

GENDER AND CLIMATE CHANGE ISSUES IN AGRICULTURE IN NIGERIA: A FOCUS ON BENUE, CROSS RIVER, PLATEAU AND RIVERS STATES



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TABLE OF CONTENTS

Title Page	ii
Acknowledgements	iii
Table of Contents	iv
List of Tables	vi
List of Acronyms	viii
Executive Summary	ix
Definition of Key Terms	xi
1. INTRODUCTION	1
1.1 Background to the Study	1
1.2 Rationale for the Study	4
1.3 Objectives of the Study	6
1.4 Research Questions	6
2. LITERATURE REVIEW	7
2.1 Concept of Climate Change	7
2.2 Causes of Climate Change	7
2.3 Gender and Climate Change	8
2.4 Climate Change and Livelihoods	11
2.4.1 Livelihoods Approach	12
2.4.1.1 Human Capital	13
2.4.1.2 Social Capital	13
2.4.1.3 Natural Capital	14
2.4.1.4 Physical Capital	14
2.4.1.5 Financial Capital	14
2.5 Gender, Climate Change and Agriculture	15
2.6 Nexus between Climate Change and Agriculture	17
2.7 Climate Change impacts in Nigeria	20
2.7.1 Impact of Climate Change on the Socio Economic Activities of Women in Nigeria	22
2.7.2 Climate Change impact in Benue State	22
2.7.3 Impact of Climate Change on the Socio-Economic Activities of Women in Benue State	24
2.7.4 Climate Change impact in Cross River State	24

2.7.5	Impact of Climate Change on the Socio-Economic Activities of Women in Cross River State	27
2.7.6	Climate Change impact in Plateau state	27
2.7.7	Impact of Climate Change on the Socio-Economic Activities of Women in Plateau State	28
2.7.8	Climate Change impact in Rivers State	28
2.7.9	Impact of Climate Change on the Socio-Economic Activities of Women in Rivers State	29
2.8	Summary of Key Findings from the Literature Review	30
3.	METHOD	31
3.1	Design	31
3.1.1	Quantitative Design	31
3.1.2	Qualitative Approach	31
3.2	Study Participants	32
3.3	Sampling Method	34
3.4	Research Instruments	34
3.5	Data Collection Procedure	35
3.6	Data Analyses and Techniques	36
4.	RESULTS AND DISCUSSION OF FINDINGS	37
4.1	Socio Economic Characteristics of Respondents	37
4.1.1	Demographic Composition of FGD and KII	40
4.2.	Nexus between Gender, Climate Change and Agriculture	40
4.3	Climate Change and Livelihoods	45
4.3.1	Impacts of Climate Change on Livelihood Assets	49
4.4	Challenges Women face in Agriculture	54
4.5	Segregation of Findings by States	58
4.5.1	Findings in Benue State	58
4.5.2	Nexus between Gender, Climate Change and Agriculture in Benue State	59
4.5.3	Impact of climate change on livelihoods in Benue state	61
4.5.4	Challenges Women face in Agriculture in Benue State	64
4.6.1	Findings in Cross River State	66
4.6.2	Nexus between Gender, Climate Change and Agriculture in Cross River State	67
4.6.3	Impact of Climate Change on Livelihoods in Cross River state	69

4.6.4	Challenges Women face in Agriculture in Cross River State	73
4.7.1	Findings in Plateau State	74
4.7.2	Nexus between Gender, Climate Change and Agriculture in Plateau State	75
4.7.3	Impact of Climate change on Livelihoods in Plateau State	78
4.7.4	Challenges Women face in Agriculture in Plateau State	81
4.8.1	Findings in Rivers State	84
4.8.2	Nexus between Gender, Climate Change and Agriculture in Rivers State	85
4.8.3	Impact of climate change on livelihood in Rivers state	87
4.8.4	Challenges Women face in Agriculture in Rivers State	90
4.9	Differences in the States on the Nexus between Gender, Climate Change and Agriculture	91
5	CONCLUSION AND RECOMMENDATIONS	94
5.1	Conclusion	94
5.2	Recommendations	95
	REFERENCES	97
	APPENDIX	105
	ABOUT THE AUTHORS	113
	LIST OF TABLES	
Table 1:	Number of FGD, KII and Case Study in Benue State	32
Table 2:	Number of FGD, KII and Case Study in Cross River State	33
Table 3:	Number of FGD, KII and Case Study in Plateau State	33
Table 4:	Number of FGD, KII and Case Study in Rivers State	34
Table 5:	Socio-Demographic characteristics of the participants for household survey	38
Table 6:	Nexus between Gender, Climate Change and Agriculture	41
Table 7:	Impact of Climate Change on Livelihood	45
Table 8:	Challenges Women face in Agriculture	55
Table 9:	Socio-Economic and Demographic variables of participants sampled in Benue State	58
Table 10:	Nexus between Gender, Climate Change and Agriculture in Benue State	60
Table 11:	Impact of Climate change on Livelihoods in Benue State	61

Table 12: Challenges Women face in Agriculture in Benue State	64
Table 13: Demographic variables of participants sampled in Cross River State	66
Table 14 Nexus between Gender, Climate Change and Agriculture in Cross River State	67
Table 15: Impact of Climate change on Livelihoods in Cross River State	69
Table 16: Challenges Women face in Agriculture in Cross River State	72
Table 17: Demographic variables of participants sampled in Plateau State	75
Table 18 Nexus between Gender, Climate Change and Agriculture in Plateau State	76
Table 19: Impact of Climate change on Livelihoods in Plateau State	78
Table 20: Challenges Women face in Agriculture in Plateau State	81
Table 21 Demographic variables of participants sampled in Rivers State	84
Table 22: Nexus between Gender, Climate Change and Agriculture in Rivers State	85
Table 23: Impact of Climate change on Livelihood in Rivers State	87
Table 24 Challenges Women face in Agriculture in Rivers State	90
Table 25: ANOVA Table on Differences in the States on the Nexus between Gender, Climate Change and Agriculture	92
Table 26: Descriptive Statistics	92
Table 27: Multiple Comparisons Between the states and the Nexus between Gender, Climate Change and Agriculture	93

LIST OF ACRONYMS

CCAPQ	Climate Change and Agriculture Production Questionnaire
CSO	Civil Society Organization
CBOs	Community Based Organizations
DFID	Department for International Development
EPI	Environmental Performance Index
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GDOL	Gender Division of Labor
GDP	Gross Domestic Product
GHGs	Greenhouse Gases
IFAD	International Fund for Agricultural Development
ILO	International Labor Organization
IPCC	Intergovernmental Panel on Climate Change
KII	Key Informant Information
NASPA-CCN	National Adaptation Strategy and Plan of Action on Climate Change for Nigeria
NEMA	National Emergency Management Agency
NGO	Non-Governmental Organization
NIMET	Nigerian Metrological Agency
PADP	Plateau Agricultural Development Programme
PLWD	Persons Living with Disability
UN	United Nations
UNDP	United Nations Developmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFCCC COP	United Nations Framework Convention on Climate Change Conference of Party
WEDO	Women's Environment and Development Organization
WHO	World Health Organization

EXECUTIVE SUMMARY

Introduction

The Climate change is a priority to researchers, government and non-governmental organizations and this has been necessitated because of the dramatic increase in the prevalence of many life-threatening mishaps in different parts of the world. Without doubt, climate change threatens everyone, all regions and countries. However, in context of magnitude and vulnerability therein, variations emerge along regions, gender, status, age, and location, among others. The worse effects of the impact of climate change is expected to bear on poor regions, countries and communities more so in the developing parts of the world like Sub-Saharan Africa. This is often as a result of their limited adaptive capacities and their dependent on climate-sensitive resources.

It has been observed that agricultural research activity and extension services in Nigeria and the study areas in particular, have been gender specific, focusing more on males and their production challenges. These agricultural research activities and extension services neglect women farmers who are facing a lot of problems that, to a large extent, limit their potentials in agricultural development. Women constitute majority of the populace, therefore, if they are given equal opportunity as males to participate effectively in agricultural production, the agricultural output in Nigeria in general and the study areas in particular will be greatly enhanced. This means that meaningful agricultural development in the study areas could be achieved by identifying those barriers militating against the participation of women in agricultural development and formulating appropriate policies that will effectively do away with these barriers.

Objectives of study

The main objective of this study is to assess gender and climate change issues in agriculture in Nigeria with a focus on Benue, Cross River, Plateau and Rivers States. Specifically, the study has the following objectives:

1. To examine the nexus between gender, climate change and agriculture.
2. To examine the influence of climate change on livelihood in these states.
3. To examine the challenges women face in agriculture in these states.

Data Collection Methods

The study was a mixed approach research design as it sought to investigate the views of farmers both men and women, girls and boys, agricultural workers on climate change and its impact on their livelihood and challenges women face. To achieve this, the study employed both qualitative and quantitative techniques. These mix methods and techniques illustrated below enabled the acquisition of specific data needed to achieve the objectives of the study.

Quantitative method: This involved the collection of quantitative data through a household survey. The collection of the quantitative data involved the use of a questionnaire to elicit specific information on household socio-economic and demographic data, gender and climate change impact on agriculture and livelihood and the connection between climate change and agriculture and household vulnerability

indicators.

Qualitative Approach: The qualitative data were generated using participatory approaches and these include:

- a. In-depth interviews with key informants (KII) who are persons that are knowledgeable about what is going on in the states with regards to impact of climate change on gender and agriculture. A total of 24KIIs were conducted in all the states sampled for the study.
- b. Focus Group Discussions (FGDs) were conducted in each of the states. A total of 70 persons participated in the FGD which involved between 5 to 7 persons. Participation was based on predetermined groups in age and sex. A total of 5 FGD sessions were conducted in each of the 4 sampled states. Sampling was based on convenience method and participants identified on the basis of their interest to participate in the discussion.

Study Area and Selection

The study was conducted in Benue, Cross River, Plateau and Rivers states. These states were selected because studies have not been conducted on the specific subject matter in the states. A total of 12 local governments within the states were sampled for the study. The respondents were sampled in rural communities in the local government areas. The sampling involved both adult males and females, young females and males participated in FGD, KII, Case Studies and Household Survey (questionnaire).

Findings

Findings showed that there is a negative nexus between climate change, gender and agriculture. Specifically, it shows that extreme environmental events such as floods, droughts and storms have been increasing in frequency and intensity in recent years thereby affecting agricultural activities and livelihoods of women who are more involved in agricultural and other livelihoods activities in rural Nigeria. Furthermore, it was found that climate change impacts on the livelihood of women. The study found that not only is livelihood directly affected, it is also indirectly affected as climate change affects the health conditions of people in the community thereby affecting their ability to carry out their livelihood activities. Labor, which is provided in communities, is impacted by the effect of climate change. Furthermore, it was found that women farmers in Nigeria are facing lots of challenges in their farming activities. Severe temperature, inability of women to afford improved agricultural inputs, non-availability of timely inputs, low prices for produce in the market, non-availability of labor as well as higher labor wage rate and harmful cultural practices like the inability to inherit or own land amongst other women in agriculture. It was also found that Benue, Cross River, Plateau and Rivers states experience the impact of climate change on gender and agriculture differently.

Conclusion

The study concluded that there is a nexus between climate change, gender and agriculture, climate change impacts negatively on the livelihoods of the people, and women face challenges in agriculture in Nigeria.

Recommendations

The study recommended that women should be empowered and their status improved through targeted support, advocacy for good governance, education and public awareness should be carried out to educate the public on climate change and the need to support and empower women in our society.

DEFINITION OF KEY TERMS

Climate change	According to IPCC (2007, p. 30) “climate change is a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties that persists for an extended period, typically decades or longer”. Thus, Climate change refers to any change in climate over time, because of natural variability or as a result of human action.
Agriculture	Agriculture is the cultivation of the soil including the allied pursuits of gathering in the crops and rearing live stock.
Livelihood	Livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assts both now and in the future, while not undermining the natural resource base (Chambers & Conway, 1991)
Sex	Sex refers to the biological characteristics that define humans as female or male.
Gender	The economic, political, and cultural attributes and opportunities associated with being male or female. The social definitions of what it means to be male or female vary among cultures and change over time. (USAID ADS Chapters 200–203). Gender refers to the array of socially constructed roles and relationships, personality traits, attitudes, behaviors, values, and relative power and influence that society ascribes to the two sexes on a differential basis. Gender is an acquired identity at is learned, changes over time, and varies widely within and across cultures. Gender is relational and refers not simply to women or men but to the relationship between them.
Gender Roles	Communities and societies create social norms of behavior, values, and attitudes that are deemed appropriate for men and women and the relations between them. These roles are assigned by social criteria rather than biological. For example, childbearing is a female sex role because men cannot bear children. Although both men and women can rear children, these duties are socially assigned.

1. INTRODUCTION

1.1 Background to the Study

The world is experiencing an indisputable fact in the form of climate change. It is affecting the economies of both developed and developing countries. Scientific evidence on climate change can by no means be disputed, however, it is difficult to predict the way in which this change will affect certain regions and countries (Radovic-Markovic & Grozdanic, 2013, p.56).

According to the United Nations Framework Convention on Climate Change (UNFCCC) (UN, 1992, p. 3), "climate change is a change of climate that is attributed directly or indirectly to human activity that alters the composition of worldwide atmosphere and which is in addition to natural climate variability over comparable time periods". This definition focus solely to the human activities, thereby narrowing what climate change entails. It is not solely the human activities that alter the composition of the global atmosphere but it is also a natural variability itself (Maharjan & Joshi, 2012). Therefore, the definition given by the Intergovernmental Panel on Climate Change (IPCC) in 2007 is considered as the broader definition of climate change. According to IPCC (2007, p. 30) "climate change is a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties that persists for an extended period, typically decades or longer". Thus, Climate change refers to any change in climate over time, either because of natural variability or as a result of human action.

Climate change is a priority to researchers, government and non-governmental organizations and this has been necessitated because of the dramatic increase in the prevalence of many life-threatening mishaps in different parts of the world. Without doubt, climate change threatens everyone, all regions and countries. However, in the context of magnitude and vulnerability, variations emerge along regions, gender, status, age, and location. The worse effects of the impact of climate change is expected to bear on poor regions, countries and communities more so in the developing parts of the world like Sub-Saharan Africa (World Bank, 2013). This is often as a result of their limited adaptive capacities and their dependence on climate-sensitive resources (Intergovernmental Panel on Climate Change (IPCC), 2007).

Nigeria is no exception with the current observations and manifestations attesting to the effect of the impact of climate change. Many parts of the country have been experiencing increased frequency and magnitude of climate extremes of droughts, floods, earth tremor and pest infestations. This negatively affects Nigerian economy (agriculture and livelihood) with various evident impacts such as significant reduction in agricultural productivity, increase in malady, morbidity and mortality rate (Usman & Dije, 2013). The energy sector is

also not left out. The hydropower plants which are source of electricity for the country have been impacted by climate change. Several other sectors such as the transportation, tourism and manufacturing sectors have all been impacted, which generally impacted on the entire Nigerian economy and its Gross Domestic Product (GDP) (Ebele & Emodi, 2016).

The effects of climate change phenomenon are diverse and vary. It has significant impact on agricultural and livelihood sectors that are critical for the survival of the most exposed human populations, whose vulnerability are often exacerbated by existing social inequalities (Dzah, 2011). Not only are agricultural and livelihood sectors affected, gender is also significantly affected by climate change. The impact of climate change is experienced differently by women and men due to gender inequalities that exist in terms of access and control of resources and decision-making (Brody, Demetriades & Esplen, 2008). From a gender perspective, research has shown that climate change is not gender neutral (Verner, 2012). Women particularly are disproportionately affected by climate change effects (Björnberg & Hansson, 2013), attributable to existing structures, such as cultural norms and economic constraints (Skinner, 2011), that perpetuate women domination, subordination and eventually accruing climate vulnerabilities.

Nigeria's vulnerability to climate change principally stems from her heavy reliance on its natural resource base. For instance, since agriculture, which majority of the population relies upon depends predominantly on rain, it entails that any changes in the climate resulting into floods or droughts, which are the most occurring climate change manifestation in the country, will directly affect majority of the population. For rural communities, particularly whose main source of livelihood is subsistence agriculture with only few alternatives, the felt effects are much worse.

On agriculture and livelihoods, the impact of climate change is very much felt in Nigeria. Crops, livestock, forestry, and fishery are affected by the change in climate in various ways. Climate change in Nigeria, most especially in the states (Benue, Cross River, Plateau and Rivers) under investigation has led to flooding, scorching temperature, change in rainfall pattern, coastal erosion, acid rain and increased water salination (Ikehi, 2014). Flooding in the states has forced rivers to overflow their banks and submerged hundreds of thousands of acres of farmland (Hassan, 2012). Flood has not only caused the destruction of buildings and lives, it has also ravaged crops and severe transportation routes in the states. Climate change has increased the cost of managing land for cultivation, disease and pest control in animal, crop and fish production, and is affecting the social and economic wellbeing of farmers. Agricultural production in the states has been greatly affected. The trend of events in the study areas would suggest that climate change has affected agriculture negatively in

the region. However, it is important to note that some experts hold contrary opinions concerning the impacts of climate change on agriculture.

Climate variability is referring to the way climate fluctuates yearly above or below a long-term average value. The effect of climate variability is an issue of great significance to the lives and livelihoods of millions of rural dwellers that depend on agriculture. This is often as a result of the associated effects of climate variation that are predominantly negative with the most severe effects being experienced in vulnerable communities that represent the majority of the Nigerian farmers, practicing farming at subsistence levels with very weak capacity to adapt (Oluwasusi & Tijani, 2013). Agriculture, food security and rural livelihoods are major challenges for most poor rural farmers as a result of climate change in sub Saharan Africa (Alvaro, Tingju, Katrin, Richard & Claudia, 2009). This made the agricultural sector most vulnerable to climate change and variability impact.

Rural livelihoods which have agriculture, agricultural related activities, animal grazing, fishing and some other activities such as cottage industries and business are highly dependent on climate change and variability. The impact of climate variability on agriculture may lead to problem with food security and will threaten the livelihood activities upon which the rural dwellers depend (Dhaka, Chayal & Poonia, 2010). Crop yields are affected both positively and negatively as a result of climate variability. Climate variability can also affect the types of crops that can be grown in certain areas by impacting agricultural inputs like water for irrigation, amounts of solar radiation that affect plant growth, as well as the prevalence of pest (Intergovernmental Panel on Climate Change (IPCC), 2007).

The negative impacts of climate change and variability continuously threaten and erode basic capabilities and rights, notably among poor and disenfranchised individuals, in turn reshaping their livelihoods (Oruonye, 2015). Natural assets, on which certain livelihoods depend directly such as rivers and fish stocks, farming through declining crop yields and pastoralism are affected by climate variability and change. Although climate variability and change affect everyone, it is not gender neutral. Climate variability and change amplify existing inequalities, reinforcing the imbalance between women and men in their vulnerability to and ability to cope with climate change (UNDP, 2007).

Regarding gender impact of climate change, women, who are the majority of the world's poor, are the most endangered to the impact of climate change (WEDO, 2007). Less empowered women are more likely to become direct victims (mortalities and injuries) of climate change disasters like hurricanes and flooding (Neumayer & Plümper, 2007). Very often, more women die than men during natural disasters and this is because they are not

warned, cannot swim or cannot leave the house alone (UNFCCC COP, 2005). When less empowered, women lose their livelihoods; they slip deeper into poverty and the inequality and marginalization they suffer from because of their gender, increases. Therefore, climate change presents a very specific threat to women's security.

The responsibilities of women in the family make them more vulnerable to climate change that is further exacerbated by the impacts of climate change. Women are affected in their multiple roles as food producers and providers, as guardians of health, care givers, and economic actors. While access to basic human needs and natural resources, such as shelter, food, fertile land, water and fuel, becomes hampered due to climate change, women's workload increases. Many of the female headed families that are poor (Mitchell et al., 2007) often live in more precarious situations, on low lands, along dangerous riverbanks, or on steep slopes.

Climate change impact, such as drought and erratic rainfall, causes women to work harder to secure (natural) resources and livelihoods. In such circumstances, less time is available to women to earn income, get an education or training, or to participate in governing bodies. Girls often become school dropouts so as to help their mothers to gather wood and water. Access to education opportunities may be reduced due to loss of livelihood assets, displacement and migration. Additional burdens may be placed on women's health and reduced time for decision-making processes and income-generating activities, due to depletion of natural resources and decreasing agricultural productivity, thereby worsening gender equality and women's empowerment (UNDP-2, 2007). Gender inequalities are further amplifying due to conflict that arises from a shortage of natural resources, while the relocation of people has severe impacts on social support networks and family ties—mechanisms that have a crucial value for women, and in their coping capacity (Patt et al., 2007).

Despite the impact of climate change, it ought to be known that not everyone in a given community is affected in an equivalent manner. Despite the fact that it is acknowledged that poor communities will be most affected by climate change, the magnitude of this vulnerability depends heavily on ecological and socioeconomic characteristics of each community (Kpadonou, Adégbola & Tovignan, 2012).

1.2 Rational for the Study

It is known globally that climate change has a significant impact on the society and women are the most vulnerable group to climate change. Climate change is thus a major issue across the world. Impacts of climate change such as more extreme weather events occurring, more variability in timing and intensity of rainfall and higher temperatures is being experience in Nigeria (Abiodun, Salami & Tadross, 2011).

Gender perspectives are critically important in climate change in Nigerian states like Benue, Cross River, Plateau and Rivers especially when examining gendered impact of climate change. Drought and water scarcity affects rural women in Nigeria more negatively. This is primarily because rural women are responsible for collecting the household water supply, the wood for cooking and heating, as well as ensuring food security for the family.

Women are more vulnerable to climate change because of their dependency on natural resources, which are threatened by climate change. Firewood or wood products are used by majority of women involved in fish processing in Nigeria. Furthermore, a larger number of food sellers in Nigeria are women and fuel wood is utilized extensively in food processing and in domestic activities that are dominated by women. Also, women are more involved in substantial agriculture and livelihood than men. The collection of firewood under conditions of heat and stress also impacts on the health of women and children who are more involved in this activity than men.

Climate change has brought about an increase in pests, and diseases which have affected the productivity of Nigeria's labour force and increases women's workload as they are largely responsible for the burden of caring for the sick. The super imposed labour, in addition to the increased burden of wood and water procurement, entails that women miss out on educational opportunities, income-generating activities, and have less time to care for their own health.

Women's vulnerability to the impacts of climate change has exacerbated historic and cultural disadvantages together with women's restricted and limited access to information and power in decision-making. For these reasons, usually the capability to adapt to and mitigate the impacts of global climate change is lower for women than men. Furthermore, the challenges women faced in agriculture are also lower than those of men.

Despite the significant roles that women play and efforts made by women farmers in agriculture, their output still falls below the required or desired outcome. This inability of women to meet the desired outcome may be due to their inability to acquire some of the farm resources that can ease their labour and increase their output. While diverse formative endeavors have been made to guarantee more prominent efficiency, the required enhancement in the general prosperity of women farmers have not yet been achieved to the desired level. This is on the ground that most agricultural extension services in Nigeria have customarily been centered around men and their production needs, while neglecting women and their production powers. Women agriculturists also lack the opportunity to acquire modern yield-increasing inputs of production. Therefore, they tend to produce less, and more of their crops are consumed within their families (Gladwin, 2002). Access to

credit and land likewise determine the degree of women involvement in agricultural production (Nuhu, Donye & Bawa, 2014).

It has been observed that agricultural research activity and extension services in Nigeria, and the study areas in particular, have been gender-specific, focusing more on males and their production challenges. These agricultural research activities and extension services neglect women farmers who are facing a lot of problems, which, to a large extent limit their potentials in agricultural development. Women constitute majority of the populace, therefore, if they are given equal opportunity as males to participate effectively in agricultural production, the agricultural output in Nigeria, in general and specifically the study areas, will be greatly enhanced. This means that meaningful agricultural development in the study areas could be achieved by identifying those barriers militating against the participation of women in agricultural development and formulating appropriate policies that will effectively do away with these barriers.

It is therefore important that differentiated responsibilities of women and men be taken into account when seeking to understand the outcomes of climate change and challenges of women in agriculture. It is based on the above that this study seek to examine gender and climate change issues in agriculture with a focus on Benue, Cross River, Plateau and Rivers States in Nigeria. Findings from the study will feed into the overall goal of understanding the underlying issues and challenges of gender, climate change and agriculture and challenges women face in agriculture.

1.3 Objectives of the Study

The main objective of this study is to examine gender and climate change issues in agriculture with a focus on Benue, Cross River, Plateau and Rivers States in Nigeria. Specifically, the study has the following objectives:

- i. To examine the nexus between gender, climate change and agriculture.
- ii. To examine the influence of climate change on the livelihoods of farmers in the study areas (states).
- iii. To examine the challenges women face in agriculture in the study areas (states).
- iv. To identify if there are significant differences in the states on the nexus between gender, climate change and agriculture.

