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The Impact of Climate Change on Agricultural Development and Farming Activities in Obudu Local Government Area of Cross River State, Nigeria

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Abstract

Climate change is a major environmental challenge affecting agricultural production and rural livelihoods. This paper examines the impact of climate change on agricultural development and farming activities in Obudu Local Government Area of Cross River State, Nigeria. The study adopted a descriptive research approach based on a review and thematic analysis of relevant literature and empirical studies on climate change and agriculture, with particular attention to Obudu and other parts of Cross River State. The findings revealed that changing rainfall patterns, rising temperatures, prolonged dry spells, excessive rainfall, flooding, soil erosion and pest infestation pose significant challenges to agricultural production. These conditions affect crop growth and yield, planting and harvesting periods, soil fertility, farmers' income and food security. Evidence from studies conducted in Obudu and other parts of Cross River State further indicated that farmers employ various adaptation strategies, including crop diversification, improved crop varieties, adjustment of planting dates, cultivation of early-maturing crops, mixed cropping, mulching, tree planting, soil conservation and off-farm employment. However, inadequate access to agricultural credit, high input costs, limited extension services, insufficient irrigation facilities and poor access to climate information constrain effective adaptation. Based on these findings, the paper recommends strengthening agricultural extension services, improving farmers' access to reliable weather information and affordable credit, promoting climate-smart agricultural practices, developing irrigation facilities and making improved, climate-resilient crop varieties available to farmers. The paper concludes that effective adaptation to climate change requires coordinated government support and improved access to agricultural resources to enhance productivity, protect farmers' livelihoods and strengthen food security in Obudu Local Government Area.

Keywords: *Climate change, agricultural development, farming activities, agricultural productivity, adaptation strategies and farmers.*

Introduction

Agriculture remains one of the most important sectors of the Nigerian economy because it provides food, employment, income and raw materials for industries. It also supports the livelihoods of millions of rural households. In communities where farming is the major economic activity, any factor that affects agricultural production can have serious consequences for household welfare and local economic development. Climate is one of the most important environmental factors influencing agricultural production because crop growth, livestock production, soil moisture and farm operations are closely connected to rainfall and temperature.

Climate change refers to long-term changes in the average conditions of the atmosphere, including changes in temperature, rainfall and the frequency or intensity of extreme weather events. Although climate has always varied naturally, human activities such as deforestation, burning of fossil fuels, land degradation and other activities

that increase greenhouse gas concentrations have accelerated current climate change. Its consequences are increasingly being experienced through changes in rainfall patterns, increasing temperatures, droughts, flooding and other environmental stresses.

Agriculture is highly sensitive to these changes. Farmers depend on predictable weather conditions to determine when to clear land, plant crops, apply fertilizer, control weeds and pests, and harvest their produce. When rainfall becomes unpredictable or temperatures increase beyond normal levels, farmers may experience poor germination, crop failure, reduced yields and increased production costs. Climate change can therefore affect not only individual farms but also food availability, household income and agricultural development.

The problem is particularly important in developing countries such as Nigeria, where many farmers depend on small-scale, rain-fed agriculture. The vulnerability of smallholder farmers is increased by limited access to irrigation, agricultural credit, improved planting materials, extension services, weather information and modern technologies. A recent study of arable crop farmers in Cross River State found that farmers use various adaptation measures, including crop diversification, improved crop cultivars, land fragmentation, off-farm employment and early-maturing crops.

Obudu Local Government Area is located in the northern part of Cross River State and has a strong agricultural base. Farming activities in the area include the cultivation of crops such as yam, cassava, maize, vegetables, rice and other food and cash crops. Agricultural activities provide food and income for many households and contribute to the local economy. Consequently, changes in environmental conditions have direct implications for the welfare of farming households.

Climate change is already receiving attention in research conducted around Obudu. A 2025 study covering Bekwarra, Obudu and Obanliku Local Government Areas examined the impact of climate change on food production and identified rising temperatures, erratic rainfall, drought, flooding, soil degradation and pest infestation as important agricultural concerns. The study also highlighted climate-smart agriculture, improved irrigation and policy interventions as important responses.

Research has also directly examined climate change and crop production in Obudu. Ugbe et al. (2025), for instance, investigated the effect of climate change on the growth and yield of tomato cultivars in Obudu. Their study demonstrates the importance of examining climate-related effects at the local level because crops may respond differently to changing environmental conditions.

The effect of climate change on agriculture is not limited to crop yield. It can influence the entire farming process. Changes in rainfall can affect land preparation and planting dates, while excessive rainfall may cause erosion, flooding and nutrient loss. High temperatures may increase evaporation and reduce soil moisture. Climate variability may also create conditions favourable to certain pests and diseases. These effects can increase farmers' expenditure while reducing the quantity and quality of agricultural produce.

