population. Thus, a sample is a representative group of the entire population and should represent the needed main characteristics. Purposive sampling technique was used to select the participants for this research. Purposive sampling was used as a way of extracting data from the targeted population. The researcher used expert purposive sampling technique so as to easily identify small scale farmers with relevant information needed on climate change.

Expert purposive sampling enables the researcher to identify the small scale farmers in the area as some households are now resenting farming due to climate change and opting for other livelihood strategies like brick moulding. Ward 9, Zhombe communal is a large communal area with homogeneous population which consist about 20 villages. The researcher chose this type of sampling to do away with biased information as the technique is justified as it does not exclude the key informants with rich information needed. Thus, purposive sampling is reliable sampling techniques in such a study as the researcher was able to draw necessary information regarding the entire population and get to the final conclusion of the research. This is so because it is judgemental, selective and subjective. This in turn made the research easier as it helped to target the respondents with relevant information through its judgemental.

3.5 Sample Size

This is the representation of the entire population that is drawn from the whole population. This is done as it is difficult to work with the entire population as there are large numbers of farmers improvising their farming practises to suit to the climatic conditions being experiences in ward 9, Zhombe Communal area. Thus, only a sample size was used to represent other farmers within the area. A sample size of 5 respondents was taken from each village in the ward which consist about 22villages, 6 AGRITEX extension officers, 4 ward members from the ward body, 2 veterinary officers and 2 meteorological officers. This enabled the researcher to have sufficient information that was needed and draw conclusions on the effectiveness of agricultural improvising strategies that are being implemented within the area of study.

3.5.1 Table 1: showing research population, sampling and sample size

POPULATION	SAMPLING	**S**AMPLE
AGRITEX Officers	Purposive sampling	6
Ward Body Members	Purposive sampling	4
Veterinary officers	Purposive sampling	2
Meteorological officers	Purposive sampling	2
Small scale farmers	Purposive sampling	110 (households)
TOTAL		**124**

Drawn by the researcher

3.6 Data Sources

There was the use of both primary and secondary sources of data. Primary data is the unprocessed data from the field research. The ward members, AGRITEX officers, Meteorological officers and the veterinary provided primary data through the use of interviews. These sources of data can be referred to as the original materials on which research is based as they provide first-hand information concerning a topic under research. This data was obtained from the interviews, questionnaire and from field observations. Secondary data was also made available to enable the study. This was achieved through the use of internet to access journals and valuable information on the internet thus, desktop research. More explanation is going to be provided below concerning the sources of information that were used during the study.

3.7 Data Collection Methods and Instruments

This study used data collection instruments which include interview, observations, desktop research and questionnaires. Research instruments were used in combination for triangulation purposes.

3.7.1 Interviews With Key Informants

This instrument involves conservation between two or more people where questions will be asked by the interviewer and the interviewee responding to them. The researcher used the interviews to determine the severity of the effects of climate change, to identify the improvised strategies that are being practised in the area as well as assessing the effectiveness of the strategies being implemented. The interviews are most critical as they go beyond verbal language. This is so noting the fact that the researcher can observe the feelings and emotions of participants through facial expressions, gestures and body language expressed by an individual. In this case the researcher was able to obtain relevant information concerning the severity of the impacts of climate change as it is one of the questions intended to be answered. The researcher also used face to face semi-structured interviews so as to allow flexibility when asking questions. The interviews were conducted to the AGRITEX officers, Meteorological officers, ward body members and veterinary officers. Qualitative research requires greater interaction and the involvement of the research in depth interviews with the community hence interviews were conducted in order to establish the extent to which people are improvising their farming practices.Interviews seems to be more advantageous as the researcher can go beyond structured questions thus, more information can be gathered.

