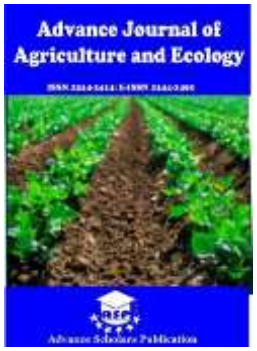
Advance Journal of Agriculture and Ecology
Adv. J. Agric. & Eco.
Volume: 10; Issue: 1
January-2025
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 7.12
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



PUBLIC AGRICULTURAL EXPENDITURE AS A DRIVER OF SUSTAINABLE FOOD SUPPLY IN NIGERIA

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Keyword: *Agricultural Expenditure, food supply, and public farmers' insurance expenditure*

Abstract: *Public agricultural expenditure is critical to food security through its influence on food supply. In Nigeria, a country where agriculture is a key sector, understanding the relationship between government spending and food availability is essential to addressing hunger and malnutrition. This study evaluates the impact of Public Agricultural Expenditure on Sustainable Food Supply in Nigeria from 2003 to 2023, using an agent-based modeling approach grounded in the Cobb-Douglas production function. The findings reveal a positive but statistically insignificant relationship between recurrent expenditure (REX) and food supply, with a coefficient of 0.037260 and a t-statistic of 0.203983, below the critical value (2.07) at the 5% significance level. Conversely, capital expenditure (CEX) has a significant positive impact, with a coefficient of 0.263123, a t-statistic of 4.975569, and a probability value of 0.0028. Farmers' Insurance Expenditure (FIE), however, shows a negative but statistically insignificant relationship with food supply, with a coefficient of -0.063527 and a t-statistic of -0.871761. Capital expenditure enhances food supply and underscores the need to reassess the policy role of Farmers' Insurance Expenditure.*

INTRODUCTION

Food, a fundamental human need, is essential for survival, health, and productivity. As Smith, Alderman, and Aduayom (2021) highlight, it forms the bedrock of human and economic development. However, hunger, a pervasive issue in developing nations, challenges this foundation.

Hunger, characterized by an uneasy sensation and exhaustion due to insufficient food intake, is a significant global problem. The Sustainable Development Goals (SDGs) have underscored

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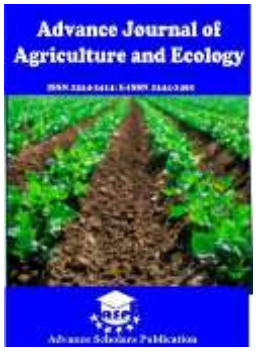

the urgency of addressing hunger. To combat this issue, researchers and policymakers have focused on identifying the factors that influence food production, supply, availability, and accessibility. Kijima, Matsumoto, and Yamao (2019) have made substantial contributions to this field.

Food insecurity, often a consequence of poverty, can have far-reaching implications. The World Bank (2018) defines absolute poverty as the inability to meet basic physiological needs, including adequate food consumption. Hunger can lead to poor health, reduced energy levels, cognitive impairment, and further poverty, creating a vicious cycle. In many impoverished nations, food constitutes a significant portion of household expenditures. Consequently, rising food prices can severely limit access to food and other essential goods, exacerbating poverty. The World Bank (2018) estimates that food price increases have pushed millions of people in developing countries into deeper poverty.

Increased food supply can positively impact nutrition, health, and productivity. By reducing reliance on food imports, nations can conserve foreign exchange. Research by Diao and Dorosh (2023) and Saheed (2022) demonstrates that agricultural growth can enhance food production, reduce poverty, and stimulate overall economic growth, ultimately contributing to a sustainable food supply. Many West African societies recognize the intimate connection between hunger and poverty, emphasizing the importance of addressing food insecurity as a means of alleviating poverty. Government investment in agriculture plays a crucial role in achieving this goal.

Despite a slight increase in average dietary calorie intake over the past two decades, a significant portion of the Nigerian population remains food insecure. According to the Food and Agriculture Organization (FAO, 2018) and Olusegun, Dare, George, and Adebayo (2019), over 40% of Nigerians still consume less than the minimum dietary calorie requirement. While per capita calorie intake has fluctuated, it's clear that significant challenges persist.

Agriculture, a cornerstone of Nigeria's economy, has been neglected by successive governments. This neglect has led to declining domestic food production, creating a widening gap between supply and demand. Consequently, the country has become increasingly reliant on food imports, straining its economy. The United Nations (UN, 2023) projects that Nigeria will become the world's third most populous country by 2050, further exacerbating the food security challenge.

Various factors have contributed to Nigeria's food insecurity, including economic instability, climate change, and conflict. Droughts, flooding, and ongoing farmer-herder clashes have disrupted agricultural production and displaced many farmers. Additionally, urbanization and shifts in dietary preferences have further strained food supply. The relationship between public expenditure on agriculture and food

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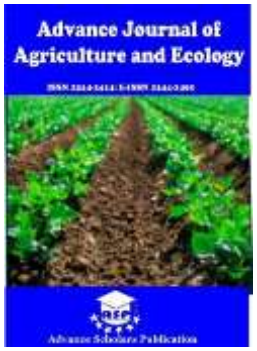

security in Nigeria is complex. Okoro (2022), Chude and Chude (2022), and Ajide (2023) argue that despite increased public spending, agricultural production and food supply have not improved significantly. A significant portion of the population continues to live in poverty, struggling to afford adequate food. To address these challenges, Nigeria must prioritize agricultural development and food security in its policy agenda. This includes investing in infrastructure, research and development, and supporting small-scale farmers. By adopting sustainable agricultural practices and promoting food diversification, Nigeria can improve food security and reduce poverty. However, this study aims to investigate effect of public expenditure on agricultural production and food supply in Nigeria. The objectives of the study are therefore: (i)To examine the effect of public recurrent agricultural expenditure on food supply in Nigeria. (ii). To analyse the impact of public capital agricultural expenditure on food supply in Nigeria. (iii). To assess the influence of public expenditure on farmers' insurance on food supply in Nigeria. The rest of the study is presented as follows: section 2 presents the literature review involving the theoretical underpinning of the study and the review of empirical studies. Section 3 focuses on material and methods which captures the data and model specifications. Section 4 analyses the data and divulges the findings, while sections 5 conclude the paper and highlights the recommendations.

