
# FACULTY OF ARTS

# DEPARTMENT OF DEVELOPMENT STUDIES

**Assessing the effectiveness of rural women small holder farmers' adaptation to climate change and variability. A case study of Chayamiti in Chimanimani**

By

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**Approval form**

The undersigned certify that they read and recommend to the Midlands State University for acceptance, of a dissertation entitled: Assessing the effectiveness of rural women smallholder farmers' adaptation to climate change and variability, using the case study of Chayamiti. Submitted by Katerere C. Samantha, in partial fulfilment of the requirements of the Bachelor of Arts in Development Studies Honours Degree.

To be completed by the student

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This dissertation is suitable for submission to the faculty. This dissertation should be checked for conformity with the faculty guidelines.

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I certify, to the best of my knowledge that the procedure has been followed and the preparation criteria has been met for this dissertation.

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**Declaration**

I, Samantha C. Katerere do hereby declare that the data presented in this dissertation is a result of my original work. Proper acknowledgements in line with ethical requirements have been observed in writing this dissertation. This dissertation does not contain another person's information, unless specifically acknowledged as being sourced. Where other written sources have been quoted, then their words have been re-written but the general information attributed to them has been referenced. Where their exact words have been used, their writing has been placed inside quotation marks, and referenced.

**Signature** **Date**

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**Acknowledgements**

To begin with, I would like to acknowledge the Lord Almighty for the gift of life and secondly, I'm grateful towards my supervisor Dr. Mudeka for her time, comments and supervision throughout the compilation of this study. Lastly I would like to thank my parents for being there for me emotionally, financially and spiritually during the study compilation.

## Dedication

This study is dedicated to my best friend, Moreblessing Nyoni.

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**Acronyms**

| | |
|---|---|
| CCI | CLIMATE CHANGE INDEX |
| CSIR | COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH |
| DAFF | DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES |
| FAO | FOOD AND AGRICULTURE ORGANISATION |
| FGDS | FOCUS GROUP DISCUSSIONS |
| GDP | GROSS DOMESTIC PRODUCT |
| GRDC | GRAINS RESEARCH AND DEVELEOPMENT CORPORATION |
| IDKS | INDIGENOUS KNWLEDGE SYSTEMS |
| IPCC | INTER-GOVERNMENTAL PANEL ON CLIMATE CHANGE |
| MEA | MILLENIUM ECOSYSTEM ASSESSMENT |
| MSU | MIDLANDS STATE UNIVERSITY |
| NASA | NATIONAL AERONAUTICS AND SPACE ADMINISTRATION |
| NGOS | NON-GOVERNMENTAL ORGANISATIONS |
| TAR | THIRD ASSESSMENT REPORT |
| UKCIP | UNITED KINGDOM CLIMATE IMPACTS PROGRAMME |
| UNEP | UNITED NATIONS ENVIRONMENT PROGRAM |
| UNAIDS | UNITED NATIONS PROGRAM ON HIV/ AIDS |
| UNFCCC | UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE |
| WGD | WOMEN IN SUSTAINABLE DEVELOPMENT |

**Abstract**

*The purpose of this research was to examine the effectiveness of the adaptation strategies employed by women smallholder farmers in the face of climate change and variability using Chayamiti as the case study. The study aimed at exploring the effectiveness of adaptation strategies employed by Chayamiti women farmers paying particular attention to climate sensitive livelihoods such as agriculture, food security and health sector that are most likely to be affected by the violent projections of climate change and variability. Throughout the process of collecting data relevant to this study, the researcher employed an integrated approach of qualitative and quantitative methods. The major findings of the research were mainly on: the impacts of climate change and variability on the female farmer's operations in Chayamiti, the effectiveness of the adaptation strategies they employ in the face of climate shocks and the challenges they face in effectively adapting to climate change and variability. Lastly, the study made several recommendations pertaining to measures to be put in place to enhance the effectiveness of adaptation measures of rural women farmers in the face of climate change and variability.*

# CHAPTER 1: INTRODUCTION

In the last decade, vulnerability, adaptation and adaptive capacity have been revealed to be key concepts in explaining societal implications of climate change (Fusel and Klein, 2006). A better understanding of farmers' adaptation is critical to identify vulnerable entities and to develop well-targeted adaptation policies (Adger and Vincent , 2005; Smit and Wandel , 2006) The study on Chayamiti women small holder farmers is directed towards examining the effectiveness of their adaptation strategies to high variability of rainfall , high risks of natural hazards , severity of extreme weather events including droughts and heat waves .This chapter introduces the whole study, it seeks to address the background to the study, statement of the problem, study objectives and questions, significance of the study , delimitations and limitations of the research.

## 1.1 Background of The Study

Africa's major economic sectors have increasingly become susceptible to climate change and variability with huge economic impacts being incurred. This vulnerability is heightened by existing developmental challenges such as endemic poverty, complex governance and institutional dimensions; limited access to capital, including markets, infrastructure, and technology; ecosystem degradation; complex disasters and conflicts. Evidence shows that the upward trend of the already high temperatures and the reduction of precipitation levels will increasingly result in reduced agricultural production in Sub- Saharan Africa (Mano & Nhemachena, 2007; Biggs et.al.,2008) These in turn have contributed to Africa's weak adaptive capacity, increasing the continent's vulnerability to magnified climate change and variability.

In the tropical rain-forest zone, declines in mean annual precipitation of around 4% in West Africa, 3% in North Congo and 2% in south Congo for the period 1960 to 1998 have been noted (e.g.,

Malhi and Wright, 2004) A 10% increase in annual rainfall along the Guinean coast during the last 30 years has, however, also been observed (Nicholson et al., 2000) In other regions, such as southern Africa no long-term trend has been noted. Increased international variability has, however, been observed in the past-1970 period, with higher rainfall anomalies and more intense and widespread droughts reported (e.g., Richard et al.,2001; Fauchereau et al., 2003) In different parts of Southern Africa (e.g., Angola, Namibia, Mozambique, Malawi, Zambia), a significant increase in heavy rainfall events has also been observed (Usman and Reason, 2004), including evidence of changes in seasons and weather extremes (Tadross et al.,2005a; New et al.,2006)

The third assessment report by the Intergovernmental Panel on Climate Change (2007), identified a range of impacts associated with climate change and variability, including decreases in grain yields; changes in runoff and water availability in the Mediterranean and Southern countries of Africa; increased stresses resulting from increased droughts and floods; significant plant and species extinctions and associated livelihoods, (IPCC, 2001) Climate change has undermined efforts to protect livelihoods in Africa as noted by Simatele and Binns (2012).

The rain season in Zimbabwe is usually between mid-November to April and currently Zimbabwe is experiencing highest degrees of variables in rainfall in the world. As a result of climate change and variability, Zimbabwe has become vulnerable to frequent drought years, occasional flood events, gradual changes in temperatures and extreme weather events such as heat waves and dry spells. Records show that temperatures have been increasing by around 0, 1 degrees Celsius a decade and future scenarios predict increasing temperatures of around 2, 5 degrees Celsius by 2050 (Government of Zimbabwe, 2013a) .

As is occurring in Zimbabwe, rural women worldwide spend hours each day collecting water for their families to drink and wash as well as for their livestock and crops (Chimanimani Statistical Department, 2004). It thus follows that, women around the world must adapt their lives to a changing climate. Increases in extreme weather conditions such as droughts, storms, and floods are already altering economies, economic development, and patterns of human migration, and are likely to be among the biggest global health threats this century. Everyone will be affected by these changes, but not equally (Yavinsky, 2012). The Economist (2010: 86) concludes that, "Global action is not going to stop climate change. The world needs to look harder at how to live with it".

Rural women in particular are reported to be at high risk of negative impacts from climate change and variability mostly because of their household responsibilities such as childcare and the collection of water which make women particularly climate sensitive as they take on more agricultural work whilst men migrate for labour. Again, the gendered social norms and household roles by women can inhibit their adaptive capacity due to lack of access to agricultural resources such as land and extension services and inputs with which to adapt to variability and change (Doss,2011, FAO, 2011, Kakota et al., 2011, Nelson and Stathers,2009, Petermon, 2010)

### 1.2 Statement of the Problem

It is not a secret that climate change and variability have gradually become major challenges especially to rural women small holder farmers. This is mainly because they depend more on climate sensitive livelihoods, for instance, agriculture. These women are proportionally more dependent on the natural resource base which is threatened by climate extremes. Globally, and in the particular case of Zimbabwe, both policy makers and Non-governmental organisations have stressed the significance of adaptation using local knowledge systems. In rural Zimbabwe, as

exemplified by Chayamiti area of Chimanimani, even the government sees adaptation as increasingly necessary. Rural women small holder farmers in Chayamiti particularly are liable to climate vagaries that include changes in rainfall duration and intensity, erratic rainfall patterns, prolonged droughts. Since they are located in a marginalized environment, their experiences of the impacts of climate change are worsened. Here, their traditional knowledge and roles in household consumption choices must be key elements in adapting to climate change and variability. It is within this context that, this study seeks to examine the effectiveness of the adaptation strategies employed by women small holder farmers in Chayamiti in response to climate vagaries.

## 1.3 Objectives of the study

### 1.3.1 General objective

- To examine the effectiveness of adaptation strategies employed by women small holder farmers of Chayamiti in response to climate change and variability.

