

## RELATIONSHIP BETWEEN GOVERNMENT AGRICULTURAL SUBSIDY AND PRODUCTIVITY ON POVERTY REDUCTION IN NIGERIA: CO-INTEGRATION MODEL FROM 1980 TO 2019

Nor Asmat Ismail\*  
Yusuf Bala Zaria

### ABSTRACT

*There was a theoretical model and empirical explanation on the impact of government agricultural subsidy and productivity on poverty reduction. The research aims to examine the short and long-run relationship between government agricultural subsidy and productivity on poverty reduction in Nigeria. The research employed the methods of unit root test, correlation and cointegration to analyze the relationship between government subsidy and productivity in agriculture on poverty reduction from 1980 to 2019. The empirical results from cointegration tests revealed the existence of four significant models at different levels. In the first model, there is a long-run relationship between government agriculture subsidies and poverty reduction. In the short run, agriculture declined. The import and export volume raised poverty reduction and trade. The second model improved government agriculture subsidies in the long- and short run. The third model shows a long- and short-run relationship between export volume, poverty reduction and government agricultural subsidy based on import. The fourth model revealed long- and short-run relationships when export volume and government agriculture subsidy fall that, increase imports. The theory of production shows that whenever the government increases the subsidy, that stabilizes agriculture and productivity on poverty reduction. When government agricultural subsidy decreases, productivity or poverty reduction declines, resulting in unskilled labour or human capital development. The research indicated a relationship between government agricultural subsidy and productivity on poverty reduction; whenever the government distributes subsidy, especially in the farming sector, it does not enhance human capital development, instead growth of goods and services import and export. In addition, other counties should consider agricultural as poverty reduction policy.*

*Keywords:* government subsidy, agriculture, productivity policy, Autoregressive Distributed Lag, Nigeria

### INTRODUCTION

Does government subsidy help to improve agricultural productivity or poverty reduction? *Government subsidy* is an economic policy or support given to certain people like farmers, small-scale- businesses, and industrial sectors to improve human capital and productivity, reduce unemployment and poverty and increase national infrastructure or economic growth. According to people-centeredness, focusing on humans and the environment is more important for poverty reduction policy because it will enhance people's needs and aspiration<sup>1</sup>. According to Aggarwal, (2022), human resources have the potential to address environmental concerns, such as green practices to facilitate the development of employment or reduce poverty. Wang F. Li & Sun, (2020) suggested the effect of the subsidy on a firm performance that exactly relates to capital development and productivity. Xiaobao & Wu (2022) opined that government subsidy increases innovation and performance. Based on the human development index does not take into account some factors except to improve agricultural productivity through financial assistance, not through government subsidy as a poverty reduction policy. However, other factors can impact productivity, such as import and export.

An agricultural subsidy is a government policy meant to ensure a good living standard for agricultural workers to improve the overall income of agricultural residents (Bai et al., 2022; Vozarova & Kotulic, 2016). Besides, agricultural practices move along to generate other factors like the importation of cultivating machines (farm inputs) that can improve agricultural production to the extent that there would be more for exportation. With government advocacy and financial support, many manufacturers could hope to enter the agricultural market to improve productivity (Wang et al. 2023). When government subsidy is considered a policy on agricultural production, it will affect human capital development, reducing unemployment and poverty.

Exhibit 1 shows that agricultural productivity translates to poverty reduction, which includes empowerment and market expansion Adeyemi Ogundipe (2017). Therefore, human capital development is buttressing government subsidy and agricultural production, which refers to the ratio of agricultural inputs to outputs since production is growing, creating, manufacturing, or improving goods and services in an economy. Hence, government agricultural subsidies improve productivity or poverty reduction. More so, it informed the research that most of the world's poor depended on agriculture for livelihood; thus, the research will find a relationship between government agricultural subsidy and productivity, improving human capital development or reducing poverty in Nigeria. More so, in Africa, more than 70% of the population depended on agriculture for their livelihood, with agriculture production largely dominating subsistence. It makes poverty transgenerational due to limited assets, empowerment (government agricultural subsidy) and weak or non-existent market linkages. The renewed commitment to agriculture at the national and global level follows the policy certainty in Exhibit 1.

<sup>1</sup> [https://en.wikipedia.org/wiki/File:Countries\\_by\\_Human\\_Development\\_Index\\_\(2021\).svg](https://en.wikipedia.org/wiki/File:Countries_by_Human_Development_Index_(2021).svg)