Table 2: Showing population and research instruments used

POPULATION	RESEARCH INSTRUMENT
AGRITEX Officers	Interview
Small scale farmers	Questionnaire
Meteorological officers	Interview
Veterinary Officers	Interview
Ward Body Members	Interview

Drawn by the researcher

3.7.2 Field Observations

The researcher chose this method as it is good at providing first-hand information. Therefore, the research was intended at observing the livelihoods of Zhombe community and the agricultural improvising strategies being practised in dealing with climate change impacts. Through observing the livelihoods, the researcher was able to tell whether the improvised strategies are effective in maintaining the sustainable livelihoods which is the basis of this study. Observations were also used in validating the data collected by questionnaire and interviews. This data collection instrument was much more effective as the researcher took advantage of the rainy season and started her research. This enabled the researcher to have adequate information as she could see how the community was affected by climate change as well as the strategies they were implementing. Thus field observations were effective to a greater extent.

3.7.3 Desktop Research

By this technique, the researcher was able to gather and analyse information that was already available on internet or in print form such as published reports and statistics. Quinch (1999) stated that desktop research refers to the collection of secondary data that has already been collected. This technique is important as it provides broader statistics and the researcher will be able to cover up the gaps and able to meet the research objectives. There are a lot of literature on climate change and the improvised strategies and such data is advantageous in that it is cheaper quick to access and easy to obtain as compared to primary data. The researcher used the library, internet, journals and documents. Desktop research helps the researcher to avoid duplication of other scholars and researchers' work rather it enabled her to identify research gaps that needed serious attention. It also enabled the researcher to determine the severity f the impact of climate change within the country so as to evaluate the strategies being implemented within the area of study.

3.7.4 A Questionnaire

The research also used questionnaires to obtain data on this research. These are written questions in which respondents provide answers on that same sheet. Bakaro (2004) argued that a questionnaire is a research instrument with a number of questions for the purpose of gathering information from the respondents. The researcher used familiar and local language on the questionnaire for easier understanding thus, Shona and Ndebele as she was aware of the literacy level within the area of study. The responses were later translated after the collection of data. The researcher considered this technique since it saves time and also allows both closed ended and open ended questions. This enables the researcher to gather all relevant information concerning climate change improvising strategies in the study area. Using questionnaire is cost effective and enables the researcher to have a lot of information

within a short period of time. The open ended questions were to attract brief, detailed responses and new areas within the reach of the research were explored. The use of questionnaire allowed respondents to articulate well on the aspects under study without fear as a free atmosphere is provided so as to do away with bias. The questionnaires were used to the communities as it also saves time and can be used for a larger population. The questions on the questionnaire were divided into sub-sections as in line with the research questions as well as research objectives.

3.8 Chapter Summary

The chapter encompassed of the research methods and design used in the study. It employed qualitative method as the researcher wanted to generate and present data in a descriptive manner. The chapter also looked at the population sampling as well as the sampling techniques and methods used in data collection. It also encompasses he data collection instruments and methods such as questionnaires with closed and open ended questions, field observations, desktop research as well as interviews. The use of different instruments allows reliability and validity of the data collected as they complement each other. The sampling techniques showed how respondents were chosen and why.

4 CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

The thrust of this chapter is to provide detailed findings carried out during the research. The chapter intend to answer research questions in relation to the objectives of the study. Data presentation,interpretationand analysis will be done as the chapter unfolds. It will be shedding more light on the findings of the study. This chapter is intended on bringing light on the evidence and severity of climate change, improvisation strategies being done and also in assessing the effectiveness of these strategies. The study is grounded on qualitative thus; it is more descriptive giving factual information in relation to the topic under study. Improvising strategies that are being done by the Zhombe community ward 9 are going to be discussed and critique some of the strategies being done in relation to their effectiveness of sustaining people's livelihoods. The chapter is guided by the Crisis Decision theory basing on its three afore mentioned stages.

4.2 Evidence and the Severity of Climate Change

The research has found out that climate change is largely impacting the rural livelihoods particularly small scale farmers in Zhombe ward 9. This was noted through the interviews conducted, questionnaires and even the observations by the researcher herself which were carried out. These research instruments and observations proved beyond doubt that climate change is negatively impacting the area as shown by the evidence of climate change in ward 9. The evidence in the area showed that farmers are really experiencing hardships in agriculture due to the rigorousness of climate change. The evidence of climate change the community identifies includes:

- The shrinking of annual water sources due to high temperatures during dry seasons.
- Depletion of grazing lands.
- Crop failure due to poor rainfall distribution
- Unpredictable onset of rainy season
- The dry spells in between rainy season
- Heat wave
- Disappearance of certain species due to extreme temperatures now experienced.

