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Traditional Perceptions of Climate Change Phenomenon Influencing Adaptation Decisions among Women Crop Farmers in Southern Nigeria

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Author's contribution
ICC (50%) Conceptualization, development of data collection instrument, data collection and analysis, writing the original manuscript and revision of manuscript.
WCC (20%). Writing the original manuscript and revision of manuscript.
AOM (15%) Conceptualization, validation of data collection instrument, supervision and editing of manuscript.
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Abstract

The study assessed traditional perceptions of climate change phenomenon influencing adaptation decisions among women crop farmers in southern Nigeria. Multi-stage sampling procedure was used to select 420 rural women crop farmers for the study. Structured interview schedule through the use of Open Data Kit, focus group discussion and in-depth interview were used to collect data. Data were analysed using mean, percentages and Binary Logit regression. Approximately 89% had taken the decision to adapt to climate change with 81% supporting their decision with action by utilizing available climate change adaptation strategies. The belief that climate change is too complex to understand ($\bar{x}$= 2.83), caused solely by man's carelessness over his environment ($\bar{x}$ = 2.97), rainfall and temperature variation ($\bar{x}$ = 3.07), violation of traditional farming rituals ($\bar{x}$ = 2.72) and God's anger on mankind ($\bar{x}$ = 2. 65) were the major traditional perceptions of climate change influencing adaptation decisions among rural women crop farmers. The traditional perceptions of climate change among other factors were found to influence rural women crop farmers' decision to adapt to climate change. Knowledge building through training

workshops on climate change is key to stimulating right adaptation decisions and action among rural women crop farmers.

Introduction

Developing economies like Nigeria whose rural populace depends on agriculture would have its agricultural production greatly impacted by climate change (Adeosun, 2021; Woetzel et al., 2020; Climate Risk Profile: Nigeria, 2021). Given that agriculture is the main source of income for rural household economies, ensuring the adaptation of agricultural practices to climate change variabilities will no doubt enhance both livelihoods of rural farmers and food security (Ifeanyi-obi et al., 2022). Rural dwellers are predominantly farmers and are in close contact with nature by virtue of their farming activities (Etuk et al., 2018). In rural areas, women play a dominant role in the development of agriculture (Federal Ministry of Agriculture and Rural Development, 2019), particularly as agriculture is the primary livelihood of women in rural areas (Glazebrook et al., 2020).

Glazebrook et al., (2020) assert that the agricultural activities of women contribute to national food baskets and consequently to food security in both the global south and global north. Women make substantial contributions to both production and management processes in agriculture (Yan et al., 2022). Indeed, women play important roles at every stage along agriculture value chains. Empirical evidence from Nigeria shows that some of the activities carried out by rural women in agriculture include land preparation, sowing, manure, and fertilizer application, hired labour to earn wages, harvesting, storage and processing as well as the marketing of their farm produce (Ifeanyi-obi & Ibanichuku, 2021).

Women contribute over 70% of agricultural workforce in Nigeria (Federal Ministry of Agriculture and Rural Development (FMARD), 2019). This highlights the important place women occupy in the agricultural sector in the country and further explains the need for gender responsiveness in tackling the threats and risks in the sector. For effective climate change adaptation decisions that will enhance livelihoods and bolster food security in rural Nigeria, socio-economic and traditional factors affecting women must be integrated. Glazebrook et al., (2020) argues that understanding the climate change challenges faced by rural women farmers in Africa as well as other socio-economic factors impacting their adaptation opens novel knowledge transfer pathways. Understanding their perception from the view of their traditional knowledge and inclinations will provide deeper understanding and better guide to planning climate change intervention programmes. Farmers' awareness and perceptions of climate change impacts influences their choice of adaptation strategies and readiness to adapt (Ado et al., 2019; Mitter et al., 2019; Kauê et al., 2018). When farmers are aware and have the right perception of climate change, they become more receptive to available adaptation options.

