Kogi Journal of Education and Pedagogy (KOJEP), Vol. 4, No. 1, JUNE, 2025

ISSN 2736-0091
E-ISSN 2737-0107

INVESTMENT MULTIPLIER CONCEPT AND ELASTICITY OF PRODUCTION DYNAMICS IN NIGERIAN AGRICULTURE

BY

Abdul Muftah SHITU: Department of Economics and Development Studies, Kwara State University, Malete – Ilorin, E-mail: shitu.abdul@kwasu.edu.ng/ + 2347032640129

&

Tajudeen LAWAL: Department of Accounting and Finance, Kwara State University, Malete -Ilorin

Abstract

Real Investment in Nigeria agriculture is expected to energize production in the sector and promote a linkage effect in Nigerian economy. Investment in Nigeria agriculture has been enormous of recent, but growth and output expansion path remain a major concern for food security. The study examines investment multiplier effect on production dynamics in agricultural sector. Time series data for 30years (1987-2016) were used for the study. The sample point was chosen because the periods witnessed growth and output recession in the sector by 2016. Loanable funds and advances under Anchored borrowers' programs, Agricultural Credit Guarantee Scheme Fund (ACSGF), Funds for Agricultural Finance in Nigeria (FAFIN), Rural Finance (RUFIN) and Nigeria Incentive-based Risk Sharing framework for Agricultural Lending (NIRSAL) as reported under Central Bank of Nigeria (CBN) and Bureau of Statistics (BOS) were used to proxy investment. Data collected were analyzed using single equation OLS regression model to estimate the coefficients with Keynesian investment multiplier. Descriptive and inferential statistics were used to analyze the data. The result showed a negative influence between investment capital and real agricultural gross domestic output. The Keynesian investment multiplier effect in the sector was ($K_{I=}$ $0.963\ times$) *which was insignificant. Elasticity of production in the sector evidenced that output expansion path was negatively inelastic at a percentage rate of* -1.23% and -0.31%. *The study concluded that real investment in agriculture had insignificant impact on real agricultural gross domestic output. Therefore, the study recommended that allocation and disbursement of investment resources should be efficient and monitored to avoid diversion so as to achieve linkage effect and increased value addition in the sector.*

Keywords: Agriculture, Gross domestic Output, Investment, Multiplier effect and Elasticity of production

Introduction

Concerted efforts have been made by government at present to diversify the productive resource base of Nigerian agriculture, increase value chain, improve the quality of human capacity index in the sector and reduce dependency on oil. Though Nigeria is a mono- product economy with the bulk of government revenue coming from oil exports which is susceptible to shocks in the international oil market (Sanusi, 2010). Central Bank of Nigeria (2011) reported that Nigeria is generously endowed with favorable condition for sustainable agricultural development. Agricultural Gross Domestic Product (AGDP) has been on decline due to the overbearing influence and near absolute dependency of the economy on the oil sub sector. Economic crisis in the nation crude oil sector today has made government supportive of intensive investments in agricultural sector as alternative to crude oil. According to Rural Financing (RUFIN, 2015) reported that sugar cane production in Niger state and palm oil production in Ogun state had an investment worth of $680million USA dollars. Under the Rural Financing programs (RUFIN), government was committed to 13 major policy activities around seedlings and fertilizer while the key development partners were committed to funding, to an equivalent amount of $500 million U.S.A dollars for Nigerian Agriculture from 2013-2016. Moreover, the International and Local Business Firms are committed to making investment of about $4 billion U.S.A dollars in agricultural sector (Federal Ministry of Agriculture and Rural Development (FMARD, 2015). Equally, RUFIN has shown commitment to help in facilitating Microfinance Banks, Co-operatives and other 176 Organizations in rural economy to access $220 billion U.S.A Dollars for Micro, Small and Medium scale enterprises funds in agriculture in all RUFIN states of the Federation (FMARD, 2015). Ministry of Budget and Planning (MBP, 2016) and Budget Office of Federation (BUDGIT,2016) observed that the economic recovery and growth plan of the Federal Government incentivized agricultural sector in the national budgets towards increased output and value chain to the tune of N68.15billion in 2015 and 2016 respectively.

