

SOCIO-ECONOMIC FACTORS INFLUENCING THE ADOPTION OF CLIMATE SMART AGRICULTURE TECHNIQUES IN COCOYAM PRODUCTION AMONG SMALL SCALE FARMERS IN ABIA STATE, NIGERIA

Abstract

The study examined socio-economic factors influencing the adoption of climate smart agriculture techniques in cocoyam production among small scale farmers in Abia State, Nigeria. Forty eight cocoyam farmers were selected through multi-stage sampling technique. Data were collected using structured questionnaire and analyzed using descriptive statistics and inferential statistical tools. Findings showed that majority were females (64.6%), and maintain average household size of 7 persons and a mean age and farming experience of 41 and 10 years respectively. Analysis on the level of awareness of climate-smart agricultural techniques showed that all the CSA techniques used by the farmers in the study area are below the mean level of 3.0. Findings on the socio-economic factors affecting the adoption of integrated pest management, manure management and improved crop variety and diversification showed that level of education was significant and positive (2.14, 2.49 and 3.97 respectively). This shows a direct relationship between level of education and adoption of the selected CSA Practices. On the other hand, age was significant and negative (-3.74) in integrated pest management showing an indirect relationship with the adoption of integrated pest management practices. The major challenges faced by cocoyam farmers in adapting to climate smart agricultural techniques was limited knowledge of CSA practices having the highest percentage (18.1%) followed by increased cost of improved variety (16.6%) and recommends efficient involvement of extension agents and governments in the dissemination of climate smart agricultural techniques (information) to farmers at the grass root level particularly cocoyam farmers in Imo State, Nigeria.

Key Words: Climate Smart, Cocoyam Farmers, Imo State.

Introduction

Agriculture is the backbone of Nigeria's economy, providing livelihoods for a substantial portion of the population and contributing significantly to national food security. In Abia State, cocoyam (*Xanthosomasagittifolium*) is a critical staple crop known for its nutritional value and economic importance. Cocoyam is a staple food crop in Abia State, valued for its adaptability to various soil conditions and its high nutritional content, which includes carbohydrates, vitamins, and minerals. As a food, cocoyam tubers are eaten in homes in various forms (Kpomah & Efekemo, 2023). They can be boiled or roasted like yam. They can also be pounded or mixed with cassava and eaten with soup. The corms can be dried and used to make flour or sliced and fried to make chips. The leaves of the plant are also edible and are usually consumed as a vegetable after cooking in dishes such as stews. *Xanthosomaspecies* produce tubers much like potato and are boiled, baked, steamed or fried prior to consumption. The corm of some varieties is also consumed. Young leaves are eaten as a vegetable. Cocoyam flour has the added advantage that is highly digestible and so is used for invalids and as an ingredient in baby foods (Darkwa and Darkwa, 2013). The flour is also used for the preparation of soup, biscuits, bread, beverages and puddings. In Nigeria, cocoyam is grated, mixed with condiments and wrapped in leaves. It is steamed for about 30minutes and served with sauce popularly known as *epankuko* (ikokore). Cocoyam flakes is another end product of cocoyam which is cooked, cut into chips and dried under the sun. The resulting flakes are later soaked in water and cooked with vegetable. (Osahon & Ekwe, 2020).

Cocoyam is particularly important for food security and nutrition in rural areas. It is also a significant cash crop for small-scale farmers, contributing to their livelihoods and economic well-being. Ensuring sustainable cocoyam production through climate-smart practices can enhance food security and improve the economic resilience of small-scale farmers (Fawzy, 2023). Climate-smart agriculture (CSA) is an integrated approach to managing landscapes—cropland, livestock, forests, and fisheries—that address the interlinked challenges of food security and climate change. According to Ma & Rahut, (2024), there are a lot of CSA technologies that are practiced in many countries, Nigeria inclusive example use of organic manure, conservation agriculture, agro-forestry, soil management, water management, irrigation, improved crop variety and diversification, integrated pest management, manure

