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Incidences of Climate Change Among Plantain Farmers in the Aguata Area of Anambra State, Nigeria

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ABSTRACT

The study examined climate change incidences among plantain farmers in the Aguata area of Anambra State, Nigeria. A purposive sampling technique was adopted in selecting 120 plantain farmers, which formed the sample size. A structured questionnaire was used for data collection. Descriptive and inferential statistics were used to analyze the data obtained. The findings revealed high incidences of rising temperatures, excessive rainfall, and pests and diseases. The results indicate that the adaptation strategies used included drought-resistant planting materials, disease-resistant varieties, mulching, organic manuring, precision farming, rainwater harvesting, drip irrigation, and agroforestry practices, among others. This study also revealed a high coefficient of determination (R^2) of 0.76, which is equivalent to 76%. The study concluded that climate change has a negative effect on plantain production in the study area. The study recommends that relevant stakeholders should support farmers by providing single-digit loans and incentives to enable them to meet the financial obligations needed to apply the adaptation strategies at the right time.

Keywords: Aguata Area, Incidences, Adaptation, Climate change, Plantain farmers

INTRODUCTION

Plantains (*Musa paradisiaca* and *Musa acuminata* $\times$ *balbisiana*) belong to the kingdom Plantae, phylum Magnoliophyta, family Plantaginaceae, and genus *Plantago*. There are two main varieties and species of plantain, which include Horn and French Horn. Three main types of plantain species exist alongside many minor plantain species, namely: Hybrid, Horn plantain, and False Horn plantain.

Plantain is ranked third among starchy staples and is a major carbohydrate food for many people, including those in Nigeria (Ebe et al., 2021; NEST, 2024; ECCC, 2024). Plantain is an important food crop in Nigeria, and in Aguata inclusively. However, it is not yet grown as an organized crop because production and processing are still done by micro-producers. Production is constrained by inadequate funds, poor farming culture, climate change and variability, as well as poor manpower resources and water management (Njoku & Ugboaja, 2019). The NBS (2023) stated facts on climate change in Nigeria, as reported by the Nigerian Environment Study and Action Team (NEST, 2024), which outlined issues such as poor nutrition, low agricultural yields, poverty, proliferation of disease vectors and pests, sleeping sickness, soil erosion, and other impacts of climate change in the Aguata Agricultural Zone of Anambra State, Nigeria.

The broad objective of this study was to examine the incidences of climate change and the adaptation strategies used among plantain farmers in the Aguata Agricultural Zone of Anambra State, Nigeria. The specific objectives were to identify the incidences of climate change and to ascertain the adaptation strategies used by the farmers to reduce the effects of climate change on plantain production. This study hypothesized (H_0) that: There is no significant relationship between climate change incidences and the adaptation strategies used by farmers in the Aguata agricultural zone of Anambra State.

METHODOLOGY

The study was conducted in the Aguata Agricultural Zone of Anambra State, Nigeria. Aguata is located in the South-East Region of Nigeria between latitudes 6° and 4° North of the Greenwich Meridian. A multi-stage and purposive sampling procedure was used in the selection of respondents for the study.

The first stage involved the selection of Anambra State. The choice of the Aguata agricultural zone was informed by the notable position of the area in plantain production. Additionally, the Aguata agricultural zone has an excellent environment, with both uplands and lowlands that favor plantain production (ASADEP, 2021; Anambra State Ministry of Agriculture, 2021). The second stage consisted of the purposive selection of two extension blocks, namely the Aguata and Orumba North blocks. The reason for their selection was based on the intensity and high concentration of plantain farmers in the study area. In the third stage, three (3) circles were selected randomly from each of the selected blocks, making a total of six circles: Uga, Ekwulobia, and Awara in the Aguata block, and Obiofia, Otolo, and Ojo, which were selected based on proximity and convenience for the researcher. The fourth stage comprised the selection of two (2) sub-circles from each of the six (6) circles, making twelve (12) sub-circles namely: Umuhu, Uga, Igbo-Ukwu, Umuchu, Achina, Amesi, Aguluezechukwu, Nneogidi, Ezinifite I, Ezinifite II, Ikenga, and Isuofia. The final stage involved selecting ten (10) plantain farmers from each of the 12 sub-circles, making a total of 120 plantain farmers, which formed the sample size for the study.