### 1.3.2 Specific objectives

- To trace the impacts of climate change and variability on female small holder farmers' activities in Chayamiti, Chimanimani.
- To identify the adaptation strategies utilised by rural women small holder farmers in Chayamiti.
- To assess the effectiveness of adaptation strategies employed by rural women small holder farmers in Chayamiti towards climate change and variability.
- To identify the challenges that rural women smallholder farmers face in efforts to adapt to climate change and variability.

## 1.4 Research Questions

### 1.4.1 General Question

- How effective are the adaptation strategies adopted by rural women small holder farmers in response to climate change and variability in Chayamiti?

### 1.4.2 Specific Questions

- What are the impacts of climate change and variability on female small holder farmers' operations in Chayamiti?
- What are the adaptation strategies utilised by rural women small holder farmers in Chayamiti?
- How effective are the adaptation strategies employed by rural women small holder farmers in Chayamiti in the face of climate change and variability?
- What are the challenges faced by rural women smallholder farmers in efforts to adapt to climate change and variability in Chayamiti?

## 1.5 Significance of the study

The research on rural women's adaptation to climate change is extremely important to various beneficiaries considering the fact that climate change and variability are realities that are negatively impacting on development today.

- **Women**

This study aims at motivating and inspiring women to become creative and think outside the box, to become innovative and come up with effective adaptation strategies in the face of climate change and variability. Also this study will sensitize women and raise awareness to the possible adaptation

strategies that rural women can employ and benefit from. It will also draw the attention on governmental and non-governmental officials concerned with rural development, to the challenges these women face in utilizing the identified adaptation strategies.

- **Local and national government**

The study will provide empirical information based on real life experiences of rural women to the government so that relevant policies can be promulgated to enhance women's adaptation capabilities. The Ministry of Agriculture: Ministry of Environment, Ministry of Women, Gender and Community Development, as well as local governments, such as Rural District Councils (RDC's), who are all concerned with rural development, stand to benefit from the findings of the study. The study will inform their policy decisions and interventions in the face of the impacts of climate change and variability.

- **Non-Governmental Organisations**

Many NGOs have sought to assist rural people especially women in Zimbabwe to boost their livelihoods and empower them economically and socially. Many more have intervened to mitigate climate change and its impacts on agriculture as well as to help women to adapt their livelihood strategies including agriculture, in the face of climate change and variability. As such, the study of the effectiveness of women's own adaptation strategies will go a long way to inform those organisations of how they should assist rural women in Zimbabwe and in Chayamiti of Chimanimani in particular.

- **The researcher**

This study will act as an introduction to the world of research and therefore, shape the researcher's academic trajectory and future professional endeavours. Also, this research will enable the researcher to be in a position of knowing what to expect in a career in Research and how research can vary.

- **Future researchers**

An investigation of this study is of paramount importance as the research is going to make new information and knowledge available to be used by future researchers as both a basis and source of their studies.

### 1.6 Definition of key terms

Climate change:

A change of climate which directly or indirectly caused by human activity that changes the composition of the global atmosphere and persists for a long period of time, usually decades or longer (CSIR, 2010).

Climate variability:

Climate variability is defined as the state or degree of being variable or changeable (H. Mifflin p.200).

Adaptation:

Adaptation involves initial plan and measures to reduce the vulnerability of natural and human systems against actual or expected stresses (UNEP, 2009).

Smallholder farmers:

Smallholder farmers are known as small scale farmers; they usually have limited resources and own a small based plot of land (DAFF, 2014).

### 1.7 Delimitations

The researcher has chosen Chayamiti as an area of study mainly because it's an extremely marginalised and neglected rural part of Zimbabwe in terms of policy making. It's highly vulnerable to the negative impacts of climate change and variability due to the gradual changes in temperatures, dry spells, changes in rainfall patterns, increase in frequency and severity of extreme weather events such as droughts. Chayamiti is located south east of Zimbabwe and is approximately 450 km away from Harare. The study area (Chayamiti) is characterised with generational poverty, low educational achievements, high rate of unemployment and lack of access to service delivery facilities and people survive on food crop, vegetable production, brick making, selling thatching grass selling firewood and engaging in food for work activities. This research is focusing specifically on the effectiveness of rural women small holder farmers' adaptation strategies in an effort to emphasise more on the vulnerability of rural women to climate change and variability and how susceptible they are to climate vagaries keeping in mind their poor status. Also, the uniqueness of this study is that its focusing on adaptation strategies employed by rural women small holder farmers to climate change, this rules out the generalisation of climate effects on women and has a precise scope of rural women in the most remote part of Zimbabwe.

## 1.8 Limitations

- **Financial constraints –** the researcher is likely to be limited financially since she is not working and yet is expected to fund transport costs back and forth the area of research. However, to cover the issue of funding the researcher is going to relay with parents to assist her financially embark on personal savings too.
- **Time frame-** considering the fact that the dissertation is not the only requirement expected of the student, there arises a problem of limited timeframe of carrying out the study. However, the researcher is going to effectively resort to the weekends to travel to the area of study (Chayamiti)
- **Lack of fixed transport to and from area of study-** first and foremost there is no straight bus from almost all CBDs to Chayamiti. The one and only bus to Chayamiti is found in Mutare and it has no fixed timetable of arrival and departure. Therefore, this means that a researcher has to travel from home town to Mutare to catch the one bus and if the researcher is left by the only bus then she will be stuck in Mutare. However, in dealing with this problem, the researcher has to ensure that she acquires the bus driver's contact number, communicates and keeps in touch with the driver so as to avoid being left behind.

## Organisation of the Dissertation

- Chapter 1 provides the introduction and background of the study and the objectives investigated in this study.
- Chapter 2 reviews the literature surrounding adaptation to climate change and variability.
- Chapter 3 explores the methodology of the research used to collect and analyse data relevant to this study.

- Chapter 4 presents results on the impacts of climate shocks on women farmers' operations and their adaptation strategies in the face of climate change and variability in Chayamiti.
- Chapter 5 presents recommendations and conclusion of the study.

**Chapter summary**

The study focused on introducing the research topic by briefly describing the projections of climate change and their impacts on human systems hence the increasing need for effective adaptation strategies to climate shocks. This has been brought out through: the background of the study, general and specific research questions and objectives; significance, delimitations, limitations, problem statement of the study, brief definition of key terms, lastly, this chapter outlined the structure through which the research is going to be organised in.

## CHAPTER 2:LITERATURE REVIEW

The purpose of this chapter is to address the knowledge gap that exists in the climate change and variability discourse by giving a comprehensive analysis of the effectiveness of adaptation strategies employed by rural women smallholder farmers in dealing with climate shocks and this is going to be made possible through the inclusion of: conceptualisation of key terms, theoretical framework of this study, clear projection of the causes, impacts and evidence of climate change and variability in both developed and developing countries downscaling to the study area(Chayamiti).

### 2.1 Conceptualisation of key terms and definitions

- Climate alludes to the description of the long-term patterns of weather in a particular area (NASA, 2005). Other scientists have defined climate as the average weather for a particular region and time frame, in most cases taken over 30-years. According to NASA (2005), "when scientists relate to climate, they're mainly focusing on the averages of precipitation, temperature, humidity, sunshine, wind velocity, and other measures of weather that takes place over a long period at a particular place". For instance, after looking at rain gauge data, lake and reservoir levels, and satellite data, scientists can tell if during summer, an area was drier than average (NASA, 2005), if the area continues to be drier than normal over the course of many summers, then this would indicate a change in the climate.
- Climate change refers to long term trends in climate averages such as global warming that has been observed over the past century and long term changes in variability (Grains Research and Development Corporation, 2008-2013). The Intergovernmental Panel on Climate Change (IPCC, 2001) defines climate change as any change in climate over time,

whether due to natural variability or anthropogenic activities which in turn lead to increase in extreme weather events melting of icebergs, sea level rise etc.

- Climate variability is defined as the state or degree of being variable or changeable (H. Mifflin p.200). Adding on, the Grains Research and Development Corporation (2008-2013) refers to climate variability to shorter term variations (daily, seasonal, annual, inter annual, several years) in climate. Climate variability alludes to variation in the mean state of the climate on all temporal and spatial skills beyond that of individual weather events (IPCC, 2001).
- Smallholder farmers are defined as those marginal and sub-marginal households that own or cultivate less than 20 hectares of land and constitute 78% of the country's farmers (WIEGO, 2013). More so, smallholder farmers are categorised as rural producers predominantly in developing countries who farm using mainly family labour and for whom the farm provides the principal source of income (J.Morton, 2007).
- Adaptation refers to consciously planned adjustments in a system to reduce, moderate or take advantage of the expected negative impacts of climate change (Smit, Burton, Klein and Wandel, 2000). Also, adaptation is the process through which societies increase their ability to cope with uncertain future, which involves taking appropriate action and making the adjustments and changes to reduce the negative impacts of climate change (UNFCCC, 2007). Rennie and Singh (1996) view adaptive strategies as ways in which local individuals, households and communities have changed their mix of productive activities, and modified their community rules and institutions in response to vulnerabilities, in order to meet their livelihood needs. Adaptation can also refer to the process that leads to a

reduction in harm or risk of harm associated with climate variability and climate change (UKCIP, 2003).

