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NEXUS BETWEEN CLIMATE CHANGE, AGRICULTURE AND ECONOMIC GROWTH IN NIGERIA

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ABSTRACT

The study conducted an empirical analysis of Nexus between climate change agriculture and economic growth in Nigeria. The research uses data spanning from 1980 to 2023 obtained from central bank of Nigeria and world development index (WDI) The data collected were linear in nature and then unit root test was conducted for all variables (GDP, Agriculture, Annual rainfall and C02 emission as proxy of climate change). The dependent variable was stationary at level, while the explanatory variables were stationary at first difference, as determined by the Augmented Dickey-Fuller test. The Johansen cointegration test showed no cointegration, indicating no long-run relationship between climate change and economic growth in Nigeria and Autoregressive Distributed Lag (ARDL) model was used to analyze the data. The findings revealed there is negative relationship between climate change, agriculture and economic growth in Nigeria due to the climate related events such as changes in rainfall pattern, unpredictable weather seasonality and rising in temperature. The findingalso revealed higher C02 emission led to lower output and negatively affect the economic growthThis paper recommended that there is need to invest in climate resielent agriculture by implementing polcies and programs that support farmers in adopting drought resistant crop. Additionally, implementing strict emvironmental regulation and emforcingpanelties to curb C02 emission. By adopting these recommendations, Nigeria can enhance its resilience to climate change, promote sustainable economic growth and protect the well being of its citizens.

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INTRODUCTION

Climate change is today perhaps the most challenging global issue as it has far-reaching effects on the economies and societies of nations all over the globe. This is especially true for developed nations. Its effects are adverse bearing more in countries like Nigeria, where majority of the people are vulnerable to climate change interruptions. The economy of Nigeria is highly dependent on the natural resources of the country with the oil and gas industries dominating. However, these resources and their respective infrastructures are threatened by climate change. Rising sea levels are likely to result in flooding in coastal areas leading to destruction of oil and gas pipelines and refineries. In addition, part of the problem would be coastal erosion which may result to loss of land and structural assets. The nation's geographical location as well as its economic activities that are climate sensitive makes Nigeria highly vulnerable to the impacts of climate change. There have been increases in average temperatures in the country as well as an increase in the occurrences of violent precipitation coupled with extreme variations of rainfall. Such alterations have had a tremendous impact on the lives of the Nigerians as well as the economic activities therein. Agriculture, which is the bedrock of Nigeria's economy employs more than sixty per cent of the population. Agricultural productivity is affected by climate change through alterations in the temperate and rainfall regimes in addition to the intensity and frequency of extreme weather hazards. Extreme weather events such as droughts and floods as well as heat stress can cause crop failed due losses to agricultural outputs and livestock, hence causing income losses to the farmers and even threatening food availability to the whole population. The challenges that are faced by Nigeria as a result of climate change are greatly affecting the economy of the country, increasing the negative environmental impacts and affecting loss of welfare among Nigerians (Adejumo, 2021). The agriculture and agro-focused sectors of Nigeria's economy portend great possibilities in the expansion and economic diversification from crude oil (Gershon et al. 2019). Climatic conditions, that is rainfall and temperature, are however major factors that affect these sectors. Changes in the rainfall and temperature patterns have caused a shift from the normal April-October rainy season and the dry season from October to March. While on the one hand, uncertainties such as unpredictable rains and extreme conditions of weather may discourage potential agribusiness investment, (Gershon and Patricia, 2019) on the other hand – excess rains can lead to increased incidences of disease vectors and pests that are harmful to crops and livestock. Furthermore, higher temperatures

also encourage the reproduction of pests which is detrimental to plants.

RESEARCH QUESTION

- How does climate change affects Nigerian economic growth?
- What is the relationship between climate change and economic growth?
- How change in annual rainfall and carbon emission related to economic growth in Nigeria?

