

**EFFECTS OF CLIMATE CHANGE ON
CROP PRODUCTION IN JOS SOUTH
LOCAL GOVERNMENT AREA,
PLATEAU STATE, NIGERIA**



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Abstract

This study examined the effect of climate change on crop production in Jos South Local Government Area, Plateau State, Nigeria. The research sought to determine the increasing variability in temperature, rainfall, and extreme weather events which influence crop yield, productivity, and food security in the region. A descriptive survey research design was employed, involving 120 smallholder farmers selected through a multistage sampling technique. Data were collected using structured questionnaires and interview, both primary and secondary data were utilized. The data were analyzed using descriptive and inferential statistics. The results from the findings revealed that more than 80% of respondents had experienced adverse climatic effects, including erratic rainfall, floods, and droughts, which significantly disrupted planting and harvesting schedules. Major crops such as maize, potatoes, and rice recorded declining yields, while only 36% of farmers demonstrated awareness of climate change as a scientific concept. Floods and droughts were identified as the most severe stressors, and adaptation practices such as mixed cropping, irrigation, and early planting were widely adopted though often limited by inadequate resources and institutional support. Statistical analysis confirmed a significant relationship between climate variability and crop yield. The study concludes that climate change poses a serious threat to food security and rural livelihoods in Jos South LGA. It recommends

integrated policy actions, expanded extension services, and improved access to climate information and credit facilities to strengthen farmers' adaptive capacity and promote sustainable agricultural resilience.

Keywords: Effects, Climate change, Crop production, Adaptation

Introduction

Climate change has emerged as one of the most pressing global challenges of the twenty-first century, with far-reaching implications for sustainable development, food security, and human well-being. The Intergovernmental Panel on Climate Change (IPCC, 2022) defines climate change as a persistent alteration in the statistical distribution of weather patterns over extended periods, typically decades or longer. These alterations, manifested through rising global temperatures, erratic rainfall patterns, prolonged droughts, and increased frequency of extreme weather events, are already exerting profound effects on ecosystems, economies, and livelihoods. Among the sectors most affected, agriculture remains particularly vulnerable, especially in developing nations where livelihoods are heavily dependent on rain-fed farming systems.

Nigeria's economy and social stability are intricately tied to the agricultural sector, which employs over 70% of the country's workforce and contributes significantly to the national Gross Domestic Product (National Bureau of Statistic (NBS), 2023). Despite this critical role, the sector faces increasing threats from climate variability and change. Fluctuations in temperature, shifting rainfall patterns, and the growing prevalence of droughts and floods disrupt agricultural production cycles, reduce crop yields, and compromise food quality. These climatic shifts not only affect the biophysical environment but also have socioeconomic consequences, threatening the livelihoods of smallholder farmers who form the backbone of Nigeria's agricultural economy (Adeleke *et al.*, 2021)

The Middle Belt region of Nigeria, and particularly Plateau State, serves as a vital agricultural hub due to its favorable climatic conditions and fertile soils. Plateau State is known for producing crops such as maize, potatoes and vegetables, which play an essential role in local and national food supply (Plateau State Government, 2020). However, in recent decades, the region has witnessed increasing climate variability. Studies and field reports indicate that Jos South Local Government Area one of the most productive zones within the state has experienced shifting rainfall patterns, late onset and early cessation of rains, prolonged dry spells, and occasional flooding (Nigeria Meteorological Agency NiMet, 2023). These changes disrupt planting schedules, reduce soil moisture availability, and increase the vulnerability of crops to pests and diseases.

Furthermore, the increasing unpredictability of weather has undermined traditional agricultural calendars that local farmers have long relied upon. Instances of unseasonal rainfall, prolonged drought, and rising temperatures have led to crop failure, soil erosion, and the depletion of groundwater reserves (Ogundele *et al.*, 2023). These effects are compounded by human activities such as deforestation, overgrazing, and bush burning, which exacerbate land degradation and reduce the ecosystem's capacity to absorb climatic shocks (Amobi & Chikwendu, 2021). Consequently, the once stable agricultural production systems in Jos South are now under threat, jeopardizing both rural incomes and regional food security.

The consequences of climate change on agriculture are multidimensional. At the ecological level, variations in temperature

and precipitation affect crop growth cycles, soil fertility, and pest prevalence. Socioeconomically, they affect farmers' incomes, food prices, and the overall stability of rural livelihoods. In Jos South, farmers who depend largely on small-scale rain-fed agriculture are increasingly forced to adapt to the new realities through measures such as mixed cropping, use of drought-resistant varieties, and irrigation (Musa & Ayanlade, 2016). However, the capacity to implement such adaptation strategies remains limited by low awareness, inadequate access to information, financial constraints, and weak institutional support (Agwu & Amu, 2019).