The total recurrent expenditure on agricultural investment was to the tune of N53.81 billion naira and capital expenditure to N263.1billion naira in 2017 national budget (National Bureau of Statistics, 2017). Usigbe (2018) reported that national council of states approved a sum of $1billion U.S.A dollar for crops and livestock production in Nigerian agriculture and additional sum of $1billion U.S.A dollar would be spent on agricultural sector over and above the present commitment of $200million U.S.A dollar in the sector from 2018. The funds would be disbursed through Anchor borrowers and Commercial Agriculture Credit Scheme (CACS) programs to encourage diversification of the economy and promote food security. CBN (2017) released a sum of N501.697 billion naira to agricultural sector for commercial farming under Commercial Agricultural Credit schemes (CACS). The cumulative cost of agricultural interventions for meeting the MDGs (Millennium Development Goals) targets of reducing poverty and hunger was $55.12billion from 2006 to 2015. Under Fund for Agricultural Finance in Nigeria

ISSN 2736-0091
E-ISSN 2737-0107

(FAFIN) initiative, $100million (USA dollars) was made available to support the small and medium scale enterprises in agricultural projects (FMARD, 2015). The role of Bank of Industry (BOI) in Nigerian economy recently through Cottage Agro Processing Funds (CAPFUNDs) program towards processing and preservation of agricultural produce (value chain) as well as stimulating small and medium scale enterprises in agriculture also buttress the government efforts to promote agricultural production. Olowofeso *et al.* (2017) said commercial banks are used by the government as the main driver of the steady growth of investment in the agricultural sector. Among the newest financing incentive to agriculture is the Nigeria Incentive- based Risk Sharing framework in Agricultural Lending (NIRSAL) which is demand driven investment facility.

Conceptually, agriculture involves productive activities like growing crops, raising animals (including poultry), fishing and forestry (Ishola, (2018). Agriculture is a science and art of producing crops and livestock for economic purposes (Gangotri, 2012). Agricultural productivity growth measures the increase in agricultural outputs per a given quantity of inputs or reduction in inputs per a given level of outputs. It measures the efficiency with which inputs are used to produce agricultural output (United State Department of Agriculture, (USDA, 2021). Alain and Sadoulet (2010) observed that agricultural GDP growth induced income growth and promotes growth leakage effects on the rest of the economy. Agricultural output on the other hand, refers to physical expansion in agricultural yields and productivity while productivity is defined as the ratio between the output volume and the inputs volume (Eatwell and Newman, 1991). The expansion path in relation to output is the isocline along which output will expand when factor prices remain constant. Expansion path in agriculture showed the optimum (least cost) combination of inputs to use to produce different levels of output. It is the maximum revenue points for different levels of resources which defined output expansion path (Olukosi and Ogungbile, 1989). It measures how efficiently production inputs such as labour and capital are being used in an economy to produce a given level of output (Krugman, 1994) It is the total value of production (TVP) which is the total physical product multiplied by the unit price of the output (Olukosi and Ogungbile, 1989). Agricultural productivity is measured as the ratio of agricultural outputs to inputs (Farmer's Weekly, 2017). Gardner (1996) reported that agricultural performance relates to growth rates of agricultural value added (AGVA) and that the rate of expansion and contraction of agricultural value added per capita is associated with Gross Domestic Product (GDP).

Theoretical review of the study examined elasticity of production as a measure of response of output to changes in the variable inputs in production. Elasticity of production (Ep) is measured by percentage change in output (Y) divided by percentage change in variable inputs (X_1). Elasticity when measured along production line or functions, can be evidenced that Ep>1 meaning that the percentage change in output is greater than percentage change in the variable inputs. This is an indication of increasing returns to scale of output. When elasticity of production is 1 (Ep =1) showed that the production level lies between 0 and1 which implied or indicated a constant return to scale. This means that a one percent increase in the level of input would be accompanied by a one percent increase in output level. However, if elasticity of production is less than one (Ep<1) then there is an indication of diminishing returns in output (Olukosi and Ogungbile, 1989). The classical growth theory of Smith (1776) and Ricardo (1817) argued that the sources of output growth are capital accumulation (investment), supply of land,growth of labour force and change in institutions but David Ricardo agreed with Smith and added technological know-how as one of the factors of economic growth. On the other hand, Solow (1956) and Swan (1958) posited that growth in output is a function of growth in input factors such as capital (investment), labour and technological progress. Leontief (1953) propounded input and output theory and explained the inter-relationship that exists between industries in an economy as input in one industry was considered as output of another industry.