1.4 Research Questions

This research seek to answer the following questions

- i. What is the nexus between gender, climate change and agriculture?
- ii. How does climate change influence livelihoods of farmers in the study areas (states)?
- iii. What challenges do women face in agriculture in the study areas (states)?
- iv. What are the difference in the study areas (states) on the nexus between gender, climate change and agriculture?

2. LITERATURE REVIEW

2.1 Concept of Climate Change

A change in the average weather experienced in a particular region or location is referred to as climate change. This change may occur over decades or even millennia. The change may affect one or more seasons as well as involve changes in one or more aspects of the weather such as rainfall, temperature or winds. Its causes may be natural, as a result of periodic changes in the earth's orbit, volcanoes and solar variability or may be attributable to human (anthropogenic) actions or activities like increasing emissions of greenhouse gases such as CO₂, land use change and/or emissions of aerosols.

In contemporary society, the term "climate change" often refers to changes due to anthropogenic causes (Abiodun, Salami & Tadross 2011). Consistent increases in temperature, varying rainfall patterns, more frequent extreme weather events (such as storms, floods, droughts, and heat waves), sea-level rise, rapidly changing seasons, ocean acidification and glacial melting are indications that climate change is occurring. These changes are being felt all over the world and are already having considerable socio-economic effects in addition to very significant ecological impacts.

2.2 Causes of Climate Change

According to the summary of the Intergovernmental Panel on Climate Change (IPCC) 4th Assessment Report (IPCC, 2007), human actions are very likely the cause of global warming; meaning that 90% or greater probability is attributable to human action. A comprehensive assessment by the IPCC of the scientific evidence suggests that human activities are contributing to climate change, and that there has been a discernible human influence on global climate. Climate changes caused by human activities, such as the burning of fossil fuels (coal, oil, and natural gas) and deforestation, are superimposed on, and to some extent masked by, natural climate fluctuations (Farauta, Egbule, Idrisa & Agu, 2011).

The buildup of greenhouse gases (GHGs) such as carbon dioxide, nitrous oxide, chlorofluorocarbons (CFCs) and methane in the atmosphere, as a result of human activities, among them, the burning of fossil fuels, bush burning, use of machines that produce smoke, the burning of fossil fuels, bush burning, use of machines that produce smoke, cooking, etc are responsible for climate change and global warming (Farauta, et al., 2011). The planet (earth) is encircled by an atmosphere containing gases that regulate temperature. Varied activities undertaken by man have varied contributions to the changes that occur in the climate systems. The burning of coal, oil, and natural gas, deforestation and varied agricultural and industrial practices, are altering the composition of the atmosphere and contributing to climate change. These human activities have led to increased atmospheric concentrations of a number of greenhouse gases (Farauta, et al., 2011).

According to De Chavez and Tauli-Corpus (2008) GHGs are chemical compounds such as water vapor, carbon dioxide, methane, and nitrous oxide found in the atmosphere. These are gases that are able to absorb and radiate heat. Water vapour, carbon dioxide (CO₂), methane (CH₄), Ozone (O₃) and nitrous oxide are some of the greenhouse gases that occur naturally. Others such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) result exclusively from human industrial processes. All of these gases are responsible for the greenhouse effect, but water vapor and CO₂ contribute 90% of the total GHG emissions. In terms of direct contribution of these greenhouse gases, CO₂ contributes 55%, methane 15%, CFCs 7%, HFC (11 and 12) 17%, and N₂O 6% (De Chavez & Tauli-Corpus, 2008).

Carbon dioxide is produced when coal, oil, and natural gas (fossil fuels) are burnt to produce energy used for transportation, manufacturing, heating, cooling, electricity generation, and other applications. Fossil fuel currently accounts for 80 to 85% of carbon dioxide being added to the atmosphere. Other activities such as land clearing for logging, ranching, and agriculture, also lead to carbon dioxide emissions. Land use changes account for 15 to 20% of current carbon dioxide emissions. Methane (natural gas) is the second most important of the greenhouse gases resulting from human activities. It is produced by rice cultivation, cattle and sheep ranching, and by decaying materials in landfills. Methane is also emitted during coal mining and oil drilling, and by leaky gas pipelines. Nitrous oxide is produced by various agricultural and industrial practices. Chlorofluorocarbons (CFCs) have been used in refrigeration, air conditioning, and as solvents. Ozone in the lower part of the atmosphere is another important greenhouse gas resulting from industrial activities (Farauta et al., 2011). It is created naturally and also by reactions in the atmosphere involving gases resulting from human activities, including nitrogen oxides from motor vehicles and power plants.

According to Farauta et al. (2011), natural changes in climate result from interactions such as those between the atmosphere and ocean, referred to as internal factors, and from external causes, such as variations in the sun's energy output which would externally vary the amount of solar radiation received by the earth's surface and in the amount of material injected into the upper atmosphere by explosive volcanic eruptions.

2.3 Gender and Climate Change

Gender is the social attributes and opportunities that are associated with being a male and a female and the relationships between women and men and girls and boys, as well as the relations between women and those between men. These attributes, opportunities and relationships are socially constructed, or produced by society and as such can be modified or changed (Skinner, 2011).

In analysis of climate change in Nigeria, it is necessary that the gender approach be

understood not only in terms of how the identities of women and men determine different vulnerabilities and capacities to cope with climate change impacts, but also how to tackle both the causes and consequences of climate change in Nigeria. IPCC (2007) recognized that people who are already the most vulnerable and marginalized, experience the greatest impacts of climate change. At the same time, the most vulnerable and marginalized individuals have the least capacity or opportunity to prepare for the impacts of a changing climate (Bridge, 2008). Women and girls who constitute the largest percentage of the world's poorest people are the ones who would experience the greatest impact of these changes that they are least responsible for and this is due to the gender roles assigned to them by society (WHO, 2011).

Women constitute about 20 to 60 per cent of the agricultural labour force in developing countries of the world. Specifically, females share of the agricultural labour force ranges from about 20 per cent in Latin America to about 50 per cent in Eastern and Southern-Eastern Asia and Sub-Saharan Africa (FAO, 2011). Women in Sub-Saharan Africa have relatively high overall labor force participation rates in the world (Prakash, 2003; FAO, 2011).

Studies conducted in developing countries of the world have indicated that women are the most affected by the negative impacts of climate change (Glazebrook, 2011; Nabikolo et al., 2012). A study conducted by CARE Canada in Myanmar highlighted that out of 130,000 people that were dead or missing after a cyclone, 61 per cent were female and attributed this high percentage to women's inability to participate in social and educational events due to their reproduction role that leaves them no time to partake in extra activities (CARE Canada, 2010). Similarly, Bartlett (2008) concluded in his study that out of 40,000 households that experienced floods in Nepal, about 80 per cent (out of which 60 per cent were women and girls) suffered flood-related fatalities. This high number of women and girls that suffered flood related fatalities was attributed to the gender-discriminatory practices that exist in Nepal. Furthermore, research by World Health Organization showed that rising temperatures may increase transmission of malaria in some location and this poses great health challenges for pregnant women who are highly vulnerable to malaria compared to the non-pregnant women (WHO, 2008).

In agriculture, women are the ones who often engage in subsistence farming and have lesser resources such as land, inputs available to them, extension services as well as few mechanisms such as training and calamity insurance, compared to their male counterparts. These mechanisms could facilitate them become more resilient and respond to the impact of climate change as well as prepare them for the next impact of climate change (Leyesa, 2006). Furthermore, women farmers experience exclusion from acquiring and holding resources such as land for farming due to certain cultural and religious beliefs tending to

lower their levels of adopting new farm technologies (FAO, 2009). And this has serious implications for attaining household food security since women are the main producers of food crops at the household level (FAO, 2009).

In a study by Badmos et al. (2018), he examined the influence of gender and the views of people towards the impact climate change on human health in south-west Nigeria. Data for the study were collected by means of questionnaire from males and females in Moba Local Government Area of Ekiti state. The collected data were analyzed using descriptive statistics and chi-square test for (i) gender variation on the respondent's perception about climate change, (ii) gender variation in the perception of the respondents as regards the impact of climate change on human health, and (iii) association between sex type and perception on the impact of climate change on human health (malaria, disability, displacement, flooding, and cholera). Result indicates that males and females show comparable knowledge about climate change and its impact on human health, but males were slightly knowledgeable. In some aspect, gender showed significant association with respondent's view on the impact of climate change on human health. Findings further showed that females showed better awareness as regards climate change contributing to malaria, while males are better aware as regards climate change contributing to flooding. Important concern revealed in the study is the low public awareness on the indirect health impact of climate change. Hence, the authors recommended continuous enlightenment of people on the various health impacts of the changing climate.

Women are of greater vulnerability to climate change impacts. Their differential vulnerability relates to the prevailing gender asymmetry in the lack of access to assets, services, and voice, which emerges from the socially and culturally defined roles of women and men. Not only are there gender-differentiated impacts of climate change, with men and women facing different risks and vulnerabilities, but men and women, especially farmers, also contribute differently to climate change and have different ways of coping with it, adapting to it, and mitigating its impacts (Ahmad, EL-Fatal, Pehu, Poutiainen & Vyzaki, 2014).

According to Ahmad, et al. (2014), there is enough evidence to suggest that women farmers have a higher exposure to climate risks compared to men, because:

- I. Women have fewer endowments. Majority of women are landless, and when they do own or lease land, their plots tend to be small and of poor quality. Not only are women landless, they also have less access to credit or cash to afford fertilizers, pesticides, and improved seeds, or to cover their capital and running costs to set up a business.
- ii. Women have fewer entitlements and less access to services. Restricted and limited

rights in the community also hampered women's ability to cope with the effects of climate change. Women also have less access to education, information and extension services they need to respond to the impact of climate change. Women's voices has only recently become stronger in international fora. While women have already made use of valuable adaptation and mitigation strategies, they have not yet been supported fully by an enabling policy environment.

- iii. Women are less mobile. When climate change effects occur, there is often a renegotiation of gender roles within a household, with family members usually relying on each other to pool the resources they need to support themselves and their children and relatives (Lambrou & Nelson, 2010). For example, men will often seek to migrate to find work outside agriculture during droughts, while women remain behind to tend the crops and livestock and supervise the children who may be pulled out of school to do household chores (IOM, 2009).

2.4 Climate Change and Livelihood

Climate change affects both rural women's and men's ability to secure their livelihoods. At the same time, it poses new challenges for the agricultural sector in reducing poverty and food insecurity and in transforming itself into a strong engine for sustainable economic growth. Climate change is likely to exacerbate inequalities between women and men if efforts to integrate gender concerns in climate change responses are neglected (Skinner 2011). Already, in view of the increased climate variability, there is a pressing need to adopt gender-sensitive approaches in order to achieve food security and poverty reduction (FAO 2011).

Livelihood security generally depends upon sufficient, sustainable access to resources and income so that one can meet essential needs for famers. Not only are livelihoods of people disturbed by climate change but also reduced the national development of developing countries around the globe. Heavy rainfall pattern at the time of mature crop destroy the whole crop and poses the worst impact on livelihoods (Fafchamps, 2000).

According to Kulkarmi and Leary (2007) during the process of human civilization, the people all over the world have developed ways of earning their livelihoods and fulfilling the necessity of basic needs of food, shelter, water and other goods and services. This indicates that climate change has affected livelihood strategies across the globe. In rural areas of developing countries like Nigeria, livelihoods are more affected because of low agricultural productivity, decreasing natural resources and unawareness of climate which lead to increase poverty. Farmers and landholders that depend on direct natural environment and rain fed agriculture for food security are more open to the impact of climate change (Whande, 2007) in Nigeria.

In Nigeria, rural livelihood for women totally depends on agricultural activities that directly depend on the natural temperature but changes in natural temperature causes for heavy rains, floods and drought that directly affect the agricultural activities and agricultural yield. The incomes of substantial farmers who are mostly women are more directly affected due to climate change because climate change affect agricultural yield.

Ateeq-Ur-Rehman et al. (2018) conducted a study to identify the impact of climate change on the socio-economic status and livelihood of farmers. A total of 280 farmers were sample from tehsil Jampur of Rajanpur district. Data were obtained through well designed interview schedule and analyzed statistically. All the respondents reported that climate change had influence on income and agricultural yield. Climate change had influence on income and economic weighted scores. All of the respondents reported that climate change had very high effect on practicing crop diversification while, more than half of the respondents reported that climate change had very high effect on planting different crops. The rank order regarding crop diversification was on high rank due to high weighted score. All of the respondents reported that climate change had great effect on forest burning. The comparisons of different means of different factors like mobility, health, economics, income, environmental destruction, agricultural yields and size of land holding affected by climate change were non-significant. The comparisons of different means of different factors like deforestation, pollution from vehicles, pollution from power generation, pollution from waste, pollution from agricultural activities, shifting cultivation, forest burning and any other factors were non-significant.

2.4.1 Livelihoods Approach

DFID developed the most widely used livelihood approach and framework. The livelihood approach and framework used for this study is conceptualized by DFID. DFID conceptualize how people operate within a vulnerability context that is shaped by varied factors including shifting seasonal constraints, natural shocks and opportunity, economic shocks and long-term trends; how they draw on the five different types of livelihood assets or capital (natural, social, physical, human and financial) in different combinations which are influenced by vulnerability context, a range of institutions and processes; and how they use their asset base to develop a range of livelihood strategies to achieve desired livelihood outcomes.

The livelihoods approach by DFID is focused on people. Therefore, an accurate and realistic knowledge of people's strengths which is referred to as capital is crucial to examine how people convert these capitals into positive livelihood outcomes (Bebbington, 1999). To achieve self defined goals, individuals require a range of capital. It is pertinent to understand that no single capital endowment is sufficient to yield the desired livelihood outcomes on its own. This is particularly true for poor people whose have very limited

access to any category of capital. As a result they have to seek ways of nurturing and combining what assets they do have in innovative ways to ensure survival (DFID, 1999).

According to the DFID, Livelihood Approach is built upon five (5) core categories or types of capital (DFID, 2000). These are human capital, social capital, natural capital, physical capital and financial capital. These capitals are important in this study because they form the foundation for building rural women's livelihoods hence any impact from climate change on them is likely to adversely influence the attainment of rural women's livelihoods.

2.4.2 Human Capital

Human capital is skill, knowledge, ability to labor and good health that together enable women to pursue different livelihood strategies and achieve their livelihood objectives (DFID, 2000). Applying human capital at household level, this study views it as the amount and quality of labor available for women which differs based on household size, skill levels, leadership potential, health status, etc. Human capital is the generic framework for livelihood, it is a building block or means of achieving livelihood outcomes. Ill health as well as lack of education is regarded by many as core dimensions of poverty. Therefore, overcoming ill health and lack of education may be one of their primary livelihood objectives (DFID, 2000). Also, being of intrinsic value - knowledge and labor or the ability to command labor is necessary to make use of any of the four other approaches of livelihood. It is therefore necessary for the achievement of positive livelihood outcomes though not on its own sufficient (Vorsah, 2015).

2.4.3 Social Capital

According to DFID (2000), social capital is the social resources upon which people draw in pursuit of their livelihood objectives. These social capital resources are developed through “networking and connecting with people” which increase or enhance people's trust and the ability to cooperate or “membership in more formalized groups” and their systems of rules, norms and sanctions (DFID, 2000). More frequently, access and amount of social capital is determined through birth, age, gender or caste and may even vary within a household.

According to Kollmair and Gamper (2002), social capital does not only have positive impact but may also have adverse effects that are restrictive for development. For instance one's membership in groups always entails excluding important other; or the social affiliation to a certain caste may be positive or negative depending on the person's hierarchical position within the system (Vorsah, 2015).

Despite its negative impact, social capital is still important through its direct impact on other capitals by improving the efficiency of economic relations (DFID, 2000). And for women who are the most deprived, social capital, in most cases, represents a place of refuge

in mitigating the effects of lack in other capital through informal networks such as women organizations.

2.4.4 Natural Capital

Resources useful for livelihoods are derived from natural capital. Wide difference exists between resources that made up the natural capital, from intangible public goods such as the atmosphere and biodiversity to divisible assets used directly for production (trees, land, etc.) (DFID, 2000). Within the framework, the relationship between natural capital and the vulnerability context is particularly close. Many of the problems that devastate the livelihoods of the rural populace or the poor are natural processes that destroy natural capital (e.g. floods, fires that destroy forests, droughts and earthquakes that destroy agricultural land) and seasonality is largely due to changes in the value or productivity of natural capital over the years (DFID, 2000). Natural capital is of significant value to those who derive all or part of their livelihoods from natural resource-based activities (farming, fishing, gathering in forests, mineral extraction, etc.) (Nicol, 2000).

2.4.5 Physical Capital

Physical capital is viewed as the basic infrastructure and producer goods that are needed to support livelihoods, example affordable transport; secure shelter and buildings; adequate water supply and sanitation; clean, affordable energy; and access to information (DFID, 2000). Physical capital has strong influence on livelihood system sustainability; for instance, long periods spent on non-productive activities, such as collection of water, needing extra labor force, etc due to lack of irrigation facilities. These long periods of time are spent on non-productive activities that could be used somewhere or for something productive (Calow, 2001). Furthermore, poor transport infrastructure can prevent effective distribution of essential fertilizers thereby making agricultural yields to be low. This further makes it difficult and expensive to transport limited produce to the market.

2.4.6 Financial Capital

This means the financial resources that are used to achieve livelihood objectives. According to DFID (2000), there are two main sources of financial capital:

Available stocks: Savings are the preferred type of financial capital because they do not have liabilities attached and usually do not entail reliance on others. They can be held in several forms: cash, bank deposits or liquid assets such as livestock and jewelry. Financial resources can also be obtained through credit-providing institutions.

Regular inflows of money: The most common types of inflows are labor, income, pensions, or other transfers from the state, and remittances. In order to make a positive contribution to financial capital, these inflows must be reliable (while complete reliability can never be

guaranteed, there is a difference between a one-off payment and a regular transfer on the basis of which people can plan investments).

Financial capital is versatile due to the fact that it can be converted into other types of capital or can be used for direct achievement of livelihood outcomes (e.g. purchasing of food to reduce food insecurity). However, it is the capital least available for the poor (Kollmair & Gamper, 2002).

2.5 Gender, Climate Change and Agriculture

About 60% of the food produced in most developing nations is by women (Aguila, Araujo & Quesadar-Aguilar, 2008). Women are not only the main stay of agricultural production; they are also responsible for post-harvest activities (Agwu & Okhimamhe, 2009). According to Kawani and Pernia (2002), rural women farmers perform about 70% or more of all agricultural production activities, 100% of food processing and utilization activities and over 50% percent of storage and marketing operations. Women tend to contribute more towards agricultural production and put in more hours in agricultural and non-agricultural activities than men (Saito, 1992). Rural women contribute two thirds of the labour force spent in agricultural production and marketing (Raman & Usman, 2004).

About 20 percent of the agricultural labor force in Sub-Saharan Africa is made up of women (ILO, 2016), with 79 percent of women engaging in agriculture as the primary economic activity in least developed countries (Doss, 2011). Notwithstanding, there is a substantial gender imbalance in agricultural productivity which differ from country to country. For example, in Ethiopia, Malawi, Niger, Nigeria, Tanzania and Uganda, production levels of women farmers are 13-25 percent lower per hectare than those of men (World Bank, IFAD, FAO, 2015). Across the developing world, women farmers tend to have significantly less access to important productive, financial and information resources for agriculture, including land. However, closing the gender gap by supporting women's access to resources (e.g., land, credit, fertilizers, extension services and other productive inputs) can increase yields by 20-30 percent and decrease the global hungry population by 150 million (FAO, 2011).

Women face barriers that significantly constrain their production and entangle them in a low productivity trap. These barriers include societal norms, the gender division of labour (GDOL), resource constraints (access to and use of land), no or low use of inputs (e.g. drought-adapted seeds), and limited access to climate services and agro-advisories. Under a changing climate, these barriers will additionally constrain women's ability to adapt, and the gender gap in agriculture will continue to widen (Nyasimi & Huyer, 2017).

In Nigeria, women farmers benefit little from agricultural services like agricultural

extension, credit schemes, and acquisition and technologies that would improve their productivity (Alabi, et al., 2009). This is as a result of the barrier exerted by cultural, social, biological and religious factors (Ijere, 1991). According to Rahman and Alamu (2003), women farmers are hardly trained and reached by extension agents with improved technologies; banks hardly give loans to them, these perpetuate and exacerbate poverty among women and hence intensifying gender inequalities in our societies. In line with this, Imolehin (2000), noted that women are known to be greatly involved in the production of rice but are confronted with problems of acquiring inputs and learning new technologies, techniques, skills and practices because of socio-economic and cultural barriers. For small scale farmers with low productivity and income, raising adequate resources to adopt improved agricultural technologies is often difficult especially for women farmers (Hamidu, 2001).

Gender roles in Nigeria, including the ways in which women participate in agricultural production, vary widely across the country due to differences in culture and religion, among other factors (Peterman, Quisumbing, Behrman & Nkonya, 2011; Oloukoi et al. 2014). Women are generally excluded from farming outside the homestead in northern Nigeria, whereas in western, southern, and central Nigeria, women play a larger and, in some cases, dominant role in agricultural production, with clearly defined responsibilities for particular plots, crops, or tasks. Understanding gender roles is important because men's and women's sensitivity to climate change largely depends on these roles. Consideration must be given, for example, to the extent to which crops produced by men and women are harmed by climate change impacts, or the extent to which certain livelihood activities, such as water collection, are affected.

Even in areas where women are more involved in agriculture, a large gender gap in production outcomes exists. This is largely due to women's lack of access to productive resources (Peterman et al. 2011; Corral, Goldstein & Winters, 2015). The large gender gap in agriculture activities suggests that men and women have different capacities to respond to shocks and stressors resulting from climate change and that women ultimately have fewer—and worse—options. Women also tend to have less access to information and land, and some may be more restricted in terms of their response options due to cultural norms that limit their mobility or participation in groups (Ogunlela & Mukhtar, 2009).

Studies conducted have shown that men also tend to dominate decision making even over matters concerning women, such as their own healthcare (National Population Commission and ICF International 2014). Consequently, women have limited bargaining power within the household which has presented a significant barrier to their ability to influence decisions regarding how to respond to climate challenges and risks. This may result in decisions that benefit men more than women. Women's limited ability to influence

decisions, for instance, on how income is spent, may also have negative implications for nutrition outcomes, as women tend to prioritize investing in children.

Women living in rural areas are highly sensitive to climate threats and will be among the most affected by climate change. Women living in rural areas are more dependent on natural resource-based activities than men for their livelihoods and family wellbeing, and these women have less capacity to adapt with fewer resources (Huyer et al., 2015; Jost et al., 2016). Effects of environmental stress on farming systems (such as those caused by climate change) include the intensification of women's workloads and decreases in household assets and are exacerbated by male migration to urban center's for employment (Jost et al., 2015). As a result, the concern is that climate change will increase food insecurity in Nigeria and further exacerbate gender inequalities. As climate change poses greater challenge to agricultural production, the risk imposed by drought, flood, pests and diseases, reduction in yield, post harvest losses etc further threatens women's ability to cope in their livelihood and agriculture activities.

2.6 Nexus between Climate Change and Agriculture

Climate change does not always have a negative impact on agriculture, especially in high latitude and high-income countries where agricultural activities are complimented by advanced technological implements and resources, leading to higher productivity of land. However, this climate change is a major barrier to developing economies, like Nigeria where majority of the population are farmers. Nigeria is highly susceptible and risk-prone to climate change. In the last few years Nigeria's vulnerability to climate change has increased because of population growth, poverty, high differentials in access to housing and inadequate good infrastructure. The effects of climate changes and the vulnerability of the small and medium farmers to these climate conditions make it daunting for the institutions and the policy makers. Moderate variations in the weather during the crucial stages of crop development can also have a major impact on the yield. While cost of inputs, types of implements used, availability of irrigation water, rainfall and commodity prices can also be some of the other factors that lead to an alteration in the yield, it is estimated that severe climate changes leading to natural and manmade calamities like floods, droughts, landslides, etc. impact the agriculture productivity most unfavorably (Kaur, 2017).

Tsojon (2017) in his study examined the impact of climate change on agricultural production by farmers in Taraba State, Nigeria. The study adopted a survey research design. A total of 290 farmers were sampled for the study using multi-stage sampling technique. Structured questionnaire tagged "climate change and agriculture production questionnaire" (CCAPQ) was used for data collection. The data collected were analyzed using percentage and mean and standard deviation. The result of the analysis revealed that

majority of the farmers were not aware and have no knowledge of climate change but have been experiencing the impact of climate change as it affected their agricultural production. The study also showed that the impact of climate change has also affected the education of the families of the farmers. The farmers adapted only the few mitigation strategies they know. That State and Federal Governments should organize seminars and workshops for farmers and for the extension agents also who can educate the farmers in the rural areas to improve their level of awareness and knowledge on climate change in Taraba State, Nigeria was the recommendation of the study.