- Effectiveness is defined as producing a desired effect by Merriam-Webster whilst Oxford Dictionary refers to the term as the degree to which something is successful in producing a desired result; success.

## 2.2 Theoretical Framework

This study is going to use the theory of ecofeminism that was proposed by Vandana Shiva. According to Vandana (1993), "ecofeminism is an activist movement that establishes connections between the domination of nature and the exploitation of women". Furthermore, the theory confirms a connection between the exploitation and degradation of the natural world and the subordination and oppression of women. Vandana Shiva (2014, p.164) argues that there exists an intrinsic relationship between the marginalization of women and the destruction of biodiversity by way of describing the commonality of gendered and environmental oppression. Therefore, the ecofeminism theory is relevant and applicable to this research as it hints on the increased need for adaptation by women to climate change and variability.

According to recent studies, it has been fairly recognised that women are mostly prone to adverse impacts of climate change and variability in comparison to men owing much to the existing gender inequalities. Gender inequalities refer to women and men having different roles, knowledge, rights, resources and time to adapt to climate change and climate variability (Cannon, 2002; Nelson et al, 2002; Denton, 2004; FAO, 2005, Babagura, 2010, Petrie, 2010). Furthermore, FAO (2007) has noted that women constitute the poor populations hence their relative reliance on climate-sensitive livelihoods thus validating the ecofeminism theory. Moving on, the theory views women as victims

of climate change as they are placed in disadvantaged position of increased role burden whereby they are forced to depend less on the natural resource base which is fast deteriorating and forced to source out other livelihood options. In the view of Davidson et al. cited in Boko et al (2007, p.457), women's perceptions of risks also tend to be awarded less attention than those of their male counterparts. Some of the premises of ecofeminism include the assumption that women and nature are one hence the holistic relationship between women and nature is established on the theme of "web of life".

### 2.3 Overview of climate change in both the developing and the developed countries

According to Peter Hoppe (2011), global warming will increase the variability of weather and most likely result in more extreme weather events. The Munich Re NatCatSERVICE (2010) data has proved an extremely magnified trend of climate variability and change in the last 30 years. Furthermore, Germanwatch Climate Risk Index (2003), which has the mandate of ranking countries according to their extreme weather risks, shows that all countries in the top 10 of this index are developing countries, with Bangladesh at the top of the hierarchy. Also, studies have shown that 95% of fatalities from natural disasters in the last 25 years occurred in developing countries. Moreover, indices characterizing the expected range of future changes of climate like the Climate Change Index (Baettig et al., 2007) vividly prove that in many developing countries these changes will be mostly magnified.

Furthermore, recent studies have currently postulated that agricultural producers located in developing economies are typically operating far below their potential productive capacity. As alluded by FAO (2007), the developing world already contends with chronic food problems.

Estimates suggest that this situation has potential of becoming critical: close to 11 % of arable land in developing countries could be affected by climate change, leading to chronic a reduction of cereal production in an average of 65 countries, and decline of 16 % of GDP in some instances (Christensen et al. (2007); IPCC (2007); Ruosteenoja et al (2003).

***Table 1: Summary of the most important projected impacts of climate change on the different sectors in developing countries***

IPCC 2007 report :

**Table 1 Summary of the most important projected impacts of climate change on the different sectors in developing countries.**

| | Africa | Asia | Latin America |
|---|---|---|---|
| **Water** | o More frequent droughts, especially in Southern Africa<br>o More frequent low water storage in reservoirs and lakes<br>o Reduced run-off in Northern and Southern Africa; increased run-off in East Africa<br>o More frequent floods, especially in East Africa<br>o Increased water stress due to both climate change and increased demand<br>o Increased water scarcity could trigger more conflicts | o Disappearing glaciers reduce summer streamflow of most large rivers affecting more than one billion people<br>o Snowmelt earlier in the season will increase risk of spring floods<br>o Increased water shortages during the dry season in South and East Asia<br>o higher flood risks during the monsoon season in South East Asia and the Indian subcontinent<br>o Likely increase of water stress due to a combination of increased population growth, higher per capita water demands and climate change. | o Rapid increase of number of people affected by water stress due to a combination of climate change and increased demand. By 2050, between 60 and 150 million people will experience water stress.<br>o re-treat of glaciers and reduction in mountain ice and snow cover will severely reduce water availability in some countries.<br>o By 2030, 60% of the people in Peru will experience reduced water availability due to disappearing glaciers<br>o In Chile the delivery of water to several coastal cities could be comprised in the near future due to melting snow packs and disappearing glaciers.<br>o Reduced hydropower generation capacity<br>o The combined effect of land clearing and more intense rainfall events is likely to increase the number of landslides.<br>o More frequent and intense cyclones will increase the number and severity of floods in Central America |
| **Agriculture** | o Severe impact on food production and security<br>o Agriculture in several marginal semi-arid regions will become unsustainable<br>o Increased poverty of small scale farmers<br>o Small increases in productivity in regions with mild climate change where rainfall is increasing<br>o Changing season will make agriculture more difficult, e.g. changed sowing dates due to later or earlier start of wet season<br>o Less predictable water availability will make nomadic agriculture more difficult | o Increased climate variability will generally increase the number of crop failures due to either floods or droughts.<br>o In areas where rainfall is predicted to increase agricultural production is likely to improve.<br>o Irrigated agriculture which depends on run-off from snowmelt and/or glaciers is likely to be affected; snow will melt earlier in the season which will reduce water availability during the (late) summer when irrigation is most needed.<br>o Agricultural production in low lying coastal areas such as large parts of Bangladesh will be affected by increased flooding and salt water intrusion.<br>o Likely increase of diseases and pests affecting both plant and animal production systems. | o Reduced yield of annual crops such as wheat, maize, rice and soybean in several regions due to higher temperatures and shorter growing seasons.<br>o In some regions such as central Argentina wheat yields could increase due to more precipitation.<br>o Regions most suitable for coffee production will move to a different location; coffee yields and quality are likely to change already with small temperature increases (1-2°C).<br>o Specifically coffee but also other crops are likely to be affected by more diseases and pests.<br>o Disappearing glaciers and reduced snow melt is likely to reduce water availability for irrigation.<br>o Likely increased land degradation and salinisation in the drier part of the continent |

***Table 2: climate impacts on southern regions***

| | Sub-Saharan Africa | Latin America | South Asia | South-East Asia |
|---|---|---|---|---|
| **Temperature** | Temperatures to increase by 3–7° C by 2080–2099. | Temperatures to increase by 1–7.5° C by 2070–2099. | Temperatures to increase by 2.3–4.5° C by 2070–2099. | Temperatures to increase by 2–3.8° C by 2070–2099. |
| **Precipitation** | Precipitation to decrease by up to 30–40% in most parts of southern Africa, but to increase by 7% in tropical and eastern regions by 2080–2099. | Precipitation to change by up to -40% to +12% by 2080. | Precipitation to increase by 10–17% by 2070–2099. | Precipitation to increase by 3–8% by 2070–2099. |
| **Agriculture** | Rain-fed cereal (wheat, maize, rice) production to decrease by 12% (net loss) by 2080, with great regional variations. | Overall grain yields to change by between -30% to +5% by 2080. For example, rain-fed wheat production is to decrease by 12–27% by 2080. | Net cereal production to decrease by at least 4–10%. For example, rain-fed wheat production is to decrease by 20–75% by 2080. | Overall cereal production to increase by up to 30%, but rain-fed wheat production is to decrease by 10–95% by 2080. |

Sources: Christensen et al. (2007); IPCC (2007); Ruosteenoja et al. (2003).

With the above estimates of climate change and variability, one can come to terms with the comment that adaptation to climate shocks requires that farmers notice first the changes in climate and then identify useful adaptation strategies and implement them (Maddison, 2006). In support of this comment is Cegbe (2011), who notes that monitoring and evaluating the effectiveness of adaptation strategies as well as sharing knowledge and lessons learnt, are of critical aspects of the whole process hence the research on the effectiveness of adaptation strategies to climate shocks is increasingly necessary in light of the current statistics on the adverse impacts of climate change and variability.

This research is of valid importance as it compliments previous studies that have proved beyond reasonable doubt that without adapting to adverse climate and variability impacts, female farmers and agricultural production will be severely affected. Previous studies on climate change and

variability have reported that farmer's adaptation to climate shocks is largely based on their ability to access credit markets, access to farming experience, level o education, age, gender, farm income and farm size (Deressa et al., 2011, Gbetiboruo, 2009, Nhemachena and Hassan, 2007). Vermeulan and Wynter (2014) have examined that all over the world, "it is possible to take 3 categories of rural people and observe a high degree of overlap between them: the poor, the food insecure and smallholders". This means that, this research is necessary to unveil the adaptation measures employed by the rural poor (particularly women) in the face of climate vagaries.

Moving on, CTA (2008) has associated climate change and variability as having direct negative impacts on food security as a result of spatial redistribution of pests, erratic rainfall patterns, intense heat waves, rising in sea levels, unpredictable seasons, and altered precipitation patterns amongst other factors. In support of that view is the assertion that most of the African countries have agro based economies thereby are the most susceptible to the adverse changes in the climate as it is likely to impact negatively on the majority of the population (www.ceep.za/climate-change/index.html). Therefore, this research is bent on projecting the need for adaptation and its effectiveness in response to climate variability shocks and extreme weather events such as drought in assisting farmers to achieve their food, income and livelihood security objectives (Kandlinkar and Risbey, 2000).

