International Journal of
Advanced Research in Accounting, Economics and Business Perspectives
p-ISSN: 2636-6894 | e-ISSN: 2636-6886

IJARAEBP
Vol. 7, No. 2
September, 2023

Agricultural Output-Food Price Nexus and Households' Welfare in Nigeria

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Article DOI: 10.48028/iiprds/ijaraebp.v7.i2.03

Abstract

This paper evaluates agricultural output-food price nexus and the welfare of households in Nigeria. The study is essentially secondary data based and utilized the Autogressive Distributed Lags (ARDL) approach for its analysis. Findings revealed that agricultural output had no significant impact on households' welfare in Nigeria. It was also shown that government spending on agriculture was unable to significantly boost food production and hence food security in Nigeria during the time under reference. This portends grave concerns for the future, and in light of this, the government should reassess its current insignificant allocation to the sector. The study also recommends that government should provide funding to enhance technology in food production through the acquisition of sophisticated farm tools (harvesters, tractors, herbicides, and fertilizer) and the construction of irrigation /storage facilities, as well as the establishment of food processing industries throughout the country, in order to enable farmers to increase productivity, leading to reduced food prices and enhanced welfare for the citizenry.

Keywords: *Agriculture, Food prices, Welfare, ARDL and Nigeria*.

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Background to the Study

Despite the fact that agriculture accounts for only approximately a fifth of Africa's GDP and half of its export value, more than two-thirds of the population lives in rural areas and rely on agriculture for their livelihood (World Bank, 2014). Smallholder farming, productivity, profitability and sustainability are thus seen as the primary means of escaping poverty in the region. Agricultural research and development initiatives focusing on agricultural intensification and modernization can contribute to increased agricultural productivity, reducing poverty and meeting rising food demand Lower food prices may boost the purchasing power of low-income people (Olsson and Hibbs, 2005; (Ravallion and Datt, 1998). Though agriculture is not a panacea for poverty reduction, but because the majority of impoverished people in Sub-Saharan African countries rely on it for their livelihoods, it can have a significant impact on poverty (Foster and Rosenzweig, 2005). Price changes, drought, pests, and illnesses are all common economic and ecological risks in agriculture. These dangers are affect especially the impoverished and small-scale farmers. Global economic shocks can also have a negative impact on a country that relies on agricultural exports (Winters et al., 2004; Easterly and Kraay, 2000). Correspondingly, a sudden decrease in the prices of agricultural outputs can quickly push small net sellers into losses and poverty. Besides, poor smallholders face a slew of obstacles that limit their output; hence households are unable to intensify agriculture and produce high-value commodities due to a lack of information regarding production methods and market opportunities, particularly for novel crops and types.

One of the major determinants of welfare in Nigeria is an excessive reliance on subsistence farming, along with restricted access to profitable off-farm work and income-generating activities, which has retarded any meaningful growth. Several scholars have agreed that there is a strong link between agricultural output, government expenditure on agriculture, credit available to farmers, security of farmers and farming communities, unemployment, exchange rate fluctuations, and household welfare, particularly in developing countries. Nonetheless, the country's high poverty rate, geometric population growth, worsening insecurity as manifested in attacks by bandits, herders and Boko-Horamists as well as a low government expenditure on agriculture, and a pervasive culture of corruption have all had a detrimental effect on food production, resulting in higher food prices and thus reduced household welfare. Given that Nigeria is a food deficient nation amidst growing demand for food, market forces naturally influence price setting, resulting in many low-middle-income households spending the greater share of their income on food. Due to the fact that households' welfare is mostly determined by their purchasing power, numerous households suffer welfare losses as their purchasing power continues to decline.

