American Journal of
Agriculture
(AJA)

Empirical Factors Influencing Food Security in Nigeria. Do Local Farmer Investors In Farming Activities Mitigate Food Shortages? Evidence in the Short and Long Run.

Dr. Nnaemeka Nathaniel Obasi

AJP

American Journal of Agriculture
ISSN 2790-5756 (Online)
Vol.4 , Issue 1, pp 24 - 46, 2022

www.ajpojournals.org

Empirical Factors Influencing Food Security in Nigeria. Do Local Farmer Investors in Farming Activities Mitigate Food Shortages? Evidence in the Short and Long Run

Dr. Nnaemeka Nathaniel Obasi

Alumni of University of the West of Scotland, Currently Director of Research and Innovation, F and I Oil and Gas Lagos, Nigeria,

Email nnaemekafandil@gmail.com, nnaemeka69@yahoo.com

ABSTRACT

Purpose: What are the significant factors influencing food security in Nigeria? What is the food security status of rural farmers? Do local farmer investors positively influence agricultural output productivity and mitigate food shortages in the long run and short run? What is the alternative source of mitigating food shortages? Through these questions, the objective of this research was to identify factors that affect food security as well as identifying empirical sources of improving food security and putting good policies in place to actualise it.

Methodology: The study has a research design covering a sample size of 145 farmers using a structured questionnaire with random sampling technique to investigate the empirical factors influencing food security in Nigeria and method of data analysis used was logistic regression analysis. Time series data from Central Bank of Nigeria Statistical Bulletin (2019) was used to investigate the role of local farmer investors in agricultural productivity/mitigation of food shortages using Johansen co-integration (long run) and Granger causality (short run) techniques.

Findings: The logistic regression result computed from the survey data from the respondent farmers revealed that age, total cost of production, farm income and health expenditure are significant factors that influence food security. Result further showed that food security status of rural farmers is not secured. Through the short run and long run investigation, the empirical results covering the period of 1980-2018 in Nigeria revealed that local farmer investors positively influence agricultural productivity and mitigate food shortages by 2.99 percent. The findings further revealed that foreign farmer investors contribute to agricultural output productivity and mitigate food shortages by 4.90 percent, thus an alternative source of mitigating food shortages in Nigeria.

Unique contribution to practice and policy: Its unique contribution to practice and policy is that policy makers will shift in line with the findings. Policy makers should ensure that policies that encourage local farmer investors as well as foreign farmer investors are put in place and adhered to help mitigate food shortages in Nigeria.

Keywords: *Local farmer investors, foreign farmer investors, food security, food insecurity, agricultural productivity*

1. Introduction

Good numbers of countries in the developing nation are experiencing food price volatility due to insufficient food (Lukas et. al 2017). However, the United Nations in 2000 set eight millennium development goals for the broad purpose of reducing the number of people who have been dying of hunger by 2015: United Nations (2003, p. 2) indicates that the eradication of hunger precedes actualisation of universal primary education, promotion of gender equality, reduction in child mortality rates, improving maternal health, combating HIV AIDS, malaria and other diseases, ensuring environmental sustainability and developing global partnership for development. Further, in 2006 thirty-nine countries of the world experienced severe shortage of goods and services as well as foods that needed assistance externally: twenty-five in Africa, eleven in Asia and near east, two in Latin America and one in Europe (Andrea and Quan 2009, p. 3).

In the 1960s agriculture was the main stay of the Nigerian economy. However, in the 1970s, all attention was shifted to oil which started to cause food shortages and the fall in oil prices in the 1980s affected economic growth (Nwachukwu and Odogie 2009, p. 9). This suggests that agricultural output was affected due to lack of commitment by the government towards diversifying the economy. Similarly, Amadi (2002, p. 2) reveals that Nigeria's over dependence on oil caused a gap in savings and foreign exchange and drags back the rate of output growth in agriculture. Thus, the need to diversify the economy cannot be over emphasised. Consequently, Eko et al. (2013) show that to ensure output growth is improved, diversification of the Nigeria economy via agriculture should not be trivialised.

On the search for avenues to increase food productivity and reduce food shortages in Nigeria by looking inwardly Uremadu (2007, p. 364) and Nwachukwu and Odogie (2009, p. 5) posit that savings accumulation as an avenue for boosting output productivity is low in Nigeria and that there are good number of local investors who have the acumen for investment but their activities are crippled by lack of funds due to poor domestic savings. This suggests that the inadequate local farmer investors caused by poor funds in Nigeria needs to be complemented by attracting foreign farmers investors

In their bid to reduce government deficits and increase output of products to reduce food shortages, Nigerian government introduced Structural Adjustment Programme (SAP) in 1986 that brought about deregulation (Amadi 2002). The purpose of the deregulation policy was to encourage competition, reduce government control in the economy, encourage free participation in sectors and attracts foreigners to reduce shortages of products and to boost output productivity (Amadi 2002)

In Nigeria, the cost of food items skyrocketed to 18.34 percent in October of 2021 over the same month in the previous year (National Bureau of Statistics 2021). Similarly, according to Statista (2021) below is the increase in average prices of selected food products in Nigeria as of September 2021 compared to the previous year.

Table 1: % change in prices of selected food products in Nigeria 2021

Food Products	% change in prices
Agric eggs (medium size), 1 dozen	25.84
Agric eggs (medium size, price of one), 1 piece	27.33
Beans, brown solid loose, 1 Kg	57.04
Beans, white black eye, solid loose, 1 Kg	62.04

Source: Statista (2021)

Furthermore, Nigeria is among the countries with the highest inflationary rate in food products (Statista 2021). The high inflationary rate is evidence of food shortages.

Since the importance of food production in Nigeria cannot be over-emphasized, it becomes imperative for this study to examine the role of local famer investors in mitigating food shortages in Nigeria both in the short and long run.

Research Hypotheses

1. Local farmer investors are likely to have positive influence on agricultural output productivity and mitigate food shortages in the long run.
2. Local farmer investors are likely to Granger cause agricultural output productivity in the short run.

1.1 Facts on the origin of food shortages in Nigeria

Agriculture used to be the main stay of Nigeria economy, seconded by manufacturing sector. From Table 1 and Table 2 in the next page it is clear that the contribution of both the agriculture and manufacturing sectors to GDP are declining. This suggests the prevalence of food shortages in Nigeria. Precisely, it shows that in the 1960s that Nigeria had abundance of food supply to cater for its citizenry. Shortages of manufactured goods improve in 2005, but fluctuate in 2006 - 2008, followed by severe shortage of manufactured goods from 2018. Oil was discovered in large quantity in Nigeria in the 1970s. Although, oil price was slashed at the international market in 1980s, Nigeria realised about two hundred billion US dollars for the period of 1970-1990 and showed that earnings from oil export was about ninety-five percent of total foreign exchange earnings (Adeola 1994, p. 10). Many years after the discovery of oil in Nigeria, the contribution of agriculture continues to decrease. Thus, food shortage in Nigeria is caused by the abandonment of agriculture due to the discovery of oil which becomes a Dutch disease (Sach and Warner 2001). Investigating the contribution of local farmer investors to agricultural output productivity will help us to ascertain whether they would be useful in mitigating food shortages in Nigeria; thereby assist policy makers in initiating the right policy to combat it.

