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Farmers Variables and Their Response to Climate Change Adaptability in Obubra Local Government Area of Cross River State, Nigeria.

By

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Abstract

This study was aimed at examining the difference between farmers in their response to climate change adaptability in Obubra Local Government Area of Cross River State, Nigeria. Specifically, the objective of the study was to examine the difference between the older and younger farmers, male and female farmers and also the difference between the educated and the none educated farmers in their response to climate change adaptability. Related literatures were reviewed based on the study variables. The survey research design was adopted for the study. Three research questions and hypotheses were formulated and answered with data drawn from 300 respondents out of a population of 973 registered farmers in Obubra Local Government Area using the simple random sampling. Questionnaire instrument on farmers variables and their response to climate change adaptability (FVATRCCA) was used for data collection. Data collected was analysed using independent t-test. The result shows that, there was a significant difference between younger and older farmers, educated and none educated farmers in their response to climate change adaptability but there was no significant difference between male and female farmers in their response to climate change adaptability. Based on these findings the researcher recommended among others that, government and other environmental stakeholders should make technology and technologist available to help people and the old to adapt to climate change.

Key words:

Introduction and background

Climate change has the potential to impact the environment in ways that place increased stress on everyone, particularly the most vulnerable populations, including the young, the elderly, males, females, the educated, and the non-educated. Climate change refers to the continuous, rapid, and prolonged alteration of climate in one direction, manifesting as variations in global or regional climates over time.

Climate change reflects shifts in the variability or average state of the atmosphere over time scales ranging from decades to millions of years. These changes can result from internal Earth processes such as volcanic activity, external forces such as variations in sunlight intensity, or human activities. According to Anyadike (2009), a change that continues rapidly in one

direction for an unusually long period is classified as climate change. These changes are often cyclical and largely unnoticed except by climatologists.

Eboho (2009) described climate change as statistically significant variations persisting over extended periods, typically decades or longer. It consists of discrepancies in the frequency and intensity of sporadic weather events, accompanied by a rise in global mean surface temperature. Akuakanwa and Ukachi (2013) emphasized that climate change represents a significant deviation from the normal atmospheric conditions required to sustain human life and biodiversity, attributing it to global warming. Botkin and Keller (2012) noted that climate changes have persisted in recent geological history, with mean annual temperatures fluctuating significantly over the past million years. Over the last 18,000 years, climate change has profoundly impacted human populations.

Aboho, Agbidye, and Asooso (2013) outlined the various ways climate change affects humans, including its impact on water resources, human settlements, health, and industries sensitive to climate variations, such as agriculture, forestry, fisheries, and tourism. Climate change has led to both decreases and increases in cereal productivity, depending on latitude. The World Health Organization (WHO) (2009) reported that climate change accounted for approximately 3% of global dengue fever deaths in 2004.

The Intergovernmental Panel on Climate Change (IPCC, 2007) summarized key environmental effects of climate change, including rising sea levels due to glacier melting, warming sea-surface temperatures, more frequent heatwaves, heavier rainfall leading to floods, increased evaporation causing drought, and more frequent hot days and nights. These effects severely impact farming activities and agricultural production, necessitating adaptive responses. Adaptation should be country-driven, gender-responsive, participatory, and transparent, incorporating traditional, indigenous, and local knowledge systems. It should also integrate with socioeconomic and environmental policies.

Adaptation involves adjusting to current or anticipated climate conditions to mitigate vulnerabilities. Climate change increasingly threatens socioeconomic development, especially in agriculture. Alston (2013) highlighted its implications, ranging from hunger and ill-health to migration. Strategies such as education, behavioral changes, and infrastructure modifications help communities manage climate risks. Governments, businesses, and individuals must collaborate on adaptation strategies to enhance resilience and sustainability.

Age and Climate Change Adaptability

Farmers' adaptability to climate change depends on multiple factors, including age. According to David et al. (2010), older individuals are among the most vulnerable due to decreased mobility, physiological changes, and restricted access to resources, all of which limit their adaptive capacity. The challenges faced by older populations in adapting to climate change have significant implications for public health, habitability, and environmental justice.

David et al. (2010) further report that climate change increases older adults' exposure to environmental risks, including extreme weather events, vector-borne diseases, reduced agricultural yields, water scarcity, and declining habitability. Older individuals have a higher mortality risk during extreme weather events due to increased susceptibility to diseases and stress on food and water supplies. Hag, Whitelegg, and Kohler (2008) observed that those aged 85 and above are particularly prone to negative health effects. McGeehin and Mirabel (2001) attribute this increased vulnerability to physical decline and frailty.

