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Awareness, Knowledge and Perception of Climate Change among Smallholder Farmers in Kwara State, Nigeria

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Abstract

Climate change impacts negatively on peoples' livelihoods particularly in developing countries, such as Nigeria where agriculture employs a large proportion of the population and the farming systems dominated by smallholder farmers. Smallholder farmers often adopt in several ways to farming systems, in many instances, adaptation strategies have exacerbated poverty, food insecurity and left behind vulnerable agrarian communities. This study examines awareness, knowledge and perception of climate change among smallholder farmers in Kwara State. The study was carried out in the four agricultural zones of Kwara State namely: derived savanna, floodplain, guinea savanna and rainforest zone. Mixed method approach was employed in the study. Sample size was determined after Krejcie and Morgan's (1970). Altogether, 1,470 farmers households were sampled, 4 Focus Group Discussions (FGD) sessions and 5 Key Informant Interviews (KII) were also conducted in each of the zones studied. Descriptive statistics including thematic analyses were used in this study. The findings were that respondents employed strong understanding of climate change in all the zones. They identified the indicators of climate change as: crop failure (82.3%), drought (68.2%) and rising temperature (54%). The study concluded that the adaptation strategies of smallholder farmers were effective in checking the menace of climate change in the study area. It was recommended that aggressive climate education of local farmers, intervention of early warning, and the provision of climate suitable crops among others should be encouraged among the farmers.

Keywords: Climate Change, Smallholder Farmers, Perception, Farming Systems, Kwara State

INTRODUCTION

Smallholder farmers who tend plots of less than two hectares are particularly susceptible to the negative impacts of climate change. Climate volatility not only intensifies the hardships faced by impoverished agriculturalists with limited land and resources, but also jeopardizes global efforts to alleviate poverty, ensure food security, and promote sustainable development. Studies have shown that around 475 million small-scale farmers worldwide eke out a living on tiny plots, living on the brink of famine while risking everything on the unpredictability of the climate (Lowder *et al*., 2016; Vermeulen *et al*., 2012; Lipper *et al*., 2014). A predominantly rural populace labors to wring livelihood from stingy dirt, often with little insulation from life-threatening food insecurity or the mounting risks of environmental instability (Cohn *et al*., 2017; Dere *et al*., 2024). Due to their reliance on rain-fed agriculture, marginal land cultivation, and lack of access to financial or technical support that could enable them to make investments in more climate-resilient agriculture, smallholder farmers are particularly vulnerable to the effects of climate change (Holland *et al*., 2017; Donatti *et al*., 2018).

The lack of knowledge about how smallholder farmers are coping with and adapting to climate change continues to impede adaptation efforts, despite mounting evidence of their vulnerability to the phenomenon (Cohn *et al*., 2017; Harvey *et al*., 2014) and increasing significance in ensuring food security in the face of climate change (Vermeulen *et al*., 2012; Lipper *et al*., 2014). In-depth, context-specific information on the impacts of climate change on smallholder farmers and whether (and how) they are modifying their management strategies is necessary for policy makers, donors, and practitioners who are interested in creating policies, societal responses, and approaches for smallholder farmer adaptation (Rafiu, *et al*., 2024; Castellanos *et al*., 2013; Donatti *et al*., 2017).

Furthermore, more data is required to understand how the susceptibility and responses of smallholder farmers varied among agricultural systems and socioeconomic situations. The Intergovernmental Panel on Climate Change (2007) described adaptation as simply adjustments to characteristics or behaviors of natural systems to reduce harm, or to capitalize on beneficial opportunities, associated with climate stimuli or impacts either current or in the future, or the process of adjustment itself. It also means the actions taken by individuals, nations and civilizations in response to real climate change. The three possible goals of climate change adaptation include reducing vulnerability to damage, making the system more resilient to damage, and taking advantage of new opportunities.

Understanding the impacts of climate change on both human and ecological systems, along with the threats and vulnerabilities it poses, is a crucial starting point for navigating the new era we live in. According to emails from the UN Climate Change Secretariat, clear evidence of climate change can be seen in environmental indicators such as fluctuating temperatures (both increases and decreases), altered precipitation patterns (either heavier, lighter, more frequent, or absent), and accelerating rises in ocean and sea levels due to widespread melting of polar ice caps. The 2019 report by the UN Climate Change Secretariat (UNCCS) highlights a range of climate-related hazards, including droughts, floods, hurricanes, severe storms, heatwaves, wildfires, cold spells, and landslides.

