

INTERNATIONAL JOURNAL OF AGRICULTURE, MANAGEMENT AND TECHNOLOGY



Vol 7(1) 2023

Published by
Federal College of Agriculture,
Ishiagu Ebonyi State

CHALLENGES FACED BY ROOT AND TUBER CROPS FARMERS IN ADAPTING TO CLIMATE CHANGE: A CASE STUDY OF IKWUANO, ABIA STATE NIGERIA

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ABSTRACT

This study was conducted to understand the challenges faced by root and tuber (R&T) crops farmers in Ikwuano Local Government Area (LGA) in Abia, Nigeria as they adapt to climate change. Both primary and secondary data were collected for the study. Primary data were obtained through a structured questionnaire administered during a field survey in 2022, while secondary data were gathered from the archive of the Agromet Unit at the National Root Crops Research Institute (NRCRI), Umudike. The results of the study showed that a significant proportion of respondents (52%) agreed that climate change has led to an increase in the number of rainy days with high intensity and changes in the timing of the wet season (49.6%). Additionally, a significant number of respondents (43.2%) also agreed that climate change has caused an increase in temperature and a decrease in crop yield. The study also found that major challenges faced by farmers in adapting to climate change include lack of collateral to secure available credit facilities (91.2%), scarcity and poor access to fertilizers (81.6%), poor storage facilities (76.8%), and low soil fertility (73.6%). In order to mitigate and adapt to these challenges, farmers reported using various strategies, including chemical fertilizers and pesticides (78.4%), improved varieties (74.4%), mulching or cover cropping (57.6%), and intensive use of organic manure (54.4%). Overall, this study observed that a farmer's ability to adapt to climate change depends on their perception of the phenomenon, the availability of solutions, and the opportunities provided to them. It is important for policymakers and other stakeholders to consider these challenges and to provide support and resources to help farmers in Ikwuano LGA adapt to climate change.

Key words: Climate change, Ikwuano, Root & Tuber Crops, farmers

1. INTRODUCTION

Agriculture is extremely vulnerable to climate change by making agricultural development in Africa more challenging and has caused substantially to food insecurity in Nigeria. Farmers are faced with the challenges of high rate of land degradation causing enhanced desertification and nutrient deficient soils. The unprecedented hike in temperature has resulted in increased events of droughts, floods, irregular patterns of precipitation, heat waves and other extreme happenings throughout the globe resulting in low crop yields including root and tuber crops, thereby increasing food prices, and reducing food production.

Root and tuber crops farmers in Nigeria are faced with various effects of climate change, ranging from the increase in flooding, drought and general rainfall fluctuation experienced in the country in the past few years. These effect results in reduction in nutritional value, taste and quality to low yield which could lead to food insecurity. Unfortunately, as in the past yesteryears, the climate cannot be predicted because there is no succinct separation in the rainy and dry

seasons in the recent times, leading to heavy loss of planted crops for farmer that are still rely on conventional on the fluctuating climate signals for the farming activities.

Both natural and human systems in all continents have experienced the impacts of climate change though the evidence is more pronounced in natural systems (IPCC, 2014). Climate Change and its impacts, especially in agricultural activities come as a result of changes in weather components over a long period of time, (Nzeh et al., 2015)

UN global climate change assessment reports that fossil fuels – coal, oil and gas – are by far the largest contributor to global climate change, accounting for over 75 per cent of global greenhouse gas emissions and nearly 90 per cent of all carbon dioxide emissions. As greenhouse gas emissions blanket the Earth, they trap the sun's heat (radiation). This leads to global warming and climate change. The world is now warming faster than at any point in recorded history. Warmer temperatures over time are changing weather patterns and disrupting the usual balance of nature. This poses

many risks to human beings and all other forms of life on Earth. The IPCC Fourth Assessment Report observes that Africa is one of the most vulnerable (due to its physical and socioeconomic characteristics) continents to the changes in climate.