Thus, Nigeria's enormous natural and human resources have not resulted in increased welfare, since poverty, youth unemployment; growing insecurity, official corruption, core inflation as well as food inflation have all remained elevated. It is also to this connection that household incomes and hence welfare have continued to nosedive, as a result of the country's low purchasing power, which has exacerbated the country's misery index, impoverishing more people daily. The likely leading effects of these distortions, manifested in decreased food

production, accessibility and utilization, are the adoption of a variety of food coping strategies, culminating in food rationing, hunger, and malnutrition, and thus calorie deficiency among households. In essence, poor income results in excessive carbohydrate and other low-quality food intake, leading to welfare loss, health issues, and more poverty. Hence to this connection, the problematic of this study is to examine agricultural output, food prices and households' welfare in Nigeria using Nigerian data. While the paper's main objective is to examine agricultural output-food price nexus and the welfare of households in Nigeria; the specific objectives are as follows: (i) to investigate the effect of agricultural productivity on households' welfare in Nigeria; (ii) to examine the impact of food prices on households' welfare in Nigeria; (iii) to determine the effect of government agricultural expenditure on households' welfare in Nigeria.

The study on agricultural output-food price nexus and households' welfare in Nigeria is carried out using quarterly data from 1999:Q1-2020:Q4. One important justification for the adoption of quarterly data is hinged on the fact that due to the frequency of occurrence of most economic variables, they are better measured or estimated in quarters. Furthermore, the choice of 1999 coincides with the period when Nigeria, upon transiting from military rule to democracy experienced several changes in the structure of the economy, leading to improved investment in the agricultural sector of the economy, as the return to democracy with less dictatorial tendencies signified investor's confidence in the economic potentialities of the country.

Conceptual Clarification

Agricultural Productivity and Production in Nigeria

Nigeria is Africa's most populous country (210 million people) and one of the largest in terms of land area (910,770 km^2). It has the world's 27th largest economy, with a gross domestic product (GDP) of $523 billion dollars and a per capita GDP of $3,010 dollars in 2013 (World Bank, 2020). Although the agricultural industry employs 60% of Nigeria's working population and generates over 40% of the country's GDP, households whose primary source of income is agriculture have a higher rate of poverty (World Bank, 2014). Crop production, which accounts for 88 percent of overall agricultural GDP is the most important subsector (Mogues et al., 2014). From 2002 to 2012, the agricultural industry in Nigeria grew at a 5.9 percent annual rate, but it is suggested that this expansion is primarily due to population growth and the cropping of bigger tracts of land, most likely by commercial farmers (Oseni et al., 2014). Nigerian agriculture is predominantly rain-fed, with low productivity, little technology, and a high-labor intensity. This low agricultural production has been attributed to low fertilizer use, soil fertility degradation, and traditional tools, low technology, rain-fed farming practices. According to the literature, Nigerian farmers in all regions are below their production boundaries, indicating that there is room to boost agricultural productivity above present levels even without changing their current levels.

Low agricultural output in Nigeria is due to a variety of factors, including low input, inadequate use of farm technology such as improved seed and fertilizer, as well as increased insecurity across the country. More than 80% of Nigerian households attribute their poverty

to agricultural issues, with lack of agricultural inputs and inability to afford inputs (such as fertilizers and seeds) accounting for 44% (Oseni and Winters, 2009). The large disparity in fertilizer use relative to prescribed fertilizer levels is frequently cited as one of the primary causes of Nigeria's low agricultural production. It has long been argued that among other constraints to improving fertilizer use in Nigeria are limited access of framers to extension services, an outdated land tenure system, climatic factors, an imperfect credit and capital market, spatial inequality distribution of fertilizer, high prices of other non-fertilizer inputs, and an insufficient fertilizer supply (Philip et al., 2009; Oseni et al., 2014).

