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AGRICULTURE SECTOR PERFORMANCE AND FOOD INFLATION: A FOCUS ON NIGERIA

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ABSTRACT

This study attempts to empirically examine the effect of agriculture sector performance on food inflation in Nigeria from 2000-2022 using data from secondary sources. Augmented Dicky- Fuller (ADF) unit root test, Autoregressive Distributed Lag (ARDL) bounds test, and Fully Modified Ordinary Least Squares were used to analyse the data. The result shows that food inflation reduces as the volume of agriculture output increases. Therefore, government should continue to improve on agricultural production by investing more in infrastructural development in rural areas, introduce better species of plants and animals, intensify mechanization of farming to ensure mass production, etc. More so, government should address other factors identified to have kept food prices high in the country including fuel scarcity, electricity shortage, foreign exchange problem, insecurity, etc.

Keywords: Agriculture output, consumer price index, Nigeria, unit root test, fully modified ordinary least squares

1. INTRODUCTION

Agriculture is the art and business of cultivating soil, producing crops and raising livestock. According to a World Bank report in 2005, stated that about two thirds of the world population is mainly concentrated in rural areas, which are predominantly agriculture-oriented areas. Therefore in respect to poverty eradication and raising the welfare standards of the population; more focus should be put on agricultural activities (Peda.net, 2023).

Nigeria has an arable land area of 34 million hectares: 6.5 million hectares for permanent crops, and 28.6 million hectares on meadows and pastures. Agriculture accounts for about 23 percent of Nigeria's GDP (Kamer, 2023). The country is a leader in various types of agricultural production, such as palm oil, cocoa beans, pineapple, and sorghum. It is the largest producer of sorghum in the world just after the United States, and ranks fifth in the production of palm oil and cocoa beans. Nigeria is also a large global exporter in this sector. Oil, fruits, nuts, seeds are among the ten best performing export categories.

Yet, Nigeria relies on $10 billion of imports to meet its food and agricultural production shortfalls (mostly wheat, rice, poultry, fish, food services, and consumer-oriented foods) (trade.gov, 2023). Europe, Asia, the United States, South America, and South Africa are major sources for agricultural imports.

However, Nigeria's agricultural sector has been hurt by several shocks: regular flooding, desertification of crop and grazing land, extremist insurgencies, and conflicts between herdsmen and local farmers. Food processing continues to suffer from a lack of financing and infrastructure. These challenges have exacerbated food inflation. Food inflation rose to 23.75% in December 2022. The food inflation rate in April 2023 was 24.61 percent on a year-on-year basis, which was 6.24 percent points higher compared to the 18.37 percent recorded in April 2022 (Inokotong, 2023).

Nevertheless, in recent time, the government of Nigeria has implemented several initiatives and programmes to address the agriculture sector situation in Nigeria including the Agriculture Promotion Policy (APP), Nigeria–Africa Trade and Investment Promotion Programme, Presidential Economic Diversification Initiative, Economic and Export Promotion Incentives and the Zero Reject Initiative, Reducing Emission from Deforestation and Forest Degradation (REDD+); Nigeria Erosion and Watershed Management Project (NEWMAP); and Action Against Desertification (AAD) Programme (FAO, 2022). The government of Nigeria has also initiated agricultural programs such as the Anchor Borrowers Program (ABP) to diversify its economy away from oil. In October 2021, the government at the Council on Agriculture and Rural Development Regular meeting, approved the implementation of new agricultural policy named "National Agricultural Technology and Innovation Plan" (NATIP) in 2022. The four-year blueprint designed to help Nigeria's COVID-19 economic recovery. This policy will replace the Agriculture Promotion Policy (APP) that was launched in 2016 but terminated in December 2020. All these efforts aim to increase agricultural productivity in order to provide sufficient quantities of food to meet domestic demand as well as an abundance of commodity crops for export in the international market.

In the light of this, the aim of this study is to empirically examine the effect of agriculture sector performance on food inflation in Nigeria. Here, the conventional measurement of growth in agriculture is used, which is changes in the physical volume of output. The most

well-known indicator of inflation used in this study is the Consumer Price Index (CPI), which measures the percentage change in the price of a basket of goods and services consumed by households. Although a few studies have been carried out on agriculture and inflation in Nigeria(Akpan & Udoh (2009); Mesike, Okoh & Inoni (2010) ; Oyinbo & Rekwot (2014); Mbah, Orjime & Mgbemena (2022)), this study is an addition to the few literature. It used recent data and recently developed advanced econometric techniques. This study is therefore divided into five sections; following this introductory section is section two, which is the methodology, section three presents data analysis and interpretation, section four presents the study's summary, conclusion and policy implications.

