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THE IMPACT OF AGRICULTURE, NON-RENEWABLE ENERGY, INTERNATIONAL TRADE AND ECONOMIC GROWTH ON NIGERIA ENVIRONMENTAL SUSTAINABILITY

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Abstract: Agriculture is a key player in the economic growth of developing nations, with energy policies for climate change crucial for development. This study in Nigeria from 1965 to 2022 explores the impact of agriculture, non-renewable energy, trade openness, and economic growth on CO_2 emissions. The data was found to be stationary, and a long-term relationship was confirmed through ARDL analysis. Results showed that a 1% boost in agriculture productivity and trade openness increased CO_2 emissions by 0.42% and 0.20% respectively. Increased use of renewable energy helped reduce emissions, while economic growth also played a role. Implementing renewable energy, fostering a low-carbon economy, and implementing trade reforms and strong environmental policies will benefit the agriculture sector and green economy in Nigeria.
Keywords: Agriculture; Environmental sustainability; International trade; Nigeria; Non-renewable energy

1 INTRODUCTION

Concern about environmental degradation has become an important topic of study for researchers in the last century due to the increase in emissions of greenhouse gases (GHG), especially CO_2. By 2022, total global greenhouse gas emissions increased by 1.7 percent, reaching a new peak of 53.8 billion tons of greenhouse gas equivalent. Global emissions of greenhouse gases have increased more than sixty percent since 1990 [1]. Global warming is a major concern that has attracted the attention of countries around the world [2]. Since the UN introduced the SDGs, international initiatives to address global warming have increased by implementing emission reduction strategies that specialize in factories and energy industries [3]. The 13th Sustainable Development Goal (SDG) focuses on addressing the effects of global warming. Air pollution is usually caused by the use of oil and gas and other non-renewable resources. These factors have negative consequences for people's health and the surrounding environment [4]. Polluted air has the potential to enter ecosystems and natural water bodies, harming marine life and contaminating clean water. Economic expansion in developed and developing countries is closely related to air pollution, because different economic activities in different sectors contribute to this problem [5]. Electricity is vital for steering business growth by helping to generate income, growth, employment and productivity. In addition, many studies show that climate is mostly related to economic expansion and resource use and trade openness is a fundamental and effective product of economic growth. Previous studies have investigated the effect of resource exchange between countries and discussed the effects of trade access on the environment [6]. A theoretical perspective on the impact of trade openness on environmental impacts shows that the consequences of maintaining pollution can be better understood through the perspective of environmental management laws [7]. Investigating the impact of environmental laws on making strategic decisions in relation to business models can strongly influence the degree of transparency [8]. The implementation of environmental laws in developed countries promotes clean production methods. As a result, many large companies are interested in investing in contaminated goods in new countries with measures to prevent pollution and this strategy allows them to generate high profits in their countries. However, there is no persuasive argument because environmental regulations have little impact on trade and investment flows. A number of academic studies have been conducted in different countries, but the findings are not conclusive. Dauda et al [9] found evidence supporting the contamination phase hypothesis. This hypothesis is supported by evidence that CO_2 emissions increase with greater openness to trade. On the other hand, different literature suggests that the opening of trade significantly reduces CO_2 emissions, supporting the truth of the paradise-halo hypothesis [10]. Also emissions from agriculture-related activities, including burning hedgerows, commercial use, use of deforestation materials, insufficient hunting, and modification of the forest to the garden during growth, which contributes to the increase of greenhouse gases globally. Around 20%-24% of a significant portion of global greenhouse gas emissions come from AFOLU, which refers to farming, forestry, and additional activities involving land [11]. Throughout the final decade of the last century, there came to be a notable rise in global agricultural production, paralleling the increase in population. The rapid growth of the global population delivers a substantial danger to the sustainability of agriculture and the health of the planet is of utmost importance, as it results in a significant increase in the world's need for nutrition. The agriculture sector was officially recognized just like a major source of the release of greenhouse gases since it is inefficient farming methods used to boost productivity and ensure food security [12]. Utilizing fossil fuel-powered farm machinery, implementing irrigation systems, practicing confined animal rearing, and applying nitrogen-rich nutrients contribute to emissions in the agriculture sector [13]. By adopting