management, livestock management etc. CSA aims to achieve three main objectives: sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change, and reducing and/or removing greenhouse gas emissions, where possible. For small-scale farmers in Abia State, adopting CSA practices is essential to sustaining cocoyam production in a changing climate. However, Small-scale farmers in Abia State face numerous challenges that affect their productivity and sustainability. These include limited access to resources such as improved seed varieties, fertilizers, and irrigation facilities; inadequate knowledge and training on modern agricultural practices; and constraints in accessing credit facilities which researchers like Omotesho *et. al.*, (2020) failed to capture in their findings which this study aims to cover. Climate change exacerbates these challenges by increasing the vulnerability of small-scale farming systems to extreme weather events, pests, and diseases. However, cocoyam production faces significant challenges from climate change, including unpredictable weather patterns; soil degradation, and increased pest and disease pressures. In Abia State, cocoyam is an important staple crop that contributes significantly to the dietary needs and economic well-being of local communities. However, the production of cocoyam is increasingly threatened by the impacts of climate change, including erratic weather patterns, soil degradation, and pest and disease outbreaks. These challenges necessitate the adoption of climate-smart agricultural practices to ensure sustainable cocoyam production. Despite the recognized benefits of climate-smart agriculture (CSA), the adoption of such practices among small-scale cocoyam farmers in Abia State remains limited. Several factors influence the extent to which farmers can and do to implement climate-smart practices. Some factors, such as farmers' access to financial resources, education, and extension services, significantly impact their ability to adopt new agricultural practices, effective agricultural extension services, improved seed varieties and knowledge of sustainable farming techniques, are essential for the successful implementation of CSA.

Understanding the factors that influence the adoption of climate-smart practices among small-scale cocoyam farmers is crucial for designing effective interventions that promote sustainable agriculture. This study will provide insights into the socio-economic factors that affect the adoption of climate-smart agricultural practices. The findings will inform policymakers, agricultural extension services,

and development agencies in their efforts to support small-scale farmers in adapting to climate change and improving their productivity and resilience.

Objectives of the Study

This study aims to investigate the factors influencing the adoption of climate-smart cocoyam production practices among small-scale farmers in Abia State, Nigeria. The specific objectives are to:

- i. identify the socio-economic characteristics of small-scale cocoyam farmers in Abia State,
- ii. assess the level of awareness and knowledge of climate-smart agricultural techniques among small-scale cocoyam farmers,
- iii. analyze the socio-economic factors affecting the adoption of climate-smart practices in cocoyam production,
- iv. examine the barriers hindering small-scale cocoyam farmers in adopting climate-smart practices.

Methodology

Study Area

This study was conducted in Abia State, Nigeria. Abia State lies between longitudes $7^{\circ} 23^1$ and $8^{\circ} 2^1$ East of the equator and latitudes $4^{\circ} 47^1$ and $6^{\circ} 12^1$ North of the Greenwich Meridian. The State is located East of Imo State and shares common boundaries with Anambra to the North, Enugu and Ebonyi states to the West and East respectively. On the East and South East, it is bounded by Cross River and Akwa Ibom States and by Rivers State on the South. Abia State is made up of 17 Local Government Areas (LGAs) with a population of 2,845,380 people according to 2006 population census (Federal Republic of Nigeria Official Gazettes, 2009). Most of the people especially, the rural dwellers are engaged mainly in subsistence farming. They engage in arable crop production such as cassava, yam, cocoyam, rice, maize and sweet potatoes. Abia State has three agricultural zones namely Aba, Bende and Umuahia.

Data Sources/ collection/ sampling technique

A multi-stage sampling technique was employed in the selection of respondents using a well structured questionnaire as follows: First stage was the purposive selection of all the agricultural zones in Abia State namely: Aba, Umuahia and Bende because they all have farmers who engage in cocoyam production and produce cocoyam in large quantities. Second stage involved the random selection of two communities from each agricultural zone making it a total of six communities. Third stage was the purposive selection of two villages from each of the communities being the villages that have the most cocoyam farmers, making it a total of twelve villages. Fourth stage was the random selection of four cocoyam famers making it a total of 48 cocoyam farmers for the study.

Method of Data Analysis

Econometric technique and descriptive statistics were used in analyzing the data collected. Objectives I and IV was analyzed using descriptive statistics, objective II was analyzed using the 3-point likert scale model while objective III was analyzed using the Logit model analysis.