2. METHODOLOGY

2.1 Model specification

Following the literature (e.g., Leoning (2009); Mbah, Orjime & Mgbemena (2022)), the study determined a model with food inflation as a function of agriculture sector performance as follows:

Mathematically, this is expressed as:

$$FINF = (AGO, REXR, LINT) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where; FINF = food inflation as measured by consumer price index (CPRIC) which reflects changes in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Data are period averages; AGO = agricultural sector performance (proxy by volume of agricultural output (tones); REXR is real exchange rate(₦); and LINT is lending interest rate (%).Lending rate is the bank rate that usually meets the short- and medium-term financing needs of the private sector. This rate is normally differentiated according to creditworthiness of borrowers and objectives of financing.

Statistically, this is expressed as:

$$LNFINF_t = \Omega_0 + \Omega_1 LNAGO_t + \Omega_2 LNREXR_t + \Omega_3 LNLINT_t + \mathrm{W}_1 \ldots\ldots\ldots\ldots (2)$$

Where, LN is the natural log, ø is the error term which is independently and identically distributed with mean zero and constant variance, t is time period, and Ω_0 is a constant term, Ω_1 to Ω_3 are unknown parameters to be estimated.

2.2 Types and Sources of Data

The data used in this study were purely secondary and were sourced majorly from World Development Indicators, theglobaleconomy.com, indexmundi.com, tradingeconomics.com, countryeconomy.com, worlddata.info, and Statistical Bulletin and Annual Report and Statement of Accounts published by the Central Bank of Nigeria (CBN). The annual time series data relating to the dependent and independent variables covered the period 2000 and 2022.

2.3 Method of Data Analysis

Unit roots can cause unpredictable results in time series analysis, as such, this study deployed Augmented Dicky- Fuller (ADF) unit root test for stationarity and the model for ADF is specified in the general form as:

$$\Delta y_1 = \alpha_0 + \alpha_0 y_{t-1} + \Sigma\alpha_1 \Delta y_1 + \delta_1 + U_1 \ldots\ldots\ldots\ldots\ldots (3)$$

where: y = time series, t = linear time trend, Δ= first difference operator, α_0 = constant term and U = random error term.

Hereafter, in investigating the long run relationship between the variables, bound test for co-integration with autoregressive distributed lag (ARDL) modeling approach was adopted in this study. This model provides some advantages in application; first, it can be applied even if the variables have different order of integration; second, it is good to prefer in small samples. Lastly, fully modified ordinary least squares (FMOLS) estimator was employed for estimation of the specified models. Chang and Philip (1995) theory for time series regression with unknown mixture of I(0) and I(1) variables had established that the method of FMOLS is applicable to models with some unit roots and unknown cointegrating rank. This method is also applicable in cases of estimation of model involving small dataset, particularly where it is quarterly time series data for robust parameter estimates.

3. DATA ANALYSIS AND INTERPRETATION

3.1 Unit Root Test

The essence of conducting a unit root test was to show whether the time series have a stationary trend, and if non-stationary, to show the order of integration at which they become stationary. Table 1 reports the results of the Augmented Dickey Fuller (ADF) unit root test which was performed using Schwarz information criterion and the automatic lag selection set at 4 lags. More so, two specifications of the Augmented Dickey Fuller (ADF) unit root test were used: (i) intercept (ii) trend and intercept. The unit root test result reveals that the variables are integrated in a mixed order of I(0) and I(1). This combination of integration gives the foundation for the use of Auto-regressive Distributed Lag (ARDL) bounds test to check for evidence of a long-run relationship among the variable.

Table 1: Augmented Dickey Fuller (ADF) Unit Root Results

Variable	ADF test				Order of Integration
	Levels		1st difference		
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	
LNAGO	-1.533607	-3.831620**	---	---	I(0)
LNREXR	-1.876691	-2.819644	-5.521139*	---	I(1)
LNFINF	0.144016	-1.954618	-5.002530*	---	I(1)
LNLINT	-4.586576	---	---	---	I(0)

Note: ADF test was performed using Schwarz information criterion and the automatic lag selection set as 4 lags. Also, *, ** and *** imply statistical significance at 1%, 5% and 10% levels respectively.

Source: *Author's computation using Eviews 10*

3.2 ARDL Bound Test

The autoregressive distributed lag (ARDL) bounds testing approach to co-integration was applied. One of the major advantage of this technique is that it can be applied in respective of the order of co-integration of the independent variables (either I(1) or I(0) or both). More so, ARDL model is statistically a significant tool of econometric analysis and has advantageous over other techniques of analysis because it can accommodate small sample size.

