International Scholars Journals

African Journal of Agricultural Marketing ISSN: 2375-1061 Vol. 13 (1), pp. 001-006, January, 2025. Available online at www.internationalscholarsjournals.org © International Scholars Journals



*Full Length Research Paper*

# A SARIMA Method for Analyzing How Agricultural Factors Affect Nigeria's GDP

**Oluremi and Sikiru**

Nnamdi Azikiwe University, Awka Nnewi Agulu, Nigeria

Accepted 17 January, 2025

**This study uses quarterly data from the first quarter of 2016 to the second quarter of 2022 to assess the impact of agricultural factors to Nigeria's overall economic growth and development. The National Bureau of Statistics Nigeria provided the information on cattle, forestry, agriculture, and fisheries. The decomposition model (additive and multiplication) was fitted using time series analysis and seasonal autoregressive integrated moving average (SARIMA). The findings indicated that while the second and third quarters saw higher GDPs than the quarterly average, the first and fourth quarters saw lower GDPs from livestock, fisheries, forestry, and crop production (the total monetary value of goods produced in years). SARIMA (1,0,1)x(1,0,1)4, SARIMA (2,0,1)x(2,0,1)4, and SARIMA (2,0,1)x(2,1,1)4 were all found to be adequate, and any of them may be utilized for additional forecasting. The SARIMA model was employed to test for adequacy. Therefore, it is advised that investments in forestry, crop production, livestock, and fisheries be made during the second and third quarters of the year in order to reap significant benefits.**

**Key words:** Livestock, Fishery, Forestry, Crop Production, Time Series, SARIMA, Decomposition.

## INTRODUCTION

The Agricultural production has long been linked to the production of vital food crops, both now and in the past. Forestry, fishing, fruit growing, beekeeping, poultry, cattle, and other activities are all included in farming. Nowadays, it is accepted that modern agriculture includes the processing, marketing, and distribution of crops and livestock products, among other things. Therefore, the processing, marketing, and distribution of agricultural goods might be considered agriculture. It is the foundation of a giving society's economic system and is essential to all economies.

Despite the oil boom, Nigeria's economy has grown for decades thanks to agriculture, which essentially supplies food, raw materials, jobs for a large portion of the population, a source of income for the country, a source of livelihood, a significant contribution to international trade, marketable surplus, economic development, and a source of savings, among other things. In order to attain food sufficiency and lower unemployment, the Nigerian government continues to rely heavily on agriculture (Anaebonam, 2014).

One globally accepted indicator of economic size and strength is the gross domestic product, or GDP (Oyedele, 2017). Nigeria's economy can be stimulated by a higher GDP. As a result, it reduced the poverty rate among Nigerians by fostering economic growth and job creation. During Nigeria's oil boom, the country's agriculture was neglected. In actuality, the sector's share of the overall GDP has decreased over time. The sector's share of the GDP dropped sharply from 55.8% in 1960–1970 to 28.4% in 1971–1980. Thankfully, Nigeria's successive administrations are starting to prioritize agriculture. Additionally, the agricultural sector's share of the GDP increased to 32.3% between 1981 and 1990, 34.2% between 1991 and 2001, and 40.3% between 2001 and 2009 (Mohammed, 2012). In 2008, Nigeria's economy was primarily driven by agriculture, which accounted for 42.1% of GDP. Industry came in second with 22%, followed by wholesale and retail trade with 17.3%, services with 16.8%, and building and construction with 1.8%. Over the previous 25 years, Nigeria's agricultural sector's contribution of the country's GDP has grown by 11.6%, from 30.5% in 1984 to 42.1% in 2008. At the same time, Nigeria's industry's percentage of the country's GDP fell from 42.4% to 22%, a 20.4% drop (Ikoku, 2010).