Food Inflation and Food Accessibility in Nigeria

Scholars are divided on the definition of inflation. While Gordon (1984) and Barro (1997) viewed inflation as a negative condition caused by a lack of monetary regulation, leading to higher prices in markets and reduces the purchasing power and hence the standard of living of average households, Barro (1997) on the other hand defined inflation as the gradual increase in the general level of prices for goods and services within an economy over time as a result of a shortage of either aggregate demand or aggregate supply, or both. Food inflation on the other hand is a term that refers to an increase in the average price of food goods in a country over a specified time period. According to Shankar (2019), food inflation is defined as an increase in the wholesale price index of a particular food item in comparison to the overall index or the consumer price index (CPI). More precisely, it is the increase in the cost of a staple food commodity relative to its previous price during a specified time period. Food inflation has a different meaning in affluent countries than it does in underdeveloped/developing countries. In rich countries such as the United States of America, Italy and Germany, an increase in food costs brings minor inconvenience to households and consumers, while in underdeveloped economies, an increase in food prices has severe repercussions for individual households' consumption patterns, since people may go hungry due to a lack of food. Although food grains are mostly viewed as commodities on the global market, they are the staple food of the poor in the majority of developing countries, which have a population of roughly two billion people (Kalkuhl, Matthias, von Braun, Joachim, and Torero, Maxim) (2016).

Households' Welfare

The term "household" refers to the fundamental residential unit in which economic output, consumption, inheritance, child-raising, and housing are structured and conducted. From the 14th century, welfare was frequently used to refer to a condition of happiness, prosperity, or merriment. In economics, it relates especially to the utility received through the acquisition of tangible things and services. While Pigou (1920) and Morattti et al (2012), defined welfare as an individual's consumption resulting from income (money), they argued that household welfare is generally defined as the amount of money required or expended to sustain a consistent level of utility. As a result, this researcher defines household welfare as the aggregate happiness or value that individuals, households, or communities obtain from the consumption of certain bundles of products (food) or services, given their available financial resources. It is a state of well-being, pleasure, and comfort, or the degree of prosperity and standard of living achievable by an individual or a group of individuals as a result of the

satisfaction gained from their income and consumption of certain bundles of commodities (food inclusive). An excellent example of welfare is having access to the food combinations necessary to maintain a healthy lifestyle for a person or household, given the purchasing power available at the time.

A prevalent theme in contemporary economic research is the quest to identify and quantify true welfare or well-being. Historically, economists utilized financial indices to assess welfare, including household income, consumption spending, gross domestic product (GDP) and consumer confidence (Slesnick, 1998). However, while other scholars adopt real income or expenditure as a proxy for household welfare, this research study utilizes final household consumption expenditure as a proxy for household welfare. This was justified by the notion that the amount of income spent by a customer on utility maximization is what in reality generates welfare. It encompasses all purchases made by resident households for daily necessities such as food, clothes, electricity, and transportation.

Theoretical Review

Sen's Poverty and Famine Theory: An Entitlement Approach

This theory propounded by Sen (1981) tied its arguments to the fact that hunger and famine for a very long time have been largely rooted in postulations made by Thomas Malthus' food availability approach. Sen did not contribute to challenging Malthus (1798)'s stance on food security until the early 1980s, when attention was shifted from national food availability to people's access to food in a dissertation on "entitlement and deprivation. The emphasis on food security in the entitlement discourse was an insistence on each individual's entitlements to commodity bundles, including food, by viewing famine as a result of households' failure to be entitled to the bundle(s) that assures them of sufficient food to improve their welfare (Sen 1981). Sen's Poverty and Famine Hypothesis is adopted for this study *as it best provides answers to the discourse on food security and households' welfare in developing countries, particularly Nigeria.*

Empirical Review

In a cross-sectional survey, using Foster–Greer–Thorbecke and probit regression model, Ogunniyi, Omotoso, Salman, Omotayo, Olagunju and Aremu, (2021) investigated the factors determining households' maize production in Nigeria and found that the value of output sold, education, credit access and participation in government safety nets programme significantly influenced food security among maize farmers in the study area. Deriving from the findings, it was recommended that efforts should be intensified to enhance the productivity of land through improved production practices.

