FUDMA Journal of Sciences (FJS)
ISSN online: 2616-1370
ISSN print: 2645 - 2944
Vol. 8 No. 6, December, 2024, pp 118 - 127
DOI: https://doi.org/10.33003/fjs-2024-0806-2741

CONTRIBUTION OF AGRICULTURAL OUTPUT TO NIGERIA'S CONSTANT BASIC PRICE GDP: A PANEL DATA REGRESSION APPROACH

***Samuel Olorunfemi Adams, Obonyilo Blessing Adunyi and Kolawole, Timileyin Babalola**

Department of Statistics, University of Abuja, Abuja, Nigeria

*Corresponding authors' email: samuel.adams@uniabuja.edu.ng
ORCID iD: https://orcid.org/0000-0001-9881-1925

ABSTRACT

This study focuses on contribution of agricultural output from crop production, livestock, fishing and forestry on Nigeria's GDP contact basic prices. The study aimed to conduct a panel data analysis of Agricultural outputs and the constant basic prices of selected economic sectors in Nigeria. This study examined the impact of crop output, livestock, fisheries, and forestry on Nigeria's constant price GDP, using numerous components of Nigeria's GDP as cross-sectional data. To achieve these goals, secondary data for crop output, livestock, fishery, forestry, and GDP constant basic price were gathered from the National Bureau of Statistics (NBS) website from Q1 2010 to Q4 2023. This study utilized panel data estimating, which clearly accounts for variation and examines the parameter's dynamic behavior. The research results show that crop output has a considerable positive effect on GDP, whereas additional agricultural goods such as farm animals, forest products, and fishery have a minor beneficial effect on GDP with correlations. The results also revealed that cereal production and livestock comprise approximately 40.62% and 35.66% of Nigeria's GDP, respectively, with the remaining proportion unexplainable due to the presence of a stochastic error factor. It is proposed that sub-sectors that contribute insignificantly to GDP at constant basic prices be enhanced in order to have a substantial impact on GDP and encourage the development and expansion of the Nigerian economy.

Keywords: Constant Basic Prices, Panel Data, Economic Sectors, Gross Domestic Product (GDP), Policy Changes

INTRODUCTION

Nigeria's economy is epitomized by the dynamic performance of multiple sectors, each of which makes a distinct contribution to the GDP of the nation as a whole. Nevertheless, despite the acknowledged significance of economic sectors such as agriculture, there still exists a significant gap in the understanding of the factors that are influencing the constant basic prices within these sectors. The problem at present is that there fails to be a thorough analysis that tackles the complexities and intricacies of the contribution of agricultural outputs such as crop production, fishing, forestry and live stocks to economic growth of a nation like Nigeria. Output from agricultural products are important indicators of economic sectors because they capture the actual worth of products and services generated without accounting for inflation. (Karen & Sheiner 2018). Formulating the targeted policies and strategies for sustainable economic growth is hampered by the inability to understand the forces behind and trends in agricultural outputs (Ames *et al*., 2001). Furthermore, the economic sectors in Nigeria are subject to a myriad of challenges, Inflation and debt, insufficient power supply, communication sector issues, the state-society divide, fraud, erratic fiscal policies, impoverished human resources growth, the characteristics of the Nigerian marketplace, regulations unpredictability, global market changes, infrastructural deficiencies, and so on. The probability that these problems may have an effect on the steady foundation of pricing of products and services inside these industries, either directly or indirectly, emphasizes the importance of a thorough investigation (Awujola, *et al.* 2015). The lack of clarity regarding the factors that drive agricultural pricing not only make it challenging to distribute commodities successfully, however it also makes it challenging for policymakers to implement initiatives that can boost the competitiveness and adaptability of these industries. As a result of this, there is a pressing need to bridge this knowledge gap through a rigorous panel data analysis that explores the trends, influences, and dynamics affecting constant basic prices in key economic sectors in Nigeria.

Despite the acknowledged importance of agricultural output to Nigeria's economic growth and development, there remains a gap in our understanding of the specific contribution of each output's contributing to variations in GDP constant basic prices over time. This knowledge gap hinders the development of targeted policies and interventions aimed at sustaining and enhancing the performance of the economy. Therefore, a comprehensive analysis using panel data regression model was employed test the underlying dynamics of constant basic prices based on the contributions from crop production, livestock, fishing and forestry. The study also seeks to address these critical issues and contribute valuable insights to the study of discourse on economic development and policy formulation in the country.

Tiffin & Irz (2006) employed the Granger causality test in his analysis of panel data from 85 nations. The analysis discovered overwhelming evidence supporting the hypothesis that agricultural value added is the causal variable in developing nations, whereas the direction of causality in wealthy countries remains unknown. Ceylan & Özkan (2013) used an enhanced Solow growth model and panel data to examine agricultural revenue during the European Union integration process. The study's two-way random effects estimation found that the agricultural value-added elasticity of per capita income was 0.025 and 0.22 for the periods 1995-2007 and 2002-2007, respectively. Asom & Ijirshar (2016) using the Solow-Swan exogenous growth model, researchers investigated the impact of agricultural value added on Nigerian economic growth. The study's unit root test results showed that all variables in the model were integrated at first difference, while the co-integration test indicated one co-integrating equation. According to the study, agriculture value added had a positive but small impact on the growth of the