Through the municipal and state governments, the Nigerian government has recently made resources available to assist farmers in obtaining fertilizer and other agricultural inputs. The goal of all these initiatives is economic diversification. Anono (2012) investigated how the petroleum and agricultural sectors contributed to the expansion and advancement of the Nigerian economy from 1960 to 2010. They stated that the GDP contribution from the agricultural sector was greater than that from the petroleum sector. Particularly in the context of developing countries,

growth in the agriculture sector is a predictor of decreasing poverty and promoting economic development (Lee, An, & Kim, 2020).
It is anticipated that rising food costs will have a significant impact on the welfare outcomes of various household groups, especially in emerging nations, and therefore on their level of poverty and food security. By enhancing the overall process of decision-making processes, these services also help farmers make better technological choices, which in turn leads to a more progressive household for these rural farmers as their net revenue increases. Nonetheless, numerous studies have demonstrated that farmers with higher levels of education are more likely to make more money than those without. Because educated farmers have a deeper understanding of a particular situation and are equipped with the necessary knowledge and awareness, they are able to make decisions that will help them earn the money they need to live better. To increase overall "food security" and "crop productivity," NGOs and several business sectors, particularly in developing nations' agricultural sectors, offer a variety of extension services (Sulewski, Wąs, Kobus, Pogodzińska et al., 2020). The agricultural sector is essential to the livelihood profile that is prevalent in emerging nations, especially in rural areas. The poorest people are typically landless and make their living from irregular wage labor, which is typically tied to agricultural operations, while the majority own or rent a small plot of land that is farmed using traditional methods. When rural household farms operate, farming—an industry—is created (Ali, 2019).

The high percentage of youth unemployment and the deterioration in numerous sectors of the nation, particularly the oil sector, are the driving forces behind this study. A country's total progress can be accelerated if the government re-strategizes agriculture to increase agricultural exports as well as feed the nation. This will result in significant financial development and advancement.

## Aim and Objectives

Estimating the actual contribution of agricultural variables to Nigeria's overall economic growth and development is the goal of this study.

Objectives:

i. To fit number of Autoregressive Integrated Moving Average (ARIMA) model to the variable.

ii. To fit decomposition model.

To fit Seasonal Autoregressive Integrated Moving Average (SARIMA) model on variables.

## Literature Review

Forestry, livestock, fisheries, and crop production are the four main subsectors of Nigerian agriculture. Crop production is the largest component, accounting for about 87.6% of the sector's total output. Fishing, forestry, and cattle follow with 8.1%, 3.2%, and 1.1%, respectively. Agriculture remains Nigeria's largest industry, accounting for an average of 24% of the nation's GDP over the last seven years (2013–2019). Additionally, the industry is the greatest employer in the country, employing roughly 36% of the workforce (Oyaniran, 2020). Other key economic areas including housing, education, and health also received large recurrent sums. Compared to other industries, Nigerian public spending on agriculture is rather low; between 2001 and 2005, less than 2% of all federal spending went into this industry. This amount is much less than what is invested in other crucial sectors, per a study conducted by the International Food Policy Institute (Aderemi, 2020).

The 2014 AU Heads of State and Government conference in Equatorial Guinea to discuss the Maputo Declaration paved the way for the Malabo Declaration. They promised to employ inclusive agricultural growth and transformation to cut the continent's poverty in half by 2025, or five years from now, and reiterated the 10% public spending target after the Malabo meeting. It is anticipated that the agricultural GDP will grow by a minimum of 6% every year. They believed that the scheme will give at least 30% of young people in agricultural value chains job opportunities and empower millions of rural dwellers. Only a small portion of African nations have complied with the treaty's terms, though, therefore not much has changed thus far (Aderemi, 2020).

Nigeria's first legally required extension policy is now being developed by the Federal Department of Agricultural Extension, which was founded in 2012, with assistance from IFAD21. This new extension policy aims to develop the private sector to provide services and the public sector to maintain quality control. In order to ensure that extension services are driven by demand, consider market demands, and target farmers who currently lack access to markets, the focus is on promoting pluralistic delivery (Rechard & Olajide, 2020).

Ademola (2019) conducted an experimental evaluation of the impact of agricultural funding on the growth of the Nigerian economy. According to the study, Nigeria's pace of economic growth is unaffected by the amount of credit available to agriculture out of all the credit that the government has granted.