Similarly, in a study on food insecurity in conflict affected regions in Nigeria's North-East, North-Central, and South-South zones, the World Bank (2017), using data from emergency response survey conducted via telephone calls among households in three affected regions between August-September 2017conducted a research and found that the mean household in all the three regions is "highly food insecure"; North-East of Nigeria is the most food insecure of the three regions; reducing meals or portion size is the most important coping strategy in all three regions; food prices are the most important source of food insecurity in all three regions.

The study recommended that, attention should be paid to increased food productivity, particularly in the North East and North Central, which rely heavily on agriculture as their main source of livelihood.

Furthermore, utilizing a point-analysis survey, Onwusiribe, Nto, Oteh and Agwu (2021) through the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Auto-Regressive Distributed Lag (ARDL) models examined the dynamics of food price volatility and households' welfare in Nigeria: implications for post-COVID-19 recovery: Data for the study which was sourced from FAO and the World Bank revealed that food prices, depth of food deficiency, food import, and food production index had a significant short-run impact on households' welfare in Nigeria. Policy recommendations were aimed at focusing on the short-term benefits while formulating policies aimed at households' welfare in the longrun.

In another study using a Random Sampling Technique with Quadratic Almost Ideal Demand System (QUAIDS) technique and the Compensated Variation model, Olubokun and Agbede (2018) studied the effects of food price inflation on households in Ondo State and found that apart from plantain, all other estimated expenditure elasticities were all positive and statistically significant, indicating that all the food items are normal goods. The scholars concluded that since all households in Ondo State suffered welfare losses from hike in food prices during the referenced period, government should as much as possible try to subsidize the prices of foodstuffs to make it easily accessible to households in Ondo State for improved welfare.

Additionally, in using time series analysis, Egwuma, Ojeleye and Adeola (2017) employed econometrics techniques of cointegration and error correction mechanism to empirically examine the relationship between food price inflation and key demand and supply variables including real gross domestic product, food import and crude oil price for the case of Nigeria between 1988 and 2017. Findings indicated that real GDP, food import, and crude oil price were positively related to food price inflation in the long-run. The coefficient of the error correction term was found to be statistically significant and showed that the dynamics of food price inflation in Nigeria is characterized by a relatively sluggish process of adjustment to the long-run equilibrium. The study recommended for the adoption of appropriate policies and creation of an enabling environment that significantly encourages increased domestic food production.

Data, Sources and Method of Data Analysis

The variable used for empirical testing includes Agricultural output (Ag-output), Agricultural Expenditure (AGX), Food prices (Fprice), Population Growth (POPGR), as the core independent variables while Security (SEC) served as the control variable to avoid the challenge of variable omission. The data are sourced from the National Bureau for Statistics (NBS) database, Central Bank of Nigeria (CBN) Statistical bulletin and World Bank Development Indicators (WBDI) respectively. The Autoregressive Distributed Lags (ARDL) Regression, the Augmented Dickey Fuller (ADF) Unit Root Test and the ARDL Bounds Test

to Cointegration were adopted as the main analytical tools of analysis in this study, using E-views 9.0 econometric software.

Model Specification

The method of estimation employed for this study is based on Auto-regressive Distributed Lag (ARDL) Model approach and Error Correction Mechanism (ECM) model. The ARDL modeling approach popularized by Pesaran and Pesaran (1997), Pesaran and Smith (1998), Pesaran and Shin (1999), and Pesaran et al. (2001) has numerous advantages. The main advantage of this approach lies in the fact that it can be applied irrespective of whether the variables are I(0) or I(1) and that none of the variables is stationary at 1(2) and beyond (Pesaran and Pesaran 1997). This study illustrates the ARDL modelling approach by considering the following equation:

