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Climate-Smart Agricultural Practices at Oyo State-Nigeria

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ABSTRACT

Climate-smart agricultural practices have been recognized to increase agricultural yield and enhance sustainable food production sustainably. This study examined the climate-smart agricultural practices used by cassava farmers and assessed the benefits obtained from using the climate-smart practices in the study area. The study adopted a two-stage sampling procedure in selecting 120 registered cassava farmers for questionnaire administration. Percentages, frequencies and chi-square were used to analyze the data. 96.8% of the farmers are male and above 60 years of age (41.7%) with household sizes of 5-8. Results indicate that 100% of respondents currently use and adopt different climate-smart agricultural practices for cassava production. Most cassava farmers derived enhanced benefits from using and adopting climate-smart agricultural practices. The chi-square analysis further revealed that the selected socio-economic profile of the respondents, such as education, farming experience, and size of farmland, significantly determined and influenced farmers' usage and adoption of climate-smart agricultural practices. Based on the discoveries from this study, extension officers and relevant agencies should develop suitable policies that will encourage farmers to adopt climate-smart agricultural practices.

Keywords: *Adoption, Cassava Production, Agricultural Smart Practices, Climate Change, Southwest*

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1. Introduction

One of the most significant problems facing sub-Saharan African countries is climate change (Ozor et al., 2015). Climate change is a significant threat in the Sub-Saharan African region attributable to its dependence on climate-related sectors like agriculture (Solomon et al., 2007). It has stimulated discourses concerning the causes' long-term effects and how to forestall its prolonged and frustrating impacts. Climate change, according to Intergovernmental Panel on Climate Change (Solomon et al., 2007), refers to the state of the climate that can be identified by variability in the mean of its properties (average temperature, wind and rainfall patterns) that persists for an extended period due to natural changes or as a result of human activities. Therefore, climate change can be fundamentally summarized as a long-term alteration in global temperature, precipitation, wind patterns and other indicators of climate that occurs over time. These changes have significant negative impacts on food security and crop production. Its impacts, such as decreased agricultural yield, high evaporation rates, reduced soil nutrients and low income, in combination with other weather variability indicators such as rising temperature and declining rainfall, could result in a reduction in agricultural productivity (Adebayo, 2010).

Agriculture remains a fundamental part of the Nigerian economy, contributing over 40% to the country's GDP and sustaining the food needs of its population (FMAWR, 2007). Sub-Saharan African countries like Nigeria, which relies on the weather-related agricultural system, are exposed and very susceptible to the effects of weather destabilization (Aid, 2008). Reports from Harris and Consulting (2014) have shown that variability in weather conditions in the sub-Saharan region reduces cropping season, reduces yield and disrupts the cropping calendar. These and many more make food production more challenging. Hence, the need for an enhanced and sustainable food production mechanism in Nigeria is pivotal.

According to the United Nations (2017), Nigeria's population growth is projected to increase to 263 million by 2030. Besides, agricultural sustainability necessitates a notable modification to ensure sufficient food supply to meet the needs of the people (Kaczanet al., 2013). However, it calls for adopting an environmental-friendly practice that ameliorates the consequences of weather variability on agricultural production. Based on this, Climate-Smart Agricultural Practice (CSAP), therefore, becomes a vital tool that enhances sustainable agricultural production. Climate Smart Agricultural Practice (CSAP), according to (Lipper, 2014), is an agricultural practice or technology that sustainably increases food production, increases adaptability, reduces and removes pollutants from the atmosphere and intensifies the attainment of national food security goals. Thus, CSAP is an age-long, ingenious agricultural mechanism that promotes increased agricultural production and income for sustained food security and enhances mitigation of climate change impact. This practice and approach focus on improving crop production, which involves using fertilizers, adopting agroforestry practices, using improved cassava varieties, planting cover crops, intercropping cassava with yam/maize etc. (Campbell et al., 2014).

Cassava is an essential aspect of agricultural production in Oyo State, Nigeria. It is irrefutably a popular staple crop cultivated throughout the year due to its capacity to boost the economic status of farmers and enhance their livelihood (Kehinde & Subuola, 2015). The relevance of this staple crop indwells in its diverse capacity as a by-product to be transformed into several other secondary products. Despite this, cassava production in the rainforest agro-ecological zone of the country is affected by variability in weather-related indicators, which leads to low cassava yield and low income (Adejuwon & Odekunle, 2006). Despite the rising concern at international policy levels and national organizations about the sustainability of agricultural development and food security in developing countries, farmers still find it challenging to use and adopt CSAP appropriately. A report by Lipper (2014) revealed that rural farmers lack awareness and knowledge of the usage of these practices.

Adopting CSAP can be viewed as a process whereby farmers fully utilize environmental-friendly agricultural mechanisms as the only best option. Adoption as a process follows a sequence of five stages: awareness—interest—evaluation—trial- adoption. However, it does not always follow this sequence in practice since interest/willingness may precede awareness. The level of adoption of CSAP may vary across societies, individuals and households. The adoption of CSAP by cassava farmers' can increase their climate-adaptation skills, improve agricultural yields, curtail environmental depletion and enhance food security goals.

