

RELATIONSHIP OF AGRICULTURAL OUTPUT ON POVERTY REDUCTION IN NIGERIA (1980-2018)

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ABSTRACT

Agriculture was known to be one of the major contributors to national development, but suffering from neglect that has led the country to heart aching unemployment and poverty. The economic burden of hardship on the society necessitates this study. Therefore, this study look into the relationship between agricultural output and poverty reduction in Nigeria. These were with the view to examining the trend of agricultural growth overtime, relative effectiveness of crop production, livestock farming, forestry and fishery on poverty reduction in Nigeria.

Secondary data was used for the study, the set of data used was time series data over the period of 1980 to 2018, sourced from National Bureau of statistics (NBS), Annual abstract of statistics of Nigeria office of statistics (FOS), Central Bank of Nigeria,(CBN) statistical bulletin, World Development Indicators (2013), Federal Agricultural organization statistics of Nigeria(FAOSTAT). Time series econometrics (Principal Component Analysis and Vector Error Correction Model) was applied to generate poverty index, and the interaction among the variables respectively.

The result of the trend of Agricultural growth showed that during the period 1980 to 2018, the percentage growth of the agriculture sector increased by 5.50 percent. Also, the result of variance decomposition established that a shock on Crop production, Livestock rearing, Forestry and Fishery respectively have significant and lasting impact on poverty reduction long into the future and hence, relationship exist between agricultural output and poverty at the long run.

In conclusion, the results of the project showed that there were variations in the trend pattern of agricultural growth, which implies that agricultural growth can affect poverty reduction positively and also, that there is long relationship existing between different sub-sector of

Agriculture. Therefore, this project work recommends that capital expenditure on Agriculture should be improved so that farmers can have access to implements

Keywords: Poverty Reduction, Agriculture, Principal Component Analysis, Unit root and Co-integration tests.

1. INTRODUCTION

One of the challenges facing mankind is how to provide an equitable standard of living, adequate food, clean water, safe shelter, a healthy and secured environment, an educated public, and satisfying job for the present and future generations. Inability to meet this needs have been referred to as the presence of poverty (Bwamwojo, 2013). The incidence of poverty in Nigeria is increasing faster than her population (World Bank) which has led to largely dependence on relations and friends for a bit of sustenance and lost in the necessities of life which include basic food, shelter, health and safety (Noko, 2016).

Poverty is also a condition of lack, insufficiency or inadequacy of financial resources with which to satisfy basic human needs of quality food, clothing and shelter, as well as portable water and health services; thus, culminating into deprivation, restriction of choices, and poor living standards (Kolawole *et.al.*, 2014). However, hunger is a direct manifestation of poverty, which includes lack of food, clothing and shelter, and lack of access to health services. As much as poverty and hunger are the conditions of lack, the basic distinction between them is that, while poverty is lack of purchasing power (financial resources) to satisfy basic needs, hunger is the lack of those basic needs; hence, there cannot be hunger without poverty.

More so, poverty can be regarded as a “Virus” spreading wider among the populace in sub-Saharan Africa. Any nation or region that want growth and development must limit the effect or eliminate the poverty “virus” completely. This can be deduced from the words of Adam Smith 1776, as found in Adofu and Ocheja (2013), “no society can be flourishing and happy, of which by far the greater part of the members are poor, unemployed and miserable”. In line with the above, poverty is one of the major problems challenging the world, especially developing and underdeveloped countries. As such, the UN made it the first objective of its Millennium Development Goal (MDG) eradication of extreme poverty and hunger by 2015. The agricultural sector has been an important sector in the Nigerian economy both in the past and present despite

the oil discovery. This is basically because, it provides employment opportunities for the teeming population, eradicating poverty and contributes to the growth of the economy. Ogen (2009) as reported by Olajide, *et al.* (2013) opined that a strong agricultural sector will provide food for the country's increasing population, provide employment, generate foreign exchange and provide raw material for industries. The sector is believed to have multi-functional effect on nation's socio-economic and industrial sector.

