



INTERNATIONAL JOURNAL OF

Organic Agricultural

RESEARCH AND DEVELOPMENT

*Advancing Sustainable Agriculture for
a Healthier Planet*

VOLUME

21

SPECIAL ISSUE

MAY, 2026



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EFFECT OF CLIMATE SMART AGRICULTURAL PRACTICES ON POVERTY STATUS OF CASSAVA –BASED FARMERS IN AGUATA L.G.A.OF ANAMBRA STATE, NIGERIA

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ABSTRACT

This research examined the effect of climate smart Agricultural practices on poverty status of cassava –based farmers in Aguata L.G.A. in Anambra State, Nigeria. Multistage sampling technique was employed for the study. Primary data was the focus for data collection. The result revealed that majority, approximately 61.25% of the cassava farmers, fall below the poverty line, Conversely, only 38.75% of the farmers were considered non-poor. The result also showed that food stuff used up about (29.65%) of the monthly expenditure on average, followed by education (21.54%), clothing and shelter (19.84%), health (14.58%). The study shows that the mean expenditure was N 3,144.43. The estimated poverty line which was based on 2/3 of MPCE per person. The result shows that the mean per capita expenditure was N 3,144.4 while poverty line per person was N 2,096.27. This implies that the farmers were living on N524.06 per person per day. This study therefore recommends integrating climate-smart agriculture into rural poverty alleviation strategies is essential. Given the strong link between CSAP adoption and improved livelihoods, national and local governments should embed these practices within broader development programs aimed at reducing rural poverty

Key words: *climate, smart, poverty, status, Agricultural, practices, cassava-based, farmers*

INTRODUCTION

Climate change poses a significant threat to agricultural systems globally, and its impacts are particularly pronounced in sub-Saharan Africa (IPCC, 2022). Nigeria, with its heavy reliance on rain-fed agriculture and a large population of smallholder farmers, is highly vulnerable to climate-change such as erratic rainfall, extreme temperatures, and increased pest and disease outbreaks (National Oceanic and Atmospheric, NOAA, 2019). These challenges directly impact agricultural productivity, threatening livelihoods and food security, particularly in rural communities (FAO, 2023). Climate change is predicted to increase the frequency of natural disasters, and affect crop yields, food security and livelihood vulnerability (Abhishek *et al.* 2022). As global temperatures rise and rainfall patterns become more unpredictable, cassava farming faces increasing risks. While cassava is somewhat resilient to drought, prolonged dry spells, and extreme weather events such as floods can adversely affect yields and quality. These changes may result in lower productivity, higher production costs, and greater vulnerability for farmers who rely on cassava for both subsistence and income (Ali *et al.* 2017).

Cassava (*Manihot esculenta*) is a starchy root

crop widely cultivated in tropical and subtropical regions around the world. Known for its high carbohydrate content, cassava is a major food staple in many countries, particularly in Africa, Asia, and Latin America. However, climate change is posing significant challenges to cassava production. Cassava farmers are susceptible to the effects of changing climate due to the lack of capacities to cope with these effects and achieve sustainable livelihoods (Abhishek *et al.* 2022).

One of these measures to address these challenges of climate change on agriculture so as to improve food crop productivity and better livelihood of rural farmers is through smart farming. Smart farming involves climate smart agriculture (CSA) which has been presented as an alternative form of agriculture from conserving the environment while addressing the food need of the world people (FAO, 2014). According to FAO (2010), the aim of CSA is to repackage agriculture in the content of a changing climate as a triple win of adoption, mitigation and development.

MATERIALS AND METHODS

This study was conducted in Aguata LGA of Anambra State, Nigeria. Anambra State is a state in south-eastern Nigeria. Aguata is a local government Area in Anambra State, Nigeria,

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with its headquarters in Aguata. A major part of the headquarters falls into the town of Aguluechukwu, while a smaller part falls into Ekwuluobia. Aguata lies between longitudes 6° 20' E and 7° 00' E of the Greenwich meridian and latitudes 6° 33' N 7° 00' N of the Equator. It has an area of 4,884 km² (1,870sq m) and a population of 6,358,311 (NBS, 2020). The annual rainfall ranges from 1400 mm in the North to 2500 mm in the south with temperatures of 25°C - 35°C. The study population comprised cassava based farmers in Aguata LGA. A multi-stage sampling technique was implemented. In the first stage, simple random sampling techniques was employed to choose four communities. Within each community, two village was randomly selected, thus accumulating eight villages. From each village, a sample frame was established with the support of village heads and resident extension agents in the communities. From these sample frames, a random sampling method was used to select 10 cassava farmers from each village, culminating in a total of 80 respondents for the study.. Primary data was collected using questionnaire and interview schedules. The information collected from the questionnaire encompassed socio-economic characteristics of the farmers, including age, marital status, experience, and education. It also covered the climate-smart agricultural practices adopted by respondents in the study area, the decision-making involved in adopting these practices, the extent of adoption, and the output and input of cassava farmers. Furthermore, the study will identified the challenges hindering the adoption of climate-smart agricultural practices. Objective (v) which entails the poverty profile and the effect of climate smart agricultural practices on poverty status of cassava based farmers in the study area will was analysed using The Foster-Greer-Thorbecke (FGT) poverty measure and simple regression\