measures such as preventing deforestation, promoting afforestation, improving plant and animal protection and investing in green energy production, the agricultural sector may be able to reduce the 25% in total greenhouse gas emissions by 2050. The economic growth of Nigeria has been largely driven by agriculture sector which account for 70% of the workforce and has also contributed to Nigeria GDP. Large percentage of the lands in Nigeria is devoted to agriculture. However, the agriculture sector in Nigeria is the one of the largest contributor to greenhouse gas emissions in Africa. The agricultural sector plays an important role in a country's economic development and progress. Many studies have been done to analyse CO_2 emissions, but few agricultural variables have been considered. However, the findings are mixed and few studies examine the relationship between agriculture, international trade, non-renewable energy and carbon emissions in Nigeria. Although Nigeria has shown strong commitment to reducing its greenhouse gas emissions. Many academic studies on greenhouse gas emissions have focused on environmental factors, often ignoring the country's trade openness and its impact on emissions. Nigeria as a growing economy is expected to produce more greenhouse gas emissions due to its strong economic performance and commitment to international trade and non-renewable energy dependency. Analysing the country's greenhouse gas emissions from growth using a method that increases transparency in the business world is important. This study aims to analyse the relationship between agriculture, non-renewable energy, exports, and economic growth in carbon dioxide emissions in Nigeria. This study adds to the existing literature on environmental sustainability by examining the relationship between parameters using a systematic approach. The study will also examine the relationship between agriculture and environmental quality in terms of economics, trade and non-renewable energy. In addition, several data sets from 1970 to 2023 are used for analysis. The ARDL approach has the advantage of capturing both short-term and long-term trends simultaneously. In addition, some unit root tests and statistical tests are used to verify the accuracy of the results. In addition, this paper provides new theoretical and practical insights that are very useful for policy makers. This research would assist to the execution of procedures focused on achieving zero hunger, ensuring access to affordable and clean energy, promoting sustainable economic growth, encouraging responsible consumption and production and taking action on climate change (SDG 2, 7, 8, 12 & 13). This study is notable for employing a pollution-based examine that evolved in accordance with the ecological oasis hypothesis. The findings of this research have important consequences for Nigeria, Africa and other developing countries of the world.

2 Literature Review

Extensive research has been conducted in the literature that examines the effects regarding transparency in trade, farming, energy efficiency, as well as CO_2 emissions. The following work explores different countries, with varying strategies alongside observations that are influenced by the financial framework of each country being studied. A study that examines the impact of agriculture on environmental quality is a concept known as the Agricultural Kuznets Curve (EKC). There is little literature available on the growth of EKC derived from agriculture.

Ali et al. [14] conducted a comprehensive study to explore the relationship between agro-ecosystems and CO_2 emissions in Pakistan from 1972 to 2014. Utilizing the Granger causality test and the Autoregressive Distributed Lag (ARDL) model, the researchers identified several factors influencing CO_2 emissions, including proficiency in manufacturing agricultural machinery for converting farm waste into crops, crop cultivation, livestock management, and diversified food production.

Balsalobre-Lorente et al [5] used FMOLS and DOLS methods to assess the impact of agriculture on CO_2 emissions in BRICS countries. This study showed a clear link between agricultural production and CO_2 emissions in the atmosphere.

Atasal et al [15] use the AMG method and find that agriculture plays an important role in reducing CO_2 emissions in the top 10 agricultural countries. Currently, many parts of the financial system contribute to CO_2 emissions. Therefore, the relationship between growth and energy is assessed in terms of environmental pollution and emissions. It successfully explored the relationship between environmental degradation and economic well-being. Increased energy use and economic growth have increased CO_2 emissions in many countries around the world. Different energy sources are known for their ability to reduce CO_2 emissions and promote a sustainable environment. Countries should improve environmental quality and develop environmental policies to encourage widespread use of clean energy sources. Many studies have investigated the impact of green energy on carbon dioxide emissions in different countries. However, the results differ in terms of the percentage of green energy in the total energy consumption of these countries. There is debate about the relationship between trade openness and CO_2 emissions. Many articles discuss the effects of scale, structure and method. Increased income growth is directly linked to subsequent increases in CO_2 emissions. The result is openness to trade and economies of scale. As trade increases, GDP also increases, and greenhouse gas emissions from the industrial sector increase. By carefully examining the effect of the composition, it can be seen that the effect of trade is small but it is harmful to the society. Finally, when looking at the effectiveness of the method; It is clear that the manufacturing sector has a significant impact on the environment due to the increasing demand for environmentally friendly production methods. The effects of openness on business fall into three main areas: scale, structure, and method. The pollution harbour hypothesis and the pollution halo hypothesis describe two different ways in which trade openness affects the environment.

