Fiscal Deficit Determinants and Agriculture Sector Output in Nigeria 1993 - 2023

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Abstract

Fiscal deficit determinants are instruments possessed by most economies of the world and has overtime been used to regulate agriculture sector output. A stable fiscal deficit determinant should be able to bring a permanent improvement to a fiscal situation especially in the productive sector of an economy and is also marked by robust tax amnesties, adequate public expenditure, favourable interest rate and a balanced exchange rate. However, these determinants of fiscal deficit have shown a high degree of volatility in most developing economies. As a result, the agriculture sector of developing economies like Nigeria has become susceptible to a fluctuating, stagnant or low output. The progress in the agriculture sector output could place the economy on a sustained path of non-oil growth if the agricultural value chain is improved significantly. Considering the importance of agriculture sector output, this study examined fiscal deficit determinants and agriculture sector output in Nigeria from the period of 1993-2023 by employing the ex post facto research design while the Autoregressive Distributive Lag (ARDL) model was used as a technique to estimate all relevant variables. The primary objective of the study was to assess how key fiscal deficit determinants—Government Revenue (GR), Government Expenditure (GE), Exchange Rate (EXCHR), Interest Rate (INTR) and Inflation Rate (INFR)—influenced Agriculture Sector Output (AO), an essential measure of economic growth. The study revealed that fiscal deficit determinants which include total government revenue, total government expenditure, exchange rate, interest rate and inflation rate have a statistically significant influence on agriculture sector output in the short run. While, in the long run there is a positive and statistically insignificant relationship between total government revenue and agriculture sector output other variables were found to be negative and statistically insignificant in the long run. The volatility in exchange rate led to an increase in the cost of agricultural production, leading to a rise in cost of agricultural products, hence affecting agriculture sector output negatively both in the short run and long run. Based on these findings, the study recommended that the Central Bank of Nigeria (CBN) should implement policies to stabilize the exchange rate thereby increasing government earnings through export duties and taxations. Federal Ministry of Finance should allocate more funds to agriculture in the annual budget and optimize government expenditure in the agricultural sector by conducting cost-benefit analyses of agricultural projects. The study also recommended that the Central Bank of Nigeria should implement policies to stabilize the exchange rate and support export-oriented agriculture through incentives and financing. Additionally, the study proposed that the Bank of Agriculture stabilizes interest rate on agricultural production, processing and marketing so as to expand lending to the agricultural sector and provide technical assistance to farmers. Finally, the study asks the Federal Ministry of Agriculture and Rural Development promotes the use of improved agricultural technologies as this would increase productivity and reduce production costs also regulate and stabilize the prices of agricultural commodities while discouraging inflation to a large extent.

Keywords: *Fuel prices, Economic growth, inflation, Economic activity*

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Background to the Study

Agricultural sector output as a concept, has been severally linked globally to production theory. This concept could however, be related to a combination of various factors instrumental in production, undergoing transformation process to bring about output. Agriculture sector output entails the total output from livestock; forestry, fishery and crop production. It is derived from the basic definition of agriculture as the cultivation and breeding of animals, plants and fungi for food, fiber, bio-fuel, medicinal plants and other products used to sustain and enhance human life (Organisation for Economic Co-operation and Development (OECD) (2020). In some oil producing countries like Nigeria, Cameroon, Cote d'Ivoire, agriculture accounts for half or more of the working population and also contributes to Gross Domestic Products (World Development Report, 2018). Agriculture accounts for 4% of global gross domestic product (GDP) and in some least developing countries, it can account for more than 25% of GDP (World Bank, 2024). Though the share of the global economy may seem comparatively small, it remains central to the lives of a great many people. In 2012, of the world's 7.1 billion people, an estimated 1.3 billion (19 percent) were directly engaged in farming, but agriculture (including the relatively small hunting/fishing and forestry sectors) represented just 2.8 percent of overall income (World Bank 2012).

Nigeria's agricultural sector is a productive sector that brings about economic growth, when proper attention is given to it through ample investments.in reality, the sector has experienced several shocks which has affected its productivity negatively. Shocks such as exchange rate volatility, constant flooding, desertification of crop and grazing land, extremist insurgencies, and conflicts between herdsmen and local farmers, also food processing continues to suffer from inadequate financing and infrastructure. These challenges have exacerbated food inflation. Food inflation rose to 23.75% in December 2022. There were wide-ranging price increases across items such as cereals, yam, meat, fish, and fruits. Additional upward pressure is caused by devaluation of the local currency (naira) which has been devalued multiple times since 2021. Also, higher fuel prices and insecurity have also contributed to rising food prices as transportation costs increase (National Bureau of Statistics, 2022).

Within the Nigerian context, there are several determinants of fiscal deficits which the government has overtime used and still uses to positively influence agriculture sector output. Some of these determinants include, Government Revenue (GR), Government Expenditure (GE), Exchange Rate (EXCHR), Interest Rate (INTR) and Inflation Rate (INFR) among many other determinants (Raymond, *et al* 2023). Government Revenue and expenditure serves as the benchmark that guides all productive activity in the various sectors of the economy. This is a cycle as more funding is captured in the annual budget; it boosts the performance of the agricultural sector and leads to increased productivity and encourages exportation of agricultural products. Exportation leads to increased revenue for the government. Categorically, an increase in government expenditure would enhance agricultural productivity and economic growth (Abbas *et al.,* (2016).