Keynesian investment multiplier process is used as a tool of analysis in this work, the concept of multiplier analysis shows that an increase in the level of investment is capable of bringing about increases in the national output more than the initial increase in the level of investment (Buhari, 1989). Many economists believe that the key to economic growth rests on increasing the level of investments in the economy (Keynes,1936). Development economists such as Lewis (1954); Rostow (1960); Ghose (1989); and Johnson (1969) as cited in Salihu (2016) that investment is a fundamental factor in the growth process. They observed that economic growth could be brought about principally by labour, capital and total factor productivity which includes human capital, social capital, governance, infrastructure capital, natural capital and knowledge capital. Investment in agricultural production is a process of capital formation necessary for growth in the sector. The theory of investment multiplier is seen as an integral part of the theory of income, output and employment. In the multiplier theory, the important element of the multiplier coefficient (k) refers to the power by which any initial investment expenditure is multiplied to obtain a final increase in income, output and employment. Based on empirical studies, Egbedenwe and Gero (2020) examined macroeconomic effects of agricultural productivity on economic growth in Nigeria, but the result revealed that agricultural productivity growth could improve other sectors of the economy. Kelikume and Nwani (2020) also observed that there was a linkage effects between agricultural output and output of other sectors of Nigerian economy. Bada (2017) used co-integration test and vector correction model to indicate long run relationship agricultural output and banks' credit investment. Ewetan et al (2017) investigated the relationship between agricultural output and economic growth and reported there was a long run relationship between the two variables. Abulla and Ben (2016) reported the impact of agricultural output on economic growth

ISSN 2736-0091
E-ISSN 2737-0107

in Nigeria using times series analysis and concluded that agriculture is beneficial and plays important role in the process of development. Zakaree (2014) in his study of the impact of agricultural credit guarantee scheme fund (ACGSF) on domestic food supply in Nigeria reported that domestic food supply cannot be said to follow the same trend as credit investment extended to agricultural sector by institutional lenders but concluded that there was a negative trend between domestic food supply (i.e. agricultural output) and investment in Nigerian agriculture.

Despite the huge investments in Nigerian agriculture by government how much of these investment multiplier effects have translated into elasticity of output and food security in agricultural sector today and net contribution to Gross Domestic Product (GDP)? The government at present has declared a state of emergence in agricultural production and food security. It is against this backdrop that the study investigates the following specific objectives:

(i) To examine investment multiplier effect on real agricultural gross domestic output
(ii) To measure the elasticity of production with respect to agricultural gross domestic output (AGDO) and real gross domestic product (RGDP)

Methodology

Theoretical Frame

The theoretical frame of this work was built on the interaction of application of Keynesian investment multiplier concept with classical and neo-classical postulations on output/productivity growth. Jhingan (2006) reported that multiplier establishes a precise relationship between aggregate national output (i.e. national income) and the rate of investment given the marginal propensity to consume. When there is an increment of investment, national output (income) will increase by an amount which is $'K'$ (i.e. multiplier) multiplied by the increment in investment. This is stated below:

$\Delta y = K\Delta I$…….…….... [10]

Keynesian Multiplier Model was adopted to determine the multiplier effect of investment in agriculture

$'K'$ is the Keynesian Investment multiplier and it is the co-efficient relating to a change in investment leading to an increment in national output or income.

Keynesian multiplier Model is stated below:

$K = {}^{\Delta y}/_{\Delta I}$ …… [11]

Where:

$y =$ Level of national output or income in the economy measured in billion naira (₦) and percentage (%)
$I =$ Investment measured in billion naira (₦) and regression coefficients or parameters.
$K =$ Multiplier coefficient which is measured in number of times with respect to multiplier effect and percentage of effect)
$\Delta =$ Change (i.e. decrease or increase) relates to variables.

Ordinary Least Square (OLS) estimation technique, t-test, F- test, Breusch-Godfrey LM serial correlation test, Breusch-Pagan-Godfrey heteroscedasticity test, Normality test, Augmented Dickey Fuller Unit Root test techniques and null hypothesis were used to determine if the variables are stationary in the series before running the regression to avoid spurious regression (random walk). Linear and log linear functional forms (exponential) were found to provide goodness of fit of the estimates.

Model specification

(a)Linear Functional Model

The implicit equation is structurally specified below:

$AGVA_t = f(\ INVEST)_t$ ----------(12)

Where:

$AGVA_t =$ Agricultural Gross Domestic Output at Value Added (AGVA)
$(INVEST)_t =$ Investment in the agricultural sector

The explicit equation of linear model is specified below:

$AGVA_t = \beta_o + \beta_1 INVEST_t + \mu_t$----------[13]

$\beta_o =$ is the autonomous intercept of the model.
β_1 is the coefficient or slope of the explanatory variable
$\mu_t =$Stochastic Error term

(b) Non – Linear Model (Exponential)

Uzowulu *et al.* (2007) and Olayemi (1998) pointed out that log linear functional form (exponential) is more realistic,and that elasticity of errors is reduced when use. Equally the functional form is effective for determining elasticity of production.