The share of the total population living below the \$1 a day on the threshold of 46 per cent is higher today than in the 1980s and 1990s, despite significant improvements in the growth of GDP in recent years, (Aiyedogbon and Ohwofasa, 2012). It was reported by Bello, *et al.*, (2009) that poverty was minimal in Nigeria between 1960s and early 1970s. This was due to the steady growth in per capita income as the agricultural, industrial and the public sectors absorbed most of the labour force. The beginning of real poverty in Nigeria was in the late 1970s to early 1980s, when oil prices began to fall in 1982 and per capita income and private consumption dropped. For instance, the poverty level stood at 43% between 1985 and 1986 but rose to 54% , 61% and 66% in 1996, 1997 and 1999 respectively (World Bank, 1995; CBN 2003 in Bello *et al.*, 2009). National Bureau of statistics reported a decline in poverty incidence to 54.4% but later grew to 69% in 2010 (Oyekale, 2013).

Following Engel's law, which state that 'as income rises, the proportion of income that is spent on food decreases' there is high level of poverty in Nigeria, the percentage of Nigerians living in absolute poverty –those who can afford only the bare essentials of food, shelter and clothing – rose to 60.9% in 2010, compare with 54.7% in 2004, the National Bureau Of Statistic (NBS) stated that although Nigeria's economy is projected to continue growing, poverty is likely to get worse as the gap between the rich and the poor continue to widen.

Nigeria as a nation is characterized with alarming poverty rate considering its high level of natural and human endowments. The World Bank (2007) records show that Nigeria has a substantial percentage of its population living below the national poverty line. Nigeria has been recorded to rank number 152 in the 2018 Human Development Index (*Vanguard 2 018*). Nigeria's basic indicators place the country among the 26 poorest countries in the world. The proportion of Nigerians living below the poverty line of one dollar a day has increased dramatically during the last two decades. In the year 2000, more than 70% of Nigerians were estimated to be

living below the internationally defined poverty line of one dollar a day. In the same year, both per capita income and per capita private consumption which are two major indicators of poverty index were lower than the early 1970s. Per capita income fell from \$1,600 in 1980 to \$290 in 2002. This is due to, among others, neglect of the agriculture sector, depreciation of the naira and economic mismanagement by the both the military and civilian governments at all level. Average GDP per capita has oscillated between US \$ 355 and 387.5t

Empirically, studies have examined the relationship between agriculture and poverty reduction in both cross country and country specific analysis. The discussion on the relationship between agricultural output and poverty remains contentious as controversies exist on the effect it has on poverty reduction. Some emphasize that the relationship is positive i.e increase in agriculture output reduces poverty. This include among others the work of Ravallion and Datt (2002); Gustavo and Kostas (2007) etc. Although some studies like Suryahadi and Hadiwidjaja (2011); Kolawole and Omobitan (2014) and Udofia and Essang (2015) stressed that the agriculture output has no effect on poverty reduction, while Besley, *et al;* (2005) concluded that the relationship that exist between them is neutral. It is important to note that most of these previous studies focus on cross-country analysis. Hence, this research will give answer to the following;

- i. What are the trends of agricultural growth in Nigeria overtime
- ii. What are the effect of Agriculture sub-sectors on poverty reduction in Nigeria
- iii. What are the roles of Agriculture towards reduction of poverty in Nigeria.

2. LITERATURE REVIEW

It was reported by Bello, *et al.*, (2009) that poverty was minimal in Nigeria between 1960 and early 1970s. This was due to the steady growth in per capita income as the agricultural, industrial and the public sectors absorbed most of the labour force. The beginning of real poverty in Nigeria was in the late 1970s to early 1980s, when oil prices began to fall in 1982 and per capita income and private consumption dropped. For instance, the poverty level stood at 43% between 1985 and 1986 but rose to 54% , 61% and 66% in 1996, 1997 and 1999 respectively (Bello *et al.*, 2009). National Bureau of statistics (2012) reported a decline in poverty incidence to 54.4% but later grew to 69% in 2010 (Oyekale, 2013).

