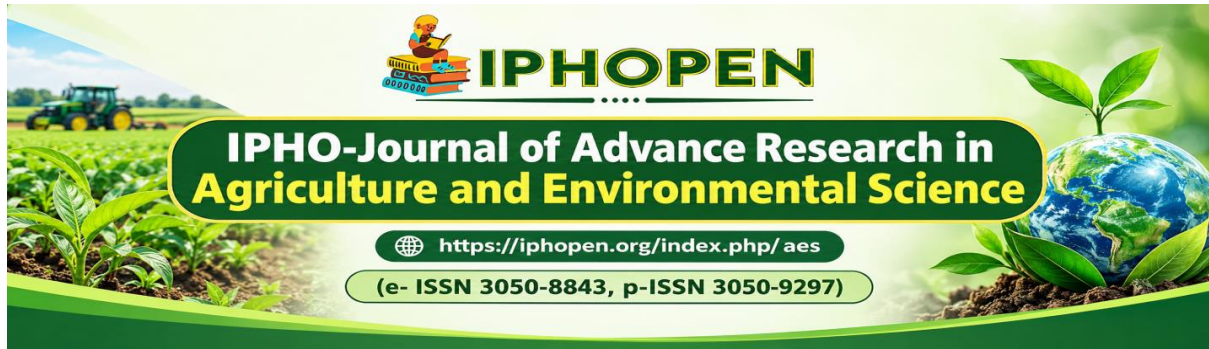




RICE FARMERS' PERCEPTIONS OF THE CAUSES OF CLIMATE CHANGE AND ASSOCIATED SOCIOECONOMIC FACTORS IN BEKWARRA LOCAL GOVERNMENT AREA, CROSS RIVER STATE, NIGERIA.

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Abstract

This study investigated the rice farmers' perceptions of the causes of climate change and associated socioeconomic factors in Bekwarra Local Government Area, Cross River State, Nigeria. Literature was duly reviewed under. A multistage sampling technique was used to select 98 respondents, and data were collected through structured questionnaire and analyzed using percentage, mean and regression analysis. Findings revealed that 57.14% of respondents were male and 42.86% female, with a mean age of 45 years. Most farmers (66 %) were married, had a mean household size of 6 persons, and 50.00% attained secondary education, while the mean farming experience was 7 years. Farmers perceived causes of climate change and largely attributed them to environmental factors such as deforestation, bush burning, and increasing temperature conditions. Regression analysis showed that education, farming experience, and extension contact significantly influenced farmers' perception of causes of climate change. The study concludes that farmers' perception of the causes of climate change was shaped by factors such as characteristics and access to information, highlighting the need for improved extension services and climate education to enhance adaptation and resilience. The study recommended among others that training and capacity-building programmes should be organized regularly to educate farmers on climate change causes in the study area.

Keywords:

Climate Change, Rice Farmers, Flooding, Drought

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1.Introduction

Climate change has become a major global environmental and developmental concern because of its implications for agricultural production, food security, rural livelihoods and sustainable natural resource management. It refers to long-term changes in temperature, rainfall patterns and other climatic conditions over an extended period. Although climate variations may occur naturally, contemporary climate change is largely associated with human activities that increase the concentration of greenhouse gases in the atmosphere. These activities include the burning of fossil fuels, deforestation, bush burning, industrial emissions and certain agricultural practices. The effects of climate change are increasingly relevant to agriculture because crop production depends substantially on climatic conditions, particularly rainfall, temperature, humidity and the availability of water.

Aa enunciated by Oniah et al (2024), agriculture is particularly vulnerable to climate change because changes in climatic conditions can influence planting dates, crop growth, pest and disease incidence, soil moisture, water availability and crop yields. In many farming communities, irregular rainfall, prolonged dry spells, excessive rainfall, flooding and rising temperatures can disrupt established farming practices and increase production risks. These challenges may affect farmers' decisions concerning crop varieties, land preparation, planting schedules, water management and the allocation of resources to agricultural activities. Consequently, understanding how farmers perceive the causes of climate change is important for developing appropriate agricultural education, extension programmes and adaptation strategies.