According to the pollster's opinion, companies seeking refuge in areas with relaxed environmental regulations are likely to contribute to higher levels of CO_2 emissions.

For example, Duada et al highlight the presence of the sacred concept of waste in African countries in the period 1990-2016.

Mahmoud et al. [16] reported on the estimation of sewage sludge in Tunisia through the ARDL method. But the host country will benefit from business innovation that promotes environmental sustainability and will encourage a positive impact on our planet. This phenomenon is known as the pollution halo effect.

Essandoh et al [17] confirmed the validity of the halo pollution effect in 52 developed and developing countries from 1991 to 2014. It was found that trade openness has a negative effect on CO_2 emissions in developed countries. Trade-related knowledge sharing was found to be effective in reducing CO_2 emissions across countries. By leveraging human capital and different resources, international locations can maximize the advantages of financial spill over. Nevertheless, a chunk of a dearth of studies investigating pollutants haven speculation on the subject of Nigeria, mainly that specialize in agriculture and renewable power. This observe seeks to cope with the modern-day void in scholarly studies; this observe investigates the impact concerning agriculture, smooth power, alternate, in addition to financial boom on Nigerian CO_2 emissions.

3 Methodology

This study analysed the outcomes of inexperienced power, agriculture, and alternate openness on CO_2 emissions in Nigeria. The studies applied the ARDL technique and blanketed the time span from 1965 to 2022. Variables have been selected primarily based totally on previous studies. Data on CO_2 emissions and renewable power have been accumulated from the Our World in Data (OWD) database, even as facts on agricultural cost added, alternate, and GDP have been retrieved from the World Development Indicators (WDI) database.

Figure 1 illustrates the visible illustration of every year styles of the variables. Variables have been converted into natural logarithms to make certain facts normality.