Due to the sample size, the study chose a maximum lag length of 1 for the dependent variable and independent variables. Moreover, the specification was with Restricted Constant and No

Trend, and the model selection criterion was Akaike information criterion. The result in Table 2 revealed that the null hypothesis of no long run relationship exist is rejected since the F-statistic value 7.555102 is greater than the upper bound I(1) which has a value of 4.66 at 1% level of significance.

Table 2: F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	7.555102	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: *Author's computation using Eviews 10*

3.3 FMOLS Estimates

Table 3 shows the outcome from the FMOLS regression. The volume of agricultural output (LNAGO) which is one of the key explanatory variables of interest in this study shows an interesting position. Here there is negative and significant effect of agricultural output (LNAGO) on food inflation (FINF)(proxy by consumer price index) as evidence in its coefficient of 1.042487. Categorically, a percentage increase in the volume of agricultural output will translate into about 1.042487% decrease in food inflation. This relationship is statistically significant at 1% significance level. The implication is that food inflation in Nigeria is not caused by the volume of agricultural output produced but by other factors. As Ajulo (2022) observed food prices have risen globally in recent years. It began with the coronavirus pandemic that made farmers and food producing companies unable to cultivate and produce food in sufficient quantities. Many food factories ran out of raw materials for their operations. Farmers have since returned to the fields and factories have reopened but food prices have remained high. In Nigeria, the cause of food inflation goes beyond the pandemic. Food inflation reached 17.2 and 18.37% in March and April 2022 respectively. Ajulo (2022) had identified some major factors that have kept food prices high in the country in recent time: fuel scarcity, electricity shortage, Russia-Ukraine crisis, foreign exchange problem and insecurity.

Similarly lending interest rate (LNLINT) is shown to exert a negative and significant effect on food inflation. Precisely, a percentage increase in lending interest rate (LNLINT) will ceteris paribus generate a decrease of approximately 10.47637% in food inflation in Nigeria at 1% significance level. Oyekanmi (2023) reported that the maximum lending rate for Nigerian banks rose to 29.13% in December 2022 from 28.14% recorded in the previous month and 27.58% in the corresponding period of 2021. The lending rates increased on the back of the multiple rate hikes by the Central Bank of Nigeria in 2022. Specifically, the CBN raised the benchmark interest rate by a collective 500 basis points to 16.5%, representing its highest rate in 21 years. The CBN raised the interest rate in 2022 to discourage more borrowing to reduce liquidity in the economy, which is believed to be contributing to the rising rate of inflation.

Table 3: FMOLS Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNAGO	-1.042487	0.328930	-3.169333	0.0053*
LNREXR	0.898557	0.605861	1.483108	0.1553
LNLINT	-10.47637	1.844324	-5.680330	0.0000*
C	16.94836	4.486979	3.777232	0.0014*

R-squared	0.792481	Mean dependent var	4.801176
Adjusted R-squared	0.757894	S.D. dependent var	0.792722
S.E. of regression	0.390053	Sum squared resid	2.738541
Long-run variance	0.187515		

Note: *, ** and *** imply statistical significance at 1%, 5% and 10% levels respectively.
Source: Author's computation using Eviews 10

The FMOL regression result in Table 3 shows that real exchange rate (LNREXR) has positive relationship with food inflation in Nigeria. The coefficient of real exchange rate (LNREXR) is positive but statistically insignificant at any standard significance level, though it indicates that when real exchange rate (LNREXR) increases by 1%, food inflation will increase by 0.898557%. Ajulo (2022) noted that Nigeria has struggled for years to meet high demand for foreign exchange, needed for importation. The government's strict capital control policies have not helped much. As a consumer economy that relies heavily on imports, the scarcity of foreign exchange (FX) helps drive prices of commodities especially food up as dollar is needed to buy commodities like wheat, maize, dairy products and other products that Nigeria largely imports. The dollar to naira rate as of June 2022 stood at N614 in the black market and 415 official rate, down from about N200 in 2016 (Ajulo, 2022).