Aside from the fact that perception is key in determining the adaptive behaviour and responses of farmers, it is also culturally and socially contextual and as such varies from place to place, thus the relevance to study perception in relation to geographical context. Notwithstanding the different prisms of the body of literature on farmers perceptions with respect to climate change, climate change adaptation strategies and responses in Nigeria (Henri-Ukoha, 2020; Ifeanyi-obi & Dasaba, 2020; Onyeneke et al., 2019), there is no evidence of a study that explores the lens of traditional perceptions which influence climate change adaptation-decisions and responses of rural women crop farmers in Southern Nigeria. Therefore, this paper seeks to explore the traditional perceptions influencing climate change adaptation decisions and responses among women crop farmers in Southern Nigeria. Empirical evidence pointing out farmers' perceptions regarding adaptation decisions and responses to climate change is relevant in ensuring that climate change adaptation planning is effective at the local scale (Dendir & Simane, 2021).

Furthermore, it is believed that people's backgrounds which may be cultural, indigenous, traditional, academic exposure, and experiential inclination tend to shape the knowledge, perception and theorization of a concept or phenomenon. The perception of subsistence farmers, including the level of agriculture practised, significantly influences their adaptation strategies to climate change, and the success of their responses to climate change is driven by local context (Sanni, 2019). The cultural values of people shape their perception and actions, and as traditional cultural values are not static, rural people initiate strategies in response to changes and other externalities (Zvobgo et al., 2022) like climate change. As climate change is a phenomenon, it could be said that the local knowledge of crop farmers in the context of their cultural and historical (or inter-generational) relationship with the environment, shape their perceptions of and adaptive responses to climate change (Nguyen & Ahmad, 2021). Hence, the need to understand the traditional perception of climate change phenomenon among rural women as this will contribute in preferring effective solutions to climate risks and threats.

This study leverages Woods et al. (2017) conceptualization and operationalization of the theory of perception and cognitive thinking, and the theory of feminization in agriculture (Glazebrook et al., 2020; Yan et al., 2022) and the applications of the theoretical debates for mainstreaming women in agriculture in the global south, which in this case is the Southern region of Nigeria. The study strengthens the proposition of Glazebrook et al., (2020) that climate change impacts threaten and damage agricultural productivity in Africa, making it necessary to understand women farmers' challenges in order to unpack innovative knowledge transfer pathways. It anchors on the theory of perception and cognitive processes as well as the theory of feminization in agriculture.

Objectives of the study

The broad objective of the study was to assess traditional perceptions of climate change influencing adaptation decisions among women crop farmers in Southern Nigeria. Specifically, the study:

i. ascertained the awareness of and response to climate change phenomenon among rural women;

ii. assessed traditional perceptions of climate change phenomenon influencing adaptation decisions and responses to climate change among women crop farmers; and

iii. determine the relationship between traditional perception of climate change phenomenon and adaptation decisions among rural women crop farmers in southern Nigeria.

Methodology

This study was conducted in Southern Nigeria which covers three of the six geopolitical zones in the country. This includes; South East, South West and South-South geopolitical zones. In selecting sample for the study, multistage sampling procedure was used. In the first stage, two states were randomly selected from each of the three geographical zones in the study area. In the southeast zone, Abia and Enugu state were selected, while Rivers and Akwa Ibom were selected from the Southsouth zone and Oyo, and Osun were selected from the Southwest zone.

The second stage comprised a purposive selection of two agricultural zones from each of the selected states based on the dominance of rural areas to make a total of twelve agricultural zones for the study. The zones selected were Aba and Umuahia for Abia State, Nsukka and Udi/Agwu for Enugu State, Zone 2 and Zone 3 for Rivers State, Etinam and Abak for AkwaIbom state, Ibadan/Ibarapa and Oyo for Oyo state and Iwo and Ife/Ijesha for Osun state.

In the third stage, one agricultural block was randomly selected from each of the selected agricultural zone giving a total of 12 Blocks for the study. The blocks selected includes; Agalaba, Olokolo/Ubakala, Igbo Etiti, Udi, Abua-Odua, Etche/Omuma, Etinam, Ikot Okoro, Oluyole, Kajola, Irewole and Oriade. The fourth stage involved a selection of one agricultural circle from each selected block (12 circles for the study), this includes Ovom, Amakama, Umunaa, Umuoke, Abua odua, Olakwo 1, Ikot Ekpan, Ikot Esikan, Oluyole, Kajola, Agbora and Akola.
The list of all registered rural women engaged in crop farming was accessed from the ADP. Where the list did not exist, it was developed with the aid of agricultural extension agents and village chiefs. From this list, 35 women crop farmers were randomly selected from each circle giving a total of 420 rural women crop farmers for the study.

