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EFFECTS OF CLIMATE SMART AGRICULTURAL PRACTICES ON FOOD PRODUCTION ON SMALLHOLDER FARMERS IN OYO STATE, NIGERIA.

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Abstract

Climate change has been a threat to agriculture and arable crops are particularly vulnerable to the adverse effects.Thus the need for mitigation on environmental damage by relying on eco- friendly methods,and conservation farming to help keep soil from eroding, preserve land fertility, and save local plants and animals life in Oyo State, South Western Nigeria.The aim of the study was to determine the effects of climate smart Agricultural practices on food production among smallholder farmers in Oyo State, Nigeria. Multi Stage sampling was used to select arable farmers in five Local Government Areas of two ADP Zones in Oyo State,Orire local government area 36 respondents,Surulere local government area 220 respondents,Irepo local government area 32 respondents,Orelope local government area 7 respondents, and Olorunsogo local government area 37 respondents based on 13.4% on the number of registered household farmers/village, totaling 332 selected farmers,a structured questionnaire was administered to elicit information from the

Keywords: climate smart agricultural practices, climate smart agricultural strategies, adoption, adaption, finance.

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respondents.The data were subjected to descriptive ,Likert scale, weighted mean score, percentage and frequency were used to analyzed the data. of the study. Awareness of climate smart Agricultural strategies,majority (100%) of the respondents indicated; Crop management, field management,soil management practices, and integrated pest management as part of the climate smart Agricultural strategies they were aware of in the study areas. Extent of use of climate smart Agricultural strategies,the respondents indicated Crop management which ranked First with weighted mean score of 3.84 as extent of use of climate smart Agricultural strategies on food production in the study areas.While Perceived effects of climate smart Agriculture on food production,the respondents indicated the effects of climate smart Agriculture practices can only be confirm by those farmers that applied it,the aftermath effect is reflected on crop yield,ranked First with weighted mean score of 4.89, as perceived effects of climate smart Agriculture on food production in the study areas. The benefits of using climate smart agricultural strategies,the respondents indicated delivers environmental benefits which had the highest percent (88.25%), as benefit of using climate smart agricultural strategies in the study areas.While coping strategies against food insecurity,all the respondents indicated all the coping strategies; borrowed money, borrowed food, selling of assets, accept help from friends and family, and engage in farm labour to obtain food had 100% as coping strategies in the study areas. Constraints associated with the adoption and use of climate smart agricultural strategies,the respondents indicated limited credit and finance ranked first with weighted mean score of 3.98 as constraints associated with the adoption and use of climate smart agricultural strategies in the study areas.While factors influencing the adoption of climate smart agricultural practices,the respondents indicated land tenure (Land ownership status), assess to production inputs e.g land, capital,seed, fertilizer, chemical, and access to extension services (information/training), had the highest percent (100%) to factors influencing adoption of climate smart agricultural practices in the study areas. Identified factors that influence the adoption of climate smart agricultural practices, the respondents indicated land tenure (land ownership status), access to production inputs e g land, capital,seed, fertilizer, chemical, and access to extension services (information/training) were ranked First with weighted mean score of 3.00 each as identified factors that influence the adoption of climate smart agricultural practices in the study areas.

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INTRODUCTION

Climate smart Agriculture (CSA) has being presented as another form of Agriculture for Conserving the environment while addressing the food needs of the world's population (FAO, 2014). Climate smart Agriculture was originally put forth in 2010 by FAO after the Hague conference on Agriculture, Food production and Climate change in 2009 (FAO, 2010, World Bank, 2010). The main aim of CSA is to repackage agriculture in the context of a changing climate in assuring a triple win: Mitigation, development, and adaptation (FAO 2010). Climate Smart Agriculture is thus define as a form of agriculture that sustainably increases agricultural productivity and income, building resilience and enhancing adaptation to climate change and removing or minimizing Greenhouse gases (GHGs) where possible, enhance achievement of National Food producton and the sustainable development goals (FAO, 2014). Collier and Dercon (2014) opine that it is an approach to develop technical, policy and investment conditions to achieve sustainable development and food production.

In another view, Shea (2014) said CSA is a focus based concept that involves new technologies that can help the farmers transition from current strategies to more climate aware practices and to encourage farmers in abandoning or lessen reliance on the methods that increases GHGs. Climate smart Agriculture adopts some form of sustainable land management practices that engage the farmer in sustainable intensification measures such as residue management, green manuring, improved water management to improve agricultural performance, conservation tillage and agroforestry (Palombi and Sessa, 2013; Delonge*et al.,* 2016). This also enables farmers to use their knowledge and skills more affectively, opt for more efficient pro- environmental technologies, share information and build stronger associations to facilitate effective negotiation of better market price (Branca*et al.,* 2011). In the most developing countries, a majority of small farmers are still reliant on rain-fed agriculture, thereby increasing their vulnerability to the consequences of climate change (Louhichi and Paloma, 2014).

The impacts of climate change have not been fully understood by the farmers resulting in poor adaptation mechanism (FAO, 2010; World Bank, 2010; Aggarwal*et al.,* 2013; Vignola *et al.,* 2015). Thus CSA provides adaptation strategies that can help avoid or ameliorate the negative impacts of climate change on agricultural production, income and as well as wellbeing of small holder farmers, it also provides a conceptual basis for enhancing agricultural adaptation and mitigation to support food production under a changing climate (Warner *et al.*, 2015). The World Bank climate smart village model gives a comprehensive and broader perspective to farmers' CSA practices. The model

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categorized these practices as energy, weather, nitrogen, carbon, water and knowledge smart (World Bank, 2010).