In addition, climate change can affect agricultural development by discouraging investment in farming. When farmers are uncertain about the weather and expected yields, they may be reluctant to invest in improved inputs and technologies. Reduced agricultural productivity can consequently lead to higher food prices, reduced household income and increased food insecurity (Intergovernmental Panel on Climate Change [IPCC], 2022).

Farmers, however, are not completely helpless in the face of climate change. They have developed various indigenous and modern adaptation strategies. These include changing planting dates, planting early-maturing varieties, cultivating different crops, mixed cropping, mulching, planting trees, conserving soil and water, using improved crop varieties and engaging in non-farm activities. Research among arable farmers in Cross River State found that crop diversification was adopted by 77.04% of respondents, while 69.50% adopted enhanced crop cultivars and 57.23% planted early-maturing crops.

Against this background, this paper examines the impact of climate change on agricultural development and farming activities in Obudu Local Government Area, Cross River State. The focus is on how changes in climatic conditions affect agricultural production, the challenges experienced by farmers and the strategies used to cope with these changes.

Methodology

The study adopted a descriptive research approach based on the review and synthesis of relevant literature and empirical studies on climate change and agriculture. The approach was considered appropriate because the purpose was to examine the effects of climate change on agricultural development and farming activities, with particular attention to Obudu Local Government Area of Cross River State.

Information was obtained from published journal articles, research reports, academic studies and other relevant scholarly materials relating to climate change, agricultural production and farmers' adaptation strategies. Particular attention was given to studies conducted in Obudu, northern Cross River State and other parts of Cross River State

because of their geographical and agricultural relevance to the study area.

The literature reviewed included studies on climate change and food production in Obudu and neighbouring Local Government Areas, climate-change adaptation among arable farmers in Cross River State, climate-smart agricultural practices and studies examining the effects of climate change on particular crops. For example, Ogar's 2025 study investigated climate change and food production in Bekwarra, Obudu and Obanliku, while Idiong et al. (2025) investigated climate-change adaptation strategies among arable crop farmers across Cross River State.

The information obtained from these sources was analysed thematically. The major themes considered were changes in climatic conditions, effects on crop production, effects on farming activities, implications for agricultural development, challenges experienced by farmers and adaptation strategies. Findings from the reviewed literature were compared and interpreted in relation to agricultural activities in Obudu Local Government Area.

The Results of Findings

Climate Change and Agricultural Production in Obudu

The findings from the reviewed literature indicate that climate change poses a significant challenge to agricultural production in Obudu Local Government Area. The major climatic factors affecting agricultural activities include changes in rainfall patterns and increasing temperatures. A recent study involving Obudu and neighbouring Local Government Areas found that climate change has implications for food production through erratic rainfall, increasing temperature, prolonged dry conditions, flooding, soil degradation and pest infestation. These conditions can make farming more uncertain and reduce farmers' ability to predict appropriate planting and harvesting periods.

Rainfall is particularly important because many farmers in the area depend on rain-fed agriculture. When rainfall begins later than expected, farmers may delay planting. Similarly, when rainfall stops earlier than expected, crops may experience water stress during important stages of growth. Excessive rainfall can also cause flooding, soil erosion and leaching of nutrients. Temperature is another important factor. Excessive temperature can increase evaporation and reduce soil moisture. It can also affect crop growth and development. Research conducted on tomato cultivars in Obudu specifically investigated climate change effects on crop growth and yield, demonstrating the relevance of temperature and other climatic conditions to crop production in the area.

Effect of Climate Change on Crop Yield

One of the major effects of climate change on farming activities is its potential to reduce crop yield. When crops receive inadequate or excessive water, or when temperatures become unsuitable for normal growth, their productivity can decline. Climate variability can affect germination, vegetative growth, flowering, fruit development and maturity. It may also increase the incidence of pests and diseases. Consequently, farmers may harvest less produce from the same amount of land.

The effect can be particularly serious for smallholder farmers who have limited financial resources to compensate for production losses. A reduction in crop yield can result in lower household income and reduced food availability. Research on yam production in Cross River State also found that increasing temperature had a negative impact on yam production and identified several adaptation measures used by farmers, including improved varieties, changing planting dates, tree planting. fertilizer use, reducing bush burning and crop diversification.

Effect on Farming Calendar and Farm Operations

Climate change affects the traditional farming calendar. Farmers traditionally rely on their knowledge of seasonal rainfall to determine when to plant and harvest. However, unpredictable rainfall makes it difficult to maintain established farming calendars. Changes in the beginning and ending of rainy seasons may force farmers to adjust their planting dates. This can increase labour costs because farmers may need to replant crops that fail due to insufficient rainfall. Unpredictable weather can also interfere with harvesting and post-harvest activities. Excessive rainfall during harvesting may damage crops and make drying and storage difficult.