Rice is an important food crop in Nigeria, contributing to household food consumption, income generation, employment and national food security. Rice production, however, is sensitive to variations in rainfall, temperature and water availability, with the nature and extent of the effects depending on the production system, rice variety, soil characteristics and local environmental conditions. Unfavourable climatic conditions may affect germination, vegetative growth, flowering, grain formation and final yield. Farmers who experience changes in rainfall onset, rainfall distribution or temperature may therefore develop different explanations for the observed changes and adopt different responses in their farming activities.

Farmers' perceptions of the causes of climate change refer to their understanding, beliefs and interpretations of the factors responsible for changes in climatic conditions. Such perceptions may be based on personal farming experiences, observations of environmental changes, indigenous knowledge, information received from agricultural extension agents, interactions with fellow farmers, radio and television programmes, social media, formal education and other sources of information (Kwembe, 2026) Some farmers may associate climate change with deforestation, bush burning, indiscriminate tree felling, industrial pollution and other human activities. Others may attribute changes in weather conditions to natural environmental processes, spiritual explanations or a combination of different factors. These perceptions are important because farmers' understanding of the causes of climate change may influence how they interpret climatic risks and respond to their possible effects on rice production.

Rice is one of the world's most important staple foods that is consumed globally by half of the world population. It is grown in over 100 countries, with Asia being the dominant producer and consumer (Gadal, *et al.*, 2019). In 2023, global rice production reached approximately 800 million metric tons (MT) of paddy rice, with China and India alone accounting for over 50% of global output Food and Agriculture Organization (FAO)(2021). Other top-producing countries include Indonesia, Bangladesh, Vietnam, and Thailand.

Rice, botanically known as *Oryza* spp is one of popular cereals grown and consumed approximately by half of the world's population. Food and Agriculture Organization (FAO,2008) reported that rice ranks as the fourth most important grain crop after maize, sorghum, and millet and that it is one of the primary sources of carbohydrates for the population. It is a member of the grass family known as Gramineae. Rice has become a key staple food in Africa, especially in urban centers. Though Africa produces rice locally, the continent still imports significant quantities to meet its growing demand. In the 2024/25 season, Africa's total rice production is projected at 28.4 million tons of milled rice, marking a 4% increase from the previous year (MillingMEA, 2024).

Countries like Nigeria, Egypt, Madagascar, and Mali lead in rice production. However, according to FAO reports, production growth is uneven across the continent. Some key producersincluding Nigeria and Egyptare expected to witness stagnation or decline due to constraints such as climate change, insecurity, poor irrigation, and rising input costs (FAO, 2024). Nonetheless, the African Union and regional governments are pushing for self-sufficiency through initiatives such as the Coalition for African Rice Development (CARD), focusing on improved seeds, mechanization, and infrastructure development. Nigeria is the largest rice producer in Africa,

cultivating over 5 million hectares annually. However, the average yield remains relatively low about 2–2.5 tons per hectare compared to global averages of 4–5 tons per hectare (National Bureau of Statistics [NBS 2023]).

According to (Kuta, 2011), local rice farmers are seriously concerned about security, availability, stability, accessibility and utilization. The change in weather affects livestock, forestry, fishery and decreases aquatic plant species including rice. Research by FAO (2024) has shown that rice production, which is one of the world's most important crops for ensuring food security and addressing poverty, is highly vulnerable to extreme events such as climate change, flooding, and drought, which threaten its sustainability and global availability.

