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Characterizing the Challenges Faced by Smallholding Cocoyam Farmers in Adopting the Coping Strategies on Climate Change in Southwest Nigeria

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Abstract

Cocoyam world largest producer is Nigeria with annual production of 5.49 million metric tons and it is planted in the South and middle belt zones of the country that are vulnerable to change in climate conditions. This study examined the socio-economic characteristics of Cocoyam farmers and the challenges encountered when adopting the coping strategies of climate change on the production of Cocoyam. Descriptive statistics was used to describe the socio economics characteristics and Likert Scale was used in capturing the challenges. Data was collected purposively with the use of a well-structured questionnaire with 120 respondents. The results showed that majority of the respondents fell within the active age of 31- 40 and 41-50 with both groups having 35.8%. most of the respondents are male with 60.0%, it was observed that almost all the respondents are educated with 40.8% having tertiary education. Many challenges were captured but lack of infrastructure is very prominent being ranked first followed by lack of proper maintenance and lack of finance also is a challenge to adoption of Climate coping strategies in the study areas. The result also showed that the total area cropped had been on the increase on the quantity produced and the price of cocoyam/kg had also been on the increase indicating that cocoyam farming is a lucrative business if properly managed. Aids in grants should be extended to cocoyam smallholding farmers to encourage more participation in planting Cocoyams.

Keywords: Production, Likert Scale, Adopting, Lucrative, Challenges.

Introduction

The agricultural sector in Nigeria has witnessed many uncertainties in production as result of increasing climatic aberration (UNFCCC, 2007) for instance few years ago, certain areas in Nigeria witnessed different magnitudes of flooding which resulted in lots of loss in crops and livestock and thereby affecting food production and availability (Agbonkhese, 2014). Also, the devastating effects of series of bush burning are seen in the destruction of the environmental green cover, crops and biodiversity. To a great extent, dry season farming has been named into a very risky venture and this contributes to occasional scarcity of vegetables in Ekiti State there is also the increasing risk of environmental hazards such as heat stress, flooding, etc. in this regard, there is need for considerable attention to be given to climate change risks in order to provide economic support to farmers stabilize farm income, encourage farmers to invest more in agriculture and reduce in agriculture and reduce indebtedness.

Cocoyam(*Colocasia esculenta*“taro”and *Xanthosoma sagittifolium*“tannia”) belong to the Araceae family, an important staple food in the plant family, growing South Eastern and South Western part of Nigeria (Chukwu *et al.*, 2009). Cocoyam ranks third in importance after cassava

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and yam among the root and tuber crops cultivated and consumed in Nigeria. Cocoyam is a useful over crop and the corms are ready to harvesting to 12months .It is one of the major five tuber crops produced in Nigeria for local consumption alongside yam (*Discoreaspp*), Cassava (*Manihotesculenta*), Irish-potato(*Solanumtuberosus*) and Sweet-potato (*Ipomeabatata*) and specifically referred to as Nigeria's giant crop because it is nutritionally superior too the roots and tuber crops in Nigeria(Agbelemoge,2013).

Nigeria is the largest producer of cocoyam in the world with an annual production of 5.49million metric ones equivalent to 45.9% of the world's production and 72.2% of West Africa's total output. Relative to cassava and yam, cocoyam contains higher contents of protein, phosphorous, vitamins and easily digestible starch while the root is rich in carbohydrates and minerals (Ezedinma *et al.*,2014). It can be consumed in various forms when boiled, fried, pounded, roasted and can be processed into cocoyam flour and chips(Ume *et al.*,2016).The leaves are used as vegetables in form of spinach for soup preparation in various parts of the world(Ukonze,2013). It is highly medicinal for diabetic patients, persons with intestinal disorders, the aged, and recommended for children with allergy (Ume *et al.*,2018).

Despite the nutritional importance of cocoyam, their advantage over other tuber crops, its potentials for poverty alleviation and food security abilities, its grow this often threatened with drought, excessive rainfall,and pest and diseases infestation, increased temperature occasioned by climate change resulting to poor yield of cocoyam. Hence, there is a need to examine the analysis of the effect of climate change on cocoyam production in Ekiti region of Nigeria. The effects of climate change have been felt by both natural and human systems on every continent, while the evidence for natural systems' effects is stronger (IPCC, 2014).