Nigerian economy in both the short and long run, but government spending was statistically significant in contributing to economic growth. Adeyemo *et al.,* (2015) examined the relationship between agricultural value added and current account balances in Nigeria for 33 years, from 1980 to 2013, using data from several sources. The analysis discovered that the variables of interest were stationary at first difference, and the Engel Granger two-step test of co-integration revealed that the variables have a long-run link, while the Johansen test revealed at least one co-integration relationship between the variables. Both the long- and short-term current account balances in the nation are negatively correlated with the value added to agriculture; similarly, the terms of trade and per capita GDP are negatively correlated with the current account position; on the other hand, the current account position is positively correlated with net foreign asset, real effective exchange rate, and gross domestic output. Fakoya (2014) said that Africa is thought to possess a huge amount of the world's natural resources, but its trade balance remains in deficit when compared to other trading partners. The study concluded that, rather than focusing heavily on the importance of export revenues, one method to accomplish economic growth and development is to add value to Africa's natural resources by transforming them into a finished product. Omorogiuwa *et al*., (2014) in their study, they employed trend analysis as a historical and descriptive method to assess Nigeria's development over each decade since its independence in 1960, as well as to investigate the factors that influenced agricultural output. The study demonstrated that extensive research into the development of the agricultural sector is critical to the country's progress, as well as the importance of determining what has not previously worked and why, before taking any actions to develop agriculture or the economy. Odetola & Etunmnu (2013) studied the impact of the agriculture sector to Nigeria's economic growth was analyzed using the growth accounting framework and time series data from 1960 to 2011. According to the report, the agriculture sector has continuously and favorably contributed to Nigeria's economic growth. Wei *et al.* (2014) used the SBM model to measure agriculture environmental efficiency in several Chinese regions over a 20-year period from 1992 to 2011. The study indicated that farm environmental efficiency and economic growth can reach a turning point faster by shifting agriculture environmental efficiency to the right side of the "U" shape to achieve sustainable development. Izuchukwu (2010)examine the effect of agriculture on the Nigerian economy utilizing a panel of data gathered from the Central Bank of Nigeria's statistical bulletin and the World Bank's indicators of development. The study indicated that 81% of the fluctuation in GDP could be accounted by savings in the country, government spending, and foreign direct investment. Adesanya & Ajala (2018) examined the influence of agricultural loans on Nigeria's economic growth from 1985-2016, using data from the CBN, Statistical Bulletin, NBS, and internet articles on agricultural policy concerns. To analyze the variables, this study used a three-stage least squares analysis estimation technique. The study's findings revealed that agriculture loan is an effective tool for anti-cyclical agricultural output, non-oil export, and GDP stability in the Nigerian economy, despite the fact that GDP dropped at the end of the period, demonstrating that such policies worsen over time. Yilson *et al*., (2021)The effect of crop production on economic growth in Nigeria was explored using yearly time series data of the parameters utilized in the study from 1986 to 2020 obtained from the CBN and the National Bureau of Statistics. GDP served as a proxy for growth in the economy, with livestock production, agriculture, forestry, and fishery as distinct factors. Uzomba *et al.* (2020) examined the correlation between agriculture funding-based contributions and the success of Nigeria's agricultural industry from 1986 to 2018. The co-integration study demonstrates a long-term link between all of the variables employed in each of the four approaches. Mboto *et al*., (2017) evaluated the influence of agricultural sector lending on the output of agriculture in Nigeria from 1999 to 2016. The study's findings demonstrated that deposit money bank credit and the Agriculture Credit Guarantee Scheme Fund had a considerable impact on agricultural productivity in Nigeria. Utuk *et al.* (2023) used time series data from 2000 to 2022 to assess the impact of agriculture value added on the relationship between agricultural exports and economic growth in Nigeria. The study used the Augmented Dicky-Fuller unit root, Auto-regressive Distributed lag (ARDL) structure and Dynamic Ordinary Least Squares (DOLS) technique for analysis. The study's findings revealed that agriculture input exports (LNAGXP) had a positive influence on real GDP, whereas agricultural value added has a negative impact on GDP. Verter & Becvarova (2016) applied OLS regression, impulse function of response, Granger causality, and Variance Decomposition approaches, the study found an inverse relationship between agricultural openness and economic growth in Nigeria. The OLS regression and Granger causality results supported the theory that agricultural exports drive economic growth in Nigeria.

Edeh *et al.,* (2020) studied the influence of government agriculture spending on the farming output in Nigeria from 1981 to 201 was assessed using time series data from the Central Bank of Nigeria's Statistical Bulletin and Annual Report. The ARDL model technique study demonstrates that capital expenditure is positively associated to agricultural output, which is also statistically significant at 5% in the present year (P(t) = 0.0080). Ahungwa *et al*., (2014)investigated the trend and importance of agriculture to Nigeria's GDP during a 53-year period (1960–2012). The study employed time-series data from the National Bureau of Statistics (NBS), the Central Bank of Nigeria, the National Planning Commission (NPC), and the CIA Fact Book, which were examined using trend and regression methods. The study's findings revealed that agriculture's percentage of overall GDP fell while remaining dominant over other industries between 1960 and 1975. Further examination of the study revealed an undulating tendency that intertwined with the manufacturing industry between 1976 and 1989.The outcomes of the regression revealed that agriculture has a positive association with GDP and provides significantly, with a coefficient of 0.664, meaning that increasing the role of agriculture can boost GDP by 66.4 percent, more than any other sector. Nwankpa (2017) analyzed the impact of agricultural reforms on poverty and hunger elimination in Nigeria, with a focus on improving food production as well as contributing to socio-economic development. The study focuses on the impact of farming transformation in promoting environmentally friendly growth and reducing hunger and poverty in the southwest region of Nigeria. Olajide, (2019) discovered a positive causal relationship between GDP and agricultural output using OLS econometric approaches, namely between 1970 and 2010. His research found that the agriculture sector accounted for around 35% of the volatility in GDP. Although the agriculture sector experienced a significant blow, immediately following the finding of oil in industrial quantities.

MATERIALS AND METHODS

Source of Data

The panel data for this study deals with different economic sectors in Nigeria's GDP. Secondary data were collected for crop production, livestock, fishing, forestry and GDP constant basic price from the National Bureau of Statistics website (NBS, 2023) from quarter one of 2010 to quarter four of 2023.

Panel Data Regression Model

Pooled Ordinary Least Squared Model

Pooled Ordinary Least Squared OLS is being described as simple OLS (Ordinary Least Squared) model which is performed on panel data, (Adams & Balogun, 2020). It ignores the time and the individual characteristics by focuses only on dependencies between the individuum. Nevertheless, simple OLS needs that there is no correlation between unobserved, independent variable(s) and the IVs (i.e., exogeneity).

$y_{it} = \beta_0 + \beta_1 x_{1,it} + \beta_2 x_{2,it} + \cdots + \beta_p x_{p,it} + e_{it}$ (1)

The independent factors are the Xs, and the dependent variable is the Y. The subscript j represents the observation (row) number. The β's are the unknown regression coefficients. Their estimates are represented by β's. Each β represents the original unknown (population) parameter, while b is an estimate of this β. The εj is the error (residual) of observation j.

A pooled model is considered under the assumption that the individuals behave in the same path, where there is possibility of homoscedasticity and no autocorrelation. Only OLS is used for obtaining efficient estimates from the model in equation (1).