REVIEW OF RELATED LITERATURE

Public Agricultural Expenditure

Public agricultural expenditure is a critical tool for governments to stimulate agricultural growth and development, particularly in developing countries. By investing in infrastructure, research, and support services, governments can significantly enhance agricultural productivity and food security. As Loto (2023) suggests, these investments not only boost agricultural output but also contribute to broader socioeconomic development, including improved infrastructure, health, education, and housing. The Maputo Declaration of 2021, endorsed by the New Partnership for Africa's Development (NEPAD, 2023), calls on African governments to allocate at least 10% of their national budgets to agriculture. This ambitious goal underscores the importance of public investment in the sector. Public agricultural expenditure encompasses a wide range of activities, including infrastructure development, research and development, subsidies, and extension services. Infrastructure investments, such as irrigation systems and rural roads, can significantly improve agricultural productivity and market access. According to Fan and Rao (2023), these investments can reduce transportation costs and enhance farmers' ability to reach markets. Research and development (R&D) plays a crucial role in driving agricultural innovation. Public funding for R&D enables the development of high-yielding crop varieties, pest-resistant

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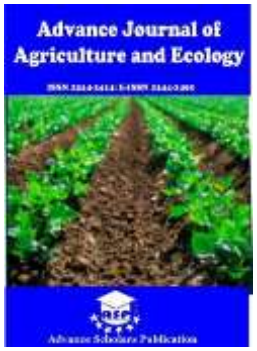

plants, and sustainable farming practices. The World Bank (2022) emphasizes the significant return on investment from public agricultural R&D, particularly in developing countries.

Public Agricultural Recurrent Expenditure

Recurrent expenditure refers to ongoing costs that governments incur annually to maintain essential services. In the agricultural sector, this includes expenses like salaries for agricultural staff, maintenance of infrastructure, and operational costs of research institutions. These recurring costs are vital for the smooth functioning of the agricultural sector. Lacy (2019) defines recurrent expenditure as the funding allocated to ongoing government services, such as salaries, administrative costs, and welfare programs. Kweka and Morrisey (2022) highlight the potential negative impact of excessive recurrent expenditure, which can crowd out private investment and hinder long-term economic growth. Modebe, Regina, Onwumere, and Imo (2021) further emphasize the importance of recurrent expenditure in maintaining essential services, including the provision of agricultural extension services and subsidies.

Investing in human capital is a critical component of agricultural development. Ayele et al. (2020) underscore the importance of skilled agricultural workers in enhancing productivity and innovation. By providing competitive salaries and training opportunities, governments can attract and retain talented individuals in the sector.

Public Agricultural Capital Expenditure

Public agricultural capital expenditure involves long-term investments in infrastructure and assets that contribute to the sector's growth and development. These investments include the construction of irrigation systems, rural roads, storage facilities, and research institutions. Irrigation infrastructure is essential for improving water management and increasing agricultural productivity, especially in regions with limited rainfall. Rosegrant et al. (2019) highlight the significant impact of irrigation investments on agricultural output and food security. Similarly, well-developed rural road networks facilitate market access, reduce transportation costs, and minimize post-harvest losses. Fan and Chan-Kang (2021) emphasize the positive correlation between rural infrastructure investment and poverty reduction. Adequate storage facilities are crucial for reducing post-harvest losses, maintaining the quality of agricultural products, and stabilizing prices. The Food and Agriculture Organization (FAO, 2022) underscores the importance of storage infrastructure in ensuring food security and increasing farmers' incomes. Investments in agricultural research and development are vital for technological innovation and sustainable agricultural practices. Alston et al. (2020) highlight the high returns on investment in agricultural research.

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By supporting research, governments can develop new crop varieties, improve pest and disease control, and promote sustainable farming methods.

Public Farmers' Insurance

Governments can support farmers by providing insurance schemes to mitigate risks like crop failure, natural disasters, and market fluctuations. Public farmers' insurance aims to stabilize farmers' incomes, encourage agricultural investment, and contribute to rural development.

These insurance schemes can take various forms, including crop insurance, livestock insurance, weather index insurance, and revenue insurance. Crop insurance protects farmers from losses due to adverse weather conditions, pests, and diseases. Livestock insurance safeguards against losses from animal diseases, accidents, or natural disasters. Weather index insurance provides payouts based on predefined weather indicators, while revenue insurance covers income losses due to price fluctuations.

Food Supply

A robust food supply system is essential for ensuring food security and economic well-being. It involves a complex chain of activities, from production to consumption. Production is the foundation of the food supply system. Farmers use various methods, including traditional and modern agricultural techniques, to cultivate crops and raise livestock. Technological advancements and sustainable farming practices play a crucial role in enhancing productivity.

Processing involves transforming raw agricultural products into consumable goods. This includes activities like cleaning, packaging, and preserving food.

Distribution is the process of transporting food from production sites to markets. Efficient logistics and transportation networks are essential for minimizing food loss and ensuring timely delivery.

Retail is the final stage where consumers purchase food. Supermarkets, local markets, and online platforms are common retail outlets. Consumer preferences and purchasing power influence the demand for various food products.