According to Nnadi *et al.*, (2013) the incidence of poverty has been high and increasing since 1980 in Nigeria. National Bureau of Statistics (2012), also forecasts the poverty rate in the country for 2011 using various economic models. However, the estimates are constrained by the assumption that the status quo in 2010 was maintained in 2011. Accordingly, it ignores the potential positive impact various poverty alleviation strategies implemented since 2011 may have had on reversing the poverty trend. Thus, using the relative, absolute and dollar per-day poverty measures, it was estimated that poverty would further rise slightly to about 71.5 percent, 61.9 percent and 62.8 percent respectively in 2011. The survey also suggests a rising income inequality in the country as measured by the Gini-coefficient. By this measure, income inequality rose from 0.429 in 2004 to 0.447 in 2010, indicating greater income inequality during the period. The analysis of consumption expenditure distribution indicates that the top 10 percent income earners was responsible for about 43 percent of total consumption expenditure, the top 20 percent was responsible for about 59 percent of total consumption expenditure while the top 40 percent was responsible for about 80 percent of total consumption expenditure in the year under review.

3. METHODOLOGY

Method of Data Collection

The method of data collection used was secondary data. The set of data used was time series data from secondary sources 1980 to 2018. These data were obtained from National Bureau of statistics (NBS), Annual abstract of statistics of Nigeria office of statistics (FOS), Central Bank of Nigeria,(CBN) statistical bulletin, World Development Indicators (2013), Federal Agricultural organization statistics of Nigeria(FAOSTAT).

Method of Data Analysis and Estimation Techniques

a. Trend and prediction of time series was computed by using ARIMA model. ARIMA (p,d,q) model is complex of a linear model. There are three parts (they do not have to contain always all of these): AR (Autoregressive) – linear combination of the influence of previous values; I (Integrative) – random walk; MA (Moving average) – linear combination of previous errors. These models are very flexible, quite hard for computing and for the understanding of the results. They are demand quality and a large number of dealing dates (it is assumed at least 50 dealing or

observations). In ARIMA models, we assume dependence between the quantities $y_{t-2}, y_{t-1}, y_{t+1}, y_{t-2}, \dots$

If the process contains seasonal fluctuation, as it is in this model, we can expect also the dependence seasons: $y_{t-2s}, y_{t-s}, y_t, y_{t+s}, y_{t+2s}, \dots$

where s is the length of the period. This process is called SARIMA $(p,d,q)_s$. where;

p is order of process AR

q is the order of process MA

d is the order of difference.

P is the order of seasonal process AR

Q is the order of MA

D is order of seasonal difference.

s is the length of seasonal period

The equation of this model is:

$$\phi_p(B^s) \phi_p(B) (1-B)^d (1-B^s)^D$$

$$Y_t = \theta_q(B) \theta_q(B^s) \alpha_t \dots\dots\dots$$

$\phi_p(B)$ is autoregressive operator,

$\theta_q(B)$ is the operator of moving averages,

$\phi_p(B^s)$ is seasonal autoregressive operator,

$\theta_q(B^s)$ is seasonal operator of moving average

$\{\alpha\}$ is white noise.

b. For the second objective, this study adopted the second transmission principle as outlined by DFID (2004) cheaper food (as a result of much agriculture output) reduces poverty. Hence, the specification of the model adopted for this investigation is implicitly stated as follows:

$$POVR = f(AGRIC) \quad (3.1)$$

Where: POVR is poverty reduction and AGRIC is the agricultural output. Since agriculture in Nigeria is divided into various sub-sectors, the agricultural output was therefore decomposed to include all the sub-sector, hence equation 3.1

$$AGRIC = f(\text{Crop, Livestock, Forest, Fish}) \quad (3.2)$$

By integrating equation (3.2) into equation (3.1), while also showing the intercept and stochastic term and finding the logarithm function of the agriculture component, the new equation which showed the effect of each sub-sector of the agricultural output on poverty reduction in Nigeria now becomes:

$$POVR = \beta_0 + \beta_1 \ln \text{Crop} + \beta_2 \ln \text{Livestock} + \beta_3 \ln \text{Forest} + \beta_4 \ln \text{Fish} + \varepsilon$$

Where: POVR is poverty reduction Index, Crop is the general crop production in Nigeria, Livestock is the total livestock production in Nigeria, Forestry and Fish are both forestry conservation and fishing production respectively in Nigeria. ε is the stochastic term which represents other factors that may determine poverty reduction which are not captured in the model. While β_0 , β_1 , β_2 , β_3 , and β_4 are the parameters. On apriori expectation, β_1 , β_2 , β_3 , and β_4 are expected to be < 0 .