Agricultural innovations through CSA also have a significant role to play in fighting poverty, lowering per unit cost of production (Kassie*et al.,* 2011). Boosting rural income and reducing hunger (Maertens and Barrett, 2013). Based on the success stories that were achieved from the Green Revolution in Asia, efforts to increase agricultural productivity in Africa have being directed towards the adoption of improved agricultural innovations (Jones *et al.,* 2010). According to IPCC (2007), the relationship of agriculture to climate change is a topic of increasing interest. Worldwide Agricultural production is expected to decrease under climate change projections, posing a threat to global food production. However, it is also important to note also that agriculture contributes a significant amount of global emissions annually, which will increase with the intensification of production to meet higher demand. In addition, estimate attribute as much as about 80% of global deforestation to agriculture (Kissinger *et al.,* 2012 as cited by Elizabeth and Sophie, 2014). IPCC 4th assessment Report predicts that climate change can cause yield to decrease by as much as about 50% in some highly vulnerable areas, including sub-Sahara Africa (Elizabeth and Sophie 2014). According to this report "Warming in Sub-Sahara Africa (SSA)", warming is expected to be greater than the global average and rainfall will decline in certain areas the study was to determine the effect of climate smart agricultural practices on food production among smallholder farmers in Oyo State, Nigeria.

MATERIALS AND METHOD

The study was carried out in Oyo State. The State is an inland State in south-western Nigeria, with Ibadan as capital. It is bounded in the north by KwaraState, in the east by OsunState, in the south by OgunState and in the west partly by OgunState and partly by the Republic of Benin (Oyo state official website 2023). Oyo State covers approximately an area of 28,454 square kilometers and is ranked 14th by size in land mass in Nigeria. The landscape consists of old hard rocks and dome shaped hills, which rise gently from about 500 meters in the southern part and reaching a height of about 1,219 metre above sea level in the northern part. Some principal rivers such as Ogun, Oba, Oyan, Otin, Ofiki, Sasa, Oni, Erinle and OsunRiver originate in this highland. The population of Oyo state according to an estimate from the National Population Commission (2006) is 5,591,589 million. The climate and soil of the state are suitable for the cultivation of a wide range of crops. The major food crops include maize, yam, cassava, millet, rice and banana, while cash crops include cocoa, kolanut, cotton etc. The Climate is equatorial, notably with dry and wet seasons with high relative humidity. The dry season lasts from November to March while

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the wet season starts from April and ends in October. Average daily temperature ranges between 25°C (77.0 °F) and 35°C (95.0°F), almost throughout the year. Some people engage in agriculture while some engage in civil service and trading (Oyo State official website, 2023).

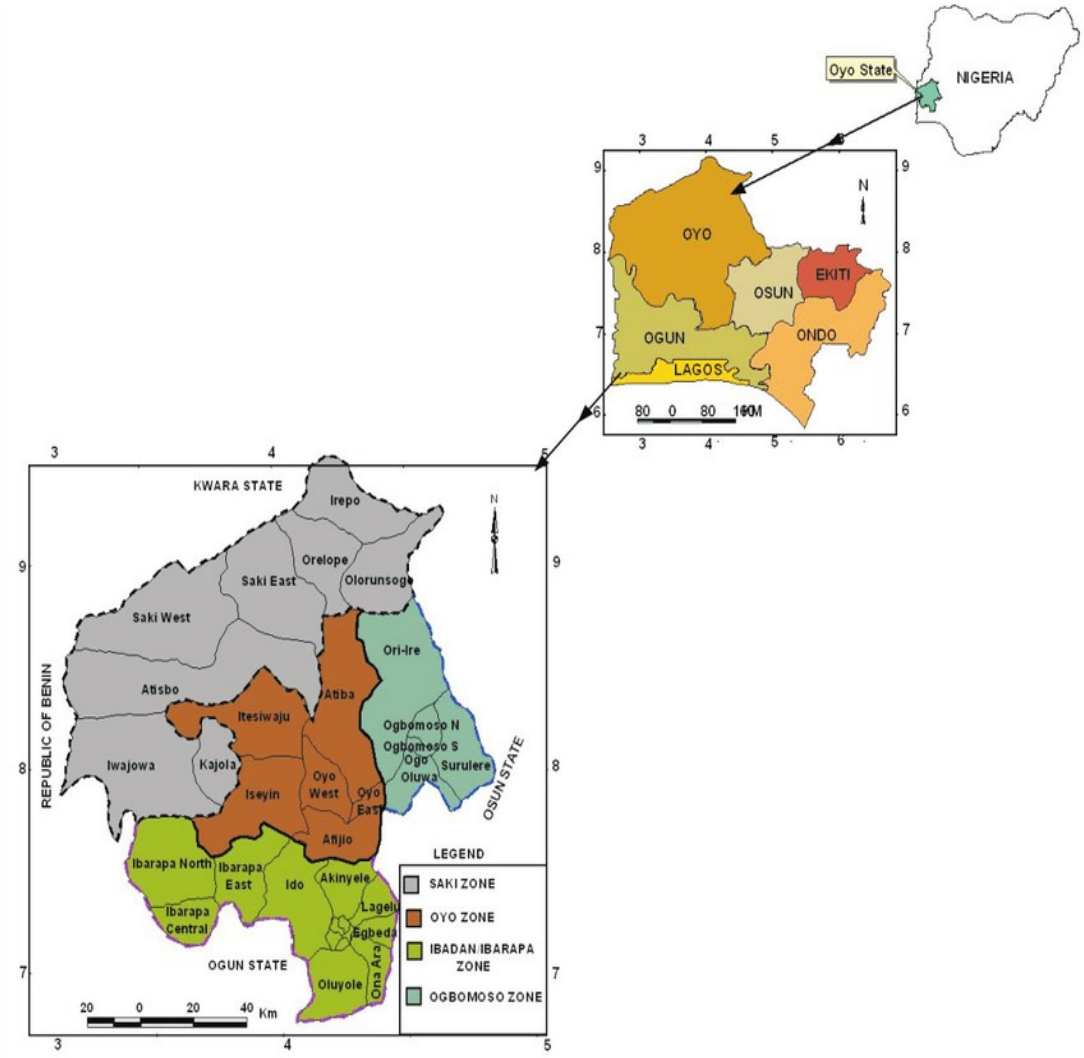

Figure 1: Map of Oyo State ADP Zones and Blocks
Source: Ashley-Dejo, 2012.