Table 2: Agricultural sector contribution to growth rate of GDP 1960-2019

Sector	1960	1970	1975	2006	2007	2008	2009	2010	2016	2017	2019
Agriculture	62.9	48.8	30.1	7.40	7.19	6.54	2.5	2.4	1.0	0.8	0.6

Central Bank of Nigeria (2009, p. 116), Central Bank of Nigeria, Annual Report (2019, p. 178)

Table 3: Manufacturing sector contribution to growth rate of GDP 1960-2019

Sector	1960	1970	1975	2005	2006	2007	2008	2018	2019
Manufacturing	4.8	7.2	5.6	9.61	9.39	9.57	9.28	2.6	1.6

Central Bank of Nigeria (2009, p. 116), Central Bank of Nigeria, Annual Report (2019, p. 187)

2. Literature on the importance of agriculture

In Nigeria in particular and developing countries in general, agricultural sector has played an important role of providing food, export earning, job creation and markets for the primary sector capital goods. These functions are important to Nigeria and developing countries. This sector is crucial for the existence of mankind and since ages it has provided mankind with food, clothing and heating (Federico 2005, p. 1). Below is the importance of agriculture.

2.1. Food availability

Agriculture especially those in the rural areas are the key drivers for improving both food availability and food access (Karolina and Malgarzala 2020). However, the provision of agricultural products in large quantity in Nigeria is difficult due to the following reasons:

I. **Fast rising population,** Nigerian population has been growing fast and need to be provided enough food. According to Population Reference Bureau (2008) and World Bank (2013) Nigeria population in 2008 and 2011 were 148.1 million and 162.5 million respectively, indicating a fast-rising population. Further, the nutrition content of the food provided is very essential. Nigeria's basic foods mostly contain carbohydrates such as rice, cocoyam, cassava, maize to mention just but few. This shows that the majority of foods taken in Nigeria are not balanced not because the people like it, but due to high prices of food that contains protein like meat, chicken, eggs, beverages among others. Thus, any type of modern technique that would be adopted in agricultural activity by investors should ensure that all the nutritional contents are present and get to the people.

II. **Increased urbanization**, in most of the developing countries in general and Nigeria in particular, there have been rise in the number of people going out from the villages to urban centres. High rate of urbanisation is observed in countries that adopt policies that favour urban development. The aftermath of this is that the villages are left undeveloped, while the urban areas developed. This inequality in development between the rural and the urban areas will make the labour force to move out of the villages or the rural areas to the urban areas in search of jobs in other sectors. Foreign farmer investors and local farmer investors in the rural areas in agricultural activity will experience shortage in the labour force and this will negatively affect food output since labour force is left for the ageing population who are living in the rural areas.

III. **Rising per capita income** often increases the demand for food. In Nigeria there is an increase in the demands for imported food coupled with low capacity utilization by firms (Gain Report 2009). This reveals that foods produced in Nigeria are lower than the demand and population growth. Consequently, revenue that should have been used to invest in productive

activities, would now been used to import food. This is why importation of goods has been increasing in Nigeria.

IV. Rising inflation, one of the reasons for the tremendous rise in the demand of food in Nigeria is the continuous rise in inflation. For example, inflationary rates in Nigeria in 2008 and 2010 were 11.0% and 26.8% respectively, indicating a rising inflation (World Bank 2013). It is understood that shortage in food supply causes price to rise and for the fact that the disequilibrium between the supply and the demand cannot be corrected via increase in food output, labour union will have no alternative than to seek for increase in wages which in turn leads to an increase in price to be able to pay for an increase in wages by the employer. It is now obvious that increasing output productivity in agricultural activity will save Nigeria the trouble of shortage of food and food importation. According to World Bank (2005, p. 104) since 1997 Nigeria has been having continuous increase in food importation and population growth.

2.2. Provision of raw materials for the local industries

Agricultural sector assists local producers in agro-allied industries by providing raw materials. For instance, cotton is provided for textile industries, cocoa is provided for beverages industries, fish is provided for industries that produce tinned fish, while maize and wheat are provided for brewing industries. Before 1980 industries in Nigeria mostly imported their raw materials but due to adoption of import substitution industrialisation policy of 1980, many producers in Nigeria set up domestic industries and produced raw materials at home to assist their agro-allied industries.

2.3. Foreign exchange

Nigeria and most countries in the developing nations mostly export primary products like cocoa, groundnut, palm oil, cotton, forest products to mention just but few. Tax is levied on the exported products and revenue realised helped in putting capital in place for economic growth. According to World Bank (2005, pp. 92-96) the contribution of agriculture to Nigeria total exports for the purpose of earning an increased export revenue has not improved. This trend has to be changed especially now that the contribution of oil to economic growth is low. The improvement in the primary product export will help to raise revenue to fund programmes and projects for improving economic growth in Nigeria.

2.4. Job creation

Agricultural sector employs majority of the population than any other sector in Nigeria. However, when large scale commercial agriculture is adopted large labour force will not be employed because it is capital intensive. But, agro-allied industries that make use of the raw material or products will absorb the labour force not employed by the large scale commercial agriculture. However, agricultural sector still creates jobs in Nigeria and other developing countries than other sectors (Gain Report 2009). Thus World Bank (2003, p. 8) reveals that the unabated rise in the agricultural tariff charged by the developed countries made the developing countries to lose twenty seven million jobs yearly and this has negative impact on diversifying in agriculture in Nigeria.

2.5. Providing markets for the primary sector capital products.

Agricultural sector provides large market for the primary sector capital products like tractors, harvesters, fertilizers, agro-chemicals among others. Some agro-chemicals are important in developing high yielding varieties of agricultural products. According to Srinivasan (2003, p. 187) an increase in agricultural output has been recognized to be linked to the discovery of new high yielding varieties of agricultural products. Similarly, Johnson (2002, pp. 1-2) explains that biotechnology in agriculture is capable of reducing food shortages in the developing countries by increasing both the output and the nutritional content.

The roles of agricultural sector in providing the aforementioned functions will significantly help to mitigate food shortages in Nigeria. However, modern technologies are needed to transform Nigeria agricultural system to ensure that output is increased in large quantity. Precisely, agricultural sector can be improved via investment, thus the need for both local farmer investors and foreign farmer investors in agricultural activity in Nigeria. The need to increase agricultural output is justified because it is the main stay of the developing countries economy and the largest employer of the labour force (Lindahl, 2005, p. 52). This indicates that an ever-increasing agricultural output is important to mitigating food shortages in Nigeria.

3. Literature review

Food security is not when all sorts of food is available. Rather is a situation when the masses at all times have access to sufficient, safe and nutritious food to maintain healthy and productive lives (FAO 2002). The three vital components of food security are food availability, food access and food utilization. The concept of food availability ensures the availability of food from domestic production and imports. Food access ensures that people access food at all times even with their limited income or resources while the food utilization ensures that the food taken is safe and do not have any chance of jeopardizing the health of the people (Omonona and Agoi, 2007; Kuwornu et al., 2013).

