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Farmers' Perceived Effects of Climate Change on Organic Maize Farming in Etche Local Government Area Rivers State

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Abstract

The study examined farmers' perceived effects of climate change on organic maize farming in Etche Local Government Area, Rivers State. A descriptive research design was employed for the study. A sample size of 110 respondents was selected through a multi-stage sampling procedure from the population of 184 registered organic maize farmers in Etche LGA. Data for the study were collected through a structured interview schedule and analysed using frequency, percentage and mean. Findings revealed that high temperatures have caused dyness of soil due to high temperature ($\bar{x}$= 3.39), excessive rainfall has caused waterlogging and maize crop damage ($\bar{x}$= 3.39), and diseases prevalence due to extreme weather conditions ($\bar{x}$ = 3.39). The study concluded that organic maize farmers in Etche LGA, Rivers State perceived the effects of climate change primarily through faster drying of the soil in farms, reduced maize germination rate, increased pest infestations on maize crops and heat stress leading to wilting of maize crops due to high temperature. It was recommended that agricultural extension officers should teach farmers the various adaptive strategies and climate-resilient practices to support organic farming in the study area.

Keywords: Climate Change, organic farming, adaptive strategies

Introduction

Agricultural performance is increasingly affected by the unassured interplay of the world's climatic variables. This situation has lead to poor yield in both quantity and quality of produce, especially in developing tropical regions (Adebayo & Olufemi, 2023; Eze et al., 2024; Barre & Osman, 2026) on organic maize farming (Okoro et al., 2023; Umeadi & Chukwu, 2025). In Nigeria, food production in recent times has suffered considerably from a number of issues, including those emanating from climate alterations such as average temperature increase, inconsistent pattern of rainfall and a number of occuring highest degree of weather possibilities (Njiru et al., 2026). Average temperature increase

describes the rise in the mean surface temperatures for a considerable long period of time, whereas inconsistent pattern of rainfall describes changes in the onset, duration and amount of water discharged from the atmosphere, highest degree of weather possibilities such as floods, storms, droughts and heatwave have increased in number of occurrence and amount due to the numerous human activities on nature (Omokaro, 2025).

These events do not only disrupt crop, livestock and fish development, but also poses danger to food security, the supply of agricultural commodities to other sectors, income generation, shelter and employment provision (Omokaro, 2025), because majority of farmers in the country are smallholders and engaged in rainfed systems of farming, where inconsistent and unfavorable climatic conditions have left farmers experiencing harvest losses and engaging in unplanned agronomic practices such as unprepared planting and harvesting seasons due to the sudden termination, and arrival of the rainy season, heavy winds, localized excessive rainfall and flooding, as well as prolonged dry seasons/delayed rainfall (Ifeanyi-obi et al., 2023). As an agricultural enterprise, organic maize farming also suffers from the aforementioned challenges (Yadav et al., 2021).

Organic maize farming is a system of maize production that makes use of ecological processes, biodiversity and soil health management practices, while avoiding the integration of synthetic chemicals (Raveloaritiana & Wanger, 2024). New studies have exposed the sustainability potential of organic maize farming in enriching soil with organic carbon, ecosystem preservation and long-term farm sustainability in areas has been exposed to climate turbulence. The motivation behind the attention to these indicators is that they have a direct effect on crop phenology, soil moisture regimes, and pest pressures, which dictate organic farm outcomes and system resilience (Ifeanyi-Obi et al., 2025), as theories suggest.

This study lies basically on the Vulnerability Framework, a theoretical perspective initially developed by Intergovernmental Panel on Climate Change in 2022, that has been widely used in climate change research to explain the dynamics of how exposure, sensitivity and adaptive capacity relate to produce differential outcomes for entities under climatic stress, suggesting that farming and other systems are vulnerable when they face climatic stimuli and lack adequate capacity to absorb or adapt to such stimuli. The theory grew from a need to understand why similar climate actors have varying effects across localities and farming systems. In agricultural research, it has been used to evaluate crop responses to climate variability, farmer adaptation behaviour and the resilience of production systems to shocks, as empirical evidence pointed out.