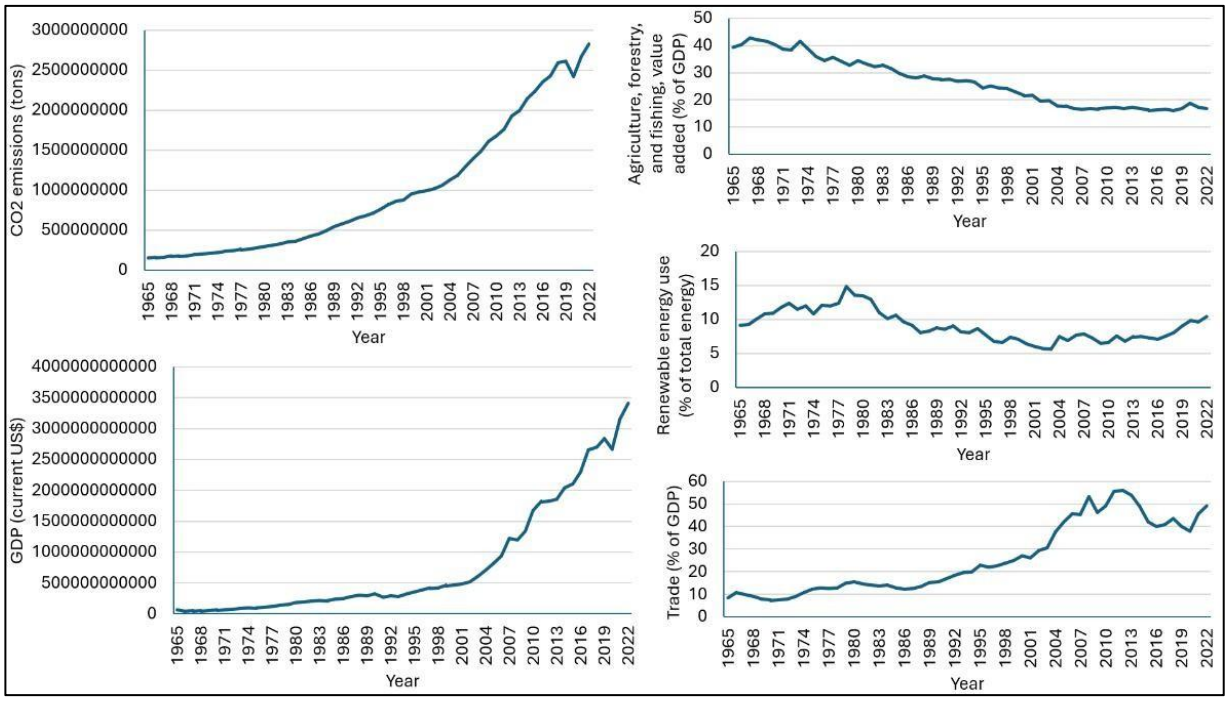

Figure 1 Annual trends of the Variables

4 EMPIRICAL LITERATURE

This framework analyses the impacts of agriculture, non-renewable energy and international trade on CO_2 emissions in Nigeria. We derive the following formulae:

$$A_t = f(B_t; C_t; D_t; E_t) \quad (1)$$

Where:

A_t, B_t, C_t, D_t, and E_t are CO_2 emissions, agricultural value-added, renewable energy, economic growth, and trade at time t.

Once the variables are assumed to have a relationship and a logarithmic form. The empirical model suggests the following:

$$LA_t = \tau_0 + \tau_1 LB_t + \tau_2 LC_t + \tau_3 LD_t + \tau_4 LE_t + \varepsilon_t \quad (2)$$

However, using non-stationary variables in the regression can produce incorrect results. Therefore, check later that everything is stable before you make any repairs. To evaluate the stability of the data sets in this study, a three-way t test was used. These tests include Augmented Dickey-Fuller (ADF) test [18], Dickey-Fuller Generalized Least Squares (DF-GLS) test and Phillips-Peron (P-P) test [19]. This study used the ARDL model to analyse the relationship between

each of the variables. The ARDL model was chosen because of several advantages. One of the most important advantages is the ability to evaluate both short-term and long-term aspects at the same time. Furthermore, this framework can be used regardless of whether these time-series variables have frictional input, I (0) or I (1). It is important to use the appropriate variables to ensure accurate regression or ARDL method results. To assess whether there is a longitudinal relationship between the variables, the bounds test was used. Pesaran et al. [20] table of critical values, if the F-test result is greater than the required maximum limit, the null hypothesis of association between the research variables is rejected. If the value of the F-test falls within critical limits, it indicates a biased result. The analysis shows that the null hypothesis is supported and shows that there is no interaction between the variables. Fortunately, the approximate result of the F-test falls below the critical limit. Additionally, long-run coefficients are created when there is a long-run relationship between the investigated variables. An example of a long-term estimation model is as follows:

$$\Delta LA_t = \tau_0 + \tau_1 LA_{t-1} + \tau_2 LB_t + \tau_3 LC_t + \tau_4 LD_t + \tau_5 LE_t + \sum_{i=1}^{q} \alpha_1 \Delta LA_{t-i} + \sum_{i=1}^{q} \alpha_2 \Delta LB_{t-i} + \sum_{i=1}^{q} \alpha_3 \Delta LC_{t-i} + \sum_{i=1}^{q} \alpha_4 \Delta LD_{t-i} + \sum_{i=1}^{q} \alpha_5 \Delta LE_{t-i} + \varepsilon_t \quad (3)$$

When a long-term relationship between a parameter is found, a short-term model prediction can be made. Equation (4) represents the transient/short-term model, known as the error correction model (ECM).

$$\Delta LA_t = \tau_0 + \tau_1 LA_{t-1} + \tau_2 LB_t + \tau_3 LC_t + \tau_4 LD_t + \tau_5 LE_t + \sum_{i=1}^{q} \alpha_1 \Delta LA_{t-i} + \sum_{i=1}^{q} \alpha_2 \Delta LB_{t-i} + \sum_{i=1}^{q} \alpha_3 \Delta LC_{t-i} + \sum_{i=1}^{q} \alpha_4 \Delta LD_{t-i} + \sum_{i=1}^{q} \alpha_5 \Delta LE_{t-i} + \theta ECM_{t-1} + \varepsilon_t \quad (4)$$

The error correction coefficient θ is an important function of the estimation model. The given value represents the adjustment speed parameter, which indicates how quickly the series converges to long-term equilibrium.