The FGT is presented below: $P_{\alpha} = \frac{1}{n} \sum_{i=1}^{\alpha} \left[\frac{Z-Y_i}{Z} \right]^{\alpha}$ where, Z = the poverty line defined as 2/3 of Mean per capita expenditure, Y = the annual per capita expenditure, aI = the number of poor households in the population of size n, a = the degree of poverty aversion; a=0; is the Headcount index (P0) measuring the incidence of poverty (proportion of the total population of a given group that is poor, based on poverty line). ,a =1; is the poverty gap index measuring the depth of poverty that is on average how far the poor is from the poverty line; ,a =2; is the squared poverty gap measuring the severity of poverty and inequality among the poor.,The FGT is presented below: $P_{\alpha} = \frac{1}{n} \sum_{i=1}^{\alpha} \left[\frac{Z-Y_i}{Z} \right]^{\alpha}$ Where, Z = the

poverty line defined as 2/3 of Mean per capita expenditure, Y = the annual per capita expenditure ,a_i = the number of poor households in the population of size n,
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 a =1; is the poverty gap index measuring the depth of poverty that is on average how far the poor is from the poverty line; a =2; is the squared poverty gap measuring the severity of poverty and inequality among the poor.,Simple regression for the effect of climate smart agricultural practices on poverty status of cassava based farmers is specified as follow:, $SMART_i = b_0 + b_1 POV_i + e_i$ Where, $SMART_i$ = Climate smart agricultural practices (Number of climate smart agricultural practices use by the farmers in the area) POV_i = Poverty status (I=poor, 0 Non-poor)
 b_0 = ntercept , e_i = error term

Poverty Profile and effect of Climate Smart Agricultural Practices on Poverty Status of Cassava Based Farmers in the Study Area

Poverty Profile ,The mean per capita monthly expenditure of the cassava based farmers in Study area is presented in table 3

Tabl 1: Mean per capita monthly expenditure and Poverty line of the cassava farmers

ITEMS	Mean value	Percentage share
Foodstuff	74,580.00	29.65
Education	54,188.00	21.54
Clothing and shelter	49,900.00	19.84
Health care	36,668.00	14.58
Bill	7,400.00	2.94
Transportation	5,960.00	2.37
Taxes/levies	2,032.00	0.81
Festival/ceremony	5,328.00	2.12
Levies	6,696.00	2.66
Toiletries	2,668.00	1.06
Utilities	3,332.00	1.32
Others expenditure	2,800.00	1.11
Total expenditure	251,552.00	N 524.06 (0.317 Dollars)
MPCE	N 3,144.4 (1.91 Dollars)	
Poverty line		100.00
Mean household size (6 persons)	N 2,096.27 (1.27 Dollars)	

Source: Field survey (2025) N 1650 = I Dollars

The analysis in the Table 1 provides information on the amount spent on each items by an average cassava based farmers in the area. The result shows that food stuff engulf about (29.65%) of

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the monthly expenditure on average, followed by education (21.54%), clothing and shelter (19.84%), health (14.58%), and others as shown. This result is expected because food, shelter and clothing were the basic need of man. The study shows that the mean expenditure was N 3,144.43. The estimated poverty line which was based on 2/3 of MPCE per person. The result shows that the mean per capita expenditure was N 3,144.4 while poverty line was per person was N 2,096.27. This implies that the farmers were living on N 524.06 per person per day. Moreover, considering the poverty line obtained and the mean household size of 5 persons per household, these values N 2,096.27 and N 524.06 were lower than the international poverty threshold per person per day living in Sub-sahara African (World Bank, 2016). The result is suggestion of the problem food insecurity among poor farm household. The amount generated by the cassava based farmers may not be able to meet the daily calories intake of 2250Kcal required per person per day.