The population of the study comprises of the registered household farmers in Oriire, and Surulere Local Government Areas in Ogbomoso ADP Zone and Olorunsogo, Oorelope, and Irepo Local Government Areas in Saki ADP Zone in Oyo state, Nigeria who are involved in cassava cultivation.

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Multistage sampling method was employed in the selection of respondents. During the first stage, 50% of the Agricultural zones were selected from Oyo State Agricultural Development Programme zoning, therefore Ogbomoso and Saki zones were randomly selected. Thereafter, 40% of the Local Government Areas
(LGAs) were selected from each selected zone i.eOriire and Surulere LGAs from Ogbomoso Agricultural zone, Irepo, Orelope and Olorunsogo LGAs from Saki Agricultural zone, which amounted to a total of five LGAs from both Agricultural zones.
Third stage involved random selection of one percent (1%) villages from the list of registered villages in each LGAs and about (13.4%) household farmers from the list of registered households in each selected village, which amounted to a total of three hundred and thirty two (332) household farmers that constituted the sample size of the study.
The data used for this study were primary data and were obtained through well-structured interview scheduled and questionnaire.
Data for the study were collected with both structured interview scheduled and questionnaire. The instrument was designed and contained both close and open ended questions based on the objective of the study.
Descriptive statistics (frequency counts, percentage, mean, ranking) , likert scale, weighted mean score and percentage were used to analyzed the collected data. The data collected were analyzed using descriptive analysis, statistics such as frequency counts, percentage, mean, ranking were used to describe socio-economic characteristics of the respondents (farmers), identify the climate smart agricultural awareness strategies used by the respondents, and identify the constraints of climate smart agricultural strategies on small holder farmers' production in the study area.
Ranking: This is asking the respondents to order a set of items from highest to lowest preference.
Likert Scale: This is asking the respondents to rate their agreement or disagreement with a statement on scale (e.g. Strongly Disagree to Strongly Agree).

Likert rating Scale
Rating the level of agreement with each statement that assesses opinions, attitudes or behaviour quantitatively are different points of Likert scale, 3 -, 4 -, 5 -, point Likert scale was used. A cut off point of 2 was established, therefore any mean below the cut off point (2) is regarded as not a strategy used.
Likert scale 3 Point; high (3), moderate (2) and Low (1) were used for factors that influences the adoption of climate smart agricultural practices (CSPS)

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Likert Scale 4 Point: Very severe (3), severe (2), Mild (1) and not severe (0), were used for constraints associated with the adoption and use of climate smart agricultural practices. Likert Scale 5 Point : Always (5), sometimes (4), often (3), rarely (2), and not used (1) were used to evaluate the extent of climate smart agricultural practices, and 5 point likert scale: Strongly Agree (5), Agree (4), Undecided (3), Disagree (2), and Strongly Disagree (1) were also used to evaluate the perceived effects of climate smart agricultural practices.

Formula for Weighted Mean Score (WMS) Is Arithmetic mean in which some elements of the data set carry more important than others, both in Maths and statistics. WMS can be calculated by multiplying each value in set by its weight, then add up the production and divide the products sum by the sum of the weight.

WMS = Σ(W * Score) /ΣW

Σ = summation

W = the weight

* = Multiplication

/ =the division

How to calculate WMS

1. Calculate the weighted value of each data point by multiplying each data point value by its weight.
2. Sum the weighted values by adding the weighted value of each data point.
3. Divide the Sum by the sum of the weighted for each data point.

RESULTS

1. Socio-economic characteristics of the respondents in the 5 LGAs.

Table 1: shows the distribution of respondents according to sex. The result indicated that 86.74% of the respondents were males while 13.25% were females. This implies that males dominate agricultural production compared to female household farmers in the area.

Table 1 presents the distribution of respondents by age and the result indicated that 38.85% of the respondents were between 41-50 years of age, 17.46% were between 51-60 years, 8.73% were 60 years and above, 23.19% were between 31-40 years while 11.74% of the respondents were below or equal to 30 years of age. The mean age of the respondents was 52 years.

The results on Table 1 further reveal the distribution of respondents by marital status and majority (90.06%) of the respondents were married, 3.61% were widower/widow, 3.91% were single, while only 2.40% of the respondents were divorced.

More than half (78.31%) of the respondents indicated Christianity, 15.66% indicated Muslim, while 6.02% of the respondents were traditional worshippers. It was observed

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that the respondents sampled in the study area were of different religion background. It was obvious that all the religions were well represented in the study area and this could promote unity. This may be true because religion can be considered as part of social life especially in the rural community where people interact with one another.

Table 1 shows respondents' educational qualifications. It was revealed that 30.12% had primary education, 46.38% had secondary education, 14.15% had tertiary education, while 9.33% of the respondents had no formal education. This implies that most of the respondents are literate at different level which is an indication that there will be affective contribution to their knowledge and awareness level on climate smart agricultural practices.

Less than half (27.71%) of the respondents spent between 1-6 years in school, 47.89% spent between 7-12 years in school, 15.06% spend 12 years and above while 9.33% of the respondents had no formal education. The mean number of years spent in school was 8 years.

About 80.12 % of the respondents indicated between 6-10 household size, 12.34% indicated below or equal 5 household size, while 7.53% of the respondents indicated 10 and above household size. The mean household size was 7 members.