The European experience suggests that older people with multiple risk factors for heat-related illness are less likely to seek communal support and may struggle with protective measures due to reduced adaptive capacity (Donner & Rodriguez, 2008). The Cornell National Social Survey (2008) found that while 83% of individuals over 55 expressed strong environmental concerns, only 12% were members of environmental organizations, indicating a gap between attitudes and behaviors.

Eaton et al. (2009) suggest that older individuals are more likely than younger people to change attitudes when presented with new information and can adopt younger perspectives. Additionally, technological advancements and rapid identification systems for at-risk older adults can enhance adaptive capacity (IPCC, 2007). Cutter and Boruff (2003) highlight that housing stock quality and the built environment significantly impact adaptability. Areas with large elderly populations tend to have lower mortality rates, possibly due to strong social networks (Browning et al., 2006). However, Cutter et al. (2003) identified old age and African-American race as indicators of reduced adaptive capacity.

Low socioeconomic status and lack of access to support institutions hinder older individuals from securing financial aid and social services after natural disasters (Dyer et al., 2008).

Gender and Climate Change Adaptability

Gender also influences farmers' climate change adaptability. Ngigi and Birner (2015) examined adaptation strategies in male- and female-headed households in rural Kenya. The study, involving 156 couples, revealed that while both genders adopt livestock-related

practices, men slightly lead in implementing changes in feeding, livestock breeds, and herd sizes. Women tend to diversify livestock portfolios by rearing small ruminants and non-ruminant livestock as a coping strategy.

Regarding crop-related adaptations, both genders implement similar strategies, such as changing crop varieties, increasing land under production, adopting soil conservation practices, and engaging in agroforestry. However, women (82%) reported more frequent changes in crop production than men (72%) (Ngigi & Birner, 2015). While men adopt an average of 2.8 agricultural practices, women adopt 2.44 practices.

In terms of agricultural information access, men interact more with extension officers and receive more information on crop and livestock production, while women have greater access to weather forecasts and climate adaptation advice (Ngigi & Birner, 2015). However, men have better access to early warning systems for extreme climate events. In social participation, 91% of women belong to social groups compared to 81% of men.

According to UN Women Watch (2011) and Alston (2013), climate change exacerbates pre-existing social inequalities, disproportionately affecting women due to limited resource access and agricultural dependency. The Food and Agriculture Organization (FAO) (2011) and Peterman et al. (2014) found persistent gender disparities in access to agricultural inputs despite policy interventions.

Mackay, Kenny, and Chappel (2010) advocate for integrating gender into decision-making, a concept known as "feminist institutionalism." The Kenyan government has launched gender-mainstreaming initiatives in all ministries, including a "gender desk" in the Ministry of Agriculture to recognize women's crucial role in agriculture.

Education and Climate Adaptability

Education plays a crucial role in climate change adaptation. According to Allison (2009), coastal communities experiencing rapid warming depend heavily on marine ecosystems and fisheries, making climate adaptation essential for food security and economic stability. Communities with lower socioeconomic status and lower educational attainment face heightened vulnerability due to limited adaptation capacity.

Allison (2009) emphasizes the urgent need for public education to expand climate literacy, ensuring citizens can mitigate climate change impacts and respond effectively to economic and

environmental challenges. Paytan, Halverson, and Weiss (2017) argue that climate-literate societies are better equipped to build resilient communities and protect fragile ecosystems. Halverson and Weiss (2017) assert that education does more to reduce climate-related disaster fatalities than economic growth. Education enhances people's ability to prepare for and recover from natural hazards. Ukachi (2013) found that better-educated individuals in Cuba, Haiti, and the Dominican Republic responded more quickly to hurricane warnings and recovered faster. A comparative study of 167 countries revealed that while economic growth (measured by GDP per capita) had little effect on disaster mortality, higher education levels, particularly among women, significantly reduced fatalities.

Matthew (2012) highlights education's role in improving knowledge, risk perception, and adaptive skills. Education indirectly enhances socioeconomic status and social capital, which are vital for coping with climate change. Educated individuals tend to have better risk awareness and are more flexible in adapting. Education empowers learners to understand climate change causes and consequences, prepares them for climate impacts, and fosters sustainable lifestyles.

Tripathi and Mishra (2017) describe adaptation as a two-step process: first, individuals must perceive climate change risks correctly; second, they must take appropriate measures. Accurate perception depends on knowledge and access to information, which are influenced by education. Misconceptions can lead to ineffective adaptation measures. The authors emphasize that perception is a cognitive process requiring sensory input and interpretation, but even when individuals correctly perceive climate risks, constraints such as lack of resources and institutional support may hinder adaptation.

