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ADOPTION AND UTILIZATION OF CLIMATE SMART AGRICULTURAL PRACTICES BY CASSAVA FARMING HOUSEHOLDS IN IDO LOCAL GOVERNMENT AREA, OYO STATE, NIGERIA

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ABSTRACT

The study examined the adoption and utilization of Climate Smart Agricultural Practices (CSAP) by cassava farming households in Ido Local Government Area, Oyo State, Nigeria. A two-stage sampling procedure was used to purposively select one hundred and twenty (120) registered farmers engaged in cassava crop production for questionnaire administration. Data obtained were analysed using descriptive and inferential statistics. The study revealed that cassava farming activities in the study area is at a small scale level owing to the size of farmland cultivated by majority (70.0%) of the respondents'. It was also observed that majority (76.7%) of the respondents' in the study area generally have adequate knowledge of climate smart agricultural practices though their mean adoption score (4.38) is critically low. This may be linked to the respondents' low level of literacy and the barriers affecting the adoption and utilization of climate agricultural practices. The study inferred that there is probably need for more awareness about the potentials of these practices in increasing agricultural productivity in the study area. Variables such as education, farming experience, size of farmland, access to credit and access to extension services were all significant at 0.05 level of significance. It is therefore recommended that extension officers, relevant agencies/associations should develop suitable policies that will encourage farmers' especially rural farmers' to adopt and utilize Climate Smart Agricultural Practices (CSAP). This will, in the mid and long term, help in boosting farmers' income and enhancing sustainable food security.

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

INTRODUCTION

One of the greatest problem facing sub-Saharan African countries is climate change (Ozor *et al.,* 2015). Climate change is described as a major threat in Sub-Saharan African region attributable to its dependence on climate-related sector like agriculture (IPCC, 2007). It has stimulated discourses in respect to the causes, long term effects, as well as how to forestall its prolonged and frustrating impacts. Climate change according to Intergovernmental Panel on Climate Change (IPCC, 2007) refers to the state of 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. Climate change can therefore, be fundamentally summarized to be a long-term alteration in global temperature, precipitation, wind patterns and other indicators of climate that occurs overtime. 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 to 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, 2008). Sub-Saharan African countries like Nigeria, which relies on weather related agricultural system is exposed and very susceptible to the effects of weather destabilization (Action Aid, 2008). Reports from AGRA (2014) have shown that variability in weather conditions in sub-Saharan region reduces cropping season, reduces yield and disrupts the cropping calendar. These and many more makes food production more challenging. Hence, the need for enhanced and sustainable food production mechanism in Nigeria is pivotal.

According to (UN, 2017), Nigeria's population growth is projected to increase to 263 million by 2030. Considering the projected rapid population growth, agricultural sustainability necessitates a notable modification to ensure sufficient food supply adequately enough to meet the needs of the people. This, however, calls for the adoption of an environmental-friendly practice that ameliorates the consequences of weather variability on agricultural production. On the basis of this, Climate Smart Agricultural Practice (CSAP) therefore, becomes a vital tool that enhances sustainable agricultural production. Climate Smart Agricultural Practice according to (FAO, 2010) is an agricultural practice or technologies that sustainably increase food productivity, increase adaptability, reduce 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; boost farmers' income, enhances sustainable food security and mitigates climate change impact. This practice and approach focuses on the enhancement of crop production which involves the use of fertilizers, adoption of agroforestry practices, use of improved cassava varieties, planting of cover crops, intercropping cassava with yam/maize etc.

Cassava crop is an essential aspect of agricultural production in Oyo State, Nigeria and irrefutably a popular staple crop that is cultivated throughout the year due to its capacity to boost the economic status of farmers' and enhance livelihood (Kehinde and 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 and Odekunle, 2006). In spite of 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 a bit challenging to use and adopt CSAP appropriately. Adoption of CSAP can be viewed as a process whereby farmers fully utilize environmental-friendly agricultural mechanism as the only best option available to mitigate the effect of climate change on crop production. Adoption as a process follows a sequence of five stages which includes: awareness—interest—evaluation—trial and adoption. However, it does not always follow this sequence in practice since interest/willingness may precede awareness. Adoption of CSAP by cassava farmers' has the capacity to increase their climate-adaptational skills, improve agricultural yields, curtail environmental depletion and enhance food security goals.

