

**GENDER ROLES IN THE ADAPTATION OF CROP PRODUCTION TO
CLIMATE CHANGE IN VIHIGA SUB-COUNTY**

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DECLARATION

This proposal is my original work prepared with no other than the indicated sources support and has not been submitted for a degree in any other university or any other award.

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SUPERVISOR APPROVAL

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ABSTRACT

Vihiga Sub-County like most of Western Kenya, is endowed with an equatorial climate, thus supports a rich diversity of flora and fauna. On the contrary, the area is susceptible to climate change impacts because, other than one major cause of global warming being emission of Greenhouse gases (carbon dioxide, methane and chlorofluro carbons) in the mainly urban and industrial areas, the major cause of global warming and climate change in Vihiga Sub-County are human related activities that contribute to increased emissions of Greenhouse gases. This has had major negative impacts conspicuously affecting the local population, which highly depends on natural resources for livelihood. Crop production yields have decreased over the years, exposing the area to risks of food insecurity. It is on this scenario that this research seeks to find out the relationship between gender roles, climate change, and adaptation in crop production. This research is important in creating awareness on the gender roles discourse and climate change issue, since majority at grassroots cannot comprehend how the two relate despite the issue of gender maturing quite rapidly. This research is justified since, a lot has been written focusing on how women's gender roles been affected leaving out men as perpetrators of climate change. Thus, gender inequality. The research is guided by three specific objectives which are to determine the extent of climate change variability in Vihiga Sub-County, to distinguish gender contribution to climate change and to compare gender roles in the adaptation of crop production to climate change. The research will adopt both qualitative and quantitative approach using a descriptive design. Purposive sampling will be adopted and sample size of 375 in a population of about 16, 293 households will be preferred. Data collection will combine participant observation, questionnaires, interviews, focused group discussions with selected farmers and government document analysis of meteorological data. Content analysis will be used for qualitative data and correlation analysis used for quantitative data obtained in comparison with that from the meteorological department. The research will help in building on the empirical evidence; given that although the issue of gender is maturing rapidly little groundwork has been done in Vihiga Sub-County. Results from this research will aid in policy formation and improving adaptation strategies for both men and women so as to attain the Sustainable Development Goals, SDGs on food insecurity.

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ABBREVIATIONS AND ACRONYMS

IPCC	-	Inter-governmental Panel on Climate Change
CO ₂	-	Carbon dioxide
DRR	-	Disaster Risk Reduction
GDP	-	Gross Development Profit
Ha	-	Hectares
MT	-	Metric Tonnes
OECD	-	Organization for Economic Co-operation and Development
UNESCO	-	United Nations Educational, Scientific and Cultural Organization
UNFCCC	-	United National Framework Convention on Climate Change
SDGs	-	Sustainable Development Goals

DEFINITION OF TERMS

Adaptation: Refers to adjustments in practices, processes or structures in response to projected or actual changes in climate, with the goal of maintaining the capacity to deal with current and future changes.

Climate Change: It refers to the changes in the climate over time which includes regional or global temperature changes and increased prevalence of extreme weather conditions.

Crop Production: is a branch of agriculture that deals with growing crops for use as food and fiber.

Gender: It refers to socially constructed roles, responsibilities and opportunities associated with men and women, as well as hidden power structures that govern the relationships between them.

CHAPTER ONE

INTRODUCTION

This chapter entails a background knowledge of climate change and gender discourse; statement of the problem; objectives of the study; research questions; significance of the study; justification of the study; scope and delimitation of the study; assumptions of the study; conceptual framework guiding the study and expected limitations of the study.

1.1 Background of the study

Climate change is a defining challenge of our time. Scientific evidence shows that even if greenhouse gas emissions are cut to zero, the world would still be on an inexorable course toward global climate change from the legacy of past emissions (UNESCO, 2004). The increased concern on the high levels of greenhouse gases by the United Nations Framework Convention on Climate Change (UNFCCC), led to the emergence of the Kyoto Protocol. The Kyoto protocol framework was the first agreement between nations to mandate Country by Country reductions in greenhouse gas emission (Stern, 2006).

Its main goal was to see participants collectively reducing emissions of greenhouse gases by 5.2% below the emission levels of 1990 by 2012. Kyoto protocol, while well intentioned would appear to be doomed to failing its objectives even before the 2008-2012 averaging commences. Carbon levels in the atmosphere are rising at a frightening rate with no sign of slowing. Global temperatures are continuing to rise (Barnett, 2007).

Record-breaking temperatures are occurring more frequently, rainfall has increased in intensity in some places, while drought-prone regions are getting dryer. In an overview of social vulnerability, the poor and the underprivileged as well as the elderly and children are found to be often hit hardest (Baettig, *et, al.*, 2007). There is growing evidence that even with ambitious mitigation action, warming close to 1.5°C

above pre-industrial levels by mid-century is already locked-in to the Earth's atmospheric system and climate change impacts such as extreme heat events may now be unavoidable (Waktin, 2007). Climate changes more alarming impact on the Earth is the increase in the world's temperatures of around 0.7⁰C since the advent of industrial era and fast rates of increase (Watkins, 2007).

Climate change poses a global challenge to both sustainable livelihoods and economic development. This risks associated with climate change are real and already happening in many sectors essential for human livelihood (IAASTD, 2009). For instance; water resources, agriculture, energy, coastal resources and health. The impacts of climate change are unevenly distributed among communities based on age, gender, culture, income and occupation. Pushing factors accelerating vulnerability include; poverty, unequal access to resources, food insecurity, economic trends and incidence of diseases in most vulnerable communities, thus impacts of climate change pose a direct threat to people's survival (UNDP, 2010).

Globally, it can be argued that the most critical social impact of climate change is human security. The reduction in food security and access to water will increase mortality and malnutrition (FAO 2007). Also related to this are the emerging social issues of health and welfare associated with climate change, particularly as climate change also threatens to increase poverty levels worldwide (Alston, 2007). This perspectives move climate change away from purely scientific and technical discussion and brings it to the center of the 21st century sustainable development goals (Dankelman, 2010).

While debate ranges on regarding responsibility for past greenhouse gas emissions and how to reduce the man-made sources of those gases, the world is actually already committed to adapting to the climate changes that will continue to develop as a result of past emissions. The need to adapt is urgent. Although climate change is a global phenomenon, it manifests itself differently at the regional and local levels. The Fourth Assessment Report of the Inter-governmental Panel on Climate Change is already having discernable, and indeed worsening, effects on communities (IPCC, 2007).

In Africa, despite its significant contribution to global warming. Africa's is one region most vulnerable to adverse impacts of climate change. Its high vulnerability stems from many factors that have continued to hit the continent, including; poverty, weak institutions, poor infrastructure, inadequate information, poor access to financial resources, poor governance and inadequate policies to respond to the impacts of climate (OECD, 2008).

Western Kenya is a region endowed with plentiful natural resources, namely; rivers, mountains/hills and rich soils which if well managed can mitigate climate change and environmental degradation while reducing poverty substantially. In western Kenya just like across Kenya climate change are wreaking havoc not only on human and animal health, but on plant species, agriculture, forestry, water supply, tourism and hydro power generation. It is no longer in doubt that these multiple impacts are directly attributed to the warming of the earth's atmosphere. With over 80% of the community dependent for their livelihoods on agriculture, the long term health of the communities' environment and resources are critical to its very survival (Vihiga integrated County plan, 2014).

1.2 Statement of the Problem

While climate change slows down progress towards gender equality and intensifies challenges to poverty reduction and food insecurity efforts. Gender inequality roles can further worsen the effect of climate change on crop production, thus high risks of food insecurity which affects the agricultural market (IFAD, 2000). Linkages among gender, poverty and vulnerability are key issues in the climate change adaptation and gender roles (Mensah, 2010). Gender subordination occurs globally in different ways depending on societal, cultural, economic and political contexts. Climate change affects men and women different because they are bound by distinct socio-economic roles and responsibilities which give rise to differences in vulnerability and ability to adapt to climate change impacts (Eriksen, 2008).

