Impact of Agricultural Sector on Economic Sustainability and Growth of Nigeria (1985-2021). ARDL Approach

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ABSTRACTS
This study examined the impact of agricultural sector on the economic sustainability and growth of Nigeria from 1985-2021. Secondary data were sourced from world development indictor 2020. Auto Regressive Distributed Lag (ARDL) approach were adopted for the study. The result of the study shows that AGROUT was positive and statistically insignificant in influencing gross domestic product (GDP) by 21% and 37% in the short run and long run, INFR and MSSP was found to have negative but insignificant impact; in both the short run and long run, EXRT shows a negative impact in influencing economic growth in Nigeria in the short run but had a positive impact but statistically insignificant. The study recommend that government should improve the current proportion of agricultural loan guaranteed, reduce the requirement of the credit scheme to peasant farmers by constant monitoring where the need arises and also invest heavily in agricultural sector in order to boost the sector and thereby improving economic growth of Nigeria.
Keywords: Agricultural Sector, Economic Growth, ARDL, Error Correction

INTRODUCTION
Agriculture is a way of life which involves the production of animals, fishes, crops, forest resources for human use and supplying the agro-allied product needed by other sectors of the economy. The word agriculture has been derived from the Latin word agriculture which is the combination of ager, "a field" and cultural "cultivation". Agriculture is a sector inherited from generations to generations as well as a dominant occupation which engages many populations across the Globe. In about 8000 B.C; the people of Jordan and Israel are the first people that started to depend on farming for years as the most important means of obtaining livelihood. Aigbokhan (2001) emphasize that in Nigeria, agriculture and petroleum are the top two primary products of the economy due to their larger portion of contribution to GDP. As at independence in 1960, agriculture accounts for 63% share of total GDP, it declined to about 8% in 1988 after the oil boom. Due to the shift of priority to agricultural development, Government has invested a lot of resources into the agricultural sector

especially in the last five years, where programs and interventions were initiated and launched. The sum of N592.9 b (Central Bank of Nigeria, 2020) to be specific was released into the agricultural sector, its share to GDP increases tremendously. Its contribution was about 20.98% share of GDP in 2016, 20.85% in 2017, 21.20% in 2018, 21.91% in 2019, 24.14% in 2020 and 29.94% in 2021 (World Bank, 2020).

Agricultural practice toward sustainability is known to be the bedrock for the growth and development in many countries, as well as a means of getting rid of poverty in developing nations. In most of the developing nations of the world in terms of economic growth and development, agriculture is known to be the bedrock of these nations. According to Central Bank of Nigeria (CBN, 2005) agriculture is the main source of food and the main employer of labor, employing about 60-70% of the population in Nigeria. The Country is divided into agro ecological zones; i.e. semi-arid, found only in the Northern region, the savannah, found in the Northern and middle region, a small highland area found in the middle and Southern region; a larger transition environment of savannah derived from the forest overlapping the Southern and middle regions; mangroves in the Niger Delta; fresh in the South Bakare (2013).

These sector in Nigeria is made up of food, cash crops, like yam, cassava, maize, cocoa, groundnut and palm oil, fishing, forestry, and livestock etc. The country is largely endowed with natural resources that are necessary for the development of agriculture. Such resources include human development resources, abundant land supply and forestry resources. Nigeria has a total land area of about 98.3 million hectares out of which 71.2 million (72.4%) are cultivable but only 34.2 million hectares (34.8%) are under use Daramola (2004). In the past, most of the practicing farmers in Nigeria engage in subsistence of agriculture using cutlasses, hoes, baskets, nets and rakes etc. and therefore, agriculture can be referred to as the life-wire of the economies of developing nations but it is a different story in this century, the advent of modern and mechanized farming equipment has made farming less rigorous and reduced the rigor involved in farming. The invention of tractors, irrigating machines, fertilizers, and so on makes farming quite easy these days. Nigeria falls under the category of developing countries, though we have benefited a lot from the

sales of cash crops through the bilateral and unilateral relationship we had with countries in Africa and other parts of the world. In an attempt toward sustainability several programs and policies were adopted such as loan schemes, improved seeds, extension services programs, operation feed the nation, Agric banks and boards to maintain standard. Despite several policies, programs and intervention by Nigerian Government in order to boost the sector since 1985-date, the country has not yet attained food security, and there are persistent increase in general prices of food items in the country as the country still import food.

