Journal of Agriculture and Food Sciences
Volume 21, Number 2, October 2023, p p 121 - 134

PERCEPTIONS OF CLIMATE CHANGE-RELATED DISASTERS AND IMPACT ON HOUSEHOLD FOOD SECURITY IN RURAL FARM HOUSEHOLDS IN IMO STATE, NIGERIA

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ABSTRACT

This study investigates the perception of climate change-related disasters and their impact on household food security in rural farm households in Imo State, Nigeria. Studies have consistently shown an association between climate change and food insecurity in different parts of the world. However the impact of climate change varies over time and space and therefore cannot be generalized. If household food security is to be secured in Imo State, it becomes imperative to identify the specific climate change related disasters that adversely affect household food security as well as the intervention priorities in specific communities. The study utilizes descriptive analytical tools to analyze the data from 186 farm households across four agricultural communities in the state. Findings reveal that excessive rainfall leading to flooding is the most prevalent climate change-related disaster, followed by excessive heat and irregular rainfall patterns. A significant majority of respondents attribute household food insecurity to these climate change-related disasters at high or very high levels. Various mitigation strategies adopted by households include changes in farming practices, irrigation methods, crop replacement, and land modification techniques. The study also identifies top priorities for government intervention as improving drainage and irrigation systems, establishing community weather forecast centers, and providing fertilizer subsidies. Additionally, enhancing hedging technology and pest/disease control strategies were recognized as important interventions. The study emphasizes the importance of tailored interventions, continuous data collection, and awareness campaigns to enhance agricultural resilience and ensure food security in the face of climate change impacts.

Keywords: Climate change, disasters, food security, adaptation, strategies, government intervention
https://dx.doi.org/10.4314/jafs.v21i2.9

INTRODUCTION

Globally, climate change constitutes both social and environmental problem facing mankind, though the experience varies in nature and intensity over time and space. Climate change refers to any change in climate over time, whether due to natural variability or as a result of human

activity (IPCC, 2007). The change in climatic conditions is attributed to the activities of man such as emission of gases from automobiles, bush burning, industrial activities and deforestation among others (Ekpenyong & Ogbuagu, 2015; Kupfer & Karimanzira n.d; Idumah, Mangodo, Ighodaro & Owombo, 2016; Pendimo, 2017). By the same token, the outcome of change in climate eventually impacts man and his environment in diverse ways.

Climate change is acknowledged to pose great threat on agricultural production and food system in many parts of the world (FAO, 2015; Hilda, 2019; Ali[1],Ali [2], Sundas, Xiling, Xuekun, Yan, & Jinsong, 2019). The change in climatic condition has both direct and indirect impacts on agricultural production and by extension food systems. Direct impacts according to FAO, (2015) include effects on various agricultural production systems caused by changes in physical factors like temperature ranges and rainfall patterns. The productivity is impacted by indirect effects when other species, including as pollinators, pests, disease vectors, and invasive species, are altered.Its adverse effect on agriculture and food system has been widely reported by researchers. For instance, Atitsogbey, Steiner-Asiedu, Nti and Ansong (2018) reported the negative impact of climate change on household food security in the Bongo District of the Upper East Region of Ghana. Zakari, Mohammed, Medugu and Sandra (2014) observed a significant relationship between crop yield on one hand and rainfall and temperature on the other hand, in Abuja, Nigeria.

In spite of the considerable efforts made so far during the last several decades to address the food security problem , it is reported that as of 2015 almost 800 million people are still chronically undernourished (FAO, 2015; Concern Worldwide, 2019). This is partly attributed to the impact of climate change. Climate change impacts include increased temperature, flooding, land degradation, soil erosion, changes in water availability, biodiversity loss, pests and disease outbreaks among others. Nevertheless, these impacts vary in nature over time and space. According to the reports by FAO (2008), these impacts will result in additional food insecurities, particularly for the resource poor in developing countries who cannot meet their food requirements through market access. This situation is likely to be worse in rural communities where majority of the occupants depend directly or indirectly on subsistence agriculture for their livelihood. According to the International Fund for Agricultural Development (IFAD), cited in FAO, (2015), at least 70 percent of the very poor live in rural areas, most of them depending partly (or completely) on agriculture for their livelihoods. Whereas small holder farmers have limited financial capacity to purchase foods at the ever increasing market price, and therefore are likely to rely largely on their own production, arguably they are the most vulnerable to climate change related disasters. This is because climate change related disasters reduce agricultural activities, productivity and income level of households.