According to IPCC (2007), a temperature change in tropical areas has in general had a negative impact on food production. Crop productivity is projected to increase slightly at mid to high latitudes for local mean temperature increases of up to 1-3% depending on the crop, and then decrease beyond that in some regions. At lower latitude, especially seasonally dry and tropical regions, crop productivity is projected to decrease for even small local temperature increase (1-2°C), which would increase risk of hunger. Globally, the potential for food production is projected to increase in local average temperature over a range of 1-3°C, but above this it is projected to decrease. Increases in the frequency of droughts and floods are projected to affect local crop production negatively, especially in subsistence sectors at low latitudes. Taken together and considering the influence of rapid population growth and urbanization, the risk of hunger is projected to remain very high in several developing countries (Khanal, 2009).

In a different study, Ikehi (2014) conducted which aimed at examining the perceived impacts of climate change on agricultural production in Niger Delta Region of Nigeria. The author specifically determined the perceived impact posed by climate change on animal, crop and fish production as well as the farming families and also explored the coping strategies for adaptation. The study adopted descriptive survey research design. The study population was 73,603 respondents, out of which 73,513 were registered farmers in 10 selected local government areas and 90 extension workers. A total of 735 (1% from each local government) farmers were selected using proportionate stratified random sampling technique while the 90 extension workers were used (based on their small size). This brings the sample size that was used for the study to 825 respondents. Structured questionnaire and a structured interview were used to collect data. Data collected was analyzed using mean and standard deviation to answer the research questions and t-test statistics was used to test the null hypotheses at 0.05 level of significance at the derived degrees of freedom. The findings of the study revealed that the perceived impacts of climate change on animal, crop, fish production as well as on farming families in the Niger Delta are moderate. Findings further revealed that climate change has resulted to high occurrence of flood in the region as well as increased poverty level and the cost of production (input and labor cost) as indicated by the farmers in the Niger Delta region. Recommendations made

included continuous training of extension workers on current information about climate change, and the encouragement of farmers by providing incentives and subsidizing inputs for them by State Ministry of Agriculture and Natural Resources and other well-meaning non-governmental organization in the region.

In a similar study, Otitoju (2014) examined the effects of climate change adaptation strategies on food crop production efficiency in Southwestern Nigeria. The study used multistage sampling technique and primary data were collected from 360 food crop farmers. Descriptive and inferential statistics were used for the analysis. Results of the multinomial logit analysis showed that household size negatively influenced the use of multiple crop varieties, land fragmentation (i.e. multiple farm plots), multiple planting dates and crop diversification. Age of household head had an inverse relationship with the choice and use of multiple crop varieties, land fragmentation (multiple farm plots), multiple planting dates and off-farm employment. Education had a negative effect on the choice and use of multiple crop varieties and multiple planting dates. Gender had positive influence on the choice and use of multiple crop varieties, multiple planting dates and off-farm employment but average distance had a positive relationship with the choice and use of land fragmentation. Tenure security positively influenced the choice and use of crop diversification but access to credit negatively correlated with multiple crop varieties, multiple planting dates and crop diversification. Factor analysis revealed that the major constraints to climate change adaptation among the food crop farmers were public, institutional and labour constraints; land, neighborhood norms and religious beliefs constraints; high cost of inputs, technological and information constraints; farm distance, access to climate information, off-farm-job and credit constraints; and poor agricultural programmes and service delivery constraints. The study recommends, inter alia, proactive regulatory land use systems that will make food crop farmers to participate in a more secured land ownership system should be put in place to enhance their investment in climate change adaptation strategies that has a long-term effect. More so, Government and non-governmental organizations should help the farmers in the area of provision and/ or facilitate the provision of input-based adaptation strategies in the study area.

Kassahun (2009) examined the impacts of climate change on crop agriculture in Nile Basin of Ethiopia using the Ricardian model. Annual crop net revenue was regressed on climate and other variables. The results showed that an annual increase of 1°C in temperature would have a positive impact on annual crop net revenue for irrigated farms, but a negative impact for dry land farms. However, marginal impact of increasing precipitation would increase crop net revenue for both irrigated and dry land farms. The results indicate that farmers are aware of climate change. In addition, the study examined the impact of uniform climate scenarios on the crop net revenue per hectare of farmers. These are increasing temperature by 2.5°C and 5°C; and decreasing precipitation by 7% and 14%. Based on the

results of these simulations, the study predicted that crop net revenues would fall for all farms under the four uniform climate scenarios except irrigated ones for a 2.5°C increase in temperature. The study also found out that most farmers did not use any adaptation option (42%) for a number of reasons. The adaptation strategy most commonly used (about 21%) is planting trees. Other adaptation strategies farmers used are soil conservation (15%), using different crop varieties (13%), early and late planting (5%) and irrigation (4%). It was also indicated that there are five major constraints to adaptation perceived by farmers in Nile basin of Ethiopia. These are lack of information (43%), lack of access to credit (22%), shortage of labor (16%), shortage of land (11%), and poor potential for irrigations (8%).

Oruonye (2015) examined the incidence of climate variability and its impact on rural livelihood on the Nigerian Mambila plateau. Climatic data like mean monthly and annual temperature and rainfall totals and rain days per annum for 30 years (1981 – 2010) were obtained. The climatic data was used to determine the trends in the time series of parameters such as annual rainfall, length of rainy season, onset and cessation of rainy season using simple regression and correlation analysis. The result of the findings indicates decreasing temperature, increasing annual rainfall, late onset and cessation and decreasing length of rainy season. It was further found that the changing climatic trend in the Mambila plateau is making it difficult for farmers in the area to properly time their planting season resulting in wilting of crops and necessitating replanting of seeds after the first planting. The study recommends the need to empower the farmers with information on climate change adaptation strategies and improved seed varieties.

2.7 Climate Change impacts in Nigeria

Current happenings in Nigeria have shown that Nigeria is not excluded from global climate change devastation being experienced across the globe. Nigeria is experiencing the negative impacts of climate change, according to the third and fourth Assessment Reports of the IPCC and Nigeria's First National Communication (FNC, 2003). Across the country, from the north to the south, millions of people are already experiencing and reacting to changing seasonal patterns of rainfall, storm surges and increased heat. Nigeria's long (853km) coastline to the south means that the large population of coastal communities is vulnerable to sea level increases and storm surges. Communities to the north, in the Sahel, are especially vulnerable to increasing aridity due to higher temperatures and reduced rainfall. Analysis of long-term variability of rainfall and temperature in Nigeria shows discernable proof of climate change (Abiodun et al., 2011).

Nigeria is extremely vulnerable to climate change (Obioha, 2008). This is evident in the astronomical rate of desertification ravaging the Northern part of Nigeria and inability of state and Federal government to empower relevant institutions that will empower and educate the local population of the need to plant trees and build a natural green wall

barriers, slow capacity to technological development and limited engagement with environmental and climate change research and implementations (IPCC, 2007; Allu, 2014). A research conducted by World Environmental Performance Index (EPI) focused on using performance indicators to assess good environmental practice showed that Nigeria ranked 153 out of the 163 countries studied, despite the lowered standard scale used to access the Sub-Saharan region (Allu, 2014). This finding clearly indicate that Nigeria has not come to terms with the realities of climate change despite evidence of land degradation observed across the country, that are caused by flooding, wind and erosions associated with climate change (Allu, 2014).

Unexpectedly, Nigeria that is the largest and wealthiest country within the West African sub-region region, and often referred to as the power house of Africa, has failed to take effective leadership in terms of its engagement with environmental and climate change research activities and implementations.

Despite the denial tendencies seemingly demonstrated by Nigeria on the impacts of climate change, it is interesting to know that one of the government agencies believes that climate change is already having an impact in Nigeria. In the past four decades, weather-related disasters have become more frequent and the trend continues (National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN) 2012). Evidences observed across all climate regions in Nigeria clearly point to the manifestations such as flash flooding and desertification in the North, gully erosions, increased precipitation and the rise in sea level to mention but a few in the South, and these show the effects and impacts of climate change in Nigeria. Sadly, these experiences are confirmations of earlier predictions about the potential risks and impact from climate change Nigeria might face, and these events have proved these predictions right (Onyekuru & Marchant, 2012).

Earlier researches conducted suggested that some indicators were used in assessing the evidence of climate change in the Nigerian region. These indicators include: increased temperature, increasing evaporation, decreasing rainfall amount in the regional interiors, increasing rainfall in the coastal regions, increasing disruption in climate patterns and increasing frequency and intensity of unusual or extreme weather related events such as; bush fires, droughts, constant loss of forest cover and biodiversity, drying up of rivers and lakes, floods, lightning, unpredictable rainfall patterns, rise in sea level, increasing desertification and land degradation, thunderstorms and windstorms (Allu, 2014).

The identified indicators may not be common to all regions and at the same magnitude, but certainly they have become constant elements to consider in the measurement of the impact of climate change in Nigeria.

2.7.1 Impact of Climate Change on the Socio-Economic Activities of Women in Nigeria

In Nigeria and globally, women and men do not experience climate change equally. Economic constraints and cultural norms restrict women's access to paid employment. This entails that women's livelihoods are very much dependent on climate-sensitive sectors such as subsistent agriculture or water collection (Skinner, 2011). The fact that women and girls in Nigeria are responsible for the unpaid care tasks around the household also means that their lives are directly affected by climate change which has brought about changes in the country. Women and girls often have to walk further to find increasingly scarce food, fuel and water, as well as caring for family members who are susceptible to the health risks brought about by climate change. This has brought about less time for education, income-generating activities or participation in community decision making process by women and girls, thereby further entrenching unequal gender relations.

Furthermore, women and girls lack land rights such as ownership rights for the means of production, technology, finances, information and training in climate adaptation and disaster prevention (Nnaji, 2012). Socially embedded inequalities influence the degree to which women are affected by climate change. For example, women's lack of property rights and land tenure entails that they are forced to cultivate on less productive land and are excluded from access to agricultural training service or inputs that could enable them to diversify their means of livelihoods or increase their ability to cope with climate-related shocks such as flooding and drought (Skinner, 2011).

Research has shown that women and children are 14 times more likely to lose their lives in a natural disaster than men (Nnaji, 2012). This is also explained by the socio-cultural stereotypes including the warnings of disasters announced in public places that are often inaccessible to women.

2.7.2 Climate Change impact in Benue State

Benue State is found within the middle belt of Nigeria; between longitudes 7°44'E and 9°55'E and between latitudes 6°29'N and 8°7'N. The state is bordered by Nasarawa state to the North, Taraba state to the East, Cross Rivers state to the Southeast, Enugu to Southwest, and Kogi to the West. The south Eastern part of Benue state shares boundary with the Republic of Cameroun. It is also bordered on the North by 280km of River Benue and is traversed by 202km of River Katsina-Ala in the inland.

Benue State is known as Nigeria's "Food Basket" because of the rich and diverse agricultural produce which include rice, yam, cassava, beans, maize, potatoes, sorghum, soya bean, millet, cocoyam, etc. Animals that are reared in the state include pig, poultry, goat, sheep, etc. Benue State's climate is a tropical climate which manifests in two distinct seasons. The

rainy season is from April to October while the dry season is from November to March. Annual rainfall varies from 1750mm in the south to 1250mm in the north (Yahaya, Iornongo & Emigilati, 2016).

According to Yahaya, et al. (2016), the trend of annual rainfall from 1985- 2014 in Benue State shows an increasing and decreasing trend over the years. Annual rainfall in the state from 1985- 2014 shows an increasing trend in most of the years which have the average annual rainfall of above 1500mm, such years includes 1985 and 1988 respectively. Furthermore, Benue State in 1994, 1995, 2003, 2006 and 2010 had an upward trend of annual rainfall of above 1500mm. The downward trend of 1999, 2000, 2001 and 2011 indicated low amount of rainfall which is below 1500mm the figure shows that there is an upward trend in the rainfall with an indication that there is about 13.2% which shows a positive correlation with most of the years. In summary, the trend of annual rainfall in Benue state fluctuated over the years. According to Nyagba (1995), this fluctuation explains why most years in Benue experienced drought which resulted to poor yield and other years experienced high rainfall which resulted to flooding.

A look at the temperature trend in Benue from 1985- 1998 exhibits a symmetrical trend where the annual temperature is between 34^oC-35^oC which does not show much variations, from 1999- 2006 there is an upward trend in annual temperature between 36^oc and above, this shows a reflection of global warming resulting into general increase in the earth's temperature (Adebayo, 2012).

The trend of relative humidity exhibited fluctuations with a corresponding increased and decreased graph. For instance, 1984- 1998 experienced a gentle slope with an increase in relative humidity from 0.6mm and above while a downward trend occurred from 1999- 2006 with indication that the state experienced little dryness where the relative humidity is below 0.6mm. Furthermore, 2008-2014 experienced an upward trend of relative humidity that is above 0.6mm indicating wetness in the state. Based on the above trend of relative humidity, most years which experienced less than 0.6mm of relative humidity brought about total dryness which imposed compulsory sufferings on people in the state (Nyagba, 1995).

Benue state experienced a similar mean monthly rainfall as compared to most of the areas in Nigeria and beyond. These are the dry and wet seasons. These seasons correspond to the period when the Tropical Maritime and Tropical Continental air- masses along with their associated winds respectively influence the Benue state and other parts of Nigeria.

In Benue state, rainfall trend and pattern varies in different months and years in different localities as some areas receive rainfall earlier than other areas and is largely dependent on

rainfall amounts. This explains why most settlements in the state experience drought while others experienced flooding. Increasing rainfall means increasing recharge of the various surface and underground water resources. This increase can create adequate water storage against periods of shortage in the state (Nyagba, 1995).

2.7.3 Impact of Climate Change on the Socio-Economic Activities of Women in Benue State

Impact of climate change on the socio-economic activities of women is critically important in states like Benue, when examining climate change and the role played by women in the state. The socio-economic activities of women in Benue state are particularly dependent on climate-sensitive sectors such as subsistent agriculture, fuel or water collection. The fact that women are responsible for the unpaid care tasks around the household entails that their lives are directly affected by the changes brought about by climate change. They often have to walk further distances to find increasingly scarce food, fuel and water, as well as caring for family members who are susceptible to the health risks brought about by climate change. As a result, women find themselves with less time for education, income-generating activities or participation in community decision-making processes thereby further entrenching unequal gender relations. Furthermore, Nnaji (2012) in her study in Benue, identified effects of climate change on women's socio-economic activities to include increased energy and time spent on water collection, fuel collection, increased wilting of crops in the field due to moisture stress, increase in the amount of money spent on water, increase in water borne disease and increased spread of water related diseases.

2.7.4 Climate Change impact in Cross River State

Cross River is located in a coastal area of the Niger Delta region of Nigeria. The Cross River lies between latitudes 04°30' and 06°45' N and Longitudes 07°30' and 09°15' E. It has a total land area of 58.8 km². The climate of the area depends on the movement of the Inter-tropical discontinuity, which is the zone separating the warm humid maritime air mass with its associated South Westerly winds from dry continental air mass (North Westerly winds). Cross River is located within the tropical monsoon climate which has a bimodal rainfall pattern, which begins in March and ends in mid October with a little dry spell in August, traditionally referred to as "August break". The little dry spell gives rise to the two rainfall maxima with the heaviest rainfall occurring in July for first peak and September for the second peak.

According to Sambo, Ufoegbune, Eruola and Ojekunle (2016), onset of rain in Cross River was a little bit late in the past climate but somehow early in the recent climate regime. Furthermore, there is no difference in retreat of rain in the entire Cross River compared to the past average. This suggested normal cessation of rain in Cross River. Considering duration of rain, Sambo, et. al. (2016) have shown that duration of rainy season in recent



This is River Benue where women farmers and fishing activities for their livelihood has dried up

climate was not different from what was obtained in the past climate except in Calabar. Though the difference was not significant, agricultural activities are likely to suffer set back in areas of decreasing rainfall duration especially in Eket and Ikom as a result of deficit in water supply associated with climate change.

The climatology of August rainfall in Cross River exhibit rainfall maxima in most locations and this could be due to the northern influence of moisture from the South Atlantic Ocean. Research conducted by Sambo, et al. (2016) has shown a shift in double rainfall maxima between July and September to June and September in recent climate while the short dry season (August break) was being experienced more in July as against its normal occurrence in the month of August in the past climate. This may be attributed to a shift in savanna belt southward due to alteration in climatic belt caused by climate change.

There has been a proportion of trace, < 25 mm, 26 – 50 mm and 51 – 99 mm rains of various sizes in Cross River which have been slightly higher in recent climate regime than the past climate, indicating increase in rainfall intensity across the state which might have contributed to high incidence of flooding in Cross River in recent time. There is also an increase in the proportion of cloud burst rains in recent climate compared to the past climate and this was attributed to climate change (NEMA, 2013). Also, there is an abrupt increase in maximum and minimum temperature in Cross River confirming incidence of global warming even in a local scale. Hence, global warming is real as confirmed at local levels. This linear increase in annual warming in recent period occurs as a result of increase in global atmospheric concentration of carbon dioxide (CO₂) levels plus the effect of other anthropogenic greenhouse gases.

Furthermore, warmer than normal temperature prevail in recent climate period in Cross River. This suggests more warming condition in the future. Higher evaporation rate in recent climate period may be attributed to warmer than normal condition of the area associated with increased rainfall amount as supported by NIMET (2012). However, seasonal evaporation exhibited great similarity across Cross River state with high rates occurring in dry season (between December and March) and lowest rates obtained at peak wet seasons (between June and September).

Higher evaporation rate in Eket and Ogoja reflected drier than normal condition in Eket and Ogoja which also suggest that most rivers were drying up in those locations. This is because evaporation is an important component of the hydrological cycle which has great influence on the water balance of the earth surface. Also, the low wind speed in most locations in recent climate period could be attributed to shift in the air front (International convergence zone, ITCZ) southward as supported by NIMET (2012). This might have influenced the increase occurrence of cloud burst storm in Calabar and Eket. The increased wind speed in

Calabar could also be attributed to its proximity to the sea which exerts its wave influence in form of wind storm (Sambo, et. al., 2016). The climatology of many communities in Cross River state has been altered by climate change, collapsed double maxima in some locations and created it in other locations. This means that the length of farming season will be affected seriously in most locations in Cross River state as a result of climate change (Sambo, et. al., 2016).

2.7.5 Impact of Climate Change on the Socio-Economic Activities of Women in Cross River State

With the alteration of the climatology of many communities in Cross River State as a result of climate change, which has also collapsed double maxima in some locations and created it in other locations, the socio-economic activities of women, like farming, are affected. For example, the second farming season also known as 'Late planting' is no more in existence in Cross River state resulting in reduction in crop yield and food supply and has raised food insecurity threat in the area (Sambo, Ufoegbune, Eruola & Ojekunle, 2016). Sambo et al. (2016) in their study revealed that socio economic activities of women like agriculture is at great risk in Cross River state suggesting high probability of food insecurity. For example, the thermal and moisture requirements of different crops showed that Ikom and Ogoja areas of the State have higher climatic production potential and their soils are less polluted for production of most arable crops like swamp rice, upland rice, maize and yams which are produced substantially by women. Indeed, socio economic activities of women in some parts of Cross River state are further worsened by high level of soil pollution caused by oil exploration activities, which on their own, have sent many farming households to bed hungry.

2.7.6 Climate Change impact in Plateau state

Plateau state which lies between latitudes 8°3' and 10°30' North and latitudes 7°30' and 8°37' East is located in the north central region of Nigeria. The climate of the state is characterized by two distinct seasons - wet and dry. The wet season in the state last for a period of 5 months (March – September) while the dry season last from October to February. The appropriate maximum high temperature is about 22°C while the mean minimum low temperature is about 18°C (Labiru, 2016). The weather in Plateau state is therefore generally cold especially between December and February as a result of the harmattan (North East trade) winds (Labiru, 2016).

Plateau state has its own share of negative impacts of climate change. These impacts are expected to get worse with time thereby necessitating more serious measures to be taken by the farmers themselves, the government, NGOs and other private sector organizations that may assist farmers.

According to Labiru, Sadiku, Ahonsi and Bulus (2006), annual rainfall is variable in Plateau state and the use of a trend line showed that annual rainfall is on the decrease with a possible of 1% decrease from the mean. The implication of the decrease in annual rainfall in the state is that, the length of growing season might slightly reduce, which in turn means that farmers should be encouraged to adopt the use of hybrid seedlings, as temperature is generally increasing in Plateau state. Therefore, the Plateau Agricultural Development Programme (PADP), through its extension workers, needs to carry out sensitization of farmers on the declining trend of rainfall in the state. This, therefore, makes imperative that agricultural activities in Plateau state is rained in nature. More so, the need for the establishment of climate change information systems by the government, particularly at the local government level. This will provide awareness campaigns for members of the public, provide weather forecast/early warning information service and provide training on how to adapt to climate change to farmers.

2.7.7 Impact of Climate Change on the Socio-Economic Activities of Women in Plateau State

Plateau state has experienced severe flood during the rainy season in the past decade. Climate change is responsible for increase in flood severity in Plateau state which has threatened the livability of the people of the state most especially women and girls. This has greatly increased poverty and job loss in women and girls as they have been denied access to socio economic activities for a long period. According to Labiru, et al. (2016), climate change has also brought about decrease in annual rainfall in Plateau state, thereby affecting the socio-economic activities of women such as agriculture, in terms of length of growing season which has slightly reduced. Furthermore, agriculture which is the mainstay of the socio-economic activities of women in Plateau state suffers a lot from erratic weather patterns such as heat stress, longer dry seasons and uncertain rainfall. Plateau state women are suffering from decline in crop yields due to unfavorable weather and climate change which has led to vulnerability in women, especially, in the form of food insecurity, hunger and shorter life expectancies. Majority (60%) of the food produced in Plateau state is provided by small scale farmers who are mostly women who cultivate small plot of land and depend on rainfall rather than irrigation system. It is pertinent to state here that poverty, outbreak of pest and disease are rated the most important impact of climate change on women in the Plateau state (Labiru, et al., 2016).

2.7.8 Climate Change impact in Rivers State

Rivers state which is a coastal community is located in the Niger Delta Area of Nigeria, encompassed by a network of tributaries, inland and the Atlantic Ocean at its Southern tip. The communities in Rivers state are largely dependent on the coastal wetlands for aquaculture and fisheries activities, which are their main economic activity. Many other economic activities especially oil prospecting and exploration activities by numerous

companies, landfills, and reclamation, and human activities such as deforestation of the mangroves of the wetlands among others that are responsible for global climate change are high in the Rivers state. Further, certain climate change activities have been observed recently in Rivers (Wokocha & Jamabo, 2015).

The fishing industry is an essential economic activity in Rivers state. The industry provides much needed protein and nutrients as well as creates jobs for thousands of people living in the state. With the high demand on fishing, their populations are declining. The population of fish is being depleted faster than they are able to restore their number. The fish population is not given enough time for the populations to regenerate and sustain the demand that has been put on them. Over fishing is not the only impact on marine communities in River state, climate change, habitat loss, and pollution are all added pressures to these important ecosystems. The banks of the water systems of Rivers state are desirable and ideal locations for people to settle (Alm, Blommestein & Broadus, 1993).

The biodiversity in Rivers state is experiencing a major impact as a result of climate change. Saltwater intrusion brings about stress on plants and tree species that are very important to life and culture (Blommestein, Boland, Harker, Lestrade & Towle, 1996). For example in many areas of Rivers state, trees are used for house construction, local medicine, food and traditional clothing, and are dying from saltwater intrusion as the seawater slowly seeps into the ground. Due to climate change and global warming, changes of weather patterns in some wet areas can become dry. Unexpected drought may lead to the loss of plant species, as well as the fishes. This is a major concern because forests are an important ecosystem that supports birds, plants, humans and other animals. Due to the rising sea level, mangroves in River state will have to retreat inland to survive.

2.7.9 Impact of Climate Change on the Socio-Economic Activities of Women in Rivers State

Socioeconomic activities of women in Rivers such as fishing may face trouble thereby witnessing a decline income in women resulting to poverty. Likewise, women who are into crop farming may find it difficult to have good crops to sell or export if the area is hit with drought or heavy rainfall due to climate change and changing weather patterns (Briguglio, 1993). Much of the fish ecosystem in Rivers state is at a serious risk from inundation, flooding and physical damage. Also infrastructure including, roads, airports and port facilities (all predominantly found on the coastal areas), are in danger of destruction. Such damages will disrupt socio economic activities of women such as food and energy supplies resulting to poverty in women.

Women are also witnessing a change in the distribution, productivity, and species composition of fish production in Rivers state, thereby generating complex and inter-related impacts on the marine systems of the area, that provide habitats and nursery areas

for fish. The changing rainfall patterns and water scarcity in Rivers state is impacting on rivers and lake fisheries as well as aquaculture production.

The socio-economic activities of women in Rivers state is dependent on fish due Rivers state been a coastal town and has a lot of fish that are particularly vulnerable to climate change. Rivers state may become a causality of climate change which will have a great impact on women economic activities, for example, fishing communities along the Mekong river, produce over 1 million tons of basa fish annually and livelihoods and fish production will suffer from salt water intrusion, resulting from rising sea level and dams (Wokocho & Jamabo, 2015).