Climate change and its effects are caused by variations in weather parameters throughout time. Any change in the climate over time, whether brought on by human activity or natural variability, is referred to as climate change (IPCC, 2014). NASA claims that this is a shift from the area's typical weather. This can indicate a shift in the area's annual precipitation total or a shift in the area's typical monthly or seasonal temperature. The statistical distribution of weather patterns changes over a long period of time (from decades to millions of years) and is referred to as climate change. The ratio of agricultural output to inputs is used to estimate productivity in agriculture. The market value of the end product, excluding intermediates like maize feed needed to produce meat, is typically used to assess production (2006) conducted a study analysing Nigeria's agricultural production between 1981 and 2003 as a key economic sector, a supplier of raw materials, and a source of foreign exchange profits for the nation. Nigerian agriculture is primarily rainfed. The agricultural sector is constantly being developed to the fullest extent possible with available means as a whole can progress only by the efficient and rational use of them. According to (Ogidi 2015), in any nation the agricultural sector has a great importance attached to it.

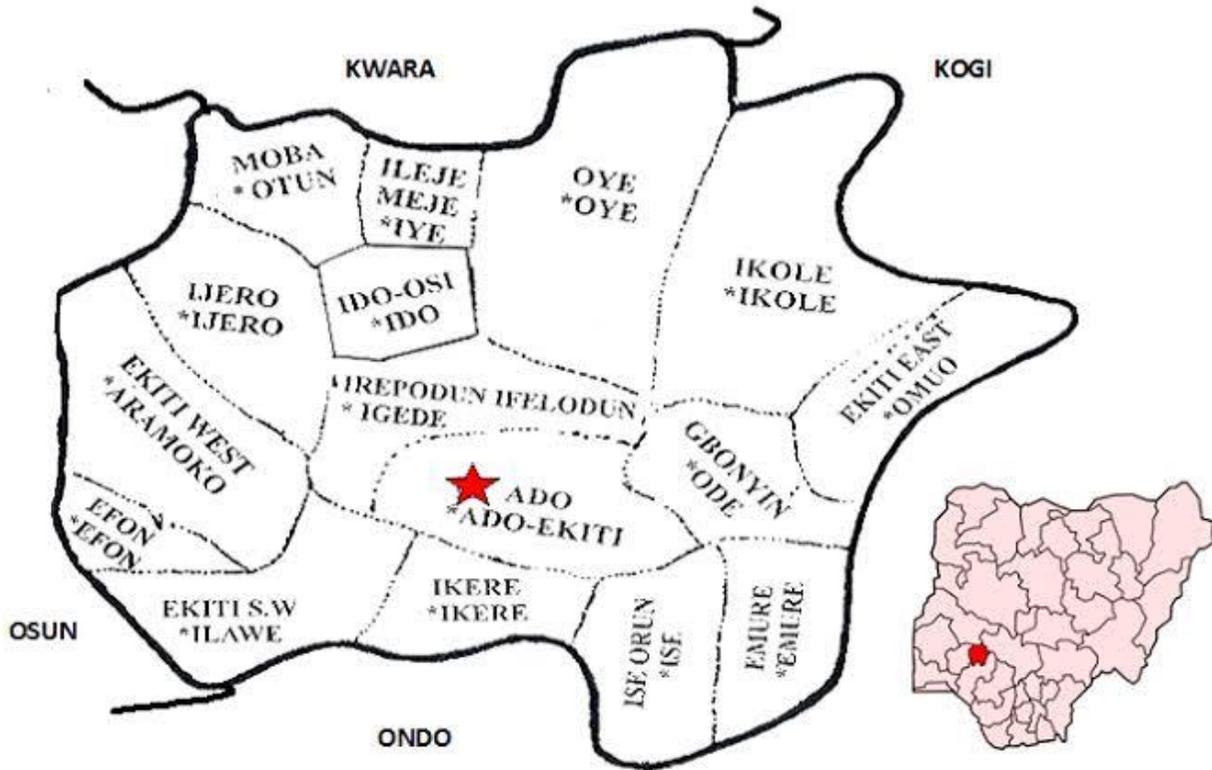
Climate change impacts the four key dimensions of food security availability, stability, access, and utilization. Availability of agricultural products is affected by climate change directly through its impacts on crop yields, crop pests and diseases, and soil fertility and water-holding properties. It is also affected by climate change in directly through its impacts on economic growth, income distribution, and agricultural demand. In addition, stability of crop yields and