Purpose of the Study
The objective of this paper is to examine the impact of agricultural sector on economic sustainability and growth of Nigeria (1985-2021).

Research Question
What is the impact of agricultural sector on economic sustainability and growth of Nigeria (1985-2021)?

Literature Review
Yunus, Taufik and James (2019), their joint study focuses on the analysis of the potential and contribution of the agricultural sector in the regency on the economic growth of the Province of West Java. The study used Location Quotient analysis and multiple regressions for the analysis, the results shows that agricultural sectors have a significant influence on the rate of economic growth in West Java. According to Dilhani (2018), his study is aimed to investigate the significant evidence \of the relationship between agriculture and GDP in Sri-Lanka. The data used for the study covers the period 1959-2016. Augmented Dickey Fuller and Johenson Co-integration test were used as the tools for empirical result of the study. The estimation proof that there is a long run relationship in agriculture toward GDP. Therefore, government should invest heavily in the sector to maintain food security to certain level in Sri-Lanka. On the other hand, Abban (2021). Examines the impact of agricultural sector on the economic GDP growth of Ghana, the study used time series data from 1984 to 2018. The Co-integration test results showed the non-existence of long-run relationships existing between the overall GDP and agricultural output. In its set-up, the error correction method estimates the long-run

relationship between economic growth and agricultural output as well as fluctuation in the short-run. Based on the basic regression model, agricultural output exhibits a significant positive impact on the overall GDP growth of the country. Amaefula (2019). His study underscores the impact of agricultural sector on the economic growth of Nigeria. Covering the period from 1981 to 2017, the study used multiple linear regression model and trend pattern of percentage ratio measure. The results showed that all the agricultural variable except CP had insignificant positive impact on RGDP and CP effect is significant under 1% level. And the trend pattern of percentage ratio measure showed that agricultural sector contributes positively to economic growth in Nigeria. Therefore, government should put more effort towards improving the sector for a robust agricultural sector contribution to economic growth in Nigeria.

Theoretical Literatures

According to Classical theorists led by Arthur Levis' in 1950s, he viewed economic growth as a process of transferring labor as a factor of production from the agricultural sector which is usually characterized by low level of productivity due to primitive/traditional method of farming to a modern industrial sector with higher productivity that could guarantee sustainability of the economy.

METHODOLOGY

The Autoregressive distributed lag model (ARDL) was used to analyses the data. The study measured the growth of Gross Domestic Product (GDP) which is been affected by agricultural sector in Nigeria. The data for the study are secondary data covering a period 1985-2021, which were sources from World development indicators and relevant journals. The dependent variable here is GDP, and the independent variables include inflation rate, exchange rate, Agricultural output and money supply. The model is specified as follows;

$GDP = f(INFR, EXRT, AGROUT, MSSP)$

$\log GDP_t = \beta o + \beta_1 \log INFR_t + \beta_2 \log EXRT_t + \beta_3 \log AGROUT_t + \beta_4 \log MSSP_t + \mu_t - - - - - - 1$

Where;

GDP = Gross Domestic Product serve as a proxy for economic growth.

INFR = is Inflation Rate

EXRT = is Exchange Rate

AGROUT = is Agricultural Output and

MSSP = is Money Supply

μ_τ = is a well behave uncorrelated error term.

Taking a log of all the variables would reduce the problem of spurious regression and also to achieve Stationarity in the analysis.

Than equation 1 would be transform and written as:

$Log\ (GDP)\ =\ Log\,INFRt\ +\ Log\,EXRTt\ +\ Log\,AGROUTt\ + Log\,MSSPt\ +\ \varepsilon t\ -\ -\ -\ -\ -\ -\ (2)$

Where εt is the error term. It is expected that, $\beta_1 > 0$ or < 0; $\beta_2 < 0$, $\beta_3 > 0$.