Effect on Soil and Land Resources

Climate change can contribute to soil degradation through intense rainfall, flooding and erosion. Heavy rainfall can wash away fertile topsoil, while prolonged dry conditions can reduce soil moisture. Soil degradation reduces the productive capacity of farmland and may force farmers to apply more fertilizer or expand cultivated areas to maintain production. Research in Cross River State has identified soil conservation practices such as mulching, mixed cropping, cover crops and organic fertilizer use as adaptation measures available to farmers.

Effect on Farmers' Income and Livelihoods

Agriculture is an important source of income for farming households in Obudu. Therefore, a reduction in agricultural productivity can directly affect household income. When yields decline, farmers may have less produce to sell. At the same time, they may spend more money on fertilizer,

pesticides, improved seeds, labour and other inputs. This creates a situation in which production costs increase while returns from farming decrease. Farmers may consequently engage in alternative income-generating activities to support their households. In Cross River State, off-farm employment was identified as one of the adaptation strategies adopted by arable crop farmers.

Effect on Food Security

Climate change has important implications for food security because agricultural production determines the availability and affordability of many food crops. Reduced agricultural productivity may decrease the amount of food available to farming households and local markets. When local supply declines, food prices may increase, creating additional difficulties for households that depend on agriculture for both food and income. The study covering Bekwarra, Obudu and Obanliku identified climate change as a threat to food production and emphasized the need for climate-resilient farming practices and improved water management.

Farmers' Adaptation Strategies

The findings show that farmers employ different strategies to reduce the negative effects of climate change. These strategies include:

1. **Crop diversification:** Farmers cultivate different crops rather than depending on one crop.
2. **Use of improved varieties:** Improved and climate-resilient varieties can help farmers cope with changing environmental conditions.
3. **Changing planting dates:** Farmers adjust planting periods in response to changes in rainfall.
4. **Early-maturing crops:** Crops that mature within shorter periods can reduce exposure to prolonged dry periods.
5. **Mixed cropping:** Growing different crops together can reduce the risk of total crop failure.
6. **Mulching:** Mulching helps conserve soil moisture and reduce evaporation.
7. **Tree planting:** Trees can help protect soil and contribute to environmental sustainability.
8. **Soil and water conservation:** Conservation practices help reduce erosion and maintain soil productivity.
9. **Off-farm employment:** Farmers engage in other economic activities to supplement agricultural income.
10. **Use of climate information:** Weather and climate information can assist farmers in making better decisions about planting and other farm operations.

Recent evidence from Cross River State shows that crop diversification, improved cultivars, land fragmentation, off-farm employment and early-maturing crops are among the major adaptation strategies used by arable farmers.

Challenges to Climate Change Adaptation

Despite farmers' efforts to adapt, several factors limit their ability to respond effectively to climate change. These include inadequate access to agricultural credit, high cost of farm inputs, limited extension services, inadequate irrigation facilities, poor access to weather information and limited access to improved planting materials. A study of yam farmers in Cross River State identified lack of credit facilities as a major barrier to adaptation. Similarly, recent research on climate-smart agriculture in Cross River State emphasizes the importance of extension services, farmer training, finance and access to agricultural inputs (Angba, 2021; Idiku et al., 2026).

Conclusion

Climate change is an important challenge to agricultural development and farming activities in Obudu Local Government Area of Cross River State. The review indicates that changes in rainfall patterns, increasing temperatures, dry spells, excessive rainfall, soil degradation, pests and other climate-related factors can affect crop production and the general performance of agricultural activities. The consequences extend beyond crop yield. Climate change can affect the farming calendar, production costs, farmers' income, household livelihoods and food security. Since many farmers depend heavily on rain-fed agriculture, unpredictable climatic conditions can expose them to significant economic risks. However, farmers have demonstrated their ability to adapt through crop diversification, improved crop varieties, changes in planting dates, mixed cropping, mulching, tree planting, soil conservation and other strategies. Evidence from Cross River State confirms that farmers are already using several of these approaches. The challenge, therefore, is not simply to encourage farmers to adapt but to create an enabling environment that makes effective adaptation possible. Access to credit, improved seeds, agricultural extension services, climate information, irrigation, modern technologies and markets is essential.

Recommendations

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

1. Government should strengthen agricultural extension services in Obudu Local Government Area so that farmers can receive

practical information on climate change, improved production methods and adaptation strategies.

2. Farmers should be provided with reliable climate and weather information. Access to timely information about rainfall and temperature patterns will help farmers make better decisions concerning planting and harvesting.
3. Climate-smart agriculture should be promoted. Farmers should be trained in practices such as crop diversification, conservation agriculture, mulching, improved varieties, mixed cropping and efficient water management.
4. Government and financial institutions should improve farmers' access to affordable credit. Access to credit will enable farmers to purchase improved seeds, fertilizer, pesticides, farm equipment and other inputs.

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