Implicit equation

$RGDP_t = f(AGDO)_t$ ----------[14]

Where:

$RGDP_t =$ Real Gross Domestic Product (at constant prices).
$AGDO_t =$ Agricultural Gross Domestic Output (at constant prices).

ISSN 2736-0091
E-ISSN 2737-0107

Explicit equation
$In(RGDP_{t)} = \beta_o + \beta_1 AGDO_t + \mu_t$ ----------[15]
Where:
$In(RGDP_t)$ = Natural logarithm of Real Gross Domestic Product (at constant prices)
β_o = is the constant variable (autonomous intercept of the model)
β_1 =is the co-efficient or slope of the explanatory variable
$AGDO_t$ = Agricultural Gross Domestic Output (at constant prices)
μ_t =Stochastic error term.

Application of Keynesian Multiplier Model to the Study:
I =Investment (Investment in agricultural sector measured in billion naira ₦ and percentage (%).
y = Agricultural Gross Domestic Output (aggregate agricultural output in the economy measured in billion naira (₦) and in percentage (%) of value added or chain.
K_I = Investment multiplier effect in the economy.
Δ = Change (i.e decrease or increase on variables).
$'b'$ = Measures the rate of change in investment to change in agricultural gross domestic output (AGDO at Value Added) using the value of the coefficients.
Investment Multiplier is expressed as:
$K_I = \frac{\Delta y}{\Delta I}$ Or$\frac{I}{I-b}$ $('b' = MPI)$----------[16]
Multiplier effect in the economy would be a change in $y\ (AGDO)$ equal to multiplier (K_I) multiply by change in Investment given as:
$\Delta y = K_I \cdot \Delta I$ ----------[17]

Elasticity of production
The elasticity of national output (RGDP) with respect to Agricultural Gross Domestic Output (AGDO) was measured (Olayemi,1998) by below stated equation:
$\beta_1\ (RGDP_t) \times \frac{AGDO_t}{RGDP_t} = \beta_{1\times} AGDO_t$ ----------[18]

A- priori Economic Expectation
If $\beta_1 > 0$, it then implies that there is a positive effect of investment on agricultural gross domestic output at value added.
β_1– Elasticity of production with respect to agricultural output is expected to be positive with exponential growth.

Results and Discussions
Objective 1: To examine Investment Multiplier Effect on Agricultural Gross Domestic Output
Table1: Percentage Contribution of Agricultural Gross Domestic Output (AGDO) to Real Gross Domestic Product (RGDP).

Measurement Parameters	AGDO	RGDP
Minimum	20.20	1.52
Maximum	48.50	6.98
Mean	31.9267	3.5583
Standard Deviation	6.91076	1.85399
Coefficient of Variation	21.64570	52.10325

Percentage Growth Rate of Agricultural Gross Domestic Output (AGDO) and Real Gross Domestic Product (RGDP)
Descriptive Statistics

Measurement Parameters	% Growth Rate in AGDO	% Growth Rate in RGDP
Minimum	-3.50	-10.75
Maximum	55.18	33.74
Mean	6.2387	4.9510
Standard Deviation	9.55741	6.92617
Coefficient of Variation	91.334	47.972

Variables	ADF At Level	ADF at 1st Difference	Status/Decision
AGVA	-1.968656	-5.984141**	I(1)
INVEST	4.464459	-4.919029**	I(1)
RGDP	2.788059	-3.200525**	I(1)
AGDO	1.329862	-4.135233***	I(1)

/* denote stationary at 5% and 1% level of significance respectively

ISSN 2736-0091
E-ISSN 2737-0107

Multiplier Effect and Estimated Regression Equations with respect to Agricultural Gross Domestic Output (AGDO) at value added (AGVA) and Investment (INVEST)
Dependent Variable: AGDO @ AGVA.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	35.56266	1.421620	25.01559**	0.0000
INVEST	-0.038347	0.009786	-3.918516**	0.0007
R-squared	0.400335	Durbin-Watson Statistics		1.377386
Adjusted R-squared	0.374263	Prob. (F-statistics)		0.000689
F-statistics	15.35477			

** denotes significant @ 5% level

Multiplier Effect and Estimated Regression equations with respect to agricultural gross domestic output (AGDO) and Investment (INVEST)
Dependent Variable: AGDO