Aboutsixty percent (60.84%) of the respondents indicated farming as primary occupation, 15.06% indicated artisan, and 12.34% indicated trading, while only 11.74% of the respondents indicated civil service as their primary occupation. Majority of the respondents were also involved in the cultivations of yam, maize, sorghum, rice, beans and cassava. This implies that most of the respondents engaged in farming as their primary occupation.

Fifty three percent (53%) of the respondents had between 11-20 years of farming experience, 7.53% had 30 years and above, 3.61% had between 21-30 years while 36.14% of the respondents had below or equal 10 years farming experience. The mean year of farming experience was 30 years. This implies that virtually all the respondents sampled are well experienced farmers.

Table 1 further reveals that most (87.95%) of the respondents had contact with extension agent while only 12.04% indicated no access to extension agent. This implies that most of the respondents had contact with extension service in the study area.

Further to the extension contact above, Table 1 reveals that of the respondents indicated their frequency of contact with extension agents. 87.95% fortnightly, while 0.0% indicated monthly and weekly as the frequency of extension contact. This implies that the respondents that had contact with extension agent received them on different occasions.

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In the same Table 1, majority (94.27%) of the respondents were members of associations while, few (5.72%) of the respondents were not member of associations. The result implies that most of the respondents belong to certain associations.

Larger number, 94.27% of the respondents indicated cooperatives as their source of credit, 0.0% indicated money lenders, 5.72% indicated friends and family while only 0.0% indicated banks. This implies that respondents sampled had different sources of credit for their livelihood. Access to credit might enable farmers to invest into climate-smart technologies and practices thereby enhancing food production.

Table 1: Distribution of respondents according to socio-economic characteristics in the five local government areas. n= 332

Socio-economic characteristics		Percentage	Mean
Sex			
Male		86.74	
Female		13.25	
Age (years)			
≤ 30		11.74	
31-40		23.19	52
41-50		38.85	
51-60		17.46	
Above 60		8.73	
Marital status			
Single		3.91	
Married		90.06	
Divorced	8	2.40	
Widower/widow	12	3.61	
Religion			
Christianity	260	78.31	
Islamic	52	15.66	
Traditional	20	6.02	
Educational qualification			
No formal education	31	9.33	
Primary education	100	30.12	
Secondary education	154	46.38	
Tertiary education	47	14.15	
Number of years spent in school			

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Socio-economic characteristics		Percentage	Mean
≤ 0	31	9.33	
1-6	92	27.71	8
7-12	159	47.89	
Above 12	50	15.06	
Household size			
≤ 5	41	12.34	
6-10	266	80.12	7
Above 10	25	7.53	
Primary occupation			
Farming	202	60.84	
Trading	41	12.34	
Artisan	50	15.06	
Civil servant	39	11.74	
Year of farming experience			
≤ 10	120	36.14	
11-20	175	52.71	30
21-30	12	3.61	
Above 30	25	7.53	
Contact with extension agent			
Yes		87.95	
No		12.09	
Frequency of extension contact			
Weekly		0.0	
Monthly		0.0	
Fortnightly		87.95	
Membership of association			
Yes	313	94.27	
No	19	5.72	
Source of credit			
Banks	00	0.0	
Money lenders	00	0.0	
Cooperatives	313	94.27	
Friends and family	19	5.72	
Total	**332**	**100.0**	

Source: Field survey, 2024.

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Awareness of climate smart agricultural strategies in the 5 LGAs.

Awareness on climate smart agricultural strategies were determined, the responses were multiple as presented on Figure 2 and the results showed that majority (91%) of the respondents indicated crop management, field management, soil management practices and integrated pest management as part of the climate smart agricultural strategies they were aware of in the study area, 81.32% indicated biodiversity management, 8.73% indicated sustainable mechanization while only 8.73% indicated improved water use and management and sustainable mechanization as part of the climate smart strategies they were aware of. This implies that respondents in the study area were aware of different climate smart agricultural strategies.

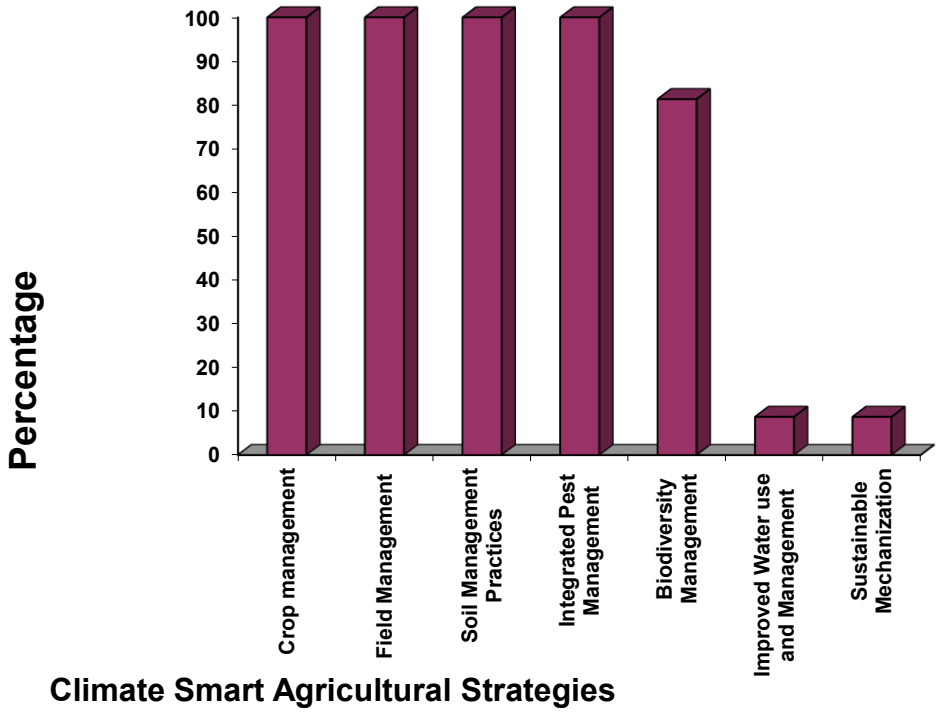

Figure 2: Distribution of respondents according to awareness of climate smart agricultural strategies in the five local government areas.