RESEARCH OBJECTIVES

The study aimed to investigate the impact of climate change on economic growth in Nigeria, with the following objectives:

- To analyze the relationship between climate change and economic growth in Nigeria
- To assess impact climate change on sub economic sectors, including agriculture, water supply, and infrastructure.
- To explore adaptation and mitigation strategies adverse effects of climate change on economic growth.

LITERATURE REVIEW

The study aimed at investigating the nexus between climate changes, agriculture and economic growth in Nigeria, therefore the literature review divided in to two namely theoretical and empirical literature:

Theoritical Literature of Climate Change: Numerous theories have been proposed to explain climate change, with the Anthropogenic Global Warming (AGW) theory being Sone of the most prominent. The AGW hypothesis suggests that human activities, particularly the release of greenhouse gases such as carbon dioxide (CO2), methane, and nitrous oxide, are driving a dangerous increase in global temperatures. This rise is attributed to the enhanced greenhouse effect. The enhanced greenhouse effect works as follows: Solar energy reaches the Earth from the sun, passing through the atmosphere, which is mostly transparent to this incoming sunlight. Some of this energy is absorbed by the Earth's surface, while the rest is reflected back as heat. Greenhouse gases in the atmosphere absorb the reflected or internally emitted thermal radiation, which causes the atmosphere to warm more than it would without these gases (Ogbuabor and Egwuchukwu, 2017). Over the past century, human activities such as burning fossil fuels, wood, and forests are believed to have increased atmospheric CO2 levels by about 50%. Proponents of the AGW theory argue that these human-driven CO2 emissions are the main cause of various disasters, including floods, droughts, extreme weather events, crop failures, species extinctions, disease outbreaks, coral reef bleaching, famines, and other catastrophic events. They suggest that these disasters will become more frequent and severe as global temperatures rise, stressing the need for significant and rapid reductions in human emissions to avoid further catastrophe. Climate change, like other environmental challenges, involves externalities. For example, the emission of greenhouse gases harms other economic agents, but the emitter is not held accountable for the damage. According to standard externality theory, one solution is to tax the emitter at a rate equivalent to the marginal social cost of the damage caused. However, this becomes more complex when those most affected are weakly represented, when the problem spans long-term time frames, when the issue is global in scale, and when there is significant uncertainty and interaction with other market failures. Therefore, while standard externality theory provides a starting point, addressing the issue of climate change requires more complex economic policies. It involves a global, long-term collective action problem, marked by major uncertainties and linked market failures.

Empirical Literature

The following studies were reviewed:

Jonathan et al., (2017) conducted research on this topic using ordinary least squares (OLS) estimation techniques, incorporating variables such as annual rainfall, carbon emissions, and forest depletion. Their findings revealed that climate change adversely affects economic growth in both the short and long term. Additionally, forest depletion was found to negatively impact growth. This suggests that the government should implement policies aimed at reducing carbon emissions and forest depletion to mitigate these effects. Similarly, (Ajayi and Shola 2024) analyzed the effects of climate change on Nigeria's economic growth using time series data from 1991 to 2021. They employed the Autoregressive Distributed Lag (ARDL) model, and their findings confirmed that all four categories of climate change methane, emissions, gases, and liquids negatively impact Nigeria's economic growth. The study showed that the overall aggregate of these emissions has a detrimental effect on economic performance in Nigeria. (Foye, 2018) conducted a study on the dynamic relationship between climate change, human health, and economic growth in Nigeria using the Structural Vector Autoregressive (SVAR) model. The impulse response function results indicated that economic growth, climate change, and human health are strong predictors of one another over the long term, both globally and locally. Variance decomposition revealed that approximately 0.3% and 62.9% of the variance in health is explained by economic growth. The study concluded that shocks related to poor human health have a stronger impact compared to the milder effects on economic growth Likewise, (Akambi et al., 2014) explored the relationship between climate change, human development, and economic growth. Using quantitative techniques, they analyzed data with variables such as climate change, human development, carbon emissions, and the poverty index. Their findings revealed that climate change imposes significant constraints on human development, which in turn has a negative impact on economic growth.