Awe (2003) investigated the mobilization of domestic financial resources for agricultural productivity in Nigeria using a time series analytic technique. The study found that government recurring spending on agriculture, bank loans to Nigeria's agricultural sector, and agricultural credit programs all positively correlate with agricultural posture. He recommended that the government's continuous agricultural spending be reassessed increased in order to boost agricultural output.

Ogen (2007) compared the development of Nigeria's agriculture sector to that of Brazil's agro-industrial economy between 1960 and 1995. The study concluded that Nigeria and other third-world countries need to rapidly take advantage of their vast agricultural potential if they are to see significant industrial and economic growth.

Olurankinse and Bayo (2012) investigated the impact of non-oil exports on Nigeria's economic growth. The findings demonstrated that non-oil exports contributed positively to the growth of the Nigerian economy during that period, despite its poor performance in terms of output level and income generation. They recommended that both the manufacturing and agricultural sectors increase production in order to improve product availability.

To attain the desired results, a proper system must be maintained. As a result, the total output of the rural farmers increases, increasing their incomes. The farmers are at the center of any country's agricultural system. Numerous countries' governments are also developing a range of policies to encourage farmers' contributions to sustainable development. In order to boost their net farming income, this incentivizes farmers to take greater chances (Ndem & Osondu, 2018).

Bakare (2012) asserts that agriculture is one of Nigeria's main economic sectors. The paper states that in order to bring agriculture to a sustainable level, Nigerian officials must enact suitable policies. Olajide et al. (2012) investigated the relationship between agricultural output and Nigeria's GDP. Agriculture and Nigeria's GDP were shown to

be strongly and favorably correlated by the study.

Akpan (2012) carried out a comparative assessment of the real-world impacts of decades of policy practice developed for Nigeria's rural communities within the framework of two separate economic eras characterized by agricultural output and petroleum oil exploration. The results demonstrated the failure of Nigeria's rural development. The study concluded that leadership issues, political commitments, and a lack of institutional capacity are the main barriers to rural development.

Odetola and Etumnu (2013) investigated the role of the agriculture sector on Nigeria's economic growth using time series data from 1960 to 2011 and a growth accounting approach. The analysis confirms the agriculture sector's importance in the Nigerian economy by showing that it has consistently and favorably increased economic growth. Oni (2014) looked into how agriculture helped reduce poverty in Nigeria between 1980 and 2011. Oni asserts that agriculture has been the primary driver of growth in recent years and has a significant potential to reduce poverty in Nigeria. Data from the Augmented Dicker Fuller (ADF) unit root test and Error Correction Model (ECM) showed that poverty reduction in Nigeria was negatively and insignificantly correlated with per capita non-agricultural GDP and inflation rate, while it was positively and significantly correlated with per capita agriculture GDP, physical infrastructure per capita, and social infrastructure per capita. The paper suggests that the government should provide Nigerian farmers with the required subsidies to enable them to adapt and use modern technologies, which will increase productivity and reduce poverty in the nation.
In order to improve the agricultural system for the country's economic growth and sustainable development, many developing countries have funded educational and training programs for their rural farmers. The goal is to inform them about the current state of affairs and assist them in identifying their own values. In these remote areas of rising nations, new technologies are also being applied to take the essential safeguards before any potentially dangerous event happens (Yu, Chen, Niu, Gao et al., 2021).

The results of Olajide, Akinalabi, and Tijani (2012) were at odds with those of Lawal (2011). They used an OLS regression model to investigate the relationship between Nigeria's GDP and agricultural output. They found that Nigeria's GDP is positively and considerably impacted by the country's agriculture sector. They also found that 34.4% of the change in Nigeria's GDP between 1970 and 2010 was attributable to the country's agricultural sector.
Many farmers, especially those in rural parts of the world, are "risk-averse" because they already have a lot to lose in order to reap the expected reward. They do obtain the required output they expected, but their risk aversion behavior keeps them from obtaining more. According to the "expected utility theory," people who "always prefer the expectation E(X) to the random variable X-are characterizable by concave utilities" are risk averters (Khaw, Li, & Woodford, 2021). Ugwuoke, Ume, and Ihedioha (2018) investigated how interest rate deregulation affected agricultural funding in Nigeria between 1970 and 2014. The study also specifically examined interest rate patterns, loan availability to the agricultural sector, and the agricultural sector's GDP contribution from 1970 to 2014. The results showed that interest rates significantly affect the quantity of credit given to the agricultural sector, but they have minimal effect on the industry's GDP contribution. Furthermore, it was observed that interest rates varied from 1970 to 2014, which prompted banks to lend money to the general public while also resulting in low agricultural productivity and unemployment. The period's rise and downward trends in the agricultural GDP contribution can be attributed to the government's disdain when oil was discovered.