The issue of food quality and safety is important factors in considering food security. This is because food intake related problems are not only hunger and malnutrition, but underweight, obesity also. However, food utilization as an aspect of food security encompasses the preparation, processing and cooking of the food (Kuwornu et. al 2013). In a nutshell, ones food is secured if he has enough food, distributed by dietary needs and ensured to nutritional needs of all the members of his household.

Abdulahi et. al (2019) investigated the determinant of food insecurity among households in Katsina. The logistic regression of the study revealed that food availability, accessibility, utilization and stability exact significant impact on food security. Tithy et. al (2020) investigated the determinant of food security in Bangladesh. Results revealed that more 60 percent of households were with food insecurity. Results further revealed that monthly household income, age of household head, education level of the household, household size, and gender of household head exact significant influence on food security status at the household level.

Enioluwa et. al (2018) investigated into the food security constraints of rural farming households in the North West Province of South Africa. The logistic regression result revealed that factors such as age of the household head, household feeding rate, total cost of production, farm income and health expenses had significant impact on respondents food security.

Oluwatoyo and Raehoene (2017) investigated on the factors influencing food security in South Africa. Results from the study indicated that HIV/AIDS, high unemployment and inadequate social welfare contributed to food insecurity in the country.

Shisana et. al (2013) investigated on food security in South Africa and utilised national representative sample. Results from the study showed that 45.6% of South African population were food secured, while 26% of the population were food insecured. Results further showed that urban formal areas had the lowest rate of hunger at 19%, while the largest number of the population that were hunger were found in rural formal area at 37%. Unlike the previous studies, this study is specific to Nigeria. This study further differed from the previous studies by investigating the role of local investors in farming activity in agricultural output in CobbDouglas production function in line with endogenous growth theory. Unlike previous studies, after identifying factors that influence food security in Nigeria it goes further to identify source and alternative source of mitigating food shortages by empirical means.

4. Theoretical review

4.1. Malthusian Population Theory of food insecurity

Population theory of food insecurity was propounded by Malthus in 1798 in his famous theory of population tagged “An essay on the principles of population” argued that population exhibits a natural growth that grew in geometric progression, while food production grew in arithmetic progression. This suggests that population was growing greater than food. The theory further revealed that unless there are restrains there will be severe food scarcity in the future. This theory was more particular to agricultural productivity because of fear of hunger and famine. Malthus further states that if nothing is done, population will soon overtakes the resources and this signifies disaster to society. He therefore outlined natural and moral checks as the control for rising population.

The flaw in the theory is that it did not put into consideration the expansionary effect of technological advancement and international trade on food production. Despite the above pitfall, this theory have succeeded in explaining the issue of food insecurity especially now that the population of Nigeria is rising, coupled with her poor technological progress and low foreign investment attraction. The prevalence of early marriage and the culture supporting marriage of more than one wife with many children are obtained in Nigeria with the consequence of hunger, starvation and food insecurity makes the theory relevant to this study.

4.2. Traditional neo-classical theory/Cobb-Douglas production function of output productivity

Traditional neo-classical growth theory was introduced by Solow and Swan in 1956. The search for theoretical linkage between local farmers and foreign farmers’ output productivity have drawn the interest of the literature for a long time. The traditional neo-classical model fails to recognise technological progress as an endogenous factor (Kornecki et. al 2008). According to traditional neoclassical growth theory, an economy where accumulation of capital is fast in the short run is bound to have a tremendous increase in output level and that an increase in output level occurs through three different ways listed as follows: increase in the quality and quantity of labour/human capital which could be through sound education and population growth; increase in capital via investment (local/foreign), savings and improvement in technology

(Afolabi 2011, p. 10). The basic assumption of the Solow growth model is that as quantity of capital used in an economy falls, its marginal product also falls. The Solow model assumes that in the long run as accumulation of capital increases beyond its optimal level diminishing return will set in and when this happens the rate of economic growth will be determined by technical progress and growth in the labour force of the economy (Schutt 2003). Kornecki et al (2008, p. 5) provides evidence from the neo-classical growth paradigm which pioneered the linking of the traditional factors of production, labour and capital to output productivity. Local/foreign investors in farming activity (as sources of capital) help to increase capital stock in the host country which tends to increase output productivity (Kornecki et. al 2008).

It further reveals that human capital as one of the traditional factors of production increases output and it is assumed to grow at exogenous exponential rates. However, endogenous growth theory championed by Romer in his research work of 1986 attempted to endogenize the sources of output growth (human capital) so that the rate of growth would be determined within the model (Schutt 2003, p. 6-9). According to Romer (1990) cited in Schutt (2003) the most important factor is research and development (R&D) which helps in the creation of new technologies. The educational attainment of the population has a significant impact on their ability to adapt to change as well as in introducing new technologies in the endogenous growth model (Afolabi 2011). In summary, endogenous growth theory assumes increasing returns to factor inputs used in the production process and technological change is determined endogenously. Furthermore, it reveals changes in the role of human capital which enters into endogenous model as a catalyst of technological progress rather than as an independent source of increasing output productivity (Schutt 2003, p. 13). The difference between the traditional neoclassical theory and endogenous growth theory is that in the former policies play a crucial role in improving output productivity in the long run whereas in the latter new knowledge and innovation play an important role (Petrakos et al 2007). Secondly, in the former investment as well as savings is only important in the short run output productivity and that technological progress, though vital in the long run is regarded as exogenous to economic system; whereas in the latter output does not converge to zero due to increasing return to scale made possible by research and development and innovation (Petrakos et al 2007, pp. 5-6).

This study adopts theoretical model of Cobb–Douglas production function because the variables in this study are used as independent factors of production in the production process to increase output. This study employs a production function in which local farmer investors in farming activity is vividly incorporated as a factor of production. According to Cobb Douglas production function outpour is produced by capital which comprises capital stock and physical capital. Example of capital stock here is human capital, while investments such as local farmer investors and foreign farmer investors in farming activity are the physical capital. Marginal elasticity in Cobb Douglas explains change in output productivity as a result of a unit change in physical capital (local/foreign investors in farming activity). CobbDouglas production function further reveals that if marginal propensity is greater than 0, an increase in both the local and foreign investors in farming activity will increase output productivity which in turn mitigate food shortages and improve food security.

5. Research methodology

The study utilised quantitative method with large sample size and adopted regression analysis. For the empirical factors influencing food security in Nigeria, the study population were rural farmers from Ugiri Clan of Imo State, Nigeria. A sample size of 145 farmers was selected and the sample size calculator used for the selection was Krejcie and Morgan (1970). Out of the 145 selected farmers only 77 of them were willing to participate in the interview. The sample technique adopted was random sampling and it gave each of them equal chance of being selected.