Data for the study were gathered from the respondents using a structured questionnaire administered to the 120 respondents. Data obtained from the study were analyzed using descriptive and inferential statistics, while multiple regression analysis was adopted in testing the hypothesis.

Model Specification

Multiple regression was used to analyze the factors that influence the incidences of climate change and the adaptation strategies used by plantain farmers in the study area. The multiple regression model is implicitly expressed as:

$Y = f(X_1, X_2, \dots, X_n) + e_i$

However, the model is explicitly specified in the following functional forms:

1. **Linear function:**

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \dots + \beta_nX_n + e_i$

2. **Exponential function:**

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$\ln Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \dots + \beta_nX_n + e_i$

3. **Semi-log function:**

$Y = \beta_0 + \beta_1\ln X_1 + \beta_2\ln X_2 + \dots + \beta_n\ln X_n + e_i$

4. **Double-log function:**

$\ln Y = \beta_0 + \beta_1\ln X_1 + \beta_2\ln X_2 + \dots + \beta_n\ln X_n + e_i$

Where:

- Y = Incidences of climate change on plantain production
- X_1 = Gender (male=1, female=0)
- X_2 = Age (years)
- X_3 = Farm size (hectares)
- X_4 = Farming experience (years)
- X_5 = Level of education (years)
- X_6 = Extension contact (number of visits)
- X_7 = Household size (numbers)
- X_8 = Level of rainfall (high=1, low=0)
- X_9 = Level of temperature (high=1, low=0)
- β_0 = Intercept
- e_i = Error term

RESULTS AND DISCUSSION

Table 1: Climate Change Incidences Reported by Plantain Farmers

Climate Change Incidences	Strongly Agreed (4)	Agreed (3)	Disagreed (2)	Strongly Disagreed (1)	Mean
Excessive rainfall pattern	70 (58.3%)	6 (5.0%)	29 (24.2%)	15 (12.5%)	3.24
Rising sea level	-	-	-	-	-
Rising temperature	22 (18.3%)	53 (44.2%)	33 (27.5%)	12 (10.0%)	2.71
Excessive flooding	60 (50.0%)	50 (41.6%)	4 (3.3%)	6 (5.0%)	3.55
Late maturity	56 (46.7%)	54 (45.0%)	6 (5.0%)	4 (3.3%)	3.35
Proliferation of pests & diseases	86 (71.7%)	25 (20.8%)	3 (2.5%)	6 (5.0%)	3.59
Low yield of plantain	95 (79.2%)	7 (5.8%)	11 (9.2%)	7 (5.8%)	3.58
Excessive dryness of the soil	70 (58.3%)	24 (20.0%)	11 (9.2%)	15 (12.5%)	2.24

Note: Values in brackets are percentages. Source: Field Survey, 2025.

The results in Table 1 show that seven incidence statements were listed. The results showed that six out of the seven variables investigated had a mean score of 2.5 and above. This implied high incidences of climate change, while only one was considered a non-incidence. The highly-rated incidences were excessive flooding (3.55), proliferation of diseases (3.59), late maturity of crops (3.35), excessive rainfall (3.24), and rising temperatures (2.71). This finding is in line with the principles of climate change as reported by UNEP (2018), NASA (2024), and ECCC (2024).

The table demonstrates that all the investigated climate change incidences have a positive incidence score on plantain production, except for excessive dryness of the soil, which recorded a mean of 2.24, implying it fell below the decision mean of 2.5.

Table 2: Adaptation Strategies to Climate Change Incidences on Plantain Production

