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# Farmers Perception of the Effects of Climate Change on Cassava Farming in Kuje Area Council, Abuja

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## Abstract

*The study examined the perception of farmers on the effects of climate change on cassava farming in Kuje Area Council, Federal Capital Territory Abuja, Nigeria. A simple random technique was used to select 100 cassava farmers as respondents for the study. Data obtained were analyzed using percentage and frequency. Farmers' perceptions of effect of climate change on cassava farming were increased temperature (45.0%), reduced crop yield (43.0%), increased frequency of drought (59.0%), increased frequency of flooding (63.0%), and increased frequency of heat on cassava (67.0%). Farmer's knowledge level about climate change shows: changes in temperature (93.0%), irrigation system (89.0%), drought (93.0%), loss in harvest (92.0%), change in yield of Cassava (92%) and lack of access to extension workers (82.0%). Extension workers should be mobilized to educate the farmers on climate change and possible solution*

**Key Words: Climate, change, cassava, farming, perception**

## Introduction

For decades, cassava has been one of the major food crops produced and consumed in Nigeria (Food and Agricultural Organization of the United Nations. 2022) with many by-products. There has been a consistent increase in the production of cassava in terms of area cultivated and yield per hectare over the last five decades in Nigeria (Food and Agricultural Organization of the United Nations. 2022). Nigeria takes the lead for decades now as the world's largest producer of cassava with an average output of 60,001,531 million tons and 7,737,846 ha of area harvested in 2020 (Food and Agricultural Organization of the United Nations. 2022). "Cassava is mostly grown by low-income, smallholder farmers. It made its mark in joining the lead of the few staple crops that can be produced efficiently on a small scale, without the need for mechanization, and in marginal areas with low nutrient soils and extreme weather events such as drought" (Food and Agriculture Organization 2021). As such, cassava is hardy and any extreme weather events that affect cassava will most likely affect many other staple food crops which could lead to a food crisis in Nigeria. Thus, this informed choosing cassava for this study. This proposition has been supported by a

study which predicted that climate change has less impact on cassava yield relative to maize, millet and sorghum (Blanc, E. 2021). The majority of farmers in developing countries like Nigeria are mostly dependent on rain for agriculture production, thus making farmers more susceptible to climate change extreme events (Akrofi-Atitianti, F. 2018) (Tibesigwa, B.; Visser, M.; Turpie, J. 2021).

At the 10th Session of IPCC WG II and 38th Session of IPCC in Yokohama, Japan, they warned the world that climate change impacts were leading to shifts in yields of crops, decreasing the overall yields and sometimes increasing them in temperate and higher latitudes (IPCC, 2021). According to Fischer et al. (2020) food production and food security in developing countries with a low capacity to cope and adapt to the challenges posed by this change in climate will be faced with its adverse consequences. Nigeria where rain-fed agriculture is the main source of livelihood for about 50-60 per cent of the population and accounts for over 25.5 per cent of the nation's gross domestic product in real terms is not expected be to left out of the severe impact (National Bureau of Statistics, 2017). The majority of Nigeria households have agriculture as the mainstay and the sector is significant in the economy of the Nation. Agriculture helps in the provision of food, employment and raw materials for agro allies industries, it also contributes to gross domestic product and helps in the generation of foreign earnings. These contributions can however be undermined by the dangerous impact of climate change. Sectorial scrutiny in 2006 of the real GDP showed that the agricultural sector contributed to about 42 percent of the GDP compared with 41.2 percent in 2005 (CBN, 2012).

The growth rate of the contribution of the agricultural sector to the GDP is now on the decrease rather than what it used to be. In 2018, Nigerian agriculture shared 22.12% contribution to the total gross domestic product; this could be linked to variations in climate. However, Crop production takes a significant aspect in agricultural production and exports in Nigeria, according to Adams et al. (2008), crop yields are directly affected by changes in climatic factors such as temperature and precipitation and the frequency and severity of extreme events like droughts, floods and windstorms. However, according to Verrnier et al., 2020 climatic factor seems more important both in terms of their variation over space and time than the other requirements for crop growth. In particular, the climate has both direct and indirect effects on crop production. The direct effect is displayed by the impact of a climatic factor on the other mechanisms of the plant environment, as submitted by Lobell et al.,(2013) Extreme events are expected to affect the instability of yields and are seen as the principal immediate threat to global crop production (Lobell et al.,2013).