The severity of climate change in ward 9 was noted on the onset and length of the rain season. The interviews carried out with the meteorological officers, AGRITEX officers, veterinary offices and the ward body members indicated that the onset of rainy season in no longer fixed. The rainy season in the area used to start mid-October but now its mid-November with a very little amount(Runesu, interview, 29 March 2018). In addition, the rain season is now longer than the expected. The researcher founds out that the rainy season is now commencing mid- November up to May. The onset of the rainy season has negatively impacted farming as the farmers are now confused in which month to start sowing.

The researcher also found out that, the rainfall amount and distribution has negatively changed in the area. The interviews with the meteorological officer (Magidi, personal communication, 29 March 2018) and the questionnaires proved that the amount of rainfall used to be received during the rainy season has not changed but rather its distribution. Comments by farmers indicated that, the amount is the same or has increased. This has been supported by Mutekwa (2009) who states that in some cases floods and prolonged dry spells are being experienced in the same season. The research found out that the rainfall patterns are no longer evenly distributed throughout the season. This is so noting the mid- season

droughts which are being experienced especially this season. This has resulted in the crop failure as well as dwindling of the grazing pastures. Rainfall is no longer evenly distributed as evidenced by higher temperatures experienced in the middle of the rainy season. Making it difficult for small scale farmers in Zhombe to invest in agriculture and make a living out of it.

The researcher has also found out that the area is experiencing extreme weather events. These are accompanied by hail storms, violent winds and high temperatures. These events are impacting agricultural activities negatively as they result in crop failure and disappearance of grazing lands as well as drying of water sources. The high temperatures and low rainfall amount on the onset of the rainy season has resulted in poor germination and drying of the germinated making it more difficult for farmer to purchase more seeds. This has resulted in most fields to be left idle as observed by the researcher. The extreme weather events have resulted in the disappearance of some species. This is so noting that on crop farming, some crops like rice and wheat in the area can now only be grown through irrigation with additional water and maximum supervision.

4.3 The Improvising Strategies and their Effectiveness in Dealing with Climate Change

The community have embarked on many different strategies in a bid to adapt to the problematic situation of climate change affecting the area. These strategies are being done in relation to the availability of resources within the community for small scale farmers. Long back the small scale farmers used to adopt only traditional coping strategies but they are also now implementing modern coping strategies due to the severity of climate change. The researcher found out different strategies that are being done and there are going to be discussed below. The effectiveness of these strategies is also going to be discussed and analysed.

4.3.1 Small Grain and Short Season Varieties

The study revealed that small scale farmers in Zhombe ward 9 have embarked on small grains crops due to the effects of climate change. The observations by the researcher showed that the small grain crop being grown include rapoko, sorghum and finger millet as shown on Fig 1. Farmers indicated that they are growing such crops in response to climate change as they are drought resistant and can strive even on higher temperatures with little rainfall. The farmers in the areaare now growing early maturity varieties. Fig 2 is showing some of the short season varieties that are being grown in the area and the varieties being grown include cow peas (tumbe) and short season maize crop which is the core plant and the staple plant for Zimbabwe. According to AGRITEX officers Mazambani and Munemo (28/03/18), the maize varieties which suit the climatic conditions in the area include SC 403 and SC 407 with higher yields, early maturity and drought tolerance. Chenje and Solar (1998) postulated that the risk and uncertainty brought by climate changesuch as drought, has encouraged the societies to venture into a variety of contingentresponses using a combination of options and diversification of crop varieties and livelihood strategies.The growing of small grain drought resistant crops and short season varieties are effective to a great extent in trying to cope up with the efects of climate change.