5 RESULTS AND DISCUSSION

Table 1 shows the descriptive and correlational statistical results of our study variables. The results show that CO_2 production shows a negative trend, while the balance shows a positive trend. Bright values, close to zero, indicate that most of them follow a normal distribution. All series show platykurtic characteristics with kurtosis values less than 3. According to the Jarque-Bera probability, it can be ensured that each of the variables adheres to a normal distribution. The correlation matrix shows that trade openness and GDP are positively and significantly related to CO_2 emissions. On the other hand, agriculture and green energy have a negative relationship with CO_2 emissions.

Table 1 Descriptive and Correlation Statistics

Variables	LA	LB	LC	LD	LE
Mean	20.321	3.2290	2.1760	26.697	3.0520
Median	20.371	3.2861	2.1532	26.515	2.9890
Maximum	21.774	3.7565	2.6960	28.871	4.0288
Minimum	18.862	2.7570	1.7282	24.550	2.0373
Skewness	-0.0170	0.0323	0.2167	0.1052	0.0550
Kurtosis	1.6924	1.5447	2.1286	1.9283	1.6530
Jarque-Bera	2.1420	3.1363	2.2827	2.8875	2.4154
Probability	0.2172	0.1778	0.3187	0.2373	0.1123
Observations	59	59	59	59	59
Correlation between the variables					
	LA	LB	LC	LD	LE
LA	1.0000				
LB	-0.9789	1.0000			
LC	-0.6734	0.7159	1.0000		
LD	0.9876	-0.9679	-0.5892	1.0000	
LE	0.9560	-0.9757	-0.6621	0.9507	1.0000

The results of unit root testing using ADF, DF-GLS, and P-P tests are displayed in Table 2. The results indicate that the variables were not stationary in their original form but became stationary when their first differences wereconsidered in

all three-unit root tests. The results of the unit root tests proceed us to conduct the analysis within the ARDL framework.

Table 2 Results of Unit Root Testing

Variables	ADF		DF-GLS		P-P	
	Log Levels	Log first differences	Log Levels	Log first differences	Log Levels	Log first differences
LA	-0.1611	-7.6776***	-0.7176	-7.3295***	-0.1624	-7.6752***
LB	-0.6015	-8.1213***	-0.7708	-4.2033***	-0.6015	-8.1213***
LC	-1.2927	-7.7088***	-1.3187	-7.6031***	-1.3395	-7.7076***
LD	-0.5072	-8.5875***	-0.8952	-7.1057***	-0.5063	-8.5106***
LE	-0.6676	-6.1753***	-0.6964	-5.2563***	-0.7140	-6.2548***

The study utilized the ARDL-bound testing procedure for a comprehensive and concise long-run cointegration within the variables (Table 3). The result shows the coexistence of accumulation, which indicates the long-term relationship between the variables. This is supported by the F-statistic (26.14) for this sample, which exceeds the critical values.

Table 3 The Outcome of the ARDL Bounds Test

Test statistic	Value	Significance	I(0)	I(1)
F-statistic	26.141	At 10%	1.99	2.94
K	4	At 5%	2.27	3.28
		At 2.0%	2.55	3.61
		At 1%	2.88	3.99

Table 4 displays the estimated findings of the long- and short-run results obtained through the ARDL approach. The outcome suggests that over time, there is a notable increase in CO_2 emissions due to agriculture and trade openness, whereas energy efficiency and GDP have the opposite effect, leading to a decrease in CO_2 emissions. Utilizing renewable energy sources in the immediate future has been shown to lower emissions, while factors such as GDP, agriculture, Trade openness and professional expertise play a crucial role in the rise of CO_2 emissions. The estimated coefficients for agriculture show a clear positive relationship with CO_2 emissions. This implies that a 1% increase in agriculture productivity culminates in a 0.42% rise in CO_2 emissions in the long run, and a 0.15% increase in the short run. One possible reason for this could be the continued dependence on fossil fuel energy in Nigeria's agricultural sector. The agricultural sector heavily relies on fossil fuels for various processes such includes thawing, watering, warmth, wrapping, water delivery, along with conveyance of crop-related merchandise. Unfortunately, the transportation of petroleum and gas leads to the increased emissions of CO_2. It appears that the promotion of the agricultural sector in India does not lead to improvements in the field of energy optimization or the implementation of sources of clean energy. Considering the significant magnitude of the farming industry and the widespread use of fossil fuels in Nigeria, it can reasonably conclude that the expansion of farming processes brings about a rapid increase in CO_2 emissions. Preceding empirical results support the foregoing conclusion Emir et al [21]. It has been stated that farming leads to an upsurge in CO_2 emissions. On the other hand, these findings challenge other scientific evidence that argue farming diminishes CO_2 emissions Raza et al [22].

