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CAPITAL INVESTMENT: LUBRICANT OF THE ENGINE OF PRODUCTION PROCESS IN AGRICULTURAL SECTOR – EVIDENCE FROM NIGERIA

This study examined the effect of capital investment on the productivity of agricultural sphere of Nigeria. The productivity of the sector was proxy as the agriculture's contribution to the GDP while commercial bank loan to agriculture, annual budgetary allocation to agricultural sector and various categories of ACGS loan scheme were proxy as investment frameworks. The data used for thus study were extracted from various bulletin of Central Bank of Nigeria and National Bureau of Statistics from 1978–2014. The long and short run relationship of these variables were estimated using the Johansen approach to cointegration and the Vector Autoregressive Error Correction Model respectively. The test of cointegration revealed presence of long run relationship among the various investment sources and categories and agricultural productivity in Nigeria. This confirmed capital as the lubricant of the production process without which other factors of production may become difficult to acquire. The short run estimates revealed total volume of loan, volume of loan to individual and volume of loan above ₦100,000 as variables that influence agricultural productivity in the short run, further confirming the important place of capital investment in creating jobs in agricultural sector.

Key words: *credit, agriculture, job creation, short-run, long-run.*

Introduction and review of literature. Over the years, there have been efforts by various governments to diversify the economy. Policies have been initiated, committees set up but the seemingly good initiatives have been marred by little commitment from government. For the agricultural sector, successive governments have made serious efforts at making good agricultural policies through schemes, programmes and institutions, they however, have not been able to back them up with adequate budgetary allocation and financing [1; 2] posits that “agriculture has been the main source of gainful employment from which Nigeria as a nation can feed her teeming population. Agriculture occupies a priority status in Nigeria as the sector serves as the key driver of growth, wealth creation and poverty reduction for a large portion of the population. It accounts for about 70 % of employment, and in spite of this [3] says it has not been able to achieve the major objectives of agricultural development identified to include; (i) increase in food production and farm income, (ii) make household food, water and energy secured and (iii) restore and maintain the natural resources. They stated further that the failure of agriculture to meet these objectives is due to limited use of purchased inputs and mechanization.

According to [4] in Nigeria today, agriculture accounts for one third of the Gross

Domestic Product GDP and employs about two-third of the labour force [5]. The Nigeria agricultural policy places the small scale farmers in central focus. This is because; the nation's agriculture has always been dominated by the small scale farmers who represent a substantial proportion of the total population and produce about 90–95 percent of the total agricultural output in the country prior to the advent of the oil boom [6]. Nigeria was noted for her high production performance in terms of food and cash crops, as well as the supply of most industrial raw materials, which is the product of our small scale farmers. For instance, the total agricultural output between 1986 and 1992 grew at the rate of 0.6 percent per year on the average [7]. However, this important role agriculture played in the Nigeria economy has declined tremendously, and the decline has for a long time been blamed on the neglect of the rural sector, comprising mainly the small scale farmers by successive administrations in the country. As the role of agriculture in the economy declines, increase in food importation became inevitable, thus leading to the reduction of the locally produced food, which has decreased farmers' expected income that could have been used to improve their farm productivity [8].

According to [1] with several uncertainties such as inadequate funding, resource scarcity, etc. the future of the agricultural sector of the nation's economy remains gloomy. In situations where funds are available, the high interest rate being charged on bank loans; banks' lopsided method of disbursing loans; poor policy implementation, and paucity of funds have been identified as some of the critical challenges facing the country's farmers. However [9] attributed most of the shortcomings of institutional credits in Nigeria to factors such as, ineffective supervision or monitoring, insufficient funds, political interference, cumbersome and time consuming loan processing, large loan defaults and absence of financial projections. Due to the peculiarities of the agricultural sector like the long gestation periods for agricultural production, the risks and uncertainties from natural causes and the predominance of small scale producers with little asset base and working capital, the sector has continued to receive less attention.