According to the US Geological survey cited in Intergovernmental Panel on Climate Change (IPCC) other living things (animals and plants) which depend on the (2014), climate change refers to the increasing changes in the measures of climate over a long period of time including which could be positive or negative are known as climate impacts. Climate change has emerged as one of the most significant threats to agricultural sustainability worldwide (Nhemachena, *et al.*, 2020). Rice, a staple food crop for more than half of the global population, is particularly vulnerable to changing climatic conditions. Rising temperatures, irregular rainfall, drought, flooding, and increased incidences of pests and diseases are disrupting rice production systems, especially in rural areas where agriculture is mostly rain-fed and practiced by smallholder farmers. In countries like Nigeria, where rice has become a national priority for food security and import substitution, these impacts are already visible through declining yields, low profit margins, and increased livelihood vulnerability for rural farmers (IPCC, 2023; FAO, 2024).

Temperature increases have been identified as a major constraint on rice yields. Studies indicate that a rise of just 1°C in average temperature could result in a 10% reduction in rice yields, particularly during the flowering stage when heat stress leads to spikelet sterility (IPCC, 2023). In tropical regions, including sub-Saharan Africa, such temperature increases shorten the crop lifecycle and reduce grain size and quality. Drought conditions, which have become more frequent in northern Nigeria and parts of Cross River State, are another serious threat. Rice, being a semi-aquatic crop, requires substantial water for optimal growth. When drought occurs, especially during the vegetative or reproductive stage, it significantly limits plant growth, causing partial or total crop failure (Elijah *et al.*, 2020).

Kwembe *et al* (2026), erratic rainfall patterns and early cessation of rains are becoming more common across Africa. In areas like Northern Cross River State especially Bekwarra Local Government Area, where rain-fed upland rice is commonly grown, unpredictable rainfall has disrupted traditional planting schedules, leading to delayed or failed germination. Flooding is also becoming more severe and widespread due to rising sea levels and extreme weather events. Lowland rice fields are frequently submerged during flash floods, resulting in the loss of young seedlings or stunted growth due to prolonged waterlogging (National Bureau of Statistics [NBS 2023]).

In addition to these physical effects, climate change has led to an increase in pest and disease outbreaks. Warmer and wetter conditions are conducive to the proliferation of pests such as stem borers and leafhoppers, as well as fungal diseases like rice blast and sheath blight. For rural farmers with limited access to pesticides or resistant seed varieties, these outbreaks can cause significant crop losses (Asor, *et al.*, 2021).

The socioeconomic consequences of these climatic challenges are profound in rice cultivation. Smallholder rice farmers often rely solely on seasonal crop production for both food and income as their main source of sustainability. When yields decline, household food insecurity rises, and incomes fall. Many farmers in rural Nigeria are unable to afford chemical inputs, irrigation technologies, or crop insurance. Furthermore, women farmers, who constitute a significant proportion of the rural agricultural labor force, are disproportionately affected due to gendered barriers in land ownership, finance, and agricultural extension access.

One of the most prominent responses to the challenges adopted by rural farmers is the use of improved and climate-resilient rice varieties measures. Research institutions such as the International Rice Research Institute (IRRI) and Africa Rice have developed early-maturing, drought-tolerant, and flood-resistant rice varieties. In Nigeria, varieties like FARO 44, FARO 52, and NERICA 8 are gaining popularity among smallholder farmers, especially those in lowland flood-prone or drought-prone areas. These varieties offer higher yields under stress conditions and are more resistant to pests and diseases.

Faced with the risks of rice farming under changing climate conditions, many farmers are expanding into other crops such as maize, cassava, or groundnut (Chaya, *et al.*, 2021). Others are engaging in non-farm income-generating activities, including petty trading, poultry rearing, and artisanal work, to reduce dependence on rice farming alone. Farmers also continue to rely on indigenous knowledge systems to adapt to climate change. Many uses local signs such as bird migration patterns, cloud formations, or insect behavior to predict rainfall and guide

planting decisions. While traditional methods may not be scientifically exact, they remain a vital part of local adaptive capacity, especially in areas with limited access to meteorological data or extension services (Mbah, *et al.*, 2021).