Hwfare = Agoutput + AGX + Fprices + POPGR + SEC

$$Ln(Hwfare) = \lambda_o + \lambda_1 Ln(Agoutput) + \lambda_2 Ln(AGX) + \lambda_3 Ln(Fprices) + \lambda_4(POPGR) + \lambda_5(SEC) + \mu_t \text{----(eqtn 1)}$$

Where:

Hwfare	=	Households' welfare
Agoutput	=	Agricultural output (productivity)
AGX	=	Government Expenditure on Agriculture
Fprices	=	Food prices (proxy for food inflation)
POPGR	=	Population growth rate
SEC	=	Security of lives and properties across the federation
Ln	=	The natural log
μt	=	Stochastic error term

Moreover, $\lambda_0, \lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5$ are the respective parameters.

The equation of ARDL is as follows:

$$\Delta Ln(Hwfare)_t = \beta_o + \beta_1 Ln(Agoutput)_{t-1} + \beta_2 Ln(AGX)_{t-1} + \beta_3 Ln(Fprices)_{t-1} + \beta_4(POPGR)_{t-1} + \beta_5(SEC)_{t-1} +$$

$$\sum_{i=1}^{n} \alpha_1 Agoutput_{t-i} + \theta_2 AGX_{t-i} + \sum_{i=1}^{n} \delta_3 Fprices_{t-i} + \sum_{i=1}^{n} \delta_3 POPGR_{t-i} + \sum_{i=1}^{n} \lambda_4 SEC_{t-i} + \mu_t \ldots \text{(eqtn 2)}$$

If the existence of a long-term relationship between the variables is borne out, the second stage in the analysis consists in estimating the short- and long-term parameters, using the ARDL approach. Once the long-term relationship between the variables is determined, then the estimates of the long-term ARDL can be obtained. If a long-term relationship between the variables exists, then there also exists an error-correction representation. Consequently, the error correction model is estimated in the third step; it indicates the speed of adjustment to long-term equilibrium following a short-term shock. A general error-correction representation of equation is formulated as follows:

$$\Delta Ln(Hwfare)_t = \beta_o +$$

$$\sum_{i=1}^{n}\alpha_1\Delta Agoutputt_{t-i} + \sum_{i=1}^{n}\theta_2\Delta AGX_{t-i} + \sum_{i-1}^{n}\delta_3\Delta Fprices_{t-i} + \sum_{i-1}^{n}\Omega_4\Delta POPGR_{t-i} + \sum_{...}^{n}\lambda_5\Delta SEC_{t-I} + \varphi_1 ECM_{It-1} + \mu_t \quad \textit{(eqtn 3)}$$

Where:
φ = Speed or rate of adjustment; α_1, $\boldsymbol{\theta}_2$, $\boldsymbol{\delta}_3$, Ω_4, $\boldsymbol{\lambda}_5$, represents the coefficients of the variables respectively; Δ is the difference operator, n is the lag length of the variables; ect_{t-1} denotes the residual from the cointegration equation (the error correction term), and $\boldsymbol{\mu}_t$ is the uncorrelated white noise residuals.

Apriori Expectation

An *a priori* expectation is a theoretical statement or criteria set by economic theory. The study evaluates agricultural output-food prices nexus and households' welfare in Nigeria. Ordinarily, on a priori, some parameters in the model such as agricultural output, government expenditure on agriculture, population growth and security of lives and properties, all things being equal are expected to turn out positive, as an increase in any of these variables connotes higher agricultural output and hence improved households' welfare. Similarly, excepting food prices, the coefficients values of security of lives and properties is expected to come out positive, implying that improved security among farmers and farming communities, all things remaining equal would translate to more food production, thus leading to reduced food prices for the various households.

ADF Unit Root Test

Table 1 summarizes the findings of the Augmented Dickey-Fuller (ADF) test which was employed to determine the stationarity properties of the series in the model. This was aimed at establishing whether the series are stationary and exhibit random walk-in tandem with the stochastic process.