This is mainly as a result of their low adaptive capacity and numerous stressors. It also noted several African countries will experience severe decrease as much as 50% in their agricultural production by the year 2020 with worst impact on subsistence farmers, thereby adversely affecting the continent's food security.

Similarly, the Food and Agriculture Organisation (FAO, 2010) noted that climate change militate against the progress made in African's economy as huge number of resources are been invested in adaptation issues. Thus, the resource base of farmers are likely to be affected, this may worsen the situation and create food insecurity problems.

In Nigeria, the impact of this change in climate are become-ng more intense, this is occasioned by the increase in flooding, drought and general rainfall fluctuation experienced in the country in the past few years. Specifically, in Root and tuber Crops (R&Ts) production, Ukonze (2012) identified many effects of climate change on R&Ts (specifically cocoyam) production ranging from reduction in nutritional value, taste and quality to low yield. The climate is no longer predictable as in the olden days where rainy and dry seasons are succinctly separated. Unfortunately, majority of the farmers still rely on the fluctuating climate signals for the farming activities resulting in heavy loss of planted crops. Nigerian Meteorological Agency, (NIMET, 2010, 2012) stated that "if the present trend of climate variability continues, it is likely that the frequency and intensity of weather-related disasters may increase in the years ahead". Observations have shown that the climate variability trend has continued to progress over the years. This highlights the cogent need of developing effective and sustainable mitigation and adaptation measures in the country. "Although Nigeria, like other developing countries, is not required under the current global climate change negotiations to take on emission reduction commitments (mitigation), it nevertheless has to adapt to the expected impacts of anticipated climate change", (Oladipo, 2010). This makes adaptation the major response to climate change in Nigeria. Varying adaptation options have been identified by different researchers in different parts of the country, as well as those developed by the farmers through experience over the years.

Eriksen et al. (2010) noted that though adaptation can significantly minimize the undesirable impacts of climate change, enough attention is yet to be paid to the outcome of these adaptation practices as regards sustainability. They explained "that in some cases, what seems to be a successful adaptation strategy to climate

change may, in fact, undermine the social, economic and environmental objectives associated with sustainable development for instance strategies or policies that make sense from one perspective, or for one group, may at the same time reduce the livelihood viability or resource access of other groups; likewise, an eagerness to reduce climate risk through specific technologies or infrastructural changes may sometimes lead to the neglect of other environmental concerns, such as biodiversity, hence, adaptation can have unintended negative effects both on people and on the environment" (Næss et al., 2005; Eriksen and O'Brien, 2007; Eriksen and Lind, 2009).

In addition, majority of the studies relating to agriculture and climate change in Africa concentrated on impacts and corresponding coping/adaptation strategies as well as projections with less attention given to the challenges of adaptation (Enete and Amusa, 2010). These incomplete assessments are not suitable enough to provide comprehensive insight into farmers adaptation constrains. To effectively achieve food security goals, it is important to also assess these areas of agriculture and climate change. Furthermore, "the vulnerability of agriculture is not determined by the nature and magnitude of environmental stress like climate change alone, but by the combination of the societal capacity to cope with and/or recover from environmental change" (Wisner et al., 2004).

Against the foregoing backdrop, this study assessed the challenges (R&Ts) farmers faced in climate change adaptation in Ikwuano, Abia State, Nigeria. It described the socio-economic characteristics of the (R&Ts) farmers, examined sources of climate change information and differences in challenges faced by (R&Ts) farmers in adapting to climate change in their different states.

Hence, this project aims to evaluate challenges faced by root and tuber crop farmers in adapting to climate change in Abia State Nigeria.