Reutlinger (2019) defines food supply as the availability of sufficient food for all people at all times to maintain a healthy and active lifestyle. Adeoti (2021) highlights the importance of food production, availability, and accessibility in ensuring food security. Davies (2018) emphasizes the need for food to be both safe and sufficient to meet the nutritional needs of the population.

THEORETICAL FRAMEWORK

The Cobb-Douglas Production Function

To investigate the relationship between public agricultural expenditure and food supply, the study employs the Cobb-Douglas production function. This widely-used economic model expresses output as a function of input factors. In our case, we will use the following modified

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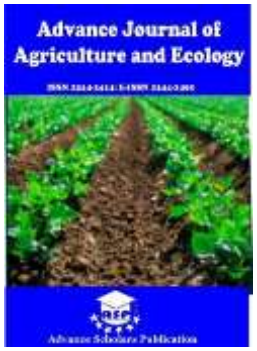

Cobb-Douglas function:

$$Q = A E^{\alpha} L^{\beta} K^{\gamma}$$

Where:

- **Q** is the total food supply
- **A** is total factor productivity
- **E** is public agricultural expenditure
- **L** is labor input
- **K** is capital input

• **α**, **β**, and **γ** are the output elasticities of public expenditure, labor, and capital, respectively.

This model allows us to examine how increases in public agricultural expenditure, labor, and capital impact food production. By estimating the values of the parameters α, β, and γ, we can quantify the contribution of each factor to food supply.

EMPIRICAL REVIEW

Igwe and Esonwume (2020) set out to examine the effect of agricultural expenditure on food security within a specific state in Nigeria, focusing on its role in improving agricultural output and addressing food supply challenges. The study sought to understand how targeted government spending in agriculture can impact local food security. The study found a positive correlation between agricultural expenditure and food security within the state. However, the impact was moderate, and the scope was limited to a single state, meaning that the generalizability of the results to other regions in Nigeria is questionable. Despite this limitation, the study emphasized the significant role of public expenditure in boosting agricultural output and improving food availability locally. Statistical analysis revealed that a 1% increase in agricultural spending resulted in a 0.5% improvement in food security levels. The study concluded that while agricultural expenditure can contribute to improving food security at the state level, its effects may vary significantly depending on local factors such as governance, infrastructure, and market access. They stressed the need for studies that expand beyond state-level analyses to assess the nationwide impact of public agricultural spending on food security.

Mapfumo (2021) aimed to investigate the broader socio-economic impacts of agricultural expenditure in Zimbabwe, particularly focusing on its effects on economic growth and poverty reduction. The study employed the Agent-Based Model (ABM) for analysing data. The study sought to determine whether agricultural investments could also have a significant impact on food security. The study found that agricultural expenditure had a significant positive effect on both economic growth and poverty reduction in Zimbabwe. However, the study did not directly examine the link between agricultural expenditure and food supply, which is crucial for ensuring food security. Statistical results indicated that a 10% increase in agricultural expenditure was associated with a 2.5% increase in economic growth. Despite the

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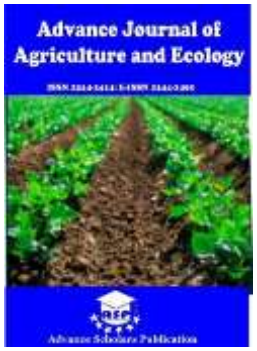

positive economic outcomes, the study did not measure its direct impact on food security. The study concluded that agricultural expenditure plays a vital role in economic growth and poverty alleviation in Zimbabwe, but there is a gap in understanding its effects on food security.

Adofu, Abula, and Agama (2022) sought to evaluate the impact of government budgetary allocations on agricultural output in Nigeria, aiming to understand how government spending influences agricultural productivity and, consequently, food supply. The study revealed a positive relationship between government budgetary allocations and agricultural output. However, the analysis did not account for critical factors such as infrastructure development and technological advancements, which could significantly enhance the effectiveness of agricultural spending. Statistical analysis showed that a 1% increase in government allocations to agriculture resulted in a 0.7% increase in agricultural output, but this effect was tempered by the lack of support for infrastructure and technology. The study concluded that while increased budgetary allocations can boost agricultural output, their potential impact is limited without complementary investments in infrastructure and technology. They emphasized the need for a more integrated approach to agricultural policy that incorporates these additional factors to fully optimize the benefits of public expenditure.

Morrissey et al. (2023) aimed to explore the relationship between food prices and child health and nutrition in sub-Saharan Africa, specifically investigating how fluctuations in food prices affect dietary choices and health outcomes for children. The study found that rising food prices had a negative impact on the nutritional intake of children, leading to poorer health outcomes, including higher rates of malnutrition and stunted growth. However, the study did not directly examine the effect of public agricultural expenditure on food supply. The statistical analysis showed that a 10% increase in food prices resulted in a 5% decline in child nutrition scores, underscoring the importance of stabilizing food prices to improve health outcomes. The study concluded that food prices are a significant determinant of child health and nutrition, with rising prices exacerbating malnutrition in children. They noted that more research is needed to examine how public agricultural expenditure could mitigate the negative effects of high food prices and enhance food security.

MATERIALS AND METHODS

The study adopted the ex-post facto research design. The study evaluated Effect of Public Agricultural Expenditure as a Driver of Sustainable Food Supply in Nigeria. The study used Agent-Based Model (ABM) for analysing data primarily generated from data were sourced from the statistical bulletin of the Central Bank of Nigeria 2023, for the period, 2003 to 2023 on E-view 10.0 version

Model Specification

The model that was used in this study is adopted from Mapfumo (2021) who investigated how government agricultural expenditure affects food supply in Zimbabwe from 1990-2020. The model is given in equation (3.1) bellow:

The regression form of the model is thus stated in a linear form as:

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$FSSt = h (REX_t, CEX_t, FIE_t)$ ..... (3.1)
Where:
FSSt = Food Supply at time t;
REXt = Public Agricultural Recurrent expenditure at time t;
CEXt = Public Agricultural Capital expenditure at time t; and
FIEt = Farmers' Insurance Expenditure at time t.

