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EFFECTS OF AGRICULTURAL SUBSECTOR'S OUTPUT ON ECONOMIC GROWTH IN NIGERIA: STRUCTURAL VAR (SVAR) MODEL APPROACH.

Fatima Bodam[1*], M. C. Duru[2], C. I. Egwaikhide[3], A. A. Alexander[4], & Alfa Yakubu[5]

[1, 3, 4, & 5] Department of Economics, Nigerian Defence Academy, Kaduna – Nigeria
[2] Department of Economics, Ahmadu Bello University, Zaria – Nigeria

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***Corresponding author:** Fatima Bodam
Department of Economics, Nigerian Defence Academy, Kaduna – Nigeria

Abstract

The agricultural sector in Nigeria had been the main producer of the food needs of the country until the discovery of oil which led to a shift to the oil sector abandoning the sector. This study examined the effect of agricultural subsector's output on Nigeria's economic growth. The study used annual time series data spanning the period between 1981 to 2023, and the data were obtained from the Central Bank of Nigeria Statistical Bulletin (2024). The data were analyzed using the structural vector autoregressive (SVAR) model. Findings from the study reveal that the output of crop production has a positive significant impact of 0.4975, forestry has 0.0007 and fishery has a positive and significant impact of 0.0054 on economic growth in Nigeria while output of livestock production has a negative and insignificant impact of -0.0040 on economic growth in Nigeria. Based on the findings, it is recommended that the government should address the challenges often faced by crop farmers such as inadequate irrigation, lack of access to technology, poor soil condition (soil infertility), farmers-herders clashes, and insecurity in Nigeria, in order to provide a conducive environment for farming and increased output. Government should also implement sustainable farming practices such as rotational grazing, intensive livestock production and minimize environmental pollution through proper waste management for increased productivity.

Keywords: Agricultural output, subsectors, Structural VAR Model, Economic growth,

1.0 Introduction

Agriculture had been the principal foreign exchange earner of Nigeria as the nation once had a record of being the world's largest exporter of groundnut, the second largest exporter of cocoa and palm produce and an important exporter of rubber and cotton in the 1960s (Sekunmade, 2022 & Adetunji, et al. 2023). Early 1970's saw agricultural exports as a percentage of total exports dropping from about 43 percent to slightly over 7 percent. The decline in agricultural export continued from the mid-1970s to the mid-1980s with a record of 17 percent. Despite Nigeria's rich agricultural resource endowments, the nation still relies on imports to meet its food and agricultural product needs. Nigeria's agricultural imports bills from 1981 had been on the rise as it rose by 12.7 percent from

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N851.6 billion in 2018 to N959.5 billion in 2019, the highest value ever recorded in the country so far, while agricultural exports declined by about 11 percent from N302.2 billion to N269.8 billion during the same period. Agriculture accounted for less than 2 percent of total exports in 2022 (Abdul, Saheed, Alexander, Bernard, & Alfa, 2022). However, from 1981, agricultural import bills began to rise as a result of declining agricultural output.

In Nigeria, the agricultural sector is responsible for the production of food, meat, fish and other related produce and products comprises four subsectors; livestock, crop, fisheries and the forestry. Livestock farming alone according to Herrero, et. al (2020) plays a significant role in rural livelihoods and the economies of developing countries as it provides income and employment for producers and consumers. Fish farming on the other hand, is a common practice in Europe, Canada, East Asia, China, Africa and developing Countries like Nigeria ((FAO, 2019). According to Keith (2010), over 500million people in the developing countries depend directly or indirectly on fisheries and aquaculture for their livelihood. In Nigeria, fish farming is one of the fastest-growing ventures in Nigeria as it plays a vital role in the nation's economy in terms of employment generation, poverty alleviation, foreign exchange earnings and provision of raw materials for the animal feeds industry (Rotawa, Adekunle, Adeagbo, Nwanze & Fasiku, 2019).

The agricultural sector in Nigeria despite the role it plays in the production of food has been neglected since the advent of oil as the main foreign exchange earner for the country. Statistics show that agricultural GDP has been on the decline. It was 26.75% in 2009, 23.75% in 2010, 22.23% in 2011, and 2012. 21.86% (Plecher, 2020). However, the GDP rose to 23.35% in 2013, 22.9% in 2014, 23.9% in 2014, 23.9% in 2015, 25.1% in 2018, and 25.2% in 2019 and dropped to 22.0% in 2020 (Oyaniran, 2020). This decline could be attributed to the neglect of the sector by the government hence the drop in the sector's contribution to economic growth.