5.1. Method of data collection

For the investigation of the empirical factors influencing food security in Nigeria the data was obtained via a structured questionnaire by the author based on the objective of the study. The data from the questionnaire were used to compute the socio-economic characteristics of the farmers and the factors that influenced food security. In other words, for the investigation of the role of local farmer investors in agricultural output productivity, time series data (secondary data) from Central Bank of Nigeria (2019) statistical bulletin were used.

5.2. Data analysis

The data for this study on the factors that influenced food security was analysed through inferential statistics (logistic regression) on SPSS 23 (2015) software. Investigation on the mitigation of food shortages by local investors in farming activity was analysed through Cointegration regression model (long run) and Granger causality regression model (short run) on E-view 8.1 software.

5.2.1. Logistic regression model

Logistic regression model was utilised to investigate the factors that influenced food security among farmers in the sample size. The logistic regression was stated as:

$Y_i = \beta_0 + \beta_1 X_1 \quad \beta_2 X_2 \qquad \beta_n X_n$ (1) stands for a binary variable which is 0 if respondents are food secure, and 1 if respondents are not food secure. is the intercept and is constant. , , to stand for the regression coefficients of the independent variables, while , , represent the variables used in the model.

Y_i β_0 β_1 β_2 β_n X_1 X_2 X_n

X_1 = age, X_2 = gender, X_3 = total cost of production, X_4 = farm income, X_5 = financial assistance, X_6 = health expenditure.

5.2.2. Augmented Dickey-fullers unit root test

$$y_t = \alpha_0 + \alpha_1 + y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta y_{t-i} + \varepsilon_t \qquad (2)$$

The left hand side of the Dickey-fullers has a linear time trend with order 1 autoregressive process, while the right hand side is the augmented. Thus, Equation 2 above is called Augmented-Dickey-fullers test. The k lagged difference terms, Δy_{t-i} are used in complex autoregressive process and the value of k is set so that the error term do not correlate and is assumed to be homoskedastic. In a nutshell, the presence of serial correlation in the

DickeyFullers test influences results and led to the introduction of Augmented Dickey-Fullers test which suggest adding of lags to take care of the residuals of serial correlation (Dickey and Fuller 1979).

Unlike Augmented Dickey-fullers test, Phillip-Perron test uses non parametric, ignores serial correlation and focuses on heteroskedasticity. The non parametric of Phillip Perron assumes there is no functional form of error process due to its application to a large sample and does not have lag length (Lavan and Paul, 2004). **5.2.3. Co-integration and error correction model**

The essence of co-integration regression is to ascertain whether there exists long run relationship among the co-integrating variables. A co-integrating variable could be stationary either in their level or first difference. For instance, when variables are not stationary in their levels but integrated in their first difference, it means they are integrated at order one, and is represented as *I* (1). If they are integrated at second difference, it means they are integrated at order 2, and is represented as *I* (2). In a nutshell, it shows that variables that are not stationary at levels or first difference can co-integrate when one or more variables that are stationary are combined.

$$\Delta X_t = \mu + \sum_{i=1}^{p-1} \Gamma i \, \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_t \qquad (3)$$

Equation 3 above is error correction model. X_t in the equation is (nx1) vector $(X_{1t}, X_{2t}, X_{3t}, \dots X_{nt})$ and μ for constant term. $\Gamma and \Pi$ are for coefficient matrices, Δ represents a difference operator and ε_t is error term. In summary, coefficient matrix Π shows the impact as well as the long run relationship and has ranks base on the significance of Eigen values. When there exists no co-integration all the rows in the Π-matrix will be zero and when it is non zero it means stationary or co-integration. The rank of the co-integration is tested with trace and maximal Eigen value tests. Trace tests the null hypothesis of r cointegrating vectors against the alternative hypothesis n. Maximum Eigen value on the other hand tests the null hypothesis against the alternative r+1 (Erik and Par 2007, p. 6). Equation 4 below is the error correction model derived from Equation 3 above.

$$LAOP_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i} \Delta LAOP_{t-i} + \sum_{i=1}^{n} \delta_{2i} \Delta LLFI_{t-1} + \sum_{i=1}^{n} \delta_{3i} \Delta LFFI_{t-1} + \lambda_1 ECM_{t-i} + \varepsilon_{2t} \qquad (4)$$

In Equation 4 above, δ is the coefficients, t represents the time variants, ε_{1t} is the residual for the time series, while the ECM_{t-1} is the error correction term. λ_1 stands for 1st canonical correlation and the t-1 represents the combinations in all the variables in the co-integrating relationship that yield the largest correlations of the difference operators (Δ). The canonical correlation is tested via trace and maximum Eigen value, Erick and Par (2007, p. 5). The statistical significance of coefficients of the error term in Equation 4 above shows the rate at which the variables are brought into equilibrium. The model will be normalised on $LAOP_t$ which captures short run dynamics. In Equation 4, $LAOP_t$ is log agricultural output productivity, $LLFI$ is log local farmer investors, while $LFFI$ is the acronym for foreign farmer investors.

American Journal of Agriculture
ISSN 2790-5756 (Online)
Vol.4 , Issue 1, pp 24 - 46, 2022

5.2.4. Granger causality test

This study also carried out Granger causality test to ascertain the direction of causality between local farmer investors (LLFI) and agricultural output productivity (LAOP). In Granger causality test, cause is influenced by actions in the past. Granger causality tests the lag values of the independent variables whether it plays a significant role in explaining the dependent variables with its lag values. In Granger causality test, movement could be unidirectional or bidirectional. The causality regression of the two variables (dependent=LAOP and independent=LLFI) are presented in Equation 5 and 6 below.

$$LAOP_t \quad \alpha_1 LAOP_{t-1} \quad \alpha_2 LAOP_{t-2} \quad \alpha_3 LAOP_{t-3} = \quad + \quad + \quad + \ldots +$$
$$\beta_1 LLFI_{t-1} \quad \beta_2 LLFI_{t-2} \quad \beta_3 LLFI_{t-3} + \quad + \quad \ldots + \varepsilon_{1t}$$

…… (5)

$$LLFI_t \quad \emptyset_1 LAOP_{t-1} \quad \emptyset_2 LAOP_{t-2} \quad \emptyset_3 LAOP_{t-3} = \quad + \quad + \quad + \ldots +$$
$$\delta_1 LLFI_{t-1} \quad \delta_2 LLFI_{t-2} \quad \delta_3 LLFI_{t-3} + \quad + \quad \ldots + \varepsilon_{2t}$$

…… (6)

5.3. Co-integration model regression, hypothesis, research questions and description of variables

The model was used to investigate the impact of local farmer investors on agricultural output productivity in mitigating food shortages in Nigeria.

$LAOP_t = \alpha_0 + \alpha_1 LLFI_t$ (7) Where ε_t = Agricultural output productivity $LAOP_t$ = Local farmer investors $LLFI_t$ Foreign farmer investors $LFFI_t$ = Constant term β_0,. , = Coefficients β_1 β_2 = Error Terms assumed to have constant variances and normally distributed

Where was the dependent variable and the regression of equation 7 above normalises on it. The basic expectations of the variables used in equation 7 are that local farmer investors in farming activity will be positively related to agricultural output productivity. $LAOP_t$

Description of variables

Age: was measured as the number of years of the respondents.