**Materials and Procedures**

The data used in this study was obtained from the first quarter of 2016 to the second quarter of 2022 and was provided by the National Bureau of Statistics [NBS]. The practice of dissecting time series components to evaluate each one's contribution to the time series variable is known as time series analysis. The term "decomposition of time series" is frequently used to describe this.

Model Details ARIMA Autoregression is incorporated into the moving average model. Box and Jenkins (2015) introduced a general model with both autoregressive and moving average parameters that specifically takes differencing into account in its derivation. Specifically, the model contains three types of parameters: the number of differencing runs (d), autoregressive parameters (p), and moving average parameters (q). Box and Jenkins devised a notation that summarizes models as ARIMA (p, d, q). For example, a model with the notation (0, 1, 2) has 0 (zero) autoregressive (p) parameters and two moving average (q) parameters that were computed for the series after it was differenced once.
ARIMA is expressed mathematically as (p, d, q). Φ P (Ls)ϕp (L)zt

**SARIMA**

Model Seasonal Autoregressive Integrated Moving Averages, or SARIMA models. The ARIMA model works well with non-stationary, non-seasonal data. Box and Jenkins (1976) have extended this model to account for seasonality. Their proposed model is called the Seasonal ARIMA (SARIMA) model. This method uses seasonal differencing of the appropriate order to remove non-stationarity from the series. The difference between an observation and its matching observation from the prior year is known as a first order seasonal difference, and it is computed as follows:Zt = Yt - Yt-s. For monthly time series 12 = S and for quarterly time series 4 = S. This model is generally termed as the SARIMA$(p,d,q)\times(P,D,Q)^s$ model.

The mathematical formulation of a SARIMA$(p,d,q)\times(P,D,Q)^s$ model in terms of lag polynomials is given below

$$\Phi P(L^s)\phi p(L)(1-L)^d(1-L^s)^D yt = \Theta Q(L^s)\theta q(L)\varepsilon t,$$

$$i.e.\ \Phi P(L^s)\phi p(L)zt = \Theta Q(L^s)^{\theta}(L)\varepsilon t.$$

**Results and Discussion**

**Multiplicative Model**

Data Gross Domestic Product

Length 104

Nmissing 0

**Seasonal Indices**

| Period | Index |
|---|---|
| 1 | 0.88838 |
| 2 | 1.02261 |
| 3 | 1.12694 |
| 4 | 0.96207 |

According to the seasonal indices, Q1 GDP was 11.162% below the quarterly normal, Q2 GDP was 2.261% higher than the quarterly average, Q3 GDP was 12.694% higher than the quarterly average, and Q4 GDP was 3.793% lower than the quarterly average.

Level of significance: α= 0.05

Test statistic: Q= n(n+2) $\sum^{k}$ $r^2$ /$(n-j)(p-value)$

$j$=1 $j$

Decision rule: Reject Ho if p-value is < α value, otherwise do not reject.

Computation:

**ARIMA Model: Gross Domestic Product Final estimates of parameters**

Type Coef Se Coef T P Ar 1 0.7910 0.0775 10.20 0.000

Sar 4 0.9829 0.0368 26.70 0.000

Ma 1 -0.2115 0.1164 -1.82 0.072

Sma 4 0.5311 0.0936 5.67 0.000

**Source:** Author's computation 2024

Number of observations: 104

Residuals: SS = 22457028 (backforecasts excluded) MS = 224570 Df = 100

Modified Box-Pierce (Ljung-Box) Chi-Square Statistic Lag 12 24 36 48

Chi-Square 5.6 7.5 11.5 11.6

Df 8 20 32 44

P-Value 0.695 0.995 1.000 1.000

**Source:** Author's computation 2024

Since p-values are all greater than α value = 0.05, we therefore do not reject Ho and conclude that the model is adequate at 5% level of significant.