The role of finance in agriculture, just like in the industrial and service sectors, cannot be over-emphasized, given that it is the oil that lubricates production activities. If Nigeria will exploit the potentials of agriculture as a tool for job creation, food security, income generation and ultimately poverty reduction, the objective of agricultural financing policies must be to establish an effective system of sustainable agricultural financing schemes targeted towards agricultural programs designed to increase small and medium scale agricultural production in the country. Credit (capital) is viewed as more than just another resource such as labour, land, equipment and raw materials according to [10; 11] opined that credit determines access to all of the resources on which farmers depend. Consequently, provision of appropriate macroeconomic policies and enabling institutional finance are capable of facilitating agricultural development with a view to enhancing the contribution of the sector in the generation of employment, income and foreign exchange [12].

Overview of Agricultural Financing Schemes in Nigeria. It was in recognition

of the downward trend observed in agricultural productivity that the Federal Government of Nigeria at various periods put in place credit policies and established credit institutions and schemes that could facilitate the flow of agricultural credit to farmers [13]. According [1] the following are some of the financial schemes and institutions of the government of Nigeria:

i. The Community Bank (CB): was set up with the goal of encouraging locally owned savings and loans institutions to meet the needs of the rural population not served by the commercial banks and government owned banks. The imposition of the ceiling on interest rates led to an inability of many CBs to recover their costs and eventually many became distressed.

ii. Microfinance Banks (MFI): was introduced by the CBN in 2005 with the specific objective of making financial services accessible to a larger segment of the potentially productive Nigerian population who otherwise have no access to such services and permit them to contribute to rural transformation, promote synergy, and mainstream/graduate the informal subsector into the formal financial system. Through this microfinance policy, the CBN introduced a new regulatory and supervisory framework that made it compulsory for all institutions to obtain a new license and have a minimum share capital of 20 million Naira.

iii. Bank of Agriculture: Bank of Agriculture Limited is the nation's foremost agricultural and rural development finance institution. It was incorporated in 1972 as Nigerian Agricultural Bank (NAB), in 1978, the name was changed to Nigerian Agricultural Bank Co-operative Bank Limited, (NACB) to reflect the inclusion of co-operative financing into its broader mandate. In October, 2001, following the Federal Government's effort to streamline the operations of its agencies that were believed to be performing overlapping functions, three institutions: Nigerian Agricultural and Co-operative Bank Limited (NACB), People's Bank of Nigeria (PBN) and the risk assets of the Family Economic Advancement Programme (FEAP) were merged to form Nigerian Agricultural, Co-operative and Rural Development Bank Limited. In October 2010, following the rebranding of the Bank to reflect its institutional transformation programme, the Bank adopted the new name "Bank of Agriculture". The Bank is wholly owned by the Federal Government of Nigeria with its 40% shares held by the Central Bank of Nigeria (CBN) and 60% shares held by the Federal Ministry of Finance. It is supervised by the Federal Ministry of Agriculture. It has an authorized share capital of ₦50 billion naira (Fifty Billion Naira).

iv. Agricultural Credit Guarantee Scheme (ACGSF): Set up since 1977, primarily to induce banks to increase and sustain lending to agriculture. Under the scheme, bank loans to farmers are guaranteed 75 percent against default by the CBN. Commercial Banks in the country see agricultural finance as development finance and they are generally not pro-development finance. According to Mafimisebi, Oguntade and Mafimisebi (2008) banks consider the guarantee provided under ACGSF as inadequate to build their confidence to finance a sector that is reputed for loan default. There is also the problem of a large backlog of unsettled claims, some of which span over twenty years. This is highly undesirable as it has eroded the

confidence of banks in not only the scheme but also all other government initiatives to provide credit to the agricultural sector.