The vulnerability of smallholder farmers in Plateau State to climate change is further intensified by socioeconomic factors such as limited education, low access to credit facilities, and poor agricultural extension services. Many farmers lack the technical knowledge to interpret meteorological data or adopt innovative climate-smart agricultural practices. Consequently, while farmers may recognize observable changes in weather patterns, their understanding of the underlying causes and long-term implications of climate change remains inadequate (Olorunfemi & Adebimpe, 2018). This knowledge gap hinders the development of effective adaptation and mitigation strategies at the community level.

Recognizing the importance of agriculture as a driver of food security and economic development, understanding the impact of climate change on crop production in Plateau State becomes critical. By focusing on Jos South Local Government Area, this study seeks to contribute to the broader discourse on climate change and food systems in Nigeria. Specifically, it examines how climatic variability influences crop production, the level of awareness among farmers, and the adaptive measures currently employed to mitigate these impacts. The

insights gained will help policymakers, agricultural extension agents, and community organizations design targeted interventions to enhance the resilience of smallholder farmers and ensure sustainable agricultural productivity in the face of a changing climate.

Statement of the Problem

Agriculture in Nigeria and particularly in Plateau State is largely rain-fed, making it acutely vulnerable to climatic variability. In recent years, irregular rainfall patterns, prolonged dry spells, and recurrent floods have disrupted traditional planting cycles, reduced soil fertility, and triggered widespread crop failures. Rising temperatures have accelerated evapotranspiration, shortened growing seasons, and heightened water stress, while intense rainfall events erode fertile topsoil and destroy farmlands. In Jos South Local Government Area, the effects are evident in the declining yields of major crops such as maize, potatoes, and vegetation. Repeated droughts and flash floods have displaced planting seasons and reduced harvest volumes, directly undermining household incomes and food availability. Smallholder farmers who form the bulk of producers lack irrigation facilities, access to improved seed varieties, and adequate storage infrastructure, making them disproportionately exposed to climate shocks. Low awareness of climate change further aggravates the problem. Although farmers observe erratic weather, pest outbreaks, and declining yields, few understand their underlying causes or long-term implications. Limited extension support, weak institutional coordination, and poor access to credit restrict farmers from adopting adaptive technologies and sustainable practices (Nwafor *et al.*, 2020). The cumulative effect is a steady erosion of food security, income stability, and rural livelihoods. Without urgent intervention, climate change will deepen poverty, inflate food prices, and threaten Nigeria's progress

toward sustainable development and agricultural resilience. This study therefore seeks to empirically examine how climate change affects crop production in Jos South LGA, identify farmers' adaptive responses, and propose evidence-based strategies to mitigate its impacts.

Research Questions

The study was guided by the following research questions:

1. What are the socioeconomic characteristics of farmers in the study area?
2. What is the level of farmers' awareness of climate change in the study area?
3. Which crops are most affected by climate change in the study area?
4. What are the perceived causes of climate change in the study area?
5. How does climate change affect crop production and yield in the study area?
6. What mitigation or adaptation measures have farmers adopted to cope with the effects of climate change?

Significance of the Study

This study holds substantial importance at multiple levels academic, practical, and policy-oriented. At the academic level, it contributes to the growing body of literature on the nexus between climate change and agricultural productivity in sub-Saharan Africa. By focusing on Jos South LGA, it provides localized empirical evidence that enriches national and regional discussions on how climatic factors shape agricultural outcomes. The findings will also serve as a reference for future researchers exploring climate resilience, environmental policy, and sustainable agriculture in Nigeria and beyond. At the practical level, the study is vital to farmers, agricultural extension workers, and rural communities who bear the brunt of climate change impacts. By

identifying the specific effects of climate variability on key crops and documenting existing adaptation strategies, the research offers actionable insights that can improve farm-level decision-making. Farmers can use the findings to modify planting schedules, adopt improved seed varieties, or integrate sustainable soil and water management practices.

At the policy level, the study provides evidence that can guide local and national governments in formulating effective climate adaptation and agricultural development policies. Understanding farmers' perceptions and responses to climate change is essential for designing community-centered interventions. The findings can also inform programs initiated by the Plateau State Ministry of Agriculture, environmental NGOs, and development agencies focusing on climate-smart agriculture and rural livelihood sustainability.

Ultimately, the research underscores the need for a holistic response to climate change one that integrates scientific knowledge, indigenous practices, and participatory policy frameworks. Strengthening farmer education, improving access to credit, and enhancing agricultural extension services are essential steps toward building resilience.