2. METHODOLOGY

The study was conducted in Ikwuano Local Government Area of Abia State, Nigeria. Ikwuano Local Government Area is a major food producing area in Abia State as shown in Figure 1. It is located between latitude 50 24'N to 50 30' E and longitude 70 32' N to 70 37' E (Chukwu, 2013). The climate is influenced by the three major air masses namely; the equatorial Maritime, the Equatorial Estuaries and the Tropical continental air masses" (Mbakwe et al., 2004). Rainfall is the key climatic variable. Loamy soil is the predominant soil type while mixed cropping is the major cropping system, (Unamma et al., 2004). Locally manufactured farm tools are still predominantly used in the area. The area represents the typical degraded humid forest ecology in the South East Agro-ecological zone of Nigeria. The area is characterized by bi-modal annual precipitation totalling

over 2000mm, air temperature ranging from 220 C to 310 c and high relative humidity during the wet season. The vegetation is predominantly lowland rainforest and this makes it suitable for an interview schedule. Primary data was collected for the study through well-structured questionnaire which was administered to the

respondents. In-depth interview and Focused Group Discussion was used to argue structured questionnaire and interview schedule. Secondary data for weather information was also used to complement the primary data. Data collected was analysed using descriptive statistics.

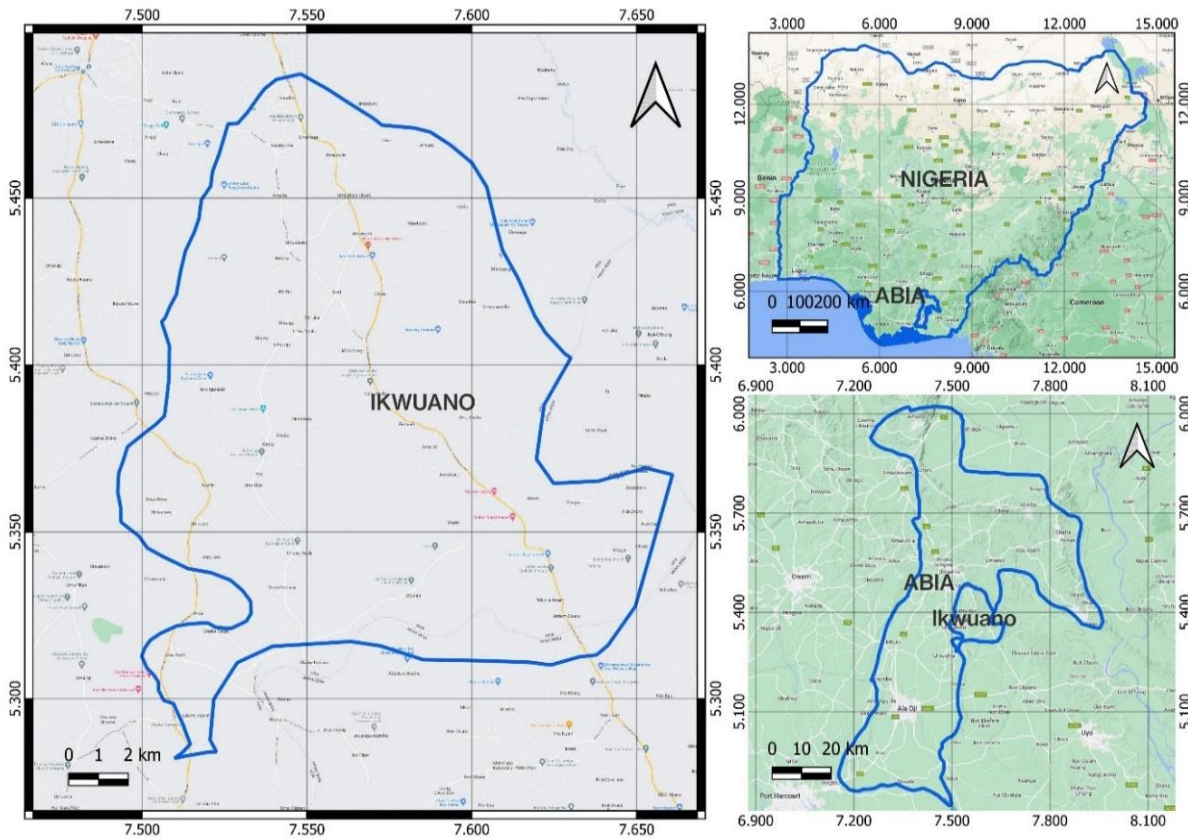


Figure 1: Map of Study Area

3. RESULT AND DISCUSSION

Socio-economic characteristics of the farmers

The results presented in Table 1, the majority of the respondents were male (58.4%), with an age range of 41-50 (41.6%), were married (57.6%), had a primary education level (36.8%), and had a household size of 4-6 (61.6%). This demographic information suggests that the respondents are likely to have access to family labor for farming and may have 20-40 years of farming experience, as the age range of 41-50 indicates. The results also show that the majority of the respondents are

farmers (48.8%), with a significant portion having a monthly income of 41,000-80,000 (44%).

The results further indicate that the majority of the respondents practice mixed cropping, with a focus on cultivating cassava (82.4%). Most of the respondents own their land through inheritance or purchase (52.8%), and have less than 1Ha of land (61.6%). This information is useful in understanding the farming practices and resources available to the respondents, which may impact their ability to adapt to climate change.