Extent of use of climate smart agricultural strategies in the five local government areas.

This extent of use of climate smart agricultural strategies was measured on five point rating scale of Always, Sometimes, Often, Rarely and Not use, WMS was also computed and ranked accordingly (Table 3). The result showed that crop management had the highest weighted means score of 3.84, this was followed closely by field management and

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soil management practices with each weighted mean score of 3.82 and 3.81 respectively. Other extents of use were in the following order: integrated pest management (WMS= 3.75), biodiversity management (WMS = 3.73), improved water use and management (WMS = 2.31) and sustainable mechanization (WMS = 2.19). This implies that not all the respondents utilized the identified climate – smart agricultural strategies.

Table 3: Respondents' response to the extent of use of climate smart agricultural strategies in the five local government areas.

n=332

Climate smart agricultural strategies	Percentage level of use Extent						
	Always	Sometimes	Often	Rarely	Not use	WMS	Rank
Crop management	90.96	2.40	6.02	0.60	0.0	3.84	1st
Field management	89.75	2.40	7.53	0.30	7.8	3.82	2nd
Soil management practices	89.45	2.10	8.43	-	7.8	3.81	3rd
Integrated pest management	86.44	5.12	5.72	2.71	-	3.75	4th
Biodiversity management	85.24	6.02	5.13	3.61	0	3.73	5th
Improved water use and management	9.63	15.06	72.28	3.01	0.0	2.31	6th
Sustainable mechanization	9.63	13.25	68.67	3.61	4.81	2.19	7th

Source: Field Survey, 2024.

WMS: Weighted Mean Score

WMS ≥ 2 is regarded as important extent of use of Climate Smart Agricultural Strategies.

Perceived effects of climate smart agriculture on food production in the five local government areas.

Likert scale of Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree were employed to determine their level of agreement on the statement on the effects of climate smart agriculture (CSA) on food production. Thereafter means were computed and ranked accordingly. Result, in Table 4. revealed that the statement "the effect of Climate Smart Agriculture can only be confirmed by those farmers that applied it, the

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aftermath effect is reflected on crop yield had the highest WMS of 4.89 and was ranked first (1st), followed by the statement "Climate Smart Agriculture Awareness will foster its adoption among farmers, hence food production will be encouraged had WMS 4.87 ranked 2nd, followed by the statement "The output of the farmers that applied climate smart agriculture" can not be compared with their counterpart output that doesn't applied Climate Smart Agriculture ranked 3rd with WMS 4.83. The statement "food production is encouraged with the application of Climate Smart Agricultural practices ranked 4th with WMS of 4.79 while the statements "While Climate Smart Agriculture improve yield quality and quantity", the application of Climate Smart agriculture would guarantee food production and climate smart agriculture can be applied to all kinds of crop production and would enhance the crop yield were ranked 5th each with WMS of 4.78. The statement "there is increase in the farmer's output, leading to increase income with the adoption of Climate Smart Agriculture ranked 8th with WMS of 4.76, and the statement "with climate smart agricultural practices farmers productivity is improved ranked 9th with WMS of 4.72.

Table 4: Distribution of respondents according to perceived effects of climate smart agriculture on food production in the 5 LGAs.

n = 332

Statements on the effects of climate smart agriculture on food production	Percentage level of perceived agreement						
	SA	A	U	D	SD	WMS	Rank
With climate smart agricultural practices, farmers productivity is improved	78.31	116.6	4.81	0.60	0	4.72	9th
Climate smart agriculture improve yield quality and quantity	82.83	13.25	3.31	0.60	0	4.78	5th
Food production is encouraged with the application of climate smart agricultural practices	82.53	13.85	3.61	0	0	4.79	4th
There is increase in the farmers' output, leading to increase income with the adoption of climate smart agriculture	81.32	14.15	3.31	1.20	0	4.76	8th
The application of climate smart agriculture would guaranteed food production	82.83	13.25	2.71	1.20	0	4.78	5th
Climate smart agriculture can be applied to all kinds of crop production and would enhance the crop yield	81.95	15.06	2.10	0.60	0.30	4.78	5th
Climate smart agriculture awareness will foster it adoption among farmers, hence food production would be encouraged	87.95	11.14	0.90	0	0	4.87	2nd
The effects of climate smart agriculture can only be confirmed by those farmers that applied its, the aftermath effect is reflected on crop yield	89.75	9.33	0.90	0	0	4.89	1st

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Statements on the effects of climate smart agriculture on food production	Percentage level of perceived agreement						
	SA	A	U	D	SD	WMS	Rank
The output of the farmers that applied climate smart agriculture cannot be compared with their counterparts' output that doesn't applied climate smart agriculture	87.09	9.03	3.91	0.0	0.0	4.83	3rd

Source: Field Survey, 2023.

SA: Strongly Agree; A: Agree; U: Undecided; Disagree; SD: Strongly Disagree
WMS: Weighted Mean Score

WMS ≥ 2 is regarded as important perceived effects of Climate Smart Agricultural on food production.

Benefits of using climate smart agricultural strategies in the five local government areas.

Figure 3 reveals the benefits associated with the use of climate smart agricultural strategies. The result showed that majority (78.31%) of the respondents indicated improve food production, and strengthen farmers' resilience (82.83), increases sustainable productivity (81.32%), delivers environmental benefits (88.25%) and reduces agricultures greenhouse gas emission (9.63%). The result implies several benefits are derived from use of climate-smart agriculture as indicated by the respondents in the study area.