In a study carried out by John Morton in 2007, he came up with many smallholder farmers' strategies for adaptation in the face of climate shocks and he mentioned that African pastoralism has evolved in adaptation to harsh environments with very high spatial and temporal variability of rainfall. In his study, he reviewed several recent studies on Northern Kenya and Southern Ethiopia that have focused on the coping strategies used by pastoralists during recent severe droughts and the longer-term adaptations that underlie them. Apparently, Morton (2007) is of the belief that

features of dry land livelihoods in Africa and elsewhere can be recognised as adaptive strategies to climate variability. For instance, Mortimore and Adams (2002) from Northern Nigeria, mentions five major elements of adaptation and two of them are presented here; a) diversification of livelihoods and b) water harvesting. Consequently, the above research falls in line with mine in the view of the empirical findings on adaptation strategies employed by smallholder farmers, however, it lacks in terms of knowledge as it fails to address the effectiveness of the adaptation strategies employed by smallholder farmers. Therefore, it's the work of this research to engage in a study on the effectiveness of adaptation strategies in Chayamiti.

Furthermore, despite the rich literature on the impacts of climate change and variability, scholars have tended to develop a biased attitude towards smallholder farmers by generalising impacts forgetting that climate shocks affect people disproportionately in different areas. A successful adaptation process will require adequately addressing the underlying causes of vulnerability: this is the role that development has to play (Lisa and Shipper, 2007). This research is valid in that it focuses specifically on rural women smallholder farmers' adaptation strategies as there has been a 'strange silence' on the effectiveness of the adaptation mechanisms of women in the face of climate change and variability. This research claims that women seem to suffer more from the adverse impacts of climate change and variability mainly because of their household responsibilities, for instance, Wichterich (2004) is in support of this view as she states that water is a prerequisite for women to be able to supply private households with firewood, drinking water, and animal feed. Tery (2009) hypothesise the notion that the ultimate losses of farm income are most likely to have adverse effects on the livelihoods of female labourers and smallholders, which will be magnified by their low social status and level of education.

This research, on the analysis of adaptation strategies to particular climate changes, seem to be the most appropriate and responsive way for smallholder farmers to cope with the adverse impacts of climate change as it is having the potential of transmitting the outcome of the farmers' perception on climate change. Recently, a study by International Conference of Sabaragamuwa University of Sri Lanka (2015), has argued that, "the adverse impacts of climate change on agricultural production could be minimized by application of suitable and relevant adaptation strategies and these include the introduction of micro irrigation, changing planting dates, reduction of irrigation depth and crop diversification". Several studies propose that changing planting time to suit rainfall variability and introduction of micro irrigation are the best adaptive methods to minimize the negative impacts of climate change hence there is a hint on effectiveness of adaptation strategies. However, the above study differs from mine as the area of study was Sri Lanka whereas this research is going to take place in Chayamiti, this further goes on to prove that the methods of adaptation that may prove to be applicable in Sri Lanka might fail to be of relevance in Chayamiti hence the uniqueness of the study in question.

According to UNAIDS (2009), women are said to bear the brunt of climate changes and variability simply because they dominate the agricultural sector and lack control over their lives in access to many opportunities that generate income. Hence, they are more prone and more likely to see their poverty status increase. In addition to that, FAO (2008) also highlighted that sometimes, due to poor health, women may not be able to produce enough to feed everyone in the family, therefore they usually eat last, after men and boys; emphasising on the issue of food security for women. Again, Below et al., (2000) identifies 104 different adaption practices broadly categorised into farm management and technology, farm financial management, diversification of farm and off-

farm activities; government interventions in infrastructure, health and risk reduction and knowledge management networks and governance (Osbahr et al., (2010))

In Varaidzo Dongozi's writings on women and climate change (2010), she quoted Betty Nhachi, a founding member of Women in Sustainable Development (WSD), a newly formed organisation which seeks to educate women and promote their participation in relation to the impacts of climate shocks, "*The tragedy is that, as women we face more agro-focused challenges, women's roles will be more pivotal in coming up with solutions to this problem, yet they continue to be side-lined*". Recent studies have highlighted that women have been Africa's farmers and custodians of farming knowledge, their experience passed on from generation to generation hence making this study relevant in assessing the effectiveness of adaptation strategies of rural women smallholder farmers' specifically focusing on Chayamiti as the study area. Adaptation to climate change and variability is relevant for rural developing countries, where societies are already struggling to meet the challenges posed by existing climate variability (Yamin, 2005; Adger et al., 2003; Handmer, 2003; Kates, 2000; Watson and Ackerman, 2000), and are therefore expected to be the most adversely affected by climate change (McCarthy et al, 2001).

**2.4 Summary**

The review of literature in this chapter has provided direction of focus for this research through providing a conceptualisation framework and theoretical framework to be used throughout the compilation of this study. With the way climate change has gained momentum in the ranks of the global challenges, adaptation has fast become a necessary strategy for responding to both climate change and variability; scholarly work on adaptation so far has focused on addressing the underlying causes of vulnerability to climate change and variability rather than sufficiently assess

the effectiveness of adaptation strategies to the impacts of climate change and variability. This work results from research aimed at examining the effectiveness of the adaptation strategies employed by rural women smallholder farmers in Chayamiti (study area) towards climate change and variability.

# CHAPTER 3: RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter comprises of the research methodology (both qualitative and quantitative) used in the process of gathering data and interpreting the collected data. In this light, the researcher outlines the data sources (both primary and secondary) used for the purposes of this research, the study population, sampling techniques relevant in the selection of the participants in the research; the selection of the sample size, tools of data collection used (in-depth interviews, semi-structured interviews, observations by the researcher and focus group discussions), data analysis and the ethical considerations of the research topic under investigation.

## 3.2 Research design

In order to respond to the objectives of the research topic, a mixed research method (qualitative and quantitative) was used. Mixed methods refers to an emergent methodology of research that facilitates the integration of quantitative and qualitative data within a single investigation (Creswell & Plano, 2011). The quantitative and qualitative were mixed together to improve reliability and validity of the collected data, also, to obtain a magnified understanding of the adaptation strategies used by women in the face of climate shocks hence assess effectiveness of the adaptation strategies.

### 3.2.1 Qualitative Research Method

Qualitative research offers a complete detailed description and analysis of the topic under research, without limiting the scope of the research and the nature of participant's responses (Collis & Hussey, 2003) and also the researcher does not decide the number of respondents in advance but continues to select additional cases till the point of data saturation is reached. A data collection

process which requires limited numbers of respondents, a data collection process which can be carried out with limited resources. On the other hand, the effectiveness of qualitative research is heavily based on the skills and abilities of researchers, while the outcomes may not be perceived as reliable, because they mostly come from researcher's personal judgments and interpretations (Creswell, 2009). Because it is more appropriate for small samples, it is also risky for the results of qualitative research to be perceived as reflecting the opinions of a wider population (Bell, 2005). According to Creswell (2009), qualitative data analysis is conducted concurrently by way of gathering data, interpreting it and writing reports about the collected data.

### 3.2.2 Quantitative Research Method

Quantitative research method mainly uses numerical analysis to reduce data into numbers or percentages (Panel, 2009). This method uses close-ended questions on quantifiable aspects such as those who are married or not. Consequently, this study employed quantitative method to compare responses across participants as respondents were asked identical questions in the same order to allow for significant comparison and sampling of responses.

## 3.3 Data Sources

This research relied on both primary and secondary sources in the collection of relevant data. Primary data is defined as data gathered before being included in the needs assessment and has not undergone analysis (Oliveira, 1993). Primary data in this study was collected through face to face interviews, focus discussions with members of the affected community and observations by the researcher, but can also be gathered through phone interviews, radio communication, email exchange, and direct observation. Primary data was collected from the female farmers under within

the sampling size, key informants such as medical practitioners from the local clinic, and agricultural extension officers' accounts of their experiences of direct and indirect climate shocks. The study also employed secondary sources in coming up with appropriate and relevant data. Secondary data was collected from relevant documents from the agricultural extension officers in Chayamiti, as well as other relevant studies conducted in the country. Therefore, the collaboration of primary and secondary sources in this research was necessary to cover every aspect of the study objectives.

### 3.4 Data collection tools

In-depth and semi-structured interviews

Interviews are a systematic way of acquiring data from participants through way of dialogues or conversations (http://www.who.int). Kvale (1996, p.14) views interviews as "an interchange of views between two or more people on a topic of mutual interest". In -depth interviews aim at identifying emotions, feelings, and opinions of the participants regarding a specific research subject. Again, the use of in-depth interview questionnaires was very important in the collection of data for this study in that it had the ability of acquiring richer information as it gave the respondents the freedom to express their ideas, perceptions, and emotions without restraint. This research also used the method of semi-structured interviews in collecting data. The main advantage of semi-structured interviews is that they create a platform for dialogue and interaction between the interviewer and the interviewee through personal and direct contact hence eliminating non-response rates (Fisher, 2005, Wilson, 2003). Furthermore, several studies have indicated that semi-structured interviews offer flexibility in terms of the flow of the interview, thereby leaving room

for the generation of conclusions that were not initially meant to be derived regarding a research subject. On the other hand, there is the risk that the interview may deviate from the pre-specified research aims and objectives (Gill & Johnson, 2002). In light of this, specific questions were drafted for the purposes of guiding the researcher towards the satisfaction of research objectives.