Fig 1*showing small grain drought resistant sorghum crop grown in Zhombe ward 9 as a climate change improvising strategy*

Fig 2 *showing short season variety of cow peas grown in ward 9 as an adaptive measure*

4.3.2 Plant Staggering

Small scale farmers in ward 9 are now practising plant staggering as an adaptive measure to the impacts of climate change. The research carried out with the farmers showed that farmers no longer plant all their crops within the first month of the rain season but rather they plant their seeds on different dates up to January. Farmers pointed out that they are doing this as

the rainy season and the rainfall distribution are no longer predictable. This is done to reduce a total crop failure as if the November crops fail maybe the January crops will have a great harvest. This seems to be helpful as in this season November crops totally failed due to dry spells experienced in between the season so farmers are looking forward to late planted crops. Plant staggering is much more effective in dealing with the impacts of climate change as proven by this research.

4.3.3 Conservation Farming

Conservation agriculture is another improvising farming technic that is being practised in ward 9 Zhombe in a bid to cope up with the effects of climate change. Conservation farming refers to a resource saving crop production that strives to achieve higher yields whilst conserving the environment at the same time. The researcher through the use of questionnaires noted that farmers adopting such type of farming as a panacea to curb the effects of climate change. This method of farming involves zero tillage known as 'Timba Udye' in the area which enables the conservation of soil moisture. Water will be collected into holes and it also saves inputs like fertilizer and manure as it will only be utilised by the crop. Observations by the researcher on farmers practising this method shows that zero tillage produces high grade maize as shown on Fig 3 as compare to other farming methods. The farmer on the picture confirmed that his production has doubled the previous season an despite of dry spells experienced this season his crops were not been affected as shown on the picture.

However, such method is only practised a very few farmers due to its labour demanding nature. This means that, only a few small scale farmers are earning a living through conservation farming method as shown on Table 3. Research has proven that farmers in the

area prefer the use of ox-drawn ploughs which requires less labour to zero tillage which is labour demanding. This is affecting the effectiveness of this improvising strategy that reduces the impacts of climate change as Zero tillage metod has the least number of farmers practising it.

Fig 3*Showing maize crop grown under conservation farming method(timbaudye)*

4.3.4 Ridge and Tie Method

Small scale farmers have also adopted new farming method of ridge and tie due to the effects of climate change. This is being practised to conserve soil moisture as well as preventing runoff but rather promote water percolation. This method involves the use of a plough or cultivator whereby a farmer first creates ridges and then plough across tying the ridge leaving a crop on a box. Interviews by the AGRITEX officers at Kwekwe head office (Runesu, interview, 29 March 2018) proved that this method serves the same purpose with zero tillage as he stated that the difference is only on the fact that this one uses ploughs. Observation also has proven that some farmers are only ridging their crops without tying as it is laborious. This is shown on the picture on Fig 4. This method of conserving the soil moisture proved to be much more effective in reducing the impacts of climate change. The health of the bean crop on the picture proves beyond doubt the effectiveness of ridging as an improvisation strategy on the effects of climate change.

Fig 4 *Showing ridging on bean crops to avoid runoff*

4.3.5 Irrigation and Gardening

Irrigation in Zhombehas become a major avenue for coping with the impacts of climate change. There was the establishment of Senkwasi Irrigation Scheme within the area which is making use of theSenkwasi Dam for water source. This is enabling the community improve their crop production thus, improving their livelihoods. Irrigation is enabling the growingof crops like wheat which are no longer be grown by rainy fed farming and also enables crop farming during dry seasons. The interview carried out shows that there is rehabilitation of Senkwasi irrigation scheme for it to be effective. The community is also practising gardening. Research proves that this is not just ordinary gardening with comprise of thethe growing of vegetables but rather maize production is also practised through gardening.

This strategy is being done to cover up for the dry spells that are being experienced as they will be making use of the additional water. Gardening is enabled by the water harvesting skills that are being improvised within ward 9 which include the use of wells and boreholes. However irrigation scheme is only benefiting a few farmers due to its centrality. The ward is too big that not every farmer will be able to travel the distance to the irrigation. One has also to note that in dry seasons there are water shortages that are being experience as the dam runs dry though government is trying to rehabilitate this dam.