Nigeria is located in the tropics with variations in climate across various agro-ecological zones which supported the growth of various crops: cereals, legumes tubers to mention just a few. Cassava (Manihot esculenta) is a hardy crop that could have significant potential to adapt to climate change and soil infertility and drought stress, and this made it possible for its wide cultivation across the country. It is a short-lived perennial crop which is grown mainly for its tuber, it is grown in an environment with a warm and humid climate Temperature and rainfall requirements for cassava in Nigeria are between 28 to 33 and 1000 and 1400 mm respectively. It is one of the most important crops in Nigeria, playing a dominant role in the rural economy in the southern agroecological zones and is increasingly gaining importance in other parts of Nigeria (Ande et al., 2020). Some species can be cooked and consumed as food, and they are also been processed into different products, (Nwaobiala, et al., 2019).

Water is the most important natural resource for humans, plants, and animals which its shortage could cause negative reversible and irreversible effects. Hence, excessive precipitation on the other hand could be more catastrophic than agricultural and meteorological drought events due to reduced and high rainfall variability. Additionally, increases in temperature are the key driver for high evapotranspiration (ETo) and consequently lead to distortion in the hydrological cycle. Manasa H. G. and Shivapur A.V. (2016) indicated that climate change (CC) is likely to have serious impacts on the hydrological cycle, water accessibility, and crop water requirements (CWRs). Siren A. J. (2010) revealed that climate warming has been attributed to the fluctuation of many components of the hydrological cycle such as changes in precipitation occurrence, distribution, intensity and increases in evaporative demand, and changes in surface runoff.

An average cassava water requirement (CWRs) is about 400 mm to 600 mm and the temperature requirement is between 25-29oC. At the initial-establishment stage (the first three months) the crop is highly sensitive to water deficit, while at the development and maturity cassava can withstand mild periods of drought (Ficklin, D.L, Elike, L. and Zhang, M. 2020). Temperature is an essential agrometeorological variable that determines crop phenological development. An increase in air temperature shortens crop growing length and consequently leads to low yield. Chowdhury S. Al-Zahrani M. and Abbas A. (2019) reported that a temperature increase of 1oC could change a crop's thermal limit and this is likely to decrease agricultural production between 5-25%. The finding of Mall et al. Mall R.K., et. al. (2006) indicated that global surface temperature (GST) is expected to increase by 1.4-3.0oC from 1990 to 2100 for the low greenhouse emission scenario, whereas for the high emission scenario, the temperature is projected to increase from 2.5-5.8oC. Conversely, projected temperature changes will affect crop sap flow, thermal limit, phenology, and crop yield. The effect of temperature increase is not limited to evapotranspiration but also affects irrigation water requirements (IWRs) and crop water requirements (CWRs).

Climate change and pressure on resources are major constraints to adequate agricultural production. Among the three, climate change is the most pressing challenge that the world faces today. Climate change is a defining phenomenon of the century. Climate change threatens to undermine the progress that has been achieved to date, especially in the agricultural sector. Enete (2021)

Hence, this study explores farmers' perception of the effect of climate change on cassava production in Kuje Area Council Abuja. Specifically, the objectives of this study are to: examine the farmer's perception of climate change, and determine the farmer's knowledge about climate change.

**Methodology**

This study was carried out in Kuje Area Council of Abuja (FCT). Kuje is located at the North Central part of Abuja. The area council lies between 80 – 90 East and latitude 70 North. The area council is bordered on the Northeast part by Abuja Municipal Area Council to the west by Gwagwalada area council and to the southwest by Abuja area council. The area council covers a total land area of 1,800sq km, about 22.5% of the Federal Capital Territory. The area council is characterized by alternate dry and wet conditions with mean annual rainfall varying from 1000mm to 1500mm.

Purposely sampling techniques were used to select Kuje area council while five wards namely Gaube, Kuchiyako, Paseli, Rubochi and Lanto were randomly selected out of

the 10 wards. Twenty (20) respondents were purposely selected from each of the wards and administered with the questionnaires to make a total number of respondents 100. This is because of the nature of the research topic and the study area. Data were collected for this research work through a well-structured questionnaire which was administered to respondents. The analytical tool that was used was means and percentage.

## Results and Discussion

### Farmers' Perceptions of Climate Change

Table 1 shows farmers' perceptions of climate change and according to the respondents the following characteristic was strongly agreed upon: increased temperature (41% and 45%), reduced crop yield (40% and 43%), increased frequency of drought (59% and 21%), increased frequency of flooding (63% and 22%), increased frequency of heat on cassava (67% and 19%), postharvest losses due to climate variability (38% and 51%), and high incidents of pest and disease (26% 48%) while soil erosion (50% and 17%) was disagreed and strongly disagreed as characteristics perceived by the respondents as it affects cassava due to climate change. According to Fischer et al. (2020) food production and food security in developing countries with a low capacity to cope and adapt to the challenges posed by this change in climate will be faced with its adverse consequences.