Estimation Technique

According to Pesaran, Shin and Smith (2001), Auto-Regressive Distributed Lag (ARDL) approach were good when adopted in testing both the short and long run relationship among variables of interest. The approach has better properties in small sample sizes than traditional co-integration methods, which typically require a large sample size for the results to be valid (Pesaran & Shin, 1997). Equation (1) above is expressed base on ARDL representation as follows:

$$\Delta logGDP_\tau = \alpha_0 + \sum_{i=1}^{p} \varphi i\, \Delta logGDP_{t-1} + \sum_{i=1}^{P} \pi i\, \Delta logINFR_{t-i}$$

$$+ \sum_{i=1}^{\rho} \rho i\, \Delta logEXRT_{t-i} + \sum_{i=1}^{\rho} \sigma i\, \Delta AGROUT_{t-i}$$

$$+ \sum_{i=1}^{\rho} \pi i\, \Delta logMSSP_{t-i} + \mathcal{E}_t\ -\ -\ -\ -\ -\ -\ -\ -\ -\ -\ -\ -\ -\ -\ -\ (3)$$

Where;

Δ is the first-difference operator.

P is the maximum number of lags to be used.

The parameters $\gamma\ i$, (where i = 1 to 3), are the respective long-run multipliers while the parameters in the summation signs $(\varphi i,\ \pi i,\ \rho i,\ \sigma i,)$ are the short-run dynamic coefficients of the underlying ARDL model in the equation.

There are two sets of critical values computed for a given significance level. One set assumes that all variables are I (o) and the other set assumes they are all I (1) Pesaran *et al.* (2001). Orthodoxly, if the computed F-statistic exceeds the upper critical bounds value, then the null hypothesis (Ho) is rejected. If the F-statistic is below the lower critical bounds value, it implies no co-integration. And, if the F-statistic falls into the bounds then the test becomes inconclusive. Accordingly, the order of integration for the underlying explanatory variables must be known before any conclusion can be drawn.

If there is an evidence of co-integration among the variables, the long-run model would be estimated as follows:

$$\Delta logGDP_\tau = \alpha_0 + \sum_{i=1}^{p} \varphi i\, \Delta logGDP_{t-1} + \sum_{i=1}^{P} \pi i\, \Delta logINFR_{t-i}$$
$$+ \sum_{i=1}^{\rho} \rho i\, \Delta logEXRT_{t-i} + \sum_{i=1}^{\rho} \sigma i\, \Delta AGROUT_{t-i}$$
$$+ \sum_{i=1}^{\rho} \pi i\, \Delta logMSSP_{t-i} + \sum_{i=1}^{\rho} + \mathcal{E}_t -----------$$
$$--(4)$$

The short-run dynamics can be derived by constructing an error correction model as shown below:

$$\Delta logGDP_\tau = \alpha_0 + \sum_{i=1}^{p} \varphi i\, \Delta logGDP_{t-1} + \sum_{i=1}^{P} \pi i\, \Delta logINFR_{t-i}$$
$$+ \sum_{i=1}^{\rho} \rho i\, \Delta logEXRT_{t-i} + \sum_{i=1}^{\rho} \sigma i\, \Delta AGROUT_{t-i}$$
$$+ \sum_{i=1}^{\rho} \pi i\, \Delta logMSSP_{t-i} + \sum_{i=1}^{P} + \aleph ECT_{t-1} + \mathcal{E}_t ------$$
$$-----(5)$$

Above equation indicate that, ECM is the error correction term, $\aleph$ represents the speed of adjustment, it should be negative and also less than one and significant. All coefficients of the short-run equation are

coefficients relating to the short-run dynamics of the model's convergence to equilibrium.

Empirical Results and Discussion

The run results of the autoregressive distributed lag (ARDL) procedure yielded consistent estimates of the long-run coefficient that are asymptotically normal irrespective of whether the underlying regressors are I(0) or I(1) (Pesaran &Shin,1998, Paseran et al 2001). The inert status of the time series data was first examined to ensure that the variables satisfied the ARDL underlying condition of I(0) and I(1) or of not otherwise. The estimates were conducted via Augmented Dickey-fuller (ADF) unit roots estimates as shown in Table 4.1.