Table 4 ARDL Long and Short-Run Results

Variables	Long-run			Short-run		
	Coefficient	t-Statistic	p-value	Coefficient	t-Statistic	p-value
LB	0.4192**	3.3519	0.0243	0.1519**	3.6397	0.0342
LC	-1.7624***	-5.1815	0.0001	-1.037***	-5.8351	0.0000
LD	-0.0236*	-1.8467	0.0693	1.9819***	3.6085	0.0002
LE	0.1983**	2.5014	0.0188	0.6061***	4.9516	0.0009
A	15.720	1.8319	0.1047	-	-	-
ECM (-1)	-	-	-	-0.5417***	-3.3119	0.0000 R
Adjusted R^2		0.9883 0.9821				

***P<0.01, **p<0.05, *p<0.1

The findings indicate that a 1% increase in non-renewable power consumption increases CO_2 emission by 1.76% in the long run whereas 1.04% in the short-run. In this context, it is imperative to prioritize the embrace of renewable power sources in order to effectively reduce CO_2 emissions in Nigeria. Prior results from experiments further support this outcome Anyanwu et al and Wang et al. The shift from fossil fuels to clean energy uses aids in reducing the negative impact on the Nigeria environment. Non-renewable energy uses will increase environmental degradation through CO_2 emissions.

The estimated coefficient of GDP shows that in the short-run, a 1% rise in GDP boosts CO_2 emissions by 1.98%. However, in the long run, the negative coefficient indicates that a 1% increase in GDP would increase CO_2 emissions by 0.02%. Our research discovered an association among economic growth and CO_2 emissions,following an inverse U shape pattern. This indicates that the association among revenue growth and CO_2 emissions in Nigeria can be reversed as the country's GDP continues to rise. The outcomes support the EKC hypothesis. This result was reinforced by previous empirical findings Uche, Das & Bera [23] that revealed an inverse U shape relationship between economic growth and CO_2 emission. Economic growth is measured by the GDP. Increase in the GDP, or economic growth, assessments in a spike in emissions of CO_2 in Nigeria. As economic growth increases, several demands related to economic growth also increase. To meet the direct and indirect increasing demand of people, waste and garbage are produced more. Fossil fuel burning also increases in the industry, including manufacturing and transportation, to support the increasing economic growth. This suggests that environmental risk should be minimized by adopting environmentally friendly technology Nigerian industry as well as shifting from fossil fuel energy production to renewable energy in Nigeria. Economic growth should be supported through environmentally friendly activities that will reduce CO_2 and lead to sustainable development. Nigeria competitive capacity through sustainable economic development will increase globally.

In terms of trade openness, the positively significant coefficients indicate that a 1% increase in trade openness increases CO_2 emission by 0.20% (long-run) and 0.61% (short run). The results confirmed the pollution haven hypothesis in Nigeria. Prior findings from experiments further supported this outcome Emir, Udemba & Philip [21]. When the degree of trade increases in a nation, it means production as well as consumption increases, which is supported by the higher use of natural resources and enhanced pollution. Industries usually stress their priority on production efficiency over environmental sustainability. When industries prioritize production, it results in environmental degradation through air pollution, water pollution, deforestation, and habitual destruction in India. Moreover, expanded trade resulted in an upsurge in the utilization of transportation that required the use of fossil fuels, thereby increasing CO_2 emissions. Nigeria trade openness may have some economic benefits, but in other to achieve long lasting sustainable development, it required friendly environmentally activities which can be encourage through the use of modern technology.