Fixed-Effects (FE) Model

The Fixed Effects -model determines individual effects of unobserved, independent variables as constant ("fix ") over time (Adams & Paul 2023). The fixed effects model can deal with the unobserved heterogeneity. The fixed effects model for k factors can be expressed in the following way:

$y_{it} = \alpha_i + \beta_1 x_{1,it} + \beta_2 x_{2,it} + \cdots + \beta_p x_{p,it} + e_{it}$ (2)

There is no constant term in the fixed effects model. Instead of the constant term β_0 in pooled model, an individual-specific component α_i which determines a unique intercept for each individual can be seen. The slopes (the β parameters) are the same for all individuals.

Random Effects (RE) Model

The random effects model is used in modelling the individual-specific component $\boldsymbol{\alpha}$ which is not treated as a parameter and it is not being estimated (Adams, *et al.* 2023). Instead, it is considered as a random variable with mean μ and variance σ^2_α. The random effects model can thus be written as:

$yit = \mu + \beta_1 X_{1,} + \beta_2 X_{2,} + \cdots + \beta_k X_{k,} + \alpha_i - \mu + \varepsilon_{it}$ (3)

where μ is the average individual effect. Let $u_{it} = \alpha_i - \mu + \varepsilon_{it}$ and (3) is now:

$yit = \mu + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \cdots + \beta_k X_{k,it} + u_{it}$ (4)

Individual Effects in Models

Fixed and random effects models for short panels introduce an individual-specific effect. For count models, with conditional mean restricted to be positive, the effect is multiplicative in the conditional mean, rather than additive (Paul & Adams, 2023). Then;

$\mu_{it} = E[y_i \mid x_i, \alpha_i] = \alpha_i \lambda_{it} = \alpha_i \exp(x'_{it}\beta)$, $i = 1, \ldots, n$, $t = 1, \ldots, T$, (5)

where the last equality specifies an exponential functional form. Note that the intercept is merged into it α_i, so that now the regressors x_{it} do not include an intercept. In this case the model can also be expressed as:

$\mu_{it} = \exp(\delta_i + x'_{it}\beta)$, (6)

where $\delta_i = \ln \alpha_i$. For the usual case of an exponential conditional mean, the individual specific effect can be interpreted as either a multiplicative effect or as an intercept shifter. If there is reason to specify a conditional mean that is not of exponential then a multiplicative effects model may be specified, with $\mu_{it} \equiv \alpha_i\, g(x'_{it}\beta)$, or an intercept shift model may beused, with

$\mu_{it} \equiv \alpha_i\, g(\delta_i + x'_{it}\beta)$. (7)

Unlike the linear model, consistent estimation of β here does not identify the marginal effect. The marginal effect given (3.8) is

$ME_{itj} \equiv \frac{\partial E[y_i \mid x_{it}, \alpha_i]}{\partial x_{itj}} = \alpha_i \exp(x'_{it}\beta)\beta_j = \beta_j E[y_i \mid x_{it}, \alpha_i]$, (8)

Hausman-Test for the Model Selection

The Hausman-Test, also known as the Durbin-Wu-Hausman test, is a test of endogeneity. The Hausman-Test or Durbin-Wu-Hausman test is used in model selection to compare the estimators of the models under test. Using the Hausman-Test, the null assumption indicates that the coefficient of variation among the response variable(s) and alpha is constant. If this is the case, Random Effect is preferable to Fixed Effect. If the null assumption doesn't hold true, we must proceed using the Fixed Effect model. (Chmelarova 2007; Hausman 1978). The general form of Hausman test statistic is:

$H = (\boldsymbol{\beta}^{I} - \boldsymbol{\beta}^{II})'[Var(\boldsymbol{\beta}^{I}) - Var(\boldsymbol{\beta}^{II})]^{-1}(\boldsymbol{\beta}^{I} - \boldsymbol{\beta}^{II})$, (9)

RESULTS AND DISCUSSION

Summary Statistics

Table 1: Summary Statistics for the Panel Data Variables

Variables	N	Minimum	Maximum	Mean	Variance	Std. Dev.
GDP	56	7426523.85	49276018.23	23305220.84	119469646697337.050	10930217.14
Crop Production	56	1488421.53	154234567.90	922337.20	427826930895783.000	20683977.64
Livestock	56	118211.00	884037.16	353248.22	27542876787.672	165960.474
Forestry	56	12420.35	77823.39	45538.6143	380615813.638	19509.37758
Fishing	56	76502.98	893337.70	224854.3589	33254486076.601	182358.126

Table 1 presents the summary statistics of the numerial variables in the Panel data. The data comprises of 56 observations each. The summary statistics include the measures of location and dispersion. The minimum value of the variables (GDP, Crop Production, Livestock, Forestry and Fishing) is 7426523.85, 1488421.53, 118211.00, 12420.35 and 76502.98 respectively while the maximum values are 49276018.23, 154234567.90, 884037.16, 77823.39 and 893337.70 respectively. The mean (average) of variables is 23305220.84, 922337.20, 353248.22, 45538.6143 and 224854.3589 respectively, which represents the measure of location of the data. The variance for the variables is 119469646697337.050, 427826930895783.000, 27542876787.672, 380615813.638 and 33254486076.601 measuring of how the data values deviate from the mean respectively. The standard deviation of the variables is 10930217.14, 20683977.64, 165960.474, 19509.37758 and 182358.126 respectively, which measures the variation or dispersion in the data.