(Gilbert and Ifarajimi 2020) conducted a study on the impact of climate change on economic growth in Nigeria, using the Fully Modified Ordinary Least Squares (FMOLS) estimator and Granger causality tests to assess both impact and causality. Their findings revealed that climate change negatively affects the per capita income growth rate and the Human Development Index (HDI). Additionally, carbon emissions were found to have a significant negative effect on Nigeria's economic welfare. Similarly, (Domnic et al., 2017) analyzed the effects of climate change on crop output in Nigeria using time series data from 1980 to 2013, with variables including rainfall, population, and carbon emissions. They employed the Vector Error Correction (VEC) model to analyze the data. The findings revealed that in the short run, only rainfall had a significantly positive impact on crop output among the climate factors. However, in the long run, all climate factors were found to have a significant effect on crop output.

(Gershon, O.&Mbajekwe C 2020) explored the relationship between climate change and agricultural production in Nigeria. Their econometric analysis, using the Autoregressive Distributed Lag (ARDL) model, revealed a long-term connection between climate change and crop production, but no such relationship was found for livestock. The findings indicated that rainfall and carbon emissions have a positive and significant impact on crop production in the long run. Similarly, (Kareem et al., 2023) investigated the implications of climate change and population growth rates on economic growth by analyzing spinning time series data from 1986 to 2021. They employed the Autoregressive Distributed Lag (ARDL) model for their analysis. The findings indicated that the first lag of LNGDP had a significant relationship with economic growth at both the 10% and 1% levels. Additionally, the third lag showed that birth growth rate and net migration had both positive and negative impacts on economic growth. The study also established a causal relationship between the crude death rate and economic growth. (Ubokudom et al., 2024) conducted a comprehensive analysis of the interrelationship between climate change, poverty, and agricultural performance in Nigeria, utilizing span time series data from 1980 to 2012. The study's findings revealed that forest depletion, carbon emissions, and government spending on agriculture had a significant negative impact on real gross domestic product (GDP). Conversely, agricultural performance showed a significant positive relationship with economic

growth. Additionally, the results indicated that rising temperatures had a negative effect on poverty levels. In a similar vein, (Fayemi J. A. 2020) examined the impact of climate change and global warming on sustainable development and socio-economic conditions. The study utilized descriptive statistics as analytical tools and employed simple random sampling techniques to select 100 residents from five chosen streets in the Ijebu Ode metropolis of Ogun State, Nigeria. The findings indicated that climate change and global warming resulted in soil erosion, flooding, desert encroachment, drought, and environmental imbalance, which posed significant threats to the sustainable livelihoods and socio-economic well-being of the population in the area studied. (Adelegun A. E& Enyoghasim M. O 2020) conducted an empirical study on the relationship between climate change, energy consumption, and economic growth. They utilized a Vector Autoregression Model as the analytical framework to establish the dynamic connections among these variables. The study's findings indicated that there is a joint Granger causality between climate change, energy use, and GDP. This suggests that climate change and energy consumption are significantly interrelated with gross domestic product. Similarly, (Osaratin et al, 2022) conducted a thorough analysis of the connections between climate change, poverty, and income inequality in Nigeria, utilizing time series data from 1980 to 2020. The study employed a dynamic ordinary least squares econometric technique for its analysis. The findings revealed a significant relationship between climate change and income inequality, supporting the U-shaped hypothesis regarding the impact of climate change on income inequality (Afolayan O. T& Aderemi T. A, 2019) In their study analyzed the relationship between environmental quality and health impacts in Nigeria, highlighting its implications for sustainable economic development. They employed a dynamic ordinary least squares (DOLS) approach. The results indicated that there is a negative and insignificant relationship between carbon emissions and mortality rates. Additionally, the study found a unidirectional causality, where carbon emissions influence electricity consumption, and it was observed that carbon emissions also Granger-cause government health expenditures. (Ceesay et al., 2020) conducted an econometric analysis to examine the relationship between climate change and economic growth. They utilized a panel estimation approach, incorporating fixed effects, random effects, and the Fisher unit root test with a trend constant. Their findings revealed that economic growth has a negative and highly significant impact on poverty growth in the selected West African countries. Additionally, the study indicated that the population in urban areas significantly influences poverty growth and has a strong correlation with food security.