In measuring poverty, Principal Component Analysis (PCA) was used. The PCA is a multivariate statistical method used to reduce the number of variables without losing too much information.

To estimate the model, the statistic properties of poverty reduction, crop production, livestock, forestry and fishery were considered as well as the lag selection test to determine the lag length of the model. Unit root tests on both variables were carried out using the Augmented Dickey-Fuller (ADF). Also, the long-run association of the variables was tested using the Johansen co-integration test. In estimating the model, VEC model was considered. The VEC model is a natural progression from a VAR representation especially when the variables of interest are not stationary at their

levels and are co integrated. The model also provides a simple framework to systematically examine the rich dynamics in multiple time series. It provides a coherent and credible approach to data description, forecasting, structural inference, policy analysis and error free method of estimating economic relations (Sim, 1980). A VECM also combines the long-run relationship with a short-run adjustment process and gives a suitable tool for policy analysis when the series are non-stationary. The VECM representation as below:

$$\Delta y_t = \theta + \sum_{i=1}^n \beta_i y_{t-i} + \lambda ECM_{t-1} + \varepsilon_t$$

Where Δ is the differencing operator, such that $\Delta y_t = y_t - y_{t-1}$

Where y_t is an (n x 1) column vector of the endogenous variables, θ is an (n x 1) vector of constant terms, β represent coefficient matrices. y_t is the 5 x 1 vector of the variables included in the model (POVR, Crop, Livestock, Forestry, Fish), θ is the 5 x 1 vector of constant terms and β is the 5 x 5 matrices which include the interactive coefficients of the variables involved in equation 3.3, and lastly λ is the 5 x 1 vector of coefficients for each of the error correction terms and ε_t is the vector of disturbance term. The vector error correction model pertaining to the five (5) variables incorporated into the model for the study is expressed below:

$$\begin{bmatrix} \Delta POVR_t \\ \Delta Crop_t \\ \Delta Livestock_t \\ \Delta Forestry_t \\ \Delta Fish_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \\ \alpha_5 \end{bmatrix} + \sum_{i=0}^k \begin{bmatrix} \beta_{1i} \theta_{1i} \pi_{1i} \\ \beta_{2i} \theta_{2i} \pi_{2i} \\ \beta_{3i} \theta_{3i} \pi_{3i} \\ \beta_{4i} \theta_{4i} \pi_{4i} \\ \beta_{5i} \theta_{5i} \pi_{5i} \end{bmatrix} \begin{bmatrix} \Delta POVR_{jt-i} \\ \Delta Crop_{jt-i} \\ \Delta Livestock_{jt-ii} \\ \Delta Forestry_{jt-i} \\ \Delta Fish_{jt-i} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \\ \lambda_4 \\ \lambda_5 \end{bmatrix} [ECM_{t-1}] + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \end{bmatrix}$$

Where: $\alpha_i = \theta$; a (3 x 1) matrix of the constants; $0 \leq i \leq k$, and k is the lag length selected based on the Akaike Information criterion (AIC) and the Final Prediction Error (FPE) and $t > 0$. The AIC and FPE are considered most appropriate for the study because they minimize the chance of under estimation while maximizing the chance of recovering the true lag in a small sample of 60 observations or less (Liew, 2004; Orisadare and Agu, 2016). $\Upsilon > 0$; and Υ is a vector of the estimated parameters in the VECM equation. The proportionate impact of one standard deviation

shock of each of the agriculture sub-sector on poverty reduction was examined using the variance decomposition tool found in the VECM.

4. RESULTS AND DISCUSSION

Unit Root and Co-integration Tests

The decision rule adopted is, if the absolute value of the ADF test is greater than the MacKinnon (1991, 1996) 1%, 5% or 10% critical value, then the null hypothesis is rejected, but if the absolute value of the ADF and PP test is less than MacKinnon (1991, 1996) critical value, it is concluded the tested variables are non - stationary. An observation of table 1 shows that our entire variable which include Poverty reduction index, crop production output, livestock output, forestry output and fishery output are not stationary at level but at their first difference they are found to be stationary.

Results of the Augmented Dickey Fuller (ADF) Unit Roots test on Variables.