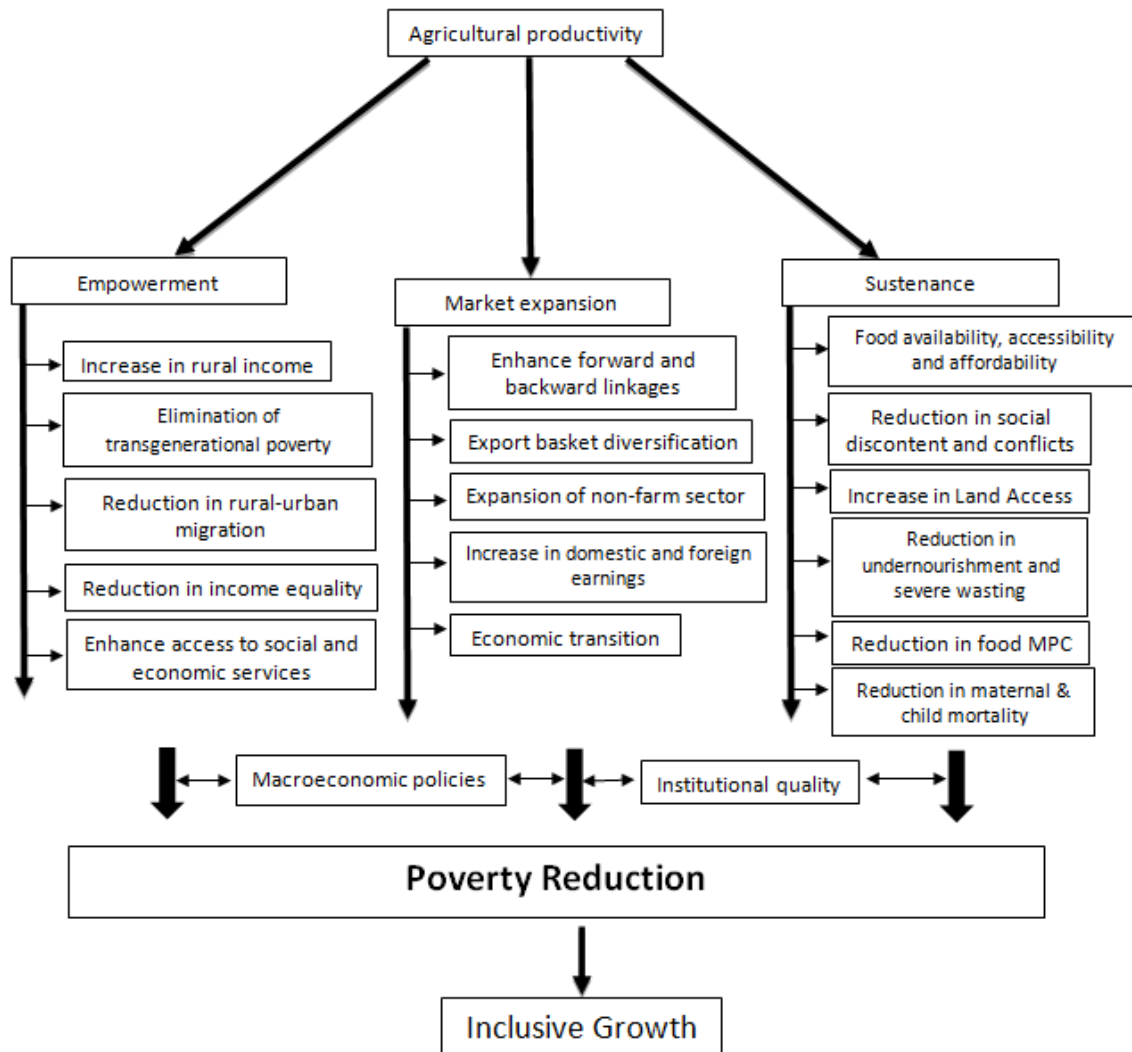


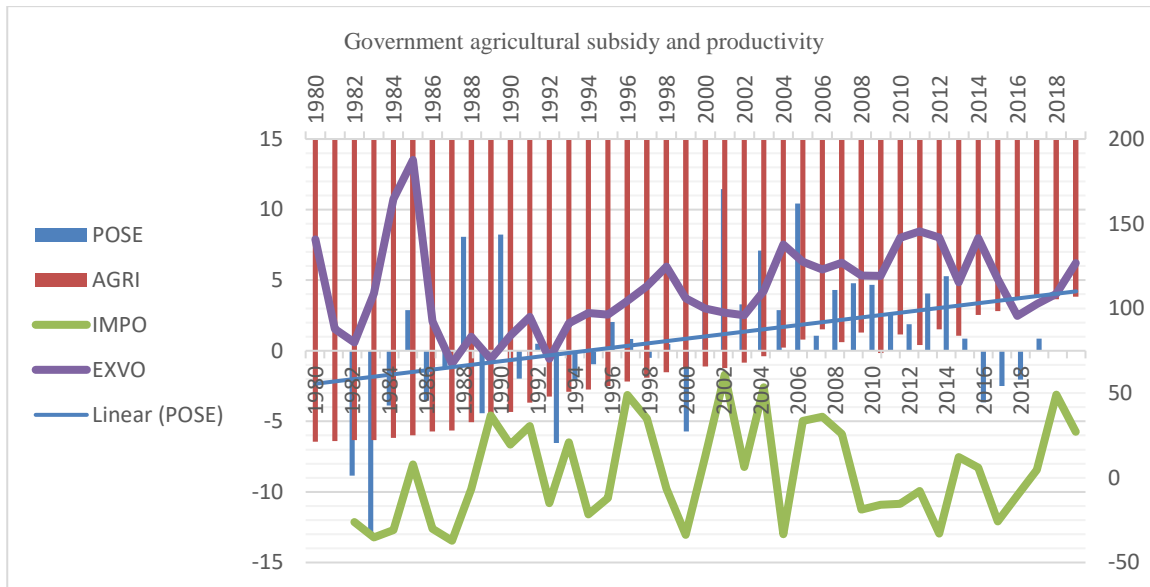
Exhibit 1. Agriculture and productivity in Nigeria

Source: adapted from Adeyemi Ogundipe, (2017)

Furthermore, government agricultural subsidy targets to support other sections of the government (i.e., import and export volume) for enhancing general economic productivity or poverty reduction. The poverty reduction is to generate employment or bridge the human capital development gap that is immense because Nigeria, as a developing country with a high population which is primarily poor, needs to harness and turn people experiencing poverty into skillful labour to generate productivity. Because the poorest people can contribute relatively more to development, government policy on subsidies alleviates poverty. It increases the supply chain of goods and services, increasing the quantity demanded of goods and services to enable the quality demanded exportation and quantity for importation. Hence, this research examines the impact of government subsidy policy on improving productivity and human capital development through empowering skilled labour.

Consequently, government agricultural subsidy has attracted significant attention from academia, firms and COVID-19 consequences. Productivity, being the central model and is accountable for agricultural production subsidy by encouraging the domestic manufacturing sector and government decisions on reducing poverty (Eyitayo et al., 2021; Matsuyama, 1992; Ngene et al., 2016; Wenqi et al., 2022; Zhou et al., 2022). Recent studies have no emphasis on productivity by combining agriculture, import and export to improve human capital or reduce poverty based on government subsidy (Agbigbe, 2016; Bighelli et al., J. 2023; Chang, 1993; Idris & Agbim, 2015; Jabareen, 2008; Omoregie OK, 2017; Siddig et al., 2014; J. et al., 2022). More attention to people and poverty assumes that people are centred based on their needs and aspirations for development or productivity (Mugumbate et al., 2020). In Nigeria, government subsidy is vital and contributes 22% of the gross domestic product from the agricultural sector and 75% from non-oil exports (Oyaniran, 2020). The import sector described the goods and services contributed 19.80% of GDP according to the World Bank development indicators in 2020. In comparison, the export volume impacts the Gross Domestic Product by 14.22%, apart from agriculture and import (Nigeria Trade Statistics, 2022). In most African states, human development or productivity could be higher. It results in the principle of getting rich quickly, a noble livelihood source for those who cannot afford a square meal and intend to be rich. However, it mostly leads to violence and criminality, which needs government intervention or subsidy policy (Dzingirayi et al., 2022). This research considers a relationship between government agricultural subsidies that can increase productivity and reduce poverty through improving crop production (agriculture), growth of goods and services and rising export volume.

Government subsidy on agricultural input is very low by international standards in Nigeria. The hope is that agricultural subsidies will induce farmers to use mechanized inputs to increase agricultural productivity and reduce poverty. The study focuses on agricultural inputs to improve crop production through subsidized materials like mechanization, fertilizers and hybrid seeds. Subsidy on improving the productivity of goods and services means subsidizing agricultural inputs to boost local production, such as wheat, rice, sugar and tomato paste, to rekindle exportation. Lastly, the lack of agricultural subsidies for productivity or poverty reduction policy affects domestic production and the lack of trade barriers (Nigeria - Country Commercial Guide, 2021). Subsidy as productivity or poverty reduction policy could benefit the net import and export of goods and services. Thus, national interest regarding subsidy reform of agricultural production, import and export would enhance productivity and relatively skilled labour to transform the country's productivity.



In Figure 1, the graph presented the pattern of government agricultural subsidy on productivity or poverty reduction that explained a 100% the subsidy policy implementation—recalling that whenever the government adopt the subsidy policy on agriculture, the import and export would enhance skilled labour, productivity, poverty reduction and impact on the import and increases the export volume. The government should continue implementing subsidies to sustain agricultural production and human capital development policy.

The productivity problem in the country is a need for more income, unemployment and productive resources for supporting livelihood that cuts across limited education, skills, human capital development and poverty. However, agriculture is the backbone of the Nigerian economy; it provides the primary source for enhancing livelihood. The farming sector in the country employs about 70% of the entire labour force. Nigeria is also known for its high penchant for foreign goods compared to locally produced ones. With overdependence on foreign goods, the country needs to support local production. Nigeria can earn more on foreign exchange, increase its revenue base and consolidate economic diversification. Then, it needs to subsidise agricultural production into practice, thereby increasing the farmers'/labourers' volumes and reducing poverty. Therefore, access to education can enhance human capital development and other essential services, including government programmes to provide social assistance to people experiencing poverty and promote pro-poor economic facilities that can bring progressive social changes in Nigeria. Subsidy as productivity or poverty reduction policy could benefit the net import and export of goods and services. Thus, national interest regarding subsidy reform of agricultural production, import and export would enhance productivity and relatively skilled labour to transform a country's productivity. Hence, the research question will explore the practical impact of government agricultural subsidy and productivity or poverty reduction in Nigeria, which corresponds with the research objective of examining the short and long-run relationship between government agricultural subsidy and productivity or poverty reduction in Nigeria.

The paper has eight Sections. Section 1 is the introduction, Section 2 theory and literature review, Section 3 presents data description and methodology whereas Section 4 findings and Section 5, 6, 7 and 8 are discussions, conclusion, recommendation and declaration.

**LITERATURE REVIEW****A. THEORETICAL MODEL OF GOVERNMENT AGRICULTURAL SUBSIDY ON PRODUCTIVITY AND POVERTY**

This theoretical model is a simple general production function or Solow growth model as productivity that is considered as human capital development index to determine the equilibrium of government agricultural subsidy and productivity or poverty reduction since development strategy includes both social and economic plans. Hence, the development approach cuts across all social and economic development methods that this research future as a theory base to study human capital development associated with increasing productivity, such as improving poor people's capacity to address development through government agricultural subsidy. In particular, on the assumption that increased labour and capital can gain the highest productivity or poverty reduction of a nation through a social and economic approach that can describe import and export (Ade Oyelabi, 1971; Bai et al., 2022; Matsuyama, 1992; Upton, 1973).