In recent times, increase in climate change related disasters such as excessive rainfall, excessive heat and wind are observed in Imo State. Studies (Offor, 2009; Umunnakwe,Ozor & Nnadi, 2015; Chidiebere-Mark, 2019) identified various adaptation measures of farmers in Imo State. It is an indication that adaptation strategy varies and therefore cannot be generalized.If household

food security is to be secured in Imo State, it becomes imperative to identify and improve mechanisms adopted by rural farm households, to cope with the challenges of climate change related disasters.

Food security is defined as having "physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (World Food Summit, 1996; Kerry, 2023). Household food insecurity by implication refers to unavailability of food, insufficient purchasing power, inappropriate distribution, and inadequate use of food at the household level.

Studies (Ekpenyong et al, 2015; Idumah et al, 2016; Pendino, 2017; Ani, Anyika, & Mutambara, 2022) show that in Nigeria, climate change adversely impacts on agricultural productivity, thus resulting in decline in food production and supply. Available literature (FAO IFAD, UNICEF, WFP, and WHO, 2021) consistently show an association between climate change and food insecurity in different parts of the world. In Imo State, increase in climate change related disasters such as high temperature, excessive rainfall, wind and flooding have been consistently observed. It is also observed that food crops are becoming more scarce and expensive in Imo State. Studies (Odoemela & Ajuka, 2012; Duru & Obiechefu, 2013; Okorie, Njoku, Iwuji & Onweremmadu, 2019) in different parts of Imo show a negative impact of climate variability on household food security. It is widely acknowledged that the impact of climate change varies over time and space and therefore cannot be generalized.If household food security is to be secured in Imo State, it becomes imperative to identify the specific climate change related disasters that adversely affect household food security status as well as their intervention needs. In addition, the extent to which households perceive climate change related disasters as a threat totheir food insecurity remains uncertain.Therefore, this study sought to identify the particular climate change related disasters that adversely affect food security status of farm households in the area, as well as ascertain the extent to which household food insecurity can be attributed to such disasters. The study also examined the mitigation strategies adopted by the households as well as identified perceived intervention needs of the rural farm households.

This study therefore seeks answers to the following questions:

i. what is the socioeconomic characteristics of farmers in the selected communities
ii. what are the climate change related disasters perceived to adversely affect the food security status of rural farm households in the selected communities?
iii. to what extent do households attribute food insecurity to the climate change related disasters in the study area?
iv. what are the strategies adopted by the rural households to adapt to the impact of the disasters?
v. what are the intervention measures needed to build resilience among rural farm households in the area?

METHODOLOGY

The study is a cross sectional survey, conducted in 4 purposively selected communities. The selection was based on active involvement in agriculture. The communities selected were Umuagwo in Ohaji/Egbema LGA, Akaboh in Oguta LGA, Uzoagba in Ikeduru LGA, and Elelem in Ngor-Okpala. The study used a semi structured questionnaire.A Cronbach's Alpha of 0.86 was derived in the reliability test, which implies a relatively high level of internal consistency among the items in the questionnaire. The researchers collected and analysed data on household experiences spanning over 3 farming seasons (3 years). A total of 50 farm households were selected from each of the 4 sampled rural communities through snowball method, which accounted for a total of 200 copies of the questionnaire administered. The study employed purposive and snowball sampling techniques to select the respondents. Heads of households whose main source of livelihood was agriculture qualified to be involved in the study. At the end, only 186 copies of the distributed questionnaire were completed and returned, thus making a total of 186 copies of the questionnaire analyzed. The data were analyzed using descriptive statistics.