4.3.6 Stream Bank Cultivation

The researcher also found out that the community is engaging into stream bank cultivation as an adaptive measure to the effects of climate change. The farmers put their fields near rivers and dam because the soil in such place is always moist. The dry spells experienced in the middle of the rainy season resulted in farmers practising stream bank cultivation so that their

fields will be near water sources and be moist throughout the rainy season. This has been supported by the observations made by the researcher as she noted that such fields near the rivers were ever green with good looking maize crops. The farmers in the area name such fields'*chigodhi'*meaning lower close to the water source.

However this method has negative implications as it is resulting in river siltation hence, reducing the carrying capacity of the water sources. According to the interviews carried out, this is impacting irrigation and gardening during dry seasons. Stream bank cultivation has also resulted in crops being easily washed away by floods. The research shows that such incident had happened in the previous season and had let down farmers who were looking forward for a bumper harvest.

4.3.7 Indigenous Knowledge Systems

Owing to the fact that the communal area largely depend on rain fed agriculture, ward 9 farmers are harnessing IKS as an adaptation mechanism for weather forecast. The IKS are used in the timing of the upcoming rainy thus, a predicting tool. Farmers had adopted this mechanism due to the lack of proper weather information from the meteorological department due to poor facilities in the country. However, respondents in the area indicated that the use of IKS as a coping strategy has enabled them to have a better harvest. The farmers are forecasting using trees, birds and wind movement as their predictable tools. A farmer in Ward 9 indicated that despite of the crop failure experienced in the area the previous season, he was able to have 13 tonnes of maize due to the help of IKS combined with meteorological information. This is so because the farmer was able to stagger his plants and could make use of late rains. The research also proved that most farmers seemed to be in favour of this method as it is not expensive, allows community participation and it is

sustainable thus, environmentally friendly. This proves the effectiveness of IKS in a bid to cope up with the effects of climate change.

4.3.8 Organic Farming

Another strategy being implemented in the area is organic farming as an improvising strategy in the face of climate change. This type of farming involves the use of natural methods and avoids the use of fertilizers and pesticides. It intends to use natural methods such as manure and compost for farming purposes. The farmers in the area are implementing such a type of farming as it also conserves the soil, making it fertile for future use. The observations proved that this farming method has maximised their yields at the same time minimising cost. Interview with the AGRITEX officers showed that agricultural production has increased with 20% as a result of organic farming which they encourage farmers. This coping strategy is so much useful as climate change has come with hail storms with wind thus the soil is not easily washed away but water or wind.

Table 3: ***showing Improvisation strategies and the number of farmers implementing it as according to the questionnaires.***

ADAPTATIVE STRATEGIES	NUMBER OF FARMERS IMPLIMENTING IT
Irrigation	22
Drought resistant crops	98
Short season varieties	88
Zero tillage	24
Water harvesting	72
Conservation farming	56
Mixed farming	78
Plant staggering	106
Stream bank cultivation	68
Intercropping	60
Gardening	44
IKS	86

Drawn by the researcher

4.4 Challenges faced by Small Scale Farmers in Adapting to Climate Change

Studies have indicated that small scale farmers suffer more from the effects of climate change as compared to commercial farmers. Small scale farmer in Zhombe are largely dependent on rain fed agriculture. The research findings prove that the irrigation scheme in the area is not been able to support all corners of the ward as only 22 reached small scale farmers are practising it. This is due to the drying up of the dam in dry seasons as well as the distance travelled which is too long. This is the same with borehole water and wells which also dries

during the dry seasons. This limits their coping capabilities as they are left without any other option but only to look up to donors for food hand-outs. This has in turn resulted in economic dependency as according to the questionnaire answered by local farmers thus, a great challenge to the ward 9 small scale farmers.