A structured interview schedule was the major instrument for data collection. This was administered using Open Data Kit (ODK) Collect. This was adopted not only as an environmentally friendly approach, but it also helped to guide the data collection process and ensured effective field survey was conducted. To complement the data collected with the use of the questionnaire, acquire in-depth knowledge on the subject as well as holistic data that provided more information for effective policy decisions, In-depth interview and focused group discussions were also conducted. Six agricultural extension agents (particularly those in charge of crop production) from each of the state used for the study were interviewed.

In addition, one focused group discussion (FDG) was conducted for key village chiefs in each agricultural block used for the study while an in-depth interview (IDI) was conducted for the traditional rulers in the blocks. Data collected were analysed using mean, percentages, and binary logit regression. Awareness of and responses to climate change were captured using simple statements with yes or no responses which were analysed using percentages. The traditional perception of climate change was captured using a four-point Likert-type scale of strongly agree (4), agree (3), disagree (2) and strongly disagree (1) A midpoint of 2.5 (4+3+2+2+1= 10/4) was obtained. The decision rule was that mean values equal to or above 2.5 mean agreement with the statement while mean values below 2.5 mean disagreements with the statement. The relationship between traditional perception of climate change phenomenon and adaptation decisions among rural women crop farmers in southern Nigeria was analysed using Binary Logit Regression analysis. The Model specification for the regression is stated as:

$$C_{ij} = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + u$$

C_{ij}, = Decision to adapt (Dummy variable:1 if the rural woman crop farmer has taken decision to adapt and 0 otherwise.
X_1 = Marital status (Married = 1, Single = 1)
X_2= Age (years)
X_3= Educational status (no formal education = 0, formal Education = 1)
X_4 = Major occupation (farming = 1, non-Farming = 0)
X_5 = Household size (number of persons in the household)
X_6 = Farming experience (number of years spent farming)
X_7 = farm size (Ha)
X_8 = Monthly income from farming activity (Naira)
X_9 = Membership of cooperative (yes = 1, no = 0)
X_{10} = Access to credit (yes = 1, no = 0)
X_{11} = Pooled index of Traditional perceptions of climate change phenomenon, measured with a 4-point-likert type scale of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1)
u = stochastic error term.

Results and Discussion

Awareness of and Response to Climate Change among Women Crop Farmers

The result in Table 1 shows that 98% of the respondents were aware of climate change with 89% indicating that they had deliberately decided to adapt their farming activities to climate change. Approximately 81% have supported their decision with action by intentionally adopting any of the climate change adaptation strategies available to them. On the other hand, 85.5% agreed that the nature and level of knowledge of climate change affect their responses to climate change effects. This result shows that the women crop farmers are aware of climate change and as well taking action to respond to the effects of the climate change phenomenon

This corroborates the finding of Akinbami et al (2019) that rural women in Nigeria have high levels of awareness of climate change and further highlighted that women in crop farming show an understanding of climate change better than women in other livelihoods.

Table 1: Awareness of and response to climate change among women crop farmers

Statements	Percentage
Aware of change in climate	99
Have you ever taken a decision to adapt your farming activities to climate change	89
Have you ever intentionally responded to climate change by implementing any of the available climate change adaptation strategies	81
Do you think the nature of knowledge of climate change you possess affect your response to climate change	85

Source: Field Survey, 2021

Traditional perceptions of climate change phenomenon influencing behavioral responses to climate change among women crop farmers

From the focused group discussion held, it was gathered that most of the beliefs and understanding of climate change among women crop farmers are based on their personal experiences in the course of their farming. The majority of them are yet to undergo any form of training on climate change.

Result in Table 2 shows that women crop farmers traditionally perceive climate change phenomenon to be caused only by rainfall and temperature ($\bar{x}$ = 3.97), man's careless handling of his environment ($\bar{x}$ = 2.97), violation of traditional farming rituals ($\bar{x}$ = 2.72) and God's anger on mankind ($\bar{x}$ = 2. 65). Though existing data shows that rainfall and temperature are among the major variables causing climate change (Aryal & Marenya, 2021)), it is erroneous for women crop farmers to believe that only rainfall and temperature are responsible for the change in the climate. This erroneous perception of climate change by farmers could limit their participation in other adaptive strategies not addressing rainfall and temperature fluctuation.