Gender: was measured as the sex of the respondents.

Total cost of production: was measured as the total economic cost incurred by the respondents in producing agricultural foods.

Farm income: was measured as the money the respondents generated by farm operations.

Financial assistance: was measured as the financial aid given to the respondent farmers.

Health expenditure: was measured as all expenditure made by the respondent farmers for the provision of health services.

Agricultural output productivity: was measured as the total output of agricultural product in the country (Nigeria).

Local farmer investors: measured as the total number of the indigenous investors in farming activity in the country (Nigeria).

Foreign farmer investors: measured as the total number of the foreign investors in farming activity in the country (Nigeria). **Research Questions**

1. What are the significant factors influencing food security in Nigeria?
2. What is the food security status of rural farmers?
3. What is the alternative empirical source of mitigating food shortages in Nigeria?

6. Results and discussion

Table 4: Characteristics of the respondent farmers

Variables	Frequency	Percentage	Mean
Age			
18 – 29	12	17.10	
30 – 39	17	23.60	
40 – 49	9	13.10	
50 – 59	25	29.20	54 years
60 – 69	8	11.70	
70 – 79	4	4.00 80	
– 89	2	1.30	
Household size			
1 – 5	30	40.7	
6 – 10	36	48.5	6 members
11 – 15	11	10.8	
Educational level			
Primary school	26	33.0	
Secondary school	11	13.3	
Higher institution	6	9.1	
Others	32	48.3	
None	2	1.3	
Total annual income (in Naira)			
1,000 – 20, 000	27	34.3	
21, 000 – 29, 0	35	45.0	
30, 000 – 39, 000	10	14.3	29, 000
40, 000 – 49, 000	4	2.8 50,	
000 – 59, 000	1	3.6	

Gender		
Male	59	75.20
Female	18	24.80
Total	**77**	**100**

Source: Author's survey result

From Table 3 above, majority of the respondent farmers' households are old. This shows that the majority of the young school leavers are in the urban areas seeking for white collar jobs. This is one of the reasons for low agricultural productivity and hence food insecurity in Nigeria. This result is in line with the findings of D'Haese et. al (2011) which showed that low agricultural productivity is as a result of old men engaging in farming activity than young men

Furthermore, 75.20 percent of the farmers were male, while 24.80 percent were female. This result supports the assumption that agriculture is for those with the physical prowess in Africa. This finding is in line with the result of Irohibe and Agwu (2014) which revealed that men engage in farming than women. The table also showed that the majority of the respondent farmers' had a household of 6. This result is not far from the findings of Abu and Soom (2016) who found household range of 7-9 members.

Penultimately, Table 4 also revealed that the preponderous of the respondent farmers in the country attended primary school and 2 out of the 77 responded farmers did not have any education at all. This suggests that the majority of the farmers in Nigeria are not educated, and as such one of the reasons for food insecurity and high poverty rate in Nigeria. This result is supported by the findings of Ogunkoya (2014) which revealed that majority of farmers are not educated.

Lastly, the results in Table 4 revealed that the majority of the farmers received an annual average income of N21, 000 – N29, 000. This also suggests that huge number of farmers in Nigeria is poor and battle with hunger. This result is supported by FAO (2003) which states that household income is one of the determinants of food security. Table 4 below elucidates on the food security of the respondent farmers. Succinctly, it lay-bare the greater number of the respondent rural farmers that do not have access to sufficient, safe and nutritious food to maintain healthy and productive lives. This result is in line with the Malthus theory which states that population exhibits a natural growth that grew in geometric progression, while food production grew in arithmetic progression. Thus, to respond to the research question 2, the food security status of the respondent farmers is not secured. **Table 5: Food security status of the respondent rural farmers**

Variable	Frequency	Percentage
Food Secure	33	42.41
Food Insecure	44	57.59
Total	**77**	**100**

Source: Author's survey result

Table 6: Logistic Regression Result Food security Coefficient Std. error Z P>/Z Marginal Tolerance efficiency

Age	0.427887	0.1864107	2.11	0.032	2.26e-07	0.7478
Gender	9.201511	5.016375	1.74	0.062	5.54e-05	0.8780
Total cost of prod.	0.0026753	0.001676	2.15	0.031	211e-07	0.7364
Farm income	11.51102	5.340242	2.13	0.032	6.27e-05	0.5478
Fin. assistance	-13.87012	4516.114	-0.01	0.997	-7.02e-05	0.6458
Health Expend.	-4.336115	2.115778	-2.03	0.042	-2.36e-05	0.6477
Constant	1.841204	4517.12	0.00	1.000		
Observation	77					
LR Chi^2 (12)	76.56					
Prob > chi^2	0.0000					
Pseudo R^2	0.8217					
Log likelihood	-8.2474364					

Source: Author's computation from survey

From Table 6 above, variables such as age, total cost of production, farm income and health expenditure were significant. This suggests that the aforementioned variables are significant to food security at 5 percent. However, variables such as gender and financial assistance were significant at 10 percent. Farm income has positive parameter (11.51102). This suggests that rise in income from agricultural produce increases food security. This result is in line with the findings of Waggins and Keats (2009). Furthermore, age and gender had positive parameters which shows that adult farmers in lieu of under-age farmers increase food security. It also suggests that the sex of the farmer play a big role in food security. The health expenditure negative parameter suggests that as farmers start to spend less on health matters, there is the tendency of actualising food security because huge amount of money will be available to invest on the farm and to buy food. To respond to research question 1, age, total cost of production, farm income and health expenditure are significant factors at 5 percent (than gender and financial assistance) that influence food security in Nigeria.

Table 7: Multicollinearity test result

Variables	VIF	Tolerance	Eigen value
Age	1.30	0.7465	1.1806
Gender	1.11	0.8781	0.8323

Total cost of production	1.32	0.7354	0.3182	
Farm income	1.77	0.5474	0.1523	
Financial assistance	1.51	0.6446	0.0623	
Health expenditure	1.53	0.6356	0.0425	Mean
VIF	1.22			

Source: Author's computation from survey

When VIF is greater than 10, multicollinearity will affect the least- squares estimators' regression (Abdullahi et. al 2019). In other words, if it is below 10 there is no multicollinearity. From Table 6 above VIF values are less than 10, while the tolerance values are more than .10, indicating the absence of multicollinearity.

Table 8: Unit root test results

Variables	t-statistics (Probability)at level	t-statistics (Probability) at 1st diff.	Lag	t-statistics (Probability) at level	t-statistics (Probability) at 1st diff.	Bandwidth
LAOP	-0.501519 (0.8779)	-5.602835 (0.0000)	0	-0.390600 (0.8989)	-5.658707 (0.0000)	5
LFFI	-1.329374 (0.6032)	-4.867154 (0.0005)	0	-1.529778 (0.5056)	-4.923387 (0.0004)	3
LLFI	-1.102308 (0.7022)	-5.966326 (0.0000)	0	-1.180594 (0.6700)	-6.021985 (0.0000)	2
AUGMENTED DICKEY FULLER TEST (ADF)				PHILIP PERRON TEST (PP)		

Author calculation using E-View 5.0

From Table 8 above, The ADF lag length at first difference and PP bandwidth at first difference where they are stationary are 0, 0, 0, and 5, 3, 2 respectively. With reference to Table 8, none of the variables is stationary at level both in the Augmented Dickey-Fuller (ADF) and Philip Perron (PP) tests. However, all the variables are stationary at first difference both in the Augmented Dickey-Fullers and Philip Perron tests. They are integrated at order one and becomes eligible for co-integration.