Nigeria where rain-fed agriculture is the main source of livelihood for about 50-60 per cent of the population and accounts for over 25.5 per cent of the nation's gross domestic product in real terms is not expected be to left out of the severe impact (National Bureau of Statistics, 2017). In Ahoada East, agricultural production is largely non-mechanized; therefore weather/climate assumes significance in every stage of production. Cassava farmers depend on climate signals as major drivers of their fanning activities. This makes the climate very significant in cassava production. Unfortunately, climatic conditions are no longer predictable as they used to be in the past. Cassava farmers had encountered a series of losses as a result of changes in climate (IPCC, 2021). Though, Cassava is known to tolerate drought to a reasonable extent, is still adversely affected by variations in climate

**Table 1: Farmers perceptions of climate change**

| Variables | S.A (%) | A(%) | N.S(%) | D(%) | S.D(%) |
|---|---|---|---|---|---|
| Increased temperature | 41 | 45 | 9 | 3 | 2 |
| Reduced crop yield | 40 | 43 | 10 | 4 | 3 |
| Increased frequency of drought | 59 | 21 | 9 | 7 | 4 |
| Increased frequency of flooding | 63 | 22 | 8 | 4 | 3 |
| Increased frequency heat on cassava | 67 | 19 | 5 | 4 | 5 |
| Intense weed growth | 30 | 42 | 12 | 8 | 8 |
| Soil erosion | 10 | 15 | 8 | 50 | 17 |
| Postharvest losses due to climate Variability | 38 | 51 | 4 | 5 | 2 |
| High incidence of pest and disease | 26 | 48 | 12 | 8 | 4 |
| Reduction in vegetation cover | 33 | 41 | 8 | 15 | 13 |

Note: (S.A=strongly agree, A=Agree, N.S= Not sure, D= Disagree, S.D=strongly disagree)

## Farmer's knowledge of Climate Change

Table 2 shows farmers knowledge level about climate change. 93% of the respondents agreed that their noticed changes in the temperature area of the farm and community which is not normal. 89% are knowledgeable about irrigation systems which they said is the alternative to shortage of water or long absence of rainfall due to climate change. An average cassava water requirement (CWRs) is about 400 mm to 600 mm and the temperature requirement is between 25-29oC. At the initial-establishment stage (the first three months) the crop is highly sensitive to water deficit, while at the development and maturity cassava can withstand mild periods of drought (Ficklin, D.L, Elike, L. and Zhang, M. 2020).

About 93% experience drought which makes 54% of the respondents embark on late harvesting of cassava farms while 46% do early harvesting of cassava farms because of high temperature (33%), drought (41%) pest and disease (12%) are most the prove of climate change in an area. "cassava is mostly grown by low-income, smallholder farmers. It made its mark in joining the lead of the few staple crops that can be produced efficiently on a small scale, without the need for mechanization, and in marginal areas with low nutrient soils and extreme weather events such as drought" (Food and Agriculture Organization 2013). 92% of the respondents noticed harvest losses due to climate change and also blamed the situation on the absence of extension workers available to the farmers as noticed by the majority (82%) of the respondents. Climate change affected cassava yield in the study area as recorded by 92% of the respondents. The direct effect is displayed by the impact of a climatic factor on the other mechanisms of the plant environment, as submitted by Lobell et al.,(2013) Extreme events are expected to affect the instability of yields and are seen as the principal immediate threat to global crop production (Lobell et al.,2013).

**Table 2: Farmers knowledge of climate change**

| Variables | Percent |
|---|---|
| **Do you notice change in the temperature of your farming area** | |
| Noticed change | 93.0 |
| Do not noticed change | 7.0 |
| **Farmers knowledge about irrigation system** | |
| Knowledgeable | 89.0 |
| Not knowledgeable | 11.0 |
| **Do you experience drought** | |
| Experience drought | 93.0 |
| Do not experienced drought | 7.0 |
| **When did you harvest your crops** | |
| Early harvest | 46.0 |
| Late harvest | 54.0 |
| **What is responsible for the change in harvesting period** | |
| High temperature | 33.0 |
| Drought | 41.0 |
| Flood | 4.0 |
| Pest and disease | 12.0 |
| **Did you noticed any lose in harvest** | |
| Noticed loses | 92.0 |
| Do not noticed loses | 8.0 |
| Do you have access to extension worker | |
| Have access | 18.0 |
| Do not have access | 82.0 |
| Change in yield of cassava | |
| Noticed change | 92.0 |
| Do not noticed change | 8.0 |

**Source: Field Survey 2021**

## Conclusion and Recommendations

Respondents perceived the effect of climate change to be increased temperature, reduced crop yield and high incidents of pest and disease. The respondent's knowledge level about climate change on cassava production seems high since they noticed a decrease in yield and loss in the harvest. Extension workers should be mobilized to educate the farmers on the challenges of climate change and possible solutions. Farmers should build irrigation systems around the farm to reduce the incidence of drought. Government should assist the farmers by providing insecticides and pesticides at an affordable rate

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