Poverty Status , Table 4 shows the poverty status of the respondent, the poverty status of cassava-based farmers, as determined by the poverty line estimated in the study, reveals a concerning economic reality in the study area. From Table 4.5 any farmers spending less than the amount obtained on consumption is describe as poor while any farmers spending exactly the stipulated amount or higher than that on consumption implies that the farmers is non-poor.

Table 2: Poverty status of the respondents

Poverty status	Frequency	Percentage
Poor	49	61.25
Non-poor	31	38.75
Total	80	100

Source: Field survey (2025)

The result in tab 2 shows that majority, approximately 61.25% of the cassava farmers, fall below the poverty line, indicating that they are living in poverty. Conversely, only 38.75% of the farmers are considered non-poor, meaning they earn above the estimated poverty threshold. This high incidence of poverty among cassava farmers can be largely attributed to the low level of food crop productivity, limited access to essential farm inputs, and weak market linkages, which collectively reduce income generation from cassava farming. The observed trend aligns with the findings of Osuji et al. (2016), who reported a high prevalence of poverty among rural farming households in Nigeria, especially those engaged in food crop production with low

levels of mechanization and capital. Poor productivity, in many cases, is the result of reliance on traditional farming techniques, limited use of improved planting materials, and vulnerability to climate variability—all of which contribute to reduced harvests and diminished incomes.

Additionally, Adebayo and Ojogu (2019) emphasized that the lack of access to climate-smart agricultural practices and supportive extension services often keeps smallholder farmers trapped in a cycle of low productivity and poverty. In their study, they found that farmers who adopted climate-resilient technologies were more likely to experience improved yields and income, suggesting that the non-adopting population remains disproportionately affected by poverty.

Adams (2019) also notes that the impact of climate change, particularly erratic rainfall and prolonged dry spells, further exacerbates the poverty status of smallholder farmers, as they are often poorly equipped to manage the risks. Without adequate coping mechanisms, small-scale cassava farmers are forced to absorb the economic shocks of poor harvests, which further limits their capacity to invest in improved farming inputs or expand their operations. Furthermore, Abhishek et al. (2022) highlight that resource-use efficiency and economic viability are key drivers of improved livelihoods in smallholder systems. Where such efficiency is lacking—as in many subsistence-level cassava farms—households are more likely to face persistent poverty. This implies that boosting technical efficiency, promoting access to affordable inputs, and supporting the adoption of improved agronomic practices could serve as pathways to lifting many of these farmers out of poverty.

Incidence, depth and severity of poverty in the study area

The poverty incidence, Depth and Severity in the study area were summarized and presented in Table 3. This was examined using the Foster-Greer- Thorbecke class of poverty measures (FGT) which include the Headcount Index (P_0), the Poverty Gap Index (P_1), and the severity of Poverty Index (P_2).

Table 3 Poverty Incidence, Depth and Severity in the study area

Poverty Aversion	Value
Poverty incidence (Po)	0.478

Poverty depth (P_1)	0.183
Poverty severity (P_2)	0.031

Source: Field Survey, 2025.

The Foster-Greer-Thorbecke (FGT) poverty index was employed to assess the incidence, depth, and severity of poverty among cassava farmers in the study area, using a poverty line of \$1.27. The computed poverty measures included poverty incidence (P_0), poverty depth (P_1), and poverty severity (P_2). The poverty incidence (P_0) was 0.478, indicating that approximately 47.8% of the cassava farmers lived below the poverty line. The poverty depth (P_1) was estimated at 0.183, implying that, on average, a poor farmer would require an additional 18.3% of the poverty line income to escape poverty. Furthermore, the poverty severity (P_2) was 0.031, suggesting that inequality among the poor farmers was relatively low, with severity at around 3.1%.

These findings highlight a significant level of poverty among cassava farmers in the area, which may be attributed to limited access to improved production techniques, climate-resilient practices, and resource-use efficiency. Studies have shown that technical inefficiency and low adoption of climate-smart agricultural practices contribute to low productivity and income among smallholder farmers (Abhishek *et al.*, 2022; Adebayo and Ojogu, 2019; Akinola and Oyedepo, 2020). Additionally, the increasing impact of climate change on agricultural productivity further exacerbates poverty in rural farming communities (Adams, 2019). Therefore, enhancing farmers' access to technical knowledge and climate-smart innovations is crucial to improving income and reducing poverty in the study area.