For a nation to produce effectively, labour must be equitably supplied with materials to work upon and aided by capital expressly, when government subsidy on agricultural implements to enhance crop production, that will boost the productivity and income of people experiencing poverty or raise both import and export volume. Therefore, the research is modelling the production function (Human Capital Development) model as an increase between gross national income annual growth next year and the following year of the country (import and export):

$$POSE_c = POSE_t \quad (1)$$

Supposing that the country (*c*) may experience high productivity through annual human capital development growth relative to other independent factors import and export (*t*). Thus, employing one or more lags of human capital development indices (agriculture, import and export) as a policy on government agricultural subsidy to measure the impact of productivity or poverty reduction as:

$$POSE_{c,t-1} \quad POSE_{c,t-2} \quad \text{and} \quad POSE_{c,t-3} \quad (2)$$

The production function model that describes government subsidies such as Agriculture + imports + exports volume in the country. Assume that government agricultural subsidy is relative to high production and enhancing productivity. Essentially,  $POSE_{c,t-1}$  it represents improving human capital on annual growth of the first model,  $POSE_{c,t-2}$  indicating the import of the second model and  $POSE_{c,t-3}$  export volume of the third model based on enhanced agricultural facilities and government subsidy. Therefore, on the theory assumption of (Idris & Agbim, 2015; Ogundipe et al., 2017), more research focus on the factors alleviating poverty to validate the results in more generalize form. Thus, this research is conducted to find the impact of government agricultural subsidy on productivity or poverty reduction in Nigeria.

Based on the theoretical model reviewed that identified the relationship between government agricultural subsidies that can increase productivity (agriculture, import and export volume) or poverty reduction. Available evidence suggested multiple pathways through which an increase in government subsidy on agriculture can reduce/improve poverty, including human capital development, agriculture, import and export.

**B. EMPIRICAL RELATIONSHIP BETWEEN GOVERNMENT AGRICULTURAL SUBSIDY AND POVERTY****REDUCTION**

This research addresses the relationship between government agricultural subsidy and productivity in improving poverty reduction in Nigeria, attracting empirical studies. However, this research focuses on finding valid evidence for the relationship between government subsidy on agriculture as crop production, import as the growth of goods and services and export volume on reducing poverty. Jaiyeola et al. (2020) compared Nigeria's income inequality and poverty reduction levels. The aggregated and disaggregated data revealed that poverty and inequality between 2010 and 2013 overwhelmingly dominated the country. The practical implication showed that the government needed policies to improve people's living standards, such as subsidies in education, health and agriculture, to reduce poverty and increase productivity. Ngene et al. (2016) examined import and export sector productivity on economic growth and employed the ordinary least square method from 1960 to 2009 in Nigeria. The results indicated that export contributes positively to economic growth. The policy implied that the government should encourage the practice of financial policies to expand domestic production to enhance exportation. Victor (2015) used the Johansen cointegration and error correction test to examine agricultural exports and economic growth from 1970 to 2012 in Nigeria. The results showed a long run among the variables, and the error correction test revealed that agricultural product exports have positively contributed to economic growth. The policy recommended that the government reform the agenda to revive export-led growth through practice. Omodero (2021) investigated the effect of agricultural inputs or food production on reducing poverty from 2009-2019 in Nigeria by regression analysis. The results indicated that agricultural practices positively and significantly impact poverty reduction, while agricultural products negatively affect poverty. The policy implication suggested that agricultural production depends on government intervention to improve financial assistance or give subsidies to poor farmers. Rashid Khan et al., (2018) measured the petroleum sector's contribution as a product subsidy because it is essential for keeping fuel prices affordable. The results revealed that government subsidy on petroleum products generally increases poor household income and GDP. The policy

suggested that government subsidies should meet socioeconomic defects in a country. Sikandar et al. (2021) employed panel data from developing countries to observe the impact of capital inflows on agriculture development to reduce poverty. It revealed that capital inflows and development assistance in the form of subsidies increase the value of agricultural exports. The policy implied that development assistance from developed countries could develop agricultural products. From survey data, Omeje et al. (2020) investigated the implications of youth entrepreneurship for economic diversification. They applied a multinomial logistic regression model to capture the relationship. The results supported the positive assertion that giving subsidies and business access was statistically significant for economic diversification in the form of business operations by people experiencing poverty. The practice indicated that government and other agencies, private and philanthropists at all levels need to do more to support the poorly skilled labour to establish business activities after empowering them.

Akhter (2015) examined export and import on economic growth using a vector autoregressive model (VAR) and data from 1981 to 2015. The results showed that imports and exports had a long-run relationship with economic growth, which was minimal in the short run. The policy suggested that practising imports and exports should encourage a longer-term impact on economic sustainability. Charity (2014) investigated the role of exports on economic growth and employed time series data from 1970 to 2011. The error correction model showed a significant impact of imports on economic growth, while exports do not. The policy suggested that practising importation can enable technological learning that drives productivity growth. Nenbee, S. G., & Harcourt, P. (2019) measured the effects of tariffs and imports between 1980 and 2016 based on secondary data and a bound test approach. The results revealed a long-run relationship between taxes and imports. More so, tariffs showed an insignificant negative effect on total imports in the short run. The policy recommended practising higher comparative advantage in producing goods and services by increasing fiscal discipline among the producers. Aisien, L. N., & Ihensekhien, A. O. (2019) examined the impact of imports on economic growth based on time series data from 1981 to 2017. The results indicated that importation was growth-enhancing and had a significant adverse effect on economic growth. Therefore, the policy implication suggested allowing the importation of capital goods to improve the technical base of the labour force. Eytayo et al., (2021) conducted a survey study that examined the impact of agricultural development on economic growth based on 200 respondents. Findings revealed that most agricultural practitioners/farmers needed to be more skillful with modern mechanization and were dependent on traditional methods of farming cultivation. The results explained that poor farmers need more support from the government to improve their method of farming cultivation, which is vital for increasing employment and farm harvesting products. The policy implication for government intervention for subsidies to lower farmers should be reviewed and intensified to enable more employment and productivity.

Zhang et al., (2021) examined government subsidies on agricultural production and pollution. Governments worldwide have formulated various subsidy schemes consisting of low-cost and high-cost firms. While incorporating the schemes as a model, the results showed that neither the cost output quantity subsidy nor the pollution alone could resolve the conflict between agricultural production and environmental protection. Henceforth, a hybrid subsidy scheme can reduce pollution, increase output, improve firms' profits, and enhance consumer surplus, which could be an effective and viable solution. The policy implication suggested that the government can adopt the hybrid subsidy scheme at a lower rate to achieve maximal social welfare. It would also help achieve a win-win situation for the government, consumers and firms. Chandio et al., (2022) investigated the impact of meteorological factors on soybean production in China. They used the determinants of soybean production, such as agricultural subsidy, cultivated area and fertilizer use. It employed the autoregressive distributed lag (ARDL) method and the quantile regression (QR) technique. The finding from an autoregressive distributed lag model informed that meteorology factors such as the yearly average CO<sub>2</sub> emission and temperature declined soybean production in the long- and short run.

In comparison, the yearly precipitation has improved soybean production. The agricultural subsidy also enhanced soybean production in the long- and short-run. The finding from the quantile regression technique showed that CO<sub>2</sub> emission and temperature negatively affected soybean production in each quantile (i.e., 0.1-0.90), while agricultural subsidy and precipitation positively augmented soybean production across all quantiles (i.e., 0.1-0.9). The policy implication suggested that the government should provide crop production subsidies to encourage and attract the farmers' attention to meteorological challenges. Ma et al. (2023) examined China's government subsidy and green credit policy mix. Using the difference-in-difference method, we find that Green Credit Guidelines (GCGs) negatively affect the high-quality environmental innovation of high-pollution firms. More so, the negative relationship between GCGs and high-quality environmental innovation depends on the level of government subsidy. Therefore, government subsidies can effectively correct the negative impact of GCGs. The policy implication is that GCGs have a window of opportunity for increased compliance costs, and lack of long-term bank credit cannot support the environmental innovation in which government subsidy can play a moderating role in the second channel.