The relationship between Exchange Rate (EXCHR) and Agricultural Output (AO) is crucial. The volatility of exchange rate would have an influence on the prices of agricultural products. According to Musa 2020, when the exchange rate (defined as the rate of change between two national currencies) rises, the aggregate price level will rise. Then, when the exchange rate falls, i.e., when the domestic currency appreciates, it is anticipated that general prices will decline. Additionally, Nnoli 2023, describes one of the most dramatic occurrences in Nigeria during the last several decades as the depreciation of the naira in 1986 as a consequence of the adoption of a structural adjustment programme (SAP). Siting CBN (2020), he states that restructuring the economy's production base with a focus on agricultural export output was a key goal of the SAP. Foreign currency measures that caused the effective exchange rate to depreciate cumulatively were expected to improve domestic output by accelerating local agriculture export prices.

Interest Rate (INTR) has always been a basic instrument in curbing inflation and stabilizing the economy's currency. The CBN adjusts the interest rate to influence borrowing costs and credit availability to farmers. For instance, in response to the COVID-19 pandemic, the CBN reduced the MPR from 13.5% to 11.5% in September 2020 to stimulate economic recovery (CBN, 2020). In spite of the above, enormous efforts and policies set up by the government which aims at optimizing agricultural productivity, repositioning agriculture to its prime place of providing food for human consumption and raw materials for industrial needs, as well as generating foreign exchange earnings, and employment for the population, the rate of productivity by the agriculture sector in the country has been declining. Between the first quarter of 2020 and the fourth quarter of 2021, credit allocated by the bank to private agriculture in Nigeria experienced an increase. Specifically, the credit received by this sector grew in 2020 from about 853 billion Nigerian naira (NGN) to over four trillion NGN in 2021. The challenge lies in achieving a sustainable balance between the fiscal deficit determinants and agriculture sector output (National Bureau of Statistics, 2022).

Given the foregoing above, this paper investigated fiscal deficit determinants and agriculture sector output in Nigeria from 1993 to 2023. Thus, the paper answered the following questions; what is the impact of total government revenue on agriculture sector output in Nigeria? What is the impact of government expenditure on agriculture sector output in Nigeria? To what extent has exchange rate impacted agriculture sector output in Nigeria? How has interest rate impacted agriculture sector output in Nigeria? and What is the impact of inflation rate on agriculture sector output in Nigeria?

Furthermore, the paper is subdivided into five sections. Following Introduction is section 2 which covers Literature Review and Theoretical Framework. A short overview of the literature has been provided in this section, which includes empirical evidence, and the concepts of fiscal deficit determinants and agriculture sector output. The empirical findings from the data analysis are presented in Sections Three and Four. Section five summarizes the paper with its conclusions and recommendations.

Literature Review
Fiscal Deficit Determinants
Fiscal deficits determinants are technically referred to as those tools used by the government through a central financial authority to regulate fiscal deficits in an economy. They are measured based on the definition adopted. Adegboyo *et al.,* (2020) report that there are different definitions of fiscal deficit determinants by different scholars. For International Monetary Fund, fiscal deficit determinants can be defined mathematically as {(revenue + grants)– (expenditure on goods and services + transfers) – (lending –repayments)}. Fiscal deficit determinants are packages of instruments of fiscal policy. It involves the use of government spending, taxation, and borrowing to influence the pattern of economic activities and also the level and growth of aggregate demand, output, and employment. Furthermore, Raymond, *et al.,* 2023, states some of the factors identified by various authors as the determinants of fiscal deficit over the years include Inflation, other sources of government revenue, development of local financial markets, interest rate, inflation rate and government's propensity to borrow.

In this paper, the fiscal deficit determinants under observation include; Total Government Revenue, Total Government Expenditure, Exchange Rate, Interest Rate and Inflation Rate. Government revenues are government income. The main sources of revenue in most economies are typically taxes and social contributions, with some income from charges for services provided by the state. Government revenue is a crucial factor that determines fiscal deficits. This is so because, a decrease in government revenue combined with increased demand on government spending can lead to fiscal deficits thereby affecting agriculture output (Eluyela 2019).

Government expenditure is one of the main engines in the public financial system of one's country, especially in budgeting, as it allows programs and services to be known to its stakeholders. It is indeed a key component of national finance and fiscal policy (Jay-Pee, 2021). Government expenditure is a determinant of fiscal deficits. This is so because fiscal deficit would occur when there is an increase in government expenditure on social welfare programs and other measures to support the economy accompanied by a simultaneous decrease in government revenue which is caused by lowered tax revenue. The exchange rate is the rate at which an economy's currency is exchanged for other countries' currency. Diala *et al.,* (2016), observed that the performance and profitability of industries and companies that depend mainly on importation are considerably affected by the exchange rate of the Naira against major currencies of the world. The exchange rate is very useful in valuing agricultural production and equipment, changes in exchange rates, nonetheless, will affect the output of the agricultural sector.

Interest rate is an economic variable that depicts the cost of acquiring credit for investment in an economy. Raymond *et al.,* (2023), opined that through the effect on nominal interest rates, and increasing debt servicing there will be an increase in a budget deficit. Theoretically, agriculture output would most likely be affected by interest rates, this is because agriculture is a real sector of the economy where investors borrow to enhance agricultural productivity.