Climate change has a strong impact on Crop production systems. Agricultural development and food production will be severely curtailed unless the risks posed by climate change are addressed (FAO, 2010). Rural communities are in the front lines in

the battle to improve food security. At the same time, these communities must also cope with changing climate conditions. Understanding the diversity within these communities can better help us target our support to them. Gender is one critical dimension of this diversity. Gender inequality in relation to climate change is one problem that poses a threat on crop production systems. Women's unequal access to and control over resources is one underlying cause of global hunger (FAO, 2010). The lack of women's access to essential development resources does not only increase hardships for women, it places an extra burden on the entire agricultural sector, the broader economy and society as a whole (FAO, 2011). According to (IPCC, 2007), if women had the same access to productive resources as men, they could increase yields on their farms by 20-30%.

Food insecurity, due to low yields will continue being on the rise if equality in gender roles in crop production and climate change adaptation is not realized (World Bank, 2009). Inequality in decision making on adaptive measure of crop production to climate change, leads to haphazard adaptation strategies which might not be efficient in curbing food insecurity. In most cases men are on the fore front of decision making leaving out women as vulnerable victims of climate change. Contrary, women are not only vulnerable but are also agents of change to both mitigation and adaptation. Women often have a strong body of knowledge and expertise that can be used in adaptation of crop production to climate change (Waktins, 2007).

However, gender equality is not yet realized in any society in any part of the world (IPCC, 2007). In most society's men and women have different roles, responsibility and decision making power. Leading to disadvantages for women. As the primary users and managers of natural resources (for instance; responsible for fetching water and crop production), women depend on the resources most at risk from climate change. Women's voices are often muted in family and community decision making (Quisumbing, 2003); this is unfortunate given women's close relationship with natural resources and awareness of conservation and potential adaptation measures. (Tompkins and Adger, 2004), argues that because women and socially marginalized groups are excluded from decision making, the sustainability of crop production programs, projects and their implementation can be questioned.

Gender equality in crop adaptation to climate change is important as it shapes men's and women's roles and opportunities, and consequently determines their access to the resources and processes needed for dealing with climate change. Accurate climate information and the ability to interpret it allow farmers, community to plan and make better decisions on how to adapt to climate change (IPCC, 2007). Therefore it is an area of concern. It's important that everyone understands the gender differentiated roles in the adaptation of crop production to climate change and the existing coping strategies that must be strengthened and supported at community level (LEG, 2002).

1.3 Objective of the Study

The overall objective of the study will be to find out how men and women confined by their socially constructed responsibilities, influence climate change adaption among the residence of Vihiga Sub-County.

- i) To determine the extent of climate change variability in Vihiga Sub-County
- ii) To distinguish gender contributions to climate change in Vihiga Sub-County.
- iii) To compare gender roles in the adaptation of crop production to climate change in Vihiga Sub-County.

1.4 Research Questions

- i) What is the extent of climate change variability in Vihiga Sub-County?
- ii) How does gender contribute to climate change in Vihiga Sub-County?
- iii) Which are the gender roles in the adaptation of crop production to climate change in Vihiga Sub-County?

1.5 Significance of the Study

This study is important in creating awareness on the gender roles and climate change which is an emerging issue, yet very few people in rural settings or grassroots can comprehend how gender can be a factor in climate change. It will also help

understand people's knowledge or perceptions on climate change issue and thus, educate those who might not be aware of climate change. The study will bring to focus gender roles in climate change adaptation, given that both men and women contribute to climate change differently in their daily human related activities; they are both differently affected by climate change impacts, although women might be at a higher risk due to their social responsibilities.

Findings from this research will therefore help in formulation of more effective climate change adaptation strategies and policies, at both local and national level, that are gender neutral, favorable to both men and women, irrespective of their differences in social and cultural responsibilities. In order to achieve the Sustainable Development Goals (SDGs) on climate change and food insecurity.

1.6 Justification of the Study

Climate change is upon us and adaptation is necessary to reduce vulnerability to its harmful effects. Climate change exhibit gendered element, in that the respective vulnerabilities of men and women tend to differ, reflecting men's and women's socially and culturally defined roles and responsibilities. The gendered nature of vulnerability needs to be examined (Wamukoya and Skutch, 2007).

Scholars such as; MacGregor (2010), noted that not much have been researched on the subject of climate change and gender when she says "whereas the concepts of class, poverty and race make regular appearances in social scientific analyses of global climate change, the same cannot be said about for gender". However the researcher argues that the aspect of gender has been included but the setback is, it has been one side as a lot has been written on how women gender roles have been affected comparing to men , thus gender inequality. This research will therefore, focus on both men and women to ensure gender equality in climate change adaptation in Vihiga Sub-County.

The study focuses on Vihiga Sub-County since the evident changes in climate in the area, are mostly caused by human related activities that contribute to increased emissions of Green House Gases (Vihiga County integrated plan, 2014). Yet, the

concept of gender roles equality in climate change and crop production adaptation has not been fully realized in the area. The complementarity of men's and women's knowledge and skills in crop production is key, for designing and implementing effective and sustainable adaptation initiatives. Answering to their specific needs and ensuring both benefits equally from the adaptation process (World Bank, 2005). Thus, there is urgent need to engage the community understand gender discourse and climate change as well as, gender roles in the adaptation of crop production to climate change (Vihiga County integrated plan, 2014).

1.7 Scope and Delimitation of the Study

The study is delimited among the men and women of Vihiga Sub-County to help understand their differentiated gender roles in the adaptation of crop production to climate change in the area.

In the context of adaptation in crop production to climate change, gender dimension is crucial in policy formulation and decision making. This is because the effects of climate change on gender inequality are not limited to immediate causes, impacts and needs for changing behaviour pattern but may lead to subsequent changes in gender relations. Gender inequality can worsen these impacts. However, taking steps to empower equality in gender roles, climate change issues and adaption can narrow this gap (Adger, 2004).

1.8 Assumptions of the Study

The study assumes there will be a cooperative respondent who will be positive and willing to participate throughout the study process. It also assumes whatever information given will be reliable and truthful. The study anticipates for favorable environmental conditions and accessibility to the study site.