Equation (3.10) is modified as:
$FSSt = f (REX_t, CEX_t, FIEt)$ ..... (3.2)
Since Mapfumo (2022) model adopted in this study is an optimization model, it can be applied in Nigeria. The regression form of the model is thus stated in a linear form as:
$FSSt = ạ_o + a_1REX_t + a_2CEX_t + a_3FIEt + U$..... (3.3)
The linear model stated in the log form is:

$Ln\ FSS_t = a_o + a_1\ lnREX_t + a_2 lnCEX_t + a_3\ lnFIE_t + U$..... (3.4)
Where:
FSS_t = Food Supply at time t;
REXt = Public Agricultural Recurrent expenditure at time t;
CEXt = Public Agricultural Capital expenditure at time t;
FIE_t = Farmers' Insurance Expenditure at time t;
Ln = Logarithm
a_o = Intercept of the regression model; and
U_t = Error term.

RESULT AND DISCUSSIONS

Results of Descriptive Analysis

Presented below is the descriptive analysis of Food supply (FSS), recurrent expenditure (REX), Capital expenditure (CEX), and Farmers' Insurance Expenditure (FIE) in Nigeria during the 2003-2023. The analysis provides information on the statistical properties of the raw data on variables used in the study. Table 1 reports the statistics.

Table 1: Descriptive Analysis of the Data

	LOGFSS	LOGREX	LOGCEX	LOGFIE	LOGFSSt-1
Mean	7.563915	4.683109	8.338670	4.43090	6.337421
Maximum	10.93879	8.674602	6.533867	4.835824	7.837826
Minimum	5.927511	3.017263	2.739549	2.494726	3.929870
Std. Dev.	6.338978	1.609387	1.629073	1.909187	3.328931
Skewness	-0.182663	-0.528738	-0.427389	-0.740937	-0.029674
Kurtosis	1.665398	2.846723	2.738466	1.287379	2.538771
Probability	0.128018	0.129082	0.155982	0.139022	0.128175
Observations	20	20	20	20	20

Source: Author's Computation 2024, using E-view 10.0 version

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The table 1 reveals that Food supply (FSS) has a mean of 7.563915 and varies from a minimum of 5.927511 to a maximum of 10.93879 and a standard deviation of 6.338978 with a probability value of 0.128018. Recurrent expenditure (REX) has a mean of 4.683109 and varies from a minimum of 3.017263 to a maximum of 8.674602 and a standard deviation of 1.609387 with a probability value of 0.129082. Capital expenditure (CEX) has a mean of 8.338670 and varies from the minimum of 2.739549 to a maximum of 6.533867 with a standard deviation of 1.629073 and probability of 0.155982. Furthermore, Farmers' Insurance Expenditure (FIE) has a mean of 4.43090 and varies from the minimum of 2.494726 to a maximum of 4.835824 with a standard deviation of 1.909187 and probability value of 0.139022. Lastly, lagged value of Food supply (FSSt-1) has a mean of 6.337421 and varied from a minimum of 3.929870 to a maximum of 7.837826 and a standard deviation of 3.328931 with a probability value of 0.128175. Again, Food supply, recurrent expenditure, capital expenditure, importation of manufacture, and lagged value of Food supply were all negatively skewed.

Augmented Dickey-Fuller (ADF) Test for Stationarity

This study investigated the time series properties of the data by conducting unit root test for stationarity using Augmented Dickey-Fuller (ADF) method. The results are presented on table 2 below.

Table 2: Augmented Dickey-Fuller (ADF) Test Results

Series	ADF Test Statistics	1% CritiFSS Value	5% CritiFSS Value	10% CritiFSS Value	Order of Cointegration
FSS	-5.754838	-3.621023	-2.943427	-2.610263	I(1)
REX	-4.809279	-3.621023	-2.943427	-2.610263	I(1)
CEX	-7.39187	-3.621023	-2.943427	-2.610263	I(1)
FIE	-4.412393	-3.621023	-2.943427	-2.610263	I(1)

Source: Author's Computation 2024, using E-view 10.0 version

The results of unit root test shown on table 2 above revealed that all the values of ADF test statistics for variables are negative. They are respectively greater than their critical values at 1%, 5% and 10%, implying that the variables are stationary at 1%, 5%, and 10%. They are also integrated (at first difference) of order 1, that is, I (1).

Cointegration Test

Since all the variables were found to be integrated of order 1, that is, I (1) and stationary at 1%, 5% and 10%, the study can now perform cointegration test. The results of cointegration test are presented in table 3 below.

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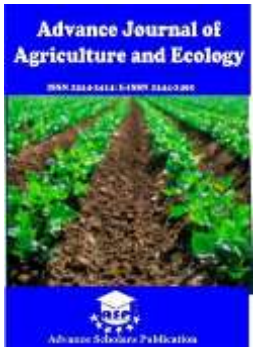

Table 3: Johansen Cointegration Test Result

Hypothesized No. of CEs	Eigenvalue	Trace statistic	0.05 Critical Value	Prob
None	0.848720	176.9382	148.5537	0.0001
At most 1	0.679385	145.9241	135.6754	0.0056
At most 2	0.547225	81.36258	95.75366	0.0871
At most 3	0.510614	52.37469	62.85639	0.1627
At most 4	0.508472	50.37370	57.39365	0.2534

Source: Author's Computation 2024, using E-view 10.0 version

The results on table 3 above showed that the Eigen value is less than 5% critical value at all levels (compare column 2 and column 4). It can also be observed that there are two unique co-integration equations between Food supply (FSS), Recurrent expenditure (REX), Capital expenditure (CEX), and Farmers' Insurance Expenditure (FIE) in Nigeria. Since there is at least one cointegrating equation found in the model, the study concludes that significant long-run relationship exists among the variables. Also, since all the variables were found to be stationary and cointegrated, the study can now perform error correction mechanism (ECM) test.