With the level of poverty among the people and the depth of unemployment especially among the youths and the employability of the vast agricultural value chains, the government designed and operates various credit schemes to induce the creation of small and medium scale agricultural production. Prominent of among the financing schemes are the Agricultural Credit Guarantee Scheme, ACGS and the Commercial Bank Credit to address the issues of very low capital flow into agricultural production. In fact, to show some level of seriousness in protecting lending institutions and credit schemes against inherent risks and uncertainty in agriculture, the government developed an agricultural insurance scheme in 1988 whose objectives according to [14] include to increase the flow of agricultural credit from lending institutions to the farmers. Basically, some of the reasons for the various credit schemes are to ensure increased agricultural outputs towards national food security, higher income for the farmers to ensure quality life towards sustainable development and overall economic development of the rural areas for further integration with the urban economy for national interest.

The purpose of the article. The purpose of this paper is to investigate the effect of capital investment on the productivity of agricultural sphere of Nigeria.

Material and methodology. Time series data collated from various bulletins of the Central Bank of Nigeria and Nigeria Bureau of Statistics from 1978–2014 were used for this study. Economic growth refers to the quantity of economic activities going on in an economy. Thence, the quantity of productive activities in an economy is directly related to the volume of capital investment available to other factors of production in the economy. The productivity of agricultural sector was measured using the agricultural productivity which was proxy as the share of agricultural sector contribution to the Gross Domestic Product for the period under study. The loan size categories less than or equal to ₦100, 000 were proxy as small scale capital investment while loan category of above ₦100, 000 was proxy as medium scale capital investment and budgetary allocation to agriculture and commercial bank loans were used as instrumental variables whose volumes were admitted to affect agricultural productivity *ceteris paribus*. A number of analytical techniques were employed for this study. They are Co-integration analysis, Vector Error Correction Model and Wald Coefficient Test. The investment frameworks and categories used in this study in their logarithmic forms were:

- 1) Federal Government budgetary allocation to agriculture (INBUDGT);
- 2) Commercial Bank loan to agriculture (INCBLTA);
- 3) Total Volume of loan under Agricultural Credit Guaranteed Scheme (INTVLOAN);
- 4) Volume of loan to Cooperatives under the ACGS (INVCOOPL);
- 5) Volume of loan to Individual Farmers under the ACGS (INVINDLN);
- 6) Volume of loan above ₦100,000 (INVLAHT);
- 7) Volume of loan between ₦50,001 and ₦100,000 (INVLBFH);

- 8) Volume of loan between ₦20,001 and ₦50,000 (INVLBTF);
- 9) Volume of loan between ₦5,001 and ₦20,000 (INVLBFT);
- 10) Volume of loan of ₦5,000 and below (INVLUFT).

Co-integration Analysis: this study employed the use of Co-integration analysis to examine the existence of long-run relationship among the variables in the model. Due to the spurious nature of regression estimates of time series data, the Augmented Dickey-Fuller Unit Root test was carried out to investigate the order of stationarity of the variables under study.

The Augmented Dickey-Fuller (ADF) Test. The ADF test is carried out by estimating:

$$\Delta Y_t = \alpha + \rho Y_{t-1} + \sum_{i=1}^j \gamma_i \Delta Y_{t-i} + U_t \quad (1)$$

The lag length j for the ADF ensure U_t is empirical white noise. The significance of ρ is tested against the null that $\rho = 0$ base on the t-statistics from the estimation of the equation above [15] show that under the null hypothesis of a unit root, this statistic does not allow the conventional Student's t-distribution, and they derive asymptotic results and simulate critical values for various test and sample sizes. The decision rule in ADF unit root test says when $ADF >$ critical value, the hypothesis that the variable has unit root is rejected and that the variable is stationary while when $ADF <$ critical value, the hypothesis that the variable has unit root is accepted and thus the variable is non-stationary.

The Maximum Likelihood Method developed by [16] was used to test for co-integration. The Trace and Max-Eigen statistics were used to examine the presence of long-run association between the dependent variable and the explanatory variables and also determine the number of co-integrating equations. The null hypothesis of the Trace statistics was that there are at most r co-integrating equations while the null of the Max-Eigen was that the null $r=0$ was tested against the alternative hypothesis that $r=1$, $r=1$ against $r=2$, etc. The Schwartz Information Criterion, SIC and the Akaike Information Criterion, AIC at 5 % significance level were used to select the optimal lag for the co-integration test.