1.9 Conceptual Framework

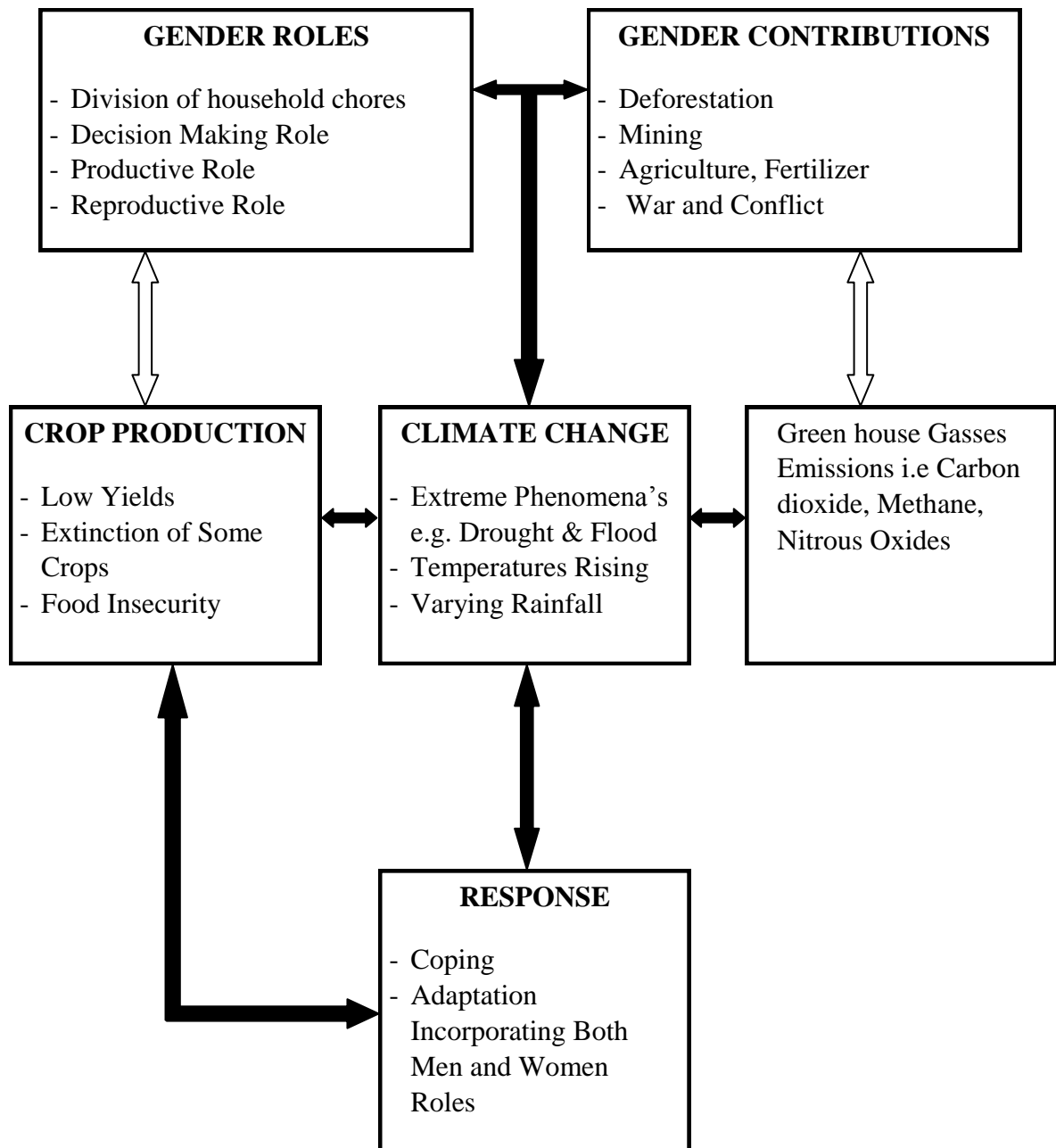


Figure 1.1: Conceptual Framework

Source: Researcher, 2017

The concept of gender roles and climate change creates a complex analysis given that the two concepts are diverse. Despite the complexity, identification of gender perspectives and the involvement of women in addressing climate change are urgent, as climate change and crop production adaptation measures are not gender neutral. Linking gender roles and climate change therefore implies understanding how to locate men and women in climate change discourse (Dankelman, 2002).

Linked to gender and climate change is the concept of gender contributions to climate change (Buvinic *et. al.*, 2004). Human activities contribute to climate change by causing changes in the Earth's atmosphere in the amounts of greenhouse gases. This is thorough burning of fossils and in the process of clearing land for agriculture. Fertilization of crops when done in excess leads to increase in greenhouse gases. This exposes high risks of climate change which in return affects crop production yields, thus food insecurity (Wilson, 2005).

For coping and adaptation to be successful (resulting in resilience) resources that would enhance men and women's capacity to adapt to climate change in crop production need to be equally accessible. This includes; access to land, credit, agricultural inputs, decision making bodies, technology and training. With appropriate resources, women and men have the ability to develop complex adaptive strategies (IPCC, 2011).

1.10 Limitations of the Study

The constraints to this study may be explaining the concept of climate change. Since majority of rural people are likely to confuse normal environmental changes with climate change. It might also be difficult for the community to comprehend how gender roles is a factor in climate change. Given majority could be of the ideas that gender is the biological sex of men and women.

Another difficulty is likely to be poor accessibility to the study areas and lack of sufficient time to get to the areas with poor transport systems.

Interviews may also be too long and some of the people might get tired in the middle and decide to give quick responses or ask the researcher to stop the interviews

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter brings into focus literature review on; gender discourse and climate change issues; the extent of climate change; males and females contributions climate change; and gender roles in the adaptation of crop production to climate change.

2.2 Extent of Climate Change

Climate change is one defining issue of our time. It is now more certain than ever, based on many lines of evidence, that humans are changing Earth's climate. The atmosphere and oceans have warmed, accompanied by sea-level rise, a strong decline in Arctic sea ice, and other climate-related changes. The evidence is clear. However, due to the nature of science, not every single detail is ever totally settled or completely certain. Nor has every pertinent question yet been answered. Scientific evidence continues to be gathered around the world, and assumptions and findings about climate change are continually analyzed and tested. Some areas of active debate and ongoing research include the link between ocean heat content and the rate of warming, estimates of how much warming to expect in the future, and the connections between climate change and extreme weather events (Enarson, 2000).

Recent estimates of the increase in global average temperature since the end of the last ice age are 4 to 5 °C (7 to 9 °F). That change occurred over a period of about 7,000 years, starting 18,000 years ago. CO₂ has risen by 40% in just the past 200 years, contributing to human alteration of the planet's energy budget that has so far warmed Earth by about 0.8 °C (1.4 °F). If the rise in CO₂ continues unchecked, warming of the same magnitude as the increase out of the ice age can be expected by the end of this century or soon after. This speed of warming is more than ten times that at the end of an ice age, the fastest known natural sustained change on a global scale (Elaine, 2001).

Even as CO₂ is rising steadily in the atmosphere, leading to gradual warming of Earth's surface, many natural factors are modulating this long-term warming. Large volcanic eruptions increase the number of small particles in the stratosphere that reflect sunlight, leading to short-term surface cooling lasting typically two to three years, followed by a slow recovery. Ocean circulation and mixing vary naturally on many time scales, causing variations in sea surface temperatures as well as changes in the rate at which heat is transported to greater depths. For example, the tropical Pacific swings between warm El Niño and cooler La Niña events on timescales of two to seven years. Scientists know of and study many different types of climate variations, such as those on decadal and multi-decadal timescales in the Pacific and North Atlantic Oceans, each with its own unique characteristics. These oceanic variations are associated with significant regional and global shifts in temperature and rainfall patterns that are evident in the observations (Morice.*et, al.*, 2012).

Warming from decade to decade can also be affected by human factors such as variations in the emissions, from coal-fired power plants and other pollution sources, of greenhouse gases and of aerosols (airborne particles that can have both warming and cooling effects). (Morice.*et, al.*, 2012) These variations in the temperature trend are clearly evident in the observed temperature record. Short-term natural climate variations could also affect the long-term human-induced climate change signal and vice-versa, because climate variations on different space and timescales can interact with one another. It is partly for this reason that climate change projections are made using climate models that can account for many different types of climate variations and their interactions. Reliable inferences about human-induced climate change must be made with a longer view, using records that cover many decades (Morice.*et, al.*, 2012).

Decades of slow warming as well as decades of accelerated warming occur naturally in the climate system. Decades that are cold or warm compared to the long-term trend are seen in the observations of the past 150 years and also captured by climate models (Annecke, 2002). Because the atmosphere stores very little heat, surface temperatures can be rapidly affected by heat uptake elsewhere in the climate system and by changes in external influences on climate (such as particles formed from material lofted high

into the atmosphere from volcanic eruptions). More than 90% of the heat added to Earth is absorbed by the oceans and penetrates only slowly into deep water. A faster rate of heat penetration into the deeper ocean will slow the warming seen at the surface and in the atmosphere, but by itself will not change the long-term warming that will occur from a given amount of CO₂ (Annecke, 2002). For example, recent studies show that some heat comes out of the ocean into the atmosphere during warm El Niño events, and more heat penetrates to ocean depths in cold La Niñas. Such changes occur repeatedly over timescales of decades and longer. An example is the major El Niño event in 1997–98 when the globally averaged air temperature soared to the highest level in the 20th century as the ocean lost heat to the atmosphere, mainly by evaporation (Archer, 2003).

Recent studies have also pointed to a number of other small cooling influences over the past decade or so. These include a relatively quiet period of solar activity and a measured increase in the amount of aerosols (reflective particles) in the atmosphere due to the cumulative effects of a succession of small volcanic eruptions. The combination of these factors, both the interaction between the ocean and the atmosphere and the forcing from the Sun and aerosols, is thought likely to be responsible for the recent slowdown in surface warming (Adato *et al.*, 2007).