RESEARCH METHODOLOGY

The research methodology section explains the methodology adopted in data collection and analysis, and it encompasses research data sources, research design and model specification.

Research Design: The research approach to be adopted will be quantitative in nature bearing in mind the inclusion of econometric models so as to relate the aspects of climate change agriculture and economic growth. It is for this reason that the present study seeks to find out the relationship between climate change and economic growth in Nigeria in quantitative terms. By utilizing econometric models and statistical analysis, such research tries to establish the extent to which climate changes impact on the Nigerian economy. Relevant data for the study will be collected from the Central Bank of Nigeria, National Bureau of Statistics, World Development Index covering the years 1980 to 2023. And the analysis of the data will be done using the Autoregressive Distributed Lag Model the analysis of these models will culminate in the interpretation of the results, thus giving rise to appropriate policy options. Specifically, the study shall focus on the use of the ARDL model as it is appropriate in this kind of analysis. Method (Model Specification) The effect of climate change on economic growth in Nigeria was assessed using an Autoregressive Distributed Lag (ARDL) model. For this purpose, the unit root test based on the Augmented Dickey-Fuller (ADF) method was used, in order to test the stationarity of the variables. The stationary test indicated that the dependent variable GDP was stationary at level while the other regressors were stationary at first difference. This said stationarity justifies the use of the ARDL model to carry out a Johansens Cointegration analysis which is necessary for this study as the aim is to see whether or how climate changes relate with the economic development or growth.

Data sources: As for the materials engaged in this research, they are of secondary dataset character because of the nature of variables for the study. This ensures the integrity of the secondary data which was obtained from the National Bureau of Statistics of Nigeria and the Central Bank of Nigeria. These variables are selected for their strong theorical basis in relation to the impact of climate change on economic growth that is represented by GDP, AGR, ARF, C02. Data collection covered the years 1980 – 2023 accounting a total of 44 observations. The particulars of data are shown below:

Variables	Sources	Frequency	Range
Gross Domestic Product (USD)	Central Bank of Nigeria (CBN)	Yearly	1980 – 2023
Agriculture	World Development Index	Yearly	1980 – 2023
Annual Rainfall	World Development Index (WDI)	Yearly	1980 – 2023
Carbon Emission	National Bureau of Statistic (NBS)	Yearly	1980 – 2023

Source Author Computation 2023.

Research Hypothesis

The following are the research hypothesis which divided in to Null and Alternative

- H_0: There is no significant connection between climate change, agriculture and economic growth in Nigeria.
- H_1: There is significant connection between climate change agriculture and economic growth in Nigeria.

Model Specification: This research aims to probe the relationship between climate change agriculture economics in Nigeria by employing the Autoregressive Distributed Lag (ARDL) model to study the association between the two. It evaluates the impact of climate change on economic development in Nigeria. This empirical model is depicted using real GDP per capita and is presumed to be influenced by agriculture, yearly precipitation, and carbon dioxide (CO2) emissions. Therefore, growth in the economy is undertaken in the context of agriculture growth (AGR), annual rainfall (ARF), and carbon (CO2) as well. The dependence structure between climate change and economic growth rate can be formulated as: GDPis dependent variable

AGR, ARF and CO2 is independent

$$RGDP_t = \mathrm{f}(\mathrm{AG}R_t + \mathrm{AR}F_t + \mathrm{CO2}_t) \quad \text{..... (1)}$$

The model becomes

$$\mathrm{RGD}P_t = \beta_0 + \Sigma\Delta\beta_1 \mathrm{AG}R_{t-1} + \Sigma\Delta\beta_2 \mathrm{AR}F_{t-1} + \Sigma\Delta\,\beta_3 \mathrm{CO2}_{t-1} + u_i \ .(1)$$