Climate change is exerting severe pressure on rice production systems across rural Nigeria. The increasing frequency and intensity of climate-related hazards are reducing yields and threatening the livelihoods of millions of smallholder farmers. Scaling up these adaptation strategies through targeted policies, inclusive financing, infrastructure development, and sustained agricultural research is essential to ensure the long-term sustainability of rice production in the face of climate uncertainty in the production area.

2. Statement of the Problem

Climate change has become a major concern in agricultural production because of its potential effects on rainfall patterns, temperature, water availability, soil conditions, pest and disease incidence, and crop productivity. Rice production is particularly sensitive to changes in climatic conditions because rice cultivation depends substantially on adequate water supply, suitable temperatures, and predictable seasonal weather patterns. Consequently, changes in rainfall distribution, prolonged dry spells, flooding, and rising temperatures may pose serious challenges to rice farmers' productivity, income, and livelihood.

Although climate change is widely discussed as an environmental and agricultural problem, the extent to which rice farmers understand its underlying causes may vary considerably. Some farmers may associate climate change with observable changes in rainfall, temperature, and seasonal patterns without necessarily understanding the scientific processes responsible for these changes. Others may attribute climate change to human activities such as deforestation, bush burning, indiscriminate tree felling, gas flaring, and the burning of fossil fuels, while some may regard it primarily as a natural phenomenon.

The problem is that rice farmers' perceptions of the causes of climate change may influence their attitudes towards environmental conservation, their farming decisions, and their willingness to adopt climate-smart agricultural practices. Where farmers have limited or inaccurate knowledge of the causes of climate change, they may be less likely to appreciate the importance of practices such as agroforestry, controlled land clearing, efficient resource use, and other environmentally sustainable agricultural activities. However, farmers' perceptions may also be shaped by their farming experience, educational qualifications, access to agricultural extension services, membership of farmers' associations, and exposure to climate-related information.

In Nigeria, rice production is highly vulnerable to climate variability, including irregular rainfall, rising temperatures, flooding, and drought, all of which negatively affect crop yield and farmers' livelihoods (Food and Agriculture Organization [FAO], 2021; Intergovernmental Panel on Climate Change [IPCC], 2022). In Bekwarra Local Government Area (LGA) of Cross River State, rice farmers are increasingly experiencing these climatic changes, which disrupt traditional farming calendars and reduce productivity.

Despite the growing concern about climate change and its implications for agricultural production, there is a need to establish what rice farmers actually perceive as the causes of climate change within the particular study area. Without such information, agricultural extension personnel, policymakers, and other stakeholders may find it difficult to design appropriate educational interventions that address farmers' specific knowledge gaps and misconceptions. Therefore, the central problem of this study is the need to determine rice farmers' perceptions of the causes of climate change, and the factors associated with their perceptions in Bekwarra LGA in Cross River State

3. Purpose of the Study

The aim of the study was to:

1. identify the perceived causes of climate change among rice farmers in Bekwarra Local Government Area, Cross River State, Nigeria
2. identify the socioeconomic factors influencing rice farmers' perception of the causes of climate in Bekwarra Local Government Area, Cross River State, Nigeria

4. Research Questions

The following research questions were drawn to guide the study:

1. What are the perceived causes of climate change among rice farmers in Bekwarra Local Government Area, Cross River State, Nigeria?
2. What are the perceived socioeconomic factors influencing rice farmers' perception of the causes of climate in Bekwarra Local Government Area, Cross River State, Nigeria

5. Methodology

The study was carried out in Bekwarra Local Government Area in Cross River State, Nigeria. Bekwarra Local Government Area represents a typical agro-ecological zone in Nigeria's Guinea Savannah region, where climate variability poses a major threat to rice production. A multistage sampling procedure was used in the selection of the respondents for study. Firstly, Bekwarra Local Government Area, Cross River State was purposively selected due to its extensive involvement in rice cultivation and the presence of active rice farming communities. Secondly, seven (7) council wards were randomly selected from the (10) council wards in the study area. Thirdly, two (2) villages were randomly selected from each of the selected wards for the study. Fourthly, respondents were randomly selected from each of the villages to give a total sample size of 98 respondents for the study. Primary data were collected from primary source using structured questionnaire. The data were analyzed using mean and multiple regression to analyze objective 1 and 2 respectively.