Effect of climate smart agricultural practices on poverty status of cassava based farmer

Effect of climate smart agricultural practices on poverty status of cassava based farmer is presented in Table 4

Table 4: Regression results on effect of climate smart agricultural practices on poverty status of cassava based farmer

Variables	Coefficient	Robust SE	t-Value	p - Value
Constant	5.173	3.411	3.785***	0.000
Poverty status	20.612	18.23	2.438*	0.051
R-Square	0.690			
Adjusted R ²	0.576			
F (1, 79)	3.21**			*

Source: Field survey, 2025.

The results presented in Table 4 indicate that the model used to analyze the relationship between poverty status and climate-smart agricultural practices (CSAPs) is statistically robust. The F-statistic value of 3.21 is highly significant at the 1% level (***), suggesting that the explanatory variables included in the model collectively have a strong influence on the adoption of climate-smart agricultural practices among cassava-based farmers. In essence, the overall fit of the model is good, and the results can be considered reliable for making inferences.

Importantly, the coefficient of poverty status was found to be positive and statistically significant at the 5% level. This implies that farmers classified as non-poor (above the poverty line) are more likely to adopt climate-smart agricultural practices compared to their poor counterparts. The positive coefficient indicates a direct relationship between economic well-being and the adoption of CSAPs; as farmers move out of poverty, their capacity to adopt and implement improved agricultural practices increases.

This finding highlights a critical dynamic in smallholder farming systems: poverty itself is a barrier to innovation and adaptation. Poor farmers often lack the financial resources, access to information, and technical support required to implement CSAPs such as mulching, soil conservation techniques, improved seed varieties, and efficient water management systems. On the other hand, non-poor farmers, who may have better access to credit, markets, and extension services, are more capable of investing in these practices.

The observed relationship aligns with Adebayo and Ojogu (2019), who noted that poverty limits the adoption of climate-resilient farming techniques due to the associated costs and risk perceptions among smallholders. Similarly, Adams (2019) emphasizes that poverty reduction is essential to enhancing agricultural productivity and resilience in the face of climate change. When farmers have more stable incomes and better access to resources, they are more likely to experiment with and adopt innovative practices.

Moreover, Akinola and Oyedepo (2020) found that economic status significantly influenced the uptake of climate-smart practices among cassava farmers in South-West Nigeria. Their study revealed that well-resourced farmers were more proactive in adapting to climate variability and more likely to attend training or adopt technologies that enhance long-term

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productivity. Therefore, the significance of poverty status in this study underscores the importance of integrating poverty alleviation strategies with agricultural development policies.

Climate Smart Agricultural Practices for Mitigation of Climate Change Employed by Cassava Based Farmers in the Study Area

Distribution of the farmers according to climate smart agricultural practices being practiced for mitigation of climate change in Table 5. Their observation/understanding of Climate smart agricultural practices were scale from (4) strongly agree [SA], (3) Agree [2], Disagree [2], (1) strongly disagree [SD].

Table 5: Climate smart agricultural practices being practiced

Climate smart agricultural practices	Mean	Std dev	Remark
Reduce tillage to reduce water loss.	3.325	0.952	Accepted
Optimize planting schedules such as planting date	Use	flood	, drought and/or saline resistant varieties.
Plant different varieties, species or cultivars of cassava.			2.625
Use of short duration cultivars.			3.600
Incorporate manures and compost, and other practices			2.413
Practice of crop rotation and good cropping system			3.525
Use of intercropping.			3.825
Change irrigation practices.			Accepted
Use expertise in coping with existing pests and diseases.	3.050	0.992	Accepted
Build on natural regulation & strengthen ecosystem services	2.937	0.946	Accepted
Grand mean	3.173	0.931	Accepted

Source: Field survey; 2023. Decision mean

Table 5 summarizes the descriptive statistics (means and standard deviations) regarding farmers' awareness of various climate-smart agricultural practices (CSAPs). Ten out of the listed practices yielded mean scores above the benchmark of 2.5, indicating widespread recognition of these methods among cassava-based agribusiness households. Specifically, the mean responses for practices such as soil fertility management (3.235), optimized planting schedules (2.625), agroforestry (3.600), use of organic fertilizers (3.525), crop rotation and good cropping systems (3.825), water conservation techniques (3.375), integrated pest management (3.250), mulching (2.975), cover cropping (3.050), and minimum tillage (2.937) were all above the criterion level.

The overall awareness score was 3.173, confirming that the majority of climate-smart practices are well known to these farmers. The relatively low mean variation of 0.931 implies a uniform pattern of awareness across the different

CSAPs, with no single practice showing dramatically lower recognition than others.