Where as
GDP = Dependent variable by growth rate of real GDP
β_0 = Intercept
β_0 _β_3 are parameter to be estimated.
AGR = Agriculture
ARF = Annual rainfall Usage
C02 = Carbon emission.
t = Number of years (44 Observation)

RESULTS AND DISCUSSION

The above table provides the findings of a unit root test which assess the nature of a given data set and its stationarity depending on whether it has a unit root and its order of integration. To this end, the Augmented Dickey-Fuller (ADF) test was carried out and is presented

Table 1. Unit Root Test

Test	Variables	Percentage	T-Statistic	Probability	Stationarity
ADF	GDP	1% 5% 10%	-3.626784 -2.945842 -2.611531	0.0021	I (0)
	AGR	1% 5% 10%	-3.596616 -2.933158 -2.604867	0.0007	I (1)
	ARF	1% 5% 10%	-3.596616 -2.933158 -2.604867	0.0009	I (1)
	C02	1% 5% 10%	-3.596616 -3.933156 -2.604867	0.0000	I (1)

Source: Author Computation EVIEWS 2024

Table 2. Johansen Cointegration Test

Hypothesize No of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob Critical Value
None	0.422979	41.99997	47.85613	0.1587
At Most 1	0.202012	18.90515	29.79707	0.4998
At Most 2	1.185880	9,427386	15.49471	0.3273
At Most 3	0.018638	0.790177	3.841465	0.3740

Source: Author Computation, EVIEWS 2024.

Table 3. Autoregressive Distributed Lag Model Results

Variables	Coefficient	Std Error	T - Statistic	Prob
GDP (-1)	0.632753	0.127216	4.973866	0.0000
AGR	4.052366	0.173292	23.38461	0.0000
AGR (-1)	-2.104624	0.579171	-3.633857	0.0008
ARF	-4.29E+09	1.59E+09	-2.706453	0.0102
C02	1.47E+10	6.71E+09	2.190050	0.0349
C	-7.75E+09	2.32E+10	-0.333379	0.7407
R. Square	0.994109	Mean of Dependent Variable		2.75E+11
Adjusted R. Square	0.993313	S.D Dependent Variable		1.47E+11
SE Regression	1.20E+10	Akaike Information Criteria		49.38517
Sum Square Residual	5.34E+21	Schwarz Criteria		49.63092
Log Likelihood	-1055.781	Hannan-Quinn Criteria		49.47580
F – Statistic	1248.840	Durbin Watson Statistic		1.323117
Prob Statistic	0.000000			

Source: Author Computation, EVIEWS 2024

Table 4. Breusch Godfry Langrage Multiplier Test

F – Statistic	4.632658	Probability F (2,35)	0.0164
Observed R. Squared	9.000468	Prob. Chi-Square (2)	0.0111