3.4 Diagnostic Test

To ensure the goodness of fit of the model, a few diagnostic tests were conducted. In Table 4, the Correlograms Q-Statistics was deployed to conduct the residual test for serial correlation. The result in Table 4 shows that the Q-statistics are insignificant all the way down to 11 lags as depicted by their probability value(except 12 lag), indicating the presence of insignificant serial correlation. More so, the diagnostic test shows that there is no autoregressive conditional heteroskedasticity (ARCH) in the residuals of the model because the Q-statistics is not significant at all lags as shown by the probability values of the correlograms of the squared residuals in Table 5. Finally, the Jarque-Bera test statistic in Figure 1 with F-statistic of 1.0742719 indicates that the residual of the model is normally distributed since the probability value of 0.418382 is greater than the significance level of 5% i.e., 0.418382 > 0.05.

Table 4: Correlograms Q-Statistics

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |* . |	. |* . |	1	0.096	0.096	0.2325	0.630
. | . |	. | . |	2	-0.012	-0.022	0.2365	0.888
. *| . |	. *| . |	3	-0.199	-0.198	1.3361	0.721
. *| . |	. *| . |	4	-0.150	-0.118	1.9937	0.737
***| . |	***| . |	5	-0.408	-0.415	7.1698	0.208
. *| . |	. *| . |	6	-0.089	-0.117	7.4325	0.283
. |*** |	. |*** |	7	0.358	0.358	11.952	0.102
. |* . |	. | . |	8	0.174	-0.019	13.090	0.109
. |* . |	. | . |	9	0.111	-0.016	13.590	0.138
. | . |	. *| . |	10	-0.065	-0.172	13.775	0.184
. *| . |	. *| . |	11	-0.094	-0.129	14.197	0.222
.**| . |	. | . |	12	-0.325	-0.029	19.758	0.072

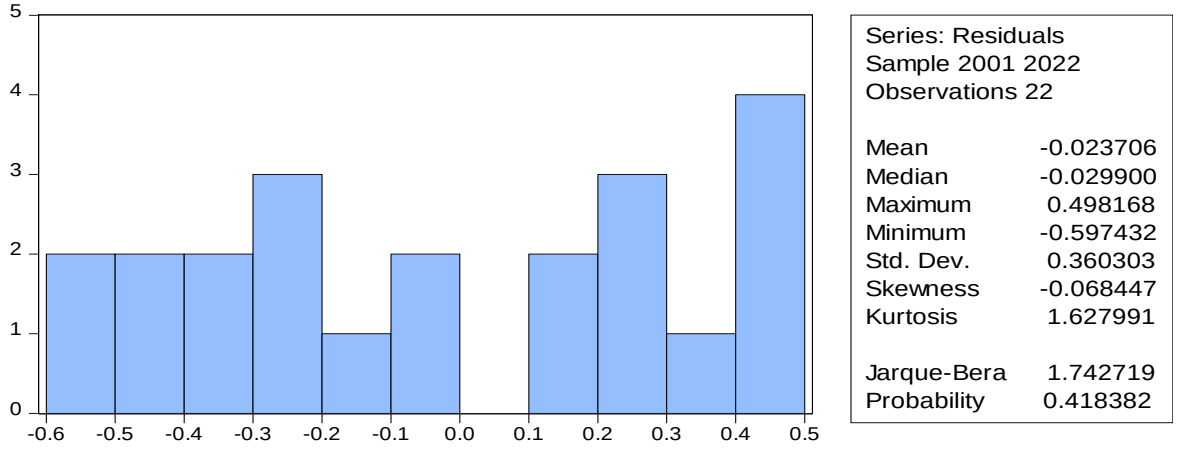
Source: *Author's computation using Eviews 10*

Table 5: Correlograms of the Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |* . |	. |* . |	1	0.164	0.164	0.6775	0.410
. | . |	. | . |	2	0.017	-0.010	0.6854	0.710
. | . |	. | . |	3	0.018	0.017	0.6942	0.875
. |* . |	. |* . |	4	0.193	0.192	1.7819	0.776
. *| . |	. *| . |	5	-0.066	-0.137	1.9183	0.860
. |* . |	. |* . |	6	0.084	0.129	2.1530	0.905
***| . |	***| . |	7	-0.380	-0.464	7.2313	0.405
.**| . |	. *| . |	8	-0.212	-0.084	8.9197	0.349
. *| . |	. | . |	9	-0.067	0.007	9.1011	0.428
. | . |	. *| . |	10	-0.019	-0.086	9.1163	0.521
.**| . |	. *| . |	11	-0.314	-0.122	13.837	0.242
. *| . |	. | . |	12	-0.079	-0.055	14.167	0.290