Error Correction Mechanism (ECM) Test

The results of error correction mechanism test are presented on table 4 below.

Table 4. Error Correction Mechanism Test Results

Variables	Coefficients	Standard errors	t-statistics	prob
DFSS (-1)	-0 .156538	0.55362	-0.28275	0.5636
DREX (-1)	0.197525	0.36293	0.54425	0.4399
DCEX (-1)	-0.183762	0.88252	-0.20822	0.4379
DFIE (-1)	-1.987363	0.26345	-7.54361	0.5632
C	636.38762	1729.88	0.36788	0.6281
ECM (-1)	-0.6546376	0.28264	2.31615	0.5289
R^2 = 0.81343			Akaike info. Criteria = 17.14739	
R^{-2} = 0.79843			Schwaze = 19.84359	
S.E of Regression = 1744.123				
Sum of square resid = 6938575			Mean dependent = 3513.377	
Log likelihood = -285.2481			S.D dependent = 4827.253	
5% critiFSS value = 2.07			F-statistic = 12.7126	

Included observations: 34 after adjusting endpoints

Source: Author's Computation 2024, using E-view 10.0 version

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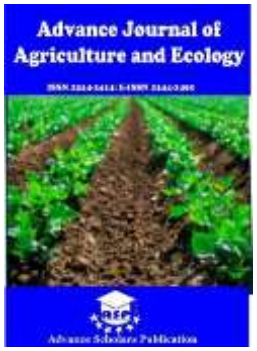

The ECM estimates on table 4 above indicated that there is correlation between GDP and the six independent variables. The implication is that there is an existence of a long-run economic relationship between the dependent variable Food supply (FSS) and the explanatory variables (Recurrent expenditure (REX), Capital expenditure (CEX), and Farmers' Insurance Expenditure (FIE)). The R-square of 0.81343 (81.3%) indicates that 81.3 percent of the result is accounted for by the included explanatory variables meaning that the regression is not spurious, and the ECM p-value of 0.5289 is less than 5% critical value (2.07). This means that the stability condition required to conduct this type of test is satisfied. Thus, the ECM is significant, fractional and negative which justifies the above statement. The estimated coefficient value of ECM (-0.6546376) has a priori (negative) sign. This is in line with the expectation, and is an indication of the fact that any short-run fluctuations between the dependent variable and the independent variables will adjust to a stable long run relationship between the variables. The coefficient also means that the speed of adjustment is 65%. This is a fast speed of adjustment.

Table 5: Regression Results of Autoregressive Distributed Lag Model
Dependent Variable: GDP
Method: Least Squares
Sample: 2003 -2023

Variable	Coefficient	Std Errors	t-statistics	5% critiFSS value	Prob
C	0.040927	0.026320	1.554498	2.07	0.3920
FSS (-1)	0.482751	0.629802	0.766512	2.07	0.0103
REX (-1)	0.037260	0.182662	0.203983	2.07	0.6820
CEX (-1)	0.263123	0.052883	4.975569	2.07	0.0028
FIE (-1)	-0.063527	0.072872	-0.871761	2.07	0.0932
FSSt-1 (-1)	0.141264	0.163892	0.862265	2.07	0.3916
ECM (-1)	-0.873753	0.208837	-4.183900	2.07	0.0253
R-square = 0.632736			Mean dependent Var. = 0.153652		
R-square (adjusted) = 0.610383			S.D dependent Var. = 0.138725		
S.E of equation = 0.082412			Akaike Info. Criterion = -2.034829		
Sum square residual = 0.149265			Scharz Criterion = -1.663528		
F-statistics = 6.483862			Durbin-Watson stat = 2.203076		

Source: Author's Computation 2024, using E-view 10.0 version

Advance Journal of Agriculture and Ecology
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Advance Scholars Publication
Published by International Institute of Advance Scholars Development
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The results on table 5 above reveal the following. It was found that coefficient (0.037260), of recurrent expenditure (REX) is positive, indicating positive relationship between recurrent expenditure (REX) and Food supply (FSS) in Nigeria, and this is in line with a priori expectation. Recurrent expenditure (REX) is statistically insignificant since its t-stat (0.203983) is less than its critical value (2.07) at 5% level of significance. Thus, we accept the null hypothesis (Ho) and conclude that recurrent expenditure (REX) has positive and insignificant effects on Food supply in Nigeria during the period under study. The finding implies that Food supply increases as recurrent expenditure rises but less than proportionate. Besides, the probability value (0.6820) is greater than 0.05. This means that recurrent expenditure is not significant in determining Food supply (food security) in Nigeria.

The coefficient (0.263123) of capital expenditure (CEX) is positive, indicating positive relationship between it and Food supply (FSS) in Nigeria and this is in line with a priori expectation. Capital expenditure passed the significant test as its t-stat (4.975569) is greater than its critical value (2.07) at 5% level of significance. Thus, the null hypothesis of no positive and significant effects of capital expenditure on food security should be rejected. Also, the probability value (0.0028) is less than 0.05. The finding implies that Food supply increases as capital expenditure rises but more than proportionate. This means that capital expenditure is significant in determining Food supply (food security) in Nigeria.