Data from the Centre for Research on the Epidemiology of Disasters (CRED) further underscores the severity of these impacts. In 2018 alone, there were 315 recorded natural disasters globally, most of which were linked to climate change. These included 16 droughts, 26 extreme heat events, 127 floods, 13 landslides, 95 storms, and 10 wildfires. These disasters affected approximately 68.5 million people, with 94% of those impacted by floods, storms, and droughts. The economic cost was also staggering, amounting to $131.7 billion in damage: storms accounted for $70.8 billion, floods for $19.7 billion, wildfires for $22.8 billion, and droughts for $9.7 billion. Collectively, these events represented 93% of total global disaster-related losses that year.

CRED's data over the previous decade shows that, except for wildfires, the annual averages of such disasters have risen significantly. Alarmingly, the financial damage caused by natural disasters in 2018 alone nearly equaled the total wildfire-related losses from the entire preceding decade (CRED, 2019). Notably, wildfires although a natural phenomenon-have become a major source of

carbon dioxide emissions. Human activities are increasingly contributing to and amplifying these emissions, thereby intensifying the effects of natural disasters. It is clear that human-induced climate change is now a significant driving force behind the increasing frequency and severity of climate-related disasters across the globe.

Conversely, the negative effects of climate change and variability have impacted most of the rural smallholder farmers' quality of life. Malnutrition and acute food insecurity already plague the African continent; the IPCC (2007) reported that over 23 million people in 11 African nations suffer from malnutrition and acute food insecurity. Smallholder farmers on this continent are more vulnerable to worsening famine scenarios due to climate change (Apata, 2012). Experience from smallholder farmers, in rural areas, shows low agricultural production, crop failure, outbreaks of human illness, outbreaks of pests and diseases, lack of water, shortages of household food items derived from agriculture and food insecurity (Mutekwa, 2009; Hauwa *et al*., 2024). The consequences for farmers particularly in rural areas have led to climatic shifts that directly impact global food security and the well-being of most farmers, who rely on climate dependent natural resources such as agriculture (Debela *et al*., 2015). As a result, their output being primarily rain-fed agriculture, their agricultural production has also been at risk with extreme climatic variability (Maponya, 2013).

A significant proportion of the workforce in developing nations are employed in agriculture; these jobs have been negatively impacted by climate change. It has made agrarian communities more vulnerable, impoverished and food insecure, particularly in Sub-Saharan Africa (SSA). Economic growth is mostly derived from agriculture, especially in developing nations. But long-term economic growth is seriously threatened by the current state of climate change (Gebreegziabher *et al*., 2012). Apata (2012) emphasizes that millions of people, particularly in northern Nigerian frontier states that are prone to desert are trapped in poverty, resulting in low living standards due to food insecurity and water scarcity. North Central Nigeria, the nation's food basket, has recently experienced floods of varying magnitudes. These include the Lokoja floods of 2012 and 2022, as reported by the National Emergency Management Agency (NEMA, 2012; 2022), the 2014 Ilorin flood (Jimoh, 2014), and the 2014 Kaduna flood (Alabelewe, 2014). These have resulted in the loss of lives, farmland, and other valuable properties. Increasing global warming and variations in rainfall had resulted in decreasing agricultural production by smallholder farmers who are expected to be disproportionately affected by the negative effects of climate change. This is because their livelihoods depend on the utilization of natural resources. As a result, farmers must adapt to climate change to maximize output.

Despite the critical role smallholder farmers play in global food security (FAO 2018), they are disproportionately vulnerable to the impacts of climate change, including increased temperature and precipitation variability, droughts, and floods (IPCC 2014b). While various climate change adaptation strategies have been implemented among smallholder farmers, such as agroforestry, conservation agriculture, and climate-smart agriculture, there is limited awareness and knowledge of their effectiveness in enhancing resilience and reducing vulnerability (Bryan *et al*., 2013). The lack of comprehensive assessments of these strategies hinders the identification of best practices, scaling up of successful interventions, and informed decision-making (Lipper *et al*., 2014).