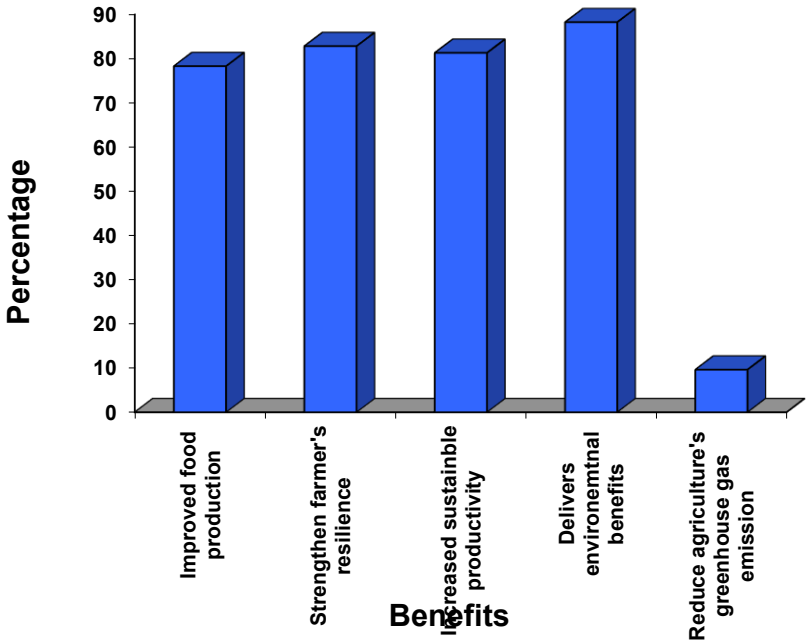

Figure3 Respondents view of benefits of using climate smart agricultural strategies in the five local government areas.

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Coping strategies against food insecurity in the five local government areas.

Figure 4.reveals different strategies employed by the respondents against food insecurity in the study area. The result revealed that all (100%) the respondents indicated borrowing of food items, borrowing of money (100%), selling of their assets (100%), accept help from friends and family (100%) and also 100% of the respondents engaged in farm labour to obtain food. The respondents thus employed diverse coping strategies against food insecurity in the study area.

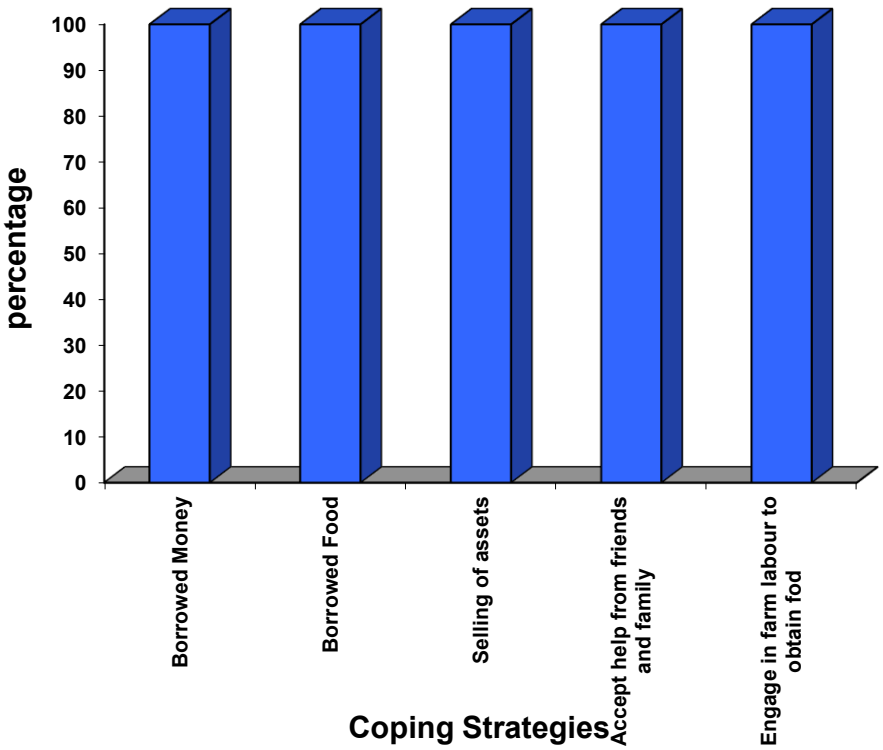

Figure4Distribution of respondents according to coping strategies against food insecurity in the five local government areas.

Constraints associated with the adoption and use of climate smart agricultural strategies in the five local government areas.

The constraints to the adoption and use of climate smart agricultural strategies were determined on 4-point rating scale of Very Severe (VS); Severe (S); Mild (M) and Not Severe (NS). Ranked first was limited credit and finance recorded a with high WMS of 3.99 and closely followed by poor physical and social infrastructure with WMS of 3.97, ranked

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2nd. Lack of practical understanding of the approach and lack of adequate and innovative financial mechanism and effective risk sharing scheme with WMS of 3.93 each, ranked 3rd. Lack of data and information and appropriate analytical tools at local and national level with WMS of 3.91 ranked 5th, while inadequate coordinated, supportive and enabling policy frameworks with WMS of 3.89 ranked 6th.

Table 7: Distribution of respondents according to constraints associated with the adoption and use of climate smart agricultural strategies in the five local government areas. **n=332**

Constraints to climate smart agricultural strategies	PercentageLevel of Severity					
	Very Severe	**Severe**	**Mild**	**Not Severe**	**WMS**	**Rank**
1. Lack of practical understanding of the approach	95.5	3.01	0.0	1.5	3.93	3rd
2. Lack of data and information and appropriate analytical tools at local and national levels	96.9	0.0	0.0	3.0	3.91	5th
3. Inadequate coordinated, supportive and enabling policy frameworks	95.5	1.5	0.0	3..0	3.89	6th
4. Lack of adequate and innovative financial mechanisms and effective risk sharing schemes	96.9	1.2	0.0	1.8	3.93	3rd
5. Limited credit and finance	99.7	0.0	0.0	0.3	3.99	1st
6. Poor physical and social infrastructure	98.5	0.0	1.5	0.3	3.97	2nd

Source: Field survey, 2024.
WMS: Weighted Means Score.
WMS ≥ 2 is regarded as important constraints associated with the adoption and use of Climate Smart Agricultural Strategies.