VARIABLES	AUGMENTED DICKEY FULLER			Remark
	t-statistic			
	Level	1 st Difference	2 nd Difference	
Poverty Index	0.428797	-5.66345*	–	I(1)
ln crop production	-0.311829	-5.88605*	–	I(1)
ln livestock	-0.284311	-5.743341*		I(1)
ln forestry	-0.04847	-5.280131*		I(1)
ln fishery	-0.025674	-5.348892*		I(1)

Source: Computation from STATA 14, 2021 Project Analysis.

NOTE: One, two and three asterisk denotes rejection of the null hypothesis at 1%, 5% and 10% respectively based on critical value. For the augmented Dickey –Fuller (ADF) test, the automatic maximum lag length based on Schwarz information criterion is applied.

Co-Integration Test

The trace test and the Max-Eigen test from this technique were utilized to establish the number of co-integrating vectors and the results are as reported in Table 2 and 3 respectively. The Trace test indicate two co-integration equation while the Max Eigen test also indicate two co-integrating equation at 5% significant level.

Since all data for this study are all I (1) variables, therefore, there is a need to test for the existence of co-integration among the variables in order to capture know the long run relationship among the variables. This study followed the multivariate co-integration methodology proposed by Johansen and Juselius (1990). This was done by comparing the Trace-Statistic results with the critical value results. This is presented in Table a and b below, which indicates that, two co-integration equations between the variables employed. This is confirmed (at $r=0^*$) by the Trace Statistic value of 125.8823, which is greater than the critical value of 72.481144 at 5% (0.05) level of significance. Alternatively, it was also confirmed by the Maximum Eigen statistic value of 76.820017, which is greater than the critical value of 31.451020 at 5% (0.05) level of significance. This implies that is long - run association between poverty reduction and the different sub-sectors of agriculture at the 5% significant level, hence, the linear combination of two or more of these variables exhibit a long- run relationship.

Trace Test

Table a: Co-Integrating results (with a linear deterministic trend) where r is the number of co integrating vectors Lag interval (1 to 3)

Null	Alternative	Statistic	Critical Value(5%)
$r=0^*$	$r=1$	125.8823	72.481144
$r\leq 1^*$	$r=2$	52.48117	44.92346
$r\leq 2^*$	$r=3$	28.60623	30.74631
$r\leq 3$	$r=4$	10.62410	15.79816
$r\leq 4^*$	$r=5$	0.28274	3.96422

Source : Computation from STATA14,2021 Project Analysis .

Trace test indicates 2 co-integrating equations at the 0 .05level

MAX-EIGENTES**Table b: Co-integrating results (with a linear deterministic trend) where r is the number of co-integrating vectors lag interval(1 to3)**

Null	Alternative	Statistics	Critical Value (5%)
$r=0^*$	$r=1$	76.820017	31.451020
$r\leq 1^*$	$r=2$	27.07423	25.23456
$r\leq 2$	$r=3$	18.781874	23.414301
$r\leq 3$	$r=4$	7.196681	13.908168
$r\leq 4^*$	$r=5$	0.118934	3.684113

Source: computation from STATA 14, 2021 Project Analysis .

Max-Eigen test indicates 2 co-integrating equations at the 0.05level.

5. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Based on the analysis in this research, The results show that there were variations in the trend pattern of agricultural growth, which implies that agricultural growth can affect poverty reduction positively. Also, there is long relationship existing between different sub-sector of Agriculture.

Therefore, the Agricultural sector is an instrumental variable that could catalyze the economy towards poverty reduction if manipulated appropriately through viable growth-driven policies. The development in agricultural sector is known to lead to the development of the total economy which was evident before the oil-boom era.

Poverty can be kept at minimum in the country if we can go back to the base and take agriculture as a priority. This will minimized unemployment and reduce poverty greatly in the nation.

Recommendations.

To this end, the research recommends that:

1. Relevant government agency should adopt favorable policies such as providing fertilizers, improve seedling, training of farmers and dredge dams to aid dry season farming and agriculture productivity.
2. Government should improve agriculture from the grass root by providing the needed condition for the poor farmers to improve their productivity.
- 3 Programmes and policies that will move agriculture up to satisfy the increasing population should be incorporated and well organized and monitored by the government .
4. Capital expenditure on agriculture should be improving so that farmers can have access to farm implements.
5. Government should help farmers to sell their product at reasonable price

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