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	35.57455	1.427886	24.91414**	0.0000
INVEST	-0.038884	0.009829	-3.955902**	0.0006
R-squared	0.404903	Durbin-Watson statistics		1.358061
Adjusted R-squared	0.379029	Prob.(F-Statistics)		0.000628
F-statistic	15.64916			

** denotes significant @ 5% level

Multiplier Effect and Estimated Regression equations (non-linear or exponential) with respect to agricultural gross domestic output (AGDO) at added value and Real Gross Domestic Product.
Dependent Variable: RGDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGDO	-0.034465	0.011839	-2.911071***	0.0079
C	32.18854	0.385368	83.52669**	0.0000
R-squared	0.269246	Durbin-Watson statistic		0.256410
Adjusted R-squared	0.237474	Prob (F-statistic)		0.007867
F-statistic	8.474336			

** and *** denotes significant @ 5% and 1% level
Source: Field work computation, 2020

Descriptive statistics showed that there was a consistent and sustained growth in the real GDP in absolute terms with an average growth rate of 3.55% (See Table 1) while the average percentage contribution of AGDO to real GDP was just 31.9% within the period under review. RGDP displaced 52.1% level of variability while AGDO displaced 21.6% which implied a slow growth rate in terms of percentage contribution of AGDO to RGDP. It evidenced that sample standard deviation was 52.1% of the value of sample mean for RGDP and 21.6% for AGDO. The annual percentage growth rate of both agricultural gross domestic output and real gross domestic product revealed the sluggish growth rate of the economy. In Table 2 the coefficient of variation for AGDO was 91.3% while RGDP was 47.9% level of variability. This was not enduring and sustainable growth because the AGDO growth effect was an increasing but decreasing rate on the RGDP.

ISSN 2736-0091
E-ISSN 2737-0107

Regression Analysis and Unit Root Test

Augmented Dickey – Fuller (ADF) unit root test statistic was carried out. With reference to Augmented Dickey- Fuller test statistic, the implication of the data result was that D(AGVA) which represented Agricultural output at Value Added percentage contribution to Real Gross Domestic Product (RGDP) was stationary after first difference while D(INVEST) which represented Investment was also stationary after first difference. Similarly, D(RGDP) representing Real Gross Domestic Product and D(AGDO) Agricultural Gross Domestic output were stationary after first difference respectively. All the variables were significant at 5% except Agricultural Gross Domestic Output (AGDO) that was significant at 1%. All series are integrated of order one [i. e. I (1)] showing linear combination for co integrating relationship.

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

Investment Multiplier (k_I) effect in the agricultural sector

The Keynesian investment multiplier (K) effect on the coefficient of the constant variable with respect to agricultural gross domestic output showed that by implication was 35.6% on agricultural output (See Tables 1) and 32.19% growth rate effect (See Table 1) on real gross domestic product due to non-agricultural output contribution to RGDP. The multiplier effect of investment on agricultural gross domestic output (AGDO) at value added in terms of increasing output and income was 0.963 times in the economy or [1/1-(- 0.038347)] or [1/1-(- 0.038884)] or 0.962 times in the sector. This implied that the investment multiplier effect (K) in the agricultural sector within the period under review was 0.963 or 0.962 times in the economy. Investment did not create a significant positive effect on agricultural output and value chain in the sector. It showed that investment resources were underutilized or misapplied. The significance test for $\beta$was probably the most important for prediction in regression analysis (Lucey, 1996). Given the value of t-test statistic at 5% level of significance for two-tailed test with appropriate value of 2.048 (i. e. the value from t-tables), based on n – 2 degrees of freedom (28), it was possible to construct a test of significance for β (the gradient) of the regression for the multiplier to enable prediction. Since 3.96 or 3.92 > 2.048 with (df =28) degree of freedom and at 5% level of significance, then the null hypothesis (H_0) was rejected that β was significant and statistically different from zero. Hence this evidenced the basis of the regression estimate used for the investment multiplier.