Factors influencing the adoption of climate smart agricultural practices in the five local government areas.

Figure 5 reveals that 100% of the respondents indicated land tenure (Land ownership status), Assess to production inputse.g land, Capital, seed, fertilizer, chemical, and Access to extension service (information/training) as factors influencing the adaptation of climate smart agricultural practices.

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The above factors were followed by farm size (cultivated) with 98.79%, knowledge/ awareness of CSAP with 93.97%, perception/socio -cultural factor e.g belief, value,norms with 92.16% and Enterprise characteristics (types of crops grown) with 88.55%.

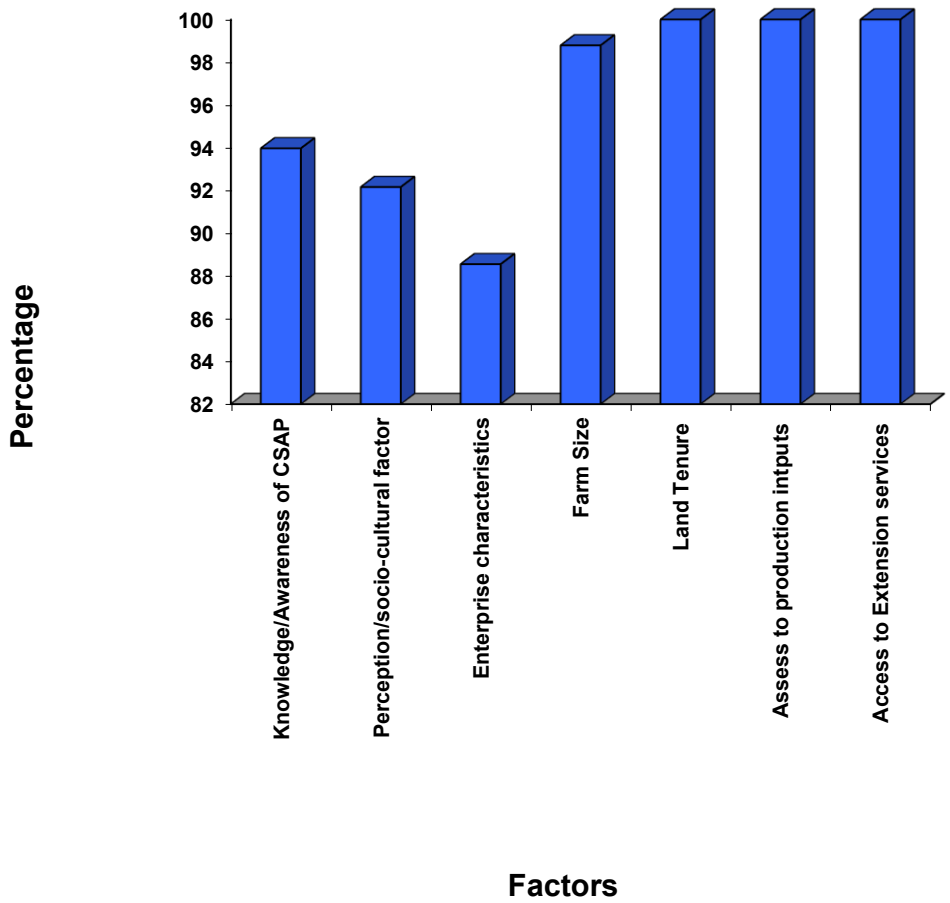

Figure 5. Distribution of respondents according to factors influencing adoption of climate smart agricultural practices in the five local government areas.

Factors that influence the adoption of climate smart agricultural practices in the five local government areas

Three rating scale of High, Medium and Low were used to determine the level of influence of each of the identified factor. Thereafter, weighted mean scores (WMS) were computed and the factorsranked accordingly (Table 9). The result showed that knowledge/awareness of CSAP, land tenure, access to production inputs and access to extension service (information/training) ranked 1st with WMS of 3.00. Perception/socio-

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cultural factors of belief, value, norms ranked 5th with WMS of 2.89, Enterprise characteristics (type of crops grown) ranked 6th with WMS of 2.87 and farm size (size cultivated) ranked 7th with WMS of 2.80.

Table 9: Distribution of respondents by identified factors that influence the adoption of climate smart agricultural practices (CSAPs) in the five local government areas.

n = 332

Factors	Percentage Level of influence				
	High	Moderate	Low	WMS	Rank
Knowledge/awareness of CSAP	100	19	1	89	3rd
Perception/socio-cultural factors e.g belief, value, norms	92.2	6.0	1.8	2.89	5th
Enterprise characteristics (types of crops grown)	88.6	9.6	1.8	2.87	6th
Farm size (size cultivated)	98.8	0.0	0.0	2.98	7th
Land tenure (land ownership status)	100	0.6	0.6	3.00	1st
Access to production inputs e.g land, Capital, seed, fertilizer, chemicals	100	0.0	0.0	3.00	1st
Access to extension service (information/training)	100	0.0	0.0	3.00	1st

Source: Field survey, 2024.

WMS: Weighted mean score

WMS ≥ 2 is regarded as important factor that influenced the adoption of Climate Smart Agricultural practices.

