

Research article

COCOA FARMERS VULNERABILITY TO CLIMATE CHANGE IN IKWUANO L.G.A OF ABIA STATE, NIGERIA

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ABSTRACT

The study analyzed the vulnerability of cocoa farmers to climate change in Ikwuano Local Government Area of Abia state, Nigeria. Purposive and simple random sampling techniques were used in the selection of communities, villages and participating farmers. The sample size was 110 farmers. Data for the study were collected through a structured questionnaire and analyzed with descriptive statistics and standard normalization method (SNM). The results revealed that majority 81.8% were males while 57.3% were married. The respondents had a mean age of 36.7, and 54.5% had secondary education. Moderate proportion 31.8% were small scale farmers and 24.5% had between 21-25 years of cocoa experience while 40.9% had cocoa production level of 11-20 bags per annum and 35.5% of the respondents had within farm income of ₦101,000 – ₦300,000 per annum. Majority (95.5%) of the respondents had interest on radio as their source of information on climate change. The result on vulnerability index of 0.1679 showed that high rainfall, stream or lift irrigation, no government irrigation system, high incidence of pests and diseases, and low farm income were indicators that influenced climate change vulnerability of cocoa farmers in the study area. It was therefore recommended that farmers should be trained on adaptation techniques for climate change through extension workers and research institute to develop early maturing cocoa varieties that are disease resistance to climate change.

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Keywords: Cocoa farmers, vulnerability, climate change

INTRODUCTION

Over historical time spans there are a number of nearly constant variables that determine climate, including latitude, altitude, proportion of land to water, and proximity to oceans and mountains. Climate change is the variation in global or regional climates over time. It reflects changes in the variability or average state of the atmosphere over time scales ranging from decades to millions of years. These changes can be caused by processes internal to the earth, external forces (e.g. variations in sunlight intensity) or more recently, human activities (Arctic Climatology and Meteorology, 2008).

Cocoa (*Theobromacocao*) cultivation gained prominence rapidly in Nigeria such that by 1965, Nigeria became the second largest producer in the world. But currently her position drop to fourth, behind Cote d'Ivoire, Ghana, and Indonesia. Cocoa is produced mainly in the rainforest area of the country, known as the cocoa belt. In Nigeria we have 14 main producing states – Abia, Cross River, Kwara, Ondo, Ekiti, Oyo, Osun, Ogun, Delta, Edo, Kogi, Adamawa, Taraba and Akwa Ibom (Adegeye, 1998).

In the cocoa growing areas of South west Nigeria, it has been established that too much rainfall reduced the number of cocoa pods per tree and increases the degree of infection by the black pods per tree (Adejuwon, 1998). Climate change effects have greater influence on three phases of cocoa production ranging from seedling phase, establishment phase to processing phase. This is because weather and climate influence most of the processes involved in cocoa production. For example: solar radiation produces energy for warming the soil, plants, air and metabolic processes; rainfall and its characteristics in terms of amount, intensity, reliability and distribution influence crop growth and soil erosion (Olowa *et al.*, 2009).

In recent years Ikwuano has lost her leading role in production of cocoa, due to downward trend in cocoa production. Among the reasons given for the decline in cocoa production as the inability of cocoa industry to increase output include generally climate variability which escalates insect vectors like capsids, black pods causing diseases and pests. Vulnerability is the degree to which a system is susceptible to or easily influenced with adverse effects of climate change, including climate variability extremes. It is a function of character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity (IPCC 2001).

Vulnerability is not simply a function of exposure, but also of people's capacity to adapt to change. If the people's capacity to adapt to change remains unchanged or unimproved, increased exposure will lead to increased vulnerability. Vulnerability is caused by inequality, inappropriate governance structures, and maladjusted economic and agricultural development (Santiago, 2001).

The vulnerability of cocoa production in area of Ikwuano local government of Abia state in Nigeria can be viewed in terms of the problems encountered by cocoa farmers that hamper increased production. This can be categorized into shocks and trends. Shocks include: drought, pest and diseases and flood while trends are fluctuation in prices, inconsistencies in policies, inadequate access to credit, marketing problems and inadequate manpower during season. Cocoa farmers however are said to be vulnerable to the effect of climate change on cocoa production if they are unable to cope with or recover from adverse effect of climate variability and extremes on their production.