RESULTS AND DISCUSSION

Socio-demographic characteristics of the farmers

The results of the socio-economic characteristics are presented in Table 1below:

The distribution of farmers based on gender showed that 40.9% were male, while 59.1% were female. This indicates a higher representation of females in the study, possibly reflecting their active involvement in farming activities. The age distribution of the respondents revealed that 5.4% were below 30 years; 6.5% were between 30-40 years; 31.7% werebetween 41-50 years; while 56.5%, were between the ages of 51 years and above. The majority of respondents fall into the 51 years and above category, suggesting that the rural communities studied have a significant population of older individuals in farming. This trend may have implications for the ability of these communities to adapt to climate change impacts.The study found that 84.4% of the respondents were married, while 15.6% were unmarried. This indicates that the majority of the respondents have a partner, potentially implying greater family support systems. The distribution of respondents based on farming experience revealed that 66.7% had more than 12 years of farming experience, 25.3% had 8-11 years of experience in farming, while 8.1% had farming experience of 4-7 years. This is an indication that majority of the respondents have extensive farming experience (more than 12 years), which could be a valuable resource in dealing with the challenges posed by climate change. However, a smaller proportion has limited experience, which may result in inability to cope with the situation. The respondents' educational backgrounds showed that 3.8% had no formal education, 28.0% had primary education, and 40.9% obtained secondary education while 27.4% reached tertiary education. This implies that a significant percentage of respondents have at least a secondary education, which could contribute

to their capacity to adapt to climate change. However, there is still a notable percentage with no formal education.In terms of family size, the distribution was as follows, family size of 1-4 persons was 45.2%, family size of more than 4 persons were 54.9%. The majority of households have family sizes greater than 4 persons. This could indicate increased labor availability for farming activities but may also raise concerns about food security challenges if climate change negatively impacts their agricultural productivity.

Most frequently observed climate change related disasters

The results of the distribution of farmers, based on theobserved prevalent climate change-related disasters observed are presented in Table 2. The highest percentage of respondents (28.5%) identified excessive rainfall accompanied by flooding as a major climate change-related disaster in the area. This indicates that flooding resulting from heavy rainfall is a significant concern for the communities, likely impacting their livelihoods and infrastructure.

The second most frequently observed climate change-related disaster reported by the farmers was excessive heat,accounting for 22.6%. This finding suggests that rising temperatures and prolonged heat waves are perceived as a considerable threat to the community, possibly affecting agriculture and overall well-being. Excessive rainfall combined with erosion was reported by 15.1% of farmers. Erosion caused by heavy rainfall can lead to land degradation and loss of arable land, impacting agriculture and the community's resilience.

A considerable proportion (11.8%) of the farmers has reported excessive rainfall without associated flooding or erosion as a climate change-related disaster. This implies that even without immediate flooding, excess rainfall can have adverse effects on agriculture in the sense that it would disrupt faming activities in the area.

Excessive wind was noted by 11.3% of farmers,indicating that strong winds and storms are also notable climate change-related disaster in the area. These events could cause damage to infrastructure and crops, affecting the community's livelihoods.

Scarcity of rainfall was reported by only 8.6% of the farmers, indicating concerns about irregular and insufficient rainfall patterns. This scarcity can negatively affect agriculture, particularly rain-fed farming systems.

A smaller percentage (2.1%) of farmers reported an increase in crop pests and diseases, likely exacerbated by changing climatic conditions. While the percentage is low, it still indicates a concern for agricultural productivity and food security. This finding agrees with the findings of Okorie, (2015), and Okoroafor, et al, (2021)that the prevalent climate change-related disasters in Imo State are flooding and its associated consequences.

Level of Attribution of Household Food Insecurity to Climate Change Related Disasters.