Mitigating the challenges confronting sustainable cassava production is very important for sustainable livelihood. Hence, the study examined the adoption of climate-smart agricultural practices by cassava farmers of Oyo State, with the following objectives: to identify the summary statistics of the sampled farmers, to examine respondents' level of awareness of climate-smart agricultural practices, assess the climate-smart agricultural practices adopted by respondents, determine the level of adoption, identify the constraints to adoption of CSAP and finally investigate the factors that determine the adoption of CSAP.

2. Materials and Methods

2.1 Study Area

IDO LGA, the study area, is located in Oyo State. It is positioned between longitude 3047′ 34.99″E and latitude 9030′ 44.49″N occupying a land area of 986km with a projected population of 174,826 as of 2020 using the population growth rate of the area (National Population Commission, 2006). It is located in the forest belt zone with an average daily temperature ranging between 25 °C and 35 °C throughout the year. Rainfall is about 1800mm annually. The LGA is highly endowed with fertile agricultural land suitable for farming activities. Residents in the LGA are primarily small-scale farmers engaged in other income-generating activities such as trading, artisanship and hunting.

2.2 Sampling Procedure and Data Analysis

The study adopted a two-stage sampling procedure in selecting one hundred and twenty cassava farmers who were registered with Government. Six out of ten political wards were selected for the first stage. For the second stage, twelve villages were randomly chosen from the political wards, out of which ten registered cassavas farmers were chosen from each of the villages for questionnaire administration (Baloch & Rashid, 2022; Hashmi et al., 2020; Hashmi et al., 2021; Rashid et al., 2021).

Data was obtained through the use of a close-ended questionnaire to evaluate the summary statistics of selected variables, examine respondents' level of awareness of climate-smart agricultural practices, assess the climate-smart agricultural practices adopted by respondents, determine the level of adoption, identify the constraints to adoption of CSAP and finally investigate the factors that determine the adoption of climate-smart agricultural practices.

3. Results and Discussions

From the result in Table 1, many (41.7%) of the respondents are within the cohort of 60yrs and above. This indicates that the older population is actively involved in farming activities. A more significant percentage (96.8%) of farmers in the study area are male, while a few (4.2%) are females. This shows that gender dominance is connected with the nature of the job. The majority (40.0%) of the farmers' had primary Education, (28.3%) had secondary Education and only (31.7%) had tertiary Education. This indicates that most of the respondents have attained a significant literacy level (Shaheen, 2022).

Findings also revealed that the majority of the respondents (88.3%) practice farming as an occupation. This is because farming is the primary means of sustenance for rural dwellers, which contributes to rural development and means of livelihood. Most cassava farmers' (70.8%)have farming experience of 16 years and above. The extent of farming experience, according to Ayanlade (2009), indicates a higher utilization and adoption of CSAP since the farmers are knowledgeable about past and present climatic conditions.

Table 1: Summary of socio-economic characteristics statistics of the sampled farmers

Variables	Frequency	Percentage (%)
Age Group (yrs)		
20-29	1	0.8
30-39	30	25.0
40-49	26	21.7
50-59	13	10.8
60 and above	50	41.7
Gender		
Male	115	96.8
Female	5	4.2
Education Status		
Primary	34	28.3
Secondary	48	40.0
Tertiary	38	31.7
Farming Experience (yrs)		
1-5	5	4.2
6-10	7	5.8
11-15	23	19.2
16 and above	85	70.8
Primary Occupation		
Trading	14	11.7
Farming	10	88.3
Size of Farmland (acres)		
< 1	84	70.0
1 – 2	24	20.0
3 – 4	12	10.0

Source: Field survey (2022)

3.1 Perception of Cassava Farmers on Climate Smart Agricultural Practices

Half (50%) of the respondents perceive climate change to be variability in rainfall patterns, (and 8%) consider it as changes in wind patterns, while (17%) regard it as an increase in temperature. Nzeadibe et al. (2011) observed that the most basic understanding of climate change is an alteration in weather-related conditions. Of the respondents, a minimal figure (10%) perceive drought as a climatic parameter, while (15%) of the respondents regard frequent flooding as climate change.