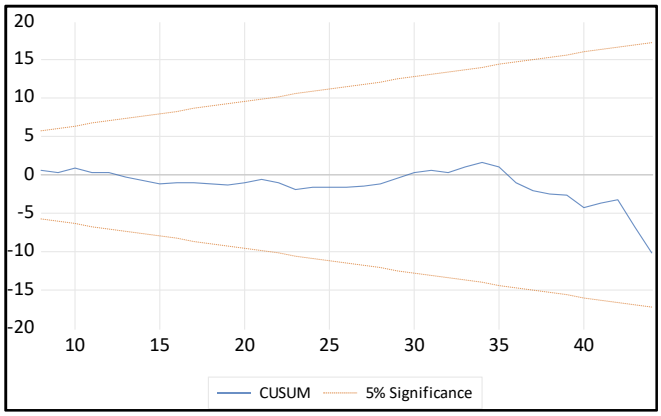
Source: Author Computation EVIEWS

in the table of the results of the stationarity test with an intercept included. Moreover, it is apparent from the table that all the variables are stationary; the dependent variable GDP is stationary at level, I (0), while other explanatory variables agriculture, annual rainfall usage and carbon emissions are I (1) stationary at first difference. This stationarity is valid statistically both at 1 and 5 percent levels of significance considering the absolute values of each t statistic respectively. So, again, since the t-statistics are higher than the probability values, this integration order points out that climate change agriculture and economic growth in Nigeria do not have any possibility of a long-run relationship existing between them. In view of the integration order which is I (0) and I (1), it is considered that the Autoregressive Distributed Lag (ARDL) model is suitable for the purpose of this study. This approach is preferred to other models in econometric analysis because it has several distinctive benefits.The table above presents the results of the unit root test, which examines the characteristics of the data to determine its stationarity, specifically whether it possesses a unit root and the order of integration. In this context, the Augmented Dickey-Fuller (ADF) test was conducted, and the results of stationarity with an intercept term are shown in the table. The table clearly indicates that all variables are stationary; the dependent variable, GDP, is stationary at level, denoted as I (0), while the other explanatory variables—agriculture, annual rainfall usage, and carbon emissions—are stationary at first difference, denoted as denoted I (1).

This stationarity is statistically significant at both the 1% and 5% levels when considering the absolute values of each t-statistic. Moreover, since the t-statistics exceed the probability values, this order of integration suggests that there is no potential for a long-run relationship between climate change, agriculture and economic growth in Nigeria. Given the order of integration, I (0) and I (1), the Autoregressive Distributed Lag (ARDL) model is deemed appropriate for the study. This model has gained popularity in econometric analysis due to its several unique advantages over other models. The preceding table presented the results of the Johansen cointegration test which shows that we fail to reject the null hypothesis at all levels, i.e., No cointegration relationship, At Most 1 cointegration relationship, At Most 2 cointegration relationship and At Most 3 cointegration relationship since the trace statistic was lower than critical value and the probability value is more than 0.05%, we accept the null hypothesis of no cointegration relationship. With reference to the table above in which trace statistic is lesser than the critical value at 0.05%, the general inference is that there is no cointegration relation between the series at cointegration relation which says there is no long run relation between climate change, agriculture and economic growth in Nigeria. This means that looking at any time series in the period whether short or long there are no two or more series that will move together and any relationship within the two or more variables in the short time span is not due to a convergent long-

term balance. Therefore, Autoregressive Distributed Lag Model is appropriate in this case and error correction model test is not required. As per the findings of the ARDL table 3, the coefficient of GDP suggests that an additional unit of one period's GDP will improve the current GDP by about 0.63% which means there exists a significant positive correlation between the past and present GDP. Likewise, for the agriculture coefficient, it is stated that current period agricultural output growth of an additional unit is likely to increase the GDP by about 4.05% hence the agriculture sector has a very positive effect on the GDP. With regards to the annual rainfall utilization ARF, its value indicates a large negative coefficient of -4.29 for annual rainfall, which implies that failure to optimally utilize annual rains would cause a huge drop in the GDP of the economy, probably due to the poor management of the total yearly rainfall there is in Nigeria. In contrast, a positive coefficient of 1.47 for carbon emission implies that an increase of one unit in carbon emissions leads to a 1.47 billion increase in GDP, which is consistent with the modern growth theories that consider high emissions to be positive for growth.The R-squared value of 0.994109 shows a strong and positive relationship between the dependent variable (GDP) and the explanatory variables (AGR, CO2, and ARF). This means that about 99.41% of the variation in Nigeria's GDP from 1980 to 2023 is explained by these variables, while the remaining 0.59% is due to other factors not included in the model. This indicates the model has a good fit. Similarly, the adjusted R-squared value of 0.993313, which accounts for the number of predictors, is slightly lower but still indicates the model is robust and performs well. The value of F – Statistic which is 1248.849 with its corresponding prob of 0.000000 implies that the overall model is statistically significant which gives an impression that at least one predictor is significantly explaining the variance in GDP. While As for the residual sum of square sources, 5.34% value exhibit the degree of variation between the actual value and predicted also signifying the better fit of the model. The standard error of 1.20 and mean of dependent variable of 1.75 confirmed the accuracy statistic power and credibility of the parameter estimate the calculated standard error is less than the mean of dependent variable this shows there is relationship between AGR, ARF, C02 with real GDP. Further, Durbin Watson statistic used to see the relation between the variables separated with given time lag Durbin Watson when courteous is 2.00 when is below two it means there is auto correlation. Base on ARDL outcome Durbain Watson statistic 1.323117 shows there is serial correlation therefore a Breusch Godfrey test need to be done in order to reduce the extent of serial correlation. Diagnosis Test. The table provides the results of the Breusch-Godfrey LM test, where an F-statistic equal to 4.632658 has significance at the 5 percent level. Given that the F (2,35) is higher than 0.005, we do not have enough evidence to reject the hypothesis that there is no serial correlation. This suggests that there is no appreciable serial correlation in the residuals. Furthermore, the R-squared figure of 9.000468 suggests that the lagged residuals explain only 9.00468 percent of the change in the residuals. This rather small change also indicates that there is no considerable serial correlation in the residuals of the ARDL model.