Table 1: Socio-Demographic Characteristics of the Respondents (n = 125).

Variable	X	%
Gender		
Female	52	41.6
Male	73	58.4
Total	125	100
Age		
20-30	12	9.6
31-40	38	30.4
41-50	52	41.6
51 and above	23	18.4
Total	125	100
Marital Status		
Married	72	57.6
Single	53	42.4
Total	125	100
Highest Qualification		
No-formal Educational	23	18.4
Primary	46	36.8
Secondary	42	33.6
Tertiary	14	11.2
Total	125	100
Household size		
1-3	43	34.4
4-6	77	61.6
7 and above	5	4
Total	125	100
Monthly income (₦)		
0-40,000	52	41.6
41,000-80,000	55	44
81,000>	18	14.4
Total	125	100
Major occupation		
Farming	61	48.8
Non-Farming	44	35.2
Both	20	16
Total	125	100

Perceived Effect of Climate Change

According to Table 2, the majority of respondents (52%), with 38.4% strongly agreeing and 13.6% agreeing, indicated that climate change has led to an increase in the number of rainy days. The respondents also agreed that climate change has caused an increase in rainfall intensity, changes in the timing of the wet season (such as an undefined onset or cessation), an

increase in temperature, and a reduction in crop yield. These findings are supported by the analysis of data obtained from the Agromet unit at NRCRI, as presented in Figures 2-5 and Table 3. These results suggest that the respondents have a good understanding of the impacts of climate change and the ways in which it is affecting their environment.

Table 2: Distribution of respondents by perceived effect of climate change (n = 125).

Variable	X	(%)
Longer rainy season		
Strongly agreed	48	38.4
Agreed	17	13.6
No response	31	24.8
Disagree	24	19.2
Strongly disagreed	5	4
Total	125	100
Higher intensive rainfall		
Strongly agreed	52	41.6
Agreed	32	25.6
No response	8	6.4
Disagree	12	9.6
Strongly disagreed	21	16.8
Total	125	100
Undefined onset/cessation of rains		
Strongly agreed	62	49.6
Agreed	25	20
No response	11	8.8
Disagree	12	9.6
Strongly disagreed	15	12
Total	125	100
Increased temperature		
Strongly agreed	54	43.2
Agreed	21	16.8
No response	11	8.8
Disagree	13	10.4
Strongly disagreed	26	20.8
Total	125	100
Decrease in yields		
Strongly agreed	54	43.2
Agreed	44	35.2
No response	6	4.8
Disagree	12	9.6
Strongly disagreed	9	7.2
Total	125	100

From Figure 3-5 and Table 3, the trend for maximum and minimum temperatures is increasing at a rate of 0.03040°C and 0.03390°C per year, respectively. Rainfall is also increasing at a rate of 4.8912 mm per

year, while the number of rainy days is decreasing at a rate of 0.48 days per year. These trends suggest that the overall climate is becoming warmer and wetter over time, and that the frequency of rainy days is decreasing.