So many organized course of action have been done over the years by different agencies like research institutes, government agencies and among others on the effects of climate change on cocoa and vulnerability in order to enhance or facilitate cocoa production by farmers at reasonable quantity. Despite all the programmes, production has been dwindling.

Several views have been given about the impacts of irregularity of climate on cocoa production; some assert that rural and poor cocoa farmers are more affected. With the preceding statement, can we infer that these claims are really in accordance with climate change? For these reasons, this study was designed to assess cocoa farmers' vulnerability to climate change in Ikwuano L.G.A, Abia State, Nigeria and provide answers to the questions below:

1. What are the socio-economic characteristics of the respondents?
2. What are the respondents' sources of information on climate change?
3. What are the mostly vulnerability indicators to climate change among farmers in the study area?

The specific objectives were to;

1. describe selected socio-economic characteristics of cocoa farmers in the study area
2. ascertain respondent's sources of information on climate change.
3. measure vulnerability index of cocoa farmers to climate change.

MATERIALS AND METHODS

This study was conducted out in Ikwuano Local Government Area of Abia state, Nigeria. It is known to be one of the largest primary producers of export cash crops. These cash crops include palm and cocoa trees. It is on record that Ikwuano has been a leading producer of cocoa in former Eastern Region and also that the quality of cocoa produced is the best in Nigeria (Smart, 2001). It was in appreciation of this unique contribution to the national economy that Ibero Roads were tarred. Ikwuano coordinates are 5°25'N 7°30'E and 5.417°N 7.500°E. It is about 14Km² southeast of Umuahia (Government press, 1992). The total rain fall decreases from 2200mm in the south to 1900mm in the north. Rainy season begins in March and ends in October with a break in August, usually referred to as "little dry season". The dry seasons which last for four months begins in November. The hottest months are January to March when the mean temperature is above 27°C. The relative humidity is usually high through the year (Nigerian Meteorological Station, 2001).

Ikwuano is bounded on the north by Bende and Umuahia LGAs, Isiala-ngwa on the west. Twenty-seven autonomous communities are in Ikwuano Local Government Area, Abia State, Nigeria; having the population 137, 993 and the total land area 108 square mile. It has vast areas of arable land. Her soil is very rich. A two stage sampling techniques was used in the selection of communities (cocoa producing areas), villages, and participating farmer. The first stage involves the purposive selection of the four (4) communities out of the twenty-seven (27) communities in Ikwuano L.G.A. This was because; cocoa production is the major agricultural activity in the communities. The second stage involves simple random selection of two (2) villages from the number of villages that make up each of the four communities because; cocoa is produced more in the villages selected. Standard normalization method was used to measure index of vulnerability of the cocoa farmers in the study area to climate change based on their responses to some questions relating to the selected indicators of vulnerability. Vulnerability index lied between 0 and 1, with 1 indicating maximum vulnerability and 0 indicating no vulnerability at all and the functional relationship between the indicators showed that vulnerability increases with increase in the value of the indicators i.e. the higher the value of the indicators compared to the vulnerability index (VI), the more the vulnerability to climate change. It therefore means that, the variation in climate variables is directly proportional to the indicators of vulnerability to climate change in the study area. The standard normalization formula is shown below:

$$Z = \frac{\bar{X} - \mu}{\sigma}$$

$$VI = \frac{\sum Z}{K}$$

Where: Z = Normalized score
X̄ = Mean
μ = Mean score
σ = Standard deviation
VI = Vulnerability index
K = Total number of indicators or variables

RESULTS AND DISCUSSION

The socio-economic characteristics of cocoa farmers are shown in table 1. The result reveals that majority (81.8%) were males while 18.2% were females. This indicates that there are more males engaged in cocoa farming than the females in the study area. The findings agree with Olowa and Olowa (2009) who observed that more males were involved in cocoa farming than males in Ondo East Local Government Area of Ondo State. The result revealed that 41.8% of the respondents had a mean age of 36.70 years. This is an indication that able-bodied and energetic farmers were involved in cocoa farming that can actively adopt effective measures to reduce vulnerability by adaptation. Also a good proportion (54.5%) of the respondents had secondary education. This shows that the respondents were literate enough to practice new technologies involved in cocoa farming. Education is a driving force towards rapid adoption and initiation of adaptation ideas on agricultural activities in rural areas. The table also shows that majority of the respondents (57.3%) are married with mean farm size of 6.25 hectares. The result also

shows that (24.5%) of the respondents had mean farming experience of 17.90 years. This indicates that majority of the respondents had long time cocoa farming experience and could have over the years experience changes in climate in the study area.