Inflation rate can simply be defined as the level at which a general and continuous increase in prices of goods and services is experienced in an economy. For some economies, it could be mere fluctuations, while for others; it is a consistent and continuous rise in price (Jeremiah and Emmanuel, 2015). Inflation rate as a determinant of fiscal deficits as regards agriculture output affects it negatively. This is seen when there is a seeming increase in the cost of materials and services needed for agricultural production, this leads to an increase in spending both by the government and investors. The higher the expenditure, the higher the prices of agriculture output. A feasible example is the recent alarming cost of food items in the market. If government spending rises faster than tax revenues, this can result in fiscal deficits. Over all, Ryan et al., (2022) posits that the excessive use of any particular mode of financing the fiscal deficits has adverse macroeconomic consequences: namely, printing money to finance fiscal deficit can create inflationary pressures in the economy, bond financing of fiscal deficit can lead to a rise in interest rates and this can turn out to crowd out private investment and the external financing of fiscal deficit can spill over to balance of payment crisis and appreciation of exchange rates and in turn cyclical debt.

Agriculture Sector Output
Akinboyo (2018) defined agriculture as the science of making use of land to raise plants and animals. It is the simplification of nature's food webs and rechanneling of energy for human, plant and animal consumption. In like manner, Awolaja *et al.,* (2018) referred to agriculture sector output as the quantity and value of agricultural products produced by the agriculture sector in a country for domestic consumption and export. Nigeria is endowed with an enormous variegated agro-ecological condition, wide arable land, water and labour, which makes agriculture one of the most important sectors of the Nigerian economy. It is particularly important in terms of its export revenue earnings, employment generation and its value addition to gross domestic product (GDP). Summarily, the Organisation for Economic Co-operation and Development (OECD) (2020) describes agriculture output as one which entails the total output from livestock; forestry, fishery and crop production.

Empirical Review
Ezu and Nwobia (2023), examined the effect of monetary and fiscal policies of the government on the industrial and agricultural growth of Nigerian economy from 1981 to 2020. Hypotheses were subjected to statistical test using regression analysis which established a functional relationship between the independent variables and dependent variable. The result of the finding showed that exchange rate has a strong positive impact on the economy. The research recommends amongst others the need for a strategic step to be taken by the policy maker in formulation and implementation of right investment-induced policies and programmes that would enhance the nation's potentials.

With the aim of measuring the growth rate of fiscal deficit financing in the country, Raymond *et al,* (2023), examined the macroeconomic factors determining the massive growth in the country's fiscal deficit financing from 1981 to 2020. The study adopted the Pairwise Granger Causality and the Two Stage Least Squares (2SLS) approaches for data analysis. The study results in a show that economic growth is positive and significant in affecting domestic deficit

financing. On the other hand, financial development, debt service and trade openness are negative and significant in affecting fiscal deficit financing. The research study recommends more prudent utilization of the funds from domestic deficit financing on productive projects to the economy.

Benjamin *et al,* (2022) focused on the determinants of government agricultural expenditure in the long and short run from 1999-2020 using Vector Error Correction Model approach. In the long run, inflation and private investment were the significant and important variables that determine agricultural expenditure. The study recommends friendly policies to curtail inflation, conducive environment to catalyze private investment and stimulation of public investment to boost agricultural growth. Similarly, James & Uduak (2022) study of government expenditure on agriculture and agricultural output in Nigeria from 1980-2018, the main analytical tool used was the Autoregressive Distributed Lag model. The findings revealed that government expenditure on Agriculture both capital and recurrent had significant relationship with agricultural output for the period under study. These findings imply that Policies that promote increase in government recurrent and capital expenditures on agriculture will increase agricultural output.

The effect of agricultural output, fiscal deficit and inflation rate on national savings in Pakistan for the period of 1973-2020, was investigated by Ghulam & Hajra (2021). To address the research objective, autoregressive distributed lag (ARDL) model and error correction model (ECM) were applied for co-integration and short-run dynamics respectively. The outcomes of the study endorsed that agricultural output and rate of interest have a significant positive impact on national savings whereas inflation rate and fiscal deficit negatively affect national savings both in the short and long run. It is recommended that effort be made to improve the productivity of the agricultural sector and curtail deficit and inflation rates to increase savings in the country.

Nwikina *et al.,* (2021), explored the effectiveness of deficit financing as a veritable instrument to enhance economic development in Nigeria from 1986 to 2019. They adopted the ARDL model and granger causality techniques in their analysis. The result shows that budget deficit and government expenditure exert positive but marginal influence on economic development in Nigeria. Furthermore, a unidirectional causality was discovered, indicating that deficit financing through government expenditure promotes economic development in Nigeria. Asukwo *et al.,* (2020), examined the effect of Commercial Banks Lending on the Growth of the Agricultural Sector in Nigeria. Their findings revealed a significant relationship between loans and advances, interest rate, liquidity, bank asset on agricultural output. They concluded that a significant relationship existed between loans and advances and agricultural output. Also, liquidity and asset had significant relationship on agricultural output. Commercial bank finances agricultural projects in Nigeria and federal government directs commercial banks to allocate a part of their lending to agriculture at reduced rates.

Nuhu *et al.,* (2020), investigated how government spending on agriculture has affected agricultural output in Nigeria from 1981 to 2019. Using the Autoregressive Distributed Lag

approach, the results revealed the presence of a long-run link between government agricultural expenditure and agricultural output in Nigeria. The findings demonstrate that government recurrent investment in agriculture had a favourable but statistically insignificant impact on agricultural product in Nigeria in the long and short run. Abubakar (2019), using regression analysis, tried to find connection between lending interest rate and agricultural sector activity in Nigeria for real and nominal values from the beginning of the fourth republic (1999) to 2016. Tests showed that interest rate had a strong significant negative relationship with agricultural sector activity. Conclusively, the study held that the negative relationship shown between interest rate and agricultural activity confirmed that lower interest rates encouraged movement in this sector and higher interest rates correlated with stunted growth in the sector.