Sea ice in the Arctic has decreased dramatically since the late 1970s, particularly in summer and autumn. Since the satellite record began in 1978 (providing for the first time a complete and continuous areal coverage of the Arctic), the yearly minimum Arctic sea ice extent (which occurs in early to mid-September) has decreased by more than 40% (Shum and Kuo, 2011). Ice cover expands again each Arctic winter but the ice is thinner than it used to be. Estimates of past sea ice extent suggest that this decline may be unprecedented in at least the past 1,450 years. The total volume of ice, the product of ice thickness and area, has decreased faster than ice extent over the past decades. Because sea ice is highly reflective, warming is amplified as the ice decreases and more sunshine is absorbed by the darker underlying ocean surface (Shum and Kuo, 2011).

Sea ice in the Antarctic has shown a slight increase in extent since 1979 overall, although some areas, such as that to the west of the Antarctic Peninsula, have

experienced a decrease. Changes in surface wind patterns around the continent have contributed to the Antarctic pattern of sea ice change while ocean factors such as the addition of cool fresh water from melting ice shelves may also have played a role. The wind changes include a recent strengthening of westerly winds, which reduces the amount of warm air from low latitudes penetrating into the southern high latitudes and alters the way in which ice moves away from the continent (National snow and ice data center, 2012). The change in winds may result in part from the effects of stratospheric ozone depletion over Antarctica (i.e., the ozone hole, a phenomenon that is distinct from the human driven changes in long-lived greenhouse gases). However, short-term trends in the Southern Ocean, such as those observed, can readily occur from natural variability of the atmosphere, ocean and sea ice system (National snow and Ice data center, 2012).

This sea-level rise has been driven by (in order of importance): expansion of water volume as the ocean warms, melting of mountain glaciers in most regions of the world, and losses from the Greenland and Antarctic ice sheets. All of these result from a warming climate. Fluctuations in sea level also occur due to changes in the amounts of water stored on land. The amount of sea level change experienced at any given location also depends on a variety of other factors, including whether regional geological processes and rebound of the land weighted down by previous ice sheets are causing the land itself to rise or sink, and whether changes in winds and currents are piling ocean water against some coasts or moving water away (Shum and Kuo, 2011).

The effects of rising sea level are felt most acutely in the increased frequency and intensity of occasional storm surges. If CO₂ and other greenhouse gases continue to increase on their current trajectories, it is projected that sea level may rise by a further 0.5 to 1 m (1.5 to 3 feet) by 2100. But rising sea levels will not stop in 2100; sea levels will be much higher in the following centuries as the sea continues to take up heat and glaciers continue to retreat (Biskup and Boellstorff, 1995). It remains difficult to predict the details of how the Greenland and Antarctic Ice Sheets will respond to continued warming, but it is thought that Greenland and perhaps West Antarctica will continue to lose mass, whereas the colder parts of Antarctica could

start to gain mass as they receive more snowfall from warmer air that contains more moisture (Biskup and Boellstorff, 1995). Sea level in the last interglacial (warm) period around 125,000 years ago peaked at probably 5 to 10 m above the present level. During this period, the Polar Regions were warmer than they are today. This suggests that, over millennia, long periods of increased warmth will lead to very significant loss of parts of the Greenland and Antarctic Ice Sheets and to consequent sea level rise (Ahmed and Fajber, 2009)).

In Africa the situation is quite different; it is widely acknowledged that Africa contributes the least of any continent in the world global warming. According to the USA department of Energy, Africa emits an average of one metric tonne of carbon dioxide per person a year, a static which pales in comparison to the 16 tonnes emitted by average American per year. In total, the United States emits 23 percent of the global total greenhouse gases while Africa, as an entire continent, emits roughly four percent (Fields, 2005).

The consequences that Africa will suffer as a result of its emissions, however, are far from proportionate when one considers its levels of emissions, while there is much uncertainty in making predictions about how exactly climate change will affect Africa (Challinor.*et. al.*, 2005). It is certain that the continent is more exposed to the impacts of climate change than many other regions of the world (WGCCD, 2005). By 1995, water availability across Africa was 2.8times less than it had been in 1970 (WGCD, 2005), and throughout the 1970s in the Sahel, 300,000 people died during drought which is believed to have been caused by change in ocean temperatures stemming for climate change (Fields, 2005).

By 2050, rainfall in Southern Africa and the Horn is expected to fall by 10%. In Darfur, decreased rainfall has already led to desertification of large farmland and grasslands, while about 1,350 square miles of Nigeria turns into desert each year (Podesta& Ogden, 2007). According to the German Institute of Meteorology and climate research, up to 70 percent of the deltas precipitation is lost during certain years, while its rainy has often been shortened up to 30 days (Godoy, 2009).

Farmers are actually feeling the beginnings of these climate change consequences today. Such changes are confirmed already both by industrialized world. As well by individuals like Namanga Ngongi, a farmer from Cameroon and president of Alliance for a Green Revolution for Africa. He stated that, global warming is already destroying African agriculture. There are more and more frequent droughts, more frequent floods and more destruction (Godoy, 2009).

2.3 Gender Contributions to Climate Change

Human activities contribute to climate change by causing changes in the Earth's atmosphere in the amounts of greenhouse gases, aerosols (small particles, cloudiness). The largest known contribution comes from the burning fossils, which releases carbon dioxide gas to the atmosphere. Greenhouse gases and aerosols affect climate by altering incoming radiation and outgoing infrared radiation that are part of Earth's energy balance. Changing the atmospheric abundance or properties of these gases and particles can lead to a warming or cooling of the climate system (Wilson, 2005).

Since the start of the industrial era, the overall effect of human activities on climate has been a warming influence. The human impact on climate during this era greatly exceeds that due to known changes in natural processes, such as solar changes and volcanic eruptions (IPCC, 2007). Human activities result in emissions of four principal greenhouse gases: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and the halocarbons (a group of gases containing fluorine, chlorine and bromine). These gases accumulate in the atmosphere, causing concentrations to increase with time. Significant increases in all of these gases have occurred in the industrial era. All of these increases are attributable to human activities. Carbon dioxide has increased from fossil fuel use in transportation, building heating and cooling and the manufacture of cement and other goods (Boyd, 2002).

Deforestation releases CO₂ and reduces its uptake by plants. Carbon dioxide is also released in natural processes such as the decay of plant matter. Methane has increased as a result of human activities related to agriculture, natural gas distribution and landfills. Methane is also released from natural processes that occur, for example, in wetlands. Methane concentrations are not currently increasing in the atmosphere

because growth rates decreased over the last two decades. Nitrous oxide is also emitted by human activities such as fertilizer use and fossil fuel burning. Natural processes in soils and the oceans also release N₂O (IPCC, 2007).

Developing countries are especially vulnerable to climate change because of several predisposing factors such as poverty, geographic exposure, heavy dependence on rain fed agriculture and issues of poor governance and social infrastructure (IPCC, 2001; Stern, 2006). The vulnerability of developing countries in Sub-Saharan Africa is further compounded by gender inequality, whereby agriculture which is the backbone of their economies is left predominantly in the hands of under-resourced, ill-informed, overworked women. However, while women farmers are disadvantaged with regard to access and control over resources, they have knowledge and experiences accumulated from years of working the environment that can be tapped for climate adaptation. Thus, climate change has specific gender characteristics emanating from women's social roles, discrimination and poverty.

2.3.1 Men's Contribution to Climate Change

Detraz, (2012) share the same opinion with (Demetriades and Esplen, 2010) that the vulnerabilities of men should also be considered in as far as the issue of climate change and gender is concerned, so rather than discounting men in gender analysis of climate change as if they are somehow no gendered and impervious to the harsh impacts. However the scholars did not put to light how men are affected they just acknowledged that they are affected.

Mearns and Norton (2010), argue that one of the reasons that has been causing men to be left out in this issue is the tendency of scholars generalizing men and women of which that can not apply to all places, making men perpetrators of climate change where as women are made the victims. This is also said by (Latham, 2007) when he aid the basis of this presumed universal vulnerability the default has been to focus exclusively on women to the degree that men are not brought into view at all, most often is to point a finger at men for causing climate change.