This research has discovered during the literature review that a preliminary analysis based on the relationship between government agricultural subsidy and productivity or poverty reduction needs to be revised. It also noticed that the government agricultural subsidy on enhancing the human capital or skilled labour needs adequate implementation, especially in improving agricultural production, import, and export have more direction on economic growth than government subsidy or human capital development, productivity and poverty reduction. There is a theoretical gap between the efforts of government subsidy while rendering empowerment (subsidy) to improve skilled labour to engage in small-scale enterprises (agricultural production, growth of goods, services and export volume) will be examine in this research. More so, the theory gap describes the relationship between government agricultural subsidy on crop production, imports and export volume and productivity or poverty reduction, especially in Fig 1. Increasing the factors of production, such as financial assistance or subsidy, would affect productivity or reduce poverty. Nevertheless, there needs to be a more analytical tool of autoregressive distributed lag to explain the indicators/variables cointegration and short- and long-run relationship. Therefore, this research closes the theoretical relationship gap between government agricultural subsidies and productivity or poverty reduction. The study period is to guide government agricultural subsidy impacting on productivity and poverty reduction as shown in Exhibits 1 and 2.



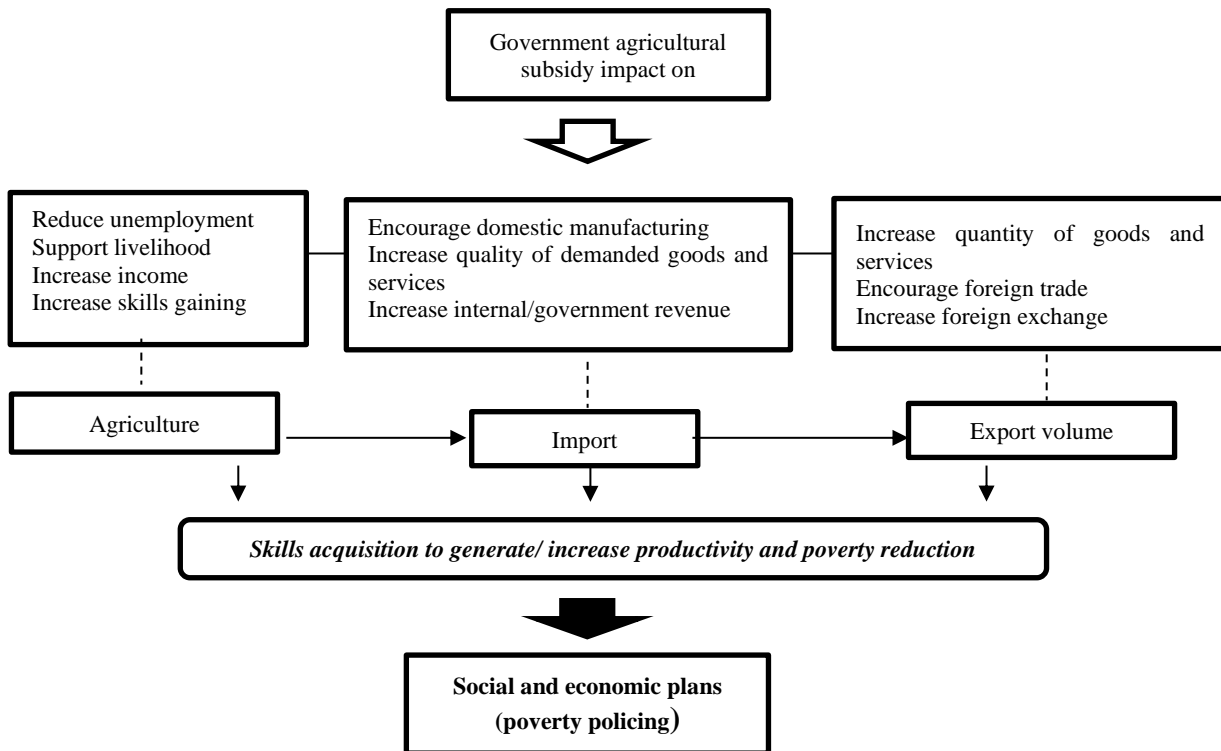


Exhibit 2: conceptual framework between government agricultural subsidy and productivity on poverty reduction in Nigeria.

**DATA AND METHODOLOGY**

**A. DATA**

This research gathered data from the World Development Indicator between 1980 and 2019 based on the productivity indices to indicate annual per cent of gross national income growth (HCD index (POSE)) in Table 1. Government subsidies represent the indicators of agriculture as per cent of annual crop production index (AGRI), per cent of yearly import of goods and services (IMPO), and per cent of annual growth of export volume index (EXVO). The research adopts a theoretical model based on the Solow growth model, considered a human capital development index, to determine the equilibrium of government agricultural subsidy and productivity or poverty reduction.

Table 1: Variables description

Data	acronym	Measurement/proxy	source
Human capital development/poverty reduction	POSE	Gross National Income per capita growth (% annual) as human capital development/poverty reduction	World Development Indicator
Agriculture	AGRI	Government subsidy represent the indicators of agriculture as per cent of annual crop production index (%)	World Development Indicator
Import	IMPO	Annual import of goods and services (%)	World Development Indicator
Export volume	EXVO	Annual growth of export volume index (%)	World Development Indicator

## B. METHODOLOGY

However, the unit root test method of Augmented Dicky-Fuller (ADF) Philips-Perron (PP) tests is applied. After that, the research employed a correlation matrix and Autoregressive distributed lag for indicators/variables cointegration, short, long-run and error term (lag) for the speed of adjustment. The use of an econometric method of analysis is vital to examine the relationship between government subsidy and productivity or poverty reduction (AGRI, IMPO, EXVO and POSE).

## C. MODEL SPECIFICATION

The research adopts Akhter's (2015) model to investigate the relationship between government subsidy and productivity or poverty reduction. Thus, the unit root is a standard statistical test to ensure that time series variables are stationary. It is a standard test for data stability. It often tests the hypothesis for null and alternative results—a p-value to infer whether a given series is stationary. A Dickey-Fuller test is a unit root test for the null hypothesis that  $\alpha = 1$  in the following model or equation. Alpha is the coefficient of the first lag on Y.

ADF model specified as:

$$y_t = c + \beta_t + \alpha y_{t-1} + \delta \Delta Y_{t-1} + \varepsilon_t \quad (3)$$

where,  $y(t-1)$  = lag 1 of time series and  $\delta Y(t-1)$  = first difference of the series at time (t-1). The ADF has similar null hypothesis as unit root test, which is the coefficient of  $Y(t-1)$  is 1, implying the presence of a unit root, if not rejected, the series is taken as non-stationary. While the alternative approach test of stationary data/variable is Philips-Perron (PP) a non-parametric method that can control serial correlation.

Second, the correlation matrix tests are a coefficient that for every positive increase in one indicator/variable, there is a positive increase of a fixed proportion in the other. The correlation coefficient gives the relationship strength. It means the larger the number, the stronger the relationship. The most commonly used formula is Pearson's correlation matrix model as:

$$\tau_{xy} = \frac{S_{xy}}{S_x S_y} \quad (4)$$

$S_x$  and  $S_y$  are the coefficient (standard deviations), whereas,  $S_{xy}$  is the coefficient (covariance).

Third, ARDL will enable cointegration tests between government subsidy and productivity or poverty reduction, in which the regressors shall become integrated of order zero or one. Given the ARDL test the model for government subsidy and productivity is specified as:

$$y_t = m + \alpha_1 y_{t-1} + \beta_0 X_t + \beta_1 X_{t-1} + \varepsilon_t \quad (5)$$

where,  $y_t$ (productivity or poverty reduction),  $X_t$ (Government agricultural subsidy) and  $\varepsilon_t$  indicate white noise or residual. Based on the adopted model that emphasises the *endogenous growth theory* of production function (human capital development) of increased labour and capital to determine the equilibrium relationship between government subsidy and productivity or poverty reduction in the past and current years as:

$$POSE_{c,t-1} = \alpha + AGRI_t + IMPO_t + EXVO_t + \varepsilon_t \quad (6)$$

$\alpha$  = intercepts of autonomous variables,  $t$  covering the years, POSE productivity, AGRI agriculture, IMPO imports of goods and services, EXVO exports volume and  $\varepsilon$  white noise or residuals. The expected sign of the coefficients is positive or negative that depends on the theory from first, second and third models.