### 3.4.2 Observation

Observation method entails the process of systematically choosing, watching and recording characteristics and behaviour of living beings. Direct observation (participant observation), is a strategy of collecting data on naturally occurring behaviour within the study context. This is mainly achieved by way of observing conditions and specific features of an affected site from a range of viewpoints and locations to provide an overall view of the affected area and by noting these observations in a checklist. Observation can include information provided by affected persons through key informant interviews of community/focus group discussions.

### 3.4.3 Focus group discussions (FGDs)

Focus group discussions are efficient in identifying the cultural norms and understanding the issues of concern within groups or sub groups in an affected population which affect community response to a disaster and use of coping mechanisms by those community members (Oliveira, 1998). A focus group discussion is a group discussion with people of similar experiences and backgrounds, usually gender (Morgan, 1988). Data collected from a Focus group discussion enables analysis and understanding of the topic under research (Hawkins, 1993). FGDs have been effective in exploring and providing an insight into different opinions pertaining to adaptation strategies in the context of climate change and variability impacts on women farmers operations in Chayamiti.

### 3.5 Sampling

For the purposes of this research, the method of purposive sampling was employed to develop the sample of the research under discussion. This method falls under the non-probability sampling techniques and is the most appropriate for the research design as sample members are selected basing on their knowledge and expertise regarding a research subject (Freedman et al., 2007). In the study, the sample members who were selected had special relationship with the topic under investigation and had very relevant experience in the field of climate change.

### 3.6 The study population

Burns and Grove (1993: 779), defines a population as all elements (individuals, objects and events) that meet the sample criteria for inclusion in a research. Mouton (1996:132) defines a sample as elements selected with the intention of finding out something about the total population from which they are taken. A convenient sample consists of subjects included in the study because they happen to be in the right place at the right time (Polit & Hungler 1993:176). The sample size of 30 Chayamiti women smallholder farmers was willing to participate in the research during the period of data collection.

### 3.7 Ethical considerations

The study was guided by certain ethical issues, for instance, participants were informed of the study objectives and reassured that their responses were treated as confidential and used only for academic purposes by the researcher. The Belmont Report constitutes the core principles that guided this research:

- *Respect for participants* requires a commitment to ensuring the autonomy of research participants, and, where autonomy may be diminished; to protect people from exploitation

of their vulnerability. Burns and Grove (1993:776) define informed consent as the prospective subject's agreement to participate voluntarily in a study. The dignity of all research participants must be respected. Adherence to this principle ensures that people will not be used simply as a means to achieve research objectives.

- *Beneficence* requires a commitment to minimizing the risks associated with research, including psychological and social risks, and maximizing the benefits that accrue to research participants.
- *Justice* requires a commitment to ensuring a fair distribution of the risks and benefits resulting from research. Those who take on the burdens of research participation should share in the benefits of the knowledge gained. Or, to put it another way, the people who are expected to benefit from the knowledge should be the ones who are asked to participate. In addition to these established principles, some bioethicists have suggested that a fourth principle,
- *Respect for communities* should be added. Respect for communities "confers on the researcher an obligation to respect the values and interests of the community in research and, wherever possible, to protect the community from harm."2 We believe that this principle is, in fact, fundamental for research when community-wide knowledge, values, and relationships are critical to research success and may in turn be affected by the research process or its outcomes.

### 3.8 Conclusion

This chapter outlined the research methodology, study population, sample, data collection tools, data analysis, research design as well as the ethical standards of the study. The researcher used an integrated approach which is a mixture of quantitative and qualitative research methods in the

collection of data. The researcher was aided by a semi-structured interview guide, observations and focus group discussions in collecting data from a convenient sample of 20 participants. The interviews had both closed and open-ended questions.

# CHAPTER 4: DATA PRESENTATION AND ANALYSIS

## 4.0 Introduction

Data was collected through fieldwork whereby, the researcher visited Chayamiti area to capture the voices and sentiments of women farmers in relation to adaptation to climate change and variability; also, there was conduction of semi-structured interviews and focus group discussions facilitated by the researcher. The data collected by the researcher was analysed using the past and present situational analysis. As postulated by Saunders (2007), after data has been collected, it must be presented in a manner that simplifies the information so that conclusions can be drawn from the findings. Data was collected through field observations where personal interviews were carried out, a technique that enables local people to make their own appraisal and analysis. An assessment was carried out to verify the degree of the impacts of climate vagaries on women smallholder farmers and the adaptation measures they have employed in this climate change scenario and the study findings are presented in the form of tables, graphs and direct quotes of the respondents.

## 4.1 Impacts of climate change and variability on women smallholder farmers' operations in Chayamiti

Due to the magnitude and frequency of extreme weather events such as droughts and heat waves emanating from climate change and variability in the area, women smallholder farmers in Chayamiti are experiencing many hardships. These include reduced water availability, which negatively affects the health of women and children and also poses a threat to food security. Particularly in Chayamiti, where livelihood choices are limited, a decrease in crop yields has threatened famines. According to United Nations Development Program (2012), "women form a disproportionately large share of the poor in countries all over the world". Similarly, women

smallholder farmers in Chayamiti face historical disadvantages that include lack of access to decision making fora and economic assets and this is further compounded by the impacts of climate change and variability (FGD findings). Study findings have discovered that 98% of women small holder farmers in Chayamiti agree to experiencing climatic conditions over the last 10 years and commonly observed climatic trends included higher temperatures (reported by 95%, lower rainfall reported by 94%, more variable rain reported by 95% and greater variability in seasons reported by 89%). Detrimental impacts of climate change are currently being experienced in Chayamiti, as reflected in the following climate sensitive sectors; agriculture and food security; water resources, biodiversity, migration patterns, human health, energy. This study seeks to assess the aspects of vulnerability which include the element of exposure or susceptibility of women to climate shocks. According to IPCC (2007), "it is estimated that rain fed agriculture will reduce by 50% by the year of 2020, whilst cereal production will decrease by 50% by the year 2080". According to the World Bank (2011), "The agriculture sector is the backbone of most economies of developing countries with 70% of rural women in sub Saharan Africa as subsistence small holder farmers". Climate change and variability has acute impacts in mainly four dimensions of food security which are; food availability, food accessibility, food utilization and food systems stability (FAO, 2011). However, observation by the researcher confirmed that all the four dimensions of food security are now a fantasy that is never going to materialize into reality in Chayamiti. This is mainly because of the acute negative impacts that climate change and variability have had on agriculture since the last decade.

Chayamiti women small holder farmers indicated changes reflected in erratic rainfall patterns, rising temperatures and incidences of extreme weather events such as droughts and heat waves. Currently the decline in rainfall quantities is leading to an increase in temperatures hence

negatively affecting the bulk of crop production. Stella Makuidze (43) during an interview session with the researcher stressed out that, *"for several years in a row, harvests have declined and a decrease in yields is now prevalent in Chayamiti as a result of poor rains".* In agreement with Stella was Marvellous Nzou, who testified that, "*I never thought that one day I would have to buy grains as a result of bad harvests".* Currently, women farmers in Chayamiti constitute 70-80% of all food production and in the context of climate change and variability; traditional food sources have become more unpredictable and scarce. Hence women farmers are the biggest losers of income as well as harvests. The researcher interviewed Esther Mukabaya (a 58 year old farmer) who confirmed to being the biggest loser in the face of climate change and variability throughout her farming operations. She claimed that, *"farming has shifted from being my primary source of income and food mainly because temperatures have increased and yields have decreased. Ten years ago, I could afford to send my children to school using cash accrued from selling maize, but these days, agriculture is just no longer a stable source for livelihood for me."*

It is estimated that annual rainfall levels in sub Saharan Africa are expected to decline by 60% by the year 2050 (Agrawall ,2012). Roseau and Vincent (2012) have noted that women in sub Saharan Africa spend 154 minutes of average fetching water and this is most likely to increase by the year 2080. This has been echoed in the statement of one respondent, *"of lately, Chayamiti area has been experiencing a continuous reduction in rainfall, and only in 2010 did we receive excessive rainfall".* In this context, the persistent water stress has perpetuated the drying up of rivers and waterways in Chayamiti as exemplified by the drying up of the *Kikunu* and *Mashanganiswa* rivers in the area. As a result, the study findings revealed that Chayamiti women farmers have less time to fulfil their domestic chores or responsibilities, to earn money through diversification of livelihood skills, to engage in politics or any other public activities such as to read, let alone to

simply rest, this further exacerbates the cycle of disempowerment among women in Chayamiti. Women have to travel long distances in search for water as confirmed by Mrs. Mishanga, *"the nearest source of water is 500m from where I stay and at times women queue for hours just to fetch one bucket of water".*