A number of men are involved in the timber industry and deforestation is being exacerbated by the growing demand of forest products, in rural areas forestry act as means of fuel, most men cut down trees for domestic purposes or for selling. Forestry cover up about 30% of the world's land and amongst its vast purposes forestry serves a crucial role of absorbing the greenhouse gases that fuel global warming. It is estimated that more than 1.5 billion tons of carbon dioxide are released to the atmosphere due to deforestation as over 30 million of acres are destroyed each year worldwide.(Climate and weather, 2010). Forests are also habitants of different species of animals and plants therefore if they are lost there are chances that these species may be extinct. Trees also play a critical role holding the water in their roots and release it into the atmosphere, implying if they are cut down the water cycle is disturbed. Trees also assist in the reduction of soil erosion as the roots hold the soil (Bradshaw, 2004).

Mining is another way humans contribute in causing climate change and men dominate in the mining industry (Caballo and Cardefia, 1997). The changing of land use like forestry land to a mining site through deforestation has the already noted consequences. Furthermore mining operations release methane gas and other pollutants into the air contributing to the reduction of the protective ozone layer and the development of the greenhouse effect of the earth warming as the sun's heat is trapped in the earth's surface (McKinney, 2010). Mining also disturbs vast stores of carbon held in soil and vegetation releasing it into the atmosphere as an added source of pollutants. The process of transporting minerals consumes large amounts of oil and gas realizing CO₂ and other pollutants contributing to climate change.

Men constitute the largest number of workers in industries and Industrialization contributes to the building up of (GHGs) firstly by clearing of the site where the industry will be through deforestation (Dessai.*et, al.*, 2004). There is also scientific evidence that shows that carbon dioxide concentrations in the atmosphere have increased substantially since industrialization. It has increased by 30% since pre-industrial times as industries are sources of (GHGs), and this has resulted in the escalation of greenhouse effect. Urbanization usually follows after industrialization with the building of residential houses in areas that hitherto had trees which are vital

carbon sinks. Also the buildings and pavements in urban areas act contribute to the formation of heat domes which pave way for global warming (Eriksen.*et, al.*, 2008).

Wars or conflicts cannot be left out as one of the anthropogenic causes of climate change; this is so because the weapons and explosives used during war produce harmful gases in the atmosphere. The use of nuclear weapons in wars is also seriously devastating according to (Crutzen and Birks, 1982) massive fires and smoke emissions in the atmosphere after nuclear use would create severe short-term environmental after effects, this means the environment is put under threat. Yet again in this case men comprise the largest number of combatants in most conflicts therefore that makes them seem to be more contributors to the emission of GHGs (Arnell, 1999).

All the mentioned activities are usually said to be facilitated mostly by men therefore that is why men are accused as contributors to the anthropogenic causes of climate change. Also what is noteworthy is that these activities are mostly done in quest of development. However, unfortunately that which men do to attain development harms the environment and points them as causers of climate change (Grothmann and Patt, 2003).

2.3.2 Women's Contributions to climate change

For instance, women often live in conditions of social exclusion, such as cultural limitations to mobilize outside their immediate environment; have less access to information on early warning systems in times of disasters, and to forecasts of climate variability; and have difficulties in participating in training processes (UNDP, 2009).Brody .*et, al.*, 2008) further noted that due to differences in access to education, access to and control of resources and power to make decisions, men and women experience their social, economic and environmental reality in different ways. This leads to differences in capacities, knowledge, interests as well as needs (UNDP, 2009). Blaikie.*et, al.*, 1997) also contend that knowledge is not homogeneous within a local population but varies according to respondents, due to gender, among others. This is likely to introduce gender based variations in climate change perceptions and knowledge among men and women farmers

The women, environment and development research and academic literature has been showing a tendency of talking about the gender aspects of climate change as if women were no more than victims (Dankelman 2002, Arora-Jonsson 2011, MacGregor 2010). Writers such as Terry (2009), Dankelman.*et, al.*, (2008) and Brody *.et, al.*, (2008), among many others, have analyzed this ‘vulnerability’ discourse and suggest that women have in fact been proactive and positive agents in adapting to climate change. Too often women are perceived as the main victims of climate change under three main arguments: firstly, because women comprise the highest percentage of poor; secondly, because the socially constructed roles and responsibilities they have within communities make them more vulnerable to climate change; and thirdly, because they have a higher mortality rate than men in climate-induced disasters.

While these three arguments are worrying, they communicate through a ‘victim talk’ that could be problematic (MacGregor 2010). Some authors discuss that poor women from the developing south only enter the climate change discussion because they are considered victims, making them a one-dimensional object and portrayed as not able to cope without the United Nation’s help (MacGregor 2010).

Seema Arora-Jonsson suggests (2011) there does not have to be a universal direct correlation between women, poverty and vulnerability. MacGregor adds, that the approach the gender and climate change literature takes is impact-focused in that if impacts can be measured and female victims are counted, then there will be enough empirical evidence to prove the ‘gender and climate change’ case. MacGregor is also concerned with the fact that a quantitative impact-focused approach leaves little room for case studies to include the voices of those women who are genuinely being impacted climate change.

Climate change affects the human capital of women and men differently in the form of mortality and in terms of their physical and psychological health, some of which is indirectly related to food insecurity. Only a few studies have empirically tested the differential impacts of climate change on women’s and men’s physical health, and most have been conducted in developed countries. Although climate impacts in developed countries are not the focus of this paper, the examples provided here point

to some possible impacts that may also occur in developing countries but remain understudied (Hepworth, 2010).

Climate variability drives the increasing scarcity of natural resources, which mostly affects women's human capital in the forms of health, time, and labor, due to their traditional roles as water and food collectors for the household. In many developing countries, cultural traditions make women responsible for collecting water, even when this involves long hours performing heavy physical labor or travelling long distances. Rural women in most developing countries are also responsible for sourcing fuel such as wood, charcoal, and agricultural wastes that are needed for household activities such as cooking, boiling water, or for keeping warm. Annecke (2002) describes that there is now a great deal known about the struggles of women to obtain fuel and the social impacts of the continued reliance on biomass or low-grade fuels. She describes that in southern Africa, qualitative and quantitative research has documented distances women walked to collect wood and the implications of wood collection on women's health and well-being. By examining the total amount of time individuals spend working, whether in the labor market, in domestic chores, or in collecting water and wood, Bardasi and Wodon (2006) find in Guinea that the total working time is higher for women than for men in urban as well as rural areas.

Difficulties in accessing fuel sources are often indirect impacts of climate change. A study by Leduc (2008) finds that decreasing snowfall in the past six years in Nepal is contributing to a longer dry season, which decreases crop production and increases famine. This has prompted income-driven deforestation by the community, which has severely reduced the availability of trees for fuel wood. Women have to walk much farther to obtain fuel wood, and this was viewed as a dangerous task on steep slopes that took about six hours every three days. Water and fuel shortages caused directly and indirectly by climate change pose considerable time and labor burdens for women, more so than for men, as the examples in this section show. The longer the women spend searching for these natural resources, the less time and energy they likely have for performing other household tasks, indicating an increase in time poverty (Leduc, 2008).

The differential impacts of climate change are evident here due to the distinct role of women to source and secure water and fuel for the household, which may also negatively impact women's and girls' health (human capital) and well-being in the longer run. The examples also point to women's vulnerability in connection with biophysical characteristics that is largely due to their roles as compared to men. Hannan (2011) further explains that an increase in women's work load and burdens as a result of climate change may mean that they have to forego opportunities that are important for their economic empowerment, such as education or training and income-generating activities. In some cases, women are forced to take their daughters from school to assist them with work on the farm or in the household, which has long-term detrimental effects on the empowerment of these girls (Hannan 2011).