2.8 Summary of Key Findings from the Literature Review

Several issues associated with gender, climate change and agriculture were identified in the literature review. Major review showed that Nigeria is extremely vulnerable to climate change as it is evident in the astronomical rate of desertification ravaging the Northern part of Nigeria. Nigeria has not come to terms with the realities of climate change despite evidence of land degradation observed across the country, that are caused by flooding, wind and erosions associated with climate change. Nigeria that is the largest and wealthiest country within the West African sub-region region, has failed to take effective leadership in terms of its engagement with environmental and climate change research activities and implementations. Furthermore, some indicators used in assessing the evidence of climate change in the Nigerian region have shown increased temperature, increasing evaporation, decreasing rainfall amount in the regional interiors, increasing rainfall in the coastal regions, increasing disruption in climate patterns and increasing frequency and intensity of unusual or extreme weather related events such as; bush fires, droughts, constant loss of forest cover and biodiversity, drying up of rivers and lakes, floods, lightning, unpredictable rainfall patterns, rise in sea level, increased desertification and land degradation, thunderstorms and windstorms.

Also, it was reviewed that women and men do not experience climate change equally. Economic constraints and cultural norms restrict women's access to paid employment, this entails that women's livelihoods are very much dependent on climate-sensitive sectors such as subsistent agriculture or water collection. The fact that women and girls in Nigeria are responsible for the unpaid care tasks around the household also means that their lives are directly affected by climate change which has brought about changes in the country. Women and girls often have to walk further to find increasingly scarce food, fuel and water, as well as caring for family members who are susceptible to the health risks brought about by climate change. This has brought about less time for education, income-generating activities or participation in community decision –making process by women and girls, thereby further entrenching unequal gender relations.

3.0 METHODOLOGY

3.1 Design

The study was a mixed approach research design as it sought to investigate the perception of farmers - both men and women, girls and boys, agricultural workers on awareness of climate change and its impact on their livelihood and challenges women face in agriculture as well as the nexus between gender, climate change and agriculture. To achieve this, the study employed both qualitative and quantitative techniques. The combination of the methods enabled the generation of appropriate data to profile the phenomenon, its dynamics and to proffer solution that will benefit farmers most especially women in Nigeria.

3.1.1 Quantitative Design

This involved the collection of quantitative data through a household survey. The collection of the quantitative data involved the use of a questionnaire to elicit specific information on household socio-economic and demographic data, gender awareness and impact of climate change on agriculture and livelihood and the connection between climate change and agriculture and household vulnerability indicators.

3.1.2 Qualitative Approach

The qualitative data were generated using participatory approaches and these include:

- a. In-depth interviews with key informants (KII) who are persons that are knowledgeable about what is going on in the states with regards to impact of climate change on gender and agriculture. A set of interview protocol was developed for ease of cross referencing. After securing informants' consent and assent, the interviewers took notes and tape-recorded proceedings of the interview which were later transcribed and used for analysis. A total of 24KIIs were conducted in all the states sampled for the study.
- b. Focus Group Discussions (FGDs) was conducted in each of the states. A total of 70 persons participated in the FGD which involved between 5 to 7 persons. Participation was based on predetermined groups in age and sex. Care was taken to ensure free expression within the group. A total of 5 FGD sessions were conducted in each of the 4 sampled states. Sampling was based on convenience method and participants identified on the basis of their interest to participate in the discussion. To ensure a focused discussion, an FGD guide was developed to moderate the FGD sessions.
- c. Case Studies: Case studies were conducted for consenting marginalized men/women, boys/girls whose livelihoods including agriculture have been affected by climate change. There was restriction to the age of respondent only to the extent that each respondent has the capacity to rationally engage with interviewer. The moderator of the

FGD probed the discussants for cases and adopted the convenient approach and selected cases in each of the study location. A question guide was developed to elicit information from respondents that were case studied.

d. Desk Study involved the review of literature and secondary data which was derived from various sources. The study made use of newspaper publications, journal articles and statistical reports, survey findings and reports, etc. These provided information on the profile, gender, agriculture and climate change as well as some of the impact and causes of climate change. The relevant information was triangulated with information gathered from other sources for analysis.

3.2 Study Participants

A total of 619 participants made up of 230 (37.2%) males and 389 (62.8%) females responded to the research household survey questionnaire. Out of the 619 participants, those sampled from Benue were 149 (24.1%), while those sampled from Cross River were 170 (27.5%), Plateau 150 (24.2%) and Rivers 150 (24.2%).

During the FGD and KII, information on the demographic composition of respondents was also taken. It was gathered that 65 persons participated in the FGD, females were 32 while males were 33. Their age ranged from 25 to 60. In terms of KII, 24 persons participated. Among those who participated in the KII, females were 6 while males were 18.

Table 1: Number of FGD, KII and Case Study in Benue State

The Table shows representation of sampled participants in FGD, KII and Case Study in Benue state

Participants	FGD	KII	Case studies (PLWDS)
Females	10	2	
Males	10	5	1
Total	20	7	1

Source: Field Work 2018

A total number of 28 participants took part in the FGD and KII in Benue State. Out of this figure, 20 took part in FGD which is made up of 10 males and 10 females. While in KII, 7 stakeholders participated, out of which 2 were females and 5 males. They were sampled from MDAs, traditional institutions, and women organizations in Benue state at the local and state government levels. Further, 1 case study involving male person living with disabilities was also conducted. Participants were sampled from 3 local governments of the state.

Table 2: Number of FGD, KII and Case Study in Cross River State

The Table shows representation of sampled participants in FGD, KII and Case Study in Cross River state

Participants	FGD	KII	Case studies (PLWDS)	Live story
Females	10	2	-	1
Males	10	7	2	
Total	20	9		

Source: Field Work 2018

A total of 32 persons participated in the FGD, KII, case study and live story in Cross River state. Out of the 32 persons, 20 respondents made up of 10 females and 10 males took part in the FGD. In terms of KII, 9 persons were interviewed from MDAs, traditional institution, religious institution and women organization in Cross River at the local and state government levels. Among the participants that took part in the KII, 7 were males while the females were 2. Further, two case studies involving male persons living with disabilities were also considered while one live story (female) was also carried out.

Table 3: Number of FGD, KII and Case Study in Plateau State

The Table shows representation of sampled participants in FGD, KII and Case Study in Plateau state

Participants	FGD	KII	Case studies (PLWDS)	Live story
Females	12	2	5	1
Males	13	6	-	-
Total	25	8	5	

Source: Field Work 2018

Participants who took part in FGD, KII and case study in Plateau state were 39. Out of this, 25 made up of 12 females and 13 males participated in the FGD while KII were 8 (2 females and 6 males) sampled from MDAs, traditional institution, religious institution and women organization in Plateau state at the local and state government levels. Further, 5 case studies involving female persons living with disabilities were also considered while one live story (female) was also carried out. Participants were sampled from 6 local governments of the state – Plateau North and Riyom sampled from Jos North Senatorial Zone, Bokokos and Pankshin sampled from Plateau Central Senatorial Zone and Langtang and Shendam sampled from Plateau South Senatorial Zone.

Table 4: Number of FGD, KII and Case Study in Rivers State

The Table shows representation of sampled participants in FGD, KII and Case Study in Rivers state

Participants	FGD	KII	Case studies (PLWDS)	Live story
Females	10	2		
Males	13	3	1	
Total	23	5	1	

Source: Field Work 2018

Participants who took part in FGD, KII and case study in Rivers state were 29. Out of this, 23, made up of 12 females and 11 males participated in the FGD while KII were 5 (2 females and 3 males) sampled from MDAs, traditional institution, religious institution and women organization in Rivers state at the local and state government levels. Furthermore, 1 case study involving male person living with disabilities was also considered.

Various individuals and groups were used as key informants during the study. They include:

- Government officials from the relevant MDAs in the States
- Community leaders (male, female and youth)
- Leadership bodies of marginalized groups (where available)
- Youth groups.
- Professional groups
- Religious leaders

3.3 Sampling Method

A multistage sampling approach was employed in this study. Firstly, the purposive sampling was used to select states. In addition, 3 local governments were selected using simple random sample technique while 1 community was selected from each local government to for the study. In the FGD, purposive sampling was adopted in selecting men, women and youth (males and females) and physically challenged persons in communities. In selecting the study population for household survey, a total of 600 households were selected using convenient sampling. Purposive sampling method was also employed for collecting data from households in the sampled local governments and communities. Purposive sampling is a valuable kind of sampling used in exploratory research which gives the best chance to get rich qualitative data (Barbie & Mouton, 2007).

3.4 Research Instruments

Key research instruments used for this study were Key Informant Interview guide, Focus Group Discussion guide and the Gender and Climate Change issues in Agriculture Questionnaire. These instruments were designed to elicit information that could throw

light on the profile, impact and challenges. Questions were framed to obtain the demographic details of respondents, their knowledge and perspective of the study subject. The research tools were designed based on participatory approach that included the themes that were developed. The question guide was varied and framed to elicit specific information from the different target groups.

The research tools were developed with the help of literature review and consultation with the expert in the field. The goal of the study was to gather statistical data (information) about the views (opinions) of farmers on gender and climate change issues in agriculture focusing on Benue, Cross River, Plateau and Rivers states in Nigeria. The questionnaire for the study was divided into five (5) sections. Section 1 dealt with the demographic information or bio-data of the respondents. Section 2 focused on the nexus between climate change and agriculture while section 3 collected data on the views of respondents on how Climate Change has impacted on their Livelihoods. Section 4 dealt with the challenges women face in agriculture as a result of climate change while section 5 looked at perception of farmers on climate change and variability indicators.

With these key issues, the researchers designed the questionnaire (See Appendix 1). The questions were mostly closed ended which gave respondents possible answers to select from. One advantage of this was that it made data analysis much easier. The closed questions were grammatical statements on which the respondent could then give her/his opinion by deciding between 3 answer-boxes: “agree”, “undecided or not sure”, “disagree”. This type of questioning enables simplification of data analysis. By asking for opinions on statements, it is easy to derive trends of opinions from a large number of people to certain issues and at the same time get a picture which was more complex than a trend consisting simply of “yes” and “no”-answers.

The KII and FGD guides (see appendix 2) which are the structured interview guides were also developed with the help of literature review and consultation with the expert in the field. The interview guide was developed to provide answers to the research objectives. The rationale behind the use of the structured interview is based on the fact that “exclusive reliance on one research instrument for data collection may distort researcher's picture of the particular slice of reality under survey. The use of interview will go a long way in helping research subject to open up and air their views in a very magnificent way based on their experiences.

3.5 Data Collection Procedure

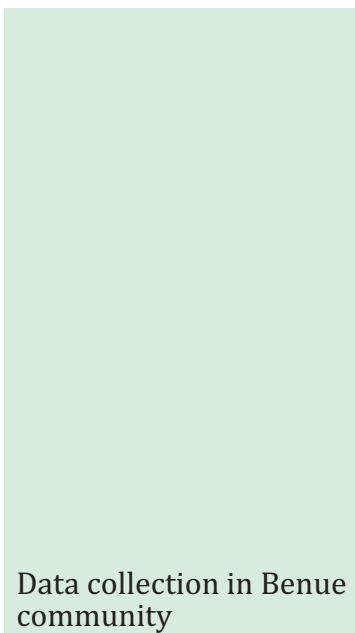
Data collectors were recruited and trained to collect data for study. The recruitment reflects gender balance and understanding of the local language. Pre-test was carried out to ensure a high degree of translation of the instruments and validity of the questions. All the

research instruments were introduced to the data collectors before the training and discussed in detailed in terms of nature and form. Data collectors were also trained on how to use kobocollect for quantitative data collection as the data was collected both via kobocollect and manual administration of the questionnaire in some states.

The data collectors recruited were given stipend as well as the cost of travel to administer the questionnaires. In order to maintain standards, briefing papers were prepared for each data collector that detailed how to administer the questionnaires as well as conduct KIIs and FGDs. The collection of data for the survey went overwhelmingly well.

3.6 Data Analyses and Techniques

The quantitative data were analyzed using descriptive techniques in the SPSS computer program while qualitative data were gathered and transcribed verbatim. The transcribed interviews and discussions were analyzed using the thematic approach.



Data collection in Benue community



4.0 RESULTS AND DISCUSSION OF FINDINGS

This section focuses on the findings of the study based on field work done through household surveys, Focus Group Discussion, Key Informant Interview and Case study. The first part of the section presents the joint result of the 4 states (Benue, Cross River, Plateau and Rivers) that were studied. The second part presents results from each state which describes climate change issues based on the states experiences.

4.1 Socio Economic Characteristics of Respondents

The section presents separate demographic factors of participants in household survey, FGD and KII. The demographic factors considered here are, age, sex, ethnicity, marital status, religion, educational qualification, occupation and farming experience. The demographic variables are considered because they influence on the way people perceive and respond to climate change due to biological and psychological differences. Climate change affect people differently in accordance with age, sex, ethnicity, marital status, religion, educational qualification, occupation and farming experience. The impact of climate change may be felt more by women, children and the people with disabilities. For example, women in Nigeria are the ones that are more involved in farming and livelihood activities to sustain the family. Educational status also has impact on the way we perceive and respond to climate change. Education influences our reactions to climate change and lack of education may deprive individuals, most especially women, the necessary knowledge that will help them deal with or adjust to the impact of climate change related issues. Thus, evidence of farmer's inability to deal with or adjust to climate change and related problems in agriculture abound in the society which is as result of poor education, most especially women. Education benefits women as it help them to understand and adjust to the climate change and also tackle agricultural and another livelihood challenges, they face.

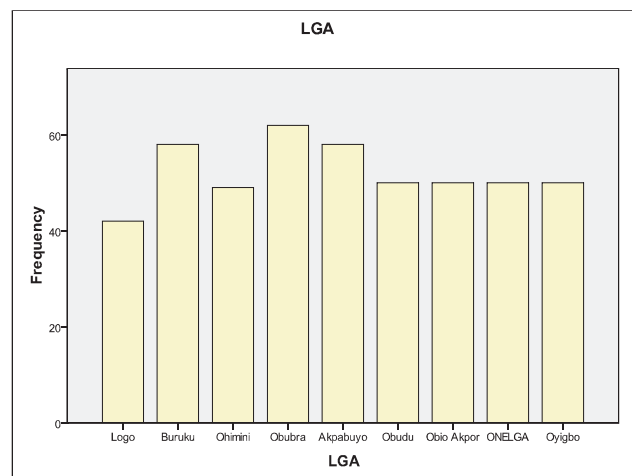
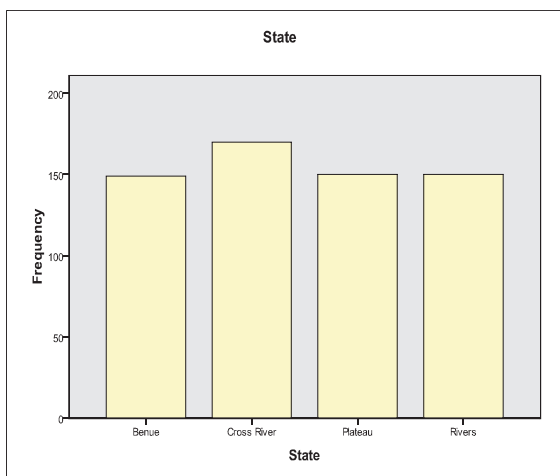
Table 5: Socio-Demographic characteristics of the participants for household survey

S/No.	Variables	Frequency	Percentages
1.	State		
	Benue	149	24.1
	Cross River	170	27.5
	Plateau	150	24.2
	Rivers	150	24.2
	Total	619	100
2	Local Government		
	Logo	42	6.8
	Buruku	58	9.4
	Ohimini	49	7.9
	Obubra	62	10.0
	Akpabuyo	58	9.4
	Obudu	50	8.1
	Oyigbo	50	8.1
	ObioAkor	50	8.1
	ONELGA	50	8.1
	Plateau State	150	24.1
	Total	619	100
3	Age		
	18-29	139	22.45
	30-39	211	34.08
	40-49	126	20.36
	50-59	83	13.41
	60-69	37	5.98
	70 - above	23	3.72
	Total	619	100
4	Sex		
	Males	230	37.2
	Females	389	62.8
	Total	619	100
5	Religion		
	Christianity	587	94.8
	Muslim	24	3.9
	Others	8	1.5
	Total	619	100
8	Education Qualification		
	Primary	116	18.7
	Secondary	389	62.8
	Tertiary	-	
	No formal education	114	18.5
	Total	619	100
9	Occupation		
	Farming	388	62.7
	Petty Trading	63	10.2
	Student	69	11.1
	Civil Servants	34	5.5
	Others	65	10.5
	Total	619	100

Source: Field Work 2018

a) State;

Four states were sampled for the study. A total of 619 respondents were sampled from these 4 states. Findings in Table 5 showed that Cross River state has the highest number of participants which is 170 (27.5%) of the total population of the study, Plateau 150 (24.2%), Rivers 150 (24.2%) while Benue state has the lowest number of respondents for the study which 149 (24.1%). Furthermore, analysis in Table 5 indicates that Obubra local government from Cross River state with 62 (10.0%) has the highest number of participants that were sampled for the household survey while Logo local government from Benue has the lowest number with 42 (6.8%) participants sampled.



a) Age;

In terms of participants' age, Table 5 indicates that participants' age ranged from 18 – 80. A breakdown of the age range showed that 139 (22.45%) participants had age range of 18-29 while 211 (34.08%) participants had age range of 30-39. This indicates that respondents between age 30-39 engage more in farm activities as the study target basically farmers in rural areas. It also indicates that individuals between age of 30-39 are more in the rural areas. Furthermore, participants between 40-49 years were 126 (20.36%), 50-59 were 83 (13.41%), 60-69 were 37 (5.98%) while participants between 70 years and above were 23 (3.72%).

b) Sex

Sex distribution of respondents in the household survey showed that females were 389 (62.8%) while males were 230 (37.2%). This indicates that more females participated in the study and further that more females are found in the rural areas than males. This could be due to the fact that men migrate to the city more than women do. Furthermore, since the study targeted rural farmers, it entails that more female engaged in farm activities and other means of livelihood than males.

c) Educational qualification

Regarding educational qualification of participants that participated in the household survey, it was found that majority of the participants, which is 389 (62.8%) have secondary school qualification, 116 (18.7%) have primary education and 114 (18.5%) have no formal education while none of the participants had tertiary education. This entails that rural farmers of which majority are women, and who are mostly the providers of source of livelihood for the family have more secondary school qualification. This calls for more educational empowerment of rural women in Nigeria.

d) Occupation

In terms of occupation, findings indicates that 388 (62.7%) of the participants were farmers, 63 (10.2%) petty traders, students were 69 (11.1%), civil servants were 34 (5.5%) and others such as tailors, hair dressers, food vendors, etc, were 65 (10.5%)

4.1.1 Demographic Composition of FGD and KII

During the FGD and KII, information on the demographic composition of respondents were also taken. It was gathered that 65 persons participated in the FGD. Out of the 65 participants that took part in the FGD, females were 32 while males were 33. Their age ranged from 25 to 60. In terms of KII, 24 persons participated; out of which females were 6 while males were 18.

4.2. Nexus between Gender, Climate Change and Agriculture

In responding to the research objective 1, both quantitative data and qualitative were analyzed. The quantitative data was analyzed using descriptive statistics while the qualitative data was transcribed and analyzed. The results of descriptive data are presented in Table 6 while results of qualitative data were summarized.

Table 6: Nexus between Gender, Climate Change and Agriculture

S/No.	Variables	Frequency	Percentages
1.	An increase in the frequency and intensity of extreme environmental events that impact on agriculture can be directly linked to climate change.		
	Agree	607	98.1
	Undecided	7	1.1
	Disagree	5	.8
	Total	619	100
2	Extreme environmental events (i.e. floods, drought and storms) as a result of climate change have been increasing in frequency and intensity in recent years affecting agricultural activities and livelihood of women.		
	Agree	606	97.9
	Undecided	5	.8
	Disagree	8	1.3
	Total	619	100
3	Women participate more in agricultural activities which are the most affected by extreme environmental events, therefore women agricultural activities are the most vulnerable to climate change		
	Agree	601	97.1
	Undecided	5	.8
	Disagree	13	2.1
	Total	619	100
4	Land-use, for example deforestation and urbanization, is a contributing factor to global climate change		
	Agree	586	94.7
	Undecided	15	2.4
	Disagree	18	2.9
	Total	619	100
5	Decrease or increase in agricultural activities of women directly link to climate change		
	Agree	596	96.3
	Undecided	12	1.9
	Disagree	11	1.8
	Total	619	100

Source: Field Work 2018

Table 6 presents the result regarding the nexus between gender, climate change and agriculture. Findings from the Table showed that respondents are aware of the impacts of climate change on agriculture and gender. Respondents are aware that an increase in the frequency and intensity of extreme environmental events can that impact on agriculture is directly linked to climate change. Furthermore, respondents believe that extreme environmental events such as floods, droughts and storms have been increasing in frequency and intensity in recent years thereby affecting agricultural activities and

livelihoods of women who are more involved in agricultural and livelihood activities in rural Nigeria. Also, result in Table 6 indicates that majority of the participants in the household survey agreed that agricultural activities which women are more involved in are the most affected by extreme environmental events; therefore, such extreme environmental events affect agricultural activities and also affects women. Another link between gender, climate change and agriculture is that climate change decreases or increases agricultural activities of women. This means that a favorable climate event can increase women agricultural and livelihoods activities, while an unfavorable climate event brings about decrease in women agricultural activities and livelihoods. This entails that when agricultural activities are affected, the income of women drops, their means of livelihoods drops, they are less empowered, they cannot afford proper health care, etc. Furthermore, when women are affected by illness as a result of climate change, agricultural and livelihoods activities also suffer, as the women are not strong to carry out the agricultural and other livelihood activities.

Based on the result in Table 6, it can be deduced that climate change has a significant relationship with gender and agriculture. There is no doubt that the effect of climate change is felt by all and sundry, however relating the effects felt by all spheres of gender, it could be inferred that the burden exerted by climate change falls more on women given that they bear more of the burden imposed on human beings by climate change.

Findings of the study indicate that gender, climate change and agriculture are deeply intertwined. There is a direct link between gender, climate change and agriculture. The result showed that women are experiencing the impact of climate change as it was seen in their agricultural production. The women who are mostly subsistent farmers in the areas of study are experiencing changes in agricultural pattern, pests' infestations on their crops, crop failure and poor harvest as well as high cost of agricultural activities, high cost of labour, slow annual growth, reproduction and milk production, reduced animal rate of eating and grazing, reduction in fish harvest, travelling long distances to farm among others. These changes are impacting negatively on the lives of women in Nigeria. Furthermore, there's decrease in agricultural activities.

Supporting the findings of the household survey with findings of FGD and KII, those who participated in the FGD and KII attested to the nexus between gender, climate change and agriculture. They attested to the vulnerability of women and agriculture to climate change, which exacerbates existing inequalities and disparities. A respondent from the Ministry of Women Affairs in Plateau during the KII said

"I will tell you this authoritatively and from very relevant sources, women farmers in Plateau and Nigeria suffer greatly from climate change, it affect crop production in a number of ways. For example, poverty, rain fall duration is extended, floods and devastated farm lands affect crops.

A traditional ruler in Plateau state during KIII noted that

"More than 80% of our women are involved in agriculture, it is difficult to find a women who doesn't even have a garden behind her house. Women experience untold hardship in our communities, you know they don't own land. We didn't create the laws that is how we met them"

A religious leader during KII in Rivers state stated that

"I do not know about climate change and agriculture but I know that in 2016 we lost a lot of corn, melon, maize, yam, cassava and vegetables. I can't tell the reason but people said it is "Buhari Ebola". Termite were eating up the crops, the destruction was so severe. And the Indian bamboo trees blocks sunlight from permeating through the bamboo to the crops. The areas we are farming is very swampy, and most of the farmers are ignorant of the environment and the kinds of crops that can grow in such an environment. Here people keep farming in the same place year in, year out and so they depend on fertilizer to empower the soil because the soil gets weakened from too much cultivation. We don't focus on farming specific crops, we plant everything in the same plot of land. In 2004, when I was in Bible school, there was a specific fertilizer for yam but our people use the same fertilizer for all kinds of crops. Farmers suffer from ignorance, so there is need for enlightenment campaigns and sensitization".



KII with a stakeholder in Cross River State

KII respondent from Ministry of Women Affairs in Rivers highlighted the nexus between gender, climate change and agriculture. The discussant is of the view that climate change has negative impact on agriculture and women are the most affected by this negative change. She stated thus

“Women farmers are experiencing the economic crunch. Flooding has affected fishing and farming. Crops are affected by flood, some communities are submerged for over a month. Reptiles are driven into people's houses. Vegetables are scarce and women farmers are greatly affected. This effect trickles down to households and children”.

The respondents agreed that the temperatures are higher than normal, change in rainfall patterns, severe droughts, frequent floods, water shortages etc. This is agreeing that Climate Change is real. They discussed and listed specific ways it impacts on women in agricultural activities.