DISCUSSION

All the sampled farmers were of different age group and sex that were involved in cassava production, and indicated that most of them are matured and were expected to become conversant with effects of climate smart practices on food production which would necessitate the application of climate smart agricultural practices on food production. The variation in the percentages may be ascribed to the reality that male were more involved in agricultural production, this may be due to energy and stress associated with farming, which many men can survive than women, it is a usual assumption that male dominate agricultural production in many areas of the world including Nigeria. The result implies that cassava production does not have any religious bias, the disparity in the percentages

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may be due to the category of people that were available during the data collection exercise, most of the sampled respondents were matured, married and possess ability to take appropriate decisions (Akintonde *et al.,* 2016).

The result shows that most of the sampled respondents were males household farmers were likely to be more aware of climate smart agriculture compared to the female household farmers in the study area due to their individual interaction. This result corroborates Ejembi (2006), who reported that in many developing countries, women face significant barriers to acquiring information and knowledge about climate smart agricultural practices. This lack of awareness limits their ability to adopt sustainable farming methods and adapt to a changing climate, increasing the vulnerability of their households to food insecurity.

Most of household farmers sampled can be considered to be active and this is expected to enhance their knowledge, awareness level and possibly their readiness to adopt and apply climate smart agricultural practices. This finding is in conformity with (Abdulai*et al.*, 2005, Tiamiyu*et al.*, 2009, Moges*et al.*, 2017) that opined that younger individuals, who are more likely to be aware of and knowledgeable about climate smart agricultural practices, may have a stronger understanding of the connection between climate change and food production. This awareness can lead to more informed decision-making and implementation of climate smart agricultural practices, which can improve food production outcomes.

Marital status may influence resource allocation, decision-making dynamics, and labour availability within a household, impacting how climate-smart agricultural practices are adopted and their subsequent effect on food production. For instance, married farmers may have access to additional labour from their spouses, potentially enabling them to implement more climate smart practices. This finding is in line with Deressa*et al.* (2009) who asserts that married and adulthood are stages that are expected to give arable crop farmers insight and need to employ possible strategies to mitigate various climate change effects on crop production. This is in agreement with Aphunu and Otoikhian (2008) that affirmed that marital status is a factor which is likely to encourage the sustainability of adoption decisions.

Religion affinity provides opportunity for formation of social and economic cooperative association to promote livelihood activities which may ensure household food production. This result support Akintonde*et al.* (2016), who reported that religion membership is expected to provide arable crop farmers a medium for exposure to other people's experience on climate change issues and ability to take initiative on the strategies considered to be appropriate among others.

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Higher level of education often correlates with greater access to information and resources, which can enhance farmer's understanding of climate smart agricultural practices. This awareness can lead to more effective adaptation strategies, improving food production by enabling farmers to mitigate the effects of climate change on their crops and livelihoods. According to Mamudu, *et al.* (2012) the level of education of a person not only increases his farm productivity but also enhances his ability to understand and evaluate new technologies. This finding also corroborate IPCC (2014) who reported that adaptation depends on factors such as wealth, technology, education, information, skills, infrastructure, access to resources and management capability.

CONCLUSION

Almost all the respondents in the study areas were aware of climate smart agricultural strategies, not all the respondents utilized the identified extent of use of climate smart agricultural strategies, they had varied view on perceived effects of climate smart agriculture on food production.

Almost all the respondent agreed that benefits are derived from the use of climate smart agricultural strategies, they also employed diverse coping strategies against food insecurity in the study areas, the respondents had varied view according to constraints associated with the adoption and use of climate agricultural strategies, also varied view on factors influencing the adoption of climate smart agricultural practices in the study area.

Which the respondents had varied view of factors that influences the adoption of climate smart agricultural practices . Thus it implies that climate smart agricultural practices has been accepted as a new way of mitigation , development and adoption as another form of agriculture for conserving the environment while addressing food needs of the world's population.

Climate-smart practices tailored to their specific context. This direct interaction helps farmers to understand the importance of adopting these practices and how to implement them effectively as a result, farmers who have regular contact with extension agents are more likely to successfully integrate climate-smart strategies into their farming operations, leading to improved food production outcome such as increased yields, resilience to climate changes and better livelihoods.

Some personal characteristics and some selected CSA practices influences output of cassava among the smallholder farmers across the selected LGAs.

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Contact with extension agents play a crucial role in bridging the gap. Climate-smart agricultural practices on food production among smallholder farmers, extension agents can provide valuable information, training, and support to farmers regarding the adoption of climate smart agricultural practices the result agrees with the findings of which ascertain that regular contact with extension agents motivates and exposes the farmers to innovations and gives them information on how to use the technologies against diverse effects of climate change on crop production.

The variation in the extension agent contact may be due to differences in the type of crop cultivated, information required and size of farmland cultivated, etc. However, more frequent interactions allow for a deeper exchange of knowledge and information between extension agents and farmers. This may facilitate better understanding of climate-smart agricultural practices and their implementation thereby enhancing food production among smallholder farmers. This finding corroborate with the report that availability of better climate and agricultural information helps farmers to make comparative decisions among alternative crop management practices and this allows them to better choose strategies that make them cope well with changes in climatic conditions. Association membership can amplify the spread in the climate-smart agricultural awareness and information by fostering knowledge sharing, resource access, collective action, and market opportunities, ultimately improving food production outcomes for smallholder farmers in the study area.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations where drawn:

1. It is pertinent to encourage cassava production through the creation of awareness on CSAPs and encourage its application among all the stakeholders in agricultural production in order to improve crop production thereby discouraging food insecurity among the rural farmers and the nation at large;
2. Respective authorities within the agricultural sector should formulate policies and at the same time support all necessary institutions in order to encourage wider adoption CSAPs among crop farmers in the study area and across the country at large.
3. Both governmental and Non-governmental Organizations should take cognizance of both personal characteristics and demographic factors in designing productive programmes for crop farmers in the State and Nigeria at large for clarity of purpose and effective application of knowledge and skill that would be derived through such programme in order to bring about desired attitudinal change among the crop farmers or participants of such training programme.

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