**Hypothesis 2 (SARIMA MODEL (2,0,1)4*(2,0,1))**

**HO:** The model is ~~adequate.~~ ~~**H1:** The model is not adequate. Leve~~l of significance: α= 0.05

Test statistic: Q = n(n+2) $\sum^{k}$ $r^2$ /$(n-j)(p-value)$

$j$=1 $j$

Decision rule: reject Ho if p-value is < α value, otherwise do not reject.

Computation:

**ARIMA Model: Gross Domestic Product**

Final Estimates of Parameters Type Coef SE Coef T P AR 1 1.6384 1.4253 1.15 0.253

AR 2 -0.6748 1.1928 -0.57 0.573

SAR 4 1.1251 0.2178 5.17 0.000

SAR 8 -0.1446 0.2064 -0.70 0.485

MA 1 0.7752 1.4624 0.53 0.597

SMA 4 0.6340 0.1748 3.63 0.000

**Source:** Author's computation 2024

Number of Observations: 104

Residuals: SS = 22902424 (backforecasts excluded) MS = 233698 DF = 98

Modified Box-Pierce (Ljung-Box) Chi-Square Statistic Lag 12 24 36 48

Chi-Square 7.5 9.9 14.2 14.2

Df 6 18 30 42

P-Value 0.280 0.936 0.994 1.000

**Source:** Author's computation 2024

Since p-values are all greater than the α value =0.05, we therefore, do not reject Ho and conclude that the model is adequate and 5% level of significant.

**Hypothesis 3 (Sarima Model (2,0,1)4*(2,1,1)) Ho:** The model is adequate.

**H1:** The model is not adequate.

Level of significance: α= 0.05

Test statistic: Q = n(n+2) $\sum^{k}$ $r^2$ /$(n-j)(p-value)$

$j$=1 $j$

Decision rule: reject Ho if p-value is < α value, otherwise do not reject.
Computation:

**Arima Model: Gross Domestic Product**

Final Estimates Of Parameters Type Coef Se Coef T P Ar 1 0.3057 0.3613 0.85 0.400

Ar 2 -0.3062 0.1019 -3.01 0.003

Sar 4 1.1251 0.1562 7.20 0.000

Sar 8 -0.1385 0.1482 -0.93 0.352

Ma 1 0.2556 0.3733 0.68 0.495

Sma 4 0.7905 0.0962 8.22 0.000

**Source:** Author's computation 2024

Differencing: 1 regular difference

Number of observations: original series 104, after differencing 103
Residuals: SS = 23201644 (back forecasts excluded)

MS = 239192 DF = 97

Modified Box-Pierce (Ljung-Box) Chi-Square Statistic Lag 12 24 36 48

Chi-Square 7.0 9.2 12.6 12.8

DF 6 18 30 42

P-Value 0.317 0.955 0.998 1.000

**Source:** Author's computation 2024

Since p-values are all greater than α value = 0.05, we do not reject Ho and conclude that the model is adequate at 5% level of significant.

**Measure of Accuracy**

| | MULTIPLICATIVE | ADDITIVE |
|---|---|---|
| MAPE | 802 | 815 |
| MAD | 1173 | 1175 |
| MSD | 2335259 | 2344982 |

**Source:** Author's computation 2024

The GDP in Q1 was 11.162% below the quarterly average, 2.261% above the quarterly average, 12.694% above the quarterly average, and 3.793% below the quarterly average in Q2, Q3, and Q4, respectively, based on the seasonal indices. All p-values were more than the level of significance, suggesting that the model is adequate, according to the Ljung-box statistic values for the three tests of data adequacy for stationarity time series, SARIMA models. For the purposes of this study, SARIMA (1,0,1) ´ (1,0,1)4, SARIMA (2,0,1) ´ (2,0,1)4, and SARIMA (2,0,1) ´ (2,1,1) 4 are sufficient. The accuracy measure showed that the multiplicative model best fits the data used in this study using mean absolute percentage error (MAPE), mean absolute deviation (MAD), and mean square deviation (MSD).