2.4 Gender roles in the adaptation of crop production to climate change

The first two human security issues that come to mind related to climate change, mainly in the developing regions, are Agriculture and water security. Within developing countries women are more likely to have a primary role in agriculture, whereas in developed countries this role is generally reversed (Alston 2007). This dynamic could be a consequence of the fact that 70 per cent of the 1.3 billion people living below the poverty line in developing countries are women (Denton, 2002,) and also poor families highly rely on subsistence farming, as they have no reliable alternative source of income to buy food. Therefore the level of vulnerability women will have highly depends on the economic, political, social, and cultural (traditions and prevailing norms) contexts. Several publications have described with case studies the different roles that women have in the management and use of land, water, energy and biodiversity (Dankelman 2002, Napinga 2008, Brody *.et, al.*, 2008, Dankelman.*et, al.*, 2008, Alston 2007, and UN Women Watch 2009). In terms of food security rural women and men generally play complimentary roles.

However, there are regions and countries where women play a greater role than men and climate change forces them to bear the burden of finding alternative ways to feed their families. For example, in Sub-Saharan Africa women are responsible for 80 per cent of food production (Brody *.et, al.*, 2008, p.4). Other factors, such as difficulty to

access credit and laws restricting property and land rights, make women in Africa even more vulnerable to food insecurity and climate change. In developed countries like Australia, women mainly work off-farm to support the family (Alston 2000 and Shortall 2002). Climate variability and the recent prolonged drought have exacerbated women's need to find alternative sources of income and have also increased their on-farm work to assist the men. This has resulted in differential workloads, sometimes forcing outward migration and family separation (Alston 2007).

In adaptation to climate change, gender is an important element that has to be taken into consideration to ensure positive results at the end of the day. Gender mainstreaming which can simply be defined as incorporation of both males and females has been globally accepted as a strategy that can enable gender equality to be attained. Concerns of both men and women should be considered as they both have to influence, participate and benefit from development efforts (WB, 2012).

Climate-related natural disasters have immediate and longer term impacts that are different for women and men depending on the extent of physical, human and social capital they have access to under various social, economic, and cultural contexts. The immediate impact of climate-related disasters such as hurricanes and floods on individuals is determined by their ability to evacuate in time to safer grounds. Such action may be prompted by warning information (a form of human capital) disseminated through mass media, which not all individuals have access to. Other socio-cultural factors and life skills such as the ability to swim (another form of human capital) may also be determinants of life and death during natural disasters (Nellemann, Verma, and Hislop 2011). For example, during floods in Gujarat, India, Ahmad and Fajber (2009) find that disaster warnings often come through media such as the television, radio, or mobile phones, which are more frequently used by men than by women. Also, according to the same authors, most women cannot swim, whereas at least 40 percent of the men can—skill that could be a crucial determinant for survival (Nellemann, 2011).

The actual percentage of women, who can swim, however, is not apparent from the study, making comparisons of the relative swimming abilities of women and men impossible. The authors allude to the fact that in the study area girls and women are

not encouraged to learn how to swim, largely for reasons of cultural appropriateness or modesty. Cultural norms may also prevent women from moving freely during times of disaster. Although not caused by climate change, such evidence can be found in the case of the Asian Tsunami in 2004. More women were reported to have died than children or men in the Andaman and Nicobar islands due to gender inequalities, rather than “by chance” (UNISDR 2008). Their roles as caregivers and mothers meant that when the tsunami hit, women put the safety of their children and assets before their own survival. Patt, Dazé, and Suarez (2009) suggest that women tend to prioritize the good of others much more than men. They also describe that women’s greater awareness of social bonds enables women to demonstrate greater cooperation and altruism to the community. On this notion, the authors suggest that “women may suffer the effects of disasters more than men not just because cultural factors put them and keep them in harm’s way, but because they themselves choose to prioritize the health and safety of others over their own health and safety.”

2.4.1 Men’s roles in Adaptation of crop production to climate change

The plight of women is being overemphasized such that it leaves many unanswered questions pertaining to the vulnerability of men to climate change. Marxist feminist theory suggests that, men own the means of production for instance; land and property, therefore one can safely conclude that if faced by climate change they are affected directly. To make ends meet most of them are left with no viable options other than being forced to engage in criminal activities such as; theft, illegal mining, migration via boarder jumping routes. Of which most of all these are activities it is the rule of the jungle “survival of the fittest” that can make them survive at the same time endangering their lives (Ncube, 2012).

2.4.2 Women’s roles in the Adaptation of crop production to climate change

Over the years the effects of climate change upon gender have been researched and when it comes to climate change and gender, women are said to suffer the most in comparison to men. (Latham, 2007) is of the view that, there is a presumed universal vulnerability of women to an extent that focus has been exclusively on them, men are

rarely brought into view at all if they are; most often they would be accused of causing climate change. This is so because men have been generalized or universalized to be perpetrators of climate change. For that reason, this has sort of sidelined them as if they are not affected by climate change.

Contributing much to this view is Eco-feminism theory which suggests that women maintain the environment while men jeopardize the environment. Eco-feminism theory states that women are the large interact with the environment hence the ones to conserve it that is why they are termed as ‘mother earth’ or ‘mother nature.’ This theory has often been used by many scholars, as a result men are being left out in the discussions of climate change and gender (Brown *et. al.*, 2012). Women are said to be close to nature because of their position as mothers who take care of their families and homes, they are more aware of environmental matters than men.

It is important to remember women are not only vulnerable to climate change but they are also effective actors or agents of climate change in relation to both mitigation and adaptation. Women have a strong body of knowledge and expertise that can be used in climate change mitigation, disaster reduction and adaptation strategies. Furthermore, women’s responsibilities in households and communities, as stewards of natural and household resources, position them well to adapt to changing environmental realities (Thomas, 2004).

Climate change has a serious ramifications in four dimensions of food security; food availability, food accessibility, food utilization and food systems ability. Women farmers currently account for 45-80 per cent of all food productions in developing countries depending on the region. About two-thirds of the female labour force in developing countries, and more than 90 per cent in many African countries, are engaged in agricultural work (MAAIF, 2004).

Climate change has significant impacts on fresh water sources, affecting the availability of water used for domestic and productive task. The consequences of the increased frequency in floods and droughts are far much reaching, particularly for the vulnerable group, including women who are responsible for water management at household level. All over the world, women and girls bear the burden of fetching

water for their families and spend significant amounts of time hauling water from distant sources. The water is rarely enough to meet their needs and may also be contaminated thus, women and girls bear the burden of poor sanitation (Thomas, 2004).

Women and men are changing their cropping practices in response to climate variability, with different impacts on well-being for both sexes. Nelson and Stathers (2009) finds in Tanzania, that changes to the mix of crops grown alters men's and women's access to and control of the income from crops, as well as their respective workloads. The overall picture is mixed: increased marketing of food crops (for example, sorghum and maize), which are grown by women, increase women's workloads despite the fact that they do not benefit from the profits. Conversely, the increased sale of groundnuts, bambara nuts, and cowpeas—traditionally sold by women—provided women with more access to and control of income. The introduction of sesame and sunflower led to more household income, but household members did not always share control of this income equally and these crops led to more weeding work for women. The study also reports that many farmers (no gender disaggregation) had to replant annual crops. Crops such as bulrush millet and groundnuts had to be replanted more often, as rains were “unpredictable, coming and then stopping abruptly”, which meant that time and seeds were wasted, and the quality of the crops affected.

In a case study in Guyana, (Bynoe, 2009) found that droughts and floods associated with the El Niño Southern Oscillation phenomenon in the late 1990s caused both women and men to spend more time planting and diversifying their crops, but women's workload increased as they had to find food for their families. (Roncoli, Ingram, and Kirshen, 2001) found that due to a drought, farmers in Burkina Faso became more interested in short- and medium-term sorghum varieties and women played an important role in the diffusion of these varieties through farmer to farmer exchange. However, the shift in cropping practices entailed costs and risks because these varieties were more vulnerable to weeds, pests, and water stress, and less productive than longer duration varieties. Although maize plantings increased among farmers (no gender disaggregation provided in the study) to shorten the hunger

season, the drought caused the crop to fail, and an unusually heavy rain following the drought triggered a high proliferation of weeds that farmers could barely keep up removing. Because of this, they had no time to replant the maize (Rancoli, Ingram, and Kirshen, 2001).