Table 2. Traditional perceptions of climate change impacting women crop farmer's adaptation decisions

Traditional perceptions of climate change influencing adaptation decisions	Mean	Standard Deviation
Rainfall and temperature are the only climate variables causing all changes in climate	3.07*	1.8
Man's careless handling of his environment is the only cause of climate change	2.97*	1.9
Climate change is too complex to understand	2.83*	1.6
Violation of traditional farming rituals is the cause of climate change	2.72*	1.7
Adherence to traditional farming rites is the major solution to climate change	2.66*	1.5
Climate change is a result of God's anger	2.65*	1.5
Only the gods can stop climate change	2.58*	1.2
My farming activities/methods can not contribute to climate change	2.51*	
We do not have the capacity to help reduce the changing climate	2.16	1.1
Human beings do not have the power to influence climate change	2.15	1.1
Climate change is part of events ushering at the end of the world hence man cannot influence it	2.00	0.9
Adoption of irrigation practice is the only solution to climate change	1.88	0.8
Only scientists and government can bring a solution to climate change	1.85	0.8
Climate change is a deceit by the government and researchers	1.72	0.6
We do not need any help from outsiders, we have local strategies to deal with climate change	1.62	0.5

Source: Field survey, 2021: *$\bar{x}$ ≥ 2.5.

The result further showed that women crop farmers perceive climate change to be too complex to understand ($\bar{x}$ = 2.83) and adherence to traditional farming rites to be the major solution to climate change ($\bar{x}$ = 2.66). They also believe that their farming activities can not contribute to climate change, it is only the gods that can stop climate change ($\bar{x}$= 2.58). Farmers' perception of climate change is known to influence their response to climate change (Sekelemani et al, 2020) and access to climate services (Diouf et al, 2019). This buttresses the dangers of erroneous perceptions of climate change by farmers as it could affect their willingness to access available adaptation support services.

Awareness and perceptions of climate change influence both farmers' readiness to adapt and the adaptation strategies adopted. Hence, the erroneous perceptions of climate change by women crop farmers identified in this study should be a source of concern to the agricultural system in Nigeria as these rural women may not be disposed to accept viable adaptation strategies available to them owing to their

wrong perceptions of causal factors and solutions to climate change. Also, this may go a long way in affecting their commitment to intervention programmes channelled towards alleviating climate change impacts since they believe that their farming activities do not contribute to climate change nor their efforts needed to mitigate climate change. Singh, et al (2018) in their study of Micro-level perception of climate change and adaptation issues in India noted that a better understanding of micro-level perceptions is imperative for effective and informed climate change adaptation planning at the macro-level. This is further highlighted in Singh (2020).

Furthermore, Kumar et al, (2021) noted that analysis of farmers' perceptions of climate change is a prerequisite for assessing their adaptation decisions. Traditional beliefs are known to influence farmers' understanding and response to threats and risks in their environment; hence, the need to understand their traditional perceptions of climate change as this could offer more insight into their response to available climate support services. Jellason et al (2020) found farmers' cultural beliefs and practices to influence their adaptation behaviour and advocated that adaptation designs should address cultural influences to avoid counterproductive responses that are capable of heightening vulnerability. In the same vein, Nguyen and Ahmad (2022) highlighted that traditional knowledge plays a significant role in the climate change adaptation of rural people and recommended that policymakers should consider traditional knowledge and perceptions in designing and formulating climate change policies.

Relationship between women crop farmers' traditional perception of climate change phenomenon and their decision to adapt

Table 3 shows the Binary Logit regression analysis which measured the relationship between rural women's traditional perception of climate change phenomenon and their decision to adapt. The Nagelkerke R-square value of 0.720 indicates that the combined effects of all the independent variables in the model explained 72% of the variation in the rural women's decision to adapt to climate change. The model is statistically significant, indicating that the independent variables estimated distinguished rural women who have taken the decision to adapt to climate change and those who have not (Chi-square = 435.033).