The Farmer/herder conflict which experts said is as a result of climate change has affected agricultural activities in the States and the impact is felt much more by women and children. The migration patterns of cattle herders to the study areas have caused incessant killings of people most especially women and children. Farmlands and crops are destroyed during these conflicts with the recent ones that happened in Benue and Plateau states from January to August 2018 leaving hundreds dead and thousands displaced as well as destruction of means of livelihoods. Also, discussant stated the unequal access to productive resources and agriculture land between women and men. This unequal access has further been exacerbated by effects of climate in the society. Further, discussants in FGD stated that women's burden is more evident as a result of Climate Change. Women in the study areas admitted to having extra workload as a result of climate change. These extra workload include low yield, scarcity of water, destruction of farm land and crops as a result of flood, working longer hours which has affected them not only physically but psychologically and emotionally as they constantly have to worry about the well-being of their family and the resultant effect of flood on their crops, land and also inability of crops to produce as required. These views from FGDs and KIIs have established that climate change has brought about negative impact on agriculture in the study areas and this impact on agriculture are mostly felt by women, thus establishing a nexus between gender, climate change and agriculture.

This finding which established a nexus between gender, climate change and agriculture is in agreement with the work of WEDO (2008). WEDO in its work on gender, climate change and human security found that in rural areas, agriculture takes up a lot of women's time because they have to deal with problems related to climate change such as soil erosion and impoverished, infertile land. The study also found that over 90% of agriculture depends on the amount of precipitation that varies from year to year. The unreliability of rain results in

loss of soil fertility, poor harvests, food shortages, and impoverished populations, especially in rural areas. Also, this finding supports that of Muttanna (2013) whose study on perception of climate change among farm women and its impact on production of red gram in Bengaluru revealed that women farmers perceived changes in the months for land preparations, date of sowing, germination, percentage of seeds, crop growth, flowering time, pod formation and number of pods and incidence of pest were more due to the variation in the climate change (Rainfall and temperature) on agriculture production (red gram). This has caused majority of the women to initiate goat rearing, followed by sheep rearing, dairy and other subsidiary occupations, while others migrated to cities in search of better job and other facilities. The major constraints experienced by women while initiating adaptation measures were, non-availability of labour and higher wage rate, followed by difficult to work in the field due to severe temperature, higher cost of agriculture inputs and low price for the produce in the market.

4.3 Climate Change and Livelihoods

Respondents in household survey, FGD and KII reported having noticed changes in their source of livelihood. They reported that these changes are as a result of adverse effect of climate change that are basically agricultural-based and also non-agricultural activities. Livelihoods are built on assets/capital, capabilities, and activities (Chambers & Conway, 1992; DFID, 1999). According to DFID (1999), any obstruction to these livelihoods' components, especially assets, is bound to adversely affect the attainment of livelihoods. The household survey result on the impact of climate change on livelihood is presented in Table 7.

Table 7: Impact of Climate Change on Livelihood

S/No	Variables	Frequency	Percentages
1.	Climate change has affected livelihoods in the community		
	Agree	590	95.3
	Undecided	23	3.7
	Disagree	6	1.0
	Total	619	100
2	Climate change has affected the health conditions of the people in the community thereby resulting to reduction in food production		
	Agree	600	96.9
	Undecided	15	2.4
	Disagree	4	.6
	Total	619	100
3	Climate change has affected access to labor in the community		
	Agree	546	88.2
	Disagree	46	7.4
	Disagree	27	4.4
	Total	619	100

Table 7: Impact of Climate Change on Livelihood *contd.*

S/No	Variables	Frequency	Percentages
4	Climate change has increased the workload of people in the community		
	Agree	572	92.4
	Undecided	32	5.2
	Disagree	15	2.4
	Total	619	100
5	Climate change has affected the wildlife/forest reserves in the community		
	Agree	569	91.9
	Undecided	20	3.2
	Disagree	30	4.8
	Total	619	100
6	Agricultural land have been negatively affected by climate change		
	Agree	598	96.6
	Undecided	15	2.4
	Disagree	6	1.0
	Total	619	100
7	Water resources have been negatively affected by climate change		
	Agree	580	93.7
	Undecided	30	4.8
	Disagree	9	1.5
	Total	619	100
8	Climate change has affected participation in social organizations/social networking (e.g. funeral, weddings, etc.) in the community		
	Agree	513	82.9
	Undecided	47	7.6
	Disagree	59	9.5
	Total	619	100
9	Shelter/buildings (including storage facilities) have been affected by climate change		
	Agree	561	90.6
	Undecided	38	6.1
	Disagree	20	3.2
	Total	619	100
10	Water supply in the community has been affected by climate change		
	Agree	575	92.9
	Undecided	28	4.5
	Disagree	16	2.6
	Total	619	100
11	Climate change has resulted in crop and/or livestock damages in the community		
	Agree	598	96.6
	Undecided	16	2.6
	Disagree	5	.8
	Total		
12	Climate change has resulted in migration of members of the community and/or loss of income earning opportunity in the community		
	Agree	509	81.9
	Undecided	54	8.7
	Disagree	58	9.4
	Total	619	100

Source: Field Work 2018

Table 7 presents the result regarding the impact of climate change on livelihoods of women. Findings from the Table showed that majority of the participants 590 (95.3%) agreed that climate change has affected livelihoods of women in their society. Not only is livelihoods directly affected, it is also indirectly affected as 600 (96.9%) of the participants agreed that climate change affects the health conditions of people in the community thereby affecting their ability to carry out their livelihood activities. Labor which is provided in community is impacted by the effect of climate change. Majority of the participants 546 (88.2%) agreed that labor in the community is affected due to the effect of climate change. When labor is negatively affected, agricultural activities and other livelihoods are affected as some of the women in rural areas depend on paid labor to carry out their agricultural activities. Furthermore, 572 (92.4%) agreed that climate change has also brought about increase in the workload of people in the community. As climate events adversely affects agricultural and livelihood activities, it entails that both men and women will have to put in extra hours of work in their agricultural activities and other livelihoods to enable them get better yields. For instance, planting season is gradually changing thereby bringing in more work on farmers.

Results in Table 7 also indicate that wildlife/forestry reserves in communities are also affected by climate change. Impacts of climate change on forest reserve are dryness of the forest and the long presence of people in forest reserves in search of livelihoods as well as herdsmen's presence within the forest reserve due to the long-delayed onset of rainfall. Majority, 598 (96.6%) of the respondents agreed that agricultural lands have been negatively affected by climate change and 580 (93.7%) agreed that water resources have been negatively affected by climate change. Other impacts also indicated by majority of the respondents are that of participation in social organizations in community. Findings indicates that community members engaged more in their farm activities, extreme harsh weather conditions, etc thereby reduced participation in social activities in the community. Shelter/buildings are also impacted by climate change. Findings showed that 561 (90.6%) of the participants agreed that climate change have affected shelter and buildings in their community.

Furthermore, climate change also brought about migration of members of the community and/or loss of income earning opportunity in community. Young men are migrating to cities leave women and elderly men in the community. This migration is due to the impact of climate change. This partially explained while majority of the participants in the household survey are women. Also, crops and/or livestock are damage in community leaving community members with no source of income earning.

Livelihoods in communities especially those of the women are affected by climate change in the study areas. The study showed that the livelihoods of the women are affected with the unsustainable farming, flooding, conflict, illness, etc. Climate change in the form of reduced rainfall or flooding is impacting livelihoods in the study areas. During FGDs and KIIs participants complained of warming environment which indicate rising temperature. There is declining productivity of agriculture, even when more labour hours are put in. Water sources and quality has significantly declined as a result of reduced rainfall and extreme temperature. There is incidence of increasing mosquitoes' infestation in the study areas which has brought about increase in malaria fever. This agrees with the work of Hellin et al. (2012) in which the authors observed that as temperatures increase, insect population and diversity are likely to increase. Climate change is one of humanity's greatest challenges. It has brought untold hardship to the people. It has brought floods, desertification, droughts and violent conflicts that are affecting the country and by implication, the state. Many communities in Nigeria have recently lost farmlands due to flash floods and heavy rainfall. From 2012 till date floods have claimed properties worth billions of naira in Nigeria.

A religious leader narrate the effect of climate change in his community in Rivers state as thus

“the effect on livelihood are enormous, there is poverty in the land. There is loss of capital, people are struggling to make ends meet. Very poor harvest. Flood has affected many farmers in Rivers state, we are just lucky but extreme weather and heavy rains are affecting roads and farmlands”.

Other impacts include poor road network as a result of floods and erosion. The poor road network cuts off communities, schools and markets. A respondent (female) during FGD in Plateau state stated

“there was a time the bridge to my village was destroyed by flood, we could not carry our goods to the market so they perished because we don't have storage facilities”.

Another respondent in FGD confirmed this view by stating that “often pupils and students in her community during raining season skip school because the river is full and they have no bridge for children to cross to the other side of the river to attend school. Although the community constructed an alternative with 2 ropes, it is very dangerous when the river is full. The community has lost 4 pupils this year (2018) as result of the river overflowing its bank”.

The issue of dry spells and droughts affect rivers and water supply during dry season usually between October to April, with its peak in March. People, especially women and girls, in the rural areas walk long kilometers to get water. This also brings about other physical and mental health challenges like water borne diseases, outbreak of cholera, stress and depression. Furthermore, means of livelihoods suffered as women and girls spent long hours in collecting water for household use with less hours on carrying out means of livelihood activities.

High temperatures as a result of climate change affects livelihoods as productivity levels dropped. During hot periods, some plants like potatoes, mustard, broccoli, tomatoes, yams, etc. which are mostly cultivated by women for livelihood are affected by the hotness of the weather.

4.3.1 Impacts of Climate Change on Livelihood Assets

During FGD and KII, it was found that climate change impact on the different types of capital upon which men and women farmers build their livelihoods. This capital as stated in the literature review includes natural capital, human capital, physical capital, social capital, and financial capital.

Human Capital

Skills, knowledge, good health and ability to labor are necessary to achieve livelihood. When farmers lack these basic qualities, having desired livelihood tend to be nearly impossible. During FGD, all the respondents were in terms with the fact that climate change has devastating effect on physical, psychological and emotional health that not only hinder farmers from pursuing different livelihood strategies and achieve their livelihood objectives but also lead to death. A respondent as interviewed confirmed having dry cough which is directly associated with climatic change in weather and season. Another respondent identified industrial waste and chemical discharge from industries into river as having significant health implications on the humans. He said

“last year a company discharged waste into a river and it foamed like detergent, it over flowed the bridge and was on the main road. Some children kept playing with it and they were saying snow, snow! I can only imagine how toxic the waste product was to human lives, animals and the environment”

Responding to the effect of climate change in connection to accessibility to labour; an elderly woman (AGED-) who is a subsistent farmer suffering from Rheumatism as a result

of cold weather cannot access her farm and it has also affected her productivity and workload. Poor road networks caused floods, erosions hampering access to labour and markets. A respondent from one of the FDG's said

'I find it very difficult to work when the weather is hot. You know growing up, Jos used to be very cold but I honestly don't know what the problem is. Well we are told it is climate change.'

Natural capital

DFID (2000) define natural capital as stock of natural resource from which flows resource and services that useful livelihoods are derived. Considering the effect of climate change on natural capital like wildlife and forest, respondents during FGD observed that some species of animals and birds are going into extinction and others are migrating for the quest of favorable environments. A respondent during FGD asked

"please when last did any of you see a vulture? Some years ago one will see them hovering around the abattoir but now you can peacefully slaughter a cow, ram or goat without seeing one in sight".

Some relate it to drought; on the other hand another respondent identified deforestation for fire wood during dry season and bush burning as impacts of climate change on wild life and forest which affects their livelihoods.

Another respondent said

"the forests will soon die. We are told don't fell trees but what are the alternatives? Do we even have a government? The world is moving forward and Plateau and Nigeria is stagnant!"

All respondents agreed that climate change has consequential effects on natural capital and agricultural land. Emphasis was made on the devastating effects caused by floods. They linked heavy and erratic rain fall and extended rain distribution to be the probable cause of erosion which encroach farm lands.

In relation to the effect of climate change on water source(s) which is a source of livelihoods, some respondents made relative comparison with the phenomenological rise and drop of water level. The water levels in the wells and rivers during the raining season cannot be the same with that of dry season.

“Climate change affects us a lot because during dry season we(women) trek very long distances to fetch water, sometimes we wake up as early as 3am so we can fetch clean water. If you go later than that, you will fetch muddy water”.

Another respondent said

“in my village we are hit by scarcity of water during the dry season so many young girls are not able to go to school. They have to trek to very far distances to get water and by the time they get back home, do their chores it is late to begin to go to school. However, some still go to school, but no one needs to tell you the performances of these girls”.

Water supply also affects electricity. The respondents alluded to this saying

“at the peak of dry season we hardly have up to 6 hours supply of electricity, we are told the water level has reduce in kura falls”.

Another respondent said

“you know water is like fire it is best as a slave, not a master, so when areas are flooded, Clinics and schools are not accessible”.

Many roads, bridges are washed away and this makes life difficult for communities. A respondent stated

I think we are being punished by the gods with floods because we are felling down trees along the river banks and tradition has it that it is forbidden by our ancestors.

During the peak of the floods which are in July and August, community members lose lives and properties running into millions of naira.

Physical capital

Physical capital comprises the basic infrastructure needed to support livelihoods, such as affordable transport; secure shelter and buildings; adequate water supply and sanitation; clean, affordable energy; and access to information (DFID, 2000).

Losses and damages caused by floods to women and men as a result of climate change are significant. These damages affect both men and women in the study area, entailing that

both men and women sustain livelihood loss. During FDGs and KIIs respondents shared their plights of losing part of their houses, roofing to the “strong winds” both during rainy and dry seasons. A respondent during one of the FDGs said

“we don't have wind breakers any more, we are busy chopping down trees and no one is planting them'.

When this point was mentioned a fresh debate arose with questions on where to get seedlings from, the cost, inadequate water supply to water plants during the dry season.

Social capital

Social capital is vital for farmers to pursue their livelihood. It is developed through networks and connectedness as it provides a buffer that helps farmers cope with climate change impacts that ensure survival periods of extreme weather events.

Social capital of farmers can be distorted by climate change thereby forcing migration, disabilities and sometimes death that can lead to the breaking up of groups and associations that promote livelihoods development.

Climate change affects participation in social events and networking. Respondents in the FGD done with Persons Living with Disabilities alluded to the fact that they are already at a disadvantaged state and it is very difficult for them to network because during the raining season it is almost impossible to go out. One said

“when it rains in Jos is it like heaven is opening a tap, when it is hot you feel like the sun has relocated to Jos and the harmattan cold is something else. So how do I cope being in a wheel chair? I can hardly go out to socialize with my family and friends. Sometimes it is very frustrating”.

Recently, many communities in the study areas have been bedeviled by incessant killings, crises and violent conflicts. Many respondents agreed that there is a link between Climate Change and violent conflicts. Both FGD and KII respondents agreed that among other reasons climate change is responsible for the herder/farmer conflict. A respondent said

“I believe climate change is a major catalyst to violent conflicts on the Plateau. The struggle for scarce resources, land and water”.

As a result of these crises many companies have relocated and left the Plateau e.g. Coca-Cola bottling company, MTN calling center which employed more than 1000 youths. These crises have also scared away investors and it is affecting the economy of the State. During an interview a respondent said

“during the conflicts, a lot of farmers abandoned their farms and ran for their lives, only to return after weeks to find their farms burned down or destroyed”.

The respondents in FGD said some people within the state relocate during farming season so they can get land to farm while others seem to have no choice they move because they have been displaced from their homes due to crisis. One respondent said

“you can't tell me these people are not out for land grabbing (he was referring to the herders) they kill and burn down villages only to settle down with the cows, renaming our villages. What have we done to deserve this? Our women are widows at very young ages and children orphans in just one night. Honestly, I feel this is beyond Climate Change. Does Climate Change make people's lives worthless and cows sacred?”

Financial Capital

Financial capital looks at livelihood building block through availability of cash or equivalent that empowers farmers to adopt different livelihood strategies. In the event of heavy rainfall and floods in the areas of study, lives are lost, houses and livelihoods are destroyed. The respondents in the FGD and KII stated that climate change promotes rural - urban migration. The Youth migrate in search of greener pastures thereby denying the community human capital and development. A respondent said

“our youths have relocated to Aba, Owerri and Porthacourt they say live is better off for them there, so we(women) are left to do most of the farming”.

It was established that farmers especially women have difficulties and are unable to access soft loans. They complained on the high interest rates by banks and many do not have collaterals to access these loans. One respondent recalled an incident when some farmers committed suicide because they couldn't pay back loans, after they lost their potato farms to blight. Others stated the inadequacies of insurance firms and policies. A respondent stated

“they are expensive, and can a local subsistent farmer afford to insure their crops and farmland?”

The respondents unanimously agreed that increase in temperature has tremendously affected crops thereby affecting the financial state of farmers on the Plateau. Some said they can't think of any crop that has not been affected but they agreed some are grossly affected than others like potatoes, tomatoes, strawberries, apples etc. An exco of the Poultry farmers association said

“we poultry farmers have lost many birds and eggs due to increase in temperature. We only have equipment that help the birds keep warm but we don't know how to reduce temperature, I don't know should we start buying air-conditions? The weather is so erratic. Today it is extremely hot and the next day extremely cold. All these is affecting the business and our income”.

All respondents during all the FGD's were seriously concerned about crop preservation. They lamented on how their crops cannot be preserved using the local methods anymore. Some of the raised concerns imply that a series of issues are responsible including seeds and seedlings, fertilizers, pesticides etc. Many said their farm produce like tomatoes, cabbages got bad on the farms before getting to the markets thereby reducing the market value.

Most respondents identified many impacts on livelihoods including herder/farmer conflict, bad roads, poor market structures, droughts, floods, access to water, forced migration (especially youth), lack of storage facilities e.g. silos, a rise in food prices.

This finding that climate change impact on the livelihood of women is in line with the work of Sanfo (2014). Sanfo found that climate change and variability impact on the livelihood of rural farmers. Also in line with this study is the work of Abou- Hadid (2006) who in his study found that access or entitlements to land, water, labour and other inputs to rural production processes are important determinants of the vulnerability of rural households, shaping the sensitivity of households' livelihoods and food security to variations in climate and land productivity which underpin the capacity of households to withstand and respond to the impacts.

4.3 Challenges Women face in Agriculture

Over the years, more women are involved in agriculture because of the rise in female-

headed households that is increasing due to so many factors including violent conflicts, migration etc. As more women are involved in agriculture, so are more challenges for them. Women farmers in Nigerians are facing a lot of challenges in their farming. These challenges may be as a result of climate change, high input cost, low market price for their produce etc. Beside their challenges, women farmers' situational conditions are also restricting them to take up any adjustments in their farming due to climate change. The findings on challenges women face in agriculture are presented in Table 8.

Table 8: Challenges Women face in Agriculture

S/No	Variables	Frequency	Percentages
1	Difficult to carry out daily work activities in the field due to severe temperature		
	Agree	602	97.3
	Undecided	15	2.4
	Disagree	2	.3
	Total	619	100
2	In ability to afford improved agricultural inputs due to higher cost		
	Agree	587	94.8
	Undecided	24	3.9
	Disagree	8	1.3
	Total	619	100
3	Non-availability of timely inputs (seeds, pp chemicals, fertilizers etc)		
	Agree	554	89.5
	Disagree	59	9.5
	Disagree	6.	1.0
	Total	619	100
4	Low price for the produce in the market		
	Agree	538	86.9
	Undecided	47	7.6
	Disagree	34	5.5
	Total	619	100
5	Non-availability of labor		
	Agree	482	77.9
	Undecided	72	11.6
	Disagree	65	10.5
	Total	619	100
6	Higher labor wage rate		
	Agree	560	90.5
	Undecided	50	8.1
	Disagree	9	1.5
	Total	619	100
7	Lack of information about long term climate change		
	Agree	561	90.6
	Undecided	52	8.4
	Disagree	6	1.0
	Total	619	100

Table 8: Challenges Women face in Agriculture *contd.*

S/No	Variables	Frequency	Percentages
8	Non-availability of needed facilities for livelihood activities		
	Agree	578	93.4
	Undecided	30	4.8
	Disagree	11	1.8
	Total	619	100
9	Lack of knowledge regarding appropriate adaptations to climate change		
	Agree	561	90.6
	Undecided	48	7.8
	Disagree	10	1.6
	Total	619	100
10	Lack of knowledge about post harvest technology		
	Agree	549	88.7
	Undecided	65	10.5
	Disagree	5	.8
	Total	619	100

The findings in the cause of this study as presented in Table 8 has clearly shown that women and girls are affected more than men by climate change due to challenges they face in agriculture. Findings in the Table particularly showed that majority of the respondents which is 602 (97.3%) agreed that women have difficulty in carrying out daily work activities in the field due to the severe temperature. Other challenges as agreed by majority of the participants are inability of women to afford improved agricultural inputs, non-availability of timely inputs, low prices for their produce in the market, non-availability of labor as well as higher labor wage rate. Furthermore, majority of the respondents as presented in Table 8 also agreed that lack of information about long term climate change is a challenge women face in agriculture. The government, NGOs, CBOs, etc are not providing women with the necessary or needed information regarding long term climate change and agriculture. Women are still depending on their non-scientific knowledge to enable them cope with the impact of climate challenge on their agricultural activities. They lack knowledge regarding appropriate adaptation strategies to climate change. In a related development, majority of participants also agreed that non-availability of needed facilities for livelihood activities and lack of knowledge about post harvest technology are also major challenges for women in agriculture.

Adding to the findings in household survey, discussants in both FGDs and KIIs further stressed other challenges that women face in agriculture to include harmful cultural practices like the inability to inherit or own land and assets are rooted in patriarchy. A discussant during FGD stated thus

'Women are viewed as properties so even when they farm and get proceeds it automatically belongs to the man.'

Most respondents agreed that women are more vulnerable and exposed to the impacts of climate change which is exacerbated by the challenges they face in agriculture. They stated less education, non-involvement in the decision-making process of the household, lack of access to agricultural inputs, modern technology are some of the challenges women face in agriculture. Other respondents stated that women farmers don't have access to market, they go through middlemen which is a big challenge for women farmers as most cases they don't get maximum value or profit from the little they produce to sell. Women in agriculture find it hard to get labour/workforce because it is male dominated. They also have little or no access to soft loans and loans from corporations and banks due to high interest rates, as lack of assets for collateral.

A respondent who is in IDP camp lamented

'I can't go and harvest my crops because my village has been occupied by herders. We are not safe in our homes, on our farms, how then should we survive? I am a widow how will I cater for my kids?'

The herder/farmer conflict has affected women farmers grossly in the study areas which is a big challenge to them. Many respondents attested to this. Women lost their lives, loved ones and properties due to violent conflicts. Some have been forced to migrate and are in camps and don't have access to farmlands.

A stakeholder in the KII category sympathized with women farmers in his community; he affirmed that about 70%-92% of the farming activities are carried out by women. His response to the question: 'Do women (farmers) face challenges in their daily agricultural activities as a result of climate change? Is as thus;

"very well, it affect them, they need support", in order to have elucidate some, he continued by saying; "I am a chief as you know, but I must say the truth. We men as brothers, Husbands, Fathers or even a friend to any Female who engage in agriculture should support them by helping in either funding or directly participate with them since our strength in not equal. Like now we are in the dry season we can ensure that harvesting crops under the severe weather condition is done with our assistance"

Furthermore, a respondent from the Ministry of women affairs stated that during a recent agricultural grant scheme in Plateau state, no woman who applied through the ministry of women affairs and social development received any grant. This is challenge as women are not considered in the distribution of agricultural grant scheme. Other respondents identified lack of farming tools, improved seeds/seedlings which can withstand warmer temperatures are challenges of women farmers.

Supporting this finding, Nuhu, Donye and Bawa (2014), in their study on barriers to women participation in agricultural development in Bauchi Local Government area of Bauchi State, Nigeria, found that women farmers are faced with a lot of barriers in their quest for effective participation in agricultural production. Some of the barriers observed that inhibit participation of women farmers in agricultural production generally are: lack of land ownership right; non-availability of credit and loans facilities; poor access to extension staff; and, inadequate training and low standard of education.

4.5 SEGREGATION OF FINDINGS BY STATES

4.5.1 Findings in Benue State

Result of the study in Benue state is presented in this section. A total of 149 persons responded to the household survey while 28 participants took part in the FGD and KII. Out of this figure, 20 took part in FGD which is made up of 10 males and 10 females. While in KII, 7 stakeholders participated out of which 2 were females and 5 males. They were sampled from MDAs, traditional institution, and women organization in Benue state at the local and state government levels.