Analysis of Empirical Results

Table 1 showed that explanatory variable [Investment] exhibited a negative influence (-0.038347) which did not conform to expected sign. The long-run influence of investment on agricultural gross domestic output (AGDO) at value added is -0.038347 which is negative but statistically significant at 5% level. This implies that the increase in investment of 1% decreased agricultural gross domestic output growth by 03.8%. The constant variable being the autonomous intercept of the model revealed a positive intercept that agricultural output at value added changed over the period without investment capital by 35.56% (35.56266). The p – value of 0.0000 of the constant variable meant that the constant variable was statistically significant at 5%. This might be due to peasant production that had no access to investment funds and other favorable natural factors that could stimulate agricultural production. The regression coefficient of determination was (R^2= 40%, i.e. [0.400335]). By implication it means that 40% variation or change in the agricultural output at value added was being explained by change in investment. The log linear regression results with (Table 1) showed the influence of real agricultural gross domestic output at value added on the real gross domestic product with the estimated equations. All the parameter estimates were significant at 5% and 1% level of significance. The probability values with their corresponding t-ratios and F-statistics showed that independent variable (AGDO) at value added was negatively significant influencing real gross domestic product (RGDP). Hence the null hypothesis (H_o) was accepted that agricultural gross domestic output (AGDO) influence real gross domestic product (RGDP) negatively. This is an exponential decay process (Budnick, 1993). This was at variance with the expected a-priori economic sign. The study showed that one percent increase in investment decreased agricultural gross domestic output at value added by 03.8% and in turn one percent increase in agricultural gross domestic output decreased real gross domestic product also by 03.4%. This could be the reason for high food imports and importation bills in the economy. This further improves on the work of (Bada, 2017) who did not include concept of elasticity of output in his study of bank credit investment effect on manufacturing and agricultural sectors of Nigerian economy.

Objective 2: To Measure the Elasticity of Production with respect to Agricultural Gross Domestic Output (AGDO) and Real Gross Domestic Product (RGDP).

The elasticity of production of (AGDO) at value added (AGVA) with respect to Real Gross Domestic Product (RGDP) and Real Investment (INVEST) are being measured based on the coefficients of the estimated equations which are the elasticities of the dependent variable with respect to the independent variable (Olayemi,1998).

$$E_i = \frac{\Delta y}{\Delta x} \times \frac{x}{y} \quad \text{----------[19]}$$

$$E_i = \beta_1 \times \frac{\bar{x}}{\bar{y}} \quad \text{----------[20]}$$

$$E_i = \beta_1 \frac{\times}{\gamma} \quad \text{----------[21]}$$

ISSN 2736-0091
E-ISSN 2737-0107

Where:
$E_{i=}$ Elasticity of agricultural output or production with respect to Real Gross Domestic Product or Investment
β_1 = Slope and estimator coefficient
$\bar{x}$ = Average value of Agricultural Gross Domestic Output (AGDO) or Investment
$\bar{Y}$ = Average value of Real Gross Domestic Product or Agricultural Gross Domestic Output at Value Added (AGVA).

$(A)\beta_1\ (RGDP_t) \times \frac{AGDO_t}{RGDP_t} = \beta_1 \times AGDO_t$
$\log RGDP_t = 32.18854 + -0.034465 AGDP_t + u_i$
n =30
$\sum AGDO_t = \sum x = 955.8$
$\sum RGDP_t = \sum y = 106.75$
β_1 = -0.034465
$\bar{x}(AGDO_t) = 955.8 \div 30 = 31.866,$
$\bar{Y}(RGDP_t) = 106.749272 \div 30 = 3.558$
$-0.034465 \times \frac{31.866}{3.558} = -0.31$
$(B) \quad \beta_1\ (AGVA_t) \times \frac{INVEST_t}{AGVA_t} = \beta_1 \times INVEST_t$
$AGDO_t$ ($AGVA_t$ % RGDP) = 35.56266 + (- 0.038347$INVEST_t$) + u_i
n = 30
$\sum INVEST_t = \sum x = 3472.4$
$\sum AGDO_{t\,@}$ ($AGVA_t$) = $\sum y = 108.5$
β_1 = — 0.038347 or – 0.038884
$\bar{x}(INVEST_t) = 3472.4 \div 30 = 115.746$
$\bar{Y}$ ($AGVA_t$) =AGDP at Value Added (AGVA) = 108.5 ÷ 30 = 3.616
$-0.038347 \times \frac{115.746}{3.616} = -1.23$ or $-0.038347 \times \frac{115.746}{3.616} = -1.23$
Source: Field work computation 2020

The parameter estimates obtained were inelastic ($-0.31\ and\ -1.23$) and insignificant which implied that investment did not influence agricultural output at value added (AGVA).The estimated elasticity of AGDO percentage growth rate in terms of mean value to RGDP and INVEST were -0.31 and -1.23 respectively. The elasticity revealed that real gross domestic product (RGDP) was highly inelastic to changes in agricultural gross domestic output with a negative coefficient of (-0.034465) and agricultural gross domestic output at value added was highly inelastic to changes in investment with a negative coefficient value of (-0.038347 or -0.038884). This was in line with (Kumbhakar, 1994) who said elasticity of production (EOP) was the same as the estimated coefficients of independent variables. This is shown by the fact that parameter estimates are inelastic and negative $(-0.034465, -0.31)\ and\ (-0.038347\ or -0.038884, -1.23)$. Hence, the degree of responsiveness of percentage change in growth rate in AGDO at value added was associated to -0.31% change in growth rate in RGDP. On other hand elasticity of – 1.23% showed the degree of responsiveness of AGDO at value added to a point change in investment. This agreed with the studies carried out by (Uzowulu *et al.*, 2007) and (Enya and Bime, 2007) that elasticity estimates showed that agricultural output was inelastic with respect to change in investment credit.