The other challenges faced by small scale farmers in Zhombe in adapting to climate change include the lack of know how. The research with the locals carried out proved that these farmers are actually lacking knowledge about climate change improving strategies. The ward9 farmers were complaining on having only 4 AGRITEX officers in such a big ward. This has result in some farmers missing some relevant information. The interview carried out with the AGRITEXofficers' shows that farmers are lacking skills due to incapacitation of the agricultural institution as a result of lack of resources and funds. The AGRITEX officers also noted that some farmers do not attend the farmer discussion groups and demonstration plots where they are taught effective adaptive strategies.

The small scale farmers in the area are also facing a challenge of lack of resources for improvising their farming practises. Farmers lack agricultural inputs so as to maximise their production. Moreover, rural-urban migration by the active population in search of better living due to climate change is also affecting the ability of the community to improvise the farming practises. The improvising strategies require a lot of labour force taking for instance, conservation farming (zero tillage). This requires a lot of labour from the planting stage up to the weeding stage until harvesting time. The old aged which encompasses the ward 9 population as according to the observations by the researcher cannot effectively do such type of work. This has come as a challenge to agricultural adaptation mechanisms by the small scale farmers negatively.

4.5 Chapter Summary

Major findings from this research proved that small scale farmers in Zhombe ward 9 are being affected by the effects of climate change owing to its severity in the area. The community is engaging in robust of adaptation or improvising strategies in a bid to deal with the effects of climate change as well as improving their rural livelihoods. However, the research findings have shown that some of the improvising strategies being implemented are actually worsening the situation at hand taking for instance stream bank cultivation which had resulted in river siltation. The challenges on improvising their farming methods have also been discussed on this chapter.

5 CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The thrust of this chapter is to give conclusion to the research in the context of the objectives and research questions of this study. The recommendations are also going to be provided as they in turn prompt for further researches by other researchers and writers. The research managed to assess the effectiveness of the agricultural improvisation strategies by small scale farmers in Ward 9 Zhombe as it is the major thrust of this research.

5.2 Conclusions

The research highlighted the severity of climate change on small scale farmers in Zhombe ward 9. Climate change has posed intractable stress on their agricultural production as well as rural livelihoods portfolios. Small scale farmers are disproportionately being affected by these climatic changes due to their reliance on rain fed agriculture and lack of effective resources that enables farming. A variety of evidence of climate change within the research area were noted and these include extreme hot temperatures (heat waves), mid- season droughts, unpredictable on set of seasons, rainfall distribution to mention just a few. All these are impacting on agricultural production by small scale farmers. Almost every farmer within the area was aware of the threats posed by climate change as it has negative complications on their agricultural production. Climate change has resulted in crop failure, migration of active population, recurrent droughts to mention just a few within the area. This inevitably threatened the sustainability of agricultural activity as a livelihood strategy for small scale farmers and also as the back bone of the country's economic activity.

The community has improvised their agricultural practises in order to cope with the climatic changes that are experienced in the area. This is so because adaptation strategies such as

irrigation, conservation farming, harnessing of IKS, growing of small grain drought resistant crops, short season varieties, ridging to mention just a few have been adopted in the area as shown in the research. The community has adopted such improvising strategies in a bid to cope with the harsh climatic conditions that have prevailed in the area over the years. The research findings indicated that these strategies are being implemented as the community is experiencing negative ramifications of climate change.

Lastly, the research has managed to assess the effectiveness of the above mentioned strategies considering how they are improving the rural livelihood in the face of this climate change. Some strategies only have the short term benefits and later on worsen the situation. For instance strategies like stream bank cultivation is search of soil moisture and fertility have short term benefits. This is because stream bank cultivation results in river siltation which during the dry seasons hinders gardening and irrigation farming as well as water source or livestock production. Some of the strategies are labour demanding and the community is abandoning them for that, for instance zero tillage. However, the community is able to survive in the face of climate change as some strategies such as organic farming and gardening are actually improving their farming practices.

The study has been guided by the Crisis Decision theory by Sweeny (2008). This talks of assessing the severity of negative response. At this stage the research was focused on the causes of climate change as well as assessing its severity. The communities then move on to identification of the problem affecting their livelihoods and try to come up with the response mechanisms. At this second stage the study focused on the improvisation strategies in a bid to cope up with the problematic climatic changes.Then lastly, guided by the third stage of Crisis

Decision theory, the researcher managed to assess the effectiveness of the adaptation strategies implemented by the community as coping techniques.