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

MATERIALS AND METHODS

Study Area

Ido LGA is located in Oyo State. It is positioned between longitude 3° 47′ 34.99″E and latitude 9° 30′ 44.49″N occupying a land area of 986km^2 with a projected population of 174,826 as at 2020 using the population growth rate of the area (NPC, 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.

Data Collection and Analysis

The study adopted two stage sampling procedure in the selection of one hundred and twenty (120) registered cassava farmers'. 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 10 registered cassava farmers' were chosen from each of the villages for questionnaire administration.

Data was obtained through the use of a close ended questionnaire to evaluate the summary statistics of selected variables, to examine respondents' level of awareness on climate smart agricultural practices, assess the climate smart agricultural practices adopted by respondents and determine the respondents' level of adoption of climate smart agricultural practices. Data obtained were analysed using descriptive statistics such as (frequency count, means and percentages) while inferential statistics (Multinomial Logit regression model) was finally used to investigate the factors that influence the adoption and utilization of climate smart agricultural practices among the sampled cassava farmers.

RESULTS AND DISCUSSIONS

From the result presented in Table 1, (41.7%) of the respondents fall within the cohort of 60yrs and above. This is an indication that the older population is actively involved in farming activities. Farming happens to be the main economic activity and the fabric of rural societies which contributes to the rural development and means of livelihood. This result aligns with the findings of Ezekiel *et al.* (2015), who reported that farmers' in the rainforest agro-ecological zone are generally aged. A larger percentage (96.8%) of farmers in the study area are male while few (4.2%) are females. This shows that gender dominance is connected with the nature of farming occupation. This affirms the findings of Osoba et al. (2019) who noted that women prefer to venture in domestic home front activities rather than engage in farming occupation. About half (40.0%) of the respondents' have obtained primary education, (28.3%) have secondary education and only (31.7%) have tertiary education. This implies that majority of the respondents' are not well and fully learned and this would have a serious implication on their awareness and adoption status. As observed by Adekunle (2009), education is a major and vital human capital which play significant roles in determining an individual's status in society. Education is expected not only to contribute to people's ability to read and understand instructions but also help them to adopt and utilize new techniques.

Furthermore, the majority (70.0%) of the farmers cultivate less than 1 acre of land. This could suggest that cassava farming in the study area is a small scale enterprise. Findings also revealed that majority (70.8%) of the respondents have farming experience of 16 years and above. Extent of farming experience according to Ayanlade (2009) indicates a higher utilization and adoption of new technologies/practices. It is envisioned that extent of farming experience would influence farmers' willingness to adopt CSAP since the farmers' with higher experience have indigenous knowledge about past and present climatic conditions. Most of the cassava farmers' (66.7%) do not have access to credit facilities and majority (85.0%) do not have access to extension services. Inaccessibility to credit and extension services according to Nyoro (2002) is a major barrier associated with adopting new practices and technologies. Credit facilities and extension services is an important catalyst for sustainable agricultural productivity. Without these, accepting and adopting a new technology may be ineffective. The study also shows that (76.7%) cassava farmers were members of agricultural associations. Membership of agricultural association in the study area signifies that registered cassava farmers can partake of agricultural development opportunities and support networks provided by government and non-governmental institutions.