Ademola (2019), empirically assessed the impact of agricultural financing on the growth of Nigerian economy. The study revealed that the size and amount of credit available to agriculture of the total amount of credit granted by the government has not been able to impact on the level of economic growth in Nigeria. This was proven in the negative influence on the level of output in Nigeria. Sharma & Mittal (2019), explored the impact of fiscal deficit on economic growth in India throughout 1985 and 2015. The study employed the ARDL model and Granger Causality test. The result of ARDL revealed that fiscal deficit had negatively affected economic growth while Granger causality test showed that fiscal deficit affects economic growth through a mechanism channel i.e. a change in the value of fiscal deficit will cause the inflation rate to change which in turn leads to changes in the exchange rate as well as interest rate concurrently and they consequently influence economic growth.
Lawal et al., (2018) examined the impact of fiscal policy on agricultural output in Nigeria using the most recent official data from 1981 to 2019. The study used annual time series data obtained from CBN annual statistical bulletin NCS and FIRS which was found to be stationary at the order of I 1 and I 0. The study found evidence of both short and long run relationship between the variables VAO GEX IDMF and ACGSF using both Johansen co integration and ARDL Bounds test.

Osmond *et, al.* (2018) investigated the impact of Government expenditure on agricultural growth in Nigeria from 1981 to 2017. Relevant data for the study were sourced from the Statistical Bulletin of the Central Bank of Nigeria and the World Bank Development indicators (WDI). The Engle-Granger two-step procedure to co-integration was deployed to estimate the model of the study. The finding of the study revealed that government expenditure on agriculture in Nigeria has negative impact on agricultural growth in the short run. In addition, Sebastian *et al.,* (2018) examined the effect of government agricultural expenditure on agricultural output in Nigeria using time series data from 1981 to 2014. Their findings revealed a positive and significant relationship between government agricultural expenditure (financing) and its output, although a weak one, as rightly shown in the regression analysis.

Aina & Omojola (2017) examined the effect of government expenditure on agricultural sector performance in Nigeria between 1980 and 2013, using secondary data from the Central

Bank of Nigeria Statistical bulletin and applying the econometrics method of Ordinary Least Square and Error Correlation Mechanism (ECM) methods. A relationship was established between government expenditure on agriculture and agricultural production output. The short run analysis showed a significant and positive relationship between government expenditure on agriculture and agricultural production output, while the long run dynamic result showed that the coefficient of government expenditure on agriculture variable is rightly signed as well as the check variables (interest and exchange rates).

Theoretical Framework

The research on "Fiscal Deficit Determinants and Agriculture Sector Output in Nigeria (1993 – 2023) is anchored on several economic theories and theoretical frameworks that provide a foundation for understanding the dynamics between fiscal deficit determinants and agriculture sector output. This is so, given the crucial role of fiscal deficit determinants in enhancing agriculture sector output and sustainable development of the economy. These theoretical reviews delve into important theoretical perspectives that buttresses the paper's research questions. This paper therefore anchored on the theory of unbalanced growth by Hirschman (1958). Hirschman proposed a positive relationship between deficit financing and sectorial growth. According to Hirschman, investing all the financial injections in strategically selected industries or sectors of the economy will lead to new investment opportunities and so pave the way for further economic development. Unbalancing the economy with Directly Productive Sectors (DPS) is one of the recommendations of Hirschman which stands for investment in Productive sectors in view to maximize profit, generate income and create employment opportunities and keep abreast the SOCs in the future hence stimulate and balances the economic. He supported his theory with a simple model which is stated as:

$$Q_{(t)} = \psi\lambda_{(t)} \tag{1}$$

Where $Y_{(t)}$ = output of DSP's at time t, ψ = input factors (labour, capital and technology etc) required in direct productive activities that will facilitate sectoral output, $\lambda_{(t)}$ = deficit financing at time t. the functional relationship between output of DSP's, input factors and deficit financing is stated thus;

$$Q(t) = f(L, K, \lambda) \tag{2}$$

Hirschman further decomposed government expenditure into financial injection such as internally generated, borrowed funds and financial aids but fail to show the mathematical expression. However, equation 2 was modified for the purpose of the present investigation.

Methodology

This paper employed the *ex-post facto* research design in obtaining, analyzing and interpreting the data and adopted the secondary method of data collection and the data were sourced from the Central Bank of Nigeria (CBN). Autoregressive Distributed Lagged (ARDL) was used for the estimation and this procedure was developed by Pesaran and Shin (1999) which was later

expanded by Pesaran, Shin, and Smith (2001) and the procedure allows the researcher to use variables that are not integrated in the same order. Also, the error correction model (ECM) will be used to establish the short-run and long-run causal relations between fiscal deficit determinants and agriculture sector output in Nigeria.