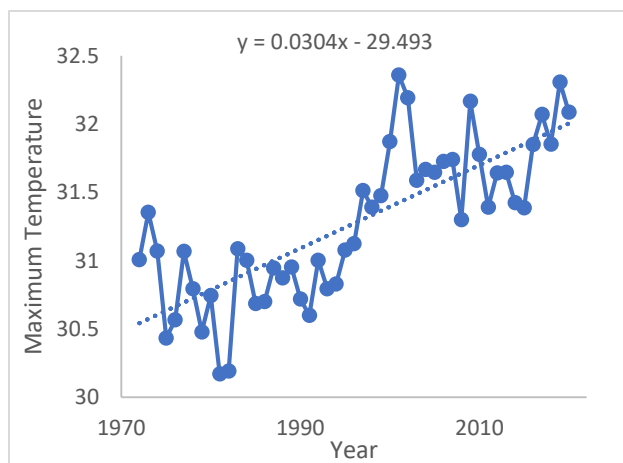


Fig. 2: Maximum Temperature

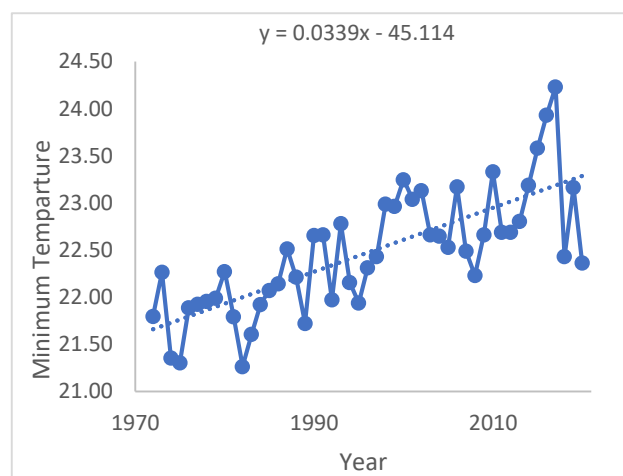


Fig. 3: Minimum Temperature

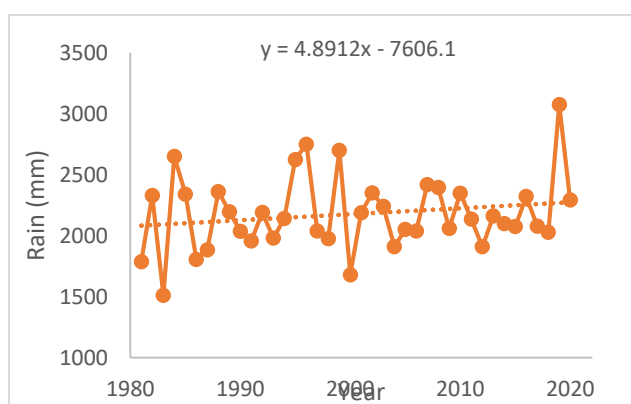


Fig. 4: Rainfall

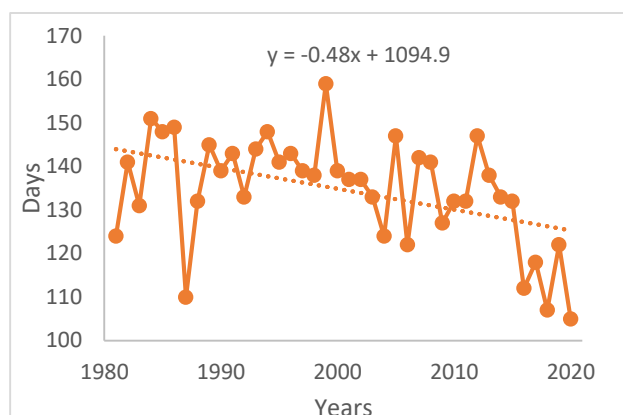


Fig. 5: Rain days

Table 3: Trend analysis of Rainfall and Temperature

Variable	Slope	Constant
Maximum Temperature	0.0304	-29.493
Minimum Temperature	0.0339	-45114
Rainfall	4.891	-7606.1
Rain Days	-0.48	1094.9