From the result, level of education, access to credit, the traditional perception of climate change phenomenon, farm size and membership in cooperative society were found to influence rural women crop farmers' decision to adapt to climate change. The coefficient for educational status is positive and significant at 5% implying that more educated rural women are more likely to take decisions to adapt to climate change. Educational status has been identified to influence farmers' decisions and attitudes towards farming activities, particularly in climate change issues. Farmers who are more educated seem to understand better issues of climate change and are more likely to take innovative actions. Marie (2020) found farm size to be among other factors influencing farmers' choice of adaptation strategies. Similarly, Esfandiari et al (2020) found educational level and farm size among other factors significantly affect farmers' decision to apply adaptation practices.

Table 3: Relationship between rural women crop farmers' traditional perception of climate change and their responses to adaptation

Variables	Coeff	Std. Error	Z-Stat
Marital status	1.379	0.593	0.632
Age	0.013	0.028	0.691
Educational status	0.176	0.079	2.233**
Major occupation	0.031	0.035	0.313
Household size	0.012	0.044	0.377
Farming experience	0.025	0.059	0.385
Farm size	1.344	0.861	1.898**
Monthly income from farming activities	0.201	0.311	1.032
Membership of cooperative society	3.766	1.152	3.212***
Access to credit	1.275	0.391	3.399***
Traditional perception	0.955	0.279	3.439***
Constant	**-25.867**	**2123.514**	**-0.011**
Omnibus Test Chi Square	**435.033**		
Prob>chi square	**0.000**		
Nagelkerke R-square	**0.720**		

***** Significant at 1%; ** Significant at 5%**

Access to credit facilities was also found to be positive and significant at 1% implying that the more rural women have access to credit facilities, the more likely they will take decisions to adapt to climate change. This is not surprising as most of the rural women noted that finance was a major constraint to their decision to take up adaptation measures, particularly the use of improved varieties of crops. They noted that some of the improved seedlings and crop species are far more expensive than the native varieties they use. In addition, it was also noted that preserved produce from some of the improved varieties cannot be planted in subsequent years making the farmers rely perpetually on the suppliers of this seedling for planting. The cost implication of this is also above the level of income of rural women. This finding corroborates the findings of Ullah (2020) that farmers' access to credit is key to their adoption of improved technologies.

The traditional perception of climate change was also positive and significant at 1%. Traditional knowledge holds key to climate change (Vo, 2021), particularly among rural people who are known to have strong inclinations towards the traditional belief systems. Certain religious beliefs and traditional norms could prevent the use of viable adaptation options available to farmers (Spear, et al 2019). Hence, a system that understands and integrates traditional knowledge and perceptions in climate change discourse will be more acceptable and easily adopted by the rural women.

Farm size and membership of cooperative society were also found to be significant. This is not surprising as rural women who own larger farm sizes are more disposed to adopt innovative farming practices, unlike their counterparts with small farm sizes. On the other hand, membership of cooperative society is known to facilitate farmers' access to information and other resources through networking and corroborating with other members of the cooperative societies. Farmers easily access loans from

financial institutions when they operate as a cooperative society rather than individual farmers. This is similar to the findings Mwinkom et al (2021) which found farm size, gender, farmer-based-organizations membership, age, household size, farm income, years of education and climate change awareness as the influencing factors to households' adaptation to the changing climate. In the same vein, Alhassan et al, (2018) found years of education, farming experience, and membership of farmer group to positively and significantly correlate with adaptation measures used by farmers in Northern Ghana.

Conclusion and Recommendations

Rural women are quite aware that there is climate change but unfortunately are yet to take meaningful deliberate actions to adapt to the changing climate. Their decision to respond to climate change is influenced by their level of education, access to credit, the traditional perception of climate change phenomenon, farm size and membership of the cooperative society. A detailed analysis of these factors will provide a credible baseline for informed intervention agenda that can drive successful adaptation. Rural beliefs and perceptions are strong influencing factors in rural people's attitudes and behaviour. Bearing this in mind, adaptation initiatives must take cognizance of the traditional perceptions of the concerned people for adaptation efforts to be successfully embraced by the rural people. However, training rural women on climate change phenomenon is necessary for effective response to climate change. Government parastatals, intervention agencies and universities through their community engagement programme could facilitate this knowledge upgrade. Agricultural extension service providers in the region should leverage existing cooperative societies in rendering their services. This could facilitate access to climate change information among rural women as well as the process of climate change decision making among rural women.

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