The challenges faced by the sector also includes the COVID-19 pandemic which caused so many nations of the world to lock down their economies, impeded imports and exports of agricultural produce, products and raw materials. The lockdown also hindered farmers in the country from carrying out their farming activities which led to increased hunger, high mortality rate, wastage of unsold farm produce and subsequently decline in the sector's contribution to GDP (Akinpelu, 2020).

Attempts have been made by various administrations/regimes to revamp Nigeria's agricultural sector, for example, between 1976 - 1979, the policies of Green Revolution (GR) and Operation Feed the Nations (OFN) were adopted to diversify Nigerian economy from mono-cultural economy but these aims were not achieved due to poor implementation and lack of continuity by succeeding governments (Buari, Alexander, Saheed, & Alfa, 2019). Programmes such as the Structural Adjustment Programme (SAP) was introduced in 1986 to enable the restructuring of the Nigeria's economy which could also lead to the restoration of the agricultural sector and aid the diversification policy of the government. Subsequently, many other programmes where established which include: National Directorate for Employment (1987), National Fadama Development Programme I (1992), and Sure-P programme (2013) among others (Iwena, 2015). These programmes introduced by successive governments were to boost agricultural production, increase exports, and also to remove the loopholes experienced in the sector, thereby increase the country's GDP.

Despite the establishment of the aforementioned programmes, farmers were still faced with challenges in the areas of acquiring lands and inadequate finance to purchase modern farming equipment even though the government made an effort to provide credit facilities for the subsistence farmers so as to increase productivity.

There are numerous studies carried out on the impact of agricultural subsectors on economic growth both in Nigeria and other countries of the world. The studies of Akpan et al. (2021), Valentine et.al (2020), Umeji (2019), Alfa (2019), Adesoye et al. (2018), Jelilov and Ozden (2017), Adams (2016) among others show a positive impact of agriculture on growth of the Nigerian economy using the agricultural subsectors. However, negative impact was revealed in the studies of Achugbu et.al (2017) and Nyamkye et. al (2021). Hence, these conflicting results need to be verified through further studies.

Aside from the policies and programmes implemented by the government, farmers also face challenges during the cultivation and production process in Nigeria. Worthy of note are; the farmers and herders clashes, insurgency in the North East, banditry and kidnapping that are being experienced in most parts of the country including the Covid-19 pandemic which have to a large extent hampered agricultural activities due to mass destruction of lives and properties. Many people have lost their sources of livelihood as such, poverty, hunger and crime are on the rise which has also led to increase in prices of food stuffs and other agricultural products. This is therefore, a wakeup call as the sector needs intervention. This study therefore attempts to empirically analyze the effect of agricultural subsectors output on Nigeria's economic growth following government efforts to revamp the sector since 1980. Against this backdrop, the main objective of this study is to examine the effect of agricultural subsector's output on Nigeria's economic growth with evidence from structural vector autoregressive (SVAR) model.

2.0 Literature Review

2.1 Conceptual Review

Agriculture has been generally defined as the cultivation of crops, domestication of animals, forestry, fisheries and horticulture for consumption by man. Agriculture as defined by Iwena (2015) is the practice whereby farmers cultivate land for the purpose of producing crops and the rearing of animals in order to provide food for man and raw materials for industries. Macdonald (2020) posits that agriculture is the science, art and practice of cultivating the soil, producing crops and raising livestock and in varying degrees, the preparation and marketing of the resulting products. These definitions are encompassing as they describe agriculture in its totality by bringing in the various subsectors which includes: crop, livestock, fisheries and forestry where the produce are either consumed or used as raw materials to produce other products for sale and exports.

Agriculture is also described as an art, science and business of producing crops and livestock for economic purposes. Agriculture includes; food production, raw materials provision and job creation in the various subsectors (crop, livestock, fisheries and forestry) and also extends to provision of foreign exchange earnings for the country through the exports of its produce and products (Musa, Alexander, Saheed, Duru, & Alfa, 2021). Crop production involves the cultivation of different types of crops. These crops may be food crops or cash crops (Ellah & Emeh, 2020). Food crops include;

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yam, cassava, rice, beans maize, cocoyam, millet, corn among others. Crops produced can also provide raw materials by local industries for the production of finished products. The crop subsector is the largest of the agricultural sector as it contributes over 80% of the sector's GDP (CBN, 2012). Ella and Emeh (2020) explained that 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. This indicates that 65.52% of the cultivatable land is not utilized reflecting the huge imports of food by the government to sustain the food demand in the country.