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

Variable	Level t-statistic value	1st Difference t-statistic value	5% critical value	Order of Integration
Hwfare	-4.589590	****	-2.897223	I(0)
AGAX	-2.899619	****	-2.899619	I(0)
FPRICES	-3.109868	****	-2.895512	I(0)
POPGR	****	-3.204429	-2.895512	I(1)
SEC	-3.800537	****	-2.898623	I(0)

Source: Extracts from E-views version 10

The unit root test indicates that the variables in the models are integrated of order zero I(0) or I(1) i.e. first difference stationary respectively. However, since all the variables are not integrated of the same order but having revealed a mix order of integration, that is, combination of I(O) and I(1) as shown above, the use of Johasen co-integration test becomes

untenable, hence the appropriate technique is the application of the popular Autoregressive Distributed Lags (ARDL) bound for co-integration to determine the existence of long-run relationship amongst the variables in the model. But to achieve this, a suitable lag selection criterion was determined.

Lag Selection Criteria

Before delving into the complexities of the cointegration test, it is crucial to choose a suitable lag length. Estimating the lag length is a critical step in many econometric analyses. To determine the appropriate number of lags to be selected during model estimation, the lag length is selected using explicit statistical information criteria obtained through unrestricted VAR estimate. The study employed the Akaike Information Criterion as the suitable lag selection criteria. See appendix page. The maximum number of lags that could be taken in this study was determined to be seven, utilizing Akaike Information Criterion (AIC), and this was selected for the estimation of a parsimonious model.

ARDL Bounds Testing

Since all variables are not integrated of the same order, but a combination of I(0) and I(1), the ARDL bounds testing method to cointegration (Pesaran & Shin, 1999; Pesaran, Shin, & Smith, 2001) was used to determine if there is cointegration or evidence of long-run relationship between the variables included in the model. The test requires that the F-statistic value be greater and above the upper and lower bound critical values at the chosen level of significance, in this case 5% threshold; otherwise, no long-run relationship exists. Below is the summary of findings from the Bounds testing.

Table 2: ARDL Bounds Testing

Level of Significance	F-statistics value (K)	Lower Bound I(0)	Upper Bound I(1)
10%		2.26	3.35
5%	8.972705 (5)	**2.62**	**3.79**
2.5%		2.96	4.18
1%		3.41	4.68

Source: Extracts from E-views 10

From Table 2 it was revealed that the F-statistic value of 8.9 is greater than the upper bounds value of 3.79 at the 5% level of significance for the ARDL model. This is thus a confirmation of a unique long-run relationship among the variables in Nigeria during the referenced period.

Longrun and Shortrun (ECM) Analysis

An empirical ARDL model estimated to determine the long-run and short run relationship between the regressors and the regressand, revealed the following, as presented in Table 3.

Table 3(a): Longrun Regression Output
Dependent Variable: Household's welfare (Hwfare)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGOUTPUT	-0.012016	0.017839	-0.67359	0.5027
AGAX	-0.02382	0.010329	-2.306094	0.0239
FPRICES	0.078073	0.02062	3.786199	0.0003
POPGR	0.067904	0.039239	1.730524	0.0877
SEC	0.002773	0.009312	0.297823	0.7667
C	3.231718	0.119216	27.108131	0.0000

Table 3(b): Shortrun Regression Output

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGOUTPUT)	-0.030023	0.00574	-5.230383	0.0000
D(AGAX)	0.000878	0.002719	0.322931	0.7477
D(FPRICES)	0.011744	0.003409	3.44492	0.0009
D(POPGR)	0.068663	0.033313	2.061131	0.0428
D(SEC)	0.004658	0.00268	1.738256	0.0863
ECM(-1)	-0.150426	0.035728	-4.210323	0.0001

R-squared: 97%
Source: Extracts from Eviews version 10

After proving the existence of a long-run relationship between the variables of the model, the second step of the methodology consists in searching for the long and short-term coefficient estimates of the model. Table 3(A) and (B) presents the estimates of long run and short run results respectively. The explanatory power of the regression model with an r-squared of 97% is impressive. This revealed that 97 percent of the variation in households' welfare is explained by the independent variables agricultural output, government spending on the agricultural sector, food prices, population growth and the level of security prevailing at the time. The remaining 3 percent is explained by the stochastic error term, that is, variables not captured in this model. The model is therefore adjudged to have a good fit and useful for making generalization within this period.