With the existence of the long-run relationship between productivity of agricultural sector and capital investment sources and category by sizes, a Vector Error Correction Model was estimated to examine the short-run equilibrium effect of the explanatory variables on the productivity of agriculture in Nigeria. To estimate the VECM, the time series variables were transformed to their first difference, i.e, integrated of order I (1). The VECM in a more compact form is modeled as below:

$$\Delta x_t = \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} + \Pi x_{t-k} + \mu_0 + \epsilon_t \quad (2)$$

where: X_i are the time series variables

Γ_i and Π are matrixes of variables

k is the lags on each variable

ϵ_t = error correction term.

To obtain the Vector Error Correction Model from the Unrestricted VAR, in line Hendry (1995), the insignificant variable with the highest probability value was

removed one after the order and the test rerun till the final ECM was obtained.

Results and discussion. Total Volume of Loan Granted by Size. The total volume of loan is presented in Table 1. Significant commitment was exhibited by the government in the volume of money made available for the credit scheme with almost 200 % increase in the volume of loan shared in the second year. The first 5 years of the scheme had increased volume of credit all in size categories with occasional decrease between years. From 1984, the scheme's outlook didn't show firm policy direction of the regarding how the Central Bank of Nigeria who is the custodian of the credit scheme hoped to stimulate job creation in the small and medium scale enterprises as none of the categories had a consistent increase/decrease in pattern until 1995. From 1995, the disbursement pattern showed a conscious commitment to use the scheme to improve small scale enterprises to medium scale as the volume of loan in the N 5,000 & below category declined with a corresponding increase in the remaining categories with the exception of the above N 100,000 medium scale category where there was about 23 % decline in the volume of loan shared in 1998 from what was shared in 1997. From 1999–2016, the scheme showed a very clear direction in its mandate to create small and medium scale enterprises with the N 50,001–N 100,000 and above N 100, 000 categories having the largest volume of loan shared at any point in time within the period with attending decline in the volume of loan shared under the N 5,000 & below and N 5,001–N 20,000 categories.

Table 1

Total Volume of Loan Granted by Size

Year	Total Volume of Loan Granted (million naira)	Total Volume of Loan 5,000 naira & below (million naira)	Total Volume of Loan of N5,001- N20,000 (million naira)	Total Volume of Loan N20,001- N50,000 (million naira)	Total Volume of Loan N50,001- N100,000 (million naira)	Total Volume of Loan Above N100,000 (million naira)
1978	11.28	0.3	1.0	4.1	1.2	4.7
1979	33.60	4.0	2.6	6.6	1.1	19.2
1980	30.95	4.5	2.5	6.9	1.3	15.7
1981	35.64	4.3	2.6	8.9	1.0	18.8
1982	31.76	9.9	1.9	6.7	0.4	12.8
1983	36.31	2.2	2.7	8.5	0.5	22.5
1984	24.65	3.5	2.8	5.2	0.7	12.4
1985	44.24	6.0	5.1	9.3	1.5	22.4
1986	68.42	10.0	6.8	10.5	3.0	38.2
1987	102.15	40.3	7.4	9.1	4.0	41.5
1988	118.61	65.4	10.2	8.0	3.8	31.1
1989	129.30	88.1	10.7	6.7	5.8	18.0
1990	98.49	74.3	6.3	6.2	5.5	6.3
1991	82.11	56.6	7.1	5.2	6.0	7.3
1992	88.03	62.2	7.8	6.0	5.9	6.1
1993	80.85	52.3	9.3	6.1	8.8	4.3
1994	103.19	56.4	15.6	8.5	13.1	9.6