Livestock production involves the rearing of domestic animals either for sale or for consumption. Such animals include: goat, sheep, cattle, poultry which also produce fur, leather, wool, milk, meat (Ellah & Emeh, 2020). These by-products are either sold in their raw form or are semi-processed for use in industries for the production of finished products. While fishery is a study that deals with breeding or rearing of fish and other aquatic animals while fish farming is the act of rearing or breeding fish in artificial water bodies for domestic consumption or commercial purposes. Anthony and Richard (2016) explain that aquaculture development in Nigeria has been driven by social and economic objectives, such as nutrition improvement in rural areas, generation of supplementary income, diversification of income activities, and the creation of employment. They further posit that over the last two decades, federal government efforts has been on artisanal fisheries development in Nigeria because the fisheries were known to contribute over 95% of the local fish production. The federal government also introduced an agricultural Scheme called; National Accelerated Fish Production Programme which provides fishing inputs at a subsidized price of 50% for fisher folks (Mathiesen, 2015).

Forestry includes all actions that pertains to creation and management of forests which includes harvesting, marketing and utilization of all forest products and services. This implies that management of forests has to be carried out in a skillful manner in order to achieve the objectives of forestry which include: provision of employment, provision of raw materials for industries and export in order to provide foreign exchange earnings for the country, revenue for the government among others.

Economic growth is the increase in the monetary value of goods and services produced in a country over a defined period of time usually a fiscal year (Ewetan, Fakile, Urhie, & Odunta, 2017). Economic growth also refers to an increase in the goods and services produced by an economy over a particular period of time. It is measured as a percentage increase in real Gross Domestic Product which is (GDP) adjusted. Onunwo and Amadi-Roberts (2022) in their study viewed economic growth as the annual increase in per capita real gross domestic product. Economic growth was viewed in this sense since it takes care of the rapid population growth on the standard of living of the people.

2.2 Theoretical Review

Input-Output Theory of Production

The input-output theory is a technique invented by Prof. Wassily W Leontief in 1951. The input-output model was later developed by Collett and Gariner in 1984 as a way to treat the interaction within a system. It is also used to analyze the inter-industrial relationship in order to understand the interdependencies and the complexities of the economy thereby creating the conditions for maintaining the equilibrium between supply and demand.

Jhingan (2011) explains the input–output method as an adaptation of the neoclassical theory of general equilibrium to the empirical study of quantitative interdependence between interrelated economic activities. He further opines that the model was originally developed to analyze and measure the connections between the various producing and consuming sectors within a national economy. The model, therefore, explains the interrelationship between various sectors and the structural relationship within each sector.

The theory further stressed on the inter-relationship that exist between industries in an economy as input in one industry is regarded as output of another industry and the development of the theory was focused towards evaluating and measuring the relationship that exist between major sectors of an economy. The theory proposed that all sectors of an economy are mutually dependent on one another as the output produced from one sector makes up the input of another sector in the same economy. The input-output theory is significant as it provides information for the planning authority to be able to determine the effect of a change in one sector on all other sectors of the economy. The planner is able to see clearly the implications of raising the level of investment in a particular sector given the requirements of inter-sectorial balancing and can then plan accordingly. The theory is also relevant for national economic planning.

Endogenous Growth Theory

The new endogenous theory was developed by Arrow (1962), Romer (1986) and Lucas (1988) as a reaction to omissions and deficiencies in the Solow–Swan neoclassical growth model. The endogenous theory is a new theory which explains the long run growth rate of an economy on the basis of the endogenous factors as against exogenous factors of the neoclassical growth theory. Jhingan (2011) explains that the endogenous growth theory, rather than criticizing the neo-classical theory simply extended it by introducing technical progress in the model.

The main argument of the endogenous growth theory is that, if a country utilizes its limited resources through the accumulation of knowledge and capital it can experience growth positively.

Having carefully examined the aforementioned theories, this study is hinged on the endogenous growth theory and the input-output theory of economic growth since they encourage creation of new ideas, modification, investment and utilization of resources within the disaggregated sectors of an economy. The endogenous growth theory is also relevant to the study because it can be applied extensively to more sectors, countries or more finely disaggregated factor inputs. The inputs when used effectively given innovation and investment could result to the needed outputs which can invariably contribute positively and significantly to economic growth.

2.3 Empirical Literature.

Bodam et.al (2024) investigate the impact of disaggregated agricultural subsectors' output on Nigeria's economic growth spanning the period between 1981-2022. The study uses Auto Regressive Distributed Lagged (ARDL) model and its findings indicate that forest output, livestock, output and crop output have long-run and significant impacts on GDP while the fish output exerts an insignificant but positive impact on GDP. The study also reveals that crop output exerts significant positive impact on GDP in the short run. Employing the Fully Modified Ordinary Least Squares (FMOLS) method, Christopher et. al (2024) examined the

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impact of agricultural productivity on economic growth in Nigeria between 1990 to 2023 using Ordinary Least Squares (OLS) to analyze the data. Findings reveal a positive and significant impact between RGDP and agricultural productivity especially crop production.