6. Results and Discussion

Table 1: Distribution of Respondents According to Sex

Variables	Frequency	Percentage (%)
Male	56	57.14
Female	42	42.86
Total	98	100

Source: Field Survey, 2026

The distribution of respondents by sex shows that males constitute 57.14% while females account for 42.86% of the total sample. This indicates a male-dominated participation in rice farming activities in Bekwarra LGA. This aligns with literature that reports male dominance in agricultural production due to greater access to land, capital, and decision-making power in rural Nigeria (FAO, 2011). However, the significant involvement of women supports findings by Doss (2001), who noted that women contribute substantially to food production despite limited access to resources. Gender differences influence perceptions of the causes of climate change, as men and women experience climate impacts differently based on roles and responsibilities (Nelson *et al.*, 2002). Male farmers may focus on production losses, while female farmers often emphasize household food security and water availability. Therefore, the gender composition of respondents suggests that both perceptions are relevant in understanding perceived causes of climate change and in designing inclusive adaptation strategies.

Table 2: Distribution of Respondents According to Age

Variables	Frequency	Percentage (%)	Mean
≤30	37	37.76	
31-40	29	29.59	
41-50	21	21.43	
51-60	9	9.18	
> 60	2	2.04	
Total	98	100	45.23

Source: Field Survey, 2026

The age distribution reveals that the majority of respondents fall within the economically active age groups, with 37.76% aged 30 years and below, and 29.59% between 31–40 years. The mean age of 45.23 years indicates that most farmers are middle-aged and possess considerable farming experience. This is consistent with Nwaru (2004), who found that middle-aged farmers dominate agricultural activities in Nigeria due to their experience and physical capacity. According to Maddison (2007), age significantly influences farmers' perception of the causes of climate change, as older farmers are more likely to observe long-term climatic variations, while younger farmers tend to adopt innovative practices more readily. The presence of diverse age groups in this study provides a balanced perspective on climate change causes. Older farmers may attribute changes to natural cycles based on historical observations, whereas younger farmers may associate them with human activities and modern environmental challenges. Thus, age plays a crucial role in shaping how the causes of climate change are perceived and addressed among rice farmers.

Table 3: Distribution of Respondents According to Marital Status

Variables	Frequency	Percentage (%)
Single	17	17.35
Married	65	66.33
Divorced	12	12.24
Widowed	4	4.08
Total	98	100

Source: Field Survey, 2026

The results indicate that a significant majority of respondents (66.33%) are married, while 17.35% are single, 12.24% are divorced, and 4.08% are widowed. This finding aligns with Olayide *et al.* (1981), who emphasized the role of family labor in Nigerian agriculture. According to Deressa *et al.* (2009), marital status influences farmers' adaptive capacity, as married individuals often have access to family labor and shared resources, enhancing their ability to respond to climate change. Married farmers may also be more concerned about long-term household welfare, influencing their perception of climate risks. Conversely, single, divorced, or widowed farmers may face labor and financial constraints, limiting their adaptive capacity. Therefore, marital status not only affects farm productivity but also shapes how farmers perceive causes of climatic changes in their environment.