Johansen co-integration tests result

The results from Table 8 below show that the null hypothesis of no co-integration existence is rejected because the trace and max-Eigen value indicate two co-integration equations (which comprises LAOP, LLFI, LFFI). The max-Eigen value test shows two co-integrating equation and has the values of 44.58896, 17.49087 for maxi-Eigen statistics. The critical values for maxi-Eigen value test are 21.13162 and 14.26460. The P-values are less than 0.05, which shows that they are not statistically different from zero. Thus, the Eigen value and maxiEigen value statistics show two co-integrating equations in the max-Eigen value test because the maxi-Eigen statistics are significant.

Furthermore, the trace test indicates 2 co-integrating equations and has the values of 63.31081, 18.72185 for trace statistics. Trace statistics are significant and greater than the critical value. The critical values for trace test are 29.79701 and 15.49471. The P-values are less than 0.05, which indicate that they are not statistically different from zero. Thus, the Eigen value and trace statistics show two co-integrating equations in the trace test because the trace statistics are significant.

Table 9: Johansen co-integration result (Series: LAOP, LLFI and LFFI)

Hypothesised No. Of Co-integrating Equation (CE)	**Trace Test**		**Maximum-Eigen Value Test**	
	Trace statistics	Critical Value P < 0.05	Maxi-Eigen Statistics	Critical Value P < 0.05
None *	63.31081	29.79707	44.58896	21.13162
At most 1 *	18.72185	15.49471	17.49087	14.26460

Note * implies 2 co-integrating equations with statistics significant at p < 0.05

Source: Author's calculation using E-View 8.1

Long-run co-integration result

$$LAOP = 2.985311^{LLFI_t} + 4.897667^{LFFI_t}$$

(S.E) (0.61032) (0.27263)

(T-ratio) [8.0247526] [10.950046]

Source: Author's computation using E-View 8.1

With reference to long run equation above, local farmer investors (LLFI) and foreign farmer investors (LFFI) have positive and significant impact on agricultural output productivity (LAOP). Further, agricultural output productivity is responsive (elastic) to local farmer investors and foreign farmer investors, though the later is greater than the former. It shows the existence of long run equilibrium relationship between LAOP, LLFI and LFFI. Thus, the hypothesis which states that local farmer investors are likely to have positive influence on agricultural output productivity and mitigate food shortages in the long run is accepted. In other words, the results from the long run equilibrium relationship show that an increase in local farmer investors and foreign farmer investors by one percent contributed to 2.99 percent and 4.90 percent agricultural output productivity respectively. Thus, local farmer investors mitigate food shortages by 2.99 percent, while foreign farmer investors as an alternative way of arresting food insecurity mitigate food shortages by 4.90 percent. Furthermore, the positive sign of local farmer investors and foreign farmer investors shows that agricultural output productivity goes towards the same direction with the independent variables. To respond to research question 3, the alternative source of mitigating food shortages is foreign farmer investors because they contributed more to agricultural output productivity in mitigating food shortages than local farmer investors.

Table 10: Short Run Dynamics: Vector Error Correction Model Results

Variable	Coefficient	Std. Error	t-statistics
Constant	0.070414	0.04120	1.70899
$\Delta LFFI$	-0.014175	0.07495	-0.18912
$\Delta LLFI$	-0.140359	0.08738	-1.60639
$\Delta LAOP\,(-1)$	0.114317	0.19474	0.58701
$\Delta LFFI\,(-1)$	-0.296678	0.32007	-0.92691
$\Delta LLFI\,(-1)$	0.127853	0.14567	0.87768
$ECM(1)$	-0.274772	0.09812	-2.80050
R-squared	0.317115	Mean dependent	0.073333
Adj. R-squared	0.207854	S.D. dependent	0.240765

S.E equation	0.214287	Akaike AIC	-0.091988
Sum sq. resid.	1.147975	Schwarz SC	0.141545
Log likelihood	6.379817		

Author's calculation using E-View 8.1

Results from vector error correction model table 10 above show that the error correction coefficient (LAOP) is properly signed at -0.274772 and statistically significant. The coefficient of the ECM is -0.274772 and it indicates that a deviation of agricultural output productivity from the equilibrium in the long run caused by short run shock is corrected by 27% in each year. The value of 27% shows an error correction mechanism of our cointegration model. Thus, the short run dynamics (error correction model) does not contradict but rather supports the co-integration relationship that exist between the dependent (LAOP) and the independent variables (LLFI) and (LFFI).

In other words, the coefficient of determination (R^2) shows that 32% of variation in agricultural output productivity is explained by the variation in the independent variables (local farmer investors, LLFI, and foreign farmer investors, LFFI).

Table 11: Granger causality test result

Null Hypothesis	Obs.	F-Statistics	Prob.
LLFI does not Granger Cause LAOP	36	5.42362	0.0112
LAOP does not Granger Cause LLFI		1.30027	0.2801
LFFI does not Granger Cause LAOP	36	4.42824	0.0225
LAOP does not Granger Cause LFFI		0.12714	0.8711
LLFI does not Granger Cause LFFI	36	0.43373	0.6517
LFFI does not Granger Cause LLFI		7.27025	0.0031

Source: Author's computation using E-View 8.1

With reference to Table 11 above, the causality test for short term relationship between local farmer investors (LLFI) and agricultural output productivity (LAOP) indicates unidirectional causality from local farmer investors to agricultural output productivity. The F-statistics is statistically significant and p-value is less than (0.05). Thus, the hypothesis which states that local farmer investors are likely to Granger cause agricultural output productivity and mitigate food shortages in the short run is accepted. The causal relationship between foreign farmer investors (LFFI) and agricultural output productivity (LAOP) is also unidirectional from foreign farmer investors to agricultural output productivity. Thus, the null hypothesis which states that there is no Granger causality relationship between local farmer investors and agricultural output productivity is rejected and the alternative which states that there is Granger causality relationship between local farmer investors and agricultural output productivity is accepted. **Table 12: Multicollinearity test**

	LAOP	LLFI	LFFI

LAOP	1	0.347754	0.520234	
LLFI	0.347754	1	0.610410	
LFFI	0.520234	0.610410	1	
Test	**Null Hypothesis**		**T-Statistics**	**Probability**
White (Chi-sq.)	**No conditional heteroscedasticity**		42.72354	0.5620
Jarque-Bera	**There is no normal distribution**		6.545031	0.2743
Langrage Multiplier	**There is no serial correlation**		8.186566	0.2033

Source: Author's computation using E-View 8.1

From Table 12 above, the values in the correlation matrix results for correlation are not up to 0.8 which shows that the co-integration and Granger causality results are not spurious.