STUDY AREA

Kwara State lies between longitudes 20 451E and 60 121E and latitudes 80 and 100 041N. Covering 36,825 km2, the state borders Niger State to the north, Kogi and Ekiti States to the east, Osun and Oyo States to the south, and the Republic of Benin to the west via an international boundary. Akpenpuun and Busari (2013) state that Kwara State is shaped like an extended stick that extends from west to east, spanning an area of roughly 32,500 square kilometers. The River Niger forms the state's natural boundaries along its eastern and northern borders. Its internal borders are shared by the Kogi State to the east, the Niger States to the north, Oyo, Osun, and the Ekiti States to the south. It upholds an international border to the west with the Republic of Benin (Figure 2.1). Kwara State is the "Gateway" between the north and the south of Nigeria due to its location between the two regions (Kwara State Government, 2011).

Kwara has sixteen Local Government Areas. It is home to the Yoruba, Nupe, Baruba, and Fulani ethnic groups. Asa, Baruten, Edu, Ekiti, lfelodun, llorin East, llorin West, llorin South, Irepodun, Kaiama, Moro, Offa, Oyun, Isin, Oke-Ero, and Patigi are among the sixteen (16) Local Government Areas in the state. Most of the population are predominantly farmers. The Kwara Agricultural Development Plan (KWADP, 2010) divides the state into four agricultural zones: zone A, Derived Savannah Area (Baruteen, Kaiama). Zone B: Area of Flood Plain (Patigi, Edu). Ilorin West, Ilorin South, Ilorin East, Asa, and Moro are all in Zone C the Guinea Savannah. Figure 2.2 depicts the zone D-Rainforest area, which includes Irepodun, Oyun, Offa, Isin, Ekiti, Ifelodun, and Oke-Ero.

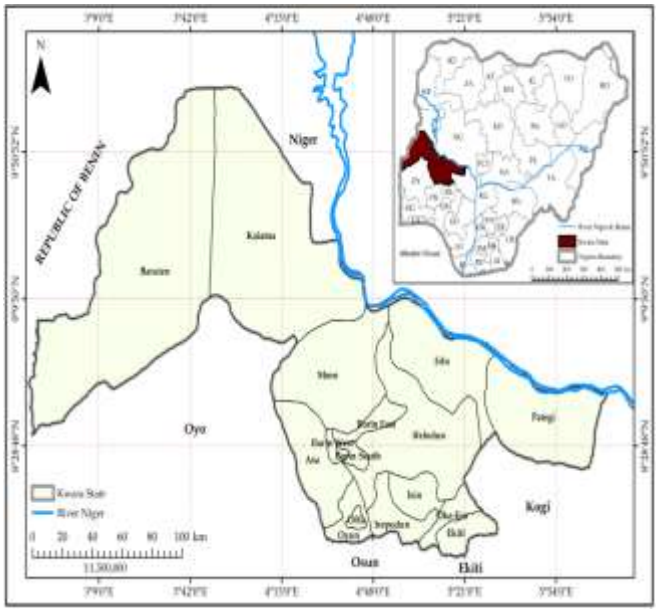

Figure 1: The Study Area Kwara State showing its position on Nigeria map
Source: Generated by Author from ArcGIS 10.5 (2024)

METHODOLOGY

Simple random and purposive sampling strategies were both used in this mixed-methods study to select participants and respondents for the collection of quantitative and qualitative data, respectively. Using the farmers population census data from the study region as the sampling frame and the statistical Table from Krejcie and Morgan (1970) as a guide for choosing the sample size, for the quantitative arm of the study. The multistage sampling technique was applied, which at each

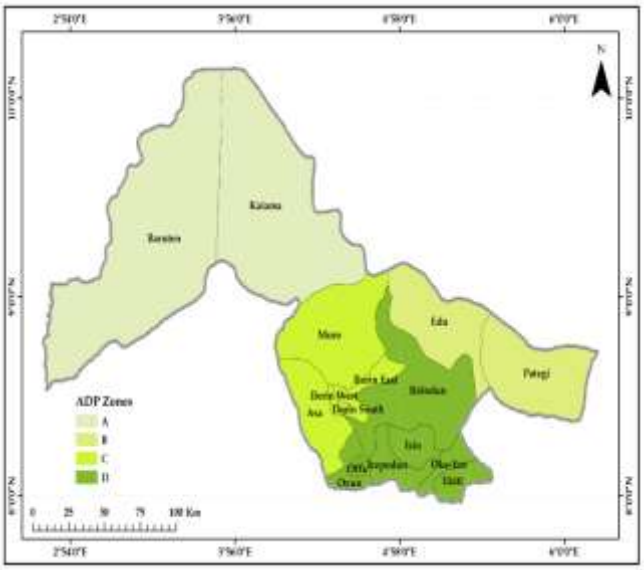

Figure 2: Map of the Study Area Showing KWADP Zoning
Source: Generated by Author from ArcGIS 10.5 (2024)