Table4: Distribution of Respondents According to Household Size

Variables	Frequency	Percentage (%)	Mean
≤5	52	53.06	6
6-10	38	38.77	
>10	8	8.17	
Total	98	100	

Source: Field Survey, 2026

The findings show that 53.06% of respondents have household sizes of five or fewer members, while 38.77% have between 6–10 members, and 8.17% have more than 10 members, with a mean household size of 6. This supports the findings of Amaza *et al.* (2007), who reported that rural households in Nigeria typically rely on family labor for farming activities. According to Apata *et al.* (2009), larger household sizes can enhance farmers' adaptive capacity by providing more labor for climate-resilient practices such as irrigation and soil conservation. However, larger households may also increase consumption pressure, making them more vulnerable to climate shocks. Smaller households, while having fewer dependents, may lack sufficient labor for intensive farming operations. Therefore, household size influences both the perception of the causes of climate change and the ability to cope with its impacts, as it determines the balance between available labor and household needs.

Table 5: Distribution of Respondents According to Educational Level

Variables	Frequency	Percentage (%)
No formal education	6	6.12
Primary school education	31	31.64
Secondary school education	49	50.00
Tertiary education	12	12.24
Total	98	100

Source: Field Survey, 2026

The results show that 50.00% of respondents have secondary education, 31.64% have primary education, 12.24% have tertiary education, and only 6.12% have no formal education. This aligns with the findings of Obayelu *et al.* (2014), who reported increasing literacy levels among Nigerian farmers. According to Maddison (2007), education enhances farmers' awareness and understanding of climate change, enabling them to access and utilize relevant information effectively. Educated farmers are more likely to adopt improved agricultural practices and interpret weather forecasts accurately (Deressa *et al.*, 2009). In contrast, farmers with little or no formal education may depend on indigenous knowledge systems. Thus, educational level plays a significant role in shaping perceptions of farmers on the causes of climate change and influences the adoption of appropriate adaptation strategies among rice farmers.

Table 4: Distribution of Respondents According to Years of Experience

Variables	Frequency	Percentage (%)	Mean
≤5	16	16.33	7.44
6-10	34	34.69	
11-15	29	29.59	
>15	19	19.39	
Total	98	100	

Source: Field Survey, 2026

The data indicate that 34.69% of respondents have 6–10 years of farming experience, 29.59% have 11–15 years, 19.39% have over 15 years, and 16.33% have less than 5 years, with a mean of 7.44 years. This supports Nwaru (2004), who observed that farming experience enhances productivity and decision-making in agriculture. According to Bryan *et al.* (2009), experienced farmers are more likely to recognize climate variability and its impacts due to long-term observation of environmental changes. Such farmers can compare past and present climatic conditions, which shapes their perception about the causes of climate change. Less experienced farmers may rely more on external information sources such as extension services. Therefore, years of farming experience significantly influence how farmers perceive, interpret, and respond to climate-related challenges in Bekwarra LGA.

Table 7: Distribution of Respondents According to Farm Size

Variables	Frequency	Percentage (%)	Mean
≤1.0	37	37.76	
1.1-2.0	45	45.92	
>2.0	16	16.32	
Total	98	100	1.7

Source: Field Survey, 2026

The findings reveal that 45.92% of respondents cultivate between 1.1–2.0 hectares, 37.76% cultivate 1.0 hectare or less, and 16.32% cultivate more than 2.0 hectares, with a mean farm size of 1.7 hectares. This is consistent with the findings of Ayinde *et al.* (2010), who reported that most Nigerian farmers operate on small landholdings. According to Apata *et al.* (2009), farm size influences farmers' capacity to adopt climate adaptation strategies, as larger farms provide opportunities for diversification and investment in improved technologies. Smallholder farmers, however, often face constraints such as limited capital and access to inputs, making them more vulnerable to climate variability. Therefore, farm size is a key factor influencing both the perception of the causes of climate change and the ability of farmers to adapt to its impacts.