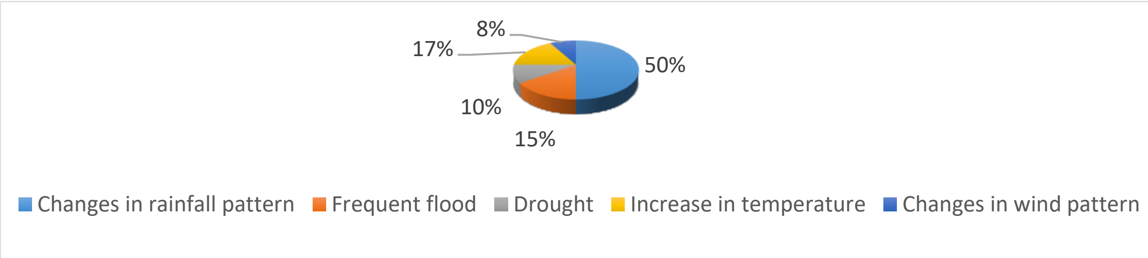

Figure 1: Perception of cassava farmers on climate change

3.2 Climate Smart Agricultural Practices Used and Adopted by Farmers

The entire (100%) respondents investigated practiced early and late planting methods as a climate-smart strategy. This indicates cassava farmers adjust their work calendars to suit their farming operations. Ayanlade et al. (2018) affirmed that smallholder farmers plant only when there is steady rainfall rather than planting at the start of the farming season. Most (91.7%) of the farmers use improved cassava varieties, (97.5%) use fertilizer to improve soil health and (97.5%) practice mulching techniques. Most (94.2%) of the cassava farmers use irrigation facilities during drought periods that sometimes emerge in the middle of the planting season. This confirms the report of Ajao and Ogunniyi (2011) that farmers often use irrigation as a strategy to mitigate climate change. The majority (97.5%) of the respondents practiced mixed cropping by planting other foods crops like yam, maize and vegetables, (57.5%) practiced agroforestry and (95.0%) planted cover crops. This supports the findings of Adedire (2010), who affirmed that agroforestry is a classical climate-smart agricultural strategy that improves sustainable food production by incorporating trees and shrubs on farms since they absorb more carbon than crops.

Table 2: Distribution Based on Climate Smart Agricultural Practices Used and Adopted on Cassava Farms

Climate Smart Practices	Highly Adopted (%)	Not Adopted (%)
Early and late planting methods to suit the onset of rainfall	120 (100.0)	-
Use of improved cassava varieties	110 (91.7)	10 (8.3)
Manure/Fertilizer application to improve soil health	117 (97.5)	3 (2.5)
Use of Irrigation facilities during drought season	113 (94.2)	7 (5.8)
Use of mulching techniques	117 (97.5)	3 (2.5)
Agroforestry practices	69 (57.5)	51 (42.5)
Intercropping cassava with yam, maize and vegetables	117 (97.5)	3 (2.5)
Planting of cover crops	114 (95.0)	6 (5.0)

Source: Field survey (2022)

3.3 Benefits Obtained from Using and Adopting CSAP

The result (99%) obtained a higher benefit through increased agricultural output, which ranked highest (2.50). The cassava farmers affirmed that they obtained high benefits like; increased income (2.48), increased food production (2.40) and enhanced pest management (2.39), which ranked 2nd, third and fourth. Other benefits obtained are proper farm planning (2.37) and improved soil health (2.22), ranking fifth and sixth. This is an indication that cassava farmers obtain significant benefits from using CSAP.

Table 3: Distribution based on Benefits Obtained from Using and Adopting CSAP

Benefits	Larger Extent	Lesser Extent	Not at All	Mean	Rank
Increased crop yield	99 (82.5)	16 (13.3)	5 (4.2)	2.50	1st
Increased income	97 (80.8)	13 (10.8)	10 (8.4)	2.48	2nd
Enhanced pest management	90 (75.0)	21 (17.5)	9(7.5)	2.39	4th
Proper farm planning	84 (70.0)	29 (24.2)	7 (5.8)	2.37	5th
Improved soil health	81 (67.5)	24 (20.0)	15 (12.5)	2.22	6th
Increased food production	75 (62.5)	31 (25.8)	14 (11.7)	2.40	3rd

Source: Field survey (2022)

The chi-square summary further revealed three characteristic variables such as; the size of farmland (x^2=29.726, p=0.013), farming experience (x^2=62.732, p=0.000), and Education (x^2=25.810, p=0.000) significantly determined and influenced farmers' usage and adoption of CSP. This implies that cassava farmers with higher educational qualifications, higher farming experience, and large farm sizes are more likely to use and adopt CSAP. Ayanlade (2009) observed that extent of farming experience and Education were statistically significant with the use and adoption of CSAP since the farmers are knowledgeable about past and present climatic conditions. However, age and sex have no significant relationship with the use and adoption of CSAP.

Table 4 Chi-Square Summary of Selected Characteristic Variables and Respondents' Adoption of CSAP

Variables	Chi-square value	P-value	Decision
Age	16.276	0.179	Not Significant
Sex	3.911	0.271	Not Significant
Education	25.810	0.000	Significant
Farming experience	62.732	0.000	Significant
Size of farmland (acres)	29.726	0.013	Significant

4. Conclusion and Recommendation

Based on the findings of this study, cassava farmers obtained great and sustainable benefits from the usage/adoption of CSAP. Education, farming experience and size of farmland significantly determined and influenced the use of climate-smart agricultural practices. The study, therefore, concludes that CSAP is beneficial for increasing yield, income and sustainable food production. Extension officers and relevant agencies should develop policies encouraging farmers to adopt climate-smart agricultural practices.

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