stage uses progressively smaller groups (units) to draw a sample from a vast population. To gather information from a sizable, widely distributed population, this is commonly employed in national surveys (Bhandari, 2023).

Kwara State is the study area with four Agricultural Zones (KWADP, 2010). Stratified sampling was used to select one local government from each of the agricultural zones: a total of four (4) local government areas were selected from the sixteen (16) local government areas in the research area - thereafter Kaiama was selected for derived savanna zone. Thus, Patigi for flood plain zone, Asa for Guinean savanna zone, and Oyun for rainforest zone. The second stage was selecting four (4) communities from each local Government area representing each zone through simple random sampling of balloting (Table 3.1). The third stage was selecting respondents from the various communities selected for the study.

The sample size was calculated using www.survey.com's free sample size calculator. The study made sure that the local populations were sufficiently covered, and this computerized sample calculator offers a straightforward way to determine the number of participants for research purposes. The population sizes were 6753, 13704, 12902, and 5385, respectively, and the sample size calculator produced a margin of error of (confidence interval) = 5% (often a frequent

choice) and a confidence level of 95% (other common choices are 90% or 99%).

This was a total projected farmer's population of farmers in each LGAs from 2010 to 2021 from Department of Planning, Monitoring and Evaluation, Kwara State Agricultural development Project, Ilorin (Table 3.1 and Table 3.2). For the study, 364 respondents from zone A, 374 for zone B, 373 for zone C, and 359 for zone D were chosen for questionnaire administration, making it a total of 1470.

The study's target respondents were males and females aged 18 and above. FGDs were also held at each of the sampled sites. To ensure gender representation, one FGDs in each site were assigned to a female group out of the three carried out per site. In each community, key informant interviews (KII) were also conducted. The major stakeholders, including traditional rulers, village head, title holders, learned and elderly people, were the target respondent.

Table 1: Farmers Population by selected Local Government Area (2010-2021)

LGA	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Kaiama	5121	5274	5406	5541	5679	5822	5922	6117	6270	6428	6588	6753
Patigi	10448	10709	10977	11247	11530	11818	12113	12416	12726	13044	13369	13704
Asa	9829	10704	10327	10585	10850	11121	11399	11977	11977	12277	12587	12902
Oyun	4101	4204	4309	4417	4527	4640	4755	4875	4998	5123	5251	5384

Source: Planning, Monitoring and Evaluation Department, Kwara State Agricultural Development Project, Ilorin, (2022)

Simple percentage charts, graphs, and means were among the descriptive statistics used to examine data on the socioeconomic traits of smallholder farmers and their comprehension of the consequences of climate change in the research area. In the age of big data, descriptive statistics are fundamental ideas in statistical analysis that are valuable and significant. The efficacy and value of descriptive statistical methods cannot be understated, given the continuously growing volumes of data generated and disseminated online (Lee, 2020).

FINDINGS

Awareness, Knowledge and perception of Climate Change among Smallholder Farmers

The awareness, knowledge and perception of respondents towards climate change variables and indicators in various agricultural zones of the study area were depicted. This feat was achieved through perceptions analysis of respondents' notion, understanding and awareness measured through observation of changes in their environment that are attributable to changes in climate conditions. In this study, knowledge of climate change, effect of climate change, extreme weather events that were experienced by the respondents, awareness programme to increase level of knowledge of farmers concerning climate change and effects of the changes were analyzed and discussed.