In developing countries, where many farmers are smallholder and marginal farmers with low education levels, adaptation challenges are more pronounced. Tripathi and Mishra (2017) stress the importance of understanding people's perception levels and how these perceptions drive or hinder climate adaptation. They argue that improving education can bridge knowledge gaps and equip individuals with the skills to make informed decisions about climate adaptation.
Conclusion

Age, gender, and education significantly influence climate change adaptability. Older populations face physical, economic, and social barriers to adaptation, while gender disparities in access to resources and information hinder women's adaptive capacity. Education plays a transformative role in enhancing climate resilience by improving knowledge, risk perception, and adaptive behavior. Policies aimed at improving climate adaptability should address these factors by fostering inclusive, knowledge-driven, and gender-sensitive approaches.

The Purpose of the Study

The purpose of the study is to examine the difference between younger and older farmers, male and female farmers, educated and less educated farmers in terms of their response to climate change adaptation in Obubra Local Government Area.

Specifically, the study sought to:

1. Examine the difference between young and old farmers in their response to climate change adaptation
2. Investigate the difference between male and female farmers in their response to climate change adaptation.
3. Examine the difference between the educated and the less educated farmers in their response to climate change adaptation.

Statement of Hypothesis

The following hypotheses were raised to guide the study:

1. There is no significant difference between younger farmers and older farmers in their response to climate change adaptability.
2. The difference between male farmers and female farmers in their response to climate change adaptability is not significant.
3. There is no significant difference between the educated farmers and the less educated farmers in their response to climate change adaptability.

Methodology

The survey research design was used in this study. The study area is Obubra Local Government Area is one among the 18 Local Government Areas of Cross River State. Obubra is also one of the Local Government Areas that constitute the Ikom Education Zone. Politically, it is in the central senatorial district of Cross River State. It has a projected population of 230,600 as at 2024. (National Population Commission, 2024).

Like farmers in other parts of the country, farmers in Obubra also battle with the mitigation and adaptability to climate change effects such as, erosion, flooding and seasonal variations in planting periods. Obubra has an area of 1,115km^2.The geographical coordinates of Obubra shows that, it lies between latitude 6°04'36'N, longitude 8°19'56'E with an elevation above sea level of 91m =>298ft.

Traditionally, the people are predominantly farmers of rice, cassava, cocoyam, yam etc though they still have civil and public servants including businessmen and women.

Population of the Study
The population of this study is 973 which is the total number of registered farmers in Obubra Local Government Area. (Cross River State Ministry of Agriculture, 2019).

Sampling Technique
The simple random sampling technique was adopted in selecting 302 respondents which is about 31% of the total population of 973registered farmers of Obubra Local Government Area. The names of the 973 registered farmers were obtained from the register of farmers with the farmers' cooperative, Ministry of Agriculture.

The names were written on pieces of papers wrapped into a container and the researcher was blindly picking one at the time with replacementuntil302names were picked. The questionnaire was therefore administered to these 302 farmers during their meetings with the help of their chairman and secretary.

Sample
A sample of 302 respondents was used. It was made up of males, females, young, old, educated and less educated farmers.

Instrumentation
The instrument used for the collection of data in this study was a questionnaire, titled Farmers Variables and their response to Climate change Adaptability in Obubra Local Government Area (FVATRCCA).

The questionnaire was divided into two sections, A and B. Section A was designed to elicit information from respondents about their variables such as Age, gender and educational status. While section B was Structured statements in line with the dependent variable (climate change adaptability). This section was designed to elicit information on respondents' responses to climate change adaptability. The four point likert scale of strongly agree, agree, disagree and strongly disagree was adopted. There were three questions in section A and fifteen questions in section B, making a total of eighteen (18) questions in all. Section A, 1-3, and section B 4-18.

Validity of the Instrument
The instrument was validated by two (2) experts from the Faculty of Education, one from Department of Educational Foundation and the other from the Department of Environmental Education. All their observations and corrections were taken care of. Example, the number of

items in the questionnaire was reduced to the present 18 while some grammatical errors were corrected. It was finally given to my supervisor for final validation and corrections.

Procedure for Data Collection

The questionnaire was given to the respondents during their farmers' cooperative meetings with the help of their chairman and secretary. Out of the 302-questionnaire issued, only 300 were collected and collated, and were found fit for the study.

Procedure for Data Preparation and Coding

The questionnaire was structured into two sections, A and B. Section "A" covers the independent variable (farmers variables) which was made up of three questions about Age, Gender and Educational status.