ECM's estimate of the significance level at the 1% level, with a negative trend, indicates that the deviation from the long-term balance this year will be corrected at a rate of 54% through various channel such as agricultural industry, trade openness, economic development and green power. In addition, the values of R2 and adjusted R2 for the long-term estimation are 0.9883 and 0.9821, respectively, indicating a high level of accuracy for the statistical regression model. It can be seen that the independent factors account for 98% of the variance in the change in the dependent variable. Model reliability was implemented using cumulative sum analysis (CUSUM) and summation of square (CUSUMSQ) based on residual regression (Figure 2). The estimated coefficients of the ARDL model are considered stable because the statistical line falls within the critical limits at the 5% significance level.

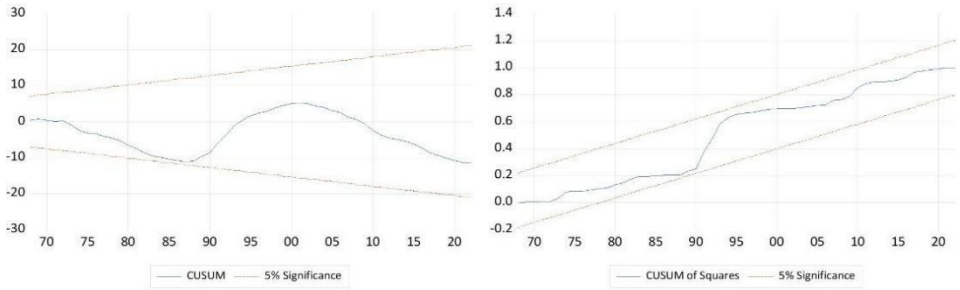

Figure 2 The Results of CUSUM and CUSUMSQ Tests

We went further in conducted additional experimental tests to validate the ARDL model used in this study. The diagnostic tests in Table 5 include the serial correlation test in addition to the univariate test. Analytical analysis shows that the residuals follow a normal distribution and that the model is reasonably well defined. In addition, there is no evidence of serial correlation and heteroskedasticity.

Table 5 The Results of Diagnostic Tests

Diagnostic tests	Coefficient	p-value	Decision
Jarque-Bera test	2.2437	0.3282	Normal residual distribution
Ramsey RESET test	0.9843	0.3472	The model is properly specified
Breusch-Godfrey LM test	1.8445	0.1739	No serial correlation exists
Breusch-Pagan-Godfrey test	0.7698	0.2794	No heteroscedasticity exists

6 CONCLUSIONS AND RECOMMENDATION

Nigerian economy is significantly driven by the agriculture and trade sectors, which play a crucial role to encourage the expansion of the marketplace. On the other hand, there is a dearth of scientific and philosophical information about the

influence that farming, the utilization of clean energy and trade accessibility has on carbon dioxide emissions. Additionally, the association among independent variables and CO_2 emissions has yielded mixed theoretical and empirical findings. This study addresses to what extent carbon emissions are affected by agricultural practices, economic expansion, and trade liberalization from 1970 to 2022. This research is built on a solid analytical framework provided by the scientific foundation underlying the Kuznets curves of runoff and pollution. We used ARDL as the diagnostic method. Cointegration tests confirm the existence of correlation between the variables in India. Furthermore, when looking at long-term data, it is clear that GDP and the use of renewable energy are associated with lower CO_2 emissions. Conversely, the agricultural sector and global events have increased CO_2 emissions. On the other hand, short-term analyses show that GDP, agriculture and international trade contribute to increasing CO_2 emissions, while renewable energy is effective in reducing them. The negative impact of agriculture, cross-border trade and economic expansion on the environment reflects the lack of environmental justice and the role of enhanced trade to contribute to the decline of the environment. The use of fossil fuels in agriculture leads to a significant increase in CO_2 emissions. Renewable energy is important for the agricultural industry. It is strongly recommended to implement solar energy systems, onshore wind power, efficient irrigation systems, project training and financial support in the agricultural sector to promote environmental sustainability. Government and those in power should celebrate the success of the transition from fossil fuels to clean energy. This can be done by increasing funding for research and development, and strengthening laws and regulations. To reduce the effects of trade opening and the impact of economic growth on the environment, it is necessary to promote the development of environmental industries that can transfer technical knowledge through all sectors of the economy. In order to facilitate an effective and efficient process of knowledge exchange, it is very important for recipient countries to increase their ability to absorb new information.

COMPETING INTERESTS

The author have no relevant financial or non-financial interests to disclose.

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