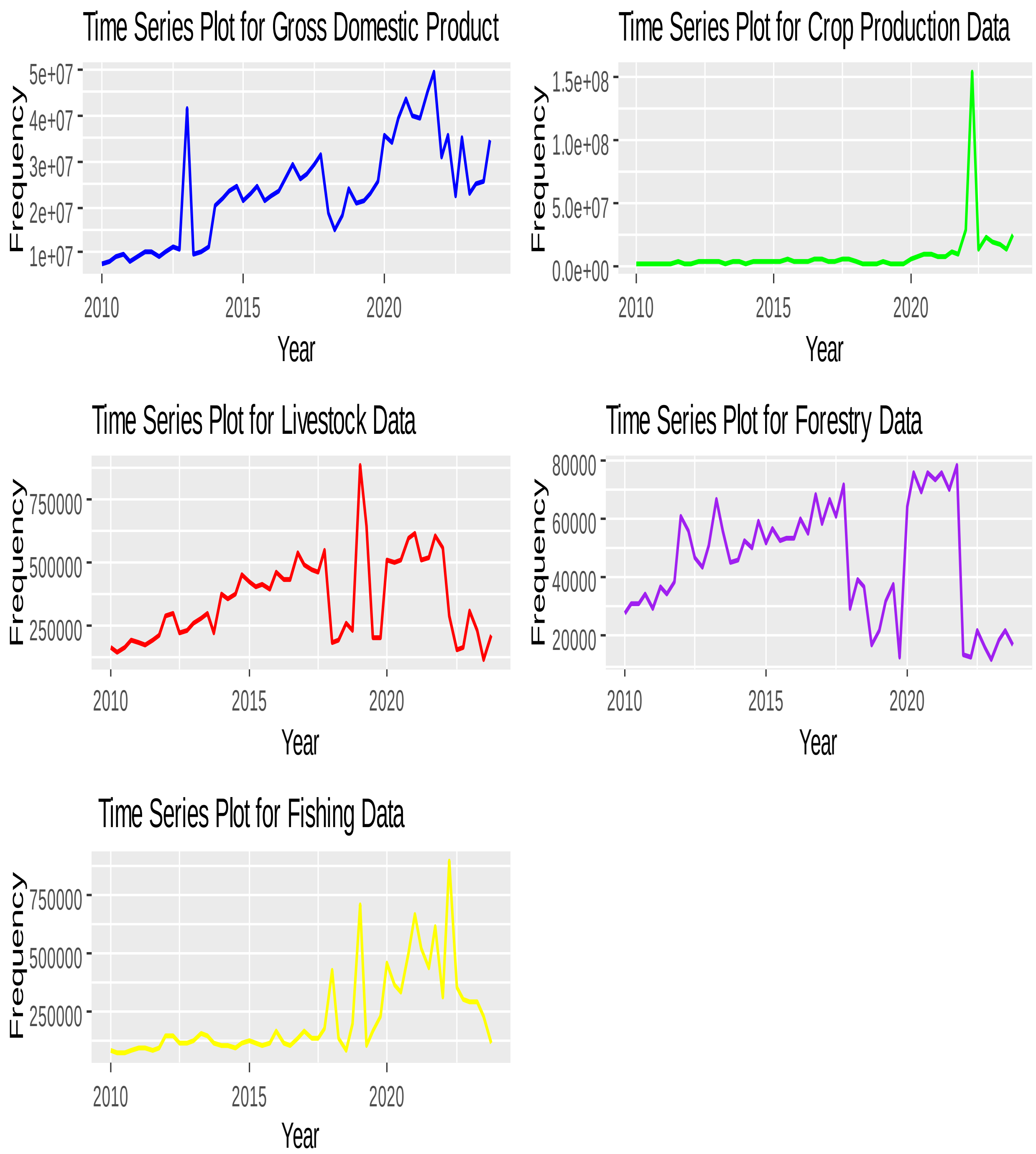


Figure 1: Time Series Plot for the Variables (GDP, Crop Production, Livestock, Forestry and Fishing) in the Data.

Figure 1 depicts the time series plot for the variables (GDP, Crop Production, Livestock, Forestry and Fishing) in the data. The plot shows the trend of all the variables (GDP, Crop Production, Livestock, Forestry and Fishing) from 2010 to 2023.

Test for Stationarity

Unit Root Test

Hypothesis to be tested are:

H_0: There is unit root in the data (i.e., the data are not stationary)

H_1: There is no unit root in the data (i.e., the data are stationary)

Decision Rule: Reject the null hypothesis (H_0) if the p-value < α-value; otherwise, do not reject H_0. i.e., if the absolute test statistic is greater the absolute critical value, then then the data is said to have unit root.

Table 2: Augmented Dickey Fuller (ADF) Test

Variables	Dickey-Fuller		p-value	
	I(0)	I(1)	I(0)	I(1)
GDP	-2.2029	-4.5263	0.4928	0.01
Crop_Production	-3.3026	-5.3188	0.08026	0.01
Livestock	-2.0831	-5.9608	0.5411	0.01
Forestry	-2.3779	-5.67	0.4222	0.01
Fishing	-1.1159	-5.4755	0.912	0.01

Table 2 displays the results of the Augmented Dickey Fuller (ADF) statistics. The p-values for all variables are larger than 0.05 at the level, indicating that they are not stationary. This means that we can't reject the null hypothesis of the unit root for any of the variables. As a result, the data were differenced (i.e., integrated once I (1)) and all variables were shown to be stationary at the 5% level of significance. At a 5% level of significance and a p-value of 0.01, we reject the null hypothesis in favor of a unit root, implying that all variables are stable.