Model Specification
The theoretical background of the investigation on Hirscman's unbalanced growth model proposed a positive relationship between deficit financing and growth which is stated thus;

$$Y_t = \omega \lambda_t \tag{3}$$

In other words, to examine the impact of fiscal deficit determinants on agriculture sector output, it is important to formulate the correlation that exists between the existing variables. However multiple regression model was used to reveal impact of fiscal deficit determinants on agricultural output through the modification of Hirscman's unbalanced growth model and the adoption of Hafeez and Sajid (2021) where they examined the relationship among agricultural output, inflation rate, fiscal deficit and national savings and the functional expression is written as:

$$LNNS = f(ADR, LNAGR, FSD, INF, GDP, RI) \tag{4}$$

Where: LNNS is natural log of national savings, ADR is age dependency ratio, LNAGR is natural log of value-added of agricultural output, FSD is fiscal deficit as a percentage of GDP, INF is inflation rate measured by growth rate in consumer price index (CPI), GDP is growth rate of GDP and RI is one- year Govt. bond yield. Base on equation 4 which is modified to align with the research objective and to establish the functional relationship between fiscal deficit determinants and agricultural output.

$$AO_t = f(TGR_t, TGE_t, EXCHR_t, INTR_t, INFR_t) \tag{5}$$

Where: AO_t is the agriculture sector output at time t, TGR_t is the total government revenue at time t, TGE_t is the total government expenditure at time t, $EXCHR_t$ is the exchange rate at time t, $INTR_t$ Interest rate at time t and $INFR_t$ is the Inflation rate at time t. This paper specifies equation 5 in a stochastic (linear regression) form to give;

$$AO_t = \varphi_0 + \varphi_1 TGR_t + \varphi_2 TGE_t + \varphi_3 EXCHR_t + \varphi_4 INTR_t + \varphi_5 INFR_t + \varepsilon_t \tag{6}$$

φ_0 is the intercept or autonomous parameter estimates or constant parameter, while φ_1, φ_2, φ_3, φ_4 and φ_5 are parameters to be estimated and ε_t is the Error term.

This paper used the Autoregressive Distributed Lag (ARDL) model. This technique was developed by Pesaran and Shin (1999) and later extended by Pesaran, Shin and Smith (2001)

An Autoregressive Distributed Lag (ARDL) model is an Ordinary Least Square (OLS) based model which is applicable for both non-stationary time series as well as for times series with mixed order of integration. A Dynamic Error Correction Model (ECM) can be derived from ARDL through a simple linear transformation.

Variables Description and Measurements
Table 1 presents specific summary of variables description, measurements and economic apriori expectations.

Table 1: Description of the variable used for the model

Code	Description	Measurement	Variable	Economic *A priori* Expectations
AO	Agriculture Sector output	The total output from crop production, forestry, fisheries and livestock. within the scope of study.	Dependent	+ or -
TGR	Total Government Revenue.	The total government revenue in Nigeria will be measured in Billion Naira.	Independent	+
TGE	Total Government Expenditure	The total government revenue in Nigeria will be measured in Billion Naira.	Independent	+
EXCHR	Exchange Rate	The total exchange rate within the scope of study will be measured in percentage %.	Independent	+
INTR	Interest Rate	The total interest rate within the scope of study will be measured in percentage %.	Independent	-
INFR	Inflation Rate	The total inflation rate within the scope of study will be measured in percentage %.	Independent	-

Source*:* Researcher's compilation, 2024

Results and Discussions
Descriptive Statistics
Table 2 presents the paper's descriptive statistics

Table 2: Summary of Descriptive Statistics

	AO	TGR	TGE	EXCHR	INTR	INFR
Mean	9404.617	3530.920	4817.309	183.2257	17.44258	18.57419
Median	11645.00	3493.580	3240.820	132.8880	17.26000	12.90000
Maximum	23654.00	8657.000	14378.00	638.0000	24.85000	72.80000
Minimum	1.180000	1098.240	160.8900	21.88443	11.50000	5.400000
Std. Dev.	8102.969	1774.621	4899.480	151.3315	2.787894	16.48371
Skewness	-0.093017	0.517690	0.856797	1.244199	0.053577	2.104637
Kurtosis	1.455415	3.509891	2.161643	4.018634	3.709505	6.366530
Jarque-Bera	3.126289	1.720503	4.700689	9.338410	0.665053	37.52486
Probability	0.209476	0.423056	0.095336	0.009380	0.717110	0.000000
Sum	198.3410	248.7175	240.8175	5679.995	540.7200	575.8000
Sum Sq. Dev.	515.1264	10.28201	57.57752	687036.4	233.1706	8151.379
Observations	31	31	31	31	31	31

Source: Researcher's Computation (2024) Employing E-Views 12

The descriptive statistics presented in Table 2 for the variables used shows that the mean value of AO is the highest at 9404.617, while INTR has the lowest mean value at 17.44258. The result also shows that all the variables have positive median values. AO possesses the highest maximum value of 23654.00, while TGR has the highest minimum value of 1098.240. AO has the highest standard deviation with a value of 8102.969, while INTR has the least standard deviation with a value of 2.787894. All variables (except AO) have positive skewness showing that the mass of the distribution is concentrated on the left. AO and TGE show kurtosis which are less than 3, meaning they are platykurtic (fat or short-tailed) and they have fewer extreme outliers than the normal distribution. The Jarque-Bera test also shows that all the variables (except EXCHR and INFR) are normally distributed as their probability values are greater than 0.05 at 5% level of significance.