Challenges in Adapting to Climate Change

Table 3 shows that respondents reported that the major challenges they face in adapting to climate change include lack of collateral to secure available credit facilities (91.2%), scarcity and poor access to fertilizers (81.6%), poor access to improved storage facilities (76.8%), and low soil fertility (73.6%). On the other hand, lack of collateral to secure available credit

facilities was reported as the least challenging factor (34.4%). These findings suggest that access to financial resources, agricultural inputs, and infrastructure are significant challenges for these respondents as they try to adapt to the impacts of climate change. It may be helpful to consider strategies for addressing these challenges in order to support the adaptive capacity of these communities.

Table 4: Distribution of respondent by challenges in adapting to climate change

Variable	X	%
Lack of sufficient farming experience to tackle some climate exigencies	52	41.6
Scarcity and Poor access to fertilizer	43	34.4
Shortage of planting materials	68	54.4
Poor knowledge of using improved farm production method	81	64.8
Lack of improved varieties to resist climate change	92	73.6
Scarcity and Poor access to fertilizer	102	81.6
Poor access to information sources	62	49.6
Poor of improved storage facilities	56	44.8
Lack of government support	71	56.8
Lack of mechanized farming	82	65.6
Lack of extension contact	96	76.8
Lack of collateral to secure available credit facilities	114	91.2
Ineffectiveness of existing cooperative societies in my area	86	68.8
High cost of transportation	91	72.8
Low soil fertility	56	44.8

3.3 Adaptation strategies used by farmers

Table 4 shows that the majority of respondents (78.4%) reported using chemical fertilizers and pesticides as a strategy to adapt to the effects of climate change. Other common strategies included the use of improved varieties (74.4%), mulching or cover cropping (57.6%), and the intensive use of organic manure (54.4%).

However, a significant number of respondents (29.6%) did not report employing any specific strategies to mitigate or adapt to the impacts of climate change. It is important to understand the reasons behind the use or lack of use of these adaptation strategies in order to develop effective interventions that support the adaptive capacity of these communities.

Table 5: Adaptation strategies used by farmers.

Variable	X	%
No adaptation strategies	37	29.6
Irrigation practices	52	41.6
Changes in the timing of land preparation and planting dates	47	37.6
Chemical fertilizers and pesticides	98	78.4
Diversification of income-generating activities	65	52
Use of improved varieties	93	74.4
Agroforestry and planting of perennial plantation (oil palm, orchard, tree species)	43	34.4
Intensive use of organic manure	68	54.4
Mulching/cover cropping	72	57.6
Use of weather forecasts	54	43.2

4. CONCLUSION AND RECOMMENDATION

This study identified eight major constraints faced by root and tuber crops farmers in southeast Nigeria as they try to adapt to climate change, as well as the strategies they have adopted to cope with these challenges. The

findings suggest that farmers in the Ikwano region are aware of climate change and its impacts on their farming practices, and have taken steps to adapt to these changes through the use of chemical fertilizers and pesticides, the adoption of improved varieties, mulching or cover cropping, and the use of organic manure.

Several factors, including farming experience, educational level, and gender, can influence a farmer's choice of adaptation strategy. However, there are also several barriers that can hinder a farmer's ability to adapt to climate change, including a lack of sufficient farming experience, scarcity and poor access to fertilizers, a lack of improved varieties that are resistant to climate change, a lack of collateral to secure available credit facilities, and the ineffectiveness of existing cooperative societies in the area.

Overall, this paper highlights the importance of a farmer's perception of climate change and their ability to access resources and opportunities in determining their ability to adapt to these changes. It is essential to consider these factors in order to support the adaptive capacity of these communities and ensure their continued success in the face of a changing climate.

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