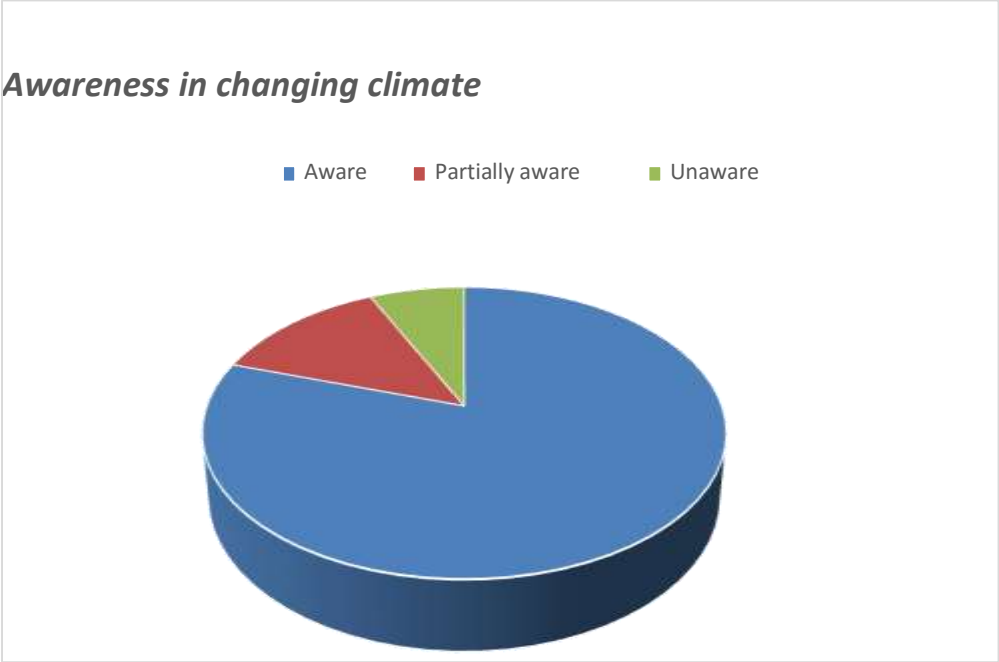
Consequently, study findings indicated that low water supplies and the destruction of forests are leading to the decrease in energy supply in Chayamiti area (specifically ward 2). To this end, wood, charcoal, and dung are major energy sources, with climate change, however, depletion in the energy sources will be realized. This increases women's' reproductive burden of sourcing energy for cooking or heating. It thus follows that, as a result of their household responsibilities which include water fetching, food and energy for cooking, women small holder farmers in Chayamiti are highly dependent on the natural resource base for their livelihoods. In this context, *"the impacts of climate change and variability makes it difficult to secure these resources,"* highlighted one respondent.

Moreover, in Chayamiti, deforestation has meant that wood (the mostly commonly used solid fuel) is found 3 or more kilometres away from where people stay (direct observations by the researcher). According to the Millennium Ecosystem Assessment (2014), climate change and variability are likely to become the chief contributors to the loss of biodiversity by the end of century and according to the researcher's observations, this statement is already being echoed in Chayamiti, as women farmers are currently suffering from declining natural resource quality and quantity. This spells a sign of hardships for women since they are responsible for the collection of traditional fuels which is a physically strenuous and demanding job that takes more than 20 hours per week, according to the observations made by the researcher.

Muller et al (2011) noted that among the reasons for increasing rates of migration are desertification and extreme weather events. While men are most likely to migrate to areas where they can undertake off farm activities, they leave women behind to become defacto house hold heads. In essence, migration is more detrimental to women than men in Africa, primarily because when coupled with unequal access to decision making fora and to resources, Chayamiti women small holder farmers are victims to limited mobility and this places them in a position where they are disproportionately affected by climate vagaries. Consequently, climate change makes women victims of vulnerability through the out-migration of males as it increases the work load of women (Chindarkar, 2012); and more conflicts over natural resources (Omolo, 2011).

Study findings have shown also that increases in malaria and typhoid are most likely to be realized, this follows that, the reproductive role burden of taking care of the sick on the part of women also increases. The study of Chayamiti has shown that ward 2 (a previously non malaria zone) has currently come to be known as a malaria infested zone. The Chayamiti local agricultural extension officers have attributed the increase in the transmission of malaria in ward 2 of Chayamiti by 8% to the rise in temperatures, increase in humidity and rising temperatures asserting that the variation in climate change are responsible for that. Again, the sister-in-charge of the local Chayamiti clinic participated in the research as a key informant and indicated that, *"malaria and diarrhoea cases have been on the rise by 12% from the beginning of 2013 to present, mainly as a result of rising temperatures and heat waves and this leads to increased suffering of women and children population leading to human related costs"*.

***Figure 1: results of women farmers aware of the changes in climate.***




According to the interviews carried out by the researcher, a number of women farmers have observed changes in the rainfall sequence noting that, *"rain used to be frequent but now it is no longer predictable"* (Fiona FGD, 2017). The interviews carried out with women small holder farmers revealed that out of the 30 women small holder farmers interviewed, 24 (80%) attested to lack of rain leading to decline in yields, 4 (13%) presented the impact was considerably average and 2 (7%) viewed it was minimal. From the focus group discussions, women farmers in Chayamiti indicated that they have been experiencing devastating changes in the rainfall patterns for the past 10 years and that they have devised several adaptation strategies among one of which is water harvesting.

Women farmers in Chayamiti talked of the delay in planting and harvesting dates of the maize crops emphasizing that lately, planting depends on the availability of rain unlike in the past when

the planting period was fixed and well known. The negative impacts of climate change and variability are felt by women farmers primarily in the "timing, frequency, magnitude and intensity of erratic rainfall patterns" (Blignaut et al, 2009). The intrinsic negative relationship between temperature and precipitation implies that rain-fed crop production and livestock keeping suffer the most as a result of changes and variability in climate. The interviews were inclusive of questions regarding changes in temperature and rainfall. In this context, Chayamiti women farmers and livestock keepers have observed how negatively these changes impact on crop growth and animal feed.

***Table 3: impacts of climate change and variability on female smallholder farmers***

| **Years of extreme events** | **Type of weather event** | **accounts of interviewed women farmers who were negatively affected** |
|---|---|---|
| 1998 | flood | -loss of lives for both humans and animals, destruction of infrastructure, destitution |
| 2008 | Rise in temperatures | -water scarcity, wilting of crops hence loss of income |
| 2010 | Lack of rainfall | -food shortages, decline in agriculture |
| 2013 | Drought | -resource based conflicts e.g. pastures, death of farm animals |
| 2015 | Heat waves | -health problems e.g. malaria, heatstroke |
| 2016 | Erratic rainfall patterns | -decrease in yields, increased water burden, de-schooling of children |

There were 30 personal interviews carried out with women small holder famers and 5 with key informants in the study area by the researcher. Consequently, most farmers who were interviewed have lived in the area for more than 20 years. The age ranged from 30 to 60 years old and out of the 30 women farmers that were interviewed, 18 households were women headed. As identified by the research, the moderate size of the family of each household was about 5 to 9 people and 88% of women farmers interviewed had directly experienced extreme weather events like droughts, and 12% of women farmers had not directly experienced the weather events but had just become victims to the impacts by virtue of marriage to Chayamiti male residents.

More so, Chayamiti women smallholder farmers, through focal group discussions went further to indicate that rain has become unpredictable, thus making it difficult for them to make farming plans and arrangements. Marita Zhongwe gave an illustration of a severe drought that had an impact on her agricultural activities indicating that, "*the drought was very detrimental to all of my maize cobs, instead of me getting the usual 40 bags or more of maize, I got not more than 10 and it was really devastating in 2013"*. A majority of the interviewed female farmers agreed to having experienced extreme events in the years such as 1998, 2008, 2010, 2013, 2015 and 2016.

### 4.2 Adaptation Strategies employed by female farmers in the face of climate change and their effectiveness

According to Osbahr et al (2010), "Successful adaptive strategies are those that encourage system resilience and sustain collective action," he goes on further to state that these adaptive strategies either bear positive or negative impacts for communities. Farming adaptation activities are put into clusters that help determine their effectiveness (Below et al., 2010) and these are: farm management and technology; farm financial management; diversification on and beyond the farm; government interventions in health, risk reduction and infrastructure; and knowledge management,

networks and governance. Consequently, in Chayamiti, a number of adaptive strategies have been employed by women small holder farmers in the face of climate change and variability; these ranged from planting new crops, intercropping, water harvesting to changes of farm size and changes in planting time .

***Table 4: results of women farmers' adaptation to climate shocks***

| **Adaptation strategy** | **Yes** | **Percent %** | **No** | **Percent %** |
|---|---|---|---|---|
| Water harvesting | 25 | 83 | 5 | 17 |
| Crop diversification | 17 | 57 | 13 | 43 |
| Change in farm size | 28 | 93 | 2 | 7 |
| Commercialization of fruits | 13 | 43 | 17 | 57 |
| Changes in planting time | 16 | 53 | 14 | 47 |
| Drought resistant crops | 18 | 60 | 12 | 40 |
| Intercropping | 26 | 87 | 4 | 13 |
| Government aid | 16 | 53 | 14 | 47 |
| Food for work | 10 | 33 | 20 | 67 |

- Intercropping

The study identified intercropping as one of the adaptive strategies used by women farmers in dealing with climate shocks. Female farmers in Chayamiti have highlighted that they grow maize together with various legume crops like sorghum and groundnuts *(nzungu).* According to one respondent, *"When we intend to mix crops in one farm, we grow for instance, one row of maize*

*and one of legumes, or one of maize and two of legumes, then one row of maize".* Miss Maunganidze, during a focus group discussion complemented the intercropping strategy by indicating that *"if maize production is affected, we can rely on the growth of legumes with a lower water requirement, for earnings".* From the observation made by the researcher, intercropping allowed female farmer households in Chayamiti to use their land optimally by taking different crops at one time for instance maize and beans (for early maturity), maize and sorghum (in cases of low rainfall).