CUSUM Stability Test



Source: Author's Computation using EViews, 2024.

The CUSUM stability test indicates the stability of the model at 5% critical limits.

IMPLICATIONS AND RECOMMENDATION

Reference to aforementioned finding, the following policy and recommendations should be suggested.

- The state has to mobilize and inform the population regarding the climatic effects on economic development and motivate the fight against these effects. This would promote the responsible citizenry and implementation of policies geared towards climate change mitigation and adaptation.
- Government should work on promoting climate change resilient farmers presently to assist them in adapting practices that will improve productivity but also reducing climate change impact by putting in place drought prone and irrigation practices and sustainable management of land.
- The finding showed that vice versa the more the output towards the economy represented by C02 emission the more its growth came with the environmental problems. Even so, it should imperative for the government to quicken the march towards the use of green energy in a bid to cut down emissions of carbon dioxide. This would go a long way in combating climate change and also pave way for economic growth with new sectors of economy and employment opportunities being created.
- In addition, development of appropriate technologies for the construction of rainwater harvesting and storage structures should be prioritized in the strategies. This is essential so as to avoid water scarcity, which, in turn, will assist in addressing the negative effects of lack of rainfall on the economic growth.
- Vulnerability to climate change should be on the agenda of every developing country and go towards strengthening the economy by allocating some of the resources into climate change adaptation. Such events will reduce economic difficulties caused by climate change associated incidents.

CONCLUSION

The research carried out an empirical evaluation of the relationship among climate change agriculture, and economic growth in Nigeria within the period 1980 and 2023. The period being the short run, the effect of climate change on economic growth was analyzed using the Autoregressive Distributed Lag (ARDL) model as the most appropriate approach, due to the nature of the study. The results suggest that, in the short run, both agricultural activities and CO2 emissions have a positive and significant impact on economic growth in Nigeria. This means that increased output and economic growth came with higher emissions of gases that are harmful to the environment, which is a concern. In terms of the observations, it is also clear that economic growth is negative in significance with regard to agricultural output as past agricultural growth tends to depress current GDP levels because of the high levels of temperature increase, variation in rainfall patterns which destroy crop growing and decrease efficiency which all have negative impacts on the agricultural economy. Ample climatic conditions at certain times of the year produce a negative lag effect which requires some dynamic change in the agricultural index in Nigeria's economic growth. Additionally, rainfall in most cases has a negative impact on the GDP since the normal precipitation has been altered and the expected amount of rain has not been put into proper use. The results indicate that Nigerian administration must formulate policies to control CO2 emissions as they present environmental issues. This could be accomplished through the encouragement of less ecologically destructive equipment, machines, and technologies. To pave the way in this direction includes improving road and rail transport systems, enhancing the use of biofuels and energy efficient devices. At the same time, measures should be put in place to improve rainfall capture and storage in order to reduce wastage and encourage preservation of water resources. These measures will also reduce the

adverse impact which the decreasing rainfall will have on Nigeria's economic growth.

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