Table 1: Summary statistics of the sampled farmers

Characteristic Variables	Sub-groups	Frequency	Percentage
Age Bracket (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
Sex	Male	115	96.8
	Female	5	4.2
Education	Primary	48	40.0
	Secondary	34	28.3
	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
Size of farmland (acres)	< 1	84	70.0
	1 – 2	24	20.0
	3 – 4	12	10.0
Access to Credit	Yes	40	33.3
	No	80	66.7
Access to extension services	Yes	18	15.0
	No	102	85.0
Membership of agric. association	Yes	92	76.7
	No	28	23.3

Source: Field Survey, 2021

Results in Table 2 shows the distribution of respondents according to their level of awareness on climate smart agricultural practices. Results revealed that majority of the respondents are aware of the following practices: agroforestry practices (3.80), mixed cropping technique (3.74), planting of cover crops (3.39) and adjustment in planting date (3.00), use of improved cassava varieties (2.87), use of mulching techniques (2.54), use of green fertilizer (1.60), use of irrigation facilities (1.21) and use of weather variability information (1.03). These were ranked accordingly based on their extent of awareness as 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th and 9th respectively. The study further revealed that most (76.7%) of the respondents are generally aware of climate smart agricultural practices. In essence, cassava farmers in the study area have good and adequate knowledge of climate smart agricultural practices. Good and adequate knowledge of climate smart agricultural practices is a prerequisite for climate change adaptation. This will help to mitigation the adverse effects of climate change by building a sustainable agricultural system that is very resilient to shocks which are related to climate change and other factors posing challenges to agricultural production.

Table 2a: Respondents' level of awareness on climate smart agricultural practices

CSAP	HA(%)	MA (%)	NA (%)	Mean	SD	Rank
Adjustment of planting date method	77 (64.2)	33 (27.5)	10 (8.3)	3.00	0.862	4th
Improved cassava varieties	75 (62.5)	25 (20.9)	20 (16.6)	2.87	0.369	5th
Green fertilizer	53 (44.2)	48 (40.0)	19 (15.8)	1.60	0.735	7th
Irrigation facilities	49 (40.9)	33 (27.5)	38 (31.6)	1.21	0.454	8th
Mulching technique	66 (55.0)	28 (23.3)	26 (21.7)	2.54	0.779	6th
Mixed cropping technique	87 (72.5)	13 (10.8)	20 (16.7)	3.74	0.461	2nd
Agroforestry practices	89 (74.1)	16 (13.4)	15 (12.5)	3.80	0.427	1st
Planting of cover crops	80 (66.7)	21 (17.5)	19 (15.8)	3.39	0.708	3rd
Weather variability information	33 (27.5)	27 (22.5)	60 (50.0)	1.03	0.165	9th

Source: Field Survey, 2021 HA=Highly Aware, MA=Moderately Aware, NA=Not Aware

Table 2b: Categorization of respondents based on level of awareness

	Frequency	Percentage
Low	**28**	**23.3**
High	**92**	**76.7**
Total	**120**	**100.0**

Source: Field Survey, 2021

Results in Table 3 shows the percentage of adopters and adoption scores for the nine climate smart agricultural practices investigated. Results of the analysis revealed that respondents had low adoption scores ranging from 3.20 - 4.80 in 7 technologies namely: adjustment of planting date method, application of green fertilizer, use of irrigation facilities, use of mulching technique, mixed cropping technique, planting of cover crops and weather variability information. However, few respondents moderately adopted 2 other technologies namely: the use of improved cassava varieties (5.00) and agroforestry practices (6.10). The study further revealed that the average mean adoption score of the respondents was 4.38 which is critically low. This may be connected to the respondents' low level of literacy, inadequate awareness on the potentials of CSAP and the barriers affecting the adoption of these practices such as lack of access to extension services. The services rendered by the few extension agents available is ineffective due to the high population of the farmers in the study area. This results align with the findings of Ogunjimi *et al*. (2022) who reported that a wide gap ratio exists between the number of farmers and the extension agents available. It can be inferred that there is probably need for more awareness about the potentials of these technologies and practices in increasing agricultural productivity among farmers in the study area. Awareness creation is very instrumental to the enlightenment of individuals on sustainable agricultural production and until proper awareness is created among these farmers, the challenges confronting sustainable cassava production will continue unabated.