The empirical studies of the effects of climate change in Nigeria and similar environments not only offer a basis for this study but also reveal gaps in the themes. Unaeze et al. (2024), investigated the risk response to climate change in integrated farming systems in Etche Local Government Area (LGA), and observed that stressors associated with rainfall were among the adaptation strategies of the local farmers. Nnodim et al. (2023) revealed that farmers in Rivers State have little information about the causes of climate change, but noted that the altered weather has a great effect on crop productivity. Wilcox et al. (2025) studied the adaptation capacities of crop farmers in Rivers State, revealing inadequate capacities to deal with climate stress among different farming households.

However, organic maize farmers are facing rising challenges in their farming engagements due to the changing climate. Specific problems include soil moisture loss due to climbing temperature, altered planting and harvesting schedules arising from inconsistent rainfall patterns, and crop damage and reduced yields due to extreme weather events such as heavy storms and localised flooding (Omokaro, 2025; Nnodim et al., 2023). This surge threatens the viability of organic maize farmers who do not engage in the application of synthetic pesticides for maize protection. The consequences of these problems manifest in reduced income, food insecurity, and increased vulnerability to poverty as their harvests become unpredictably lean especially among smallholder farmers who constitute a larger proportion of organic crop producers in Nigeria (Unaeze et al., 2024). Despite existing research on climate change in Nigeria, there is a notable gap in empirical studies that specifically link these climate variables to organic maize farming in Etche LGA. It is based on the foregoing that the present study examined farmers' perceived effects of climate change on organic maize farming in Etche LGA, Rivers State. Specifically, the study assessed temperature changes effects on organic maize farming; evaluated the effects of altered rainfall patterns on organic farming production, and examined the effects of increased frequency of extreme weather events on organic maize farming.

Methodology

The study was carried out in Etche LGA. The LGA situated at approximately 4°59′27"N - 5°17'31"N and longitude 6°55'21"E - 7°17'33"E is one of the 23 LGAs in Rivers State, Nigeria. Agriculture is the basic means of livelihood, with cassava, yam, plantains, maize, and vegetables as the major crops cultivated in the area. The main livestock raised are goats, sheep and birds. The people are predominantly farmers, fishermen and potters.

This study employed a descriptive research design (which allows numerical data gathering from a fraction of the study population) to examine the effects of climate change on organic maize farming in Etche LGA, Rivers State. The study population comprised 184 registered organic maize farmers in Etche LGA obtained from Rivers State Ministry of Agriculture, 2025. A sample size of 110 respondents selected using a multistage sampling technique were used for the study to ensure representative coverage of the registered organic farmers in the study area. The first stage involved the purposive selection of 6 communities (towns and villages) based on the larger number of organic maize farmers in the areas to ensure better representation. In the second stage, 50% of the 14 villages in the selected communities were systematically chosen, making a total of 7 villages visited for the study. In the third (final) stage, proportionate sampling technique was used to the 110 respondents who filled out and returned the questionnaire. This selection was aided by the list of registered farmers provided by the Rivers State Agricultural Development Program.

Data for the study were collected from the respondents using structured interview schedule which was tested for reliability using the test re-test method. The Cronbach Alpha correlation value of 0.87 at 95% threshold, was obtained confirming that the instrument was reliable for the study. The instrument was also subjected to face and content scrutiny by three lecturers in the Department of Agricultural Extension, Ignatius

Ajuru University of Education Rumuolumeni, Rivers State, who ascertained its validity. The structured interview schedule contained items measured on a four-point Likert scale of Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1; and the criterion mean was set at 2.50. The Cronbache Alpha reliability coefficient of the instrument was 0.87. Trained research assistants facilitated the distribution and collection of questionnaires to and from respondents at their homes, based on prior identification and scheduling. Data analysis was done using frequency, percentage and mean.