Government agricultural subsidies can develop human skills, increasing income, employment and productivity. The presence of short- and long-run relationships is a sign of at least a one-way relationship of testing the validity of the government agricultural subsidy hypothesis-driven from equation (6) and represented in equations (7 and 10) as:

$$POSE_t = \beta_0 + \sum_{i=0}^p \beta_1 \Delta AGRI_{t-1} + \sum_{i=0}^p \beta_2 \Delta IMPO_{t-1} + \sum_{i=0}^p \beta_3 \Delta EXVO_{t-1} + \varphi_1 POSE_t + \varphi_2 AGRI_t + \varphi_3 IMPO_t + \varphi_4 EXVO_t + \lambda ECT_{t-1} \quad (7)$$

$$AGRI_t = \beta_0 + \sum_{i=0}^p \beta_1 \Delta IMPO_{t-1} + \sum_{i=0}^p \beta_2 \Delta EXVO_{t-1} + \sum_{i=0}^p \beta_3 \Delta POSE_{t-1} + \varphi_1 AGRI_t + \varphi_2 IMPO_t + \varphi_3 EXVO_t + \varphi_4 POSE_t + \lambda ECT_{t-1} \quad (8)$$

$$IMPO_t = \beta_0 + \sum_{i=0}^p \beta_1 \Delta EXVO_{t-1} + \sum_{i=0}^p \beta_2 \Delta POSE_{t-1} + \sum_{i=0}^p \beta_3 \Delta AGRI_{t-1} + \varphi_1 IMPO_t + \varphi_2 EXVO_t + \varphi_3 POSE_t + \lambda ECT_{t-1} \quad (9)$$

$$EXVO_t = \beta_0 + \sum_{t=0}^p \beta_1 \Delta POSE_{t-1} + \sum_{t=0}^p \beta_2 \Delta AGRI_{t-1} + \sum_{t=0}^p \beta_3 \Delta IMPO_{t-1} + \varphi_1 EXVO_t + \varphi_2 POSE_t + \varphi_3 AGRI_t + \lambda CEM_{t-1} \quad (10)$$

where  $\Delta$  is the first difference,  $\beta$  denote the coefficient,  $t$  period and  $\varepsilon$  the white noise or residuals of POSE, AGRI, IMPO and EXVO in the short-run. On the other hand, the sign  $\varphi$  in the second part is the long-run relationship. Similarly, for obtaining the maximum lag length of each variable ( $i - 1$  year or lag), estimates  $(p + 1)^k$  which is the number of lags showing P and K to explain several variables in equation (7). Nevertheless, the number of appropriate lags is selected by Akaike Information Criterion (AIC). Assume that the other set of critical values, the null hypothesis ( $H_0 = \alpha_1 = \alpha_2 = \alpha_3 = 0$ ) is to test against alternative hypothesis ( $H_1 = \alpha_1 = \alpha_2 = \alpha_3 = 0$ ) to determine the existence of cointegration and short-run relationship. the sign  $\lambda$  denote speed of adjustment in the short-run equilibrium between government subsidy and productivity. It's expected to be negative and significant to converge back in the long run. The diagnostic tests are supposed to clarify non-normality, heteroscedasticity and serial correlation problems.

**FINDING**

**A. TEST FOR STATIONARITY**

All the analysis of the research is based on the econometric method, and equation 3 presents the unit root such as Augmented-Dickey-Fuller (ADF) and Phillips Perron (PP) tests in Table 2:

Table 2: ADF and PP unit root tests

Variables	Level	First difference
POSE	-4.649246***	-10.79708***
AGRI	-0.458879*	-4.424143***
IMPO	-4.880869***	-6.528291***
EXVO	-3.457345***	-5.944433***
PP test		
Variables	Level	First difference
POSE	-4.596220***	-12.44886***
AGRI	0.466340*	-10.87464***
IMPO	-4.798906***	-15.66355***
EXVO	-3.349161***	-10.73524***

\*, \*\*, \*\*\* significance at 1%, 5% and 10%

Source: Author's compilation

The unit root test, which comprised ADF and PP results in Table 2 above, showed that all POSE, IMPO, and EXVO variables are stationary at the level and first difference. In other words, all the indicators/variables under the research integrated I(0) except AGRI, which has an unstable unit root at the level. However, the indicators/variables have shown an impact between government subsidy policing and productivity at the first difference that is steady or stationary. The research determines that all the indicators/variables have a unit root at the level and foremost difference between ADF and PP tests.

**B. CORRELATION MATRIX TEST**

The correlation matrix, as in equation 4, is presented in Table 3, which shows the correlation coefficient that measured two indicators/variables. When one increases as the other increases, the correlation is positive; when one decreases, the other increases are negative. In the case of Table 3, AGRI is positive and significant, whereas the IMPO and EXVO are positive and insignificant, meaning that AGRI correlated with POSE in the short run. In contrast, IMPO and EXVO connected with POSE and AGRI significantly at a 5% level (t-statistical probability) in the short- and long-run. More so, the matrix test has proven that all the indicators/variables can explain and suggest government agricultural subsidies for productivity or poverty reduction.



Table 3: Correlation matrix test

Correlation t-Statistic Probability	POSE	AGRI	IMPO	EXVO
POSE	1.000000 ----- -----			
AGRI	0.328711 2.088313 (0.04)*	1.000000 ----- -----		
IMPO	0.252461 1.565478 (0.12)**	0.231131 1.425380 (0.16)**	1.000000 ----- -----	
EXVO	0.226277 1.393815 (0.17)**	0.268468 1.672198 (0.10)**	-0.071296 -0.428866 (0.67)***	1.000000 ----- -----

Note: p-value in parenthesis ()

\*, \*\*, \*\*\* significance at 1%, 5% and 10%

Source: Author's compilation

The correlation between government agriculture subsidy, import and export volume on productivity is positive, except that only government agricultural subsidy is exceptionally more significant at 1%. We assumed all the indicators/variables were linear with no missing data since they were positive and significant at the 5% level. Based on the indicators/variables correlation, the research is looking for long- and short-run cointegration, including diagnostic tests.

### C. COINTEGRATION (ARDL) TEST

The cointegration test results in Table 4 revealed that poverty reduction integrated with the government agricultural subsidy at a 5% significant level in the first, third and fourth cointegrating models and the second cointegrating model at a 10% significant level. The assumption for improving human capital development/poverty reduction from past to current years described government agricultural subsidy in Nigeria by the model's cointegration. In contrast, the calculated F-statistics with the critical value defined cannot reject the null hypothesis of no cointegration and shows a connection between the indicators/variables (cointegration).

Table 4: Cointegration and bound test

Models	F-statistics	Conclusion	
POSE=AGRI, IMPO, EXVO	6.340**	Cointegration	
AGRI=IMPO, EXVO, POSE	2.552*	Cointegration	
IMPO=EXVO, POSE, AGRI	9.000**	Cointegration	
EXVO=POSE, AGRI, IMPO	3.686**	Cointegration	
	lower	Upper bound	
Critical bound (relationship)	I(0)	I(1)	K
POSE=AGRI, IMPO, EXVO	3.65	4.66	3
AGRI=IMPO=EXVO=POSE	2.37	3.2	3
IMPO=EXVO, POSE, AGRI	3.65	4.66	3
EXVO=POSE, AGRI, IMPO	3.65	4.66	3

Source: Author's compilation

Note: \*\*\*, \*\*, \* denotes 1%, 5% and 10% significance level. In the second Column denoting (K) equation variables based on ARDL maximum lag (3,3,1,3) one-way relationships.

Long- and short-run test is built based on equation 7 to 10, followed by error correction presented in Table 5. Table 5 first cointegration model long run, it means that government subsidy on agriculture increases by 1% at any time the productivity or poverty increases by -0.058%, and it reflects that government agricultural subsidy has declined significantly at lag 1. Import significantly increases productivity by 0.163%, and export volume raises productivity by 0.119%, which is statistically significant. Nigeria would need to focus on government agricultural subsidies to revive subsistence and cash farming to enhance employment, productivity, and income to reduce poverty. In addition, based on the coefficients, it is worth noting that all regressors affect productivity except government agricultural subsidy by -0.058%, which is statistically significant. Therefore, the government agricultural subsidy would enhance human capital development and improve productivity through the government's fiscal policy.