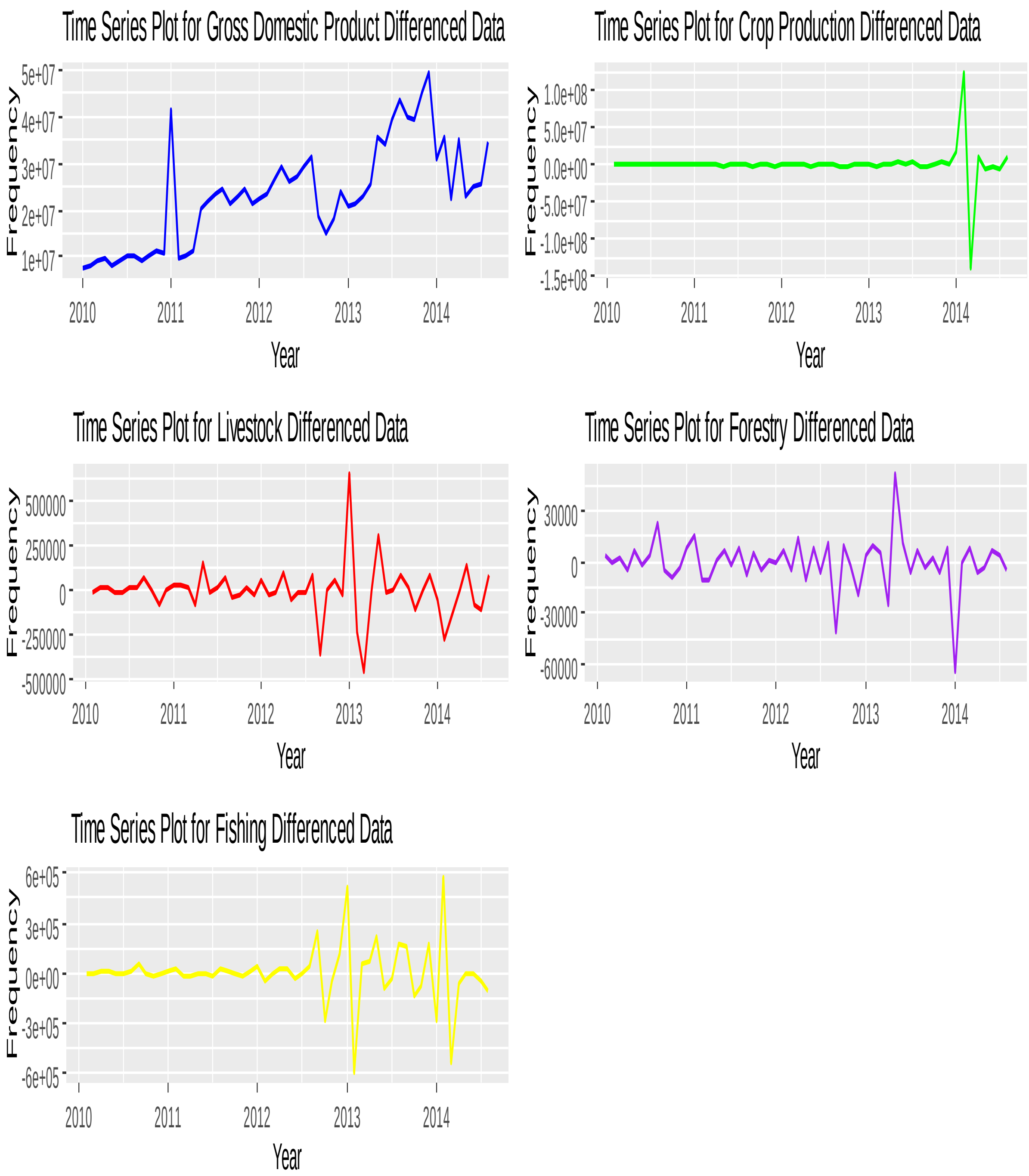


Figure 2: Plot of Differenced GDP, Crop Production, Livestock, Forestry and Fishing Data

Figure 2 demonstrates that the GDP, livestock Crop Production, forestry, and Fishing Data are now stable (that is, the series' mean, variance, and covariance remain constant across time). The time-series graph of the first differential above appears fixed in mean and variability, indicating that the series level remains relatively constant across time. Figure 4.2 above shows that the average is exactly zero, implying a stationary series. The unit root test is a formal way of assessing the linearity of a previously conducted series to supplement and assist the graphical analysis.

Test for Normality

The one sample Shapiro-Wilk test is applied as follows

H_0**:**The variable follows a normal distribution

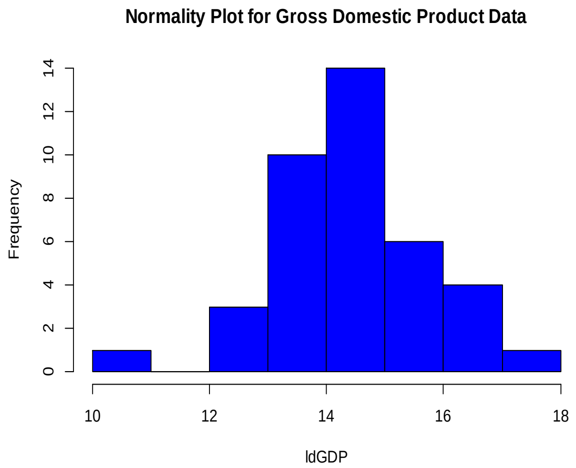
H_1**:**The variable does not follow a normal distribution

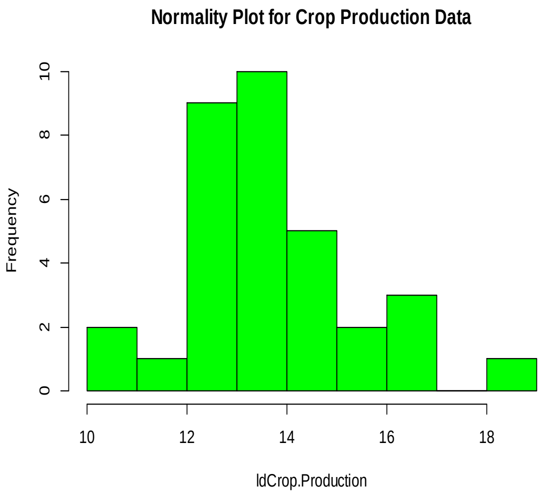
A = 0.05(where α is the level of significance)

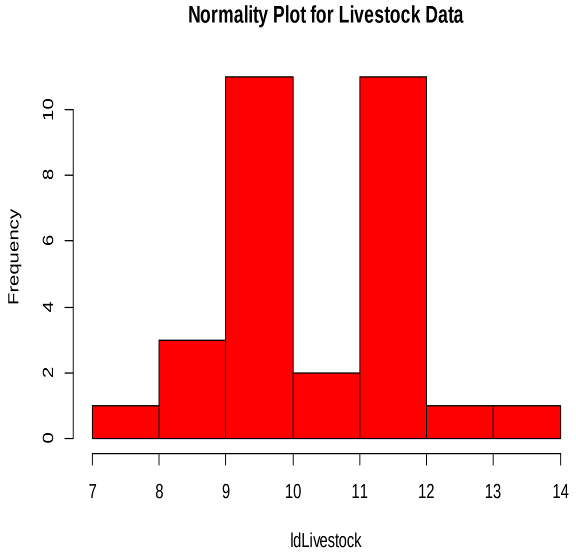
Table 3: Shapiro – Wilk Test for Normality

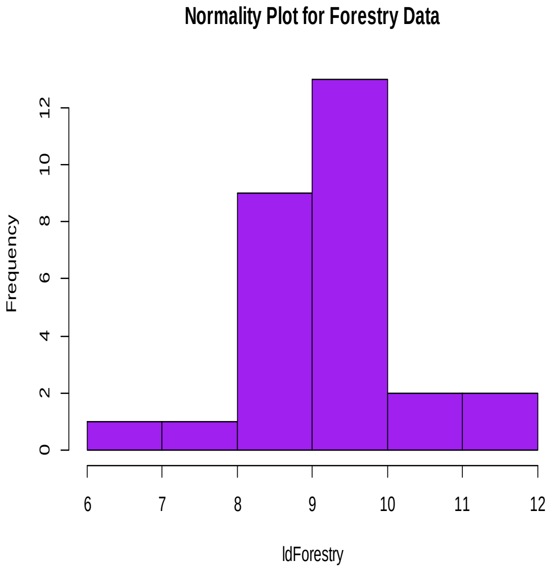
Variables	Shapiro Wilks	p-value
GDP	0.96513	0.2633
Crop_Production	0.9378	0.05865
Livestock	0.97983	0.821
Forestry	0.94962	0.1938
Fishing	0.90568,	0.05035

Table 3 displays the Shapiro-Wilk test for normality for the variables in the data. The Shapiro-wilks value and the p-value are displayed in the table. Sinc the p-value for all the variables is greater 0.05 level of significance, we assume that the data follow a normal distribution. This suggest that all the variables in the data are normally distributed.