5.3 Recommendations

After assessing the effectiveness of climate change improvisation strategies by the Zhombe communal area; the following are the recommendations by the researcher to improve agricultural practises by small scale farmers within the area.

- There is the need to increase on the number AGRITEX officers in the area and also constant workshops with the AGRITEX officers so as to increase the skills and knowledge of small scale farmers. This will enable small scale farmers to have better trainings on issues of climate change and adaptation strategies.
- For the effectiveness of conservation farming, the community should engage into collective farming strategies 'humwe/mushandirapamwe' to avoid the problem of labour intensity.
- Ministry of Lands Agriculture and Rural Settlement and EMA to work in conjunction and do away strategies that lead to environmental degradation such as stream bank cultivation. This then results in improved farming as well as conservation of theenvironment. Gardening and irrigation will now be practised effectively during dry seasons as rivers and dam's carrying capacity would not been reduced.
- Small scale farmers should be given access to finances so that they have a way for other better farming activities rather than relying only on rainy fed agriculture. Farmers are lacking essential agricultural inputs that will in turn improve their rural livelihoods.

- The researcher also recommends the harnessing of irrigation schemes to full capacity. The area only has one irrigation scheme which is not effective and it is not even central to all farmers hence the need to harness it.
- The need to rehabilitate the dam in the area for operation by the irrigation scheme. The only dam the community has is now full of silt and rubbish being dumped inside making it ineffective.

5.4 Chapter Summaries

In a nutshell, it can finally be concluded that climate change has had negative implications on the small scale farmers. Improvisation strategies were being harnessed through plant staggering, growing of drought resistant crops, short season varieties, reinforcing the IKS to mention a few as adaptation measures to climate change. The effectiveness of such strategies was also considered on the conclusion of this research. The recommendations were also outlined on this chapter for further researches.

REFERENCE LIST

Primary sources

Magidi, S. (29/03/18). Personal Interview.

Mazambani, E. and Munemo, T.(29/03/18). Personal Interview.

Runesu, T. (28/03/18). Personal Interview

Secondary sources

Bakaro, V. (2004).The Connection between Gender and Development .Gaborone: University of Lesotho.

Bird, G. and Busse, B. (2005) .Climate Change and Variability in Africa .Pretoria: Rhodes University Press.

Brazier, S. (2008). A conceptual framework for understanding semi-arid land degradation: Ecohydrological interactions across multiple-space and time scales. Ecohydrology, 1(1), pp.23-34.

Braizer, S. (2015).Climate Change in Zimbabwe, Facts for Planners and Decision Makers. Alexandra Park: Harare

Brooks, N. (2003).,'Vulnerability risk and adaptation: A conceptual framework'. Tyndall Centre for Climate Change Research Working Paper, 38, pp.1-16.

Bryman, A. (2012) Social Research Methods 4th edition. Oxford: Oxford University Press

Chagutah, T.(2010). Climate change vulnerability and preparedness in Southern Africa: Zimbabwe country report. Heinrich BoellStiftung, Cape Town.

Charovachi, G. (2013) 'Climate Change in Africa' Russian Journal of Social Sciences. Vol 29(54) pp. 15-16

De Jonge, (2010). Effects of irrigation deprivation during the harvest period on yield determinants in mature almond trees.Tree Physiology, 21(14), pp.1073-1079.

Erestein, O. (2003)Smallholder conservation Farming in the Tropics and Sub-tropics. Agriculture, Ecosystems and Environment, 100(1), pp.17-37

FAO. (2006). The state of food insecurity in the world : Eradicating Hunger - Taking StockTen Years after the World Food summit, FAO: Rome

IPCC Synthesis Report (2007) Rainfall Pattern in Southern Africa. Oxford: Oxford University Press.