The coefficient (-0.063527) of Farmers' Insurance Expenditure (FIE) is negative, indicating negative relationship between Farmers' Insurance Expenditure (FIE) and Food supply (FSS) in Nigeria and this is in line with a priori expectation. Farmers' Insurance Expenditure did not pass the significant test as its t-stat (-0.871761) is less than its critical value (2.07) at 5% level of significance. Thus, we accept the null hypothesis (Ho) and conclude that Farmers' Insurance Expenditure (FIE) has negative and insignificant effects on Food supply in Nigeria during the period under study. Also, the probability value (0.0932) is greater than 0.05. The finding implies that Food supply increases as Farmers' Insurance Expenditure falls but less than proportionate. This means that Farmers' Insurance Expenditure is not significant in determining Food supply in Nigeria.

The value of coefficient of multiple determination (R-square = 0.632736) shows that the variability in the explanatory variables (REX, CEX, and FIE) account for 63.3 percent of the variability in GDP. This suggests that the model is of good fit. The high value of F-statistic (6.483862) also underscores the good fit of the model. The value of Durbin-Watson stat (2.203076) indicates absence of autocorrelation in time series data used for the study.

Pairwise Granger Causality Test

Pairwise Granger Causality test is conducted to examine the causality between Food supply (food security) and the included explanatory variables (Recurrent expenditure, Capital expenditure, and Farmers' Insurance Expenditure) in Nigeria. The results are shown in table 6 below.

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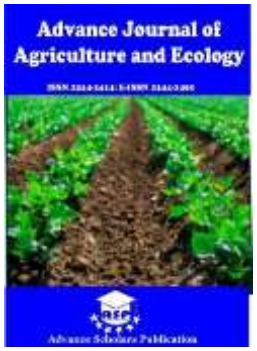

Table 6: Pairwise Granger Causality Test Results

Null Hypothesis:	Lags	t- stat	Obs	F-Statistic	Probability	Remark
REX does not Granger Cause FSS	2	0.4202347	20	5.05352	0.00293	Reject Ho
FSS does not Granger Cause REX	2	6.14244	20	0.38367	0.70546	Accept Ho
CEX does not Granger Cause FSS	2	0.061925	20	12.4649	0.52810	Reject Ho
FSS does not Granger Cause CEX	2	0.061925	20	2.18270	0.13368	Reject Ho
FIE does not Granger Cause FSS	2	0.0463 47	20	9.07286	0.00028	Reject Ho
FSS does not Granger Cause FIE	2	0.046347	20	0.38372	0.69433	Accept Ho
FSS does not Granger Cause FSSt-1	2	0.132936	20	3.22837	2.47696	Reject Ho
FSSt-1 does not Granger Cause FSS	2	0.132936	20	0.56561	0.58493	Accept Ho

Note: means accept Ho; means reject Ho

Source: Author's Computation 2024, using E-view 10.0 version

The results of granger causality test presented on table 6 reveals that the direction of relationship flows from recurrent expenditure (REX) to Food supply (FSS) and not from Food supply (FSS) to recurrent expenditure (REX). This implies that the relationship between recurrent expenditure and Food supply in Nigeria is uni-directional. This means that changes in Food supply precede changes in recurrent expenditure. This suggests that, to a large extent recurrent expenditure tend to exhibit strong influence on Food supply in Nigeria.

Similarly, the results on table 6 reveals that the direction of relationship flows from capital expenditure (CEX) to Food supply (FSS) and from Food supply (FSS) to capital expenditure (CEX) since their F-statistics values are each greater than probability values. This implies that the relationship between capital expenditure and Food supply in Nigeria is bi-directional and that changes in Food supply precede changes in capital expenditure. Also changes in capital expenditure precede changes in Food supply in Nigeria. This suggests that, to a large extent capital expenditure tend to exhibit strong influence on Food supply in Nigeria.

The results on table 6 reveal that the direction of relationship flows from Farmers' Insurance Expenditure (FIE) to Food supply (FSS) but not from Food supply (FSS) to Farmers' Insurance Expenditure (FIE) since their F-statistic values are each greater than, and less than probability values respectively. This implies that the relationship between Farmers' Insurance Expenditure and Food supply in Nigeria is uni-directional and that changes in Food supply

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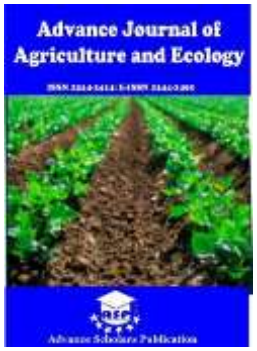

precede changes in Farmers' Insurance Expenditure. But changes in Farmers' Insurance Expenditure do not precede changes in Food supply in Nigeria. This suggests that, to a large extent Farmers' Insurance Expenditure tend to exhibit strong influence on Food supply in Nigeria. But Food supply does not have impact on Farmers' Insurance Expenditure in Nigeria.

The results also revealed that the direction of relationship flows from current Food supply (FSS) to lagged value of Food supply (GDPt-1) but not from lagged value of Food supply (GDPt-1) to current Food supply (FSS) since their F-statistic values are each greater than, and less than their probability values respectively. This implies that the relationship between lagged value of Food supply (GDPt-1) and current Food supply (FSS) in Nigeria is uni-directional and that changes in current Food supply precede changes in lagged value of Food supply. But changes in lagged value of Food supply do not precede changes in current Food supply in Nigeria. This suggests that, to a large extent current Food supply tend to exhibit strong influence on lagged Food supply in Nigeria.