Table 9 Socio-Economic and Demographic variables of participants sampled in Benue State

S/No.	Variables	Frequency	Percentages
1	Local Government		
	Logo	42	28.2
	Buruku	58	38.9
	Ohimini	49	32.9
	Total	149	100
2	Sex		
	Males	80	53.7
	Females	69	46.3
	Total	149	100
3	Religion		
	Christianity	146	98.0
	Muslim	-	-
	Others	3	2.0
	Total	149	100

Table 9 Socio-Economic and Demographic variables of participants sampled in Benue State *contd.*

S/No.	Variables	Frequency	Percentages
4	Education Qualification		
	Primary	7	4.7
	Secondary	109	73.2
	Tertiary	-	
	No formal education	33	22.1
	Total	149	100
5	Occupation		
	Farming	124	83.2
	Petty Trading	11	7.4
	Student	14	9.4
	Total	149	100

Table 9 present demographic variables of participants from Benue State, the findings in the Table indicate that 149 participants took part in the household survey in Benue State. The participants were sampled in 3 local governments – one from each of the 3 senatorial zones in the state. The findings showed that 42 (28.2%) persons were sampled in Logo local government while in Buruku, 58 (38.9%) respondents were sampled and 49 (32.9%) sampled in Ohimini local government. Regarding sex distribution, it was found that 80 (53.7%) of the sampled participants were males and females were 69 (46.3%). In terms of education, 109 (73.2%) of the respondents had secondary school education, 7 (4.7%) had primary education and 33 (22.1%) had no formal education. The occupation of the sampled respondents showed that 124 (83.2%) are farmers, 11 (7.4%) petty traders and 14 (9.4%) students.

4.5.2 Nexus between Gender, Climate Change and Agriculture in Benue State

Climate change is not a recent phenomenon to people of Benue state as they have been experiencing impacts of climate change. Like most states in Nigeria, Benue has experienced accelerated population growth which has led to changes in the land use activities. Land use changes in particular, have a direct impact on agriculture. This section presents the nexus between gender, climate change and agriculture in Benue state.

Table 10 Nexus between Gender, Climate Change and Agriculture in Benue State

S/No	Variables	Frequency	Percentages
1.	An increase in the frequency and intensity of extreme environmental events that impact on agriculture can be directly linked to climate change.		
	Agree	147	98.7
	Undecided	2	1.3
	Disagree	-	-
	Total	149	100
2	Extreme environmental events (i.e. floods, drought, and storms) as a result of climate change have been increasing in frequency and intensity in recent years affecting agricultural activities and livelihood of women.		
	Agree	147	98.7
	Undecided	2	1.3
	Disagree	-	-
	Total	149	100
3	Women participate more in agricultural activities which are the most affected by extreme environmental events, therefore women agricultural activities are the most vulnerable to climate change		
	Agree	149	100
	Undecided	-	-
	Disagree	-	-
	Total	149	100
4	Land-use, for example deforestation and urbanization, is a contributing factor to global climate change		
	Agree	148	99.3
	Undecided	1	.7
	Disagree	-	-
	Total	149	100
5	Decrease or increase in agricultural activities of women directly link to climate change		
	Agree	149	100
	Undecided	-	-
	Disagree	-	-
	Total	149	100

There is a relationship between climate change, gender and agriculture in Benue state. Climate change has posed a very serious threat to sustainable agricultural production and food security in the state. Climate change affects both men and women farmers thereby affecting agricultural activities and livelihoods. It has brought about low crop yield, prices, production, consumption, and nutrition.

Based on the findings presented in Table 10, findings showed that out of the 149 participants that took part in the study in Benue state, 147 (98.7%) agreed that climate change has impact on agricultural activities in the state. Also, 147 (98.7%) agreed that extreme environmental events as a result of climate change which has increase and

intensify in recent years is affecting agricultural activities and livelihoods of women. Further, all participants agreed that women who are more into subsistence agriculture are most vulnerable to climate change. In related development, all respondents in the household survey agreed that decrease or increase in agricultural activities of women is directly linked to climate change. This entails that when the climate is favorable, there is an increase in agricultural activities while an unfavorable climate change brings about decrease in agricultural activities of women.

Findings during FGD and KII indicates that both the young women and youth as well as persons living with disability in Benue state believe that climate change has brought about hardship and unfavorable conditions around the globe and their immediate communities. They agreed that there is much change in climate such as heavy rainfall being experienced as well as high temperature as a result of increase in sun shine.

4.5.3 Impact of climate change on livelihoods in Benue state

Table 11: Impact of Climate change on Livelihoods in Benue State

S/No	Variables	Frequency	Percentages
1.	Climate change has affected livelihoods in the community		
	Agree	146	98.0
	Undecided	2	1.3
	Disagree	1	.7
	Total	149	100
2	Climate change has affected the health conditions of the people in the community thereby resulting to reduction in food production		
	Agree	144	96.6
	Undecided	5	3.4
	Disagree	-	-6
	Total	149	100
3	Climate change has affected access to labor in the community		
	Agree	147	98.7
	Disagree	2	1.3
	Disagree	-	-
	Total	149	100
4	Climate change has increased the workload of people in the community		
	Agree	147	98.7
	Undecided	2	1.3
	Disagree	-	-
	Total	149	100
5	Climate change has affected the wildlife/forest reserves in the community		
	Agree	146	97.3
	Undecided	4	2.7
	Disagree	-	-
	Total	149	100

4.5.3 Impact of climate change on livelihoods in Benue state

Table 11: Impact of Climate change on Livelihoods in Benue State *contd.*

S/No	Variables	Frequency	Percentages
6	Agricultural land have been negatively affected by climate change		
	Agree	147	98.7
	Undecided	2	1.3
	Disagree	-	-
	Total	149	100
7	Water resources have been negatively affected by climate change		
	Agree	146	98.0
	Undecided	3	1.3
	Disagree	1	.7
	Total	149	100
8	Climate change has affected participation in social organizations/social networking (e.g. funeral, weddings, etc.) in the community		
	Agree	131	87.9
	Undecided	14	9.4
	Disagree	4	2.7
	Total	149	100
9	Shelter/buildings (including storage facilities) have been affected by climate change		
	Agree	130	87.2
	Undecided	18	12.1
	Disagree	1	.7
	Total	149	100
10	Water supply in the community has been affected by climate change		
	Agree	142	95.3
	Undecided	3	2.0
	Disagree	4	2.7
	Total	149	100
11	Climate change has resulted in crop and/or livestock damages in the community		
	Agree	146	98.0
	Undecided	3	2.0
	Disagree	-	-
	Total	149	100
12	Climate change has resulted in migration of members of the community and/or loss of income earning opportunity in the community		
	Agree	137	91.9
	Undecided	12	8.1
	Disagree	-	-
	Total	149	100

Findings from the Table 11 indicate that climate change affects livelihoods in Benue communities, as it affects the health conditions of people in Benue communities thereby resulting to reduction in food production. Other impacts of climate change on livelihood in Benue communities are access to labor, increase workload, agricultural land, water resources, participation in social organizations, shelter, water supply, crop and livestock

production as well as migration of members in rural communities and/or loss of income earning opportunities in communities.

Findings from respondents who participated in FGDs and KIIs in Benue highlighted that climate change impacts on livelihood assets/capital. Findings from FGDs and KIIs regarding impact of climate change on livelihood assets are presented below:

a. Human Capital

As regards the effect of climate change on health and death, participants during FGD and KII highlighted the deteriorating health challenges they now face. In terms of access to labor, the respondents asserted that labor is more expensive now when compared to the previous years, resulting to more workload.

b. Natural Capital

Young men, youths, old women, old men and PLWD all agreed that human activities such as deforestation and indiscriminate bush burning has resulted to the extinction of wildlife and forests. According to them, agricultural land has become infertile and water sources have been left in shambles.

c. Physical Capital:

Regarding physical capital, discussants observed the general destruction of physical infrastructure including houses and bridges, fallen electricity poles and supply as well as dehydrated water sources. These have disrupted the smooth operations of public goods such as schools, clinics, roads etc in the communities.

d. Social Capital

Discussants further highlighted during FGDs and KII that there is a reduction in participation in social organization/networking. This, according to them was due to people in communities especially women dedicating more time in household, agricultural and income generating activities coupled with harsh weather conditions.

e. Financial Capital

All the groups agreed that there is little to be sold from their produce or livestock left due to climate change causing great financial difficulties which has resulted to seeking earning opportunities outside their respective communities.

4.5.4 Challenges Women face in Agriculture in Benue State

Table 12: Challenges Women face in Agriculture in Benue State

S/No	Variables	Frequency	Percentages
1	Difficult to carry out daily work activities in the field due to severe temperature		
	Agree	149	100
	Undecided	-	-
	Disagree	-	-
	Total	149	100
2	In ability to afford improved agricultural inputs due to higher cost		
	Agree	140	94.0
	Undecided	9	6.0
	Disagree	-	-
	Total	149	100
3	Non-availability of timely inputs (seeds, pp chemicals, fertilizers etc)		
	Agree	125	83.9
	Disagree	24	16.1
	Disagree	-	-
	Total	149	100
4	Low price for the produce in the market		
	Agree	141	94.6
	Undecided	8	5.4
	Disagree	-	-
	Total	149	100
5	Non-availability of labour		
	Agree	108	72.5
	Undecided	38	25.5
	Disagree	3	2.0
	Total	149	100
6	Higher labour wage rate		
	Agree	139	93.3
	Undecided	10	6.7
	Disagree	-	-
	Total	149	100
7	Lack of information about long term climate change		
	Agree	115	77.2
	Undecided	30	20.1
	Disagree	4	2.7
	Total	149	100
8	Non-availability of needed facilities for livelihood activities		
	Agree	132	88.6
	Undecided	16	10.7
	Disagree	1	.7
	Total	149	100

4.5.4 Challenges Women face in Agriculture in Benue State

Table 12: Challenges Women face in Agriculture in Benue State *contd.*

S/No	Variables	Frequency	Percentages
9	Lack of knowledge regarding appropriate adaptations to climate change		
	Agree	117	78.5
	Undecided	31	20.7
	Disagree	1	.7
	Total	149	100
10	Lack of knowledge about post harvest technology		
	Agree	107	71.8
	Undecided	42	28.2
	Disagree	-	-
	Total	149	100

All over Nigeria, women play vital roles in agricultural production. In Benue State, they are actively involved in farming activities and constitute about 60-80% of the labour used for farming activities like planting, weeding, transportation, processing, marketing and storage of products and they also account for two-thirds of food crops produced in the state. Despite the role of women in agricultural activities and feeding the state and nation at large, women in Benue face a lot of challenges in agriculture. Findings in Table 12 indicate that severe temperature, inability to afford improved agricultural inputs due to high cost, non-availability of timely inputs, low prices for their produce and non-availability of labor as well as high labor wage rate are some of the challenges women face in agriculture in Benue state. Other challenges highlighted include lack of information about long term climate change, non-availability of needed facilities for livelihood activities, lack of knowledge regarding appropriate adaptations to climate change and lack of knowledge about post harvest technology are challenges all participants in the household survey agreed that women are facing in agriculture in Benue state.

During FGD and KII, discussants asserted that they have challenges of pest and diseases on their crop produces as well as livestock. Persons living with disability highlighted increase exposure to heat stress as well as greater erosion due to stronger wind as a challenge they faced thereby making earning opportunities more difficult. Others said they are experiencing premature death of crops on the field and also low-income rate. Furthermore, soil infertility as a result of heavy downpour, causing flooding which washes away the nutrients from the surface of the soil, leaving clay soil which is not compatible for their species of plants grown was also stated as a challenge women face in agriculture in the communities. Other challenges are destruction/pollution of water sources hindering access to portable water, collapse of bridges and roads as a result of erosion and flood, making access to available market difficult and unequal access to productive resources. It

was also found that women's burden is more evident in their response to the challenges they face as a result of climate change. Women admitted to having extra workload when faced with climate stressors as working longer hours affect them not only physically but emotionally as they constantly have to worry about the well-being of their family and farm.

4.6.1 FINDINGS IN CROSS RIVER STATE

A total of 170 participants responded to the household survey while a total of 32 persons participated in the FGD, KII, case study and live story in Cross River state. Cross River is located in a coastal area of the Niger Delta region of Nigeria. The state is located within the tropical monsoon climate which has a bimodal rainfall pattern, which begins in March and ends in mid October with a little dry spell in August traditionally referred to as "August break".

Findings of the study in Cross River are presented in this section of the study.

Table 13: Demographic variables of participants sampled in Cross River State

S/No.	Variables	Frequency	Percentages
1	Local Government		
	Obubra	62	36.5
	Akpabuyo	58	34.1
	Obudu	50	29.4
	Total	170	100
2	Sex		
	Males	67	39.4
	Females	103	60.6
	Total	170	100
3	Religion		
	Christianity	168	98.8
	Muslim	-	-
	Others	2	1.2
	Total	170	100
4	Education Qualification		
	Primary	46	27.1
	Secondary	80	47.1
	Tertiary	-	
	No formal education	44	25.9
	Total	170	100
5	Occupation		
	Farming	148	87.1
	Petty Trading	8	4.7
	Student	14	8.2
	Total	170	100

Demographic variables of participants Cross River State are presented in Table 13. The findings in the Table showed that 170 participants took part in the household survey in Cross River State. The participants were sampled in 3 local governments. The local governments were in turn sampled from each of the 3 senatorial districts in the state. The findings showed that 62 (36.5%) persons were sampled in Obubra local government, 58 (34.1%) sampled in Akpabuyo while 50 (29.4%) respondents were sampled in Obudu local government area. Out of the 170 respondents that took part in the household, 103 (60.6%) were females while 67 (39.4%) were males. Participants education qualification showed that 46 (27.1%) had primary school education, 80 (47.17%) had secondary school education and 44 (25.9%) had no formal education. Respondents occupation showed that 148 (87.1%) are farmers, 8 (4.7%) petty traders and 14 (8.2%) students.

4.6.2 Nexus between Gender, Climate Change and Agriculture in Cross River State

Climate change affects the agricultural and socio-economic activities of women in Cross River state. Certain agricultural activities that were carried in Cross River state are no longer in existence; for example the second farming season also known as 'Late planting' is no more in existence in Cross River resulting in reduction in crop yield and food supply which has raised food insecurity threat in the area. Result of the study regarding the relationship between gender, climate change and agriculture in Cross River state is presented in Table 14

Findings

Table 14: Nexus between Gender, Climate Change and Agriculture in Cross River State

S/No	Variables	Frequency	Percentages
1.	An increase in the frequency and intensity of extreme environmental events that impact on agriculture can be directly linked to climate change.		
	Agree	166	97.6
	Undecided	-	-
	Disagree	4	2.4
	Total	170	100
2	Extreme environmental events (i.e. floods, drought, and storms) as a result of climate change have been increasing in frequency and intensity in recent years affecting agricultural activities and livelihood of women.		
	Agree	166	97.6
	Undecided	-	-
	Disagree	4	2.4
	Total	170	100

Table 14: Nexus between Gender, Climate Change and Agriculture in Cross River State

S/No	Variables	Frequency	Percentages
3	Women participate more in agricultural activities which are the most affected by extreme environmental events, therefore women agricultural activities are the most vulnerable to climate change		
	Agree	165	97.1
	Undecided	-	-
	Disagree	5	2.9
	Total	170	100
4	Land-use, for example deforestation and urbanization, is a contributing factor to global climate change		
	Agree	166	97.6
	Undecided	-	-
	Disagree	4	2.4
	Total	170	100
5	Decrease or increase in agricultural activities of women directly link to climate change		
	Agree	165	97.1
	Undecided	1	.6
	Disagree	4	2.4
	Total	170	100

Findings in Table 14 have shown that a relationship exists between climate change, gender and agriculture in Cross River state. Agricultural productivity and food security in Cross River state are typically impacted by climate change. Cross River state like any part of Nigeria depend on rainwater for crop production. Women who are more involved in crop production in the state are the most affected by the impact of climate change. Unpredictable changes in the onset of rains have affected women's agricultural activities most especially the second farming season also known as 'Late planting'. The result in Table 14 shows that majority of the participants who took part in the household survey agreed that extreme environmental events have impacted on agricultural activities in the state. Furthermore, participants also agreed that extreme environmental events as a result of climate change have been increasing in frequency thereby affecting agricultural activities of women and their livelihoods. Also, majority of the participants agreed that women's agricultural activities are the most vulnerable to the effect of climate change. In a related development, decrease or increase in agricultural activities of women is directly link to climate change. The findings presented show that there is a nexus between climate change, gender and agriculture.

Results of FGD and KII in Cross River state also show that there is a nexus between climate change, gender and agriculture. According to participants in the FGDs and KIIs, 'there is an increase in the frequency and intensity of extreme environmental events in the state such

as excessive rainfall and high temperature. According to participants, years back the rainy season ends in October but recently rains have been experienced up to December, as witnessed last year December 25, 2017. Despite the heavy rainfall which sometimes results to flood, there's high temperature, which most times is experienced even while it is raining.

High rate of deforestation for agricultural activities, trading of logs (especially in Akpabuyo) and urbanization have been observed in the state, sometimes unauthorized selling of conservation reserves to merchants, even carried out by staff of the Cross-River state forestry commission has been recorded; all contributing to global climate change.

There's decrease in agricultural activities especially in Obubra, where 100% of the farmers are women, above 30 years of age, and even travel long distances to farms. Most of the young people don't farm, some have migrated to cities, others schooling, the stress of trekking long distances to access services, increase in invasive weeds choking crops to death, inaccessible roads, outbreak of black pod disease (cocoa farmers), manual labor, extreme weather events, low crop yield and post-harvest loss and wastage, low price for farm products, led to decrease in agricultural activities in the state, leading to food shortage and famine.

Other environmental events recorded in the state include flood, storms which affect vegetables such as water leaf, pumpkin leaves, and palm wine tappers (as complained by farmers in Akpabuyo) Yams, cassava and okra (as complained by farmers in Obubra) and Yams, cassava and cocoa (as complained in Obudu).

4.6.3 Impact of Climate Change on Livelihoods in Cross River state

Table 15: Impact of Climate change on Livelihoods in Cross River State

S/No	Variables	Frequency	Percentages
1.	Climate change has affected livelihoods in the community		
	Agree	167	98.2
	Undecided	-	-
	Disagree	3	1.8
	Total	170	100
2	Climate change has affected the health conditions of the people in the community thereby resulting to reduction in food production		
	Agree	167	98.2
	Undecided	-	
	Disagree	3	1.8
	Total	170	100

4.6.3 Impact of Climate Change on Livelihoods in Cross River state**Table 15: Impact of Climate change on Livelihoods in Cross River State *contd.***

S/No	Variables	Frequency	Percentages
3	Climate change has affected access to labor in the community		
	Agree	167	98.2
	Disagree	-	
	Disagree	3	1.8
	Total	170	100
4	Climate change has increased the workload of people in the community		
	Agree	167	98.2
	Undecided	-	
	Disagree	3	1.8
	Total	170	100
5	Climate change has affected the wildlife/forest reserves in the community		
	Agree	167	98.2
	Undecided	-	
	Disagree	3	1.8
	Total	170	100
6	Agricultural land have been negatively affected by climate change		
	Agree	165	97.1
	Undecided	2	1.2
	Disagree	3	1.8
	Total	170	100
7	Water resources have been negatively affected by climate change		
	Agree	165	97.1
	Undecided	2	1.2
	Disagree	3	1.8
	Total	170	100
8	Climate change has affected participation in social organizations/social networking (e.g. funeral, weddings, etc.) in the community		
	Agree	161	94.7
	Undecided	5	2.9
	Disagree	4	2.4
	Total	170	100
9	Shelter/buildings (including storage facilities) have been affected by climate change		
	Agree	164	96.5
	Undecided	3	1.8
	Disagree	3	1.8
	Total	170	100
10	Water supply in the community has been affected by climate change		
	Agree	161	94.7
	Undecided	5	2.9
	Disagree	4	2.4
	Total	170	100

4.6.3 Impact of Climate Change on Livelihoods in Cross River state

Table 15: Impact of Climate change on Livelihoods in Cross River State *contd.*

S/No	Variables	Frequency	Percentages
11	Climate change has resulted in crop and/or livestock damages in the community		
	Agree	162	95.3
	Undecided	5	2.9
	Disagree	3	1.8
	Total	170	100
12	Climate change has resulted in migration of members of the community and/or loss of income earning opportunity in the community		
	Agree	145	85.3
	Undecided	16	9.4
	Disagree	9	5.3
	Total	170	100

Findings from Table 15 indicate that majority of respondents in Cross River state agreed that climate change has affected livelihoods in their communities. Also, majority of the participants agreed that climate change has affected the health conditions of people in the community thereby affecting livelihoods, access to labor in the communities and increased workload of people in the communities. Furthermore, agricultural land and water resources which are means of livelihoods have been negatively affected by climate change. In a related development, participation in social organizations/social networking, shelter/buildings, crop and/or livestock damages and migration of members of the community and/or loss of income earning opportunity in the community are all impacts that participants in the household survey agreed are effects of climate change on livelihoods in the state.

Similarly, discussants in FGDs and KIIs in Cross River state pointed that climate change has affected livelihoods in Cross River; however, the most affected in state are the women, 90% of farmers in the state are women. Discussants stated that women in Cross River suffer from heat weave, spinal cord and waist pain, kneel and joints pain, changes in skin color, reactions on the skins including reactions from strange insect's bite and these women tend to look much older than their actual age and die earlier than the men. These health conditions have affected the health of the women thereby resulting to reduction in food production and loss of means of livelihoods. Work load has been doubled as women in Obubra are witnessing the presence of invasive weeds which kills crops and are always on the farm to clear these grasses, hence increasing their workload. Wildlife and forest reserves have been affected as deforestation, rice farms and palm oil plantations are on the increase in the state. The source of water in these communities is stream which usually dries up in the dry season, resulting to difficulty in accessing other water sources, hence affects agricultural and livelihoods activities.

In Obubra local government as narrated by the chief HRH, Ovarr Robert Mbina

In year 2015 we didn't witness any rain till the month of July, women were fetching water from the streams to water their crops, these inadequate water altered the planting season, most crops died, they experienced famine and loss of live stocks which are their means of livelihood in the community.



HRH Ovarr Robert MbinaMbinaAjone
(Ohorodu 1 of Okum kingdom)

4.6.4 Challenges Women face in Agriculture in Cross River State

Table 16: Challenges Women face in Agriculture in Cross River State

S/No	Variables	Frequency	Percentages
1	Difficult to carry out daily work activities in the field due to severe temperature		
	Agree	168	98.8
	Undecided	-	-
	Disagree	2	1.2
	Total	170	100
2	In ability to afford improved agricultural inputs due to higher cost		
	Agree	167	98.2
	Undecided	1	.6
	Disagree	2	1.2
	Total	170	100
3	Non-availability of timely inputs (seeds, pp chemicals, fertilizers etc)		
	Agree	168	98.8
	Disagree	1	.6
	Disagree	1	.6
	Total	170	100
4	Low price for the produce in the market		
	Agree	148	87.1
	Undecided	1	.6
	Disagree	21	12.4
	Total	170	100

4.6.4 Challenges Women face in Agriculture in Cross River State

Table 16: Challenges Women face in Agriculture in Cross River State *contd.*

S/No	Variables	Frequency	Percentages
5	Non-availability of labour		
	Agree	142	83.5
	Undecided	2	1.2
	Disagree	26	15.3
	Total	170	100
6	Higher labour wage rate		
	Agree	168	98.8
	Undecided	-	-
	Disagree	2	1.2
	Total	170	100
7	Lack of information about long term climate change		
	Agree	167	98.2
	Undecided	2	1.2
	Disagree	1	.6
	Total	170	100
8	Non-availability of needed facilities for livelihood activities		
	Agree	168	98.8
	Undecided	1	.6
	Disagree	1	.6
	Total	170	100
9	Lack of knowledge regarding appropriate adaptations to climate change		
	Agree	165	97.1
	Undecided	2	1.2
	Disagree	3	1.8
	Total	170	100
10	Lack of knowledge about post harvest technology		
	Agree	167	98.2
	Undecided	2	1.2
	Disagree	1	.6
	Total	170	100

Table 16 showed that challenges women face in agriculture in Cross River. Findings indicate that, majority of the respondents agreed that women find it difficult to carry out their daily agricultural activities in the field due to severe temperature, inability to afford improved agricultural inputs due to higher cost, non-availability of timely inputs, low price for the produce in the market, non-availability of labor and higher labor wage rate are all challenges respondents agreed that women in Cross River state face. Other challenges as agreed by majority of respondents are lack of information about long term climate change, non-availability of needed facilities for livelihood activities, lack of knowledge regarding appropriate adaptations to climate change and post harvest technology. All these are challenges affecting women in agriculture.

In a related development, discussants in FGDs and KIIs pointed out that challenges of women in agriculture in Cross River state include difficulty to work in fields due to high temperature and excess and nonstop rainfall, inability to afford improved inputs due to higher cost and no subsidy from the government and also non-availability of timely inputs. Discussants also identify low prices for agricultural products e.g. a basin of garri is sold at NGN1800, two big avocados is sold at NGN50, a liter of palm wine is NGN80, 2 bunches of waterleaf is sold at NGN50, these discourage farmers as they live in perpetual poverty.