## Conclusion

This study examines the impact of agricultural variables on Nigeria's GDP using the SARIMA and decomposition models. The results show that the multiplicative model has the lowest value and is the most effective. While Q2 and Q3 GDP are often greater than the quarterly average and lower in other quarters, the first and fourth quarter GDP (gross domestic product, or the total monetary values of items generated in a year on livestock, fisheries, forestry, and crop production) is lower than the quarterly average. 1,0,1 SARIMA ´ (1,0,1)4, 2,0,1 SARIMA ´ (2,0,1)4 Additionally, SARIMA (2,0,1) ´ (2,1,1) 4 is determined to be sufficient.This might be applied to additional GDP forecasting and prediction.

## Recommendations

- It is recommended that the result be replicated on other agricultural data.
- It is advised that investments be made in livestock, forestry, crop production, and fisheries during the second and third quarters of the year because the combined monetary values of these sectors are higher than the quarterly average.
- It is also recommended that any of the fitted SARIMA models be use for forecasting GDP

**References**


Ademola Ayodele (2019). Impact of Agricultural Financing on Nigeria Economy. *Asian Journal of Agricultural Extension, Economics and Sociology*.*31* (2); 1-13, 2019.

Aderemi, O. (2020). Despite ₦592.9 Billion Budget on Agriculture in the Last Five Years – There's Less to Show for It; www.dataphyte.com/economy/agriculture-economy.

Akpan, N. S. (2012). From agriculture to petroleum oil production: what has changed about Nigeria's rural development? *International Journal of Development Society*,*1*, 97–100

Ali, E. (2019). Farmers' attitudes towards climate risks and effects of farmers' risk aversion behavior on inputs use in Northern Togo. *Sarhad Journal of Agriculture, 35*(3), 663-674.

Anaebonam, W. (2014). Agricultural sustainability: hope for Nigeria's economy? Newswatch Times Anthony, E. (2010). Agricultural Credit and Economic Growth in Nigeria: *An Empirical Analysis Business and Economics Journal.* 14:1-7

Aminu, U. and Anono, A. Z. (2012). An empirical analysis of the contribution of agriculture and petroleum sector to the growth and development of the Nigerian economy from 1960–2010. *International Journal of Social Sciences and Education*, *2*, 758–769.

Asravor, R. K. (2019). Farmers' risk preference and the adoption of risk management strategies in Northern Ghana. *Journal of Environmental AgBioForum, 23*(2), 2021 | 121

Awe, A. A. (2013). The Impact of Foreign Direct Investment on Economic Growth in Nigeria. *Journal of Economics and Sustainable Developments*.*4*(2), 122-132.

Awe, A. A. and Ajayi, S. O. (2009). Diversification of Nigerian revenue base for economic development: the contribution of the non-oil sector. *Pakistan Journal on Social Science. 6*, 138–143.

Awe, A. A. (2013). Mobilization of domestic financial resources for agricultural Productivity in Nigeria. *Australia Journal Business and Management Research, 2*, 1–7.

Bakare, A. S. (2013). An econometric analysis of sustainable agriculture and rural development in Nigeria: A Vector Autoregressive Approach (VAR). *Journal of Agricultural Economic and Development. 2,* 184–193.

Iganiga, B. O. and Unemhilin, D. O. (2011). The impact of federal government agricultural expenditure on agricultural output in Nigeria. *Journal of Economics, 2,* 81–88.

Iganiga, B. O. and Unemhilin, D. O. (2011). The Impact of Federal Government Agricultural Expenditure on Agricultural Output in Nigeria. *Journal of Economics 2*(2), 81-88.

Ikoku, A. E. (2010). Is the Stock Market a Leading Indicator of Economic Activity in Nigeria? CBN *Journal of Applied Statistics. 1*(1), 17-38.

Johansen, S. and Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration with application to the demand for money. *Oxford Bulletin of Economics and Statistics., 52*, 169–210.