food supplies is negatively affected by variable weather conditions. These challenges therefore pose questions like: to what extent has climate change affected Cocoyam production in Nigeria? What are the activities of the farmers that exacerbate the effect of climate variability and change in Ekiti State?

There have been numerous studies of climate change, the bulk of these were conducted in temperate and highly industrialized countries. Most of the empirical work to date on the effect of climate change on crop production has focused on Europe, the United-States, Canada and Australia. World wide little research has focused on developing regions such as those in the tropical rain forest where the poor who maybe most vulnerable to adverse changes live. Scientists fear that the most adverse effects are likely to occur in this region. Some of the studies in developing regions considered the effects of one or two aspects of climate change on maize and other crops. None within the knowledge of the researcher has focused on Cocoyam production in the agro-ecological zones of many developing countries especially that of the rainforest zone of Nigeria where the most vulnerable group live; hence, the necessity for this study

Methodology

The study was conducted in Ekiti State, Nigeria; Ekiti state is located between latitudes 7°25' and 8°05' East of Greenwich Meridian and between longitude 4°45' and 46°05' North of the Equator. The state is bounded to the North by Kwara and Kogi states while it is bounded by Osun state to the West, Edo to the East, and Ondo to the South. Ekiti state is a landlocked state, having no coastal boundary. The Ekiti people are culturally homogenous and speak a dialect of the Yoruba language known as Ekiti. In terms of arts and culture, Ekiti State is among the richest in the federation in the variety and quality of its tradition, arts, music and poetry. The Ekiti people are good wood carvers, blacksmith, and ornamental potters, mat weavers and basket makers. The main occupation of Ekiti people is farming. Hence, the State is agrarian in nature and therefore has many rural settlements. The state enjoys a tropical climate with two distinct seasons: rainy season (April to October) and dry season (November to March). The temperature ranges from 21°C to 28°C, with high humidity. The population of the inhabitants of the state, according to a 2006 population census, was 2,737,186 (NPC, 2006). Their major agricultural produce includes cocoa, kolanut, orange (and other citrus), oil palm, maize, rice, cassava, yam, cocoyam, sweet potato and melon.



Source: researchgate.net

Fig 3.1: Map of Ekiti State.

2. Sampling Procedure and Sample Size

Multistage sampling procedure was employed. In the first stage, two local Government Areas (LGAs) was purposively selected out of the sixteen(16) Local Government Areas in Ekiti state being the highest producers of Cocoyam in the State, these are; Ikole, and Oye LGA. In the second stage, three communities was randomly selected from each LGA using simple random sampling technique. In the third stage, 20 farmers were selected from each community using simple random sampling and thus, making a total of 120 cocoyam farmers from the two LGs

2.2 Analytical Techniques

Data collected were subjected to different statistical techniques

1. The descriptive statistics such as frequency distribution and percentages were used in analysing the socioeconomic characteristics of the cocoyam farmers in the study area.
2. Five points Likert-Scale that provides five possible responses to the questions asked was used in capturing the challenges encountered by farmers in adopting the coping strategies on climate

change. Likert scale is used to measure opinions, attitudes or behaviour of the respondents, Where

SA--- Strongly Agree

A-----Agree

N----Neutral

SD---Strongly Disagree

D---Disagree

Results And Discussion

The socioeconomic characteristics of the household in the study area are presented below

Table 1: Distribution of Respondents According to Age

Age	Frequency	Percentage
21-30	13	10.8
31-40	43	35.8
41-50	43	35.8
>50	21	17.5
Total	120	100
Mean	42.9	
Standard deviation	10.01	

Source: *Field Survey*, 2024 .