Furthermore, all the variables pass through other necessary diagnostic tests regarding heterroscedasticity, normal distribution and serial correlation. Results from Table 12 further showed that the P-values are greater than 0.05 which shows that the null hypotheses of no serial correlation and no heteroscedasticity are accepted, while the alternative rejected. The null hypothesis of no normality of error term is rejected and the alternative accepted.

7. Conclusion

This research set up an empirical investigation to analyse factors influencing food security, and food security status of farmers as well as the influence of local farmer investors on agricultural output in mitigating food shortages in Nigeria. This paper adopted logistic regression analysis method for a sample survey of 145 respondents as well as long run and short run regression analysis covering the period of 1980-2018. Analysis first revealed that, age, total cost of production, farm income and health expenditure are significant factors influencing food security in Nigeria. Result further revealed that the food security status of farmers was not secured. The long run and short run results revealed that local farmer investors positively related to agricultural output growth and Granger cause agricultural output growth respectively. This study therefore concludes that in order to curb food insecurity measures supporting local farmer investors as well as attracting foreign farmer investors should be put in place.

8. Practical and social implication of the study

To improve food security of farmers in Nigeria, this study recommend that policies that grant financial assistance, free medical services and subsidised farm inputs to farmers should be the priority of policy makers. Furthermore, tax holiday to local farmer investors and to foreign farmer investors to provide an alternative source of mitigating food security in Nigeria. The implication of the study is that policy makers will shift in line with the findings by putting in place good policies that provide incentives and social amenities like good roads, steady power supply good health facilities to enable young farmers to stay in the rural areas for agricultural production. Provision of conducive environment for the local farmer investors and foreign farmer investors will help them to actualise increase revenue and improve their social responsibilities to the host communities.

9. Research limitations

One of the potential limitations of this study is that most of the selected respondents were unable to respond to questions in the questionnaire. Out of 145 respondents covered, only 77 were able to respond to questions, thereby made the sample size covered in this study low

There was no data for human capital for agricultural activity for the full Cobb-Douglas model to be in place. The Cobb-Douglas model utilises local investors, foreign investors and human capital in production process, but in this study human capital variable was not in the model due to lack of data. This study suggests that future research on the impact of local investors in manufacturing activity on output productivity in a complete Cobb-Douglas production model to ascertain whether food insecurity could be mitigated by increased manufactured goods.

10. Originality and value of the study

The originality of this research work consist in computing the contributions of local farmer investors (entrepreneurs) to agricultural output in mitigating food shortages in Cobb-Douglas production model thereby provided an empirical solution to food insecurity of the rural famers who produced food on a low scale. This new feature also showed the value of mitigating food shortages via foreign investors in faming activity as alternative source of mitigating food shortages. Unlike previous studies, this research linked the findings from the food insecurity to Malthus theory of population and unlike Malthus theory which saw natural means like war and death as solution to food insecurity. This study added value by recommending good policies (unnatural) as solution to food insecurity in Nigeria.

REFERENCES

Abdullahi A., Moukhtar M. I. and Abubakar S. (2019) Empirical analysis of the determinants of food insecurity in Katsina. East African Scholars of Journal of Economics, Business and Management, Volume 2, Issue 2, February 2019

Abu, G. A., Soom, A. (2016) Analysis of factors affecting food security in rural and urban farming households of Benue State, Nigeria, International Journal of Food and Agricultural Economics., 4(1), 55–68.

Adeola, A. F. (1994) Analysis of Energy Pricing Policy in Nigeria: an Application of Computable General Equilibrium Model, A PhD thesis in Economics Department of University of Ibadan, Nigeria.

Afolabi, K. (2011) The Impact of Oil exports on Economic Growth in Nigeria. [Online] Available: htpp://abdulhamidmustapha.wordpress.com/psychology. [Accessed: September 2 2021]

Amadi, S. N (2002) The Impact of Macroeconomic Environment on Foreign Direct Investment in Nigeria. International Journal of Development, 4 (2)

Andreea, M. and Quan, L. (2009) Modernization vs. Dependency Revisited: Effects of Foreign Direct Investment on Food Security in Less Developed Countries [Online] Available: http://www.personal.psu.edu/asm218/materials--final/ISQfood(sept2009).pdf.[Accessed: September 2, 2021].

Central Bank of Nigeria (2009) Statistical Bulletin.Central Bank of Nigeria Publication, Vol.
20, pp. 1-513

Central Bank of Nigeria (2019) Annual Report, Central Bank of Nigeria Publication

Central Bank of Nigeria (2019) Statistical Bulletin, Central Bank of Nigeria Publication

D'Haese, L., Van Rooyen, J., Vink, N., Kirsten, J., Staelens,L., Van-damme, E., Shönfeld, H.,Remaut-Dewinter,A.M., D'Haese, M. (2011). Food security: Limpopo Province. [Online]
Available:http://www.up.ac.za/media/shared/Legacy/sitefiles/file/48/4153/finalreportlimpopo projet2011.pdf [Accessed December 12 2021]

Dickey, D., and W. Fuller (1979) Distribution of the Estimators for Autoregressive Time Series with a Unit root. Journal of the American Statistics Association, 74, 427-431.

Enioluwa, J. I. Abiodun, O. O. and Busisiwe, N. M. (2018) Empirical analysis of food security status of agricultural households in the platinium province of South Africa. Journal of Agribusiness and Rural Development 1 (47) 2018, 29-38

Eko, S. A., Utting, C. A. and Onun, E. U. (2013) Beyond Oil, Dual Imperatives for 'Diversifying the Nigerian Economy. Journal of Management and Strategy, Vol. 4, No. 3, 2013

Elkan, W. (1995) Export-Oriented Industrialisation: East Asia, an Introduction to Development Economics. London: Prentice Hall

Erik, H. and Par, O. (2007) Testing for Co-integration Using the Johansen Methodology when Variables are Near-Integrated. IMF Working Paper, WP/07/141, June 2007. [Online] Available: http://www.imf.org/external/pubs/ft/wp/2007. [Accessed June 6 2021].

FAO. (2002). Reducing poverty and hunger, the critical role of enhancing for food, agriculture, and rural development, Food and Agriculture Organization, International Fund for Agricultural Development, Rome, Italy.

FAO (2003) Trade reforms and food security. Rome: FAO.

FAO (2011) The State of Food Insecurity in the World, FAO Report. [Online] Available: http://foreignpolicyblog.com/2011/10/29/fao-report. [Accessed: June 7, 2021]

Federico, G. (2005) Feeding the World: An Economic History of Agriculture, 1800-2000. New Jersey: Princeton.

Gain Report (2009) Nigeria Exporter Guide Annual. Gain Report Number N19010. [Online] Available: http://photos.state.gov/libraries/nigeria/788/reports/web-exg-ng.pdf [Accessed: 13 June 2021].