The results of the distribution of farmers based on the level of attribution of household food insecurity to climate change-related disasters are presented in Table 3. It categorizes the responses into four levels: Very high, High, Low, and Very low, along with the corresponding

frequencies and percentages. The results show that majority of respondents (36.6% + 45.2% = 81.8%) attribute household food insecurity to climate change-related disasters at the high or very high levels. This suggests that a significant portion of the surveyed population perceives climate change as a significant factor contributing to food insecurity in their households. Numerous studies (FAO IFAD, UNICEF, WFP, & WHO, 2021; Ani, Anyika, & Mutambara, 2022) have also highlighted the link between climate change and food security. A smaller proportion of respondents (11.8%) attribute household food insecurity to climate change-related disasters at the low level, while an even smaller percentage (6.5%) attribute it at the very low level. This suggests that a minority of the respondents do not perceive climate change as a significant contributor to food insecurity in their households. Studies (FAO, 2015; Pretty & Reddy, 2023; Amelia & Tri, 2023) have found that perceptions of climate change impacts on food security can vary widely depending on factors such as location, socioeconomic status, and awareness. These variations in perception may explain the lower levels of attribution observed in the survey.

Mitigation strategies adopted by the households against the impact of the disasters

Based on the data presented in Table 4 below regarding strategies adopted by households to mitigate the impact of disasters, the most common mitigation strategy adopted by households is "Making big mounds/fat ridges", accounting for 19.4% of the total responses. Other frequently adopted strategies include "Changing planting/replanting/weeding periods" and "Use fertilizer and also make big mounds", each with a frequency of 21 households (11.3%). Strategies related to soil and water management, such as "Mulching" and "Use of local irrigation method" are being employed by 9.7% and 9.1% of the households, respectively. These strategies are essential for maintaining soil health and optimizing water use.

Crop-related strategies, including "Replacement of damaged crops" and "Use of short stem variety" are being used by a smaller percentage of households (4.8% and 7.5% respectively), suggesting a focus on crop resilience and adaptation.

Some households are adopting multiple strategies simultaneously, such as combining the use of fertilizer with making big mounds with a frequency of 21 households (11.3%).

"Use of local drainage system (e.g., rechanneling of waterway)" and "Planting hedging"are strategies adopted by 11.3% and 7.0% of households, respectively, indicating a focus on managing water flow and creating protective barriers.

About 8.6% of households reported having no specific adaptation strategy, highlighting the need for targeted interventions or awareness programmes to enhance disaster resilience in these households. The mitigation strategies adopted by households therefore emphasizes the diversity of approaches taken to mitigate disaster impacts. Similarly, the findings by Okoroh, Olaolu, & Igbokwe, (2016) reveal that farmers adopt a number of strategies to lessen the effects of climate change. Given their perceptions, these farmers must have tried these strategies and concluded that they were effective.

Perceptions of the households about Government intervention priority

The result in Table 5 shows that thehighest percentage of the farmers (39.8%) prioritize the improvement of drainage systems, indicating a significant concern among the households regarding the need for effective drainage to mitigate water-related issues such as flooding and waterlogging. The second most prioritized intervention, identified by 26.9% of the farmers, is the improvement of irrigation systems. This suggests that a considerable portion of the households recognizes the importance of reliable and efficient irrigation for agricultural productivity and water management. About 17.2% of the farmers consider the establishment of a community weather forecast center as a priority. This indicates a recognition of the importance of accurate weather forecasting for effective agricultural planning and risk management. A smaller but notable proportion (7.0%) of the respondents prioritize a fertilizer subsidy. An indication that a segment of the households sees subsidized access to fertilizers as a crucial intervention to mitigate climate change related disasters. A smaller percentage (5.9%) of farmers prioritizes improved hedging technology. This indicates a lesser focus on financial risk management or hedging strategies compared to other agricultural interventions. The lowest proportion of farmers (3.2%) prioritizes subsidies for pest and disease control technology. This suggests that there is less emphasis on financial support for pest and disease management compared to other interventions. However, according to the study by Okoroh et al (2016) the prioritized mitigation strategies employed by farmers in their study area include reduction in the use of generators for power in their houses, crop rotation practices, growing drought-resistant crop varieties, planting deeper into the soil to avoid heat stress.