Conclusion

The average growth rate in the agricultural sector also declined during the period under study despite the rising profile of investment to the sector. There was a significant difference in the average growth rate between investment and AGDO. The difference was evidenced in the negative growth rate of agricultural output (0.038884) against the rising profile of the value of investment. This means that the average growth rate of the value of investment in the sector lead to negative growth rate on the agricultural gross domestic output.

The multiplier effect ($K_{I)}$ investment was as low as 0.963 times (i.e approximated one time) effect on the economy. This means that investment purveyance into the agricultural sector had a low multiplier effect in increasing output, employment, income and wealth in the sector.

The elasticity of the production with respect to output in the sector was also of negative value and less than one which made production to be inelastic. Hence agricultural growth was inelastic, and the results of the study did not conform with the a-priori expectation.

ISSN 2736-0091
E-ISSN 2737-0107

Recommendations

1. The study recommended that real investment remains a key factor to energize and motivate agricultural production in the sector.
2. The output expansion path in the sector must be tied to efficient, effective delivery and monitoring of investment funds in the sector.

References

Abula, M. and Ben, M. D. (2016). Impact of Agricultural Output on Economic Growth in Nigeria, *Archives of Current Research International*. 4 (1): 1-10

Alain, D.J. and Sadoulet, E. (2010) *World Bank Research Observer*, 25 (1). Retrieved June 24, 2019, from: https//elibrary.worldbank.org/doi/abs/10.1093/wbro/Ikpo1

Bada, O. T. (2017). The Effects of Banks' Credits on the Development of Manufacturing and Agricultural Sectors of Nigeria's Economy. *International Journal of Advanced Studies in Economics and Public Sector Management.* Vol. 5 (1).

Budnick, F. S. (1993). *Applied Mathematics for Business, Economics and Social Sciences.* New York: McGraw Hill Inc Publishers

BUDGIT, (2016). *Budget Office of Federation,* Budgit Research Unit. http://your budgit. Com/wp-content/uploads/2016/0112015 publication. - Assessed 7/12/2017.

Buhari, A.L. (1989). *AIB Monetary and Macro Economics.* University of Ilorin: University of Ilorin Press.

CBN, (2011). Financing the Real Sector for Sustainable Economic Growth in Nigeria: Performance, Challenges and Prospects. *Economic and Financial Review.* 49 (4): 57-63

CBN (2017). Central Bank of Nigeria Released N501 Billion for Commercial Agriculture Credit Scheme. https:// leadership. ng. /2017/10…/cbn-release-n501bn-commercial-agric-credi-Scheme. Assessed 8/1/2018

Eatwell, J. M. and Newman, P. (1991). *The New Palgave: A Dictionary of Economics, Vols.3,4and12* Tokyo: Macmillan Press

Egbendewe, Y.G. and Gero, A. A. (2020). Macroeconomic Effects of Semi-Subsistence Agricultural Productivity Growth: Evidence from Benin Republic, *Scientific Africa* (7): Elsevier B. V, doi: 10.1016/j.sciaf. 2019.e00222

Enya, V. E. and Bime, M. (2007). Analysis of the Influence of Agricultural and Non- agricultural sectors Performance 0n Nigerian Economy (1986-2004) *Global Journal of Agricultural Sciences.*7 (1): 7-9

Ewetan, O., Adebisi, F., Urhie, E. and Odutan, E. (2017). *Agricultural Output and Economic Growth in Nigeria.* https://dx.doi.org/10.5171/2017.516093

Farmer's Weekly, (2017). *Agricultural Output Terms Explained.* Retrieved June 24, 2019, from: https://www.farmer's weekly.co.za

FMARD, (2015). *Nigeria Needs Younger AgroPreneurs.* www. fmard. gov. ng./Nigeria needs (Federal Ministry of Agriculture and Rural Development). Retrieved 10/6/ 2016.