Results and Discussion

Socio Economic characteristics of cocoyam farmers

Table 1: Socio-Economic Characteristics of Cocoyam farmers

Variable	Cocoyam farmers	
	Frequency	%
Gender		
Male	17	35.4
Female	31	64.6
Total	48	100
Age (yrs)		
21-30	3	6.3
31-40	18	37.5
41-50	25	52.1
51-60	2	4.2
Total	48	100

Mean	41 years	
Education experience (years)		
0	0	0
1-6	7	14.6
7-12	33	68.8
13-18	8	16.7
Total	48	100
Mean	10 years	
Household size (no of persons)		
1-5	19	39.6
6-10	24	50
11-15	5	10.4
Total	48	100
Mean	7 persons	
Farming experience (years)		
1-5	9	18.8
6-10	16	33.3
11-15	23	47.9
Total	48	100
Mean	10 years	
Farm Size (Ha)		
0.1-0.5	29	60.4
0.6-1.0	12	25
1.1-1.5	5	10.4
1.6-2.0	2	4.2
Total	48	100
Mean	0.5 hectares	

Source: Field Survey Data, 2025

The socio-economic characteristics of the respondents are presented in Table 1. The study revealed that majority (64.6%) of the cocoyam farmers were females while 35.4% of them were males. This implies that females are more involved and participate more actively in cocoyam production than the males. The study further revealed that 52.1% of the respondents fall within the age range of

41 and 50 years with mean age of 41 years; this implies that the majority of the farmers were younger, who can contribute positively to agricultural production and will be more flexible to new ideas. This result is consistent with the findings of Anyiam, *et. al.*, (2023) who observed that youth constitute the majority of the cocoyam farmers and younger farmers are more flexible to new ideas and risk; hence they are expected to adopt innovations more readily than older farmers. The majority of the farmers (68.8%) had formal education with mean level of education at 10 years. This indicates that the farmers educational level is high because education has a great impact on farmers adoption rate. According to Onyewuchi, (2024), literacy level of farmers could easily help them understand, evaluate and likely adopt improved technologies and other agricultural technologies that may be available them. The literacy level greatly influences the decision making and adoption of innovation by farmers, which may bring about increase in production of the crop. The educational level of farmers does not only increase his productivity but also increase his ability to understand and evaluate new techniques. The majority of the farmers (50%) had household size of 6-10 persons with mean household size of 7 persons which indicates that there is appreciable source of family labour to help in farming operations. Majority (47.9%) of the cocoyam farmers had 11-15 years of farming experience while 33.3% had 6- 10 years farming experience with a mean of 10 years experience. This implies that they have acquired sufficient experience in cocoyam production and could easily fit into the adoption of climate smart agricultural techniques to optimize cocoyam production. According to Mukaila, *et. al.*, (2022), years spent in farming operations and allied activities determine the skills and knowledge gained in the venture thus, the farming experience will greatly influence farmers' production level and income as well. The study further showed that majority of the cocoyam farmers' farm sizes ranged between 0.1-0.5 hectare (60.4%) which is also consistent with the findings of Nwafor, (2021).

Level of awareness and knowledge of climate-smart agricultural techniques

Table 2: Awareness and knowledge of climate-smart agricultural practices

CSA Cocoyam Techniques	Fully Aware (3)	Slightly Aware (2)	Not Aware (1)	Mean	Rank
Integrated pest management	15	25	8	2.15	3 rd
Manure Management	32	12	4	2.58	1 st
Improved Crop Variety and Diversification	21	22	5	2.33	2 nd

Source: Field Survey Data, 2024. NB: Mean Above 3.0 = Preferred; Mean Below 3.0 = Least Preferred

From Table 2 above, all the CSA techniques used by the farmers in the study area are below the mean level of 3.0. Integrated pest management has a mean of 2.15 while manure management and improved crop variety and diversification have mean levels of 2.58 and 2.33 respectively. This shows that the cocoyam farmers in the study area have limited knowledge of climate-smart agricultural practices. This finding corresponds with the findings of Mbanasor, *et. al.*, (2024).