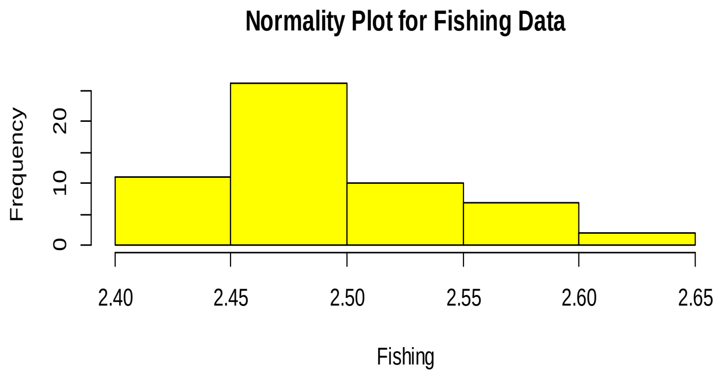


Figure 3: Normality Plot for the GDP, Crop Production, Livestock, Forestry and Fishing Data

Figure 3 shows that the GDP, Crop Production, Livestock, Forestry and Fishing Data are normally distributed.

Mean Equality from Analysis of Variance (ANOVA)

Hypothesis

H_0: There is no significant difference in the mean value of the variable

H_1: There is significant difference in the mean value of the variable

Table 4: Mean Equality for the Panel Data

Variable	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Crop Production	1	5.561	5.561	50.122	4.07e-09 ***
Livestock	1	3.77	3.77	33.982	3.79e-07 ***
Forestry	1	0.012	0.012	0.107	0.7451
Fishing	1	0.422	0.422	3.807	0.0566
Residuals	51	5.658	0.111		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 4 shows the mean equalitiy across the sector, the p-value for Crop Production and Livestock is 4.07e-09 and 3.79e-07 respectively less than the level of significance (0.005). We reject the H_0 (there is no significant difference in the mean value of the Crop Production and Livestock). Hence, we conclude that there is significant difference in the mean value of the two variable i.e. the mean value is not equal across all the time. However, for Forestry and Fishing, it is evident that there mean are equal as their p-values are lesser than the level of significance.

Panel Data Model Estimation

Table 5: Random Effects Panel Data Model

Coefficients	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	6.994999	1.974025	3.5435	0.0003948 ***
log(Crop Production)	0.29946	0.084161	3.5582	0.0003734 ***
log(Livestock)	0.212972	0.121616	1.7512	0.0799154.
log(Forestry)	0.138012	0.126884	1.0877	0.276729
log(Fishing)	0.088047	0.101955	0.8636	0.387817
Total Sum of Squares		*6.0698*		
Residual Sum of Squares		*3.6041*		
R-Squared		*0.40622*		
Adj. R-Squared		*0.35965*		
Chisq		*34.8908*		
p-value		*4.8915e07*		

*One-way (individual) effect Random Effect Model (Swamy-Arora's transformation) Balanced Panel: n = 12, T = 8, N = 96; Balanced Panel: n = 14, T = 4, N = 56, Min = -0.536084, 1Q = -0.205072, Median = 0.055882, 3Q = 0.109643, Max = 0.932495, Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Table 5 depicts the random effects panel data model. The random effect model showed that the intercept is 6.994999, the Crop production has a significant positive impact on the GDP with co-efficient of 0.29946 and p-value is 0.0003734, which is less than the level of significance (0.05). All other predictor variables (Livestock, Forestry and Fishing) have a non-significant positive impact on the GDP with coefficient of 0.212972, 0.138012 and 0.088047 with p-values of 0.0799154, 0.276729 and 0.387817 respectively. The R square and adjusted R square are 0.40622 (40.62%) and 0.35965 (35.96%) respectively. The result revealed that the predictor variables acounted for 35.96%of the variation of GDP leaving the remaing percentage unexplained due to the presence of stochastic error term. The chi-square statistics (χ^2 = 34.89) which is significant at 5% level of significance with p-value 4.8915e-07 revealing that the model is significant.

Fixed Effects Panel Data Model

Table 6: Fixed Effects Panel Data Model

Coefficients	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**
log(Crop Production)	0.267006	0.099754	2.6766	0.01092 *
log(Livestock)	-0.05383	0.111224	-0.4839	0.6312
log(Forestry)	-0.16519	0.162889	-1.0141	0.31694
log(Fishing)	-0.154	0.100696	-1.5294	0.13446
Total Sum of Squares	2.0479			
Residual Sum of Squares	1.6226			
R-Squared	0.20765			
Adj. R-Squared	0.14683			
F-statistic	2.4896			
p-value	0.059381			

Oneway (individual) effect Within Model, Balanced Panel: n = 14, T = 4, N = 56*; Balanced Panel: n = 12, T = 8, N = 96, Min* = -0.350141*, 1Q* = -0.056062*, Median* = -0.010108 *, Mean = 0, 3Q* = 0.039598 *, Max* = 1.004014*, Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Table 6 depicts the fixed effects panel data model. The fixed effect model showed that the Crop production has a significant positive impact on the GDP with co-efficient of 0.267006 and p-value is 0.01092, which is less than the level of significance (0.05). All other predictor variables (Livestock, Forestry and Fishing) have a non-significant negative impact on the GDP with coefficient of 0.05383, 0.16519 and 0.154 with p-values of 0.6312, 0.31694, and 0.13446 respectively. The R square and adjusted R square are 0.20765 (20.76%) and 0.14683 (14.68%) respectively. The result revealed that the predictor variables acounted for 14.68%of the variation of GDP leaving the remaing percentage unexplained due to the presence of stochastic error term. The F-statistic (F= 2.4896) which is not significant at 5% level of significance as p-value 0.059381 greater than the level of significance hereby reveal that the fixed effect model is not significant.