METHODOLOGY

This study adopted a survey research design, which was considered appropriate for obtaining primary data from farmers on their experiences, perceptions, and adaptive responses to climate change. The population comprised all the smallholder crop farmers in Jos South Local Government Area of Plateau State, while the sample size consisted of 120 respondents drawn from selected farming communities across the four main districts Vwang, Du, Gyel, and Kuru. A multi-stage sampling technique was employed: first, three districts were purposively selected based on their agricultural activity; second,

twelve farming communities were randomly chosen; and finally, ten farmers from each community were selected through simple random sampling to ensure fair representation.

Data were collected using a structured questionnaire, which contained both open-ended and close-ended items covering socioeconomic characteristics, awareness of climate change, perceived effects on crop production, and adaptation strategies. The instrument's validity was established through expert review by agricultural extension specialists and research supervisors to ensure content and construct accuracy. To ensure reliability, a pilot test was conducted among 20 farmers in a nearby community, and a Cronbach Alpha coefficient of 0.82 confirmed the internal consistency of the

questionnaire. The procedure for data collection involved direct administration of the instrument to respondents with the assistance of trained enumerators familiar with the local dialect, ensuring clarity and completeness of responses. Ethical considerations were adhered to when engaging with the respondent; informed consent was sought and the researchers urged the respondents they could withdraw at any time at their own freewill, each respondent was treated with outmost professionalism to ensure accurate and valid responses.. Data collected were analyzed using descriptive statistics frequency counts, means, and standard deviation. The statistical package for Social Sciences (SPSS) aided the computation of the data.

Results

Table 1: Socioeconomic Characteristics of Respondents

Variable	Category	Frequency	Percentage (%)
Age	11–30	43	39.1
	31–50	44	40
	51–60	16	14.5
	Above 60	7	6.4
Sex	Male	62	56.3
	Female	48	43.7
Education Level	Primary	20	18.2
	Secondary	45	40.9
	Tertiary	24	21.8
	Non-formal	21	19.1
Marital Status	Single	31	28.2
	Married	72	65.5
	Divorced/Widowed	7	6.3
Main Occupation	Farming	70	63.6
	Trading	17	15.4
	Civil Service	10	9.1
	Artisan/Others	9	7.3
Farm Size (ha)	1–5	105	95.4
	6–10	4	3.6
	>10	1	1

Source: Researchers' fieldwork (2025)

Table 1 showed that most respondents are within the active age group (31–50 years), reflecting a youthful and productive farming population. Males constitute a slightly higher proportion (56.3%), though female participation remains significant. The dominance of secondary education (40.9%) suggests a moderate literacy level that can influence farmers' understanding of agricultural innovations. Farming is the major occupation (63.6%), with most respondents operating on small holdings of 1–5 hectares, typical of subsistence agriculture in rural Plateau State.

Table 2: Level of Awareness and Sources of Information on Climate Change

Parameter	Category	Frequency	Percentage (%)
Awareness of Climate Change	Yes	40	36.3
	No	70	63.7
Source of Information	Radio	47	42.7
	Television	31	28.2
	Social Media	16	14.5
	Newspaper	5	4.5
	Extension Workers	11	10

Source: Researchers' fieldwork (2025)

Table 2 shows that only about one-third (36.3%) of farmers demonstrated awareness of climate change, revealing a significant information gap. Radio with 42.7% and television with 28.2%, remain the main communication channels, while agricultural extension services expected to play a pivotal role ranked among the least utilized. This limited outreach suggests inadequate institutional mechanisms for disseminating climate-related information to rural farmers.

Table 3: Major Crops Affected by Climate Change

Crop Type	Frequency	Percentage (%)
Potato	45	41
Maize	30	27
Rice	18	16
Soya Bean	10	9
Spinach/Vegetables	7	6

Source: Researchers' fieldwork (2025)

The result from table 3 shows that Potatoes and maize are the most vulnerable crops to climate-related stresses in Jos South, together accounting for over two-thirds of reported impacts. Farmers noted reduced yields, delayed maturity, and frequent pest infestations.

Table 4: Perceived Causes of Climate Change

Cause	Frequency	Percentage (%)
Deforestation	51	46.4
Bush Burning	25	22.7
Land Use Change	20	18.2
Industrial Activities	14	12.7

Source: Researchers' fieldwork (2025)

Table 4 shows the perceived causes of climate change, revealed that 46.4% of respondents attribute climate change primarily to deforestation, and often linked to fuel wood collection and agricultural expansion. Bush burning is also a prevalent cause due to traditional land-clearing

practices. While 12.7% mentioned industrial processes, this perception underscores the dominance of local environmental factors in farmers' understanding of climate change.