Continuation of the Table 1

1995	164.16	65.2	31.6	17.1	26.9	23.3
1996	225.50	57.8	64.1	23.0	51.3	29.3
1997	242.04	41.3	86.9	29.8	53	31.0
1998	215.70	24.8	92.3	21.4	53.2	24.0
1999	246.08	13.2	112.7	37.2	50.9	32.0
2000	361.45	1.7	146.5	116.1	42.5	54.7
2001	728.55	2.8	135.3	307.1	172	111.3
2002	1,051.59	0.7	120.2	419.9	323.9	186.8
2003	1,164.46	1.4	172.7	298.4	393.9	298.1
2004	2,083.74	1.5	173.5	474.3	631	803.4
2005	3,046.74	0.3	233.9	593.6	724.8	14,94.2
2006	4,263.06	0.7	167.8	891.3	1,069.3	2,134
2007	4,425.86	0.1	56.9	642.2	1,108.3	2,618.5
2008	6,721.07	0.8	33.1	919.2	1,044.5	4,723.4
2009	8,349.51	0.1	90.4	686.4	983.5	6,589
2010	7,740.51	0.1	68.2	644	1,109.7	5,918.4
2011	10,189.60	0.2	106	628.5	1,275.9	8,179
2012	9,706.76	26.2	98.3	422.4	878.2	8,281.6
2013	9,424.45	0.5	74.1	696.3	1,463.3	7,190.3
2014	12,997.00	0.2	143.7	592.3	1,593	10,667.7

Source: National Bureau Statistics 2014 Annual Bulletin.

Long Run Relationship between Capital Investment Framework and Agricultural Productivity. Following the assumption of non-stationary nature of time series data and to avoid spurious regression, the Augmented Dickey-Fuller (ADF) unit root test was carried out on the natural logarithm of all the variables. All variables became stationary after first differenced except INVLUFT which was stationary at levels, i.e, I (0) as presented in Table 2. Given the foregoing, this suggested the possibility of the presence of co-integrating relationship among the variables. Thus, test for co-integrating vector was done to find out if long-run relationship exists among the variables.

Table 2

Unit Root Test Result

Variable	ADF Statistics		Critical values		Order of Integration
	Levels	1 st Difference	1%	5%	
INAGRIC	-1.62	-4.57	-3.63	-2.95	I(1)
INTVLOAN	-0.28	-6.12	-3.63	-2.95	I(1)
INBUDGT	-0.99	-8.58	-3.63	-2.95	I(1)
INCBLTA	0.13	-5.42	-3.63	-2.95	I(1)
INVCOOPL	-1.72	-6.74	-3.63	-2.95	I(1)
INVINDLN	0.19	-5.37	-3.63	-2.95	I(1)
INVLAHT	0.53	-5.23	-3.63	-2.94	I(1)
INVLBFH	-0.15	-4.62	-3.63	-2.95	I(1)
INVLBFT	-1.68	-5.52	-3.63	-2.95	I(1)
INVLBTF	-0.50	-5.18	-3.63	-2.95	I(1)
INVLUFT	-4.20	-8.37	-3.63	-2.95	I(0)

Source: authors' Computation Using EViews 7.0.

The Johansen co-integration analysis between the INAGRIC and the ten independent time series variables revealed that there were at six co-integrating equations using the Trace statistics and four co-integrating equations using the Max-Eigen statistics values at 5 % significance level. The Johansen co-integrating test output at optimal one lag is presented in Table 3.

Table 3

Unstructured Co-integration Rank Test (Trace Statistics)

Null Hypothesis	Trace Statistic	0.05 Critical Value	P-value	Max-Eigen Statistic	0.05 Critical Value	P-value
At most 0	658.7477*	285.1425	0.0000	225.4670*	70.5351	0.0001
At most 1	433.2807*	239.2354	0.0000	130.8391*	64.5047	0.0000
At most 2	302.4416*	197.3709	0.0000	89.4993*	58.4335	0.0000
At most 3	212.9423*	159.5297	0.0000	61.4349*	52.3626	0.0046
At most 4	151.5074*	125.6154	0.0005	43.8609	46.2314	0.0879
At most 5	107.6466*	95.7537	0.0059	36.9705	40.0776	0.1075
At most 6	70.6761*	69.8189	0.0427	27.3039	33.8769	0.2474
At most 7	43.3722	47.8561	0.1238	20.4458	27.5843	0.3111
At most 8	22.9264	29.7971	0.2497	16.4167	21.1316	0.2014
At most 9	6.5098	15.4947	0.6352	6.1075	14.2646	0.5994
At most 10	0.4022	3.8415	0.5259	0.4022	3.8415	0.5259

Note. Trace test indicates 7 co-integrating eqn(s) while Max-Eigen indicated 4 co-integration eqn(s) at the 0.05 level;

* denotes rejection of the hypothesis at 0.05 level;

** MacKinnon-Haug-Michelis (1999) p-values.

Source: authors' Computation Using EViews 7.0.