Source: *Author's computation using Eviews 10*

Figure 1: Normality Test



Source: *Extracted from Eviews 10*

4. SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

Food is one of the most important basic needs for survival. Its availability and accessibility are very important to any nation because its unavailability can lead to civil unrest, untimely death, malnourishment and more. In Nigeria, unfortunately, the price of food items in the markets has increased exponentially, daily. This study aimed to empirically examine the effect of agriculture sector performance on food inflation in Nigeria from 2000-2022 using data from secondary sources including World Development Indicators, theglobaleconomy.com, indexmundi.com, tradingeconomics.com, countryeconomy.com, worlddata.info, and Statistical Bulletin and Annual Report and Statement of Accounts published by the Central Bank of Nigeria (CBN). Using Augmented Dicky- Fuller (ADF) unit root test, Autoregressive Distributed Lag (ARDL) bounds test, and Fully Modified Ordinary Least Squares to analyse the data, the results shows that there is negative and significant effect of agricultural output (LNAGO) on food inflation.

Similarly lending interest rate (LNLINT) is shown to exert a negative and significant effect on food inflation. Furthermore, the FMOL regression results show that real exchange rate (LNREXR) has positive and insignificant relationship with food inflation in Nigeria.

The conclusion is that the volume of agricultural output impact negatively on food inflation. Meaning that food inflation reduces as the volume of agriculture output increases. The implication is that food inflation in Nigeria is not caused by the volume of agricultural output produced but by other factors. Therefore, government should continue to improve on agricultural production by investing more in infrastructural development in rural areas, e.g., good roads, electricity, etc.; introduce better species of plants and animals; provide more extension services and training of farmers on the use of modern equipment; intensify mechanization of farming to ensure mass production; provide specialized financial institutions in various agricultural areas to meet the need of specific type of agriculture; provide adequate storage facilities, e.g., silo, cold room, etc.

The government should also look into other factors that have kept food prices high in the country including fuel scarcity, electricity shortage, foreign exchange problem, insecurity, etc.

REFERENCES

1. Ajulo, D. (2022). Five Reasons Food Prices Remain High in Nigeria in 2022. https://www.premiumtimesng.com/agriculture/agric-news/540069-five-reasons-food-prices-remain-high-in-nigeria-in-2022.html?tztc=1(Accessed 2.03.2023)
2. Akpan, S. B., & Udoh, E. J. (2009). Relative Price Variability of Grains and Inflation Rate Movement in Nigeria. *Global Journal of Agricultural Sciences*, 8(2), 107-11. https://doi.org/10.4314/gjass.v8i2.51877
3. Chang, Y., & Philips, P. C. T. (1995). Time Series Regression with Mixtures of Integrated Processes: Econometric theory. Cambridge University Press, (11), 1033-1094.
4. FAO (2022). Nigeria Agriculture at a Glance. https://www.fao.org/nigeria/fao-in-nigeria/nigeria-at-a-glance/en/
5. Inokotong, J. (2023). Inflation Rate in Nigeria Hits 22.22%, Highest in 17 Years. https://tribuneonlineng.com/inflation-rate-in-nigeria-hits-22-22-highest-in-17-years/(Accessed 2.04.2023)
6. Kamer, L. (2023). Agriculture in Nigeria - Statistics and Facts. https://www.statista.com/topics/6729/agriculture-in-nigeria/#topicOverview(Accessed 5.03.2023)
7. Mbah, C. C., Orjime, S. M., & Mgbemena, E. M. (2022). Agricultural Productivity, Food Prices and Inflation in Nigeria. *Journal of Management, Economics, and Industrial Organization*, 6(3), 113-126. http://doi.org/10.31039/jomeino.2022.6.3.8
8. Mesike, C. S., Okoh, R.N., & Inoni, O.E. (2010). Impact of Inflation and Government Agricultural Policies on Relative Price Variability of Cash Crops in Nigeria. Report and Opinion, 2(5), 8- 13.
9. Oyekanmi, S. (2023).Bank Lending Rate Hits 29.13% in December 2022. https://nairametrics.com/2023/02/01/bank-lending-rate-hits-29-13-in-december-2022/(Accessed 4.04.2023)
10. Oyinbo, O., & Rekwot, G. Z. (2014). The Relationships of Inflationary Trend, Agricultural Productivity and Economic Growth in Nigeria. *CBN Journal of Applied Statistics, 5(1), 35- 47*. http://hdl.handle.net/10419/144788
11. Peda.net (2023). Importance of Agriculture. https://peda.net/kenya/ass/subjects2/agriculture/form-one/ita/ioa(Accessed 2.03.2023)
12. Trade.gov (2023). Agriculture Sector. https://www.trade.gov/country-commercial-guides/nigeria-agriculture-sector (Accessed 20.05.2023)