Results and Discussion

Effects of Temperature Changes on Organic Maize Farming in Etche LGA, Rivers State

From Table 1, the respondents agreed that temperature changes have led to: frequent planting schedule adjustment ($\bar{x}$ = 3.53), Increased pest infestations caused by temperature fluctuations ($\bar{x}$= 3.41), wilting due to heat stress ($\bar{x}$= 3.40), dryness of soil due to high temperature ($\bar{x}$= 3.39), stunted growth due excessive heat ($\bar{x}$= 3.39), lower soil fertility and maize crop productivity ($\bar{x}$ = 3.39), reduced yield arising from high temperature ($\bar{x}$= 3.33), reduced output quality ($\bar{x}$= 3.27), reduced germination rate due to rising temperature ($\bar{x}$ = 3.21) and inconsistent flowering times due to increased temperature ($\bar{x}$= 2.89). The grand mean above the criterion mean ($\bar{x}$= 3.32) confirm that temperature changes affected organic maize farming. The findings showed that farmers strongly agreed that temperature changes have adversely affected organic maize farming through dryness of soil due to high temperature, reduced germination rates, disrupted growth cycles, increased pest infestations, and lowered yields. These results align with the work of Onyeneke et al. (2024), who reported that rising temperatures in Nigeria have led to decreased crop performance due to heat stress and altered phenology. Similarly, Okpara and Onuoha (2024) and Olumide (2024), found that temperature variability significantly reduces smallholder farmers' productivity in Nigeria by affecting soil moisture and crop health. The present findings underscore the vulnerability of organic systems to temperature fluctuations, which challenge their reliance on natural ecological processes. These findings correspond with the work of Adebayo and Olufemi (2023), who reported minimal variation in climate change impact perceptions among Nigerian farmers. The present results may reflect a shared exposure and vulnerability in Etche, underscoring that all farmers face similar challenges from climate variability.

Table 1: Effects of temperature changes on organic maize farming

Items	Farmers	
	$\bar{x}$	SD
Dyness of soil due to high temperature	3.39	0.84
Reduced germination rate due to rising temperature	3.21	0.89
Stunted growth due to excessive heat.	3.39	0.83
Increased pest infestations caused by temperature fluctuations.	3.41	0.77
Reduced yield arising from high temperature.	3.33	0.83
Wilting due to heat stress	3.40	0.82
Inconsistent flowering times due to increased temperature	2.89	1.13
Frequent planting schedule adjustment	3.53	0.70
Reduced output quality caused high yield	3.27	0.83
Lower soil fertility and crop productivity	3.39	0.77
Grand Mean	**3.32**	

Cut-off point = 2.50
Source: Field survey, 2025.

Effects of Altered Rainfall Patterns on Organic Maize Farming

From Table 2, the respondents agreed that the effects of altered rainfall pattern on organic maize farming were disruption in planting schedule ($\bar{x}$= 3.39), waterlogging and crop damage caused by excessive rainfall $\bar{x}$= 3.39), nutrient leaching from soil caused by heavy rainfall ($\bar{x}$= 3.39), lower soil moisture due to reduced rainfall ($\bar{x}$= 3.38), poor crop growth due to change in rainfall pattern ($\bar{x}$= 3.37), lower yields caused by erratic rainfall ($\bar{x}$= 3.37), increased disease incidences due to rainfall variability ($\bar{x}$= 3.33). On the contrary, the respondents disagree that the effects of altered rainfall pattern on organic maize farming was increased dependency on irrigation due to inconsistent rainfall ($\bar{x}$= 2.27). The grand mean ($\bar{x}$= 3.28) above the criterion mean confirmed that altered rainfall patterns affected organic maize farming in the study area. The findings revealed that altered rainfall patterns significantly disrupt planting schedules, cause water stress, induce waterlogging, and increase crop disease incidences. This confirms the observations by Nwafor and Eze (2022), who documented that erratic rainfall negatively impacts soil moisture and crop yields among Nigerian organic farmers. Furthermore, Ibeawuchi et al. (2023) highlighted that unpredictable precipitation patterns increase farmers' reliance on irrigation and exacerbate nutrient leaching, particularly in organic farming systems that depend on balanced soil ecology. These parallels reinforce concerns about rainfall variability as a critical threat to organic production stability in Etche. The present results may reflect a shared exposure and vulnerability in Etche, underscoring that organic maize farmers face similar challenges from climate variability.