Short Run Relationship between Capital Investment Framework and Agricultural Productivity. With the existence of long-run relationship among the variables, the unrestricted Vector Autoregressive estimates were obtained. The result of the test is as shown in Table 4.

Table 4

Unrestricted Vector Autoregressive Estimates

Variable	Coefficient	Standard error	t-statistics	p-value
Δ INAGRIC(-1)	0.936084	0.277155	3.377475	0.0055 **
Δ INAGRIC(-2)	-0.266409	0.314672	-0.846622	0.4138
Δ INBUDGT(-1)	0.002083	0.074564	0.027934	0.9782
Δ INBUDGT(-2)	0.031685	0.078386	0.404218	0.6932
Δ INCBLTA(-1)	0.173855	0.167895	1.035500	0.3209
Δ INCBLTA(-2)	-0.064771	0.223568	-0.289713	0.7770
Δ INTVLOAN(-1)	0.166689	0.914288	0.182315	0.8584
Δ INTVLOAN(-2)	1.745045	0.826534	2.111280	0.0564*
Δ INVCOOPL(-1)	0.016628	0.081970	0.202855	0.8426
Δ INVCOOPL(-2)	0.005707	0.045847	0.124485	0.9030
Δ INVINDLN(-1)	-0.287138	0.621050	-0.462343	0.6521
Δ INVINDLN(-2)	-0.843524	0.508513	-1.658805	0.1230
Δ INVLAHT(-1)	0.034483	0.207837	0.165913	0.8710
Δ INVLAHT(-2)	-0.505258	0.217099	-2.327323	0.0383**
Δ INVLBFH(-1)	0.015314	0.126418	0.121134	0.9056

Continuation of the Table 4

Δ INVLBFH(-2)	0.025888	0.192845	0.134243	0.8954
Δ INVLBFT(-1)	-0.005904	0.126828	-0.046553	0.9636
Δ INVLBFT(-2)	-0.026844	0.183071	-0.146631	0.8859
Δ INVLBTF(-1)	0.190576	0.194061	0.982038	0.3455
Δ INVLBTF(-2)	-0.122100	0.215482	-0.566635	0.5814
Δ INVLUFT(-1)	0.005616	0.048985	0.114647	0.9106
Δ INVLUFT(-2)	0.016205	0.039006	0.415446	0.6851
C	1.768508	1.554535	1.137644	0.2775

Note. ** indicates significant at 5 %;

* indicates significant at 10 %;

Δ means first difference.

$R^2 = 0.998$ Adjusted $R^2 = 0.996$ F-statistic = 356.73 Prob(F-statistic) = 0.0000 Akaike Info Criterion = -0.685 Schwarz Criterion = 0.337 Durbin-Watson stat = 2.48

Source: authors' Computation Using EViews 7.0.

From the above unrestricted VAR output, apart from INAGRIC (-1) and INVLAHT (-2) which are significant at 5 % and INTVLOAN (-2) significant at 10 %, all other variables are not significant. From this point, in line with [17], the insignificant variables with the highest probability was removed and the test re-run. Δ INBUDGT (-1) with the p-value of 0.9782 was the first to be removed and one after the other, every variable with the highest p-value was removed until the restricted VAR which is the Vector Error Correction Model estimates in Table 5 was obtained.