Table 4.1: Results of ADF unit roots of the variables in levels and at the first differences

With trend and constant			
Variables	At level	First diff	Remark
GDP	-3.9534 (0.0197)**		I(0)
EXRT		-4.6910 (0.0032)***	I(1)
MSSP		-7.01820 (0.0000)***	I(1)
INFR		- 4.3294 (0.0102)**	I(1)
AGROUT	-3.8934 (0.0230)**		I(0)

Note * ** and *** represent statistical significance at 1%, 5% and 10%level respectively

ARDL Bounds Testing for Co-integration

The run result of the long-run co-integrating relationship among the indicated variables is based on the Nayaran (2004) bound testis reported in Table 4.2. Pesaran et al (2001) bounds test could not be in this test because of our sample size is too small   (n=36). The table shows, the computed F-statistics values of (4.42) exceeds the upper bound critical values at both 5 per cent. This, therefore, implies a strong rejection of the null hypothesis of no level relationship at the 5 per cent confidence level. The test results suggest that there exists a long-run co-integrating relationship among the study variables.

Table 4.2: Results of the Bound test based on ARDL

Test Statistic	Value	K
F-statistic	4.418639	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

Note: K represents number of independent variables in the model

Source: Author's compilation based on E-views 10 output

The long-run and short-run co-efficient of the ARDL model

Table 4.3: Results of the long-run and short-run of the selected model

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFR)	-0.071397	0.033494	-2.131604	0.0416
D(MSSP)	-0.000000	0.000000	-1.631603	0.1136
D(EXRT)	-0.020417	0.024771	-0.824224	0.4165
D(AGROUT)	0.218733	0.391045	0.559356	0.5802
CointEq(-1)	-0.3872607	0.164586	-5.959184	0.0000

Cointeq = GDP - (-0.0666*INFR -0.0000*MSSP + 0.0392*EXRT + 0.3750
*AGROUT + 2.0004)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFR	-0.066643	0.033448	-1.992461	0.0558
MSSP	-0.000000	0.000000	-2.888504	0.0072
EXRT	0.039175	0.015267	2.566003	0.0157
AGROUT	0.375043	0.356465	1.052118	0.3014
C	2.000449	1.383427	1.446009	0.1589

Note: Δ= first difference operator.*,** and *** denote 1%, 5% and 10% significant level, respectively.

Source: Author's computation using E-views, 9.0.

Ensuing the rejection of the null proposition of no long-run co-integration relationship between the study variables, we estimated the long-run and short-run coefficients based on the optimal ARDL model. The results are reported in table 4.3. As shown, Agricultural output (AGROUT) has a positive and insignificant impact on economic growth in the short-run (0.5802), but has a positive but insignificant impact on economic growth of Nigeria in the long-run not at 5% level of significance (0.3014). Thus one (1) percent increase in agricultural output in Nigeria's GDP by approximately .21 percent in the short-run and .38 percent in the long-run. This result agrees with the classical economic theory as well as corroborates those of Abban, (2021) slightly, who also found a positive impact and insignificant results within the span of 1984 to 2018 in Ghana. This study was contrary to the finding of Daramola, (2004) who found a negative but significant impact on economic growth in the long-run in Nigeria.

Though, the control variables of the model results reveal that in the short-run only AGROUT had a positive but significant impact, while in the long-run the values of INFR and MSSSP also, has a negative and insignificant impact to influence economic growth in Nigeria at 5%. On the contrary, the run results of the other variable are negative both in the long and short. Findings are in line to Yunus, Taufik and James (2019). However, in disagreement with Dilhani, (2018) contradicts a prior expectation. The estimated value of error correction term is (– 0.387260), which shows that the economy would adjust annually by 38% to equilibrium position in Nigeria after shock. Lastly, the adjusted coefficient of the determination indicates that the estimated ARDL model has satisfactory goodness of fit, exerting about 52% explanatory power with respect to variation in economic growth of Nigeria during the study period.