Table 2: Effects of altered rainfall patterns on organic maize farming

Items	Farmers (n = 110)	
	$\bar{x}$	SD
Disruption of planting schedule due to irregular rainfall	3.39	0.84
Water stress caused by reduced rainfall	3.12	0.99
Waterlogging and maize crop damage caused by excessive rainfall	3.39	0.83
Poor crop growth due to change in rainfall pattern	3.37	0.80
Lower yield caused by erratic rainfall	3.37	0.80
Lower soil moisture due to reduced rainfall	3.38	0.82
Increased dependency on irrigation due to inconsistent rainfall	2.75	1.15
Nutrient leaching from soil caused by heavy rainfall	3.39	0.83
Increased disease incidences due to rainfall variability.	3.33	0.83
Grand Mean	**3.28**	

Cut-off point = 2.50
Source: Field survey, 2025.

Effects of Increased Frequency of Extreme Weather Events on Organic Maize Farming

From Table 3, the respondents agreed that the effects of increased temperature frequency of extreme weather events on organic maize farming manifested in following ways: increased crop production cost ($\bar{x}$= 3.47), heavy winds have reduction in the quantity of harvest ($\bar{x}$= 3.40), less predictable farming ($\overline{x}$= 3.40), damage to crops and farm structures ($\bar{x}$= 3.39), delayed farming operations ($\bar{x}$= 3.39), disease prevalence ($\bar{x}$= 3.39), increased post-harvest losses ($\bar{x}$= 3.33), adoption of new farming techniques ($\bar{x}$= 3.33) reduced soil fertility ($\bar{x}$= 3.08). On the contrary, the respondents disagreed that the effects of increased temperature frequency of extreme weather events on organic maize farming manifested in farm destruction ($\bar{x}$= 1.85). The grand mean ($\bar{x}$= 3.20) above the criterion mean confirmed that increased frequency of extreme weather events affected organic farming in the study area. The findings revealed that extreme weather events affected organic maize farming through crop and infrastructure damage, delayed operations, increased post-harvest losses, soil fertility decline, and rising disease attack. The present study supports the report of Matthew et al. (2025) that climate change has affected maize production through increased storm frequency, rising crop disease incidence, and higher production costs. This study's results highlight the pressing need for resilience-building interventions that are directed towards organic maize farmers who are vulnerable to these adverse climate occurrences. However, the findings contradict those of Adewale and Bello (2023), who linked intensified storms and flooding to reduce agricultural productivity in Nigeria's coastal zones due to significant destruction of farmlands. The non-destruction of farmlands in the study area as the findings revealed

could be due to the presence of well-drained soil and topography of the area (Agah & Omeke, 2023).

Table 3: Farmers' perceived effects of increased frequency of extreme weather events on organic maize farming

Items	Farmers (n = 110)	
	$\bar{x}$	SD
Damaged to crops and farm structures	3.39	1.91
Farm destruction	1.85	0.88
Delayed in farming operations	3.39	0.74
Reduction in the quantity of harvest	3.40	0.86
Increased post-harvest losses	3.33	0.81
Increased production cost	3.47	0.89
Reduced soil fertility	3.08	0.83
Disease prevalence	3.39	0.85
Less predictable farming	3.40	0.92
Adoption of new farming technique	3.33	0.84
Grand Mean	**3.20**	

Cut-off point: 2.50
Source: Field survey, 2025.

Conclusion and Recommendations

The study concluded that organic maize farmers in Etche LGA, Rivers State perceived the effects of climate change primarily through faster drying of the soil in farms, reduced maize germination rate, increased pest infestations on maize crops and heat stress leading to wilting of maize crops due to high temperature. The organic maize farmers have perceived waterlogging and damage to maize crop to be from excessive rainfall altered planting schedule and damage to maize crop and other farm infrastructures due to altered rainfall and extreme weather events. Extension services should expose organic maize farmers in Etche LGA Rivers State to climate change adaptation strategies to cope with the effects of climate change. The government should prioritize improving access to climate information, expanding financial resources, and strengthening capacity-building initiatives to promote resilience to the effects of climate stressors. Further, the Rivers State Ministry of Agriculture should develop and promote maize varieties that can

withstand high temperature, and provide training for farmers on soil moisture conservation techniques and adjusting planting schedules to mitigate the adverse effects of rising temperatures.

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