The study revealed the distribution of respondents' awareness and knowledge of what climate change means to them in the four agricultural zones (Table 2). It was revealed from the analysis that most of the respondents considered "crop failure" which accounted for 82.3% agreement level as the most recognized community-based climate change indicator. The larger number of the respondents that reported the crop failure is from the savanna derived zone that happens to be the major farming communities that produce yam in Kwara State. It was further revealed from the analysis that "high wind and heat waves" which accounted for 44.7% agreement level and "increased incidence of drought" which accounted for 46.0% agreement level as the second most experienced community-based climate change indicators. These two most mentioned indicators were recorded mostly in the guinea savanna and rainforest agricultural zones of the study area. Trailing behind this revelation is "excessive rainfall" increase in both human pollution and human population too was revealed in the derived savanna zone of the study area. The fertile land in this zone has been attracting people

Table 2: Awareness and Knowledge of Climate Change and Community Based Indicators

Impact of Climate Change	Guinea Savanah	Rain forest	Floodplain	Derived Savannah	Frequency	Percentage (%)
Decline in Fish Production	7(0.6)	7 (0.6)	20 (1.7)	19(1.6)	53	4.6
High Wind and Heat Waves	205(-17.6)	240(-20.7)	61 (5.3)	12(1.0)	518	44.7
Increased Incidence of Drought	131(-11.3)	244(-21.0)	74 (6.4)	85(7.3)	534	46
Crop Failure	255(-22.0)	282(-24.3)	88 (7.6)	330(-28.4)	955	82.3
Excessive Rainfall	101(-8.7)	44(3.8)	56 (4.8)	291(-25.1)	492	42.4
Human Pollution	12(1.0)	9 (0.8%)	3 (0.3)	125(-10.8)	149	12.8
Increased Population	64(5.5)	80 (6.9%)	1 (0.1)	152(-13.1)	297	25.6

Source: Author's Compilation (2024)

to engage in farming activities even without the use of fertilizers or chemicals. The least recognized notion of climate change indicators in the studied communities is found to be decline in fish production which was found to be 4.6% and occurred mostly in the floodplain zone of the study area.

Various stakeholders in the study area were engaged, and several themes were discussed. These revealed the understanding of climate change in various communities in the study area. Guinea savanna had more responses than any other zones of interest. Derived savanna and floodplain zones responded more on the theme of changed in rainfall as it is either lack of rainfall or rainfall being too destructive as there are several evidence of such during study.

The theme Change in Rainfall was discussed in the four agricultural zones, and their responses were stated as follows. Guinea savanna zone "…Rainfall break during farming period "…no rain and it's affecting our yam cultivation and maize; bush fowl eat our maize and guinea corn" "…and rainfall period is increasing…"

Derived savanna zone "…changes in raining season period…" "The last decade rain has reduced and not falling as at when due…" "…pattern of rain had changed over the past decades…" "…rainfall period had changed from 5-6 months…" "We are aware, we take note of the raining month …We are aware that there are crops that require too much water and not too much water.

Flood plain zone, the Emir and other major stakeholders confirmed that there has been too much rain in the past 10 year which has led to flooding…" "Three years-experience, heavy downpours, flooding of almost all the 104 communities that reside on the riverbanks…"

"Rainfall has reduced, late rainfall too" "rainfall is below average, and we are aware of it in our local dimension…" rainfall not regular and fluctuating "… and raining season and it changes too with daily weather condition"

In the rainforest zone, we are aware of the change as raining season has changed, we get rain early than before. We cannot forecast weather again recent changes like few years back, rain before march April but now we can't predict because it can come may or later, rain is not predictable again. We can't predict the rain again like before mostly for our crops like cassava yam maize… There are changes especially the rainfall has reduced drastically…

On the theme of pattern of rainfall and temperature: Change in Rainfall pattern. The study area was thoroughly assessed for the information, and the following were revealed. In the guinea savanna zone, temperature has increased, and rainfall has also increased. Rain is not constant again and we don't have enough water, and we suffer more during the dry season.

Rain is not falling as at when due, late rainfall. In the derived savanna zone, Increase in rainfall…

The trend of rainfall has been fluctuating over the decades because sometimes we have high rainfall and sometimes low rainfall; rain also comes early too. Rainfall has been reducing and fluctuating and… Last year's rainfall reduced; this year it's too much so we can say it fluctuated. Decrease rainfall and… Rainfall has changed (we feel heat before and rain starts but now rain fall at any time without prediction. Rainfall starts May-June before but now it has changes… The flood plain also recorded that they experience late rainfall now and when it rains it little compared to what we want. Sometimes we experience rain in the community but no rain on the farmland. …both rainfall and temperature are not regular. …both variables are fluctuating not regular, rainfall comes late and heavy when eventually falls. These variables are fluctuating. The rainforest zone revealed that rainfall is late, and it eventually becomes too heavy in the last few years, rainfall and temperature pattern has changed. Inadequate rainfall has not been regular. We have late rainfall, but it comes early this year and excess rainfall is reducing.