Khaw, M. W., Li, Z., & Woodford, M. (2021). *Cognitive imprecision and small-stakes risk aversion*. The review of economic studies, *88*(4)

Liverpool-Tasie, L. S., Kuku, O. and Ajibola, A. (2011). *A review of literature on agricultural productivity, social capital and food security in Nigeria*. NSSP Working Paper No. 22. IFRRI.

Lawal, W. A. (2011). An Analysis of Government Spending on Agricultural Sector and its Contribution to GDP in Nigeria. *International Journal of Business and Social Science: 2*(20):244-250.

Liverpool-Tasie, L. S., Kuku, O. and Ajibola, A. (2011). *A Review of Literature on Agricultural Productivity, Social Capital and Food Security in Nigeria*. NSSP Working Paper No. 21: IFRRI.

Mohammed, M. (2012). *Conservation Agriculture for the Twenty-First Century*. NIJAAS. *5*(2):142-150

Ndem, C. N., & Osondu, C. K. (2018). *Risk sources and management strategies among cassava farmers in Abia State*, Nigeria. RISK, *18*(1), 267-276.

Odetola, T. and Etumnu, C. (2013*). Contribution of agriculture to economic growth in Nigeria*. *A* Paper Presented at the 18th Annual Conference of African Econometric Society (AES), Accra.

Ogen, O. (2007). *The agricultural sector and Nigeria's development: comparative perspectives* from the Brazilian agro-industrial economy, 1960-1995. Nebula 4:184–194.

Olajide, O. T., Akinlabi B. H. and Tijani A. A. (2012). *Agricultural resource and economic growth in Nigeria.* Euro. Sci. J. 8:103–115.

Olurankinse, F. and Bayo, F. (2012). *Analysis of the impact of non-oil sector on economic growth. Can. Social Science*. 8:244–248.

Oni, L. B. (2014). An assessment of agriculture and poverty reduction nexus in Nigeria. *Journal of African Macro Review, 4,* 265–284.

Olajide, O. T., Akinlabi, B. H. and Tijani, A. A. (2012). *Agricultural Resource and Economic Growth in Nigeria. European Scientific Journal (Oct. ed.).8*(22), 103-115

Oyaniran, T. (2020). *State of Agriculture in Nigeria*. AFCFTA workshop; September, 2020.

Oyedele, T. (2017). Economic and fiscal implications of Nigeria's rebased GDP. PWC Publication. *www.pwc.com retrieved* on 29-03-2017.

Rechard & Olajide (2020); cited in Sola A. & Aseh, E.V. (2020). *Analysis of Agricultural Technical and Vocational Education and Training (Atvet) System in Nigeria;* Report of a Pre-Feasibility Study Conducted from 23rd February To 4th March, 2020

Sulewski, P., Wąs, A., Kobus, P., Pogodzińska, K., Szymańska, M., & Sosulski, T. (2020). *Farmers' attitudes towards risk*—An empirical study from Poland. Agronomy, *10*(10), 1555.

Lee, Y., Ann, D., & Kim, T. (2020). *The effects of agricultural extension service on crop production, revenue, and profit: evidence from Mbale district in Uganda**. Agricultural Economics Research, *61*(3), 161- 179

Ugwu, D. S. and Kanu, I. O. (2012). Effects of agricultural reforms on the agricultural sector in Nigeria*. Journal of African Study Development. 4*, 51-59.

Yahaya, M. K. and Olajide, R. B. (2005). Assessment of the impact of Nigerian agricultural cooperative bank's credit facilities on small scale farmers in Ibarapa East LGA of Oyo State. *Journal of Agriculture Extension, 8*, 16-21.

World Bank. (2017). Agriculture Data. Retrieved From World Bank Open Data. www.Lse.Ac.Uk/Europeaninstitute/Research/Hellenicobservatory/

Yu, L., Chen, C., Niu, Z., Gao, Y., Yang, H., & Xue, Z. (2021). Risk aversion, cooperative membership and the adoption of green control techniques: evidence from China. Journal of Cleaner Production, 279, 123288. doi: https://doi.org/10.1016/j.jclepro.2020.123288