The age distribution of the respondents revealed that majority of the respondents (35.8%) were within the ages of 31 – 40 and 41 - 50 years (35.8%). whereas(17.5%) were above 50 years,(10.8%) were within 21 – 30 years. Majority of the respondents were composed of youths who were energetic and adult who were full of experiences of farming practices.

Table 2: Distribution of Respondents According to Sex

Sex	Frequency	Percentage
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Male	72	60
Female	48	40
Total	120	100

Source: *Field Survey*, 2024

Table 2 below revealed that (60.0%) of the respondent were male, while (40.0%) were female. This shows that the number of males was fairly greater than the number of females. This is an indication that farming is male dominated in the study area.

Table 3: Distribution of Respondents According to Marital Status

Marital Status	Frequency	Percentage
Single	18	15
Married	85	70.8
Divorced	9	7.5
Widowed	8	6.7
Total	120	100

Source: *Field Survey*, 2024

Table 3 shows the marital status which revealed that the majority (70.8%) of respondents are married followed by single individuals with (15.0%), divorced (7.5%), and widowed (6.7%). This implies that married people are highly involved in cocoyam farming and it agrees with the notion that farming is a family business conducted by farm families with both spouses making means to cut labor expenses

Table 4: Distribution of Respondents According to Family size

Family size	Frequency	Percentage
1-3	25	20.8

4-5	63	52.5
6-8	29	24.2
9 and above	3	2.5
Total	120	100

Source: *Field Survey, 2024*

Table 4 shows the result of the family which reveals that the majority (52.5%) of respondents belong to households with 4-5 members, followed by households with 6-8 members (24.2%), followed by household with 1- 3 members (20.8%), followed by household of 9 and above members 3(2.5%)

Table 5: Distribution of Respondents According to Income

Income	Frequency	Percentage
50,000-59,000	24	20
60,000-69,000	14	11.7
70,000-79,000	15	12.5
80,000-89,000	24	20
90,000 and above	43	35.8
Total	120	100

Source: *Field Survey, 2024*

Table 5 further shows that majority (35.8%) of the respondents earn the sum of #90,000 and above, followed by #80,000-#89,000 (20%) and #50,000-#59,000 (20%), followed by #70,000-#79,000 (12.5%), #60,000-#69,000 (11.7%). The mean income is #700,000 with a standard deviation of 1.552445. This implies that an average respondent received an estimate of #58000 every month which also influences their involvement in cooperative. The findings of this result agrees with Ekwere and Gabriel (2019) who reported that the average farmer in cooperatives received a monthly income of 40000 and above during their research on Effect of membership on income of members of farmers multipurpose cooperative societies in Anambra state, Nigeria.

Table 7: Distribution of Respondents According to Educational Qualification

Education qualification	Frequency	Percentage
No primary education	3	2.5
Primary education	9	7.5
Secondary education	59	49.2
Tertiary education	49	40.8
Total	120	100

Source: *Field Survey, 2024*

Table 7 shows that 49.2% attained secondary education, tertiary institution (40.8%), primary education (7.5%), respondents with no primary education takes (2.5%), This shows that majority of the respondent were educated with SSCE and B.Sc. holders who had a fair knowledge of agriculture and could read and write, which means that farmers will be able to read and understand the concept of new innovations These findings is in conformity with Onya *et al.*, (2019) on the Farm-level determinants of access to land by arable crop farmers in Abia State, who found out that majority of the arable crop farmers could read and write

Table 8: Distribution of Respondents According to Major Occupation

Occupation	Frequency	Percentage
Trading	34	28.3
Farming	49	40.8
Civil/public servant	20	16.7
Artisan	17	14.2
Total	120	100

Source: *Field Survey, 2024*

Table 8, the percentage of the respondent involved in farming is (40.8%) followed by people that were engaged in trading (28.3%), civil servant were the next with (16.7%) and Artisan (14.2%). This shows that there are a lot of farmers in the study area.