In a similar view with participants during the household survey, it was stated that non-availability of labor is a major challenge women face in agriculture. Discussants stated that these women clear the land, make ridges or heeps, sow seeds, weed, harvest, sometimes in cases of inadequate rain, they transport water to water their crops, they harvest and transport these crops on their heads back home. The soil is highly infertile. They have no knowledge about climate change, they blamed their excesses and inadequacies as punishment from the gods for the atrocities committed in the land. They lack knowledge on adaptation measures and have no knowledge about post-harvest technology except drying but is almost impossible due to excess rainfall. During KII, a key stakeholder in the state explained that women in his community look older than their ages as a result of extreme weather conditions and impacts of climate change, and so cheats on his wife with younger women. It is worthy to note that climate change is causing infidelity in marriages.

4.7.1 Findings in Plateau State

Plateau state has its own share of negative impacts of climate change. According to Labiru, Sadiku, Ahonsi and Bulus (2006), annual rainfall varies in Plateau state. The implication of the decrease in annual rainfall in the state is that the length of growing season might slightly reduce, which in turn means that farmers especially women face challenges. Findings in Plateau state are presented in this section.

Table 17 Demographic variables of participants sampled in Plateau State

S/No.	Variables	Frequency	Percentages
1	Sex		
	Males	63	42.0
	Females	87	58.0
	Total	150	100
2	Religion		
	Christianity	125	83.3
	Muslim	24	16.0
	Others	1	.7
	Total	150	100
3	Education Qualification		
	Primary	29	19.3
	Secondary	91	60.7
	Tertiary	-	-
	No formal education	30	20.0
	Total	150	100
4	Occupation		
	Farming	72	48.0
	Petty Trading	10	6.7
	Student	11	7.3
	Others	57	38.1
	Total	150	100

Table 17 present demographic variables of participants from Plateau State, the findings in the Table indicate that 150 participants took part in the household survey in Plateau State. Sex distribution of participants indicate that 63 (42.0%) of the sampled participants were males and females were 87(58.0%). In terms of education, 91 (60.7%) of the respondents had secondary school education, 29 (19.3%) had primary education and 30 (20.0%) had no formal education. The occupation of the sampled respondents showed that 72 (48.0%) are farmers, 10 (6.7%) petty traders and 11 (7.3%) students and 57 (38.1%) engage in other forms of livelihoods.

4.7.2 Nexus between Gender, Climate Change and Agriculture in Plateau State

Plateau state has experienced severe impact of climate change most especially during the rainy season in the past decade. This climate change has brought about increase in flood severity in the state which has threatened the livability and agricultural activities of the people of the state most especially women and girls. This has greatly increased poverty in women and girls due to the fact that it has denied many women and girls access to socio economic and agricultural activities for a long period. The women who are denied access to agricultural activities, as a result of flooding from climate change suffers income and possible job loss.

The result presented in Table 18 explains the nexus between climate change, gender and agriculture in Plateau state.

Table 18: Nexus between Gender, Climate Change and Agriculture in Plateau State

S/No	Variables	Frequency	Percentages
1.	An increase in the frequency and intensity of extreme environmental events that impact on agriculture can be directly linked to climate change.		
	Agree	149	99.3
	Undecided	1	.7
	Disagree	-	-4
	Total	150	100
2	Extreme environmental events (i.e. floods, drought, and storms) as a result of climate change have been increasing in frequency and intensity in recent years affecting agricultural activities and livelihood of women.		
	Agree	149	99.36
	Undecided	1	.7
	Disagree	-	-
	Total	150	100
3	Women participate more in agricultural activities which are the most affected by extreme environmental events, therefore women agricultural activities are the most vulnerable to climate change		
	Agree	147	98.0
	Undecided	3	2.0
	Disagree	-	-
	Total	170	100
4	Land-use, for example deforestation and urbanization, is a contributing factor to global climate change		
	Agree	138	92.0
	Undecided	11	7.3
	Disagree	1	.7
	Total	150	100
5	Decrease or increase in agricultural activities of women directly link to climate change		
	Agree	145	96.0
	Undecided	3	2.0
	Disagree	2	1.3
	Total	150	100

Findings in Table 18 have shown that nexus exists between climate change, gender and agriculture in Plateau state. Agricultural productivity, livelihoods and women in Plateau state are typically impacted upon by climate change. Plateau state, like any part of Nigeria, depends on rainwater for crop production. Women are more involved in crop production in the state thereby making them the most affected by the impact of climate change.

Based on the findings in Table 18, climate change has affected women's agricultural activities thereby establishing a link between climate change, gender and agriculture. The result in Table 18 showed that majority of the participants who took part in the household survey agreed extreme environmental events have been increasing in frequency hence affecting agricultural activities of women and their livelihoods in the state. Also, majority of the participants agreed that women's agricultural activities are the most vulnerable to the effect of climate change. In a related development, decrease or increase in agricultural activities of women is directly linked to climate change. The findings presented showed that there is a nexus between climate change, gender and agriculture in Plateau state.

In a similar finding during FGDs and KIIs, it was established that gender, agriculture and climate change are deeply intertwined. There is a direct link between gender, climate change and agriculture. Those interviewed attested to the vulnerability of women to climate change, which exacerbates existing inequalities and disparities. A respondent from the Ministry of Women Affairs during the KII said

"I will tell you this authoritatively and from very relevant sources, women farmers in Plateau and Nigeria suffer greatly from climate change, it affects crop production in a number of ways. For example, poverty, rain fall duration is extended; floods and devastated farm lands affect crops.

A traditional ruler noted that

'more than 80% of our women are involved in agriculture, it is difficult to find a women who doesn't even have a garden behind her house. Women experience untold hardship in our communities, you know women don't own land. We didn't create the laws that is how we met them.'

The respondents agreed that the temperatures are higher than normal, change in rainfall patterns, severe droughts, frequent floods, water shortages etc. This is agreeing that Climate Change is real. They discussed and listed specific ways it impacts on the livelihoods of women, especially agriculture.



KII in Plateau State

4.7.3. Impact of Climate change on Livelihoods in Plateau State

Table 19: Impact of Climate change on Livelihoods in Plateau State

S/No	Variables	Frequency	Percentages
1.	Climate change has affected livelihoods in the community		
	Agree	137	91.3
	Undecided	12	18.0
	Disagree	1	.7
	Total	150	100
2	Climate change has affected the health conditions of the people in the community thereby resulting to reduction in food production		
	Agree	143	95.3
	Undecided	6	4.0
	Disagree	2	.7
	Total	150	100
3	Climate change has affected access to labor in the community		
	Agree	106	70.7
	Disagree	32	21.3
	Disagree	12	8.0
	Total	150	100
4	Climate change has increased the workload of people in the community		
	Agree	131	87.3
	Undecided	15	10.0
	Disagree	4	2.7
	Total	150	100
5	Climate change has affected the wildlife/forest reserves in the community		
	Agree	113	75.3
	Undecided	12	8.0
	Disagree	25	16.7
	Total	150	100
6	Agricultural land have been negatively affected by climate change		
	Agree	144	96.0
	Undecided	6	4.0
	Disagree	-	-
	Total	150	100
7	Water resources have been negatively affected by climate change		
	Agree	132	88.0
	Undecided	16	10.7
	Disagree	2	1.3
	Total	150	100
8	Climate change has affected participation in social organizations/social networking (e.g. funeral, weddings, etc.) in the community		
	Agree	117	78.0
	Undecided	13	8.7
	Disagree	20	13.3
	Total	150	100

4.7.3. Impact of Climate change on Livelihoods in Plateau State

Table 19: Impact of Climate change on Livelihoods in Plateau State

S/No	Variables	Frequency	Percentages
9	Shelter/buildings (including storage facilities) have been affected by climate change		
	Agree	137	94.7
	Undecided	11	7.3
	Disagree	2	1.3
	Total	150	100
10	Water supply in the community has been affected by climate change		
	Agree	142	94.7
	Undecided	7	4.7
	Disagree	1	.7
	Total	150	100
11	Climate change has resulted in crop and/or livestock damages in the community		
	Agree	146	97.3
	Undecided	4	2.7
	Disagree	-	-
	Total	150	100
12	Climate change has resulted in migration of members of the community and/or loss of income earning opportunity in the community		
	Agree	133	88.7
	Undecided	12	8.0
	Disagree	5	3.3
	Total	149	100

Table 19 shows respondents' views regarding impact of climate change on livelihoods in Plateau state. Findings from the Table indicate that climate change affects livelihoods in Plateau communities, in the areas of health (resulting to reduction in food production), access to labor, increase workload, agricultural land, water resources, participation in social organizations, shelter, water supply, crop and livestock production as well as migration of members in rural communities and/or loss of income earning opportunities in communities. These findings show that climate change has significant impact on livelihood in the state.

Result of FGDs and KIIs indicate that climate change affects livelihoods in the State in various ways. Their responses were either from personal experiences, true life account of events and historical. In an exclusive interview with the Director of Research and planning of the Ministry of environment and solid minerals in Plateau, he said 'Climate change is one of humanity's greatest challenges.' He talked about how floods, desertification, droughts and violent conflicts are affecting the State. The Southern senatorial zone has recently lost farmlands due to flash floods, due to heavy rainfall. He observed that from 2012 till date floods have claimed properties worth billions of naira in State. More so, he observed that

the change in rainfall patterns affect crop production and yield. Most farmers depend on rain fed agriculture and is one major problem that was noted by other respondents. Another respondent from the Ministry of Agriculture observed that Plateau state has become a 'grazing zone' due to harsh realities of climate change in the Northern part of Nigeria. This, he said, has affected agriculture in the State, stressing that resources are being stretched.

The Farmer/herder conflict has affected agricultural activities in the State. The migration patterns of cattle herders to places like Tenti, Gashis in the State has caused incessant killings of people including women and children. Farmlands and crops were destroyed during these conflicts with the recent one that happened in August 2018, killing hundreds and leaving thousands displaced. The respondents and findings during this survey have linked Climate Change to violent conflicts in the State. Other respondents talked about health issues caused by quarrying and mining activities. A respondent said

'many people especially women have gone into tin mining and quarry because they can't depend on agriculture anymore because they don't have access to land, fertilizers etc.'

Other factors include poor road network by floods and erosion. The poor road network cuts them off from other communities and markets. In response to this a respondent said'

there was a time the bridge to my village was destroyed by flood, we could not carry our goods to the market so they perished because we don't have storage facilities.'

A respondent also confirmed how often pupils and students in her community have to skip school because the river is full and they have no bridge. Although the community constructed an alternative with 2 ropes, it is very dangerous when the river is full. The community has lost 4 pupils this year. The issue of dry spells and droughts affect rivers and water supply during dry season usually between October to April, with its peak in March. People especially in the rural areas walk long kilometers to get water. This also brings about other health challenges like water borne diseases. There was an outbreak of cholera which killed many in the State.

Another issue that stated how climate change affected livelihood was high temperatures. It was gathered that productivity levels dropped during hot periods and many farmers complained about how it affects some plants like potatoes, mustard, broccoli, tomatoes etc.



A rope bridge in a community in Plateau state

4.7.4 Challenges Women face in Agriculture in Plateau State

Over the years more women in Plateau state are highly involved in agriculture because of rise in female-headed households that is increasing due to so many factors including violent conflicts, migration, etc. Findings to support this view are presented in Table 20

Table 20: Challenges Women face in Agriculture in Plateau State

S/No	Variables	Frequency	Percentages
1	Difficult to carry out daily work activities in the field due to severe temperature		
	Agree	140	93.3
	Undecided	10	6.7
	Disagree	-	-
	Total	150	100
2	In ability to afford improved agricultural inputs due to higher cost		
	Agree	141	94.0
	Undecided	5	3.3
	Disagree	4	2.7
	Total	150	100
3	Non-availability of timely inputs (seeds, pp chemicals, fertilizers etc)		
	Agree	134	89.3
	Disagree	14	9.3
	Disagree	2	1.3
	Total	150	100
4	Low price for the produce in the market		
	Agree	124	82.7
	Undecided	22	14.7
	Disagree	4	2.7
	Total	150	100
5	Non-availability of labour		
	Agree	119	79.3
	Undecided	12	8.0
	Disagree	19	12.7
	Total	150	100

Table 20: Challenges Women face in Agriculture in Plateau State *contd.*

S/No	Variables	Frequency	Percentages
6	Higher labour wage rate		
	Agree	131	87.3
	Undecided	15	10.0
	Disagree	4	2.7
	Total	150	100
7	Lack of information about long term climate change		
	Agree	140	93.3
	Undecided	10	6.7
	Disagree	-	-
	Total	150	100
8	Non-availability of needed facilities for livelihood activities		
	Agree	44	96.0
	Undecided	3	2.0
	Disagree	3	2.0
	Total	150	100
9	Lack of knowledge regarding appropriate adaptations to climate change		
	Agree	139	92
	Undecided	9	6.0
	Disagree	2	1.3
	Total	150	100
10	Lack of knowledge about post harvest technology		
	Agree	137	91.3
	Undecided	12	8.0
	Disagree	1	.7
	Total	150	100

Table 20 showed the challenges women face in agriculture in Plateau state. The findings in the cause of this survey has clearly shown women and girls are affected more than men by climate change due to challenges they face in agriculture. Majority of the respondents in the household survey agreed that women find it difficult to carry out their daily agricultural activities in the field due to severe temperature. Inability to afford improved agricultural inputs due to higher cost, non-availability of timely inputs, low price for the produce in the market, non-availability of labor and higher labor wage rate are all challenges respondents agreed that Plateau state women face in agriculture. Other challenges as agreed by majority of respondents are lack of information about long term climate change, non-availability of needed facilities for livelihood activities, lack of knowledge regarding appropriate adaptations to climate change and post harvest technology. All these are challenges affecting women in agriculture in Plateau state.

Respondents during FGDs and KIIs further stressed how harmful cultural practices like the inability to inherit or own land and assets affect women in agriculture in Plateau state because traditional practices and cultures are rooted in patriarchy. A respondent said

'Women are viewed as properties so even when they farm and get proceeds it automatically belongs to the man.'

Most respondents agreed that women are more vulnerable and exposed to the impacts of climate change because they are poorer, less educated, and not involved in the decision-making process of the household. Responses from 2 FDGs suggest that women farmers do not have access to market as they have to go through middlemen. Women in agriculture find it hard to get labour workforce because it is male - dominated. Women in agriculture have little or no access to soft loans and loans from corporations and banks due to high interest rates, as well as lack of assets for collateral.

Presently, women farmers are in various Internally Displaced Persons (IDP) camps in Plateau state. These women who are mainly subsistent farmers, face various challenges. A respondent lamented

'I can't go and harvest my crops because my village has been occupied by herders. We are not safe in our homes, on our farms, how then should we survive? I am a widow how will I cater for my kids?'

The herder farmer conflict has affected women grossly in the state. Many respondents attested to this. Women lost their lives, loved ones and properties due to violent conflicts. Some have been forced to migrate and are in camps and don't have access to farmlands. A stake holder in the KII category sympathized with women farmers in his community; he emphatically stated that between 70%-92% of the farming activities are carried out by women. A respondent stated thus;

"...very well, it affects them, they need support, I am a chief as you know, but I must say the truth. We men as brothers, Husbands, Fathers or even a friend to any Female who engage in agriculture should support them by helping in either funding or directly participate with them since our strengths are not equal. Like now we are in the dry season we can ensure that harvesting crops under the severe weather condition is done with our assistance"

A respondent from the Ministry of women affairs lamented that during a recent agricultural grant scheme, no woman who applied through the Ministry of Women Affairs and Social Development received any grant. Another stakeholder and many other participants in FGD categories agreed that women farmers are affected the most by climate change. Respondents identified lack of farming tools, improved seeds/seedlings that can withstand warmer temperatures tend to affect women farmers.

4.8.1 Findings in Rivers States

This section presents the result of the study in Rivers state. Respondents for the household survey were 150. The demographic composition of the respondents are presented in Table 21

Table 21 Demographic variables of participants sampled in Rivers State

S/No.	Variables	Frequency	Percentages
1	Local Government		
	ObioAkpok	50	33.3
	Onelga	50	33.3
	Oyigbo	50	33.3
	Total	150	100
2	Sex		
	Males	20	13.3
	Females	130	86.7
	Total	150	100
3	Religion		
	Christianity	148	98.7
	Muslim	2	1.3
	Others	-	-
	Total	150	100
4	Education Qualification		
	Primary	34	22.7
	Secondary	113	75.3
	Tertiary	-	
	No formal education	3	2.0
	Total	150	100
5	Occupation		
	Farming	86	57.3
	Petty Trading	34	22.7
	Student	30	20.4
	Total	150	100

A total of 150 participants took part in the household survey in Rivers State. The participants were sampled in 3 local governments – one from each of the 3 senatorial constituency in the state. The findings showed that in 50 persons were sampled from each of the 3 local governments. Respondents sex distribution show that males 20 (13.3%) of the sampled participants while females were 130 (86.7%). In terms of education, 113 (75.3%) of the respondents had secondary school education, 34 (22.7%) had primary education and 3 (2.0%) had no formal education

4.8.2 Nexus between Gender, Climate Change and Agriculture in Rivers State

Table 22 Nexus between Gender, Climate Change and Agriculture in Rivers State

S/No	Variables	Frequency	Percentages
1.	An increase in the frequency and intensity of extreme environmental events that impact on agriculture can be directly linked to climate change.		
	Agree	145	96.7
	Undecided	4	2.7
	Disagree	2	.7
	Total	150	100
2	Extreme environmental events (i.e. floods, drought, and storms) as a result of climate change have been increasing in frequency and intensity in recent years affecting agricultural activities and livelihood of women.		
	Agree	144	96.0
	Undecided	2	1.3
	Disagree	4	2.7
	Total	150	100
3	Women participate more in agricultural activities which are the most affected by extreme environmental events, therefore women agricultural activities are the most vulnerable to climate change		
	Agree	140	93.3
	Undecided	2	1.3
	Disagree	8	5.3
	Total	150	100
4	Land-use, for example deforestation and urbanization, is a contributing factor to global climate change		
	Agree	134	89.3
	Undecided	3	2.0
	Disagree	13	8.7
	Total	150	100
5	Decrease or increase in agricultural activities of women directly link to climate change		
	Agree	137	91.3
	Undecided	8	5.3
	Disagree	5	3.3
	Total	150	100

Findings in Table 22 show the nexus between climate change, gender and agriculture in Rivers state. Agricultural productivity and food security in Rivers state are typically impacted by climate change. Rivers State is a coastal community in the Niger Delta Area of Nigeria encompassed by a network of tributaries, inland and the Atlantic Ocean at its Southern tip. The communities of the Rivers State are largely dependent on the coastal wetlands for aquaculture and fisheries activities, which are their main economic activity. Fishing industry is an essential part of Rivers state. It provides much needed protein, and nutrients as well as creates jobs for thousands of people in the state. With the high demand

on fishing, their populations are declining. Fish populations are being depleted faster than they are able to restore their number. They are not given enough time for the populations to regenerate and sustain the demand that has been put on them. Climate change has also added pressures to these important ecosystems. Women who are actively involved in fish and crop production in the state are affected by the impact of climate change. The result in Table 22 showed that majority of the participants who took part in the household survey agreed that extreme environmental events have impacted on agricultural activities in the state. Furthermore, participants also agreed that extreme environmental events as a result of climate change have been increasing in frequency thereby affecting agricultural activities of women and their livelihoods. Also, majority of the participants agreed that women's agricultural activities are the most vulnerable to the effects of climate change. In a related development, decrease or increase in agricultural activities of women is directly linked to climate change. The findings presented showed the nexus between climate change, gender and agriculture in Rivers state.

Results of FGDs and KIIs in Rivers also showed a connection between climate change, gender agriculture. A discussant during the FGD stated that

"I do not know about climate change and agriculture but I know that in 2016 we lost a lot of corn, melon, maize, yam, cassava and vegetables. I can't tell the reason but people said it is "Buhari Ebola". Termites were eating up the crops, the destruction was so severe. And the Indian bamboo trees blocks sunlight from permeating through the bamboo to the crops. The areas we are farming is very swampy, and most of the farmers are ignorant of the environment and the kinds of crops that can grow in such an environment. Here people keep farming in the same place year in, year out and so they depend on fertilizer to empower the soil because the soil gets weakened from too much cultivation. We don't focus on farming specific crops, we plant everything in the same plot of land. In 2004, when I was in Bible school, there was a specific fertilizer for yam but our people use the same fertilizer for all kinds of crops. Farmers suffer from ignorance, so there is need for enlightenment campaigns and sensitization.

The effect of livelihood are enormous, there is poverty in the land. There is loss of capital, people are struggling to make ends meet. Very poor harvest. Flood has affected many local governments are farmers in Rivers state, we are just lucky but extreme weather and heavy rains are affecting roads and farmlands.

A respondent during KII stated thus

Women farmers are experiencing the economic crunch. Flooding has affected fishing and farming. Crops are affected by flood, some communities are submerged for over a month. Reptiles are driven into people's houses. Vegetables are scarce and women farmers are greatly affected. This effect trickles down to households and children.

4.8.3 Impact of climate change on livelihood in Rivers state

Table 23: Impact of Climate change on Livelihood in Rivers State

S/No	Variables	Frequency	Percentages
1.	Climate change has affected livelihoods in the community		
	Agree	140	93.3
	Undecided	9	6.0
	Disagree	1	.7
	Total	150	100
2	Climate change has affected the health conditions of the people in the community thereby resulting to reduction in food production		
	Agree	146	97.3
	Undecided	4	2.7
	Disagree	-	-
	Total	150	100
3	Climate change has affected access to labor in the community		
	Agree	126	84.0
	Disagree	12	8.0
	Disagree	12	8.0
	Total	150	100
4	Climate change has increased the workload of people in the community		
	Agree	127	84.7
	Undecided	15	10.0
	Disagree	8	5.3
	Total	150	100
5	Climate change has affected the wildlife/forest reserves in the community		
	Agree	144	96.0
	Undecided	4	2.7
	Disagree	2	1.3
	Total	170	100
6	Agricultural land have been negatively affected by climate change		
	Agree	142	94.7
	Undecided	5	3.3
	Disagree	3	2.0
	Total	150	100
7	Water resources have been negatively affected by climate change		
	Agree	137	91.3
	Undecided	10	6.7
	Disagree	3	2.0
	Total	150	100

4.8.3 Impact of climate change on livelihood in Rivers state

Table 23: Impact of Climate change on Livelihood in Rivers State *contd.*

S/No	Variables	Frequency	Percentages
8	Climate change has affected participation in social organizations/social networking (e.g. funeral, weddings, etc.) in the community		
	Agree	104	69
	Undecided	15	10.0
	Disagree	31	20.7
	Total	150	100
9	Shelter/buildings (including storage facilities) have been affected by climate change		
	Agree	130	86.7
	Undecided	6	4.0
	Disagree	14	9.3
	Total	150	100
10	Water supply in the community has been affected by climate change		
	Agree	130	86.7
	Undecided	13	8.7
	Disagree	7	4.7
	Total	150	100
11	Climate change has resulted in crop and/or livestock damages in the community		
	Agree	144	96.0
	Undecided	4	2.7
	Disagree	2	1.3
	Total	150	100
12	Climate change has resulted in migration of members of the community and/or loss of income earning opportunity in the community		
	Agree	92	61.3
	Undecided	14	9.3
	Disagree	44	29.3
	Total	150	100

Results in Table 23 present the impact of climate change on livelihoods in Rivers state. Findings from the household survey indicates that majority of respondents in Rivers agreed that climate change has affected livelihoods in their communities. Also, majority of participants agreed that climate change has affected the health conditions of people in the community thereby affecting livelihood, affected access to labor in the communities and increase workload of people in the communities. Furthermore, agricultural land and water resources which are means of livelihood have been negatively affected by climate change. In a related development, participation in social organizations/social networking, shelter/buildings, crop and/or livestock damages and migration of members of the community and/or loss of income earning opportunity in the community are all impacts that participants in household survey agreed that are effects of climate change on livelihood in the state.

Discussants during FGDs and KIIs stated that climate change has brought illness in communities due to the scorching sunlight. Participants stated that common ailments experienced by farmers are Arthritis and rheumatism, whether they are into subsistence farming or mechanized farming because of the pains from the scorching sunlight. Farmers age quickly, particularly women, who most times suffer arthritis. When women are ill, their source of livelihood is also affected. Respondents also highlighted impact of climate change on livelihood to be that skin rashes. Also effect on forest and wildlife is that deforestation has rendered animals homeless, there is decrease in hunting success and the ponds are empty because the fishes die. On shelter, participants said migration resulting in population reduction in the area and their leakage and damages of roofs and houses caused by flood and acidic rainfall. Other effects are stunted growth of crops due to excess rainfall and sunlight.

Participants also observed that heavy rains have affected the livelihood of women in the community. A member of farmers cooperative in Rivers state stated that:

“...Palm fruit manure is the best for okazi, it helps replace the lost nutrients. Palm fruits is not good with rains. They are affected by heavy rains, those of us that are into palm oil production are experiencing shortage of palm oil.”