CONCLUSION

The study highlights the most frequently observed climate change-related disasters in the study area, with excessive rainfall causing flooding being the most significant concern. Other notable concerns include excessive heat and irregularity of rainfall. It's evident that the local population perceives these climate change-related disasters as threats to their livelihoods and well-being.A substantial proportion of the farmers attribute household food insecurity to climate change-related disasters at high or very high levels, and a range of mitigation strategies adopted by households, including changes in farming practices, irrigation methods, crop replacement, and land modification techniques were highlighted. The top priorities identified by households for government intervention include improving drainage systems and enhancing irrigation systems. Establishing a community weather forecast center in local language and providing fertilizer subsidies, were also recognized as important. These findings suggest a need for substantial investment in infrastructure, especially regarding water management and accurate weather forecasting, using local language.The researchers suggest a multifaceted approach to enhance agricultural resilience in the face of climate change. We recommend that governments should prioritize investments in drainage, irrigation systems, and rain harvesting to mitigate the impact of excessive rainfall and ensure consistent water availability for agriculture. Additionally, the

establishment of community weather forecast centers, using local languages and leveraging technology, is recommended to provide timely and accurate weather information for effective agricultural planning. Affordability and accessibility of fertilizers should be addressed through governmental policies to enhance agricultural productivity. Agricultural stakeholders are urged to conduct awareness campaigns on improved hedging technology and pest/disease control strategies. There is need for continuous data gathering and research to understand evolving perceptions and needs related to climate change, emphasizing the need for tailored policies and interventions. Finally, ongoing monitoring and evaluation are deemed essential to adapt interventions and policies based on changing circumstances and emerging priorities within the region.

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APPENDICES

Table 1: Distribution of Socioeconomic Characteristics of the Farmers

Variable	Frequency	Percentage
GENDER		
Male	76	40.9
Female	110	59.1
AGE		
Below 30 years	10	5.4
30-40 years	12	6.5
41-50 years	59	31.7
51 years and above	105	56.5
MARITAL STATUS		
Married	157	84.4
Not married	29	15.6
FARMING EXPERIENCE		
4-7 years	15	8.1
8-11 years	47	25.3
12 years and above	124	66.7
LEVEL OF EDUCATION		
No formal education	7	3.8
Primary education	52	28.0
Secondary education	76	40.9
Tertiary education	51	27.4
Family Size		
Alone	29	15.6
2-4	55	29.6
5-7	60	32.3
8 and above	42	22.6

Table 2. Distribution of Farmers based on Most Frequently Observed Climate Change Related Disasters in Rural Communities

Variables	Frequency	%
Excessive rainfall with flooding	53	28.5
Excessive heat	42	22.6
Scarcity of rainfall	16	8.6
Excessive wind	21	11.3
Excessive rainfall with erosion	28	15.1
Excessive rainfall without flooding/erosion	22	11.8
Increased crop pests/diseases	4	2.1
Total	186	100

Table 3. Distribution of Farmers based on Level of Attribution of Household Food Insecurity to Climate Change Related Disasters.

Responses	Frequency	percentage
Very high	68	36.6
High	84	45.2
Low	22	11.8
Very low	12	6.5
Total	186	100.0

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Table 4. Distribution of the Farmers based on Mitigation Strategies Adopted against the Impact of the Disasters

Variables	Frequency n = 186	%
Make big mounds/fat ridges	36	19.4
Mulching	18	9.7
Use local irrigation method	17	9.1
Replace damaged crops	9	4.8
Change planting/replanting/weeding periods	21	11.3
Use short stem variety	14	7.5
Use fertilizer and also make big mounds	21	11.3
Planting hedging	13	7.0
Use local drainage system (e.g rechanneling of water way)	21	11.3
No adaptation strategy	16	8.6

Table 5. Distribution of the Farmers based on Prioritized Government Interventions

Variables	Frequency n = 186	%
Improve drainage system	74	39.8
Need for improved irrigation system	50	26.9
Establishment of community weather forecast center	32	17.2
Fertilizer subsidy	13	7.0
Improved hedging technology	11	5.9
Subsidize pest/disease control technology	6	3.2