Adaptation Strategies	Strongly Agreed (4)	Agreed (3)	Disagreed (2)	Strongly Disagreed (1)	Mean
Use of drought-tolerant materials	65 (54.2%)	28 (23.3%)	22 (18.3%)	5 (4.2%)	3.3
Disease-resistant plantain varieties	67 (55.8%)	23 (19.2%)	20 (16.7%)	10 (8.3%)	3.1
Incorporation of Agroforestry systems	18 (15.0%)	62 (51.7%)	27 (20.8%)	15 (12.5%)	2.7
Adoption of drip irrigation	22 (18.3%)	38 (31.7%)	45 (37.5%)	15 (12.5%)	2.6
Rainwater harvesting systems	56 (46.7%)	24 (20.0%)	25 (20.8%)	18 (15.0%)	3
Construction of drainage channels	54 (45.0%)	26 (21.7%)	28 (23.3%)	12 (10.0%)	3
Use of compost and organic manure	66 (55.0%)	34 (28.3%)	18 (15.0%)	2 (1.7%)	3.4
Implementation of mulching	55 (45.8%)	25 (20.8%)	28 (23.3%)	12 (10.0%)	3
Cover cropping	72 (60.0%)	28 (23.3%)	15 (12.5%)	5 (4.2%)	3.4
Contour farming	66 (55.0%)	24 (20.0%)	22 (18.3%)	8 (6.7%)	3.2
Regular monitoring & early detection	63 (52.5%)	27 (22.5%)	18 (15.0%)	12 (10.0%)	3.2
Diversification (crops/livestock)	18 (15.0%)	63 (52.5%)	27 (22.5%)	12 (10.0%)	2.7
Training farmers on climate resilience	27 (22.5%)	18 (15.0%)	63 (52.5%)	12 (10.0%)	2.5
Early warning systems	18 (15.0%)	27 (22.5%)	63 (52.5%)	12 (10.0%)	2.4
Extension network for info delivery	28 (23.3%)	15 (12.5%)	72 (60.0%)	5 (4.2%)	2.6
Use of mobile forecasting / technology	18 (15.0%)	27 (22.5%)	63 (52.5%)	12 (10.0%)	2.4

Source: Field survey, 2025.

The distribution of plantain farmers according to adaptation strategies to climate change is presented in Table 2. The adaptation strategies with the highest mean scores were the use of compost and organic manure, cover cropping, contour farming, regular monitoring and early detection of pests, rainwater harvesting, implementation of mulching, incorporation of agroforestry systems, diversification of livelihoods (planting complementary crops/livestock), adoption of drip irrigation, extension networks for better information delivery, and training farmers on climate-resilient practices.

Data in the table also indicated that some items investigated had mean scores less than the benchmark discriminator index of 2.5. These included early warning systems and the adoption of mobile forecasting tools (2.4). The utilization of various adaptation strategies indicates that plantain is a major food crop in the study area, and farmers need adequate knowledge on how to improve their yield, maintain the crop, and process their output. This finding is in line with the assertions of the IPCC (2024, 2025) principles of climate change.

Table 3: Relationship between Farmers' Climate Change Incidences and Adaptation Strategies

Explanatory variables	Linear	Semi-log	Double-log	Exponential
Constant	229.034	87.165	143.408	102.559
Global rising temperature (X_1)	70.316 (1.953)*	3.094 (1.388)	0.075 (3.912)***	0.006 (2.714)***
Intensity of extreme weather (X_2)	12.007 (1.668)	4.117 (2.542)	0.640 (2.916)	0.009 (2.543)
Energy consumption (X_3)	10.827 (1.385)	3.529 (1.416)	0.046 (1.529)	0.003 (1.702)
Increased transportation (X_4)	11.209 (1.822)	2.802 (1.713)	0.052 (3.673)	0.006 (2.912)
Soil degradation (X_5)	10.116 (1.911)	3.417 (1.882)	3.085 (3.112)	0.007 (1.613)
Changing rainfall pattern (X_6)	13.065 (2.557)	0.044 (2.915)	0.005 (1.802)	4.726 (1.903)
Income level of farmers (X_8)	-10.244 (-1.642)	-3.008 (-1.716)	-0.039 (-1.416)	-0.008 (-1.553)
Educational level (X_{10})	11.333 (1.564)	2.908 (1.656)	0.046 (1.829)	0.007 (1.418)
Farm size (X_{11})	14.592 (2.914)	3.115 (1.777)	0.066 (4.169)	0.008 (3.413)
Social network (X_{12})	10.827 (-2.668)	-4.089 (-1.365)	-0.091 (-3.094)	-0.006 (-2.556)
Access to climate info (X_{13})	11.387 (1.514)	2.692 (1.409)	0.053 (1.316)	0.007 (1.811)
Access to extension services (X_{14})	12.464 (1.391)	3.547 (1.825)	0.081 (1.922)	0.004 (1.397)
Cultural belief (X_{15})	133.829 (1.698)	4.663 (1.742)	0.055 (1.613)	0.009 (1.814)

R^2	0.4938	0.4125	0.7628	0.6123
F-Value	21.9467	16.1765	73.7005	36.1239
Sample size (n)	120	120	120	120

Source: Field survey, 2025.