- Food for work

The Food for work *(dhigaudye)* adaptation strategy has been employed as one of the methods which the women small holder farmers are using to deal with climate vagaries. One respondent defined the adaptation strategy literally by saying, *"it simply means you eat what you work for"*. The interviews highlighted that this strategy was introduced by the government but to be facilitated by the local extension officers *(vadhumeni)* and the Headmen of Ward 1 ad 2 *(masabhuku)*, helping the female farmers to earn a living by way of engaging in community work such as repairing of potholes in the area and working on other farms for small earnings. Consequently, the purpose of this adaptation strategy is to deal with the issue of food security as people are given food packages like sugar, rice and salt as token of gratitude after working. From the focus group discussion carried out by the researcher, the results indicated that only 33% of Chayamiti women farmers engage in the food for work programme whilst 67% of the women farmers' interviewed expressed that they cannot practice it, *"since the process needs intensive hard labour and cannot be practiced on a large piece of land".*

- Growth of drought resistant crop

In the context of climate change and variability impacts, 60% of the interviewed Chayamiti women farmers indicated that the growth of drought resistant crops has quickly gained momentum in Chayamiti as an adaptation strategy. These include legume plants such as millet, beans, cow peas and sorghum in an attempt to improve their source of livelihood even after the decline of some crops such as maize. However, 40% of the respondents stated that they lack the necessary information such as the type of crops that are relevant in the context of drought, therefore, cannot practise the growth of drought resistant crops as an adaptation strategy.

- Water harvesting

Water harvesting as an adaptation strategy employed by women farmers in Chayamiti is effective in dealing with the issue of water deficit in the community. In essence, women farmers especially in ward 1 collect rain water using open dishes, buckets and wells among others. Mrs Makuni has attested to this strategy as helpful, *"especially during dry spells in that it is priceless and affordable"*, as she has been able to use the reserved water for watering her plants and execution of domestic chores and demands. However, "*this method is only helpful in the first weeks of slightly heavy rainfalls and afterwards we go back to square one of water shortages again"* (Dorothy Mushinga, 31 complained).

- Government aid

Interviews with women smallholder farmers indicated that 42% of the respondents admitted to having received food aid from the government, whilst 58% of respondents declined to having ever received assistance from the government during times of extreme weather hazards. However, the focus group discussions with the women interviewees managed to reveal that 100% of those who

claim to have received aid from the government were also not satisfied. As such, most of the respondents rendered the assistance from the government useful in the short period of time but useless in the long run saying that, *"the food they give us is not enough to last us through the hunger phase considering that we have got extended families".*

- Changes in planting time

In Chayamiti, changes in planting patterns have proved to be an important adaptation strategy employed by women farmers in the face of climate change and variability. The study findings have revealed that 53% of the women farmers in Chayamiti have changed their planting dates as an adaptation strategy to the changes in temperature and rainfall, whilst 12% continued planting the normal seasonal dates and 35% started practicing intercropping to adapt to the rainfall changes. Mrs. Makwara was quoted saying, *"Our planting calendar has now changed, we wait for the rain since most our crops are rain-fed, and so our planting season is now being negatively affected by rain, if there is no rain, we don't plant water-demanding crops".* The study revealed that in an attempt to predict planting and harvesting time, Chayamiti women employed their knowledge of indigenous systems by looking at their indicators for rain such as the shape of the moon. One respondent said, *"Since time in memorial, we have been using our own indigenous ways of predicting the approach of the planting seasons such as atmospheric observations and animal behaviour".* The study findings discovered that these indicators were observed during different times of the year. Another women farmer alluded, *"the moon shape (full moon) and the direction its facing(north) were used as an indication for planting season; different calls of birds symbolized different weather changes, "black ants" (termites) also forecasted approaching rains".*

- Mixing traditional and modern farming practices

Blending traditional methods of farming with modern practices has become the most widely employed adaptation strategy by female farmers in Chayamiti, as it has shown a way of reducing the gap between vulnerability and resilient capacity of the existing systems of agriculture, especially in the face of climate change and variability. On the basis of their own perceptions and judgment, female farmers in Chayamiti are blending old and new farming practices (such as intercropping and mulching), with positive results. *"Last year we planted seeds late and rain was near to average, yet still we reaped more than what we used to get."* This shows that traditional knowledge and farming practices based on it are a vital ingredient in the current need to adapt to climate change and variability.

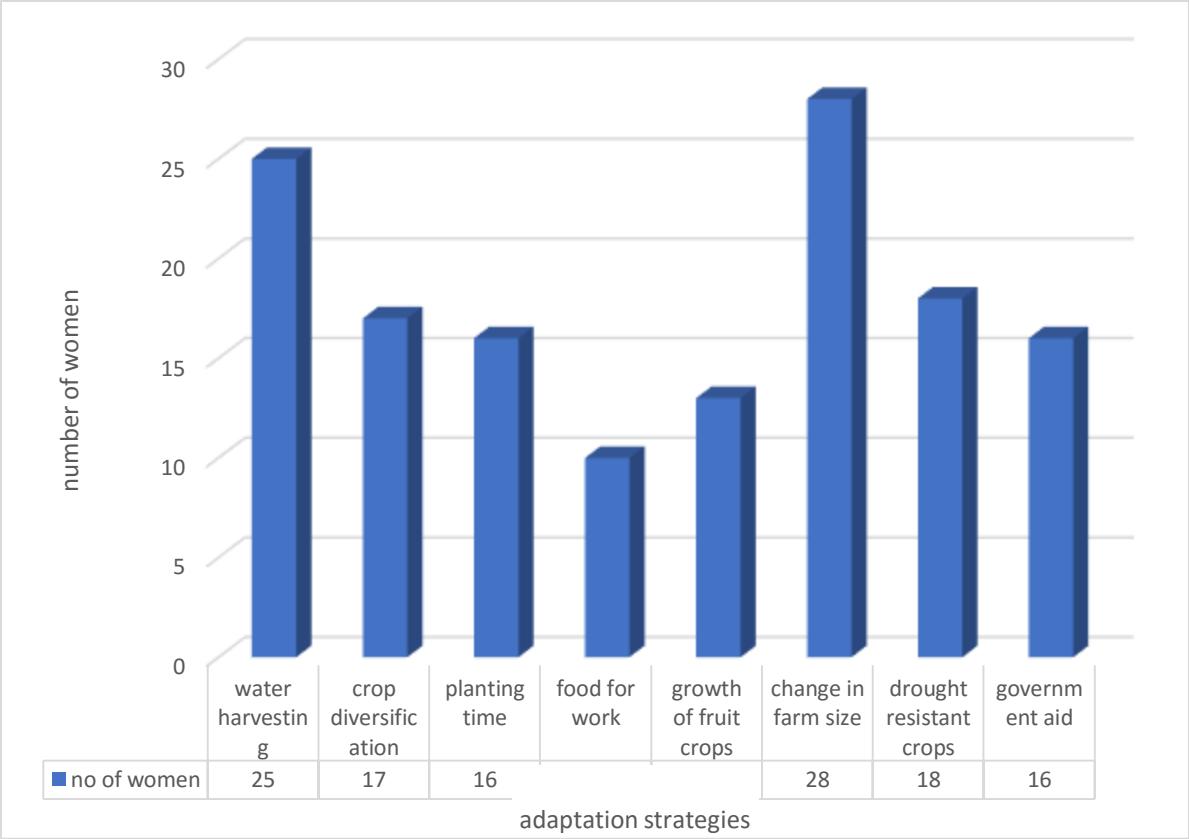
- Crop diversification

Study findings have highlighted that an adaptation strategy of crop diversification has become widely used in Chayamiti whereby the female farmers have shifted from growing maize as the only traditional crop and have started growing sorghum and other crops instead. One respondent indicated the disadvantages of relying on only one crop saying, "*It increases our vulnerability as female farmers, considering that if that crop fails then food insecurity becomes the order of the day*". Respondents also revealed that crop failure can easily increase food insecurity especially in the case of planting one crop type, hence the diversification. The study also discovered that diversification of crops in Chayamiti has helped female farmers to secure an income (Esther, FGD) as well as food security (Mrs Mhonera ) even in the years of extreme events such as the 2008 drought.

- Non-farming activities

According to the study findings of focus group discussions, an overwhelming 65% of respondents reported that they are engaging in both agricultural and non-agricultural activities whilst 35% of the female farmers indicated that they have shifted to non-agricultural activities. Some of the non-farm activities in the study area were petty trade, brick moulding, handicrafts, brewing and selling of beer *(ndari)* and wage labour. Consequently, those engaging in trading deals are primarily concerned with goods like *"cooking oil, soap, sugar"* which they purchase from Mutare, Nedziwa and Chimanimani village. A female farmer in ward 2 of Chayamiti stated that, "*I decided to engage in small trading business soon after the 2008 drought which led to the decline of agricultural production. And as a result of consistence of income accrued from petty trade, I'm now able to pay for school fees for my two children"*. Therefore, the above discussion reveals that female farmers in Chayamiti have come to realise the advantages of diversifying their livelihood activities as an adaption strategy in the face of climate change and variability.