Effects of Climate Change in the Study Area

There are several effects of climate change in the study area identified by the respondents but the ones that stand out the most was the increased level of drought across the four agricultural zones. Table 4.8 below showed the respondents on the overall level of effects of climate change in their respective communities. It was revealed from the analysis that 68.2% of the respondents (793 out of 1162 respondents) agreed that drought is the main effect of climate change in their community, most especially at the guinea savanna zone of the study area. It was further revealed that 54% of the respondents (628 out of 1162 respondents) agreed that "Rising Temperature" is the second most recognized effect of climate change, this was also recorded more in the guinea savanna zone. 26.9% of the respondents agreed that "Increasing intensity and frequency of extreme weather events" is one of the main effects of climate change in their community. The least recognized effect of climate change in the studied communities are "Sea Level Rise" and "Melting Glaciers" which accounted for 1.2% and 1.1% respectively. Flooding as an effect of climate change in the studied community accounted for approximately 11.6% agreement level which mostly occurred at the floodplain and derived savanna zone. A community in the floodplain zone complains of crocodile invasion most of their flooded farmland and this increase the risk of death or serious injury from the animal attack. While Coastal Erosion and Desertification each accounted for 17.2% agreement level in the studied communities. Large frequency of desertification was also recorded mostly in the rainforest zone. Plates 1, 2, 3, 4, 5, and 6 show some major effects of climate change in the study area.

Key informant interviews were carried out on the theme of effects of climate change in the study area. Most stakeholders interviewed agreed that there are increased crop failures or low crop yield in the rainforest zone. Increased drought, increased flooding and erosion was raised and agreed upon in the derived savanna zone. The effects of climate change have also increased banditry and extortion in the derived savanna zone. There have been issues concerning the death of farmers and death of livestock and the cost of labor on farm to has increased in the derived savanna zone. The flood plain zone agreed that they have started using improved seedlings and the chemicals now being used are expensive and some are even fake sometimes. However, various stakeholders in the study area were engaged and several themes were discussed during focus group discussion (FGD) and key informant interview (KII). The understanding of climate change in various communities in the study area and the effect of climate change was revealed. During FGD, all participants agreed that there has been changes in rainfall pattern and increase in temperature in the derived savanna zone which has also led to low crop yield including decrease in the shear butter production the zone. Increase in drought was recorded in both derived savanna and guinea savanna zones. Destructive wind is of great concern in the guinea savanna zone as it was recorded and seen to have removed several roofs in the communities. Pest invasion was recorded in three zones understudy including, guinea savanna, derived savanna and floodplain zones. There are various indicators of climate change discussed and agreed upon by participants at various zones during the study which includes, low crop yield in the derived and guinea savanna zones.

Table 3: Effect of Climate Change in Community

Effect of Climate Change	Guinea Savanah (%)	Rainforest (%)	Floodplain (%)	Derived Savanah (%)	Frequency	Percentage (%)
Sea level rise	6(42.9)	5(35.7)	0	3(21.4)	14	1.2
Drought	260(32.8)	291(36.7)	141(17.8)	101(12.7)	793	68.2
Flooding	22(16.3)	10(7.4)	52(38.5)	51(37.7)	135	11.6
Coastal Erosion	13(6.5)	37(18.5)	1(1)	149(74.5)	200	17.2
Rising Temperature	223(35.5)	213(33.9)	66(10.5)	126(20.0)	628	54
Melting Glaciers	-	3(23.0)	0(0)	10(77)	13	1.1
Desertification	62(31)	113(56.5)	7(3.5)	18(9)	200	17.2
Increasing intensity and frequency of extreme weather events	21(6.7)	12(3.8)	69(22)	211(67.4)	313	26.9
None	7(63.6)	0	0	4(36.4)	11	0.9
Other	4(80)	0	0	1(20)	5	0.4

Source: Author's Compilation (2024) ***Note:*** *figures in parentheses are percentages*

Plate 1: Flooded Guinea-corn Coaster Farmland in Kanikoko (Derived Savanna Zone)
Source: Author's Compilation (2024)