Ibbih and Nwogu (2024) in their study examined the impact of crop production on economic growth in Nigeria from 1981 to 2018. The study used Johansen cointegration test to analyze the data and the result of the study reveals a positive and significant relationship between the various crops produced and Nigeria's economic growth in the long run long-run except for cotton production. However, the findings further reveal that groundnut production contributes significantly to the output of the Nigerian economy in the short- run.

Uzonwanne et. al (2023) used time series data ranging from 1981 to 2021 to analyze the impact of livestock production on the gross domestic product (GDP) in the Nigeria. The study employed auto-redistributed lag model (ARDL) techniques to analyze the data. The result of the study shows that livestock production has positive and significant impact on economic growth in Nigeria.

Ehghebolo (2023) investigates the impact of the four agricultural sub-sectors on economic growth in Nigeria. Employing the Eagle-Granger Co-integration and Error Correction Model (ECM) for the time series data for the period between 1981 - 2021, the results show that in the long and short run periods, crop production, forestry, and fishery positively and significantly impact on real gross domestic product in Nigeria. Livestock, on the other hand, negatively but insignificantly impact on real gross domestic product.

Akpan (2022) utilized per capita GDP as a proxy for economic growth and autoregressive regressive distributed lag (ARDL) testing bound model on time series data that covers the period between 1981 to 2020 to study the relationship between the agricultural sub-sectors production and the growth of the Nigerian economy. The result shows that crop subsector output, livestock subsector output, forestry and fishery subsector outputs have significant positive relationships with the per capita GDP.

The study carried out by Akpan et. al (2021) provides an empirical information on the relationship between agricultural subsector's production and the growth of Nigeria's economy. The study uses regression based on the autoregressive distributed lag (ARDL) testing bound model approach to cointegration. The result of the data analysis indicates that the agricultural subsectors have a positive impact thereby significantly influence production movement of the subsectors per capita GDP of Nigeria in both the short and long-run period.

Suren and Cecil (2021) examine the economic impact of cattle sector in Canada using descriptive statistics and analyzing data obtained from the regional province using input-output model. Findings reveal that cattle sector makes huge contribution to both the regional and the national economy in Canada, but not without the help of other sectors. This implies that interdependence between various sectors could lead to a spiral effect and a continuous increase in GDP.

Ilyas et. al (2021) analyze the Impact of Livestock and Fisheries on Economic Growth in Pakistan from 1987 to 2017 using Johansen co-integration and the Vector-Correction Model. The results show that in the short run, livestock and fisheries have a negative and insignificant effect on economic growth. The significant negative value of the Vector Error indicates that the parameters will adjust and return to equilibrium in the long run. However, the co-integration results show a positive relationship between the sub-sectors of agriculture and economic growth.

Nyamekye et. al (2021) empirically examine the impact of agricultural sector on the economic growth of Ghana, using time series data from 1984 to 2018. The study uses Cointegration test to analyze the data which shows non-existence of long-run relationship between the overall GDP and agricultural output. However, agricultural output has a positive and significant impact on the overall GDP growth of Ghana.

Han and Lin (2021) study the patterns of agricultural diversification in China and its Policy implications for agricultural modernization using descriptive statistics to analyze the data. The results show a cyclic tendency of agricultural diversification along with an increase in per capita GDP, implying a positive relationship in the sub-sectors of agriculture and GDP.

Adewole et.al (2020) investigate how agriculture, external debt, importation and exportation affect the economic growth of Nigeria over the period between 1979 -2019 using an annual time series data. A structural vector autoregressive model was used in determining the short and long run pattern. The result of the study shows that there exists a positive relationship between agriculture and real gross domestic product (RGDP) and Nigerian economy. Importation has a positive impact at the initial period while on the long period exhibits a negative impact on RGDP. External debt also shows a negative impact at the initial period while on the long run exhibit a negative on RGDP. The result from the structural variance decomposition shows that agriculture and importation contribute more variability to RGDP in Nigeria.

Ella and Emehs (2020) study the determinants of macroeconomic variables that affect agricultural production in Nigeria covering the period between 1986 - 2016. Ordinary Least Squares (OLS) regression technique was used to analyze the data and the result shows that corn, rice, millet and palm oil output have positive relationship with GDP. Although the individual test reveals that corn has no significant impact while millet has a significant impact on GDP within the period under study.