While section "B" covers the dependent variable (climate change adaptability) which was made up of fifteen questions. The questionnaire contains a total of 18 questions. The collated questionnaire was coded as follows: Section A: Age 39 and below (young farmers) – 1; Age 40 and above (old farmers) - 2
Gender: Female 2 Male – 1; Education: SSCE and below (less educated) -1; NCE and above (educated) – 2; Section B: For positively worded statements: Strongly agree (SA) – 4; Agree (A) – 3; Disagree (D) – 2; Strongly Disagree (SD) - 1;
The scoring was reversed for negatively worded statements.

Presentation of results

The results were presented hypothesis-by-hypothesis. Each hypothesis was tested at 0.05 level of significance.

Ho1

There is no significant difference in age, between younger farmers and older farmers in their respond to climate change adaptability. The independent variable here is age while the dependent variable is climate change adaptability. To test the hypothesis, scores of respondents on age and their scores on climate change adaptability was obtained and analysed using independent t-test. The result of the analysis have been presented on table 1.

Table 1: Independent t-test analysis of the difference in Age between younger farmers and older farmers in their response to climate change adaptability

Age difference	N	Mean	SD	t-val	Sig.
Young farmers	146	39.507	2.441		
				2.162	.000
Older farmers	154	28.103	2.880		

Significant at 0.05 level, df = 298; critical t-val=1.968

The result of the analysis presented in table 1 indicates that the calculated t-value of 2.162 is greater that the critical t-value of 1.968 at the 0.05 level of significant with 298 degrees of freedom. This shows that the null hypothesis was rejected. This means that there is a significant difference in Age between younger farmers and older farmers in their respond to climate change adaptability in Obubra Local Government Area of Cross River State, Nigeria.

Ho_2

The difference in gender between male farmers and female farmers in their respond to climate change adaptability is not significant.

The independent variable here is gender while the dependent variable is climate change adaptability. To test the hypothesis, scores of respondents on gender and their scores on climate change adaptability was obtained and analyzed using independent t-test. The result of the analysis has been presented in table 2.

Table 2: Independent t-test analysis the difference in gender between male farmers and female farmers in their response to climate change adaptability

Gender	N	Mean	SD	t-val	Sig.
Male	165	35.000	3.724		
				0.021	0.650
Female	135	34.887	3.010		

The result of the analysis in table 2 shows that, the calculated t-value of 0.021 is less than the critical t-value of 1.968 at the 0.05 level of significant with 298 degrees of freedom.

Therefore, the null hypothesis was upheld and accepted. This means that, there was no significant gender difference between male and female farmers in their response to climate change adaptability in Obubra Local Government Area of Cross River State, Nigeria.

H_{O3}

There is no significant difference between the educated farmers and the less educated farmers in their respond to climate change adaptability. The independent variable here is education while the dependent variable in climate change adaptability. To test the hypothesis, scores of respondents in education and their scores and analysed using independent t-test. The result of the analysis has been presented in table 4.

Table 3: Independent t-test analysis of the difference between the educated farmers and the less educated farmers In their response to climate change adaptability

Educational Status	N	Mean	SD	t-val	Sig.
Educated farmers	102	40.642	3.920	6.386	0.001
Less Educated farmers	198	26.220	2.000		

Significant at 0.05 level; df = 298, critical t-val= 1.968

The result of the analysis presented in table 3 above indicates that the calculated t-value of 6.386 is greater than the critical t-value of 1.968 at 0.05 level of significant with 298 degree of freedom. This shows that the null hypothesis was rejected. This means that there is a significant difference between the educated farmers and the less educated farmers in their response to climate change adaptability in Obubra Local Government Area of Cross River State, Nigeria.

Discussion of Findings

This section is focused on the discussion of the findings obtained in the study based on each of the hypothesis formulated for the study.

Age and climate change adaptability

Finding obtained from the analysis of hypothesis one revealed that the null hypothesis was rejected. This means that there was a significant difference in age, between younger farmers and older farmers in their response to climate change adaptability in Obubra Local Government Area of Cross River State, Nigeria.

With a mean score of 39.507 of respond to climate change adaptability of the younger farmers against the mean score of 28.103 for older farmers. It means the younger farmers respond more to climate change adaptability than the older farmers in Obubra Local Government Area.

This is in agreement with David (2010) who reported that older people are among the most at risk because of decreased mobility resulting from age, changes in physiology and more restricted access to resources. All of which may limit adaptive capacity of the old people. David et al (2010) added that for older adults, the challenges climate brings heightened vulnerability to environmental risks, which include extreme weather events, exacerbated vector borne diseases, compromised agriculture, reduced availability of fresh water and decreased habitability of human population centres.