Table 5

Vector Error Correction estimates

Variables	Coefficient	Standard error	t-statistics	p-value
D(INAGRIC(-1))	0.007799	0.120893	0.064509	0.9491
D(INAGRIC(-2))	0.337687	0.111721	3.022596	0.0059***
D(INTVLOAN(-1))	-3.167761	0.509112	-6.222125	0.0000***
D(INTVLOAN(-2))	-1.047465	0.408755	-2.562571	0.0171**
D(INVINDLN(-1))	1.615319	0.294938	5.476806	0.0000***
D(INVINDLN(-2))	0.468193	0.244870	1.912005	0.0679*
D(INVLAHT(-1))	0.988828	0.142625	6.933064	0.0000***
D(INVLAHT(-2))	0.457261	0.127877	3.575798	0.0015***
ECM	-0.350278	0.047043	-7.445882	0.0000***
C	0.192844	0.037792	5.102747	0.0000***

Note. *** indicates significant at 1 %;

** indicates significant at 5 %;

* indicates significant at 10 %;

Δ means first difference.

$R^2 = 0.792$ Adjusted $R^2 = 0.714$ F-statistic = 10.138 Prob(F-statistic) = 0.000003
Akaike Info Criterion = -1.875 Schwarz Criterion = -1.426 Durbin-Watson stat = 1.63.

Source: authors' Computation Using EViews 7.0.

From the above result, total volume of loan (INTVLOAN), Volume of loan to individuals (INVINDLN) and the volume of loan above N100, 000 (INVLAHT) were significant at 1%. Thus, in the short-run, these variables have the potency to improve job creation in the agricultural sector. Of these variables, D(INTVLOAN(-1)) and D(INTVLOAN(-2)) didn't exhibit the *a priori* expectation with its negative sign.

However, this is as a result of the number of loan granted to the beneficiaries. Table 1 showed that the total volume of ACGS scarcely increase arithmetically while the number of loans granted kept increasing geometrically at a sporadic rate. Hence, the amount of loan per head has not been enough to keep the beneficiaries in business. For instance, the year with the highest volume and number of loan disbursement was 2014 with a total volume of loan of ₦12,997 million naira with a total beneficiaries of 72,322. From this, the per head was approximately ₦0.179710m, i.e., ₦179,710 which is not enough to take and agripreneur from land clearing to harvesting. The significance of the volume of loan to individuals (INVINDNL) and its sign is expected because once the loan was approved, it got to the beneficiaries in the same amount that was approved compared to the loans given to cooperatives in which the real amount of money that got to each member of the cooperative was dependent on the total number of the members of the cooperative societies. Agriculture being a capital intensive business which will only give a yield that is related to the volume of investment, hence the significance of the loans given to individuals and loans above ₦100,000. Thus, the significance of the volume of loan above ₦100,000.

The coefficient of determination of 0.792 revealed that about 79.2 % variation in agricultural productivity is explained by INTVLOAN, INVINDLN and INVLAHT. The Akiake information criterion and the Schwartz criterion improved from -0.685 and 0.337 to -1.875 and -1.426 respectively. The significance of F-stat at 5 % showed that the model is fitted well. The coefficient of the error correction term fulfilled the *a priori* expectation of negativity and significance, showing the presence of long-run relationship or causality between agricultural labour productivity and the explanatory variables. The ECM coefficient of -0.3503 shows the speed of adjustment of about 35.03 % from a short-run steady state disequilibrium and it is significant at 1 %.

Causality Test. To estimate the short-run causality of the variables in the equation above, a Wald Coefficient Diagnostic Test was carried out with the null hypothesis of $C(4)=C(5)=0$, $C(6)=C(7)=0$ and $C(8)=C(9)=0$ for each variable respectively, i.e., there is no significant relationship individually between INTVLOAN, INVINDLN and INVLAHT and the agricultural productivity against the alternative of *there is significant relationship between each of the variables and agricultural productivity*. The result of the Wald Test is shown in the Table 6.