Hancock , B.(2002). An Introduction to Qualitative Research. University of Nottingham

Moyo, S. (2012) Farmers Perceptions on Climate Change and Variability. Journal 120(2), pp. 317-335

Mudzonga, E. (2010): Farmers' Adaptation to Climate Change in Chivi District of Zimbabwe, Gweru: Mambo Press

Mugabe, F.T. (2010) 'Perceived Impacts of Climate Change related parameters on Smallholder Farmers in Zambia and Zimbabwe'. Journal on Sustainable Development in Africa, 12(5) pp170-186

Musiyiwa, P. (2014) Climate Change in Rural Zimbabwe.Alexandra Park: Harare

Mutekwa, V.T. (2009). 'Climate change impacts and adaptation in the agricultural sector: the case of smallholder farmers in Zimbabwe'.Journal of Sustainable Development in Africa, 11(2), pp.237-256.

Muzani,W. Saropa, G. Nymushamba, G. B. Climate Change Adaptation in Zimbabwe Agricultural Sector. Gweru: Mambo Press

Smit, B. Burton, I. Klein, R.J. and Wandel, J.(2000). An anatomy of adaptation to climate change and variability. Climatic change, 45(1), pp.223-251.

Sweeny, K. (2008). 'Crisis decision theory: Decisions in the face of negative events'.Psychological Bulletin, 134(1), p.61.

UNFCC (2007) Climate Change in Europe and Africa. Oxford: Oxford University Press

World Bank.(2008).Climate Change and Adaptation Strategies. Oxford: World Bank

Zimbabwe Handbook of Climate. (2007) .Climate Change in Zimbabwe. Geneva: UNICEF

Internet Sources

Machingauta, B. (2013) 'Zimbabwe is the worst affected country with climate change', Available at http://www.ngauta.com accessed on Jan 2015

Quinch, B. (1999) 'Environmental Variability in Africa' Available at www.mno.variability.edu.

RESEARCH INSRUMENTS

An interview guide for small scale farmers in Zombe ward 9

Good day sir/Madam

My name is Adeline Mabuto, a 4th year student at Midlands State University currently studying Development Studies. I am carrying out a research entitled: An assessment of climate change improvising strategies on agriculture in the case of small scale farmers in Zhombe, ward 9. This is being done in partial fulfilment of this degree and the information provided is strictly for academic purposes. Your responses will be treated with high confidentiality.

Your cooperation will be greatly appreciated.

1. What evidence of climate change is there in your area?
2. Are there any changes in the rainy season?
3. Have you noticed any changes on the amount of rainfall now being received?
4. What are the major impacts of climate change in your area?
5. What is being done to address the effect of climate change?
6. To what extent are these strategies reducing the impacts of climate change and improving the people's living standards?
7. What sort of programmes are you involved in creating awareness to the community?
8. What are the challenges in implementing those strategies and what are they?
9. What form of assistance has the government and agricultural authorities provided so far in improvising agriculture to suit climatic changes?

.

MIDLANDS STATE UNIVERSITY

A QUESTIONNAIRE

Climate change and improvising strategies

1. Are you experiencing the shift of seasons in your area?

YES	
NO	

2. Are you experiencing any dryness in between the rainy season?

YES	
NO	

3. Is the amount of rainfall used to be received reduced?

YES	
NO	

4. What strategies are being implemented in your area to reduce the impact of climate change?*(tick on strategies you are implementing)*

Irrigation	
Drought resistant crops	
Short season varieties	
Zero tillage	
Water harvesting	
Conservation farming	

Mixed farming	
Plant staggering	
Stream bank cultivation	
Intercropping	

5. Are they any positive changes on agricultural production brought by these improvising strategies?

YES	
NO	

6. Are they improving and sustaining your livelihoods?

YES	
NO	

7. What do you think needs to be done by government and agricultural institutions to deal with the impact of climate change……...……
……
……
……..

8. What challenges are you facing in your area in trying to cope up with the impacts of climate change?(*tick on the challenges you are facing)*

   a. Lack of know how ☐

b. lack of access on decision making ☐

c. lack of resources and control over them ☐

d. poverty ☐

e. economic dependency ☐