Data collection in Rivers state

4.8.4 Challenges Women face in Agriculture in Rivers State

Table 24: Challenges Women face in Agriculture in Rivers State

S/No	Variables	Frequency	Percentages
1	Difficult to carry out daily work activities in the field due to severe temperature		
	Agree	145	96.7
	Undecided	5	3.3
	Disagree	-	-
	Total	150	100
2	In ability to afford improved agricultural inputs due to higher cost		
	Agree	139	92.7
	Undecided	9	6.0
	Disagree	2	1.3
	Total	150	100
3	Non-availability of timely inputs (seeds, pp chemicals, fertilizers etc)		
	Agree	127	84.7
	Disagree	20	13.3
	Disagree	3	2.0
	Total	150	100
4	Low price for the produce in the market		
	Agree	125	83.3
	Undecided	16	10.7
	Disagree	9	6.0
	Total	150	100
5	Non-availability of labour		
	Agree	113	75.3
	Undecided	20	13.3
	Disagree	17	11.3
	Total	150	100
6	Higher labour wage rate		
	Agree	122	81.3
	Undecided	25	16.7
	Disagree	3	2.0
	Total	150	100
7	Lack of information about long term climate change		
	Agree	139	92.7
	Undecided	10	6.7
	Disagree	1	.7
	Total	150	100
8	Non-availability of needed facilities for livelihood activities		
	Agree	134	89.3
	Undecided	10	6.7
	Disagree	6	4.0
	Total	150	100
9	Lack of knowledge regarding appropriate adaptations to climate change		
	Agree	140	93.3
	Undecided	6	4.0
	Disagree	4	2.7
	Total	150	100
10	Lack of knowledge about post harvest technology		
	Agree	138	92.0
	Undecided	9	6.0
	Disagree	3	2.0
	Total	150	100

Table 24 presents challenges women face in agriculture in Rivers state. The findings in the has clearly shown that women are affected more than men by climate change due to challenges they face in Agriculture. Majority of the respondents in the household survey agreed that women find it difficult to carry out their daily agricultural activities in the field due to severe temperature. In ability to afford improved agricultural inputs due to higher cost, non-availability of timely inputs, low price for the produce in the market, non-availability of labor and higher labor wage rate are all challenges respondents agreed that women in River face in agriculture. Other challenges as agreed by majority of respondents are lack of information about long term climate change, non-availability of needed facilities for livelihood activities, lack of knowledge regarding appropriate adaptations to climate change and post harvest technology. All these are challenges affecting women in agriculture in Rivers state.

During FGDs and KIIs, discussants stated that oil spillage and gas flaring have affected agriculture and this has caused economic loss to farmers. Other challenges farmers face in the community are drought and excess rainfall throughout the year. Challenges faced by women are low produce of crops because of waterlogged farms resulting in little or no income for the women. Also, no assistance provided to the community by any institution. A participants during FGD stated thus:

Oil spillage and gas flaring have affected agriculture and this has caused economic loss to farmers. Ministry of agriculture is supposed to put in checks and ensure this does not happen but they seem handicapped. The Ministry of Environment is supposed to handle this but nothing has been done”.

4.9 Differences in the States on the Nexus between Gender, Climate Change and Agriculture

Furthermore, the study examined differences between the various states (Benue, Cross River, Plateau and Rivers) on the nexus between gender, climate change and agriculture. A univariate test of significance was conducted to test whether there are statistically significant differences between the various states on the nexus between gender, climate change and agriculture. The result is presented in Table 25.

Table 25: ANOVA Table on Differences in the States on the Nexus between Gender, Climate Change and Agriculture

Source of variance	Sum of Squares (SS)	df	Mean Squares	F	Sig.
Corrected model	1036.225	3	345.408	15.424	.000
Intercept	808704.575	1	808704.575	36112.026	.000
State	1036.225	3	345.408	15.424**	.000
Error	13772.512	615	22.394		
Total	825696.000	619			
Corrected Total	14808.737	618			

Table 25 is a summary of analysis of variance (ANOVA) showing the difference between the various states on the nexus between gender, climate change and agriculture. The result of the analysis of variance on Table 25 shows that there is a significant difference between the various states on the nexus between gender, climate change and agriculture ($F = 15.424$, $df = 3, 615$; $P < .01$). This finding implies Benue, Cross River, Plateau and Rivers states experience the impact of climate change on gender and agriculture differently.

Table 26: Descriptive Statistics

State	Mean	Std. Deviation	N
Benue	35.1074	3.21975	149
Cross River	35.9471	6.50467	170
Plateau	35.3333	3.60958	150
Rivers	38.4133	4.59528	150
Total	36.1939	4.89514	619

An interception of the mean scores indicated that Rivers state has highest same mean scores on the nexus between gender, climate change and agriculture ($M = 38.413$, $SD = 4.595$) with Benue state having the lowest means scores ($M = 35.107$, $SD = 3.2197$).

Table 27: Multiple Comparisons Between the states and the Nexus between Gender, Climate Change and Agriculture:

(I) State	(J) State	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Benue	Cross River	-.8397	.53106	.686	-2.2453	.5660
	Plateau	-.2260	.54735	1.000	-1.6747	1.2228
	Rivers	-3.3060*	.54735	.000	-4.7547	-1.8572
Cross River	Benue	.8397	.53106	.686	-.5660	2.2453
	Plateau	.6137	.53012	1.000	-.7894	2.0169
	Rivers	-2.4663*	.53012	.000	-3.8694	-1.0631
Plateau	Benue	.2260	.54735	1.000	-1.2228	1.6747
	Cross River	-.6137	.53012	1.000	-2.0169	.7894
	Rivers	-3.0800*	.54643	.000	-4.5263	-1.6337
Rivers	Benue	3.3060*	.54735	.000	1.8572	4.7547
	Cross River	2.4663*	.53012	.000	1.0631	3.8694
	Plateau	3.0800*	.54643	.000	1.6337	4.5263

In a related development, it was found that no mean differences exist between Benue State and Cross River state ($M = -.839$; $P > .05$) nexus between gender, climate change and agriculture. There was no significant difference between Benue state and Plateau state ($M = -.226$; $P > .05$) on nexus between gender, climate change and agriculture. Findings in the Table 5.2 however showed that there is a statistically significant mean difference between Benue state and Rivers on nexus between gender, climate change and agriculture ($M = -2.466$ $P < .00$).

Regarding differences between Cross River state and Plateau state, no significant difference was found ($M = .6137$; $P > .05$) on nexus between gender, climate change and agriculture between the two states. However, there was significant mean difference between Cross River state and Rivers ($M = -2.4663$; $P < .00$). There was significant mean difference between Plateau state and Rivers state on nexus between gender, climate change and agriculture ($M = -3.0800$; $P < .00$). The findings entails that the 4 states experience climate change and its relationship on gender and agriculture differently.

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Based on the presentations of the nexus between climate change, gender and agriculture as well as the impact of climate change and challenges women face in agriculture in the 4 states of study, we would conclude on 3 important points.

First, there is a relationship between climate change, gender and agriculture. Women in rural areas who are majorly farmers in the study area are facing difficulties, struggling to deal with the effects of climate change. The increase in frequency and magnitude of impacts of harsh weather conditions in the areas of study is of particular concern. The climate phenomenon happening in these states include extended times for severe floods, shortages of fresh water, diseases, droughts, poor yield, extremely hot weather, conflict, etc. Majority of the respondents agreed that climate change is affecting men and women differently. They also agreed that women are mostly affected by the effect of climate change.

In order with the effect of climate change, women's workloads have increased substantially, even though their workloads have been high, there is a drastic increase in their work load. These factors make the negative relationship between climate change, gender and agriculture. This negative relationship between climate change, gender and agricultural negatively affects women both physically, socially and psychologically, because they have been forced to work longer, worry about their farms, family, etc.

Second, changes in climatic condition will continue into the distant future. This entails that the livelihood means of the rural poor especially women will continue to be negatively impacted. Food production in vulnerable local communities such as the study areas will continue to dwindle. The livelihood of women keep on dwindling if appropriate measures are not taken to provide with support such as information on best adaptation measures to climate change among others. The obvious effect of this is lack of livelihood for women resulting to food insecurity manifesting in malnutrition, hunger and poor health. Also, in this paper, it has been shown that Climate change has affected livelihoods in the communities, health conditions of the people in the communities thereby resulting to reduction in food production, access to labor in the communities, increased the workload, etc all affected thereby affecting the woman's means of livelihood.

Third, based on the findings of this study, women farmers in the study area are faced with a lot of challenges in their desires to effectively carry out their agricultural activities in Nigeria. Some of the barriers observed that inhibit participation of women farmers in agricultural production generally are: difficult to work in the field due to severe

temperature, in ability to afford improved agricultural inputs due to higher cost, non availability of timely inputs (seeds, pp chemicals, fertilizers etc), low price for the produce in the market, non availability of labor and higher labor wage rate, lack of information about long term climate change and non availability of irrigation facility. Other challenges are lack of knowledge regarding appropriate adaptations, lack of knowledge about post harvest technology, lack of land ownership right; non-availability of credit and loans facilities; poor access to extension staff; and, inadequate training and low standard of education. It is, therefore, important that these barriers be addressed by the Federal, State and Local Governments and nongovernmental organizations as to facilitate effective women's participation in agricultural activities. We must understand that, when a woman is affected, the family is affected and when the family is affected, the society then to be affected. Address these barriers will boost women output and ensure greater food security in the study area as well as healthy family and society.

5.2 Recommendations

Based on the findings from the FGD, KII and household survey, the following strategies and recommendations are made.

1. Empowering women and improving their status through targeted support to improve her agency, power and relations:

Women's status affects how she is perceived; her self-worth, and the kind of activities she is expected to undertake. The social status of women contributes to the negative relationship between climate change, gender and agriculture. This affects their ability to effectively cope with the effects of climate change as they lack access to basic information, support, etc. Women's lower status leads to the segregation by men that they are responsible for substantial agriculture and livelihood. Therefore, it is recommended that the status of women be enhanced through civic education targeting both men and women, targeted financial literacy and support. Also training women and building their capacity is critical to the enhancement of their status therefore ensuring that they do not only engage in substantial agriculture but also engage in commercial agriculture. Because there is perceived lack of women empowerment in Nigeria (Achakpa & Radovic-Markovic, 2018), empowering women and building their resilience gives them opportunity to boost their income status, ability to cope with extreme weather conditions and knowledge thereby adapting to the effect of climate change.

2. Advocacy for Good Governance

The lack of good governance has limit women access to information, loans, education, etc. Poor governance and misappropriation of funds meant for development and empowerment of women in communities prevent such empowerment. Therefore, for

enhanced women resilience and coping ability, there is need to advocate for accountability, transparency, citizens' participation and inclusion, rule of law and due process in the government. If these are in place, government will ensure the empowerment of rural women.

3. Education and public awareness:

Most projects are run by MDAs and within communities where little gender sensitization has taken place and where awareness and understanding of gender inequality is low. It is important to sensitize all the stakeholders, men and women on the importance of involving women throughout the whole project process from planning, implementation, monitoring and evaluation. Extensive and intensive social mobilization should precede project implementation to create a sense of awareness and ownership, and to bring about attitude change. Successful mobilization requires a minimum of six months prior to implementation. This is the only way to ensure that policies advocating for women's participation in decision making are understood and accepted at the community level.

4. Gender Policy in Climate Change, Nigeria

It is imperative to have a gender policy in climate change to guide the government, MDAs, non-governmental and donor organizations involved in climate change services in addressing gender issues in the programs, policies, procedures and personnel. The gender analysis of these implementing agencies should include their organizational structure and culture; their policy formulating mechanisms; the organizations objectives and strategies; the personnel policies and human resource development; the provision of gender training; and the role of change agents in the organization. Gender balanced policies in climate change should acknowledge the intention of improving the lives of women and enhancing their participation. Policy and Legal positions should aim to break the marginalized position of women in management of climate change resources.

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APPENDIX

RESEARCH TOOLS

Dear Respondent

Request to Complete Questionnaire

We are conducting research to examine impact of climate change on agriculture, livelihood and gender in Nigeria. This research is for academic purpose. Please, answer the questions below honestly and be rest assured that any information given will be treated confidentially and only for the purpose of this research.

Thanks

General Instruction

Please tick (✓) where appropriate

Section A: Demographic Information

1. Age:
2. Sex: Male female
3. Ethnicity: -----
4. Marital status: single married divorce widowed
5. Religion: Christianity Islam others
6. Educational qualification: No formal education Primary education
Secondary school education High school education
7. Farming experience (years):
8. Occupation
- i. Main (farming):
- ii. Subsidiary occupations: Dairy Poultry Sheep rearing Goat rearing
 Petty shops, Others (specify):

Section B

S/No	Items	Agree	Undecided	Disagree
	Nexus between Climate Change and Agriculture			
1	An increase in the frequency and intensity of extreme environmental events that impact on agriculture can be directly linked to climate change.			
2	Extreme environmental events (i.e floods, drought, and storms) as a result of climate change have been increasing in frequency and intensity in recent years affecting agricultural activities and livelihood of women.			
3	Agricultural activities are the most affected by extreme environmental events and are therefore the most vulnerable.			
4	Land-use, for example deforestation and urbanization, is a contributing factor to global climate change.			
5	Decrease or increase in agricultural activities of women directly link to climate change.			
	Impacts of Climate Change on Livelihoods			
1	Climate change has affected livelihoods in the community			
2	Climate change has affected the health conditions of the people in the community thereby resulting to reduction in food production			
3	Climate change has affected access to labor in the community			
4	Climate change has increased the workload of people in the community			
5	Climate change has affected the wildlife/forest reserves in the community			
6	Agricultural land have been negatively affected by climate change			
7	Water resources have been negatively affected by climate change			

8	Has climate change affected participation in social organizations/social networking (e.g. funeral, weddings, etc.) in the community			
9	Shelter/buildings (including storage facilities) have been affected by climate change			
10	Water supply in the community has been affected by climate change			
11	Climate change has resulted in crop and/or livestock damages in the community			
12	Climate change has resulted in migration of members of the community and/or loss of income earning opportunity in the community			
	Challenges Women face in Agriculture as a result of Climate Change			
1	Difficult to work in the field due to severe temperature			
2	In ability to afford improved agricultural inputs due to higher cost			
3	Non-availability of timely inputs (seeds, pp chemicals, fertilizers etc)			
4	Low price for the produce in the market			
5	Non-availability of labour			
6	Higher labour wage rate			
7	Lack of information about long term climate change			
8	Non-availability of irrigation facility			
9	Lack of knowledge regarding appropriate adaptations			
10	Lack of knowledge about post harvest technology			

	Perception of farmers on climate change and variability indicators			
1	There has been an increase in the temperature in the community			
2	Experienced More extreme temperature in the community			
3	Experienced Less extreme temperature in the community			
4	There is more scorching sunshine experienced in the community			
5	There has not been any changes in the temperature			

FGD GUIDE

Introduction

Good Day All,

Thank you very much for accepting to do this interview. My name is (Name of Interviewer). The purpose of this interview is to get a deeper understanding of the experiences of the people of this community regarding the impact of climate change on agriculture, livelihood and gender. This information would be used for academic purpose.

Rules

- v I would like you to note that information you shall provide in the course of this interview will be treated as confidential and will only be used for the purpose of this study. No information as such would be linked directly to your name however it would be used for the purpose it is intended. This is to protect your privacy.
- v Note that there is no right or wrong answers.
- v In other to help us capture details of this interview I wish to request your kind permission to audio-record this interview.
- v We are requesting you to sign a consent form in compliance with the terms of our research ethics

QUESTIONS

1. What are your views regarding climate change?
2. Have you noticed any significant changes in weather variables (such as temperature, rainfall amount, duration and distribution, sunshine, heat spell etc) in the last years?
3. Has there being changes in the agricultural production output (crop yields/livestock production) for both men and women in the community?
4. What is responsible for these changes? (i) Extreme weather/climate change events (floods, droughts, heat spell etc.) (ii) Pest/diseases (iii) soil infertility issues
5. What are the effects of climate change on these livelihood assets:

A. Human capital

- i. Effect on health/death
- ii. Access to labour
- iii. Effect on workload

B. Natural capital

- i. Effect on wildlife/forest
- ii. Effect on agricultural land
- iii. Effect on water resource

C. Physical capital

- i. Effect on shelter/personal buildings (storage facilities etc)
- ii. Effect on water supply
- iii. Effect on electricity
- iv. Effect on public goods (schools, clinics, roads, community centers, etc.)

D. Social capital

- i. Effect on participation in social organization/networking
- ii. Effect on decision-making at household/community level
- ii. Effect on participation in informal/non-formal educational activities.

E. Financial capital

- i. Effect on personal belongings & equipment
- ii. Effect on crops and/or livestock
- iii. Effect on migration and income earning opportunity
- iv. Effect on access to credit?

6. What kind of effects on crops have you observed from increasing temperature?

7. What sort of change have you observed due to climate change on cash and food crops?

8. What are the challenges faced in your community as a result of climate change

10. Specifically, do women face challenges as a result of climate change? If yes, what are the challenges women face as a result of climate change?

11. Are the members of the communities (specifically farmers) assisted by any institution to help address the climate change impacts?

KII FOR STAKEHOLDERS, CSOS, NGOS

Introduction

Good Day Sir/Madam,

Thank you very much for accepting to do this interview. My name is (Name of Interviewer)

As you may be aware, the purpose of this interview is to get a deeper understanding of understanding of the experiences of the people of this community regarding the impact of climate change on agriculture, livelihood and gender. This information would be used for academic purpose.

Rules

- v I would like you to note that information you shall provide in the course of this interview will be treated as confidential and will only be used for the purpose of this study. No information as such would be linked directly to your name however it would be used for the purpose it is intended. This is to protect your privacy.
- v Note that there is no right or wrong answers.
- v In other to help us capture details of this interview I wish to request your kind permission to audio-record this interview.
- v We are requesting you to sign a consent form in compliance with the terms of our research ethics

Interview Question Guide for Key Informants

1. What is your perception of climate change?
2. What are the major climatic changes being felt globally?
3. How has climate change affect Nigeria in general and (state....) in particular?
4. Has climate change threatened agriculture?
5. If yes, how has climate change threaten agriculture?
6. How has the agricultural productivity affected?
7. What is the effect of climate change on livelihood?
8. Do women face challenges in their daily agricultural activities as a result of climate change?
9. If yes, what are the agricultural challenges women face as a result of climate change?
10. How do farmers perceive climate change and variability indicators (temperature, rainfall, floods and droughts)?
11. Has the Government of Nigeria undertaken any specific steps to deal with the impacts of climate change?

CASE STUDIES/STORIES

Introduction

Good Day Sir/Madam,
 Thank you very much for accepting to do this interview. My name is (Name of Interviewer)

The purpose of this interview is to get a deeper understanding of your experiences regarding the impact of climate change on agriculture, livelihood and gender. This information would be used for academic purpose.

Rules

- v I would like you to note that information you shall provide in the course of this interview will be treated as confidential and will only be used for the purpose of this study. No information as such would be linked directly to your name however it would be used for the purpose it is intended. This is to protect your privacy.
- v Note that there is no right or wrong answers.
- v In other to help us capture details of this interview I wish to request your kind permission to audio-record this interview.
- v We are requesting you to sign a consent form in compliance with the terms of our research ethics

Biodata

1. Age: 18-25 26-30 31-35 36 and above
2. Sex: Male Female
3. Marital status: Single Married Divorce Widowed Separated
4. Religion: Christianity Islam others
5. Ethnicity: -----
6. Educational Qualification: No formal Education Primary Education Secondary Education Tertiary Education
7. Nature of Marginalization (observe and describe)

.....

INTERVIEW GUIDE

1. How frequent do you engage in farming activities?
2. How has climate change affected your livelihoods in the community?
3. Has climate change affect your health conditions?
4. How has your agricultural land affected negatively by climate change?
5. How has your access to water supply in the community affected by climate change?
6. How has climate change made it difficult for you to work on the field?

ABOUT THE AUTHORS

Main Authors

Dr. Priscilla M. Achakpa is the co-founder and executive director of Women Environmental Programme (WEP) International. (WEP) is the leading organization working on women's empowerment and gender equality in sustainable development and democratization policies and projects. WEP works locally with grassroots women's movements on improving access to water and sanitation, on climate protection, peace and conflict, eliminating pollution and harmful chemicals and waste and sustainable agriculture. She holds Ph.D in Economics from the University of Business Engineering and Management, Banja Luka, Bosnia and Herzegovina; M.SC in Development Studies, from Benue State University; Higher National Diploma and National Diploma in Business Admin; Post Graduate Diploma in Management; Post Graduate Diploma in Project Management and Programme Administration; Post Graduate Diploma in Land Management and Informal Settlement Regularization and several short courses on gender issues, conflict and peace building as well as other developmental issues.

Dr. Priscilla is a recipient of many national and international awards including Ashoka Fellow in 2013; "2face Peace Award" for Exemplary Advocacy on Internally Displace Persons (IDPs) and Peaceful Co-Existence in Nigeria in 2016; ECO Ambassador by Channels TV Nigeria and Deutsche Welle of Germany in April 2016; Climate Change Warrior by Vogue Magazine, USA in December 2015; Institute for Peace and Conflict Resolution (IPCR) & United Nations Development Programme (UNDP) award for Community Peacebuilding in Nigeria, September 2012; and Mother of Peace Award -Enebo1: for Mediating and Bringing Peace to Agila Community in Benue State Nigeria, 2011. Dr Priscilla Achakpa was elected as coordinator of the Women's Major Group to the United Nations Environment Programme (UNEP) and has just finished her term as the Organizing Partner (OP) of the Women's Major Group representing Africa for the UN Sustainable Development process. She serves as an expert to the Nigerian government for the climate negotiations on gender.

Dr. Reuben Lubem Ibaishwa is a practicing Clinical Psychologist and researcher by profession He has worked as a Psychosocial and Mental Health, GBV, Child Protection expert and Researcher. He holds a Doctor of Philosophy Degree in Clinical Psychology. He has lectured in the department of Psychology, Nigerian Defense Academy (NDA). Dr. Lubem combine training and experience to deliver effectively and efficiently in areas of psychological services, protection, GBV programming and research. He is on the Board of Directors, Women Environmental Programme (WEP). He is proficient in delivering specialized psychological services such as response to GBV issues in North East Nigeria, management of programmes in emergency situations, research and coordinating of psychological programmes for vulnerable population.

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Emem J Okon

Emem Okon is a feminist activist, grassroots mobilizer, gender specialist, social change advocate, pan-Africanist and a development practitioner who has successfully led grassroots campaigns in the Niger Delta region of Nigeria and in the African region with over 20 years' experience in the non-profit sector and specializes in practical issues associated with gender, women empowerment, grassroots mobilization, Climate Change, budget monitoring, women peace and security, leadership, gender and extractives, advocacy campaigns and development practices as it affects women in rural communities.

Emem is the Co-Founder of Women Initiative on Climate Change (WICC) a grassroots network of community women groups working on gender and climate change issues to amplify voices of community women groups on impact of climate change on women. She is on the Board of Trustees as well as the Regional Steering Committee of WoMIN Africa Gender and Extractive Alliance an African regional women-led alliance of women organizations and community women groups working on gender and extractives to challenge corporate power and project the voices of community women groups on impact of negative and destructive resource extraction.

Emem is currently the Founder and Executive Director of Kebetkache Women Development & Resource Centre; a member of the NEITI Civil Society Steering Committee in Nigeria, and one of the Alternate members of the Governing Council to HYPREP on the implementation of the UNEP report on Ogoniland.

Before she founded Kebetkache Women Development & Resource Centre, she was the Rivers State Coordinator of Women in Nigeria and the Program Coordinator Niger Delta Women for Justice a grassroots Pan-Niger Delta women's movement. She has been involved in many women advocacy campaigns and coordinated many networks in the south south geo-political zone including being the South south zonal coordinator of West African Network for Peace-Building (WANEP); Chairperson of the Coordinating Council of the CSO Alliance on SGDs; Rivers State Deputy Coordinator of Coalition of Eastern NGOs.

Emem received the Sisterhood award from Women International Center, USA in 2012 and also received an honorary Chieftaincy title of ETI-UFAN from the Duke Royal House of Cross River State in 2017. She is a Deaconess and a Director in Royal House of Grace International Church.

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She has written more than thirty books and more than hundred peers' journal articles. Her publications are published by top world publishing companies as Routledge, Francis Taylor, Springer, Palgrave MacMillan, Emerald, Sage and IAP Publisher, GI Global.

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John Terzungwe Baaki is the Programme Manager of Women Environmental Programme (WEP). He holds a Bachelor of Science Degree in Geography from Benue State University, Makurdi, Benue State. He is currently studying for his Master of Science Degree in Climatology at Nasarawa State University, Keffi, Nasarawa State. John is a passionate development practitioner with vast experience and interest in research, climate change, gender and project management.