Pooled Ordinary Least Square (POLS) Panel Data Model

Table 7: Pooled Ordinary Least Square (POLS) Model

Coefficients	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**
(Intercept)	4.44181	1.52526	2.912	0.005313 **
log(Crop Production)	0.25544	0.07207	3.545	0.000852 ***
log(Livestock)	0.43844	0.12682	3.457	0.001110 **
log(Forestry)	0.06035	0.11305	0.534	0.595774
log(Fishing)	0.1874	0.09605	1.951	0.056557
Total Sum of Squares	15.422			
Residual Sum of Squares	*0.3331*			
R-Squared	*0.6331*			
Adj. R-Squared	*0.6044*			
F-statistic	22.0044			
p-value	1.3455e-10			

Balanced Panel: n = 14, T = 4, N = 56, Min = -0.61662*, 1Q* = -0.23831*, Median* = 0.07639*, 3Q* = 0.14742*, Max* = 0.92145*, Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Table 7 displays the pooled ordinary least square (POLS) model. The POLS model showed that the intercept is 4.44181 which is significant as the p-vel is less that the level of significance, the Crop production and the Livestock have a significant positive impact on the GDP with co-efficient of 0.25544 and 0.43844 with p-value 0.000852 and 0.001110 respectively, which is less than the level of significance (0.05). All other predictor variables (Forestry and Fishing) have a non-significant positive impact on the GDP with coefficient value of 0.06035 and 0.1874with p-values of 0.595774 and 0.056557 respectively. The R square and adjusted R square are 0.6331 (63.31%) and 0.6044 (60.44%) respectively. The result revealed that the predictor variables acounted for 60.44%of the variation of GDP leaving the remaing percentage unexplained due to the presence of stochastic error term. The F-statistic (F= 22.0044) which is significant at 5% level of significance with p-value 1.3455e-10 revealing that the model is significant.

Durbin-Wu-Hausman (DWH) Specification Test

Hypothesis

$\boldsymbol{H_0}$**:** Random effect is the preferred model

$\boldsymbol{H_1}$**:** Fixed effects is the preferred model

Table 8: Durbin-Wu-Hausman (DWH) Specification Test

Hausman Test	
Chisq	28.286
Df	4
p-value	0.09205

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Table 8 depicts the Durbin-Wu-Hausman (DWH) specification test. The Durbin-Wu-Hausman (DWH) Chi-square test value is 28.286 with degree of freedom 4 and p-value is 0.09205 which is higher than the level of significance (0.05). Hence, we do reject the H_0. Therefore, we conclude that the preferred model is the random effect model. Hence, the results from the random effect model are preferred for the interpretation of the relationship between GDP and the predictor variables (Crop Production, Livestock, Forestry, and Fishing)

CONCLUSION

This study focuses on the contribution of agricultural output to economic growth in Nigeria, with the aim of conducting a panel data analysis on the constant basic prices of some selected agricultural sectors in Nigeria. The panel data for this study deals with different sub-sectors of Nigeria's GDP and agricultural output from crop production, livestock, forestry, and fishery. The data used in this study is secondary data obtained from the National Bureau of Statistics (NBS) online website. The data covers the period from 2010 to December 2023, with yearly frequency. The data was analyzed using a panel data regression model with the aid of R statistical software (R version 4.3.2). The summary statistics of the numerical variables of the panel data in the study revealed that the data comprises 56 observations each. The summary statistics include the measures of location and dispersion. The minimum value of the variables (GDP, crop production, livestock, forestry, and fishing) is 7426523.85, 1488421.53, 118211.00, 12420.35, and 76502.98, respectively, while the maximum values are 49276018.23, 154234567.90, 884037.16, 77823.39, and 893337.70, respectively. The mean (average) of variables is 23305220.84, 922337.20, 353248.22, 45538.6143, and 224854.3589, respectively. The variance for the variables is 119469646697337.050, 427826930895783.000, 27542876787.672, 380615813.638, and 33254486076.601, respectively. The standard deviation of the variables is 10930217.14, 20683977.64, 165960.474, 19509.37758, and 182358.126, respectively. The time series plot shows the data were not stationary at level, and the data were differenced and are all stationary at first differencing. The graph of heterogeneity for GDP across all the years in the panel data shows that the mean values of GDP across all the years considered in the data are heterogeneous across the years, i.e., the data are different across the years graphically. The mean equality across the sector, the p-value for crop production and livestock, is 4.07 e-09 and 3.79 e-07, respectively, less than the level of significance (0.005). We reject it (there is no significant difference in the mean value of crop production and livestock). The graph of sectors treatment status shows that all the cross-sections are heterogemeous with 3 cases (treatment level), with treatment level 1 whose value is 17.27, treatment level 2 is 27.5587, and treatment level 3 is 48.1360. The Durbin-Wu-Hausman (DWH) specification test has a chi-square test value of 28.286 and a p-value of 0.09205, which is greater than the level of significance (0.05). This result suggests that the random effect model is preferred for the interpretation of the relationship between agriculture constant basic price contribution to the GDP. The result from the random effect model showed that the intercept is 6.994999, and crop production has a significant positive impact on the GDP with a coefficient of 0.29946 and a p-value of 0.0003734, which is less than the level of significance (0.05). All other predictor variables (livestock, forestry, and fishing) have a non-significant positive impact on the GDP with coefficients of 0.212972, 0.138012, and 0.088047 with p-values of 0.0799154, 0.276729, and 0.387817, respectively. The R square and adjusted R square are 0.40622 (40.62%) and 0.35965 (35.66%), respectively. The result revealed that the predictor variables accounted for 35.96% of the variation of GDP, leaving the remaining percentage unexplained due to the presence of stochastic error term. The chi-square statistics (χ^2 = 34.89), which is significant at the 5% level of significance with a p-value of 4.8915e-07, reveal that the model is significant. Based on the findings from the analysis of this study, the study recommended that there should be proper monitoring on all the sub-sectors that are insignificant to the GDP at constant basic prices for them to yield significant impact to boost the GDP and also resulting in a better position to boost the economy at large.