The short-run illustrated a decline in government agricultural subsidy and lower export and enhanced import, and the error correction between the short- and long-run is 0.80% at an adjustment/improvement speed of 0.66%. Based on the established DW statistics of -2.115, it fits the model. Model 2 results indicated that whenever government agriculture subsidy increases, import rise by 0.073%, export volume increases by 0.048%, and poverty reduction by 0.299%, all significant at 1%, 5% and lag 1. In the short-run of the model, all the indicators of import, export volume and poverty reduction error are at -0.80%. It also adjusts at a speed of -0.62%—DW statistic at 2.251. Model 3 shows the cointegration of 0.423% export volume, poverty reduction by 3.49% and government agricultural subsidy by 0.558% based on import significance at 5%, 1%, and 5% on lag 1. In the short-run, indicators corrected at -1.73%, speed of adjustment 0.69% and DW statistics at 2.306. Model 4 indicated the cointegration of the indicators based on the export volume: poverty fell by -1.309%, government agricultural subsidy -2.620%, import rise by 0.139% significantly at 5, 1%, 5% levels, lag 2, 0 and 3. The short-run error correction term is -0.68%, speed of adjustment 0.511% and DW statistics 2.296.

Table 5: Long- and short-run test

Cointegrating model 1

Long-run relationship	coefficient	Std.Error	T-[p-value]
Dependent variable POSE(1)			
Regressors			
AGRI(-1)	-0.058	0.041	0.16**
IMPO(1)	0.163	0.048	0.00***
EXVO	0.119	0.051	0.03***
Short-run and ECT			
Dependent variable D(POSE(-1))			
Regressors			
D(AGRI(-2))	-0.744	0.211	0.00***
D(IMPO)	0.072	0.021	0.00***
D(EXVO(-2))	-0.064	0.030	0.04***
ECT(-1)*	-0.800	0.131	0.00***
R-square	0.764		
Adjusted-R-square	0.666		
DW stat	2.115		

Cointegrating model 2

Long-run relationship	coefficient	Std.Error	T-[p-value]
Dependent variable D(AGRIC((-2))			
Regressors			
D(IMPO(-1))	0.073	0.035	0.05***
D(EXVO(-1))	0.048	0.032	0.14**
D(POSE(-1))	0.299	0.216	0.18**
Short-run and ECT			
Dependent variable D(AGRIC(-2))			
Regressors			
D(IMPO(-1))	0.073	0.023	0.00***
D(EXVO(-1))	0.048	0.025	0.07**
D(POSE)	0.050	0.110	0.65**
ECT(-1)*	-0.040	0.010	0.00***
R-square	0.724		
Adjusted-R-square	0.621		
DW stat	2.251		

Cointegrating model 3

Long-run relationship	coefficient	Std.Error	T-[p-value]
Dependent variable D(IMPO((-1))			
Regressors			
D(EXVO(-1))	0.420	0.239	0.09**
D(POSE(-1))	3.49	1.141	0.02***
D(AGRIC(-1))	0.558	1.141	0.69**

Short-run and ECT			
Dependent variable D(IMPO(-1))			
Regressors			
D(EXVO(-1))	0.420	0.180	0.03***
D(POSE(-1))	3.493	0.963	0.00***
D(AGRIC(-1))	0.558	1.080	0.61**
ECT(-1)*	-1.73	0.235	0.00***
R-square	0.796		
Adjusted-R-square	0.698		
DW stat	2.306		

Cointegration model 4

Long-run relationship	coefficient	Std.Error	T-[p-value]
Dependent variable D(EXVO(-2))			
Regressors			
D(POSE(-2))	-1.309	1.007	0.20**
D(AGRIC(-3))	-2.620	1.119	0.04***
D(IMPO)	0.139	0.162	0.40**
Short-run and ECT			
Dependent variable D(EXVO(-2))			
Regressors			
D(POSE(-2))	-1.309	0.615	0.04***
D(AGRIC(-2))	-2.209	0.972	0.03***
D(IMPO(-1))	0.319	0.081	0.10**
ECT(-1)*	-0.687	0.145	0.00***
R-square	0.668		
Adjusted-R-square	0.510		
DW stat	2.296		

Source: Author's compilation

Notes: significant at \*\*\*, 1%, \*\*5% and \*10%.

In light of the cointegration test, the research also realized that the first model indicated a relationship between government agricultural subsidy and productivity or poverty reduction. All the variables explained poverty reduction except government agricultural subsidy, which was negative and significant. The second model of the dependent variable of government agricultural subsidy revealed a significant sign of positive government agricultural subsidy on import, export and poverty reduction. The third model indicated the response variable of import positive and significant relationship on export, poverty reduction, and government agricultural subsidy. Lastly, the fourth model shows a relationship between poverty reduction and government agricultural subsidies, except for imports, which was positive on export volume. As a result, if the government agricultural subsidy increases, it can translate to rapid and stable human capital development and productivity in Nigerian agriculture, import and export plans (social/economic). The research describes the relationship between government agricultural subsidy on agriculture, import, and export volume positive and negative association that was significant in the models.

ARDL maximum lag (3,3,1,3) is selected based on AIC and the dependent variable of productivity or poverty reduction. The DW confirm no autocorrelation. R-squares proved and predicted that the variable of government agricultural subsidy had elaborated productivity/poverty reduction. The statistical evidence suggested that any decrease in government subsidy relative to agricultural productivity becomes negative and significant. It strengthens human capital development and affects high unemployment, lower agricultural product, exports and higher imports (Dzingirayi, P., Shawatu, M. & Chitiga, P. (2022)). The gathered evidence from the unit root test, correlation, and ARDL cointegration methods have explained that all the models fit.

#### D. DIAGNOSTIC TEST

After the ARDL estimation, the diagnostic tests revealed model stability without serial correlation and heteroscedasticity problems. The research uses specific error (RESET), cumulative sum (CUSUM) and cumulative sum of square (CUSUMQ), all at a 5% significance level and parameter stability in Figures 2 a & b. The theory of production function for productivity equilibrium point of view for any change (increase/decrease) in government subsidy could cause productivity.

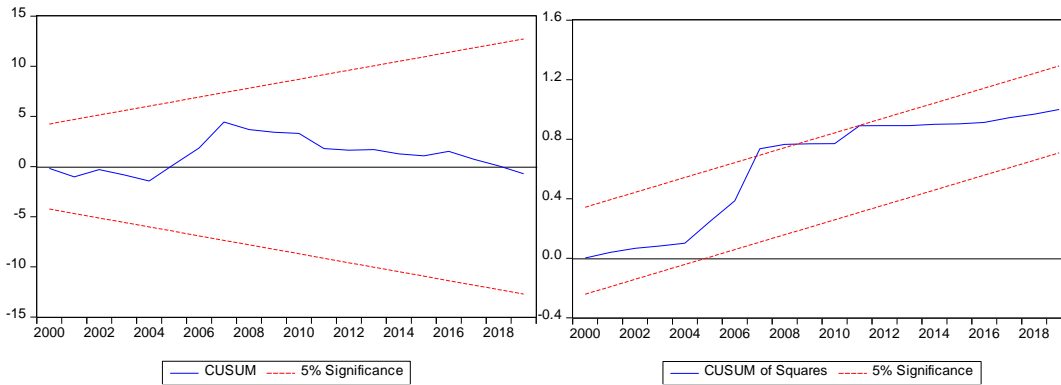


Figure 2a

Figure 2b

## DISCUSSION AND POLICY IMPLICATION FOR GOVERNMENT AGRICULTURAL SUBSIDY ON POVERTY

The relationships between government agricultural subsidy and productivity/poverty reduction revealed negative government agricultural subsidy and positive import and export volume outcomes. In contrast, the question is whether there are any relationships among the indicators/variables. Thus, figure 1 is the pattern that first depicts the relationship trend between government agricultural subsidy, import and export volume by prediction line of 100% productivity or poverty reduction during the research period. In line with the prediction line, we applied the stationarity test, and both government agricultural subsidy and productivity/poverty reduction became stationary in the short- and long-run, significant at first difference. After that, the research employed a correlation test that revealed positive and considerable government agricultural subsidies on productivity/poverty reduction. Autoregressive distributed lag (ARDL) models also proved cointegration and significant government agricultural subsidy short- and long-run relationships in a specific lag of Akaike Information Criteria (AIC).