Table 9: Distribution of Respondents According to member of cooperative

Member of cooperative	Frequency	Percentage
Yes	76	63.3
No	44	36.7
Total	120	100

Source: *Field Survey*, 2024

Table 9, revealed that in the study area 63.3% of the respondents belong to cooperative association while 36.7% did not belong to any belong cooperative association, indicating we have more cooperators

Table 10: Distribution of respondents on Years of Experience

Years of Experience	Frequency	Percentage
Below 5	43	35.8
6-10	50	41.7
11-15	21	17.5
16 and above	6	5.0
Total	120	100
Mean	8.0083	
Standard deviation	3.48465	

Source: *Field Survey*, 2024

Table 10 shows that majority of the Respondent (41.7%) had 6-10 farming experience, whereas (35.8%) had below 5 years farming experiences, while (17.5%) had about 11 – 15 years farming experience, and (5.0%) had 16 and above of farming experience.

Table 12: Percentage distribution of the challenges encountered by the respondent

S/n	Challenges	SA	A	N	D	SD	Total Score	Mean score	Rank
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1	Lack of finance	42(35.00)	42(35.00)	24(20.0)	11(9.17)	1(0.83)	473	3.94	4th
2	Lack of information	31(25.83)	39(32.50)	41(34.17)	5(4.17)	4(3.33)	448	3.73	5th
3	Lack of labor forces	54(45.00)	32(26.67)	16(13.33)	17(14.17)	1(0.83)	481	4.01	3rd
4	High cost of maintenance practices	64(53.33)	36(30.00)	16(13.33)	4(3.33)	0	520	4.33	2nd
5	Limited source of planting material	27(22.50)	19(15.83)	53(44.17)	18(15.00)	3(2.50)	409	3.41	6th
6	Lack of infrastructure	82(68.33)	21(17.50)	13(10.83)	3(2.50)	1(0.83)	540	4.50	1st

Source: Field Survey, 2024

Note: Figure in Parenthesis are the Percentages

SA = Strongly Agree

A = Agree

N = Neutral

D = Disagree

SD = Strongly Disagree

Table 12 revealed that Lack of infrastructure ranked 1st as a challenges with a mean 4.50, followed by High cost of maintenance practices ranked 2nd with a mean 4.33, Lack of labor forces ranked 3rd with the mean 4.01, Lack of Finance ranked 4th with mean 3.94, Lack of information ranked 5th with mean 3.73, Limited source of planting material ranked 6th with mean 3.41. This implies that the cocoyam farmers don't have access to essential facilities and systems to support their farming activities. This findings agree to Food Agriculture Organization (2013) that lack of infrastructure is a major constraints to agricultural productivity and profitability in developing countries

Conclusion

It is clearly evident that most of the farmers in the study area are youth who were energetic and

adult who were full of experiences from their lifetime of farming practices, averagely educated, and are aware of the existence of climate change whose variables affected their cocoyam production. Specifically, the study concluded climatic change variables such as total rainfall, pest and diseases, and drought had negative effects on cocoyam production and its output. To mitigate this situation, the farmers use mulching techniques. Conclusively, the trend in cocoyam production though on the increase was not enough to meet the demand by the consuming populace as evidenced in the price per kilogram of cocoyam. The major challenge facing the cocoyam farmers is lack of infrastructures, high cost of labour, lack of finance and high cost of maintenance. There is therefore the need to improve on farmer's enlightenment of climate change variables towards helping the farmers to further improve their output and hence reduce the price sold, so as to sell more with lower price instead of selling few with bigger money

Recommendation

- a The general public should be involved in the cultivation of cocoyam as it helps to provide food for the household.
- b.Sales of cocoyam is a lucrative venture as it helps to alleviate poverty level and provides employment.
- c.The infrastructures in the study area must be updated, old ones be replaced where absent new construction must be embark upon
- d. Government and the farmers must work out raising funds modalities like cooperatives or credit and thrift society so that they will have access to money
- e. Government needs to provide grants and inputs to farmer's s and storage facilities to encourage it production at a reduced cost.
- f. Cocoyam is highly profitable since no part of it is wasted, therefore, I encourage more persons to go into cocoyam farming.

Conflict of Interest

The authors declare no conflict of interest

Authors Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them

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