The mean output of dried cocoa bean produced per year by farmers in the study area was 20.4227273 bags and the mean weight is 19.9318182Kg (0.01993182 Metric tons) with a mean annual farm income of ₦503927.273. Transport Information Services (TIS) from the German Insurance Association has it that 1 jute or sisal bag of dried cocoa bean weigh 65kg. The result shows low production level in cocoa agricultural practices in the study area. This corroborated the views of Wood (1985) which attributed low level of production to smallholder cocoa production which is traditionally a low input to low output system in which yield is limited or declined by the presence of pests and diseases. The implication of this is that, most of the respondents are poor, illiterates, have low investments, and dearth of government support including extension service.

Table 1: Percentage Distribution of selected socio-economic characteristics of respondents in Ikwano Local Government Area of Abia state, Nigeria (N = 110)

Variables	Frequency	Percentage
Gender:		
Male	90	81.8
Female	20	18.2
Age (in years):		
21-30	27	24.5
31-40	46	41.8
41-50	34	31.0
51-60	3	2.7
Mean = 36.70		
Level of Education:		
No formal education	19	17.5
Primary education	11	10.0
Secondary education	60	54.5
Tertiary	20	18.2
Marital Status:		
Married	63	57.3
Single	47	42.7
Farm size (in hectares):		
0.1-1.0	6	5.5
1.1-2.0	13	11.8
2.1-3.0	35	31.8
3.1-4.0	32	29.1
4.1-5.0	12	10.9
5.1-6.0	12	10.9
Mean = 6.25		
Farming experience (years):		
5-10	20	18.2
11-15	24	21.8
16-20	22	20.0

21-25	27	24.5
26-30	17	15.5
Mean = 17.90		

**Cocoa production level
 (Numbers of bags sold per year):**

1-10	23	20.9
11-20	45	40.9
21-30	21	19.1
31-40	10	9.1
41-50	11	10.0

Mean = 20.4227273

Mean Weight = 19.9318182Kg

1bag = 65Kg

Annual farm income (₦):

10,000-100,000	6	5.5
101,000-300,000	39	35.5
301,000-500,000	21	19.1
501,000-800,000	19	17.3
801,000-1,000,000	9	8.2
1,001,000-1,300,000	16	14.5

Mean= ₦ 503927.273

Source: Field Survey Data, 2013

Cocoa Farmers Sources of Information on Climate Change in Ikwuano L.G.A of Abia State, Nigeria

Result in table 2 shows different sources of information on climate change among cocoa farmers in the study area. Majority of the respondents (95.5%) had radio as their source of information. The choice of radio by farmers over other sources of information could be attributed to accessibility, availability and affordability of radio by farmers. Also because of wide coverage, farmers in the study area utilize radio as effective means of information source. This result justifies that cocoa farmers were mostly informed on climate change and ways of adapting to it through radio programmes known as “the farmers” and featured in English and Igbo language on broadcasting cooperation (BCA); Pacesetter Radio Nigeria and others. This result agrees with Ogunbameru (2001); Buba (2003), Nwachukwu (2003), Ani (2004) and FADAMA (2005) that emphasized the use of agricultural programmes on radio to improve adaptation of cocoa farmers to climate change. In addition, Abubaka *et al.* (2009) revealed that the use of local languages and dialects to inform target audience on the improved practices against effects of climate change in order to increase harvest has been known to effective. Nwachukwu (2010), in his study found that within the socio-cultural milieu of Nigeria farmers, the most important or popular means of communicating to farmers on new and improved technologies is the radio. Time and daily duties of farmers is never a barrier in passing information through radio to peasant farmers. The result on choice of friends (76.4%) and fellow farmers (68.2%) is based on the fact that, most farmers relates with one another on virtually daily basis, hence the tendency to pass message on recommended practices to one another more often. The result corroborates the findings by Fadiji *et al.* (2005) and Ekong (2008). Also, it indicates that cocoa farmers have more reliability on their friends as well as on their fellow farmers and imitate each other for better output. This further agrees with Adedoyin (1990) in Banmeke *et al.* (2005) who revealed that, how far people progress in whatever they are doing depends largely upon the availability and accessibility of accurate and reliable information source.