After taking two lags, the long-run relationship between government subsidies on agriculture and productivity/poverty reduction was negative and significant. These findings invalidate Jaiyeola, A. O. & Bayat, A. (2020) that the government agricultural subsidy is industrious and associated with poverty reduction. The policy implications also suggested government agricultural subsidy support and improved people's living standards. Import and export also contribute to social and economic development in the short- and long run, based on Ngene et al. (2016) prediction and this research on government agricultural subsidy on productivity/poverty reduction. The policy implies that the government should revisit fiscal policy to encourage domestic production. Victor (2015) found cointegration between agriculture and export, which corroborates with the findings of this research in the short- and long run. The policy proposed that the government should reconsider reviving the export-led growth policy through agricultural subsidies. Omodero (2021) found that agriculture has a significant effect on reducing unemployment and a negative impact on employment. However, this research found both increased employment and productivity or poverty reduction positive in the long- and short-run on agricultural subsidies. The policy suggested that government intervention in subsidizing agricultural inputs to poor farmers is supposed to remain practically monitored. Therefore, the examined relationships based on the methodological analysis confirmed the Solow growth theory and production function model by increasing capital and labour in the sense of government agricultural subsidy to improve productivity or poverty reduction, explaining the equilibrium speed of improvement from short- and long-term that remains steady and specific.

## CONCLUSION

his research analyzed the relationship between government agricultural subsidy and productivity on poverty reduction, which describes the production function model and the growth theory. The growth theory of increasing labour and capital to generate maximum utility remains a significant productivity/poverty reduction indicator in this research. However, this research's theoretical and empirical study on government agricultural subsidies to affect poverty reduction between 1980-2019 in Nigeria is determining. What could be more practical is explicitly the impact between government agricultural subsidies and imports based on improved poverty reduction in Nigeria.

## RECOMMENDATION

Government agricultural subsidies proved to enhance productivity or poverty reduction in this research. It can be vital for meeting up with Nigeria's and other developed and developing countries social and economic plans that can lead to the export of agricultural products within and outside of the countries. Subsidy as productivity or poverty reduction policy could benefit the net import and export of goods and services. Thus, national interest regarding subsidy reform of agricultural production, import and export would enhance productivity and relatively skilled labour, transforming the country's productivity and reducing poverty. In addition, government agricultural subsidies could be an immense indicator for governments, policymakers, scholars and researchers to make policies. The research recommendation regarding the impact of government agricultural subsidy and productivity/poverty reduction since all the methods employed have ascertained policy feasibility, thereby suggesting policing strategies. Moreover, the research recommends future research on panel government agricultural subsidy and productivity on poverty in Sub-sahara Africa.

## REFERENCES

- Ade Oyelabi, J. (1971). Test of factor substitution in Nigeria's manufacturing sector. *Eastern Africa Economic Review*, 3(1), 29–39. [https://catalogue.leidenuniv.nl/prime-explore/fulldisplay?docid=UBL\\_ALMA71305806720002711&context=L&vid=UBL\\_V1&lang=en\\_US&search\\_scope=lib\\_asc&adaptor=Local Search Engine&tab=leiden&query=lsr04,contains,theory of production,AND&mode=advanced&offset=0](https://catalogue.leidenuniv.nl/prime-explore/fulldisplay?docid=UBL_ALMA71305806720002711&context=L&vid=UBL_V1&lang=en_US&search_scope=lib_asc&adaptor=Local Search Engine&tab=leiden&query=lsr04,contains,theory of production,AND&mode=advanced&offset=0)
- Agbigbe, W. A. (2016). The Impact of Transportation Infrastructure on Nigeria's Economic Development. *ProQuest Dissertations and Theses*, 192. <http://ezphost.dur.ac.uk/login?url=https://search.proquest.com/docview/1830760935?accountid=14533%0Ahttp://openurl.ac.uk/ukfed:dur.ac.uk?genre=dissertations+%26+theses&issn=&title=The+Impact+of+Transportation+Infrastructure+on+Nigeria%27s+Economic+Develop>
- Aggarwal, P. (2022). Relationship of green human resource management with environmental performance: mediating effect of green organizational culture. *International Journal of Productivity and Management*. <https://doi.org/10.1108/BIJ-08-2021-0474>
- Aisien, L. N., & Ihensekhien, A. O. (2019). Could Imports Be Beneficial to Economic Growth in Nigeria. *Malaysian Journal of Social Sciences and Humanities*, 4(3), 63–75. <https://www.semanticscholar.org/paper/8e6788e77888548ec4db7332ed8456c1be559bbb>
- Akhter, M. (2015). The Impact of Export and Import on Economic Growth in Bangladesh. *Journal of Management and Social Sciences*, 6(2), 350–364. [file:///C:/Users/DELL/Downloads/abono,+Journal+manager,+8\)+JMSS+Vol+6+No+2+Adegboyega.pdf](file:///C:/Users/DELL/Downloads/abono,+Journal+manager,+8)+JMSS+Vol+6+No+2+Adegboyega.pdf)
- Bai, J., Wang, Y., & Sun, W. (2022). Exploring the role of agricultural subsidy policies for sustainable agriculture Based on Chinese agricultural big data. *Sustainable Energy Technologies and Assessments*, 53(PA), 102473. <https://doi.org/10.1016/j.seta.2022.102473>
- Bighelli, T., Lalinsky, T., & Vanhala, J. (2023). Cross-country evidence on the allocation of COVID-19 government subsidies and consequences for productivity. *Journal of the Japanese and International Economies*, 68(December 2022), 101246. <https://doi.org/10.1016/j.jjie.2023.101246>
- Chandio, A. A., Akram, W., Sargani, G. R., Twumasi, M. A., & Ahmad, F. (2022). Assessing the impacts of meteorological factors on soybean production in China: What role can agricultural subsidy play? *Ecological Informatics*, 71(August), 101778. <https://doi.org/10.1016/j.ecoinf.2022.101778>
- Chang, T. Z. (1993). Parallel Importation in Taiwan: A View from a Newly Emerged Country and a Comparative Analysis. *International Marketing Review*, 10(6), 30–41. <https://doi.org/10.1108/02651339310051605>
- Charity, O. M. G. and O. K. (2014). Growth Evidence of Imports in Nigeria: A Time Series Analysis. *International Researcher*, 3(4), 45–54. [www.iresearcher.org](http://www.iresearcher.org)
- Dzingirayi, P., Shawatu, M. and Chitiga, P. (2022). T. participation of gender equity in artisanal small-scale mining in, & Zimbabwe. People centred – The Journal of Development Administration (JDA), 7(2), 38-45. (2022). The participation of gender equity in artisanal small-scale mining in Zimbabwe. *The Journal of Development Administration*, 7(2), 38–45. <https://africasocialwork.net/wp-content/uploads/2022/07/1-The-participation-of-gender-equity-in-artisanal-small-scale-mining-in-Zimbabwe.pdf>
- Eyitayo J, O., Faith F., O., Oluwakemi, I., Busayo.B, O., Olubukoye O., O., Jide J., O., & Isaac A., O. (2021). Poverty: Place of Agricultural Development on Economic Growth of Nigeria. *International Journal of Research and Innovation in Social Science*, 05(09), 511–519. <https://doi.org/10.47772/ijriss.2021.5933>
- Gallardo, F. I., Monforti Ferrario, A., Lamagna, M., Bocci, E., Astiaso Garcia, D., & Baeza-Jeria, T. E. (2021). A Techno-Economic Analysis of solar hydrogen production by electrolysis in the north of Chile and the case of exportation from Atacama Desert to Japan. *International Journal of Hydrogen Energy*, 46(26), 13709–13728. <https://doi.org/10.1016/j.ijhydene.2020.07.050>
- Idris, A. J., & Agbim, K. C. (2015). Micro-Credit as a Strategy for Poverty Alleviation among Women Entrepreneurs in Nasarawa State, Nigeria. *Journal of Business Studies Quarterly*, 6(3), 122–143. <http://search.ebscohost.com/login.aspx?direct=true&db=buh&AN=101770179&site=ehost-live>
- Jabareen, Y. (2008). A new conceptual framework for sustainable development. *Environment, Development and Sustainability*, 10(2), 179–192. <https://doi.org/10.1007/s10668-006-9058-z>
- Jaiyeola, A. O., & Bayat, A. (2020). Assessment of Trends in Income Poverty in Nigeria from 2010–2013: An Analysis Based on the Nigeria General Household Survey. *Journal of Poverty*, 24(3), 185–202. <https://doi.org/10.1080/10875549.2019.1668900>
- Lee, G. O. M. (1999). The managerial implications of labour importation in Hong Kong. *International Journal of Manpower*, 20(7), 469–482. <https://doi.org/10.1108/01437729910292257>
- Lunt, N., & Horsfall, D. (2014). Government Policy. In *European Economic Review* (Medical To, pp. 1–22). <https://www.sciencedirect.com/topics/economics-econometrics-and-finance/government-policy/pdf>
- Ma, Y., Sha, Y., Wang, Z., & Zhang, W. (2023). The effect of the policy mix of green credit and government subsidy on environmental innovation. *Energy Economics*, 118(December 2021), 106512. <https://doi.org/10.1016/j.eneco.2023.106512>
- Matsuyama, K. (1992). Agricultural productivity, comparative advantage, and economic growth. *Journal of Economic Theory*, 58(2). [https://doi.org/10.1016/0022-0531\(92\)90057-0](https://doi.org/10.1016/0022-0531(92)90057-0)
- Mugumbate, J. R., Tarusikirwa, M. C., Nyoni, C., Mtetwa, E., Nyikahadzoyi, K., Dhemba and Nyaruwata, L. T. (2020). People-centred development (PCD): philosophies, key concepts and approaches to teaching, learning and practice. *The Journal of Development Administration*, 7(1), 1–12. <https://africasocialwork.net/wp-content/uploads/2022/04/1-people-centred-development.pdf>
- Nenbee, S. G., & Harcourt, P. (2019). The changing dimensions of tariff and imports in Nigeria. *International Journal of Commerce*