***Figure 2 showing numbers of women farmers adapting differently to climate shocks***




### 4.3 Challenges faced by female farmers in copying with climate shocks

Both the semi-structured interviews and direct observations indicated a number of challenges that are leading to the ineffectiveness of adaptation strategies especially in the context of adverse impacts of climate change and variability on women smallholder farmers operations in Chayamiti. Therefore, the table below indicate the challenges standing in the way of effective adaptation and the impacts these challenges have on the female farmers in Chayamiti. The impacts highlighted below are in direct quotations from respondents.

***Table 5: Challenges preventing effective adaptation of women farmers to climate shocks***

| **CHALLENGE** | **IMPACT** |
|---|---|
| Lack of access to information | *"We do not receive any information on climate change and variability, we never attended any workshops or training on climate change. When one the female farmers is having problems, we just consult from other farmers and sometimes listen to the radio."* |
| Irrigation Systems | *"We wait for the rains. If there is no rain, we don't plant."* |
| Lack of relevant inputs | *"We sometimes get inputs like seeds and fertilisers from the government. However, we always receive them very late, so disappointing."* |
| Lack of extension services support | *"We know we have extension officers existing in this community, but they do not assist us in the way they are supposed to, we suffer from pests that affect our crop yields and yet the agricultural extension officers never show up to assist with training sessions on what pesticides to apply in such a scenario ."* |
| Financial constraints | *"We cannot afford to purchase inputs like seeds and fertilizers, let alone pesticides, even in cases where there is late government intervention and this is a major setback in terms of agricultural production."* |

The study findings have revealed that the greatest challenge facing female farmers in Chayamiti, in the face of climate change and variability is: lack of agricultural support services and minimal government interventions, which in turn affects the effectiveness of their adaptation strategies in coping with climate shocks. 76% of the respondents indicated that, in the previous years, they have received inputs from the government after planting season has passed, whilst the remaining 24% has reported that they have not received any agricultural support at all. Rather, they rely mainly on their indigenous knowledge and consultations amongst each other for agricultural support. Remarks from one female farmer who was very upset with the late government interventions indicated that, *"the government is supposed to be our pillar of strength in cases like these, where we are struggling with climate change and variability, its mandate is to help us survive and not just side-line us the way it's doing now."*

### 4.4 Conclusion

This chapter has indicated beyond reasonable doubt that women small holder farmers in chayamiti employ different methods to adapt to climate shocks and amongst the adaptation strategies are mulching, irrigation, crop diversification, fertilizer application, flood control measures, change in farm size and growth of fruits for sale. However, from the above evidence, women farmers in Chayamiti lacked funds information and necessary facilities to assist them in adapting against climate change and variability hence leading to the death of livestock, decline in crop production and decrease in harvests proving that the impacts of climate change and variability are intensified by poverty, marginalization and heavy reliance on the natural resource base.

# CHAPTER 5: RECOMMENDATIONS AND CONCLUSION

## 5.1 Introduction

After the compilation of the study, on the impacts of climate change and variability on women smallholder farmers in Chayamiti, the adaptation strategies they employ in dealing with climate shocks and the challenges that stand in the way of effective adaptation; the researcher managed to outline possible recommendations and solutions that the government of Zimbabwe, stakeholders such as NGOs and women can embrace to promote the effectiveness of adaptation strategies in coping with climate shocks.

## 5.2 Recommendations

1. Women should have access to information and education on climate issues in order to strengthen their adaptive capacity.
2. Several weather centres should be created especially in marginalized and remote areas to promote farmer's access to current weather information.
3. A greater account of the needs and interests of women should be taken into consideration in order to improve the efficacy of environmental policies.
4. The government must include climate funding on the national budget to be used in times of extreme weather hazards.
5. State parties ought to take into consideration the distinct challenges rural women have when adapting to climate change and variability.
6. There should be the existence of a strategy that engages in capacity building of resilience of women faced with climate change and variability thus empowering women at individual, citizen and social level.

7. Women are supposed to be included in consultations and decision making forums on post disaster recovery actions since their contributions seem to be side-lined, underestimated and undervalued.
8. Promotion and encouragement of the knowledge and contributions of women in the fight against climate change and variability.
9. The government of Zimbabwe, through microfinance institutions, should empower women farmers through economic diversification.
10. There is need for alternative energy sources such as electricity from small-level hydropower schemes such as solar power to reduce dependency on fossil fuels.
11. There is need for the promotion of traditional food in governmental food programs such as mid-day meals for school children.
12. The Zimbabwean government must help female farmers suffering from climate shocks in marginalised areas, by ensuring that there is adequate provision and delivery of appropriate agricultural inputs (seeds and fertilisers) at the appropriate time.
13. Agricultural adaptation to climate change and variability should be mainstreamed into the governments poverty alleviation programme.

### 5.3Conclusion

The study was carried out in Chayamiti and the researcher managed to acquire information necessary for the study from 30 respondents that were randomly selected using semi-structured interviews, focus group discussions, field surveys and observations. Women small holder farmers in Chayamiti area are vividly marginalized and uneducated, they mainly depend on their husbands to obtain land for farming food crops like maize and vegetables whilst livestock keeping is limited

to rearing of poultry commonly known as roadrunners and goats. The women farmers in Chayamiti are aware of climate change and variability in the area but lack the necessary tools to adapt to it. The shortage of appropriate technology and financial constraints made it difficult for them to effectively adapt to climate shocks.

In conclusion, Climate change and variability are negatively impacting on climate sensitive sectors worsening food security issues in Chayamiti. In as much as women smallholder farmers have considerable experience in dealing with climate change and variability, the long-term levels of variability associated with long-term climate change are definitely outside the realm of traditional adapting strategies (Pettengell, 2010). Consequently, as climate change and variability impacts are increasing women smallholder farmers in Chayamiti have proved to be less capable of adapting to climate shocks mainly because they lack the financial capabilities hence the urgent need to identify approaches which strengthen ongoing economic development efforts and enhance the adaptive capacity of rural women farmers. Reducing women's' vulnerability to climate change and variability is closely linked to the poverty reduction taking into account that poverty is both a condition and a determinant of vulnerability (Hamill et al., 2008). Effective and sustainable adaptation to climate change and variability in the long run is thus dependent on broad-based economic development.

**Appendix A: Focus group questions to women small holder farmers under study**

1. Has there been climate change in Chayamiti?

2. How has climate change and variability affected the environment in your area?

3. How climate change and variability affected the lifestyle of women small holder farmers in this area?

4. As a result of climate shocks, how different is it now to earn a living than before? What used to happen before that is no longer possible now?

5. What challenges do women small holder farmers in Chayamiti face in an attempt to combat the effects of climate change and variability?

6. In light of this, ha the community received any form assistance in adapting to climate changes and variability?

7. What kind of assistance do you think is necessary for women to effectively adapt to climate change and variability?

## Appendix B: Observation points

1. Visible impacts of climate change and variability in Chayamiti

2. Observing women partaking their adaptive strategies in the face of climate shocks

**Appendix C: Interview Guide**

My name is Samantha Katerere, I am an undergraduate at Midlands State University studying Development Studies. In partial fulfilment of the requirements of the Bachelor of Arts Honours Degree, I am doing a research on the topic that reads assessing the effectiveness of rural women small holder farmers' adaptation to climate change and variability using Chayamiti as my case study. May you kindly cooperate with me, as I guarantee you that your contributions are going to be used for the purposes of this dissertation only.

| PLACE | NAME |
|---|---|
| District | |
| Village | |
| Ward | |

3. Age Group (tick where applicable)

☐ Below 18 ☐ 19 – 29 ☐ 30 – 39 ☐ 40 – 49 ☐ 50+

4. Marital status (tick where applicable)

☐ Married ☐ Single ☐ Widowed ☐ Divorced

5. Do you understand the meaning of climate change and variability?

☐ Yes ☐ No

6. What crops do you grow at present and what determines selection of crops?

_____

_____

7. What is the source of your crop irrigation?

☐ Rain-fed ☐ Rain-harvest ☐ River ☐ Tanks ☐ Canals

8. Have you experienced climate change in this area? If yes, in what ways?

_____

_____

_____

9. How do you feel climate change and variability has affected the following areas:

a) Agriculture

_____

_____

_____

b) Water availability

_____

_____

_____

c) Energy

_____

_____

_____

10. Which adaptation strategies do you use in coping with climate change?

| **Adaptation strategies** | **Rank according to priority (A-H)** |
|---|---|
| A)Water Harvesting | |
| B) Crop diversification | |
| C) Changes in planting time | |
| D) Changes in farm size | |
| E) Growth and sell of fruits | |
| F) Food for work | |
| G) Government aid | |
| H) Growth of drought resistant crops | |

11. Of the above strategies, which ones are sustainable and why?

_____

_____

_____

12. What challenges, if any, are you facing in employing these strategies?

_____

_____

_____

13. What interventions, if any, have you received from the government?

_____

_____

_____

_____

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