Rotawa et.al (2019) carry out an economic analysis of agriculture, forestry and fisheries on the economic development of Nigeria using descriptive statistics to analyze the data. The study finds that fisheries and forestry sectors have continued to increase the GDP in Nigeria in the last three decades. This shows a positive impact on the Nigeria's economic growth.

Isah and Umar (2019) use the Johansen cointegration test to analyze the impact of agricultural subsectors on the Nigeria's economic growth between 1981 - 2016. The crop, livestock and fisheries subsectors have significant impact on the real GDP with the exception of the forestry subsector.

3.0 Methodology

Model Specification

Structural Vector Auto-regressive (SVAR) Model

This study uses the structural vector autoregressive (SVAR) model. The SVAR is a multivariate, linear representation of a vector of observables on its own lags.

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In this study, the SVAR model was adapted from the work of Adewole, Bodunwa, and Akinyanju (2020) with modifications.

The functional form is specified as follows:

RGDP = f (AGR, EXTD, EXP, IMP)…….. (1)

Where,

RGDP = Real GDP
AGR = Agriculture
EXTD = External Debt
EXP = Exportation of Goods And
SERVICES IMP = importation of goods and services

$RGDP = \beta_0 + \beta_1 AGR + \beta_2 EXP + \beta_3 IMP + \beta_4 EXTD + B\varepsilon_t$ …… (2)

The following variables were removed: external debt, exportation and importation of goods and services and replaced with livestock, crop, fisheries and forestry outputs. Therefore

Xt = [GDP, CRPP, LSTP, FSHR, FRT] …… (3)

Where:

GDP = gross domestic product; CRPP = output of crop production; LSTP = output of livestock
FSHR = output of fishery; FRTP = output of forestry.

The structural specification of SVAR is given as;

$$Ay_t = A_1^s y_{t-1} + \cdots + A_p^s y_{t-p} + C^s x_t + Bu_t \quad \text{…… (4)}$$

Where;

A, A_s^t and C^s are structural coefficients and μ_t is the unobserved structural innovation.

It is easy to see the relationship between the SVAR specification and the corresponding reduced-form VAR. Assuming that A is invertible, we then have:

$$y_t = A^{-1} A^s{}_1 y_{t-1} + \ldots\ldots + A^{-1} A^s{}_p y_{t-p} + A^{-1} C^s X_t + A^{-1} B_{ut}$$

$$= A_1 y_{t-1} + \ldots + A_p y_{t-p} + C X_t + \mathcal{E}_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

SVAR has certain advantages over the unrestricted VAR. One advantage of the SVAR over the unrestricted VAR is that it enables us to specify the theoretically established nature of the contemporaneous links between variables, rather than the recursive nature of the Cholesky decomposition that the unrestricted VAR imposes.

Augmented Phillips–Ouliaris (APO) Co-integration Test

The augmented Phillips and Ouliaris (APO) co-integration, developed by Phillips and Ouliaris (1990), was used in this study. Phillips and Ouliaris (1990) show that residual-based unit root tests applied to the estimated co-integrating residuals do not have the usual Dickey–Fuller distributions under the null hypothesis of no co-integration.

Pre-Estimation Statistics

Kwiatkoski-Phillips-Smith-Shin (KPSS) Unit Root Tests

Kwiatkoski-Phillips-Smith-Shin (KPSS) was used to determine the stationarity of the data set to be used in this study. To establish stationarity at different frequencies of data, the dependent variable Yt must not have unit root at the different frequencies of the data.

The choice of KPSS was informed by the imperatives of avoiding the problem of high size distortion associated which are common in ADF and PP unit root test options. Zivot and Andrews (1992) noted that the Augmented Dickey Fuller (ADF) and Philips Peron (PP) tests suffer from high size distortion while KPSS is robust in the midst of serial correlation and heteroskedasticity. Unlike ADF and PP unit root tests, where the null hypothesis is non-stationary, the null hypothesis for KPSS is that the process is stationary. Thus, rejection of the null hypothesis occurs if KPSS > critical value (CV).

Sources of Data

The study uses annual time series secondary data on Gross Domestic Product (GDP), Output of crop Production (CRPP), Output of livestock Production (LSTP), and Output of fishery Production (FSHR) and output of Forestry Production (FRTP). Data on all the variables cover the period of 1981 to 2023 and were be obtained from the Central Bank of Nigeria statistical bulletin (2024).