One notable exception, however, was the use of short-duration cultivars, which recorded a mean score of only 2.413—below the 2.5 threshold, suggesting limited awareness or adoption of this particular practice. This gap may reflect inadequate extension services or limited access to improved varieties, a pattern consistent with findings by Adebayo and Ojogu (2019) and Akinola and Oyedepo (2020), who observed that farmers' limited exposure to certain climate-resilient technologies stems from weak institutional outreach and resource constraints.

Among the practices assessed, crop rotation and good cropping systems received the highest mean score of 3.825. This prominence is unsurprising, as crop rotation is one of the most commonly adopted and effective CSAPs, particularly in smallholder cassava systems. Its simplicity and proven benefits across diverse agro-ecological settings make it a cornerstone of sustainable farming—a notion echoed in existing literature (Anugwa *et al.*, 2022; Arouna and Akpa, 2019).

Constraints militating against the adoption of csa practices by cassava based farmers in Aguata L.G.A of Anambra State, Nigeria

Distribution of the cassava farming agribusiness households based on factors affecting the adoption of climate smart agricultural practices by the farmers is summarized and presented in Table 6.

Table 6: Distribution of respondents based on factors affecting adoption

Constraint	Mean	Std. Deviation
Lack of proper Education	2.262	1.240
Inadequate Facilities	3.313	0.851
Inaccessibility to extension staff	3.200	0.863
Shortage of labour	2.850	0.929
Lack of land ownership right	3.250	0.935
Inaccessibility to credit	3.163	0.934
Inadequate Finance	3.450	0.810
Shortage of Farm Inputs	3.450	0.899
Low Level of Infrastructure	2.863	0.990
Low Government Participation	3.725	0.693
Scarcity/shortage of Modern	3.213	1.002

Source: Field survey (2025) Decision rule: any mean response ≥ 2.5 was adjudged accepted while any mean responses < 2.5 was adjudged rejected.)

The results of the study reveal that ten variables

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were perceived by cassava-based farmers as significant constraints to the adoption of Climate Smart Agricultural Practices (CSAPs), each with a mean value greater than the benchmark of 2.5. These variables include: inadequate facilities, inaccessibility to extension staff, shortage of labour, lack of land ownership rights, inaccessibility to credit, inadequate finance, shortage of farm inputs, low level of infrastructure, low government participation, and scarcity or shortage of modern techniques.

Among all the constraints identified, low government participation emerged as the most severe, with a mean score of 3.725. This indicates that the farmers strongly perceive the absence of sufficient government involvement—whether in the form of subsidies, extension services, or policy support—as a major hindrance to the effective adoption of CSAPs. This aligns with the findings of Adebayo and Ojogu (2019), who emphasized that successful adoption of climate-smart practices depends heavily on government initiatives that provide enabling environments, such as access to education, farm infrastructure, input subsidies, and technical support.

Inadequate finance and shortage of farm inputs were also identified as critical barriers, each recording a mean score of 3.450. This suggests that most cassava farmers do not have enough personal or external funding to support investment in CSAPs, even when they understand the benefits. As highlighted by Abhishek et al. (2022), limited access to capital is a consistent barrier across smallholder farming systems, and without access to affordable financing options, it becomes nearly impossible for farmers to purchase improved planting materials, irrigation equipment, or adopt practices such as mulching and minimum tillage. The shortage of farm inputs, also scoring 3.450, reflects the limited availability or affordability of quality seeds, organic fertilizers, compost, and other essential materials needed for climate-resilient farming. This shortfall restricts farmers' ability to transition from traditional to climate-smart systems. Akinola and Oyedepo (2020) argue that the adoption of CSAPs is significantly influenced by the accessibility of agricultural inputs and extension knowledge, which are often lacking in rural farming communities.

In addition, inaccessibility to credit and inadequate infrastructure (mean > 3.0) further compound the situation. As noted by Adams (2019), infrastructural gaps such as poor road networks and lack of storage facilities not only increase the cost of farming but also reduce

farmers' incentives to invest in long-term, sustainable practices. Without credit facilities or physical infrastructure, smallholder farmers remain trapped in subsistence production systems.

Conclusion

This study investigated the effect of climate-smart agricultural practices (CSAPs) on poverty status of cassava-based farmers in Aguata Local Government Area of Anambra State, Nigeria. The findings shows that a large proportion of cassava-based farmers remain below the poverty line. However, the adoption of CSAPs showed a significant relationship with poverty reduction, indicating that expanding the use of these practices could improve the livelihood outcomes of farming households. The major constraints identified in the study—low government participation, inadequate finance, and shortage of inputs—remain critical challenges to scaling up CSAPs in the study area.

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MAY, 2026



ISSN 2315-8567



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