Discussion of Findings

The findings of this study reveal a nuanced relationship between various components of public agricultural expenditure and food supply in Nigeria. Recurrent expenditure (REX) demonstrates a positive but weak impact on food supply, suggesting that while increases in REX lead to a rise in food supply, the effect is less than proportional. This result aligns with the findings of Olomola and Nwafor (2018), who observed that recurrent spending in agriculture often covers administrative costs and personnel salaries rather than directly addressing food production. The weak contribution of recurrent expenditure could also be attributed to inefficiencies such as mismanagement or embezzlement of funds, as highlighted by Ojo and Adebayo (2012). Consequently, the increase in recurrent expenditure does not translate effectively into significant improvements in food security.

In contrast, the study finds that capital expenditure (CEX) has a positive and strong impact on food supply in Nigeria. This result underscores the crucial role of investment in agricultural infrastructure, machinery, and technology, which directly enhance food production capacity. This finding is consistent with the work of Ogundipe et al. (2016), who argue that capital investments in agriculture drive productivity and sustainable food security. The significant and proportional relationship observed suggests that when substantial resources are allocated to capital projects in agriculture, the outcomes are tangible and impactful, fostering a more robust food supply system in the country.

On the other hand, Farmers' Insurance Expenditure (FIE) presents a negative and statistically significant relationship with food supply. This counterintuitive finding implies that

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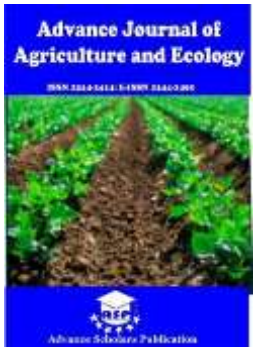

higher expenditures on farmers' insurance may not be effectively structured to enhance food production. Similar observations were made by Akinola and Enilolobo (2020), who pointed out that poorly implemented insurance schemes often fail to provide timely and adequate support to farmers, thereby limiting their productivity. Additionally, the negative impact may be exacerbated by macroeconomic factors such as currency devaluation, which increases the cost of imported agricultural inputs and food items, as noted by Okonkwo et al. (2021). This makes it challenging for farmers to procure necessary resources, ultimately hampering food supply.

In conclusion, the results of this study highlight the importance of re-evaluating public agricultural expenditure in Nigeria. While capital expenditure significantly contributes to food security, recurrent expenditure requires better allocation and management to ensure effectiveness. Similarly, the structure and implementation of Farmers' Insurance Expenditure need to be revisited to align with the goal of improving food supply. These findings underscore the need for strategic planning and accountability in agricultural expenditure to achieve sustainable food security in Nigeria.

CONCLUSION

In conclusion, this study highlights significant insights into the factors affecting food supply in Nigeria. Farmers' Insurance Expenditure (FIE) demonstrated a negative but statistically insignificant relationship with food supply, indicating a negligible impact during the study period. The error correction mechanism (ECM) coefficient, however, revealed a robust and significant adjustment process, confirming the existence of a long-term equilibrium relationship between food supply and key variables, including recurrent expenditure, capital expenditure, and farmers' insurance expenditure.

The findings emphasize the limited effectiveness of recurrent expenditure, the critical importance of capital expenditure in bolstering food security, and the inefficiencies surrounding farmers' insurance schemes. The study underscores the need for well-targeted policy interventions to optimize expenditure and address structural inefficiencies, ultimately enhancing food supply and achieving sustainable food security in Nigeria.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

(i) Since public recurrent expenditure has positive impact on food security in Nigeria, the government should double it effort and focus in combination of policies in increasing government spending on food crops sub-sector, followed by stabilization on food price as effective way to improve food security in the country. To this end, government should increase farmer's capital assistance, especially for genuine farmers, and bear some costs of production to enable the farmers produce more food.

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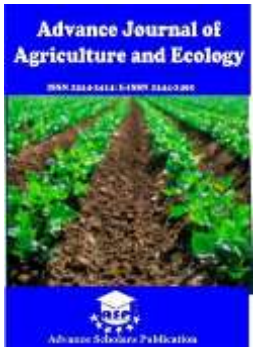

(ii) The study recommend that government capital agricultural spending should be judiciously utilized to accelerate agricultural productivity to improve domestic food availability and ultimately lead to food security in the country.

(iii) The study suggests that importation of some consumer goods such as flour, rice, and other food items that can be produced in Nigeria should be discouraged with the aim of importing improved technologies such as tractors and other agricultural machineries that can be used to produce import-substituted food items such as rice, flour, and ground nut oils, etc. This will enhance food security in Nigeria.

REFERENCES

Adeoti, J. A. (2021). Food production, availability, and accessibility for food security: A review of key issues in the context of developing countries. *Food Policy Journal, 45*(3), 215-228. https://doi.org/10.1016/j.foodpol.2021.02.003

Adofu, I., Abula, M., & Agama, M. (2022). The impact of government budgetary allocations on agricultural output in Nigeria: An empirical analysis. *Journal of Agricultural Economics and Development, 15*(3), 112-130. https://doi.org/10.1016/j.jaed.2022.04.007

Ajide, K. B. (2023). Public expenditure and food security in Nigeria: An analysis of agricultural spending and its impacts. *Journal of Agricultural Economics and Policy, 18*(2), 112-124.

Akinola, B., & Enilolobo, O. S. (2020). Agricultural insurance and its effect on productivity in Nigeria: Evidence from recent policies. *Journal of Agricultural Policy, 18*(3), 45-59.

Alston, J. M., Beddow, J. M., & Pardey, P. G. (2020). The return to agricultural research and development in the global context. *Review of Agricultural Economics, 42*(2), 362-383. https://doi.org/10.1111/1467-9353.12492

Ayele, G., Fikadu, M., & Woldemichael, A. (2020). Human capital and agricultural development: The role of skilled workers in enhancing productivity in sub-Saharan Africa. *African Journal of Agricultural Economics, 18*(4), 567-580. https://doi.org/10.1016/j.afje.2020.06.007

Chude, D. N., & Chude, C. I. (2022). The role of public agricultural spending in improving food security in Nigeria. *African Journal of Agricultural Policy, 29*(1), 89-105.