Table 3: Summary of Unit Root Test Result

Variable	ADF Test Statistics	5% critical value	P-Value	Order of integration
AO	-4.933684	-3.574244	0.0023	I(1)
TGR	-8.043224	-3.574244	0.0000	I(1)
TGE	-3.653769	-3.622033	0.0479	I(1)
EXCHR	-5.075962	-3.574244	0.0016	I(1)
INTR	-4.366785	-3.595026	0.0098	I(0)
INFR	-3.017019	-2.967767	0.0450	I(0)

Source: Researcher's Computation (2024) Employing E-Views 12

The estimated result in table 3 found AO, TGR, TGE and EXCHR to be stationary at first difference (i.e. integrated of order one), while INTR and INFR were found to be stationary at levels (i.e. integrated of order zero) as shown by their corresponding value of ADF test statistics which are all greater than the critical values and all were found to be statistically significant as their p-values were less than 0.05.

Table 4: Summary of Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	9.187858	10%	2.75	3.79
K	5	5%	3.12	4.25
		2.5%	3.49	4.67
		1%	3.93	5.23

Source: Researcher's Computation (2024) Employing E-Views 12

From table 4, the computed F-statistics value of 9.187858 was found to be greater than the upper bound critical value of 4.25 at 5% confidence level. On the basis of this, the null hypothesis of no long-run relationship is rejected at the 5% significance level and it can be inferred that the variables are co-integrated, and as such, there is a long-run equilibrium relationship between the variables of interest.

Table 5: ARDL-ECM (Short-run)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	26.70084	2.335477	11.43271	0.0003
@TREND	2.548706	0.236588	10.77276	0.0004
D(LOGAO(-1))	-0.627958	0.078908	-7.958105	0.0014
D(LOGTGR)	8.384905	1.068401	7.848090	0.0014
D(LOGTGR(-1))	0.296446	0.943030	0.314354	0.7690
D(LOGTGR(-2))	4.194986	0.922806	4.545904	0.0105
D(LOGTGE)	-2.929329	0.678594	-4.316761	0.0125
D(LOGTGE(-1))	24.94406	2.376583	10.49577	0.0005
D(LOGTGE(-2))	9.840882	1.058455	9.297402	0.0007
D(EXCHR)	0.070345	0.007009	10.03569	0.0006
D(EXCHR(-1))	0.131287	0.013157	9.978449	0.0006
D(EXCHR(-2))	0.088561	0.013015	6.804396	0.0024
D(INTR)	-1.232631	0.103640	-11.89342	0.0003
D(INTR(-1))	0.844243	0.140890	5.992201	0.0039
D(INTR(-2))	-0.252601	0.052863	-4.778430	0.0088
D(INFR)	0.093641	0.012737	7.351687	0.0018
D(INFR(-1))	0.208473	0.020626	10.10709	0.0005
D(INFR(-2))	0.094592	0.014871	6.360808	0.0031
CointEq(-1)*	-0.662367	0.059474	-11.13715	0.0004
R-squared	0.966943	Mean dependent var		0.344971
Adjusted R-squared	0.900829	S.D. dependent var		1.265300
F-statistic	14.62545	Durbin-Watson stat		3.297563
Prob(F-statistic)	0.000141			

Source: Researcher's Computation (2024) Employing E-Views 12

As shown in table 5, the lagged coefficient of the Error Correction Term (ECT-1) is negative, less than one and statistically significant at 5% (as shown by -0.662367; and a p-value of

0.0004). This means that once there is disequilibrium in the system, it will take an average (annual) speed of 66.2367% to restore to the long-run relationship. The coefficient of determination (R-squared) of 0.966943 showed that in the short-run, the explanatory variables accounted for 96.69% changes in LOGAO, while the remaining 3.31% was as a result of other factors affecting LOGAO that were not captured in the model.

Table 6: Summary of ARDL Long-run

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTGR	47.76098	29.31889	1.629017	0.1786
LOGTGE	-47.97778	37.55849	-1.277415	0.2706
EXCHR	-0.069009	0.040466	-1.705365	0.1633
INTR	-5.802549	3.315146	-1.750315	0.1550
INFR	-0.326008	0.237898	-1.370369	0.2424

Source: Researcher's Computation (2023) Employing E-Views 12

The result shows that LOGTGE, EXCHR, INTR and INFR have a negative and insignificant impact on LOGAO in Nigeria. On the other hand, both LOGTGE has a positive and insignificant impact on LOGAO in Nigeria.

Post Estimation Tests
Table 7: Summary of Post-Estimation Tests

Test	F-Stat /Coefficient	Prob.
Normality Test	3.5424	0.1701
Serial Correlation (LM)	3.9101	0.2037
Heteroskedasticity	0.7987	0.6828

Source: Researcher's Computation (2024) Employing E-Views 12

From the table above, the Jarque-Bera normality test shows that the residuals for this model are normally distributed at 5% level of significance, given that the probability value (0.1701) is greater than 0.05. On the other hand, the serial correlation (LM) test shows that the model is free from serial or autocorrelation as shown by the probability value of 0.2037 which is greater than 0.05. Lastly, the result of the heteroscedasticity test shows that there is no evidence of heteroscedasticity in the model as evidenced by the probability value of 0.6828 which is greater than 0.05.

Table 8: Summary of Wald Test Result

Variable	Test Statistic	Value	Df	Probability
TGR	Chi-square	22.87666	3	0.0000
TGE	Chi-square	11.00182	3	0.0117
EXCHR	Chi-square	20.48960	3	0.0001
INTR	Chi-square	17.02025	3	0.0007
INFR	Chi-square	21.62773	3	0.0001

Source: Researcher's Computation (2024)

The table 8 reveals the Chi-square co-efficient value for Total Government Revenue, Total Government Expenditure, Exchange Rate, Interest Rate and Inflation Rate with their associated probability value of less than 0.05, the null hypothesis for each variable is rejected. It therefore shows that Total Government Revenue, Total Government Expenditure, Exchange Rate, Interest Rate and Inflation Rate have a significant impact on agriculture sector output in Nigeria.