4.0 Data Analysis and Discussion of Results

Table 1: Descriptive Statistics

	CRPP	FRSP	FSHR	GDP	LSTP
Mean	7189.277	95.43144	374.7198	41580.45	681.3191
Median	1270.629	36.22867	68.80796	11383.66	271.0261
Std. Dev.	9794.725	110.3009	709.1230	52753.83	780.8864
Skewness	1.442935	0.828817	2.568018	1.061013	0.835416
Kurtosis	4.213109	2.154541	9.029849	2.737677	2.153384
Jarque-Bera	1.755812	4.203745	112.4055	3.191155	4.285956
Probability	0.113154	0.074965	0.000000	0.416646	0.543154
Observations	43	43	43	43	43

Source: computation of output using Eviews12

Table 1 shows the result of descriptive statistics for all the variables of the study. From Table 1, the mean represents the average of the observations for each variable while the standard deviation (Std. Dev.) measures the degree of deviation from each

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sample mean. Skewness quantifies the degree of asymmetry in the series, and zero (0) skew indicates that the distribution is symmetric around its mean. It can be positively skewed, with the long right tail containing more high values, or negatively skewed, with the long left tail containing more low values. The kurtosis of a series distribution measures its peak or flatness. It has a normal distribution of 0 to 3, which is mesokurtic, but more than three is leptokurtic, which is a positive or peaked curve, and platykurtic, which is a negative or flattering curve. Jacque-Bera measures the normal distribution of the individual data. The probability value is expected to be greater than 0.1 (5% level of significance) before the distribution is normally distributed. Finally, the number of values in the series is the observation.

In Table 1, all the variables have mean values that are as small as possible when compared with their units of measurement which is in millions, thereby suggesting a robust distribution with *FRSP* having the lowest value (95.43144) and GDP having the highest mean value (41580.45). Also, the corresponding standard deviation for all the variables, except for *GDP* and CRPP, are quite small implying that the estimated variables are not far from their actual mean. Hence, the errors due to the estimation are likely to be negligible.

However, the kurtosis of the distribution of the variables, except for CRPP and FSHR, are within the normal distribution of 0 to 3, which is mesokurtic, while the skewness of the distribution indicate that all the estimated variables are asymmetry as they navigate around the value of 1 rather than zero (0). However, the Jarque-Bera distribution indicates that all the variables are individually normally distributed, except for FSHR.

Table 2: Result KPSS Unit Root Test of Stationarity;
H_0: The variables are stationary

Variables	KPSS Levels	KPSS 1st Difference	Remarks
GDP	0.8967	0.3765 [ ]**	**I (1)**
CRPP	0.6262	0.1348 [ ]**	**I (1)**
FRSP	0.7357	0.3546 [ ]**	**I (1)**
FSHR	0.5738	0.3390 [ ]**	**I (1)**
LSTP	0.7050	0.1512 [ ]**	**I (1)**
KPSS Critical Value at 5% = 0.463000			

Source: Computation output Using E-views 12

[ ] indicate that the test is conducted form general to specific

*** denote significant at 5%*

Table 2 shows the result of KPSS test conducted to ascertain the stationarity status of the variables of the study. The results show that, at levels, all the variables are not stationary because their calculated values are greater than their critical values at 5%. However, at first difference, all the variables are stationary because their calculated values are less than their critical values at 5%. Hence, all the variables of the study are said to be integrated of the order of one [I (1)]. Thus, the presence of a unit root in the variables suggests that it is necessary to test for a co-integration relationship.

Table 3: Optimal Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1217.2300	NA	1.14e+21	62.6788	62.8921	62.7554
1	-1019.5000	334.6328*	1.65e+17*	53.8205	55.1001	54.2796*
2	997.0136	32.2879	2.00e+17	53.9494*	56.2954*	54.7912
3	-980.9300	18.9642	3.78e+17	54.4069	57.8193	55.6313

Source: Computation Output Using E-views 12

The optimal lag is presented in Table 3 with the maximum of 3 lags. Optimal lags are important for every econometric analysis because when the lags are too high it will lead to the problem of multicollinearity which renders the individual coefficient insignificant and when the lag is too low, it will expose the estimate to serial correlation (Gujirati, 2013). However, AIC and SC selected 2 lags while the other information criteria selected 1 lag. However, the study takes 2 lags as suggested by AIC and SC because 2 is neither too high nor too low.

Table 4: Result of Augmented Phillips-Oularis Co-integration Test

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
CRPP	-3.148951	0.5411	-15.07578	0.6104
FRSP	-2.631937	0.7743	-14.78006	0.6284
FSHR	-3.035817	0.5957	-14.70520	0.6330
GDP	-2.760891	0.7217	-12.28466	0.7725
LSTP	-4.875645	0.0394	-32.08754	0.0239

Source: Computation Output Using E-views 12

Table 4 shows the result of augmented Phillips-Ouliaris Co-integration test. The result shows that the probability values of tau-statistic and z-statistic for LSTP is significant at 5 per cent. This suggests the existence of one co-integrating vector in the system, implying that the null hypothesis of absence of co-integration is rejected. In other words, there is long-run equilibrium and co-movement among the variables of the study. The implication of this finding is that one of the variables in the pair could be predicted from the others in the series. The result further provides empirical evidence that CRPP, FRSP, FSHR, and GDP, as used in this study, do not represent separate or independent policy variables; instead, they form part of one integrated system in the economy with a common deterministic process. Therefore,

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policymakers, while using one of the variables in policy decisions, must also consider its impact on the other variables.