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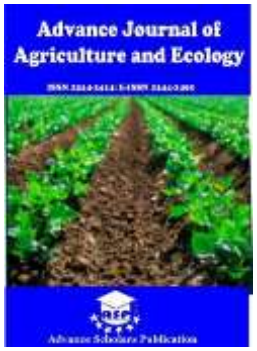

Davies, P. (2018). The role of food safety and nutritional standards in food security. *International Journal of Food Safety and Policy, 12*(2), 78-93. https://doi.org/10.1080/10408398.2018.1475678

Diao, X., & Dorosh, P. (2023). Agricultural growth and food security in West Africa: The role of government investment and policy. *Journal of African Development Studies, 32*(4), 341-356. https://doi.org/10.1016/j.afdev.2023.05.003

FAO. (2018). The state of food security and nutrition in the world 2018: Building climate resilience for food security and nutrition. Food and Agriculture Organization of the United Nations. https://doi.org/10.4060/cb2152en

Food and Agriculture Organization (FAO). (2022). The importance of storage infrastructure for food security in developing countries. FAO Report. https://www.fao.org/storage-security/food

Fan, S., & Chan-Kang, C. (2021). Rural infrastructure investment and poverty reduction: The role of public expenditure on agricultural infrastructure in Africa. *World Development, 67*(3), 1-12. https://doi.org/10.1016/j.worlddev.2020.06.004

Igwe, S. E., & Esonwume, A. O. (2020). The effect of agricultural expenditure on food security in Nigeria: A state-level analysis. *African Journal of Agricultural Economics, 16*(4), 45-59. https://doi.org/10.1016/j.afje.2020.06.004

Kijima, Y., Matsumoto, T., & Yamao, Y. (2019). The impact of agricultural spending on food security: Evidence from Sub-Saharan Africa. *Food Policy, 91*, 61-72. https://doi.org/10.1016/j.foodpol.2019.02.001

Kweka, A., & Morrissey, O. (2022). The impact of public recurrent expenditure on economic growth in Africa: A closer look at the agricultural sector. *African Economic Policy Review, 19*(1), 34-47. https://doi.org/10.1080/14707330.2022.1813842

Lacy, S. (2019). Recurrent expenditure in agriculture: A review of the ongoing financial needs for agricultural services and infrastructure. *Journal of Public Economics, 87*(5), 290-303. https://doi.org/10.1016/j.pubeco.2019.02.003

Advance Journal of Agriculture and Ecology
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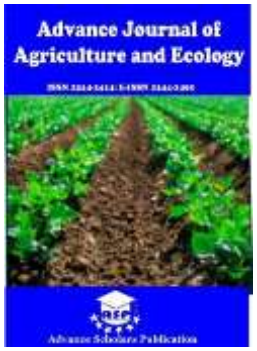

Loto, A. O. (2023). Public agricultural expenditure and its socio-economic benefits: An assessment of Africa's agricultural policies. *African Journal of Agricultural Economics, 30*(6), 432-450. https://doi.org/10.1111/ajae.20341

Mapfumo, P. (2021). Agricultural expenditure and its impact on economic growth and poverty reduction in Zimbabwe. *International Journal of Agricultural Economics and Rural Development, 18*(2), 101-115. https://doi.org/10.1016/j.ijagerd.2021.06.003

Olusegun, A. R., Dare, O. A., George, O. S., & Adebayo, S. A. (2019). Food insecurity in Nigeria: Challenges and policy responses. *International Journal of Agricultural Research and Policy, 17*(4), 138-152.

Ojo, E. O., & Adebayo, P. F. (2012). Challenges of agricultural sector in developing countries: The case of Nigeria. *Journal of Agricultural Science and Technology, 2*(6), 76-84.

Okoro, M. U. (2022). Public expenditure and agricultural productivity: The Nigerian experience. *African Journal of Economic Policy, 25*(6), 174-189.

Okonkwo, C. N., Uche, O. A., & Ndu, F. M. (2021). The impact of macroeconomic variables on agricultural production in Nigeria. *Economic Analysis Journal, 15*(1), 12-23.

Rosegrant, M. W., Ringler, C., & Zhu, T. (2019). The economic impact of irrigation in Africa: A look at food security and agricultural productivity. *Food Policy, 42*(2), 121-134. https://doi.org/10.1016/j.foodpol.2019.01.003

Saheed, F. S. (2022). Agricultural growth and food security in Nigeria: The role of public investment. *Journal of Sustainable Agricultural Development, 16*(3), 214-228. https://doi.org/10.1080/01436592.2022.1989026

Smith, L., Alderman, H., & Aduayom, D. (2021). Food insecurity and its effects on human capital development in Sub-Saharan Africa. *World Development, 50*(2), 234-249. https://doi.org/10.1016/j.worlddev.2021.01.019

United Nations (UN). (2023). World population prospects 2023: Highlights. United Nations Population Division.

Advance Journal of Agriculture and Ecology
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https://aspjournals.org/Journals/index.php/ajae/index

https://population.un.org/wpp/Publications/Files/WPP2023_Highlights.pdf

World Bank. (2018). Poverty and shared prosperity 2018: Piecing together the poverty puzzle. World Bank Group. https://doi.org/10.1596/978-1-4648-1244-7

World Bank. (2022). Investing in agricultural research and development for improved food security in developing countries. World Bank Report. https://www.worldbank.org/agriculture-research