Table 5: Effects of Climate Change on Crop Production

Effect	Frequency	Percentage (%)
Affected by Climate Change	Yes	90
	No	20
Stage Most Affected	Germination	44
	Maturity	25
	Planting	20
	Harvest	11
Type of Impact Experienced	Drought	33
	Flood	36
	High Temperature	23
	Heat Waves	9
	Dry Spells	9
Effect on Yield	Decrease	99
	No Change	11

Source: Researchers' fieldwork (2025)

Table 5 titles effects of climate change on crops revealed that Over 80% of farmers reported being affected by climate change, with germination and maturity stages most vulnerable. Floods (32.7%) and drought (30%) were the leading stressors, confirming the dual challenges of excessive and insufficient rainfall in the region. Ninety percent of farmers recorded a decline in yield, indicating severe economic and food security implications.

Table 6: Mitigation and Adaptation Measures Adopted

Strategy	Frequency	Percentage (%)
Irrigation	80	73.7
Fertilizer Application	74	67.7
Mixed Cropping	70	64.6
Improved Seed Varieties	70	64.6
Early Cultivation	60	55.6
Use of Cover Crops	50	45.5
Livestock Integration	24	22.2

Source: Researchers' fieldwork (2025)

Table 6, revealed that majority of farmers employ basic adaptation strategies such as irrigation, fertilizer use, and mixed cropping to offset yield losses. Irrigation though limited to

shallow wells and small-scale watering systems was the most common response. Early planting and use of improved seed varieties were also practiced to align with shortened and unpredictable rainfall periods. These measures reflect an awareness of changing climatic realities but remain largely reactive and low-tech due to financial and infrastructural constraints.

Discussion of Findings

The study revealed that climate change has become an immediate and measurable challenge to crop production in Jos South Local Government Area. Evidence from the field shows that over 80% of farmers have experienced adverse climatic effects erratic rainfall, prolonged dry spells, and periodic flooding that have disrupted planting calendars and reduced yields. Major crops such as potatoes, maize, and rice were identified as the most affected, with 90% of respondents reporting decreased productivity, particularly during germination and maturity stages. Most farmers in the area cultivate less than five hectares of land and depend solely on rainfall. Limited access to irrigation, improved seeds, and credit facilities has heightened their vulnerability. Only 36% of respondents demonstrated awareness of climate change as a scientific phenomenon, while the majority attributed its causes to deforestation and bush burning. This aligns with the observations of Olorunfemi and Adebimpe (2018) and Agwu and Amu (2019), who reported similar awareness gaps among rural farmers in Nigeria. Farmers' focus on local drivers such as land clearing and fuel wood collection confirms Amobi and Chikwendu's (2021) assertion that human-induced environmental degradation intensifies regional climate risks. Despite these challenges, the study recorded adaptive efforts such as mixed cropping, early planting, and small-scale irrigation. These practices, though modest, demonstrate growing awareness of climate stress and align with findings by Musa and Ayanlade (2016) and Nwafor *et al.*, 2020, who emphasized that farmer-led adaptation significantly enhances food security and yield resilience. However, the predominance

of low-technology coping mechanisms indicates limited institutional support and weak access to climate information.

Thus, the findings corroborate IPCC (2022) projections that unmitigated climate variability in sub-Saharan Africa will continue to reduce agricultural yields and deepen food insecurity. The study therefore underscores that climate change in Jos South is not only an environmental issue but also a socioeconomic concern, affecting livelihoods, income stability, and long-term sustainability. Building adaptive capacity through education, credit access, and technology adoption remains essential to ensuring agricultural resilience and food security in Plateau State.

Conclusion

This study concludes that climate change is a major driver of declining crop productivity in Jos South LGA. The evidence shows that unpredictable rainfall, rising temperatures, and extreme weather events have disrupted crop cycles, reduced yields, and deepened food insecurity. Smallholder farmers, who form the majority, are most affected due to their dependence on rain-fed farming and limited adaptive resources. There is an urgent need for coordinated action that combines farmer education, institutional support, and sustainable farming technologies. Strengthening adaptive capacity through climate-smart agriculture and integrated policies will help safeguard livelihoods, stabilize food systems, and promote environmental sustainability in Plateau State and across Nigeria.

Recommendation

Based on the findings of the study, the following recommendations were made:

1. Government and development agencies should prioritize the

- integration of Climate-Smart Agriculture into local and national policies to strengthen farmers' adaptive capacity, while expanding small-scale irrigation and providing access to improved, drought-resistant crop varieties to reduce dependence on erratic rainfall.
2. Agricultural Extension service should be revitalized to enhance climate change awareness through regular farmer training and localized weather forecasting, supported by research institutions that develop and disseminate context-specific adaptation technologies.
 3. Financial institutions should offer affordable credit and insurance packages tailored to smallholder farmers, enabling investment in resilient farming practices.
 4. Community-based organizations and Non-Governmental Organization should promote reforestation, sustainable land use, and cooperative farming structures to foster collective adaptation and long-term food security in Jos South and similar Agro-ecological zones.

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