Table 3: Percentage of adopters and adoption scores

Adopted CSAP	No of Adopters	Percentage of Adopters	Adoption score	Remarks
Adjustment of planting date method	19	16	3.20	Low
Use of improved cassava varieties	76	63	5.00	Moderate
Application of green fertilizer	66	55	4.80	Low
Use of irrigation facilities	47	39	4.20	Low
Use of mulching technique	54	45	4.40	Low
Mixed cropping technique	47	39	4.20	Low
Agroforestry practices	78	65	6.10	Moderate
Planting of cover crops	52	43	4.42	Low
Weather variability information	34	28	3.84	Low

Source: Field Survey, 2021 *Mean adoption score = 4.38

Low adoption (0 - 4.90), Moderate adoption (5.0 - 6.90) and High adoption (7.0 – 10)

Results in Table 4 shows the results of the multinomial logit regression model that was used to determine the factors influencing the adoption of climate smart agricultural practices among cassava farmers in the study area. From the result, variables such as education, farming experience, size of farmland, access to credit and access to extension services were all significant at the 0.05 level of significance. This is an indication that these variables significantly influences and determines respondents' adoption of climate smart agricultural practices in the study area. In other words, farmers with larger size of farmland have a better chance of adopting climate smart agricultural practices than those with small farm size. This means that as the population increases, the demand for larger farmland to cater for the food needs of the people may also increase leading to increased agricultural yield and increased farm income for sustainable food security. Similarly, farmers with higher farming experience are likely to adopt climate smart agricultural practices than those with fewer years of farming experience. This may be associated with the fact that farmers' with higher farming experience are presumed to have native knowledge about past and present climatic conditions. This result validates the findings of Bazezew *et al.* (2013) who reported that farmers' adopt climate smart technologies based on their experience in farming activities. In the same way, education, access to credit and access to extension services play vital roles in the adoption of climate smart agricultural practices. Farmers with better and quality education, have better advantage of enhancing their farm productivity and increasing their climate adaptational skills especially when they showcase the knowledge they have gathered in their years of education in their farming activities. Cassava farmers who have access to credit facilities and extension services also have the likelihood and tendency of obtaining weather-related information required for climate adaptability and also purchase necessary farm inputs needed for utilization and adoption of climate smart agricultural practices. This result align with the findings of Owoeye (2020) who observed that access to climate information and extension services is an important variable that influences farmers' willingness to embrace climate smart options.

Table 4: Factors influencing the adoption and utilization of CSAP among cassava farmers

Variable	Coefficient	Standard error	t-value
Age	-0.536	0.274	-1.956
Sex	0.017	0.015	1.133
Education	0.489	0.362	1.351*
Farming experience	0.306	0.117	2.615*
Size of Farmland	0.657	0.185	0.045*
Access to credit	0.881	0.136	0.518*
Access to Ext. services	0.312	0.122	2.557*
Membership of agric. ass	0.455	0.141	3.226
Constant	0.694	0.262	2.648
Pro>Chi-square	0.041		
Pseudo R2	0.737		
Observation	120		

*Significant at 5% level

CONCLUSION AND RECOMMENDATION

Based on discoveries from this study, the study concludes that majority (76.7%) of the respondents' in the study area generally have good and adequate knowledge of climate smart agricultural practices even though their mean adoption score (4.38) is critically low. This may be connected to the respondents' low level of literacy and the barriers affecting the adoption of climate agricultural practices. It can therefore be deduced that there is probably need for intensive and concentrated awareness about the potentials of these technologies in increasing agricultural yield and productivity in the study area. In addition, results of the regression showed that variables such as education, farming experience, size of farmland, access to credit and access to extension services were all significant at the 0.05 level of significance among the factors that influenced the adoption of climate smart agricultural practices. It is therefore recommended that climate smart agricultural practices should be further encouraged among farmers, especially the rural farmers. This will, in the mid and long term, help in boosting farmers' income and enhancing sustainable food security. Extension officers and relevant agencies/associations should develop suitable policies that will encourage farmers to adopt climate smart agricultural practices.

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