Discussion of Findings
The overall findings from the analyses showed that total government revenue, total government expenditure, exchange rate, interest rate and inflation rate have a statistically significant impact on agricultural sector output in Nigeria. Detailed findings based on each of the research questions, objectives, hypotheses and the model specified are discussed hereunder to show the fiscal determinants of agricultural sector output in Nigeria.

The short-run result in appendix 5; Table 4.6, revealed that once there was disequilibrium in this model, it would take an average speed to restore or adjust the system back to equilibrium from short-run to the long-run. Also, the R-squared result reflected the fitness of the model, as it revealed that taxation accounted for the variation in agriculture sector output, while the remaining percentage accounted for other factors affecting the agriculture sector output that were not captured in the model. This implied that in the short-run, there is a significant relationship between the fiscal determinants and agricultural sector output in Nigeria. This positive relationship implies that fiscal deficit determinants, are often used as a tool for enhancing productivity, they are associated with stronger adequacy within policy formation. This finding aligns with the work of James & Uduak (2022) who observed that government expenditure on Agriculture both capital and recurrent had significant relationship with agricultural output for the period under study. Whereas Commercial Bank loan to Agriculture and Agricultural Credit Guarantee scheme fund both are not significant in the determination of Agricultural output in Nigeria for the period under study. It further reveals that the most important variables that affect agricultural output in Nigeria in ascending order of importance are government recurrent expenditure on agriculture and government capital expenditure on agriculture. Similarly, Ghulam & Hajra (2021), in their study on Pakistan national savings, found out that agricultural output and rate of interest have a significant positive impact on national savings whereas inflation rate and fiscal deficit negatively affect national savings in the short – run.

In contrast, the long-run result in appendix 4 Table 7, depicted a positive and statistically insignificant relationship between total government revenue and agricultural sector output in Nigeria. This reflected a positive LOGTGR coefficient value and its associated p-value. This revealed that a 1% change in LOGTGR, on the average, increased LOGAO within the sample period. This was in conformity to the theoretical prediction of Hirschman (1958), who proposed economic growth through financial injection in some sectors which he called Directly Productive Sectors (DPS). According to Hirschman, investing all the financial injections in strategically selected industries or sectors of the economy will lead to new investment opportunities and so pave the way for further economic development. He further

decomposed government revenue into financial injection such as internally generated, borrowed funds and financial aids. This implies that an increase in government revenue will help stabilize and enhance productivity in the agriculture sector.

However, the coefficient of total government expenditure (LOGTGE) was found to be negative and statistically insignificant in the long-run, as reflected by the negative coefficient value and p-value. This showed that a 1% increase in LOGTGE, on the average, decreased LOGAO within the study period. This finding aligns with the work of Nuhu *et. al 2020,* whose findings demonstrate that government recurrent investment in agriculture had a favourable but statistically insignificant impact on agricultural product in Nigeria in the long and short run. They concluded that the government should promote the consumption of locally grown farm products to reduce the resources spent on agricultural items, which erode consumer's purchasing power owing to imported inflation. In agreement to these findings, Utpal and Dahul (2018), in their study revealed that in the long run, the effect of public expenditure through agriculture and allied activities, on agricultural output was significantly negative. However, these findings contrast with the results of Oladipo *et.,al* (2020), which shows that government capital expenditure on agriculture has a positive and significant impact on agricultural output, while Government recurrent expenditure on agriculture also has a positive impact on agricultural output in Nigeria.

Similarly, exchange rate (EXCHR) exerted a negative relationship with agricultural sector output in Nigeria and it was found to be statistically insignificant in the long-run. This was evident by the negative coefficient value and associated p-value, implying that a 1% change in EXCHR, on the average, decreased LOGAO during the sample period. This finding aligns with the study of Gatawa and Mahmud (2019). The long-run results revealed that exchange rate has statistically significant negative impact on agricultural exports volume which is contrary to normal expectations. Relatively, the study of Victor *et al,* 2019, revealed that there was no significant impact of exchange rate on Agricultural Gross Domestic Production (AGDP) in Nigeria and recommended that Nigeria"s economy should be diversified to enable the non-oil sector become significant foreign exchange earners.

Findings from the study also revealed that interest rate (INTR) has a negative coefficient value and p-value, thereby showing a negative long-run relationship with LOGAO. This also conforms to the theoretical prediction that high interest rate discourages investment in agriculture. In agreement with the study of Alzoub and Kasasbeh: (2019), Interest rate effect is in line with the finance theory as higher rates lead to lower growth. Additionally, this outcome contrasts with the study of Ademola (2019), which revealed that the real interest rates and the total commercial bank loans to agriculture showed positive impact on the output level of agriculture in Nigeria. Lastly, the coefficient of inflation rate (INFR) was found to be negative and statistically insignificant in the long-run, as reflected by the negative coefficient value and p-value presented. This showed that a 1% increase in INFR, on the average, decreased LOGAO approximately. This is consistent with the a priori expectation that high inflation rate leads to high alarming cost of agricultural output. Also aligning with the study of Sharma & Mittal (2019), revealing that changes in inflation rate leads to changes in the

exchange rate as well as interest rate concurrently and they consequently influence sectoral growth in an economy.