Diagnostics and Stability Test for ARDL Model

The validity of the ARDL bound test relies on the normally distributed error terms that are homoscedastic and serially uncorrelated and also on the stability of the coefficient over time (Kripfganz & Schneider, 2018). Therefore, post estimation diagnostic test of heteroskedasticity test, serial correlation LM test, as well as the stability tests using CUSUM and CUSUM Square test are conducted. Breusch-Godfrey Serial Correlation LM test and Breusch-Pagan-Godfrey test of Heteroskedasticity result accept the null of no serial autocorrelation and heteroskedasticity respectively. Similarly, the results for the stability test, the Cumulative Sum of Recursive (CUSUM) and CUSUM Square is shown in Figure 1 revealed lie within the 5% critical bound or region. Although the data of the study stretches over a long period of time (1985-2021). The lag length selection usually trims some observation appearing on the graph plots of CUSUM and CUSUM Squares. We ensured minimal lag selection in the estimation of the above two tests. This enables us to capture the residual stability test over a reasonable period of time with CUSUM and CUSUM Square also starting at 2000. However, the CUSUM Square depicts a relative instability around 2004 to 2008 which was attributed to government policies, ethno-religious conflict, Boko haram and that of Niger Delta conflict during the later years.

Fig 1: Plot of Cummulative Sum of Residuals and Cusum of Square
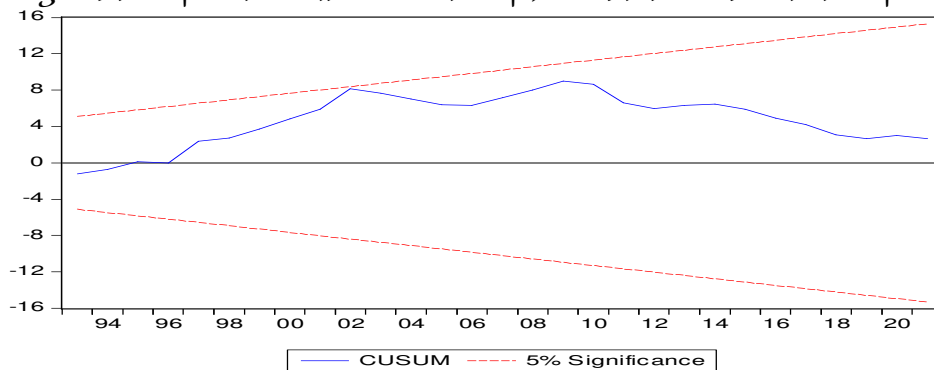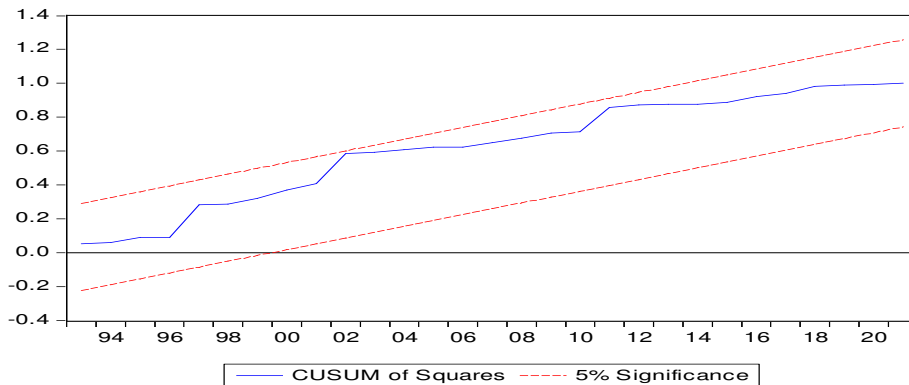
CONCLUSION AND POLICY IMPLICATION

The empirical analysis on whether agricultural sector mends or discourage economic sustainability and growth has remained inconclusive and debatable over the years. This paper contributes to the empirical literature using the reviewed literatures with model that focused on Nigeria. The estimation technique used was the ARDL bound co-integration regression. We found an insignificant negative relationship between interest rate and money supply to economic sustainability and growth in the short and long run, but statistically is significant at 5 %. This indicates that a lot needs to be done on agricultural sector, through training and re-training of farmers to modern technology, insecticides, loan to be challenged through productive mean the results of EXRT had impact toward agricultural output since implements had to be import for farmers productivity to be high in Nigeria.

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