However, Granger and Weiss (1983) demonstrate that if there are set of variables, and many of them are co-integrated, with only one or very few not co-integrated, they could be regarded as being generated by an Error Correction Model, called the Granger representation Theorem. However, if there are set of variables, and many of them are not co-integrated, with only one or very few being co-integrated, they could be regarded as being generated by vector autoregressive or structural vector autoregressive process. Hence, it becomes necessary to model a structural vector autoregressive process that describes the dynamic path of the variables of this study.

Table 5: Result of Structural VAR
C (1) = CRPP; C (2) = FRSP; C (3) = FSHR; C (4) = LSTP

Dependent variable: GDP

Structural VAR is just-identified				
Model: Ae = Bu where E[uu']=I				
A =				
1	0	0	0	0
C(1)	1	0	0	0
C(2)	C(5)	1	0	0
C(3)	C(6)	C(8)	1	0
C(4)	C(7)	C(9)	C(10)	1
B =				
C(11)	0	0	0	0
0	C(12)	0	0	0
0	0	C(13)	0	0
0	0	0	C(14)	0
0	0	0	0	C(15)
Output	**Coefficients**	**Std Error**	**t - values**	**Probability**
C(1)	0.497500	0.067844	7.332999	0.0000
C(2)	0.000736	0.000137	5.385714	0.0000
C(3)	0.005426	0.001338	4.056659	0.0000
C(4)	-0.004028	0.002532	-1.590842	0.1116

Source: Computation Output Using E-views 12

Table 5 shows the estimated result for structural vector autoregressive (SVAR) model. The SVAR was estimated at lag two, as suggested by the selection criteria The statistical properties of the SVAR such as variance and correlation matrices are reported in part A and part B of Table 5. The calculated variance and correlation matrices of the residuals suggest that the null hypothesis that the co-variances are jointly zero is rejected at 5 percent level. This implies there are contemporaneous correlations among the variables that would have been ignored by the unrestricted VAR. Hence, the choice of structural vector autoregressive model in this study is justified.

Results of the estimated SVAR indicate that all the estimated coefficients, except LSTP, are highly statistically significant. The result shows that the output of crop production (CRPP) has a positive impact on Nigeria's GDP over the period of study. A one per cent increase in CRPP increases GDP by about 0.498 per cent. The positive relationship between CRPP and GDP in Nigeria is, perhaps, consistent with economic theory. Crop Production is the major driver of the agricultural sector in Nigeria, accounting for 86.85% of the overall nominal value of the sector in the first quarter of 2023. This finding agrees with the findings of Oluwatoyose and Shri (2014) and Ehghebolo (2023).

Similarly, output of forestry production (FRSP) has a positive impact on Nigeria's GDP over the period of study. A one per cent increase in FRSP increases GDP by about 0.0007 per cent. The positive relationship between FRSP and GDP conforms to the apriori expectation. This is because forest industry is a major source of economic growth and employment. In many countries, this sector contributes more than 10% to GDP and provides formal and informal employment. In Nigeria, forestry provides employment for an estimated 40 to 60 million people in the country, and it is a source of land for industrial and commodity crops, as well as raw materials for construction, furniture, paper and pulp. This finding agrees with the findings of Awoyemi, Afolabi and Akomolafe (2017) and Jelilov and Ozden (2017).

Similarly, the output of fishery has a positive impact on Nigeria's GDP over the period of study. A one per cent increase in FSHR increases GDP by about 0.0054 per cent. The positive relationship between FSHR and GDP conforms to the apriori expectation. This is because increase in fish production can also create employment opportunities in the fishing industry, which can help to boost the country's economy and household income generation. This will indirectly enhances food security in the economy. This finding agrees with the result of Rotawa et. Al (2019).

However, the output of livestock production has a negative impact on GDP. The result shows that one per cent increase in LSTP decreases GDP by about 0.0040 per cent. The negative relationship between LSTP and GDP does not conforms to the apriori expectation. Also, the result is not statistically significant. This finding disagrees with the result of Oluwatoyese and Shri (2014). The negative impact of LSTP on Nigeria's GDP could be attributed to many factors such as water pollution stemming from the generation of large amounts of concentrated waste which ultimately leads to the runoff of nitrogen and phosphorus (Tilman et al., 2002); air pollution from odors, ammonia, nitrous oxide, and particles (Galyean et al., 2022), with consequences for human health.