Table 8: Distribution of Respondents According to Access to Extension Agent

Variables	Frequency	Percentage (%)
Yes	26	26.53
No	72	73.47
Total	98	100

Source: Field Survey, 2026

The results show that only 26.53% of respondents have access to extension services, while a large majority (73.47%) do not. This finding aligns with Oladele (2004), who reported inadequate extension coverage in many rural areas of Nigeria. According to Deressa *et al.* (2009), access to extension services improves farmers' awareness of climate change and enhances their ability to adopt adaptive practices. Farmers without extension contact may rely on traditional knowledge, which may not always provide accurate explanations of the causes of climate change. Therefore, limited access to extension services negatively affects farmers' perception and response to climate change, underscoring the need for improved agricultural advisory systems in the study area.

Table.9: Distribution of Respondents According to Member of Cooperative

Variables	Frequency	Percentage (%)
No	76	77.55
Yes	22	22.45
Total	98	100

Source: Field Survey, 2026

The findings indicate that 77.55% of respondents are not members of any cooperative, while only 22.45% belong to cooperative societies. This supports the findings of Bernard *et al.* (2008), who noted that many smallholder farmers in Africa do not belong to cooperatives. According to Fischer and Qaim (2012), cooperative membership enhances access to information, credit, and inputs, which are critical for climate change adaptation. Farmers in cooperatives are more likely to share knowledge and adopt improved practices. In contrast, non-members often face isolation and limited access to support services. Therefore, low cooperative participation may hinder effective dissemination of climate information and influence farmers' perception of the causes of climate change in Bekwarra LGA.

Table 10: Perceived Causes of Climate Change

S/No.	Causes	Mean Score
1	Bush Burning	3.82
2	Over use of chemicals and fertilizers	3.34
3	Industrial activities	2.71
4	Natural causes of climate change	1.54
5	Deforestation	3.91
6	Overgrazing	3.46
7	Blocking Drainages	2.87
8	Pollution	2.63

Source: Field Survey, 2026

The results in Table 10 reveal that respondents strongly perceive deforestation (3.91) and bush burning (3.82) as the major causes of climate change in Bekwarra LGA. This aligns with the findings of Intergovernmental Panel on Climate Change (IPCC, 2014), which identifies deforestation as a key driver of greenhouse gas emissions due to loss of carbon sinks. Similarly, overgrazing (3.46) and overuse of chemicals and fertilizers (3.34) were rated highly, supporting the work of Lal (2004), who noted that unsustainable agricultural practices contribute to environmental degradation and climate variability.

Moderate perceptions were recorded for blocking of drainages (2.87), industrial activities (2.71), and pollution (2.63). According to Adebayo (2010), rural farmers often associate visible environmental issues such as flooding and waste accumulation with climate change. However, natural causes (1.54) received the lowest rating, indicating that farmers largely attribute climate change to human activities. This supports Nzeadibe *et al.* (2011), who found that farmers in Nigeria increasingly recognize anthropogenic causes of climate change. Overall, the findings suggest a high level of awareness of human-induced environmental factors among rice farmers.

Table11: Mean distribution of factors influencing perception of the causes of climatic change among rice farmers

S/No.	Factors	Mean Score
1	Extension services	3.21
2	Radio/Television	3.67
3	Discussions with other farmers	2.64
4	Personal experience	3.89
5	Experience of flooding	3.11
6	Experience of drought	3.46
7	Changes in rice yield	3.41
8	Training/workshops	2.51
9	Cooperative membership	2.13
10	Social media	3.72
11	Rice price fluctuation	3.01

Source: Field Survey, 2026

Results in Table 11 indicates that personal experience (3.89) is the most influential factor shaping farmers' perception of climate change. This aligns with Maddison (2007), who found that farmers' direct observation of environmental changes strongly influences their understanding of climate variability. Similarly, social media (3.72) and radio/television (3.67) are key influencing factors, supporting Aker (2011) and Chapman *et al.* (2003), who emphasized the role of ICT and mass media in shaping agricultural knowledge.