The output from the longrun autoregressive distributed lag above is quite revealing and call for urgent policy review on the part of policymakers. Except for the coefficient values of agricultural output and the level of security prevailing in the country, Table 3(A) revealed that all other variables in the agricultural output-household welfare equation were statistically significant in explaining the model in the long run. However, short-run estimates indicated that, aside the coefficient value of government expenditure on agriculture (AGAX), all other series in the model were statistically significant predictors of households' welfare during the

quarters examined. For instance, it was shown that both in the long and short term, a unit decline in the index of agricultural productivity resulted in a corresponding decrease in Nigeria's aggregate food stock, hence households' welfare was negatively affected.

Similarly, evidence from long-run estimates indicated that government expenditure on agriculture had a detrimental effect on food supply in Nigeria during the quarters analyzed. That is, each unit decrease in food production was as a result of a fall or decline in government investment in the agricultural sector. This may be related to the activity of non-state actors who have rendered government investment in the field fruitless. In addition, it was revealed that food prices in the long run and short run revealed statistically significant influence on households' welfare as it clearly showed that increasing food prices translated to reduced welfare for the average Nigerian.

Additionally, the computed coefficients for the longrun and shortrun estimates in Tables 4 indicated that population increase was statistically significant and hence had a considerable impact on agriculture output and thus the welfare of Nigerian households during the referenced periods. The coefficients of 0.067904 and 0.068663 revealed that each additional or upward movement in population growth has a proportionately injurious or negative effect on agricultural productivity and thus households' welfare. Furthermore, Table 4 revealed that the coefficient value of security was positive and exerted statistically significant influence on households' welfare both in the longrun and short-term within the period examined. Specifically, it was revealed that for every percentage rise in the cases of political violence, terrorism, banditry, kidnapping and mindless killing of vulnerable farmers, a proportionate decrease or decline is occasioned in the food production sector of the economy, triggering higher food prices and hence reduced welfare for households.

Finally, the slope coefficient of the error correction term (-0.150426) represented the rate of adjustment and is also consistent with the long-run equilibrium convergence hypothesis when the agricultural output-food prices and household welfare equations are disturbed. Given system innovation, the error correction term suggested that it will take approximately 15 percent, i.e. 6 years, six months, and a nine weeks speed of adjustment to attain equilibrium in the system. Although the rate of adjustment is sluggish, the ultimate convergence to an equilibrium state is contingent on the effectiveness of government initiatives aimed at resolving the incidence of low food output and hence rising prices.

Post Estimation Analyses

This section examines the usefulness, robustness and reliability of the estimated models by conducting diagnostic tests. Basic diagnostic tests such as serial correlation test, heteroscedasticity test and normality test were conducted. The results are shown in Table 4.

Table 4: Post Estimation Analysis

S/N	Test	F-Statistic	P-Value	Decision
1	Breusch-Godfrey Serial Correlation LM Test	1.024030	0.3645	Accepted
2	Heteroskedasticity Test: Breusch-Pagan-Godfrey	1.769128	0.0458	Rejected

Source: Author's Computation Using E-views 10

From the Heteroskedasticity Test: Breusch-Pagan-Godfrey test results, the hypothesis of zero homoscedasticity in the residuals were rejected. This was because the probability value of 0.0458 which is less than 5%. However, the Breusch-Godfrey Serial Correlation LM test revealed an insignificant value of 0.3645, which is in excess of 0.05. This leads to the rejection of the presence of serial autocorrelation in the residuals thus concluding that the residuals are serially correlated. It can therefore be deduced that the model is valid and useful for policy making.