These examples demonstrate a connection between user and biophysical characteristics in the vulnerability context. Women and men respond to climate signals by diversifying their crops, which requires additional human capital investments in the form of time and labor. This may be due to the unfamiliarity of dealing with new types of crops in comparison with crops that had been planted regularly in the past, or that more diversified farms require more labor and time to operate as different types of crops may require different treatment. These tasks contribute to the time demands of women and men, causing greater difficulties for women who have to deal with other household chores at the same time (as in the case of Bynoe 2009). Women may sometimes find opportunities to increase their control of income through crop diversification, but this is context-specific and cannot be generalized.

Other social factors such as caste may influence the survival of women and men in disaster situations. Ahmad and Fajber (2009) find in Gujarat, India, that women are more vulnerable to climate variability than men, but the vulnerability of individual women varies according to their socioeconomic group and access to entitlements. Caste intersects with gender to determine who is vulnerable, where they live, and their access to resources such as communication and information systems. Lower caste groups may be unable to enter flood shelters because of social practices— ritual pollution—that discriminate against them. Poor tribal groups also reside in low-lying, flood-prone areas on the outskirts of the village, making it difficult for them to access relief, or get information on impending disasters.

With climate change as well as other anthropogenic environmental degradation, there is likelihood that natural capital such as water, wood, and other fuels used for energy generation may become scarcer in some regions of the world. In the case of some developing countries, women are likely to spend more time and labor on these collection tasks. These tasks contribute to their time poverty, and bring negative

consequences to their health and well-being. In Vietnam, Shaw et al. (2008) found that women have to collect water from water sources that are farther and farther away as each drought take its toll. Asheber (2010) finds similar results in Ethiopia, and (Dankelman.*et, al.*, 2008) in Senegal, where women were more severely affected by water shortages than men, largely due to their role as water collectors for the household. The women had to travel farther in search for water, as well as spend more time checking different wells for water availability.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter entails the study area, research design, data sources and collection methods, reliability and validity of the research and data analysis.

3.1.1 Study Area

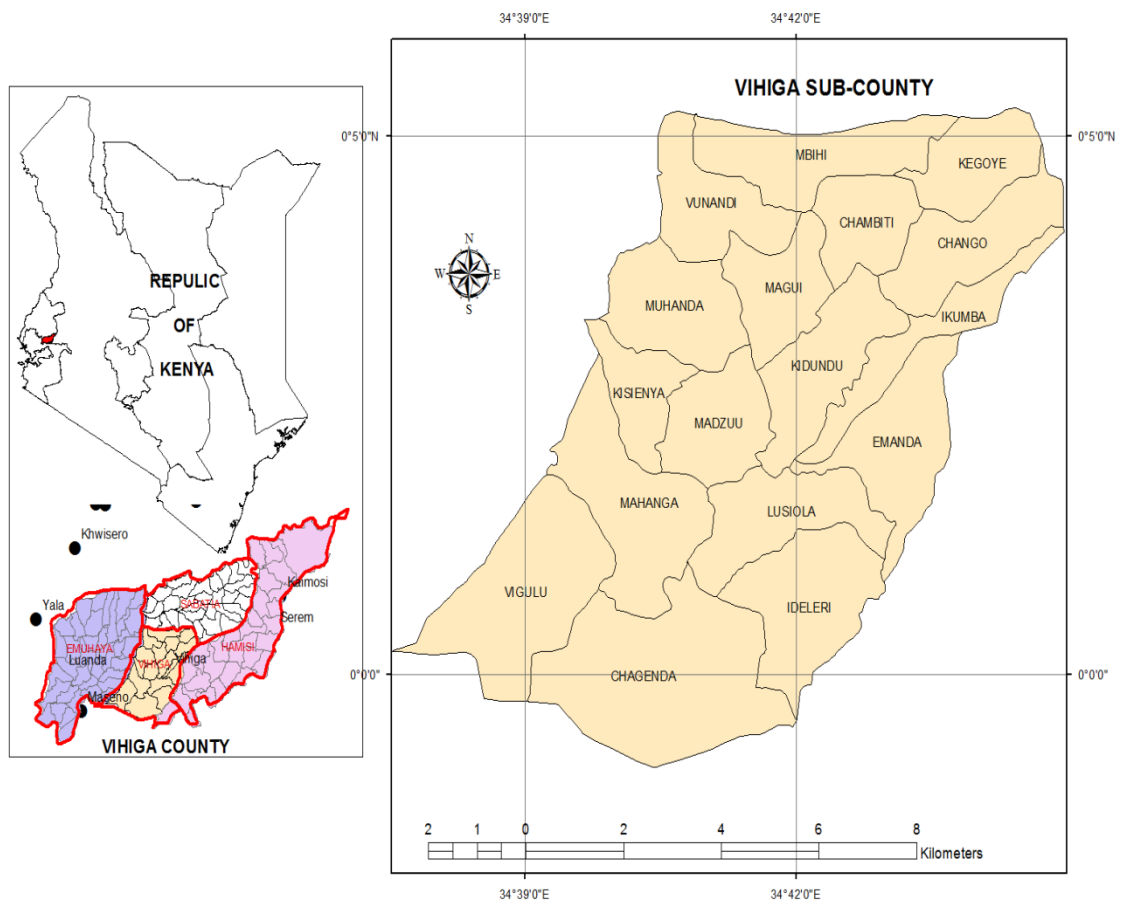


Figure 3.1: Map of Study Area

Source: Researcher, 2017

The research will be carried out in Vihiga Sub-County of Vihiga County. Located on latitude 0°3' north and on longitude 34°42' east. The area comprises of four sub-locations, namely; Chagenda, Endeleri, Masana and Lusiola Sub-locations. The study area falls within the high potential agricultural lands which are also associated with some of the highest rural population densities in the country, with a population of about 19,293 and varying densities from 277 to 1064 persons per sq. (Population Census, 2009). This is where we have the Maragoli Hills forest which covers an area of 369.1 Ha, it's now common knowledge that the forest has been degraded since the mid 1970's due to excessive tree cutting without corresponding forestation thus, affecting the local population since is a major catchment area as many streams derive their source from the Hills. The area experiences high Equatorial climate, rainfall is distributed throughout the year with an average annual precipitation of 1900mm (MoD&P, 2013).The soils in the county are mainly sedimentary in nature The soils support various farming activities which include cash crops like tea and coffee. The abundant rain in the county enables rearing of livestock, crop farming, fruits and other horticultural crops vital for sustainability of agro based industries. The types of soils and climate favour two planting seasons in the year. During long rains, crops such as maize, sweet potatoes, sorghum and beans are grown for subsistence use in most parts of the county. Yet due to various reasons, such as; poor land use practices in the community and over dependence on natural resources the area now experiences climate change.

3.2 Research Design

The study will adopt both qualitative and quantitative research approach, using a descriptive design. A descriptive design is a scientific method which involves observing and describing the behaviour of subject without influencing it in anyway. Qualitative research approach will be preferred for the following reasons: Human behaviour is best explained using qualitative methods; Human emotions that cannot be investigated by direct observation such as; emotions and attitudes are better studied by qualitative methods (Nachmais, 2008).

Creswell (2009) defined qualitative research as follows: “A means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The process of research involves merging questions and procedures, with data typically collected in the participants setting, data analysis, inductively building from particulars to general themes, and the researchers making interpretations of the meaning of data”. Researchers that engage in the qualitative research method have a healthy respect for inductive reasoning, seek out individual perception and explain the complexity of a situation, (Creswell, 2009). Therefore it makes sense to use qualitative research approach to understand how men and women in Vihiga Sub-County contribute to climate change and whether or not gender roles increases vulnerability.

3.3 Data Sources and Collection Methods

The research will use both primary and secondary sources in data collection.

3.3 Primary Sources

The researcher will use participant’s observation, questionnaires, focused group discussions (FGDs) and interviews to obtain primary data on gender roles in the adaptation of crop production to climate change.