Environmental experiences such as drought (3.46), changes in rice yield (3.41), and flooding (3.11) also significantly influence perception. According to Deressa *et al.* (2009), farmers' exposure to climate-related events enhances awareness and adaptation responses. Extension services (3.21) have moderate influence, reflecting limited outreach effectiveness (Oladele, 2004).

Less influential factors include training/workshops (2.51), cooperative membership (2.13), and discussions with other farmers (2.64), suggesting weak institutional and group-based learning structures. Overall, the findings indicate that perception is largely shaped by personal and experiential factors rather than formal institutional support systems.

Table 12: Multiple regression analysis of the factors influencing perception of the causes of climatic change among rice farmers

Variable	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t-Value	
Constant	-23.310	12.353		-1.887	.066*
Age	6.185	0.782	0.639	7.910	.000***
Household Size	-7.754	1.590	-0.485	-4.875	.000***
Marital Status	0.093	1.160	0.003	0.080	.937
Education	2.032	0.955	0.160	2.129	.039**
Gender	-1.777	1.712	-0.075	-1.038	.305
Cooperative	-0.327	0.913	-0.035	-0.358	.722
Experience	1.029	0.348	0.148	2.953	.005***
Farm Size	5.054	2.301	0.029	2.197	.034**
Extension Service	0.247	0.087	0.042	2.846	.007*
F-Value				140.847	
R-Square (R ²)				0.896 (89.6%)	

***Significant at 1%, **Significant at 5% and *Significant at 10%

Source: Field Survey, 2026

The multiple regression results in Table 12 show that the model is statistically significant, with an F-value of 140.847, indicating that the explanatory variables jointly influence farmers' perception of the causes of climate change. The R² value of 0.896 (89.6%) implies that the included variables explain a high proportion of variation in perception. This is consistent with Deressa *et al.* (2009), who found that farmers' perception of the causes of climate change is strongly influenced by socioeconomic characteristics. Among the variables, age ($\beta = 0.639$, $p < 0.00$) has a positive and highly significant effect, suggesting that older farmers are more likely to perceive causes of climate change, likely due to accumulated experience, as supported by Maddison (2007). Household size ($\beta = -0.485$, $p < 0.000$) shows a negative significant relationship, indicating that larger households may face constraints that limit awareness or accurate perception.

Education ($\beta = 0.160$, $p < 0.397$) and farming experience ($\beta = 0.148$, $p < 0.005$) positively influence perception, confirming that knowledge and exposure enhance climate awareness (Apata *et al.*, 2009). Farm size ($p < 0.034$) and extension services ($p < 0.007$) are also significant, suggesting that access to resources and information improves perception. However, gender, marital status, and cooperative membership are not statistically significant, indicating limited influence. Overall, the results highlight that perception of the causes of climate change is mainly driven by experience, education, and access to information.

7. Conclusion

Climate change is a significant challenge affecting rice farming in Bekwarra Local Government Area with noticeable impacts on productivity and farmers' livelihoods. Rice farmers in the area are aware of climate change and can identify its key indicators, including erratic rainfall, increased temperature, flooding, and drought. Rice farmers have varying levels of understanding of the causes of climate change, based on their farming experiences, educational backgrounds, access to agricultural extension services, and exposure to climate-related information.

The findings revealed that rice farmers perceive climate change as being caused by both human activities and natural processes. Human activities include deforestation, bush burning, indiscriminate felling of trees, gas flaring, industrial emissions, burning of fossil fuels, and other activities that release greenhouse gases into the atmosphere. Some farmers attribute climate change to natural variations in weather patterns, changes in rainfall, and rising temperatures.

However, some farmers have incomplete and inaccurate knowledge of the scientific causes of climate change. This indicated the need for improved climate change education and awareness programmes targeted at rice farmers in the study in Bekwarra Local Government Area 5.3 8.

8. Recommendations

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

1. Government and relevant agencies should strengthen agricultural extension services to improve farmers' access to accurate climate information.
2. Training and capacity-building programs should be organized regularly to educate farmers on climate change causes

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