- and Management Research, 5(4), 37–44. www.managejournal.com
- Ngene A. Nwele J.O. and Uduimoh A.A. (2016). Evaluation of Manufactured Goods Import and the Manufacturing Sector Productivity in Nigeria. *Saudi Journal of Business and Management Studies*, 1(4), 186–195. <https://doi.org/10.21276/sjbms.2016.1.4.5>
- Nigeria - Country Commercial Guide. (2021). Includes information on average tariff rates and types that U.S. firms should be aware of when exporting to the market. <https://www.trade.gov/country-commercial-guides/nigeria-import-tariffs>
- Nigeria Trade Statistics. (2022). *Nigeria All Products Exports and Imports*.
- Ogundipe, A., Oduntan, E., Ogunniyi, A., & Olagunju, K. (2017). Agricultural Productivity, Poverty Reduction and Inclusive Growth in Africa: Linkages and Pathways. *Asian Journal of Agricultural Extension, Economics & Sociology*, 18(1), 1–15. <https://doi.org/10.9734/ajaees/2017/32427>
- Omeje, A. N., Jideofor, A., & Ugwu, M. O. (2020). Youth Empowerment and Entrepreneurship in Nigeria: Implication for Economic Diversification. *SAGE Open*, 10(4). <https://doi.org/10.1177/2158244020982996>
- Omodero, C. O. (2021). Sustainable agriculture, food production and poverty lessening in Nigeria. *International Journal of Sustainable Development and Planning*, 16(1), 81–87. <https://doi.org/10.18280/ijstdp.160108>
- Omoriegbe OK. (2017). Entrepreneurial Opportunities and Financing Sources in a Developing Economy : A Focus on Nigeria. *Arabian Journal of Business and Entrepreneurial Opportunities*, 7(4), 2–8. <https://doi.org/10.4172/2223-5833.1000314>
- Oyaniran, T. (2020). Current State of Nigeria Agriculture and Agribusiness Sector. In *AfCFTA Workshop* (Issue September). <https://www.pwc.com/ng/en/assets/pdf/afcfta-agribusiness-current-state-nigeria-agriculture-sector.pdf>
- Rashid Khan, H. U., Siddique, M., Zaman, K., Yousaf, S. U., Shoukry, A. M., Gani, S., Sasmoko, Khan, A., Hishan, S. S., & Saleem, H. (2018). The impact of air transportation, railways transportation, and port container traffic on energy demand, customs duty, and economic growth: Evidence from a panel of low-, middle-, and high -income countries. *Journal of Air Transport Management*, 70(February 2017), 18–35. <https://doi.org/10.1016/j.jairtraman.2018.04.013>
- Siddig, K., Aguiar, A., Grethe, H., Minor, P., & Walmsley, T. (2014). Impacts of removing fuel import subsidies in Nigeria on poverty. In *Energy Policy* (Vol. 69, Issue July). <https://doi.org/10.1016/j.enpol.2014.02.006>
- Sikandar, F., Erokhin, V., Shu, W. H., Rehman, S., & Ivolga, A. (2021). The impact of foreign capital inflows on agriculture development and poverty reduction: Panel data analysis for developing countries. *Sustainability (Switzerland)*, 13(6). <https://doi.org/10.3390/su13063242>
- Upton, M. (1973). Farm management in Africa : the principles of production and planning. *Oxford University Press*. [https://catalogue.leidenuniv.nl/primo-explore/fulldisplay?docid=UBL\\_ALMA21309303040002711&context=L&vid=UBL\\_V1&lang=en\\_US&search\\_scope=lib\\_asc&adaptor=Local Search Engine&tab=leiden&query=lsr04,contains,theory of production,AND&mode=advanced&offset=0](https://catalogue.leidenuniv.nl/primo-explore/fulldisplay?docid=UBL_ALMA21309303040002711&context=L&vid=UBL_V1&lang=en_US&search_scope=lib_asc&adaptor=Local Search Engine&tab=leiden&query=lsr04,contains,theory of production,AND&mode=advanced&offset=0)
- Victor, U. I. (2015). The empirical analysis of agricultural exports and economic growth in Nigeria. *Journal of Development and Agricultural Economics*, 7(3), 113–122. <https://doi.org/10.5897/jdae2014.0615>
- Vozarova, I. K., & Kotulic, R. (2016). Quantification of the Effect of Subsidies on the Production Performance of the Slovak Agriculture. *Procedia Economics and Finance*, 39(November 2015), 298–304. [https://doi.org/10.1016/s2212-5671\(16\)30327-6](https://doi.org/10.1016/s2212-5671(16)30327-6)
- Wang, F., Li, Y., & Sun, J. (2020). The transformation effect of R & D subsidies on firm performance An empirical study based on signal financing and innovation incentives. *Journal of Chinese Management Studies*, 14(2), 373–390. <https://doi.org/10.1108/CMS-02-2019-0045>
- Wang, Z., Huo, J., & Duan, Y. (2023). Manufacturers' strategy for introducing remanufactured products under a government subsidy: Introduce or not? *Journal of Management Science and Engineering*, 8(1), 128–148. <https://doi.org/10.1016/j.jmse.2022.07.006>
- Wenqi, D., Khurshid, A., Rauf, A., & Calin, A. C. (2022). Journal of Innovation. *Journal of Innovation & Knowledge*, 7(2), 100189. <https://doi.org/10.1016/j.jik.2022.100189>
- Xiaobao, P., & Wu, J. (2022). Do subsidy increases promote or inhibit innovation? Evidence from Chinese enterprises listed on the SSE STAR Market. *Journal of Chinese Management Studies*. <https://doi.org/10.1108/CMS-05-2022-0183>
- Zhang, J., & Wang, Z. (2022). Does inter-provincial energy exportation affect local energy affordability? Evidence from China. *Energy Reports*, 8, 13848–13858. <https://doi.org/10.1016/j.egy.2022.10.299>
- Zhang, R., Ma, W., & Liu, J. (2021). Impact of government subsidy on agricultural production and pollution: A game-theoretic approach. *Journal of Cleaner Production*, 285, 124806. <https://doi.org/10.1016/j.jclepro.2020.124806>
- Zhou, Y., Rahman, M. M., Khanam, R., & Taylor, B. R. (2022). *The impact of penalty and subsidy mechanisms on the decisions of the government, businesses, and consumers during COVID-19 — Tripartite evolutionary game theory analysis*. 9(May).

Nor Asmat Ismail\*

School of Social Sciences, Universiti Sains Malaysia  
Email address: norasmat@usm.my

\*Corresponding author

Yusuf Bala Zaria

School of Social Sciences, Universiti Sains Malaysia and  
Department of Social Sciences, Mustafa Comprehensive School Kontagora  
Email address: yusufbalazaria90@gmail.com