The results of the four functional forms of the multiple regression analysis are presented in Table 3. The results showed that the double-log function produced the highest coefficient of multiple determination (R^2), the highest number of significant variables, and conformed to a priori expectations. The double-log function was therefore chosen as the lead equation.

The coefficients of global rising temperature (X_1), intensity of extreme weather events (X_2), increased transportation (X_4), soil degradation (X_5), changing rainfall patterns (X_6), access to resources (X_9), and farm size (X_{10}) were significant at the 0.01 level. Meanwhile, the coefficients for energy consumption (X_3), agricultural activities (X_7), access to extension services (X_{14}), cultural belief (X_{15}), and access to climate information (X_{13}) were not significant at the 0.05 level.

The F-ratio is statistically significant at the 1% level, which reveals that the model is adequate for use in further analysis. Ebe et al. (2021), NASA (2024), and NEST (2022) obtained similar results in examining the perceived effects of climate variability and change on the livelihoods of arable crop farmers in the Agbani agricultural zone of Enugu State. This is in consonance with a priori expectations, as socioeconomic characteristics positively influence the adaptation strategies used by plantain farmers regarding climate change.

The R^2 value of 0.76 indicates that 76.3% of the variability in climate change adaptation is explained by the independent variables. The F-value was highly significant at the 1% level of probability, indicating a regression of best fit. The results of the regression analyses showed that the coefficients for global rising temperatures (X_1), intensity of extreme weather events (X_2), income level (X_8), educational level (X_{10}), and access to climate change information (X_{13}) were positively signed and highly significant at the 5% level of probability. This implies that an increase in income leads to better adaptation to climate change, which results in a positive impact on the yield of plantains in the study area.

The coefficients for social network (X_{12}), changing rainfall patterns (X_6), and agricultural activities (X_7) were negatively signed. This implies that these variables had a negative or inverse effect on the perceived impacts of climate change in the study area. Therefore, the null hypothesis is rejected with respect to the significant variables and accepted with respect to the non-significant variables.

CONCLUSION

The researchers found that climate change incidences affected plantain production, although adaptation strategies for climate change were used by farmers. The study recommends that effective policies to improve the adaptation strategies of farmers should be put in place. Furthermore, the government should encourage plantain production by providing climate change-tolerant varieties and monetary incentives to support farmers.

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References

1. Anambra State Agricultural Development Programme (ASADEP). (2024).
2. Anambra State Ministry of Agriculture. (2021). Agricultural production show.
3. Ebe, F.E., Obike, K.C., Oti, G.O., Njoku, J.I.K., & Ogbu, O.U. (2021). Perceived effects of climate variability and change on livelihood of arable crop farmers in Agbani agricultural zone of Enugu state, Nigeria. *Faman Journal*, 21(1), 63-76.
4. European Commission for Climate Change (ECCC). (2024). Incidences of climate change on crop production.
5. Inter-governmental Panel on Climate Change (IPCC). (2025). Climate report. Retrieved on 2025-01-12 from www.ipcc-data.org.
6. Inter-governmental Panel on Climate Change (IPCC). (2024). Climate change adaptation strategies for survival report, 2024. Contributions, Cambridge University Press.
7. National Aeronautics and Space Administration (NASA). (2022). Effect of climate variability on aviation industry. Washington: Academic Press. ISBN-0.308-14587.
8. Nigerian Environmental Study/Action Team (NEST). (2024). Symposium climate change perspective report.
9. Nigerian Bureau of Statistics (NBS). (2023). Population Figures, Official Survey. 104(25), November 2023.
10. Njoku, J.I.K., & Ugboaja, C.I. (2019). Effects wealth forecast information by farmers, in Abia state, Nigeria. *International Journal of Agriculture, Management and Technology*, 3(2), 28-32.
11. United Nations Environment Programme (UNEP). (2018). Measuring vulnerability in national hazards: towards disaster resilience societies. United States of America.