Gangotri, E. C. (2012). The Contribution of Agricultural to Economic Growth: Some Empirical Evidence. *World Development 16* (11): 1329-1339

Gardner, B. (1996). *Economic and Agricultural Performance with Changing Policy Environment, Policy Reforms in Agriculture: An Assessment of Results in Eight Countries.* Retrieved June 24, 2019, from: www. Fao.org /3/w744le/w744le04.htm

Ishola, K.A. (2018). *Macroeconomics Analysis.* Lavgark, Ilorin: Investment Publishers Ilorin.

Jhingan, M.L. (2006). *Macroeconomic Theory.* Haryana: Vrinda Publication Limited

Kelikume, I. and Nwani, S. (2020). Empirical Analysis of causal linkage between Agricultural Output and Real GDP: Evidence from Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology*. Pp. 69-77

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money.* New York: Harcourt and Brace Company

Kumbhakar, S. C. (1994). Efficiency Estimation in a Profit Maximizing Model Using Flexible Production Function. *Journal of Agricultural Economics, Vol. 10 (2):*143-152

Krugman, P. (1994). *The New Growth Fizzle,* New York Times.

Leontief, W. (1953). "Domestic Production and Foreign Trade: The American Capital Position Re-Examined" *Proceedings of the American Philosophical Society.* 97 (4):332-349 JSTOR 3149288

Lucey, T. (1996). *Quantitative Techniques.* Fifith Edition, London: ELST Publishers.

MBP, (2016). Ministry of Budget and Planning (MBP). 2016 *Budget Appropriations.* http://www.naira/and. com/ 2844170/critical- analysis- 2016 budget. Assessed 7/12/2017.

NBS, (2017). *National Bureau of Statistics*. Appropriation Act 2017: Reports on Agricultural Financing (AGF). http://Budget office.gov.ng./index.php/hmbng.public presentation. – Assessed 7/1/2018.

Olayemi, J.K. (1998). *Elements of Applied Econometrics.*Ibadan: El-Shaddai Global Venture Ltd

Olowofeso, O. E., Adeboye, A. A., Adejo, V. T., Bassey, K. J. and Abraham, O. (2017). Agricultural Sector Credit and Output Relationship in Nigeria: Evidence from Non- Linear ARDL, The Central Bank of Nigeria, *Journal of Applied Statistics. 8 (1)*

ISSN 2736-0091
E-ISSN 2737-0107

Olukosi, J.O. and Ogungbile, A. O. (1989). *Introduction to Agricultural Production Economics: Principles and Applications*, Zaria: Agitab Publishers Limited

Ricardo, D. (1817). *On the Principles of Political Economy and Taxation*, London: John Murray press

Rostow, W. W. (1960). *The Stages of Economic Growth: A Non-Communist Manifesto.* London: Cambridge: University Press.

RUFIN, (2015). *Rural Finance Institution Building Program*, Federal Ministry of Agriculture and Rural Development. www.rufin Nigeria. org. Retrieved 10/12/ 2015.

Salihu, M. (2016). *Impact of Agriculture on the Growth of Nigerian Economy,* Unpublished, Ph.D. Dissertation (Non- Thesis). Department of Agricultural Economics, Modibbo Adama University of Technology, Yola.

Sanusi, L.O. (2010) "Growth Prospects for Nigerian Economy." *http://www.centbank.org.(CBN*) Unpublished Assessed 20/12/ 2010.

Smith, A. (1776). *An Inquiry into Nature and Causes of the Wealth of Nations.* London

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth, *Quarterly Journal of Economics* 70 (1).

Swan, T. W. (1958). *Economic Growth and Capital Accumulation*, Economic Record. No 32

Usigbe, L. (2018). The National Council of States Okays $1billion USA dollars for Agricultural and Livestock Production. *Tribune Newspaper*. Friday, February 23.

USDA, (2021). *Sustainable Agricultural Productivity Growth: What, Why and How?* United States Department of Agriculture (USDA), United States Government. An Official Websites use.gov, https://usda.gov USDA.

Uzowulu, G.I., Ajayi, S., Opue, J.A., Adinya, I.B. and Kuye, O.O. (2007). Monetary Policies and Credit Financing As Factors in Agricultural Productivity in Cross River State. *Global Journal of Agricultural Science*. 7 (1): 1-6.

Zakaree, S. S. (2014). Impact of Agriculture Credit Guarantee Scheme Fund (ACSGF) on Domestic Food Supply in Nigeria. *British Journal of Economics. 4 (8)* 1273-1284. www. Science domain.org.