The findings is in harmony with Kovats and Ebi (2005) who pointed out that, the European experience demonstrates that, older people with more risk factors for health-related illness are less likely to use community centres' and less able to take protective action on their own because their adaptive capacity is reduced. The finding is also in line with Donner and Rodriguez (2008) who opined that, a complicating factor is that relatively healthy, community dwelling older people may be less responsive to hurricane warnings as a result of climate change. That older people may have physical impairments that make preparation more difficult and such people may be less connected to community assistance resources to adapt to climate change.

The findings is also In agreement with Hay et al (2008) who observed that, the oldest old (age 85 and above) are more likely to suffer negative health effects from climate change because of their poor respond to climate change adaptability in their environment.

Gender and climate change adaptability

Findings obtained from the analysis of hypothesis two revealed that, the null hypothesis was up held and accepted. This means that there was no significant difference between male farmers and female farmers in their respond to climate change adaptability in Obubra Local Government Area of Cross River State, Nigeria.

With a mean score of 35.000 of respond to climate change adaptability by the male farmers and 34.887 by female farmers, it is an indication that there is not significant difference between their responses to climate change adaptability in Obubra Local Government Area of Cross River State.

This finding is in harmony with Ngigi and Birner (2017) that, there is a slight similarity among husbands and wives regarding their decision to take up livestock related practices. However according to Ngigi and Birner there was no similarity among couples in adoption of specific livestock related practices when it comes to the adaptation measures in the domain of livestock

management. The differences between them according to Ngigi and Birner (2017) is not statistically significant.

The finding is not in agreement with FAO (2011) and Peterman et al (2014)'that substantial empirical evidence indicates that gender disparity exists in access to agricultural inputs, and that in spite of policies and interventions supporting gender equality and empowering women, including women inclusion governance, that gender disparity remains a worldwide challenge.

Education and climate change adaptability

Finding obtained from the analysis of hypothesis three revealed that the null hypothesis was rejected. This means that there was a significant difference between the educated farmers and the less educated farmer in their respond to climate change adaptability in Obubra Local Government Area of Cross River State, Nigeria.

This finding is in agreement with Allison (2009) that, fisher communities in some countries are of low socio-economic status and will be more vulnerable to the effect of climate change, due to a higher percentage of dependence on fishery industries and a low capacity to adapt to changes in climate which may also be as a result of their educational status.

According to Allison (2009) the combination of rapid warming and high rate of poverty creates an urgent need for public education an outreach in communities in these and similar settings because expanding climate literacy according to Allison (2009) is imperative for ensuring that citizens throughout the world will be better prepared to mitigate climate change. Adding that education will help them to respond to both the economic and environmental challenges as well as the opportunities that climate change brings.

The finding is in harmony with Paytan (2017) that human health, biodiversity, economic stability and national security are expected to be affected by climate but a climate literate citizenry is essential to build sustainable communities that are resilient to climate change including extreme weather and climate events, and also to protect fragile ecosystems.

The finding is also in agreement with Wamsler (2012) that education does more to reduce deaths from climate related disasters than economic growth adding that education helps to reduce vulnerability to disasters and enhances adaptation to climate change.

According to Wamsler (2012) improvement in education can give people the skills and knowledge to be better prepared for and better able to recover from natural hazards. The finding is in line with Muttarak (2012) that education directly improves knowledge, the ability to understand and process information and risk perception. That education also indirectly enhances socio-economic status and social capital which are qualities and skills useful for surviving and coping with disaster especially due to climate change.

The finding is also in harmony with Tripathi and Mishra (2017) that knowledge depends on the educational attainment and experience of a person. That perception is a cognitive process which involves receiving sensory information and interpreting it. Therefore, adapting agriculture to climate change according to Tripathi & Mishra (2017) is a major challenge, especially in a developing country where a vast majority of farmers are marginal and small holder farmers, who are less educated and have significantly lower adaptive capacity.

Conclusion and recommendations

Findings from the analysis of data revealed that age and education influenced farmers response to climate change adaptability while gender has no influence on the response of farmers to climate change adaptability in Obubra Local Government Area of Cross River State.

Based on the findings of this research work, the following recommendations were made by the researcher.

1. Government and other environmental stake holder should make technology and technologist available to assist people especially the old to adapt to climate change.
2. Government and other environmental stakeholders should continue to create awareness about gender equality especially in environmental issues and particularly in the adaptation to climate change.
3. Government and environmental stake holders should help in making information about climate change adaptability available for all categories of farmers including the less educated.

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