3.3.1 Participant Observation

Participant observation is a technique of field research used in social sciences, by which a researcher studies the life of a group or community by sharing in its activities. It provides a context for development of sampling guidelines and interview guides. It gives a researcher a better understanding of what is happening in the culture and lends credence to one’s interpretations of the observations (Bernard and Russell, 1994).

3.3.2 Questionnaire

The questionnaire will have formats of both structured and unstructured (Eiselen & Uys, 2005). This tool may also be designed for online users if need be. The advantages of this methodology are that other than giving a good comparative

analysis of the role of men and women in the adaptation of crop production to climate change in Vihiga Sub-County. It is of low cost if the sample size is big. It is also free from the bias of the investigator since answers are a reflection of the respondent's own feelings and words.

3.3.3 Focused Group Discussions (FGDs)

The researcher will carry out FGDs on farmers in a group of around 8 to 13. A focus group is an interview conducted by a trained moderator among a small group of respondents. The respondents are recruited on basis of similar demographic, psychographics, interests, attitudes or behaviors. The interview is conducted in an informal and natural way where respondents are free to give views (Greenbaum, 2000). Focus group allows interviewers to study people in a more natural conversation pattern.

3.3.4 Interview

This is also another important method of data collection in research. It is an important method because the researcher has a chance to get first-hand information from the respondent, the researcher can clarify some questions further in case the respondent fails to understand any and the researcher has an advantage of gathering more additional information related to the subject of research. To help in the analysis of qualitative data, the researcher will develop an interview summary form which will be completed as soon as possible after each interview or focus group has taken place (Lindlof and Taylor, 2002).

3.4 Secondary Sources

Secondary data on climate change patterns will be obtained from the Meteorological department of Kenya. Journals and documented literature on climate change will also be used in obtaining secondary data.

3.5 Target Population and Sample Size

The target population of the researcher will be Vihiga County; the research accessible population will be Vihiga sub-county to help determine the role of gender in adaptation of crop production to climate change.

3.5.1 Sample Size

Given the average population in Vihiga sub-county is about 19,293 households according to the population census (2009). Using the Krejcie and Morgan (1970) table for determining sample size from a given population, the expected sample for population of about 19,293 people will be 375. Quota sampling will be used to get half of men and half of women from the sample size.

3.6 Sampling Technique

The research will conduct a Purposive sampling technique, a biased sampling technique, which occurs when a researcher chooses a particular group or place to study because it is known to be of the type that is wanted. The researcher decides to choose purposive sampling instead the researcher continues using the chosen procedure such as snowballing or theoretical sampling until a ‘saturation point’ is reached. The main reason is to pick out the sample in relation to some criterion, which is considered important for the particular study (Lindlof and Taylor, 2002). This method is appropriate when the study places special emphasis upon the control of certain specific variables.

3.7 Reliability and Validity

3.7.1 Reliability

(Joppe, 2000) defines reliability as the extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. In a qualitative research the

essence of reliability lies with consistency. A margin of variability for results is tolerated in a qualitative research provided the methodology and epistemological logistics consistently yield data are ontologically similar but differs in richness and ambience within similar dimensions.

Silverman (2009) proposed five approaches in enhancing the reliability of process and results: refutation analysis, constant data comparison, comprehensive data use, inclusive of the deviant case and use of tables. As data will be extracted from the original sources, researchers must verify their accuracy in terms of form and context with constant comparison, either alone or with peers (a form of triangulation). The scope and analysis of data included should be as comprehensive and inclusive with reference to quantitative aspects if possible. Adopting the dictum of false friability as essence of truth and science, attempted to refute the qualitative data analysts should be performed to assess reliability.

3.7.2 Validity

Validity in a qualitative research means “appropriateness” of the tool, processes and data. Whether the research question is valid for desired outcome, the choice of methodology is appropriate for answering the research question, the design is valid for the methodology, the sampling and data analysis is appropriate and finally the results and conclusions are valid for the sample and context (Marshall *et. al.*, 1999). In assessing validity of qualitative research, the challenge can start from the ontology and epistemology of the issue being studied, e.g. the concept of individual is seen differently between humanistic and positive psychologists due to the differing philosophical perspectives: where humanistic believe individual is a product of existential awareness and social interaction, positive psychologist think the individuals exists side-by-side with formation of any human being.

In quantitative research outcome measures should have acceptable validity to be interpretable. "Acceptable" here means validity at a level that is conventionally accepted by experts in the field (Greenbum and Thomas, 2000).

3.8 Data Analysis

Data analysis is a process for obtaining raw data and converting into information useful for decision making by users. Data is collected and analyzed to answer research questions, test hypothesis or disprove theories. The research approach is both qualitative and quantitative; therefore content analysis and correlation analysis will be preferred. The qualitative approach based on documented studies such as; data from Meteorological department will also be important in complementing the field result's one (Grothmann, 2003).

The following types of analyses will also be implemented with an aim of meeting the objectives of the research: Descriptive Analysis: involving calculation of table graphs and charts for purposes of determine the extent of climate change in Vihiga Sub-County. Also distinguishing analysis to identify any unexpected patterns or results of the research. Comparative analysis: this is the formal analysis aimed at: Adding measures of precision (e.g. standard errors and results of significance tests) to the results found in the descriptive analysis improving the estimates of various critical quantities. Interpretation: this does not just about understand the meaning of a statistical test, but the whole job of integrating the new knowledge with the existing body of knowledge on the problem. This will involve comparing results with those from other studies, building predictive models and formulating new hypotheses.

WORK PLAN AND BUDGET

Table 3.1: Work Plan and Budget

	SEPT 2016	Oct	Nov	Dec	Jan 2017	Feb	March	April	TOTALS
1. Proposal writing									20,000
2. Data collection									70,000
3. Data Analysis									50,000
4. First Draft									10,000
5. Presentation of Findings									6,000
6. Submission of Report									2,500
TOTALS Ksh.									158,500

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APPENDICES

Appendix 1: Survey Questionnaire

Questionnaire No..... Date of interview:

Enumerator's name

Location of survey site;

County.....District.....Division.....

Location..... Sub- location Village.....

GPS readings/...../

Altitude (meters) Longitude (East) Latitude (N or S)

Household Characteristics

1. Respondent's name

2. Respondent's Sex (tick): Male [] Female []

3. Household head (tick): Male [] Female []

4. Age of Respondent (years, tick) 15-24 [] 25-34 [] 35-44 [] 45-54 []
>55yrs []

5. Education level (tick): Primary [] Secondary [] University []
others []

6. Land ownership: Hired [] owned [] communal []
family []

- i). Please circle the option that most represents your views on the following statements using the scale provided:
- a). Long-term changes in climate over the last 10 years have been noticed in the village
- b). Over the last 10 years, days have been getting hotter
- c). Over the last 10 years, days have been getting colder
- d). Rainfall has been decreasing over the last 10 years
- Scale**
1. Strongly Agree,
 2. Somewhat Agree
 3. Somewhat Disagree
 4. Strongly Disagree
 5. Don't Know
- Scale**
1. Strongly Agree,
 2. Somewhat Agree
 3. Somewhat Disagree
 4. Strongly Disagree
 5. Don't Know
- Scale**
1. Strongly Agree,
 2. Somewhat Agree
 3. Somewhat Disagree
 4. Strongly Disagree
 5. Don't Know
- Scale**
1. Strongly Agree,
 2. Somewhat Agree
 3. Somewhat Disagree
 4. Strongly Disagree
 5. Don't Know

Appendix 2: Interview Questions to the Community

These questions are purely for academic purpose

Venue Date.....

Time (from)..... (to).....

Designation of interviewee.....

Interview schedule

- 1) Has there been climate change in Vihiga Sub-County?
- 2) What plants or animals that once existed have become extinct?
- 3) Do men and women influence the climatic changes in any way?
- 4) How has climate change affected the environment and people of Vihiga Sub-county?
- 5) How have either men or women been affected by climate change?
- 6) What livelihood strategies are the men and women doing because of climate change?
- 7) What is the role of either men or women in the adaptation of crop production in Vihiga Sub-County?
- 8) What assistance has the community received so far in combating against climate change?
- 9) What do you think should be done to ensure both men and women adapt to climate change equally?