Table 2: Distribution of Respondents According to Source of Information on Climate Change in Ikwuano L.G.A of Abia State, Nigeria

Sources of Information	Frequency	Percentage
Television	57	51.8
Radio	105	95.5
Fellow farmers	75	68.2
Friends	84	76.4
Extension agent	60	54.5

Source: Field Survey Data, 2013

* Multiple respondents were recorded

Measurement of Vulnerability of Cocoa Farmers/ Climate Change in Ikwuano Local Government Area of Abia State, Nigeria

The result of vulnerability index of cocoa farmers in Ikwuano Local Government Area of Abia State is presented in table 3.

The result indicated that there was high vulnerability to climate change with the variables that have increase functional relationship (↑) with vulnerability index (VI) as high rainfall ranked first. This implies that, the cocoa farmers based on rain-fed agriculture. In this case, the result showed that the study area was vulnerable to climate change with the variables that have increase functional relationship (↑) with vulnerability index (VI). The result also indicated that, the cocoa farmers in the study area had minimal vulnerability index (VI) of 0.1679 of which 5 out of the 12 indicators or variables were significant by having their normalization score greater than the reference vulnerability index (0.1679) and mean greater than the reference mean of 2.50. The choice of composite vulnerability index was inspired by the nature of the data since it probed into 2012 and 2013. Vulnerability evaluation is an integral part of the Local Option for Communities to Adapt and Technologies to Enhance Capacity (LOCATE) methodology, to help select priority communities for the implementation of Community Based Adaptation Projects. The evaluation takes into account a number of elements, including poverty, climatic factors, hazards and extreme events (Zakieldeen, 2009).

Table 3: Vulnerability of Cocoa Farmers to Climate Change in Ikwuano L.G.A Abia State (N = 110)

Indicators/Variables	Mean	Standard Deviation	Normalized Score	Functional Relationship	Rank *
High Rainfall	3.0818	1.0763	0.5405	↑	1 st
Stream or lift Water Irrigation	3.0000	1.1414	0.4380	↑	2 nd
No Government Irrigation System	2.8545	1.0738	0.3301	↑	3 rd
High Frequency of Pests and Diseases	2.7909	0.9196	0.3163	↑	4 th
Low Farm Income	2.8090	1.0091	0.3062	↑	5 th

No Access to Credit/Subsidy	2.6363	0.9743	0.1399	↓	6 th
Age	2.6000	0.8710	0.1136	↓	7 th
High Sloppy Lands	2.5636	0.9533	0.0667	↓	8 th
High Land Slides	2.5181	0.9836	0.0184	↓	9 th
Scarce Community Work Force	2.3363	1.0252	-0.1596	↓	10 th
High Temperature	2.4454	0.9246	-0.0590	↓	11 th
Literacy Rate	2.4636	1.0198	-0.0356	↓	12 th

Vulnerability index (VI) 0.1679

Mean score (μ) 2.50

Source: *Computed From Field Survey Data, 2013*

* Ranking is in order of vulnerability, with 1st as the most vulnerable and 12th as the least. ↑ ↓ = Functional Relationship with Vulnerability Index

CONCLUSION AND RECOMMENDATIONS

The study has shown that the cocoa farmers are vulnerable to climate change in relation to the indicators: high rainfall, stream or lift irrigation, no government irrigation system, high frequency of pests and diseases, low farm income, which resulted in declining yield in their cocoa production and also reflect negatively on their annual farm income indicating that cocoa farmers are more vulnerable to climate change in rural areas.

The study therefore recommends that;

1. Current adaptation measures should be advocated in vulnerable communities by relevant agencies such as ADPs.
2. Government should subsidize the price of chemicals used for spraying against black pod diseases and capsid pests including other inputs to reduce incidence of pest and disease infestation on cocoa production.

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