REFERENCES

Adams, S.O**.,** Emmanuel, D.O. & Paul, C. (2023). Effect of Total Active Voice Call Subscribers on Economic Growth in Nigeria: An Application of Cross-Sectional Panel Data Model., *Malaysian Journal of Science and Advanced Technology*, 3(4), 236 – 243. https://doi.org/10.56532/mjsat.v3i4.175 2785-8901

Adams, S. O., & Paul, C. (2023). E-government Development Indices and the Attainment of United Nations Sustainable Development Goals in Africa: A Cross-Sectional Data Analysis, *European Journal of Sustainable Development Research*, *7*(4), 1-11. https://doi.org/10.29333/ejosdr/13576

Adams, S.O. & Balogun, P.O. (2020). Panel Data Analysis on Corporate Effective Tax Rates of Some Listed Large Firms in Nigeria, *Dutch Journal of Finance and Management*, 4(2), 1-9. https://doi.org/10.21601/djfm/9345

Adesanya, T.A. & Ajala, O.A. (2018). Agricultural Credit and Economic Growth in Nigeria, Humanities, Management & the Social Sciences Journal, 7(1), 11-20. https://dx.doi.org/10.22624/aims/humanities/v7n1p2

Adeyemo, T.A., Ajijola, S., Odetola, S.K. & Okoruwa, V.O. (2015). Impact of Agricultural Value Added on Current Account Balances in Nigeria, *Journal of Economics and Sustainable Development*, 6(4), 108-116.

Ahungwa, G.T., Haruna, U. & Abdusalam, R.Y. (2014). Trend Analysis of the Contribution of Agriculture to the Gross Domestic Product of Nigeria (1960 - 2012). *IOSR Journal of Agriculture and Veterinary Science, 7*, 50-55.

Ames, B., Brown, W., Devarajan, S., & Izquierdo, A. (2001). Macroeconomic policy and poverty reduction, International Monetary Fund. Analysis from selected African Countries. *Journal of Human Ecology* 48(2), 227-233.

Asom S.T. & Ijirshar, V. U. (2016). Impact of Agriculture Value Added on the Growth of Nigerian Economy, *Nigerian Journal of Management Sciences*, 5(1), 238-245.

Awujola., A.**,** Adams, S.O. & Alumbugu, A.I. (2015)**.** Oil Exportation and Economic Growth in Nigeria.*Developing Country Studies*, 5(15), 1-15.

Ceylan, R. F. & Özkan, B. (2013). Agricultural Value Added and Economic Growth in the European Union Accession Process. *New Medit*, 12(4), 62-71

Chmelarova, V. 2007. The Hausman Test, and Some Alternatives, with Heteroskedastic Data. Baton Rouge: Louisiana State University.https://doi.org/10.31390/gradschool_dissertations.936

Edeh, C.E., Ogbodo, J. C. & Onyekwelu U. L. (2020). Impact of Government Expenditure on Agriculture on /Agricultural Sector Output in Nigeria (1981-2018), *International Journal of Research and Innovation in Social Science*, 4(10), 15-26.

Fakoya M. B. (2014). National Resource, Value-Added and Economic growth: Empirical Analysis from Selected African Countries, *Journal of Human Ecology*, 48(2), 227-233. https://doi.org/10.31901/24566608.2014/48.02.04

Hausman, J. (1978). Specification Tests in Econometrics, *Econometrica*, 46 (6), 1251–1271.https://doi.org/10.2307/1913827

Izuchukwu, O.O. (2010). Analysis of the Contribution of Agricultural Sector on the Nigerian Economic Development, *World Review of Business Research*, 1(1), 191-200.

Karen D. & Sheiner, L. (2018). GDP as a Measure of Economic Well-being. https://www.brookings.edu/wp-content/uploads/2018/08/wp43-8.23.18.pdf \

Mboto, H. W., Atseye, F. A., & Lawal, S. G. (2017). Effect of Agricultural Sector Credit on Agricultural Output in Nigeria, *ESUT Journal of Accountancy*, 8(2). 1-15. https://www.researchgate.net/publication/333995906

(NBS) (2023). National Bureau of Statistics Bulletin. https://www.nigerianstat.gov.ng/pdfuploads/NIGERIAN%20economy.pdf

Nwankpa, N. (2017). Sustainable Agricultural Development in Nigeria: A Way Out of Hunger and Poverty. *European Journal of Sustainable Development*, *6*(4), 175. https://doi.org/10.14207/ejsd.2017.v6n4p175

Odetola, T. & Etumnu, C.Z. (2013). Contribution of the Agriculture Sector to Economic Growth in Nigeria, *The 18th Annual Conference of the African Econometric Society, Accra, Ghana*. 1-18.

Olajide, O. T. (2019). Agriculture Resource and Economic Growth in Nigeria, *European Scientific Journal.* 8 (22), 123-126.

Omorogiuwa, O., Zivkovic, J. & Ademoh, F. (2014). The Role of Agriculture in the Economic Development of Nigeria, *European Scientific Journal*, 10(4), 133-147.

Paul C. & Adams, S.O. (2023). The Effect of E-Government Development Indices (EGDI) on Corruption Perception Index in Sub-Sahara Africa: A Panel Data Analysis, African Journal of Science, Technology Innovation and Development. 16(1), 17-25. https://doi.org/10.1080/20421338.2023.2247904

Tiffin, R. & Irz, X. (2006). Is agriculture the engine of growth? *Agricultural Economics*, 35, 79-89. https://doi.org/10.1111/j.1574-0862.2006.00141.x

Utuk, I.O., Akpan, B.L., Eduno, E.B. & Udo, A.B. (2023). Agricultural Export and Economic Growth in Nigeria: Does Agriculture Value Added Matter? *International Journal of Research and Innovation in Social Science*, VII (XI), 880-892; https://doi.org/10.47772/IJRISS.2023.7011067

Uzomba, P. C., Nikade, T., & Otokutu, O. P. (2020). Agricultural Funding-Based Contributions and Performance of Nigerian Agricultural Sector, *International Journal of Academic Research in Business and Social Sciences*, 10(1), 331–349. https://doi.org/10.46886/IJARBSS/v10-i1/6854

Verter, N. & Bečvářová, V. (2016). The Impact of Agricultural Exports on Economic Growth in Nigeria, *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 64(2), 691-700. https://doi.org/10.11118/actaun:actaun_2016064020691

Wei, X., Peng, J. & Cao, L. (2014). An Empirical Study of the Relationship between Agriculture Environmental Efficiency and Economic Growth, *Modern Economy*, 5, 598-608. https://doi.org/10.4236/me.2014.55056

Yilson, E. E., Azara, A.I., Dishok, N.I., Yilkes, D.O. & Mutgap, L.D. (2021). Agriculture and Economic Growth in Nigeria, *Arts and Social Science Research*, 11, 258-277.