Table 6: Post estimation Diagnostics

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	14.82270	Prob. F(2,36)	0.0000
Obs*R-squared	19.41876	Prob. Chi-Square(2)	0.0001
Heteroskedasticity Test: ARCH			
F-statistic	3.071703	Prob. F(2,38)	0.0580
Obs*R-squared	5.705941	Prob. Chi-Square(2)	0.0577

Figure 1: Normality test

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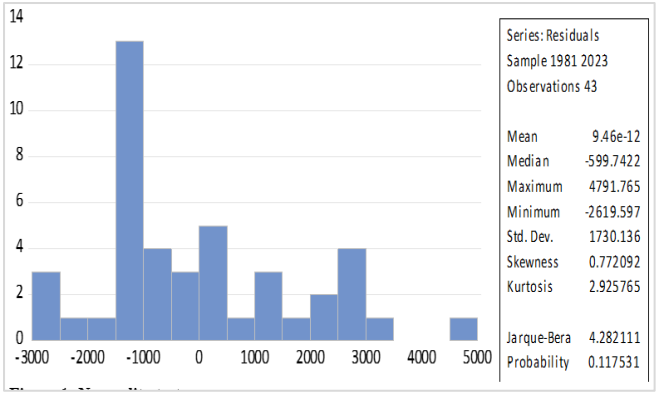
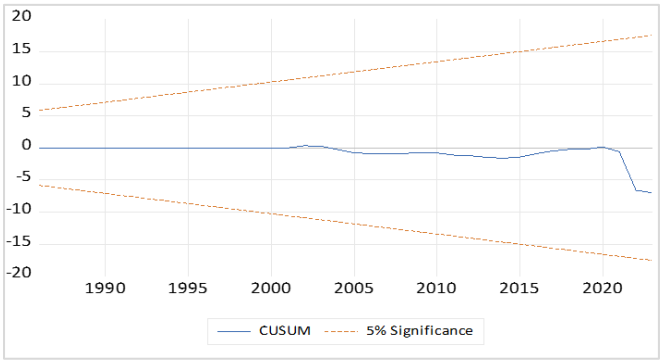


Figure 2: Stability test



Source: Computation Output Using E-views 12

Table 6 shows the results of post-estimation statistics. The serial correlation LM test has a probability value of 0.0000 which is less than 0.05. This suggests the presence of autocorrelation in the residuals of the model. However, the probability value for the test of heteroskedasticity is 0.58 and is greater than 0.050, implying the absence of heteroskedasticity in the model. Furthermore, the normality plot reported in Figure 1 shows that the Jarque-Bera value and its probability are 4.28 and 0.117 respectively. Hence, the error terms of the data used in the study are normally distributed. The result also passed the test of stability. This is because the CUSUM plot reported in Figure 2 does not cross either of the 5% critical lines. Therefore, it could be concluded that the estimated parameters for the study are stable for the period under investigation.

5.0 Conclusion and Recommendations

The study uses annual time series data covering the period between 1981 – 2023 to examine the effect of agricultural subsector outputs on economic growth in Nigeria: SVAR model approach. Findings of the study shows that Nigeria's GDP increased due to the increase output of crop production, forestry and fishery, but falls as the of livestock production decreases. The decrease in the output of livestock production can also be attributed to farmers and hearders clashes since farmers' livestock farmers/hearders struggle for limited land and restricted vegetation to rear livestock. Therefore, the study concludes that the output of crop production, forestry and fishery have positive and significant impact on Nigeria's economic growth within the period of investigation. The implication of this finding is that Nigeria's economic growth is driven mainly by crop production fishery and forestry but not by livestock rearing. Based on the findings, the study recommends the following:

i. Government should address the challenges often faced by crop farmers such as inadequate irrigation, lack of access to technology, poor soil condition (soil infertility), farmers-herders clashes, insecurity in Nigeria in order to provide a conducive environment for farming and increased output.
ii. Government at the federal and state level should implement agricultural programmes on disease prevention and control such as robust vaccination programmes, affordable veterinary services and biosecurity to enhance animal health and increase output.
iii. Government should also implement sustainable farming practices such as rotational grazing, intensive livestock production, minimize environmental pollution through proper waste management for increased productivity.
iv. Government prohibition on deforestation and indiscriminate bush burning should be properly implemented to avoid incessant felling of trees and destruction of important forest plant species.
v. Government should subsidize fish feeds, drugs among others for fish farmers.

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