Test of Hypotheses

Three hypotheses are formulated and tested as follows:

Ho_1: Agricultural output has no significant impact on households' welfare in Nigeria.

Ho_2: Food prices does not exert any significant effect on the welfare of Nigerian households.

Ho_3: Government expenditure on agriculture has no significant impact on households' welfare in Nigeria.

To conclude on the three hypotheses above, t-statistic and p-values for the longrun coefficients shall be used. Consequently, in reference to the longrun regression output in Table 3(A&B), it is concluded as follows: Agricultural output has no significant impact on households' welfare in Nigeria; on the other hand, government spending on the sector was found to have a significant, though negative effect on output growth during the period examined, even as, food prices exerted significant adverse effect on households' welfare during the periods examined.

Concluding Remarks

This paper evaluated agricultural output-food price nexus and the welfare of households in Nigeria. The study is essentially secondary data based and utilized various econometric tools. The study found evidence of a unique longrun relationship between the dependent and independent variables in the model. Similarly, results from the longrun and shortrun regression succinctly revealed that agricultural output had no significant impact on households' welfare in Nigeria; secondly, that, government spending on the sector was found to have a significant, though negative effect on output growth during the period examined, just as, food prices exerted significant but adverse effect on households' welfare within the referenced periods.

In concluding therefore, this study states that the longrun inverse relationship between government spending on agriculture and food production confirmed the fact that government spending on the sector was unable to significantly boost food production, leading to food insecurity in Nigeria during the referenced period. Consequently, the government should reassess its current meagre budgetary allocation to the agricultural sector. There is no gainsaying the fact that food production is, without a doubt, a serious enterprise that merits all the attention it receives. Given that when food production increases, the likelihood of being unable to access food decreases significantly, thus reduced government spending on agriculture and the risk of misappropriation deny farmers access to agricultural inputs such as pesticides, fertilizers, improved seedlings, tractors, and harvesters, all of which have a detrimental effect on overall agricultural output, leading to an inevitable demand-supply gap and hence higher food prices. Consequently, it is further recommended that the various anticorruption agencies, including the Economic and Financial Crimes Commission (EFCC) and the Independent Corrupt Practices and Other Related Commission (ICPC) should be strengthened to punish all involved in cases of misappropriation of budgeted funds to the agricultural sector.

Finally, to ameliorate citizens' plight in combating the current wave of rising food prices, government should also earn for more sustainable food production and this they can achieve by improving on security. Government and its security agencies should therefore go beyond its present propaganda and grandstanding and provide a peaceful environment for farmers. They should be more proactive and devise workable strategies aimed at de-escalating growing tension across Nigeria's six geopolitical zones including the Federal Capital Territory Abuja, so as to allow farmers to return to more productive farming activities as soon as possible.

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Appendix I:
Lag Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4359.311	NA	3.57e+37	112.0080	112.2799	112.1168
1	-3504.472	1490.489	8.72e+28	92.16595	94.88523	93.25453
2	-3343.816	243.0442	1.22e+28	90.12348	95.29011	92.19178
3	-3288.619	70.76462	2.92e+28	90.78511	98.39909	93.83313
4	-3168.253	126.5384	1.66e+28	89.77573	99.83706	93.80347
5	-2554.669	503.4542	4.47e+22	76.11971	88.62839	81.12716
6	-2369.381	109.2719	1.42e+22	73.44568	88.40171	79.43285
7	-2003.904	131.1971*	1.90e+20*	66.15138*	83.55477*	73.11828*

Source: Author's extract from E-views 10;
LR: Sequential Modified Test Statistic
FPE: Final Prediction Error
AIC: Akaike Information Criterion
SC: Schwarz Information Criterion
HQ: Hannan-Quinn Information Criterion
Note: * indicates lag order selected by the criterion.