Conclusion and Recommendations

This paper investigated fiscal deficit determinants and agriculture sector output in Nigeria from the period of 1993 to 2023, by employing Autoregressive Distributed Lag (ARDL) technique. The positive and negative relationships observed indicated that fiscal deficit determinants significantly contribute to the overall agriculture sector output growth of the nation. The result revealed that all the variables used have a statistically significant influence on agriculture sector output in the short run. However, in the long run there is a positive and statistically insignificant relationship between total government revenue and agriculture sector output, while other variables were found to be negative and statistically insignificant. Summarily, fiscal deficit determinants enhanced agriculture sector output in Nigeria in the short run. However, volatility in these determinants appears to affect agriculture sector output negatively both in the short run and long run.

Based on the analysis of the findings, the following policy recommendations are suggested:
Given the positive and statistically insignificant relationship between Total Government Revenue and Agriculture Sector Output, it is recommended that the Central Bank of Nigeria (CBN) should implement policies to stabilize the exchange rate thereby increasing government earnings through export duties and taxations. The Federal Ministry of Agriculture and Rural Development should work towards an increased government revenue through enhancing agricultural productivity by optimizing government expenditure in the agricultural sector.

Regarding the Total Government Expenditure, the study's findings indicate that while this determinant is crucial in influencing agriculture sector output positively, its negative impact on Agriculture Sector Output depicts that the current level of government expenditure is below par. The Federal Ministry of Finance, Budget, and National Planning should increase government expenditure on agriculture by allocating more funds to agriculture in the annual budget and also, develop detailed proposals for increased funding and ensure effective utilization of allocated funds.

The negative and insignificant relationship between Exchange Rate and Agriculture Sector Output, suggests that the Central Bank of Nigeria (CBN) should implement policies to stabilize the exchange rate and support export-oriented agriculture thereby providing incentives and finance to farmers. However, the CBN should exercise caution when adjusting the exchange rate, ensuring that increases are calibrated to avoid any damage on balance of trade that could stifle economic growth. The negative relationship between Interest Rate and Agriculture Sector Output requires a wholistic and regulatory approach to bring about a negotiable interest rate on agricultural loans. The Bank of Agriculture is encouraged to stabilize interest rate on agricultural production, processing and marketing so as to expand lending to the agricultural sector and provide technical assistance to farmers. Finally, the relationship between Inflation Rate and Agriculture Sector Output which is negative suggests

that high inflation rate leads to high alarming cost of agricultural output. The Federal Ministry of Agriculture and Rural Development should promote the use of improved agricultural technologies to increase productivity and reduce production costs as this will regulate and stabilize the prices of agricultural commodities and at the same time discourage inflation to a large extent.

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Appendix 1: Data for Regression

YEAR	TGR	TGE	INTR	AO	EXCHR	INFR
1993	1174.87	191.23	18.32	1.80	22.07	44.6
1994	1216.64	160.89	21.00	1.18	22.00	57.1
1995	1098.24	248.77	20.18	1.51	21.90	57.0
1996	1176.95	337.22	19.74	1.59	21.88	72.8
1997	1209.98	428.22	13.54	2.06	21.89	29.3
1998	1278.54	487.11	18.29	2.89	21.89	8.5
1999	1435.90	947.69	21.32	5.90	92.34	9.9
2000	1589.27	701.05	17.98	6.34	101.70	6.6
2001	2117.97	1018.00	18.29	7.06	111.23	6.9
2002	3109.38	1018.18	24.85	9.99	120.58	18.9
2003	3314.51	1225.99	20.71	7.54	129.22	12.9
2004	3325.16	1426.20	19.18	11.26	132.89	14.0
2005	3689.06	1822.10	17.95	9516	131.27	14.9
2006	3417.58	1938.00	17.26	10222	128.65	17.9
2007	3493.58	2450.90	16.94	10958	125.81	8.2
2008	3219.64	3240.82	15.14	11645	118.55	5.4
2009	4125.60	3452.99	18.99	12330	148.90	11.6
2010	4434.07	4194.58	17.59	13048	150.30	12.5
2011	4628.47	4712.06	16.02	13429	153.86	13.7
2012	5007.65	4605.39	16.79	14329	157.50	10.8
2013	4805.64	5185.32	16.72	14750	157.31	12.2
2014	4714.56	4587.39	16.55	15380	158.55	8.5
2015	3741.75	4988.86	16.85	15952	192.44	8.0
2016	3307.46	9760.71	16.87	16607	253.49	9.0
2017	4027.94	11990.56	16.90	17179	305.79	15.7
2018	5320.89	12820.00	14.80	17544	362.00	16.5
2019	5261.91	12522.60	13.50	17958	405.00	12.1
2020	4952.22	12094.75	11.50	18348	410.00	11.4
2021	6397.10	12559.00	11.70	18738	415.00	13.2
2022	4209.00	14378.00	16.50	19897	448.00	16.9
2023	8657.00	13842.00	18.75	23654	638.00	18.8

Central Bank of Nigeria (CBN) statistical bulletin (2023), National Bureau of Statistic (NBS) (2023), and World Bank's World Development Indicators (WDI) databank (2023).
TGR= Total Government Revenue; TGE = Total Government Expenditure; EXCHR = Exchange Rate; INTR = Interest Rate; INFR = Inflation Rate; AO = Agricultural Output