Table 3. Factors affecting adoption of Integrated Pest Management

Dependent variable: Adoption of Integrated Pest Management				
Independent variable	Marginal effects	Std Error	Z-value	P-value
Age of respondent	-0.0162	0.21165	-3.74	0.005 **
Level of education	0.0146	0.02074	2.14	0.041**
Farm size	0.01545	0.02551	0.84	0.389
Farming experience	-0.0422	0.02144	-0.89	0.287
Household size	-0.0076	0.01655	-0.57	0.577
Number of Obs = 48			Prob> chi ² = 0.0000	
Wald				
Statistic = 114.2065				
Pseudo R ² = 0.7456				
Log likelihood = 23.351087				

Source: Field Survey Data, 2025. ** Significant at 5%

Integrated pest management: Table 3 above shows that there was a significant and negative relationship between adoption of integrated pest management and age and a significant and positive relationship between integrated pest management and education level of the respondents. This finding shows that the older the farmers, the lower the adoption of integrated pest management practices. This finding is in tandem with that of Deshmukh, et al, (2021). On the other hand, increase in the level of education of cocoyam farmers will necessitate the adoption of integrated pest management practices in the study area. This further authenticates the findings of Kughur, et. al., (2017).

Table 4. Factors affecting adoption of Manure Management

Dependent variable: Adoption of Manure Management				
Independent variable	Marginal effects	Std Error	Z-value	P-value
Age of respondent	-0.0067	0.00454	-1.21	0.311
Level of education	0.069	0.02999	2.49	0.042**
Farm size	0.00776	0.02779	0.28	0.722
Farming experience	0.32755	0.05467	6.20	0.001**
Household size	0.07577	0.03114	2.30	0.008**
Number of Obs = 48			Prob> chi2 = 0.0000	
Wald				
Statistic = 94.2315				
Pseudo R ² = 0.4719				
Log likelihood = 65.876519				

Source: Field Survey Data, 2025. ** Significant at 5%

Adoption of manure management. From Table 4 above, education level (2.49), Farming experience (6.20) and household size (2.30) had a positive and significant influence on the adoption of manure management practices by the cocoyam farmers in the study area which corresponds with the findings of Semwanga et al (2024) and Mebrate et al (2022). This shows that increase in any of these variables will increase the adoption of manure management.

Table 5. Factors affecting Improved crop variety and Diversification

Dependent variable: Improved crop variety and Diversification

Independent variable	Marginal effects	Std Error	Z-value	P-value
Age of respondent	0.15772	0.06671	2.94	0.004**
Level of education	0.13842	0.04222	3.97	0.000**
Farm size	0.00726	0.03652	0.33	0.821
Farming experience	0.47654	0.06586	5.40	0.001**
Household size	0.01477	0.01842	0.82	0.212

Number of Obs = 48
Wald
Statistic = 87.5413
Pseudo R² = 0.5784
Log likelihood = 63.921841

Source: Field Survey Data, 2025. ** Significant at 5%

Improved crop variety and Diversification. Age, Education level and farming experience had a positive and significant effect on adoption of improved crop variety and diversification as seen in Table 5 above. This shows that increase in any of the three variables will lead to a significant increase in the adoption of improved crop variety and diversification. This finding is consistent with the findings of Inoni et al., (2021) and Islam, et al., (2024).

Table 6: Barriers hindering small-scale cocoyam farmers from adopting climate-smart practices

Barriers	Frequency	Percentage
Inadequate access to technology	41	15.5
Limited knowledge of CSA practices	48	18.1
Limited access to extension agents	27	10.2
Lack of Government support	43	16.2
Resource scarcity	38	14.3
Increased cost of improved crop variety	44	16.6
Limited knowledge of crop diversification	24	9.1

Source: Field Survey Data: 2025 *Multiple responses recorded

Generally, farmers face varying challenges in the course of their production and cocoyam production is no exception which led the researchers to delve into making adequate inquiries as to the challenges faced by the cocoyam farmers as seen in Table 6 above. From the Table, it could be seen that limited knowledge of CSA practices (18.1%) is the major challenge faced by the cocoyam farmers in the study area followed by increased cost of improved crop variety (16.6%), lack of Government support (16.2%) among others. This is also in line with the findings from Table 2 above and conforms with the findings of Agyekum, et al., (2024).

Conclusion

The study revealed that farmers are not aware of the climate smart agricultural practices.

Recommendations

Based on the findings the following recommendations were made:

- There should be efficient involvement of extension agents and government in the dissemination of climate smart agricultural techniques to farmers at the grass root level particularly cocoyam farmers in Imo State, Nigeria to create awareness.
- Improved varieties of cocoyam should be made available to the farmers at the least possible cost.

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