Plate 3: Flooded Soyabeans Farmland at Gwaria (Derived Savanna Zone)
Source: Author's Compilation (2024)

Plate 2: Flooded and Collapse Bridge at Kanikoko (Derived Savanna Zone)
Source: Author's Compilation (2024)

Plate 4: Flooded Terrain in Patigi (Floodplain Zone)
Source: Author's Compilation (2024)

Plate 5: Coast of river Niger at Patigi (Floodplain zone)
Source: Author's Compilation (2024)

Plate 6: Rice farmland on a flood terrain at Patigi (Floodplain zone)
Source: Author's Compilation (2024)

There was a high temperature, a longer dry season, and a reduced dew point recorded in the derived savanna zone of the study area. Most FGD participants in the derived savanna zone agreed on the presence of frequent cobwebs as a major indicator of climate change in their community. It was also agreed upon at the same zone that due to temperature rise, there has been easy melting of their shear butter, however, reducing the productivity rate.

The presence of earthworms in most of our water sources, wound on our foot from walking on marshy water and emergence of strange grasses are all major indicators revealed during discussion with FGD participants in the derived savanna zone. Farmers' poverty or even death was raised by the FGD participants of both guinea savanna and rainforest zone. Increased in cold weather period, late harvest season was revealed by the FGD participants of the floodplain zone. Late planting season was also raised by both participants of derived savanna and floodplain zones.

The perception of farmers about the change they have experienced in the past decades was also revealed during focus group discussion. It was agreed upon by all most participants of derived savanna and floodplain zone that there has been increased use of chemicals and changes in planting dates. Participants from derived savanna zone also raised the issue of increased use of machinery, tillage and stumping, changes in the types of crops being planted, exhaustion of virgin lands, and increased use of fertilizers. Many of the participants in floodplain zone agreed to have stopped making ridges for most of their crops and to have also abandoned most of their traditions on farming methods.

Climate Change Awareness Campaign

The presence of climate change awareness campaign in the study area was assessed also to get the understanding of climate change among smallholder farmers in the study area, and it was revealed from the analysis that 475 out of 1162 respondents accounting for 40.9% agreed that there has been climate change awareness campaign conducted in their community (table 4.9). 58.7% (682 out of 1162) of the respondents agreed that there have never been any climate change awareness campaigns in their community in the past. This implied that most of the respondents believed that there has not been any significant awareness campaign on climate change in their community in the past. This indicates that there is a low level of awareness on the context of climate change in the studied communities.

CONCLUSION AND RECOMMENDATION

The studied communities are dominated by smallholder farmers who live below the poverty line. Farming is majorly rainfed in the study area. The level of understanding of climate change among smallholder farmers in the study area is so high that they can also identify several effects of climate change in their various communities. They were able to identify several climate change indicators in the study area. Destructive wind, flood, and drought were significant effects of climate change identified by most respondents. Many respondents (58%) agreed that there is no significant climate change awareness in the study area. Radio was the main method of disseminating climate information in the study area.

Table 4: Climate Change Awareness Campaign

Responses	Guinea Savanah	Rainforest	Floodplain	Derived Savanah	Frequency	Percentage (%)
Yes	82(17.3)	42 (8.8)	89(18.7)	262(55.2)	475	40.9
No	233(34.1)	271(39.7)	61(8.9)	117(17.1)	682	58.7
Missing Values	2(40)	2(40)	1(20)	0	5	0.4
Total					1162	100

Source: Author's Compilation (2024)

It was concluded that Climate change often exacerbates ecosystem degradation, making it harder for the communities to adapt in the study area. Conservation efforts (such as economic diversification, green finance and empowerment, nature-based solutions, efficient resource allocation, institutional strengthening, warning systems, local capacity building and policy alignment) are necessary but face resources constraints.

Climate change awareness campaign should be carried out often in various indigenous languages in the study area because most smallholder farmers are not educated. Workshops should be conducted often for agricultural extension workers in the rural communities. Farmers should regulate the use of chemicals for farming to reduce the risks of crop failure and reduce soil infertility especially in the floodplain zone of the study area. Farmers should also promote community-based adaptation through emphasis on farm level adaptation. Cultural practices such as hand irrigation, making ridges, planting shading trees among others should be improved

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