Irohibe, I. J., Agwu, A. E. (2014) Assessment of Food Security Situation among Farming Households in Rural Areas of Kano State, Nigeria. Journal of Central European Agriculture 15(1), 94–107.

Johnson, G. D. (2002) Economic Development. Economic Development and Cultural Change 51 (1).

Karolina, P., and Malgorzala, K. (2020) The role of agriculture in ensuring food security in developing countries: considerations in the context of the problem of sustainable food production. MDPI Sustainability Publication, 7 July 2020

Kornecki, l., Raghavan, V. And Welsh, D. (2008) Foreign Direct Investment Stimulates Economic Growth: An Empirical Evidence from Central and Eastern Europe. USASBE 2008.
Proceeding. Available: http://sbaer.uca.edu/research/usasbe/2008/pdf/PaperID109.pdf [Accessed: September 12 2021]

Kuwornu, J. K. M., Suleyman, D. M., & Amegashie, D. P. K. (2013). Analysis of food security status of farming households in the forest belt of the central region of Ghana, Russian Journal of Agricultural and Socio-economic Sciences, 1(13), 26-39

Lavan, M. and Paul, R. (2004) Unit Root Testing to Help Model Building. Handbooks in Central Banking No. 22, Issued by the Centre for Central Banking Studies, Bank of England, London. [Online] Available: www.bankofengland.co.uk/education/documents/ccbs/handbooks [Accessed June 8 2021].

Lindahl, C. (2005) Wealth of the Poor: Eliminating Poverty through Market and Private Sector Development. Sida Studies No. 14.

Lukas, K., Mattias, K., and Irfan, M. (2017) Food price volatility in developing countries: the role of trade policies and storage. Working Paper on food secure that matters, February 2017.

National Bureau of Statistics (2021) Nigeria food inflation 2021 data, [online]: available tradingeconomics.com [Accessed 20 November 2021]

Nwachukwu, T. and Odogie, P. (2009) What Drives private Savings in Nigeria, National Centre for Economic Management and Administration, Nigeria, A Paper Presented at the Centre for the Study of African Economies (CSAE) Conference, University of Oxford, March

Ogunkoya, F. T. (2014). Socioeconomic factors that affect livestock numbers: A case study of smallholder cattle and sheep farmers in the Free State province of South-Africa. Submitted for the degree of Master of Science in Agriculture. South Africa: University of South Africa.

Oluwatayo, I. B., and Rachoene, M. A. (2017) Effects of agricultural commercialisation on food security among small holder farmers in Palokwanne Municipality Capricon District of Limpopo Province South Africa, Journal of Agricultural Business and Rural Development 1 (43) 143-156

Omonona, B. T., & Agoi, G. A. (2007) Analysis of food security situation among Nigerian urban households: Evidence from Lagos state, Nigeria. Journal of Central European Agriculture, 8(3), 397-406.

Petrakos, G. Arvanitidis, P. and Pavleas, S. (2007) Determinant of economic growth: the experts' view. Working Paper, Research Paper in Economics 20/2007

Population Reference Bureau (2008) 2008 World Population Data Sheet, [Online] Available: http://www.prb.org/pdf08/ [Accessed: 19 May 2021].

Sachs, J. D. and Warner, A. M. (2001) The Curse of National Resources, European Economic Review, 45(4-6):827-38.

Schutt, F. (2003) The Importance of Human Capital for Economic Growth. Institute for

World Economics and International Management, August 2003. [Online] Available: htpp://www.iwim.uni-bremen.de [Accessed: June 7, 2013].

Shishan, O., Labadarios, O., Rehle, T., Simbayil, L., Zuma, K., Dhansay, A., Reday, P., Parker, W., Hosain, E. (2013 South African National Health and Nutrition Examination Survey, Capetown South Africa, HSRC Press.

Romer, P. M. (1990) Endogenous technological change, Journal of Political Economy, University of Chicago Press, vol. 98(5) pp. 71-102

Srinivasan, C. S. (2003) Potential economic impact of terminator technologies: policy implications for developing Countries. The Journal of Environmental and Development Economics, 8(1) 187

Statista (2021) Nigeria price increase of food products 2021 [Online]: available www.statista.com [Accessed 20 November 2021]

Tithy, D. Elias, H. and Morteza, H. (2020) Assessing the determinants of food security status in Bangladesh: A micro-econometric analysis, Economics, Law and Policy, Vol. 3, No. 2 2020.

United Nations (2003) Why Do The Millennium Development Goals Matter? From the Secretary-General's Report on Implementation of the United Nations Millennium Declaration, Publication of UNDP.

Uremadu, S. O. (2007) Core Determinants of Financial Savings in Nigeria: An Empirical Analysis for National Monetary Policy Formulation, International Review of Business Research Paper. Vol. 3, No. 3, August, pp. 356-367.

Waggins, S., Keats, S. (2009). Current State of Food Security in African and Africa-Eu partnership on the Millennium Development Goals. A paper for the 2nd Joints Experts Growing Meeting, Africa-EU MDGS Partnership, Subgroup on priority Action 2: Accelerate the food security targets of the MDGs. Pretoria, South Africa. March, 24.

World Bank (2003) Sustainable Development in a Dynamic World: Transforming Institutions, Growth, and Quality of Life. World Development Report Washington, DC: The Creative Communication Group.

World Bank (2005) African Development Indicators, Washington DC: World Bank

World Bank (2013) Inflation, GDP deflator (Annual %).The World Bank. [Online] Available: http://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG [Accessed: 19 May 2021].

APPENDICES Time series data for long and short run investigation

Year	LFI	AOP	FFI
1980	3.00	1.21	0.09
1981	25.22	1.24	0.10
1982	29.41	1.24	0.11
1983	29.46	1.24	0.12
1984	24.72	1.20	0.08
1985	32.35	1.13	0.10
1986	47.34	1.13	0.11
1987	43.09	1.18	0.10
1988	40.63	1.28	0.08
1989	40.26	1.30	0.10
1990	42.21	1.27	0.06
1991	42.01	1.26	0.04
1992	42.94	1.56	0.17
1993	42.02	1.87	0.25
1994	47.20	1.84	0.24

1995	39.24	1.87	0.75
1996	1.60	1.83	0.98
1997	1.49	1.78	0.79
1998	1.45	3.04	1.24
1999	1.50	3.06	1.23
2000	1.61	3.07	1.20
2001	1.63	3.09	0.93
2002	1.53	3.28	0.68
2003	1.54	3.31	0.68
2004	1.57	3.33	0.67
2005	1.37	3.36	0.59
2006	1.32	3.40	0.51
2007	1.77	3.43	0.52
2008	1.58	3.45	0.54
2009	1.65	3.44	0.53
2010	1.60	3.45	0.54
2011	1.62	3.44	0.53
2012	1.61	3.38	0.49
2013	1.62	3.41	0.51
2014	1.61	3.39	0.57
2015	1.63	3.40	0.54
2016	1.62	3.37	0.55
2017	1.60	3.38	0.52
2018	1.61	3.34	0.48

Source: Central Bank of Nigeria Statistical Bulletin (2019)