Table 6

Wald Coefficient Diagnostic Test

Variable	F-statistics	Chi-square	Prob(F-stat)	Prob(Chi-square)
INTVLOAN	29.89475	49.78950	0.0000***	0.0000***
INVINDLN	16.55944	33.11889	0.0000***	0.0000***
INVLAHT	25.68037	51.36075	0.0000***	0.0000***

Note.***significant at 1 %

Source: Authors' Computation Using EViews 7.0.

The Wald test above rejected the null hypotheses and thus confirmed the existence of short-run causality between each of the variables and agricultural productivity *y*. Thus, total volume of loan (INTVLOAN), volume of loan above

N100,000 (INVLAHT) and loans to individuals (INVINDLN) to set-up agricultural businesses all have short-run causal effect in creating sustainable jobs in the agricultural sector.

Residual Diagnostic Test. With the goodness of fit of the model, residual diagnosis was carried out using the Breusch-Godfrey serial correlation test, Breusch-Pagan-Godfrey heteroscedasticity test as well as Normality test. The results of the tests are shown in the Table 7.

Table 7

Residual Diagnostic Test			
Test for Normality			
Jarque-Bera		Prob(Jarque-Bera)	
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.858675	Prob.F-stat:(2, 22)	0.4374
Obs*R-squared	2.461906	Prob.Chi-square(2)	0.2920
Breusch-Pagan-Godfrey Heteroscedasticity Test			
F-statistic	0.246083	Prob.F-stat:(2, 22)	0.9922
Obs*R-squared	4.191623	Prob.Chi-square(2)	0.9797

Source: authors' Computation Using EViews 7.0.

From the above, the null hypotheses of *no serial correlation in the residual, no heteroscedasticity and residual is normally distributed were all accepted.* Thus, there is no serial correlation and heteroskedasticity in the residual and the residual is normally distributed. Therefore, the model for this study is desirable.

Conclusions. In the bid of the government to stimulate creation of jobs for the teeming unemployed youths in the country in the agricultural sector through investment sources such as budgetary allocation to agricultural sector, ACGS credit scheme loan categories as well as commercial bank loan, only the loan categories of Agricultural Credit Guaranteed Scheme has shown both short-run and long-run relationship with agricultural productivity. Within the ACGS scheme, there are sizes of loans categories which include ₦5,000 & below, ₦5,001 and ₦20,000, ₦20,001 and ₦50,000, ₦50,001 and ₦100,000 as well as ₦100,000 & above categories. With the exception of budgetary allocation, commercial bank loan and ACGS loans above ₦100,000 which was proxy as investment in medium scale enterprises, all other size categories were proxy as investment in small scale enterprises. The individual and cooperative loan categories were also considered. Among all the size categories, only the volume of loan greater than ₦100,000 significantly influence productivity in the agricultural sector in both short and long run. This implies that the capital intensive nature of agriculture requires making capital available to prospective players who would be interested in engaging in sustainable career in the sector. However, all the variables considered had long-run association with agricultural productivity.

Therefore, it is expedient for the Nigeria government to develop investment framework that would not just be targeted at getting more people involved in agriculture but would also guarantee a sustainable living for the existing and intending farmers. It is not enough to get people involved in agriculture; they must be assured of a living in the business if the nation is to make progress in agricultural

development. A capital intensive agricultural development is the way out of Nigeria's import-dependency for food and food products. Hence, loans below ₦100,000 is no capital at all. In fact, any loan that cannot guarantee a cashback into the business and still afford the farmers to make a living is not what the nation needs to attain job creation, food security and overall agricultural development. This study therefore encouraged the Nigeria government to develop well-defined and clearly structured investment frameworks that would not just encourage the people to embrace agriculture as an escape route out of unemployment but to embrace it as a business to be nurtured. Hence, loans in agricultural sector must be able to guarantee cashback into the business as well as sustainable living for the farmers to keep them in agribusiness.

References

1. Sunny, I. (2014), The Impact of Banks' and Public Sector's Financing Activities on Agricultural Output in Nigeria. *Journal of Agriculture and Environmental Sciences*, vol. 3, no. 2, pp. 129–143.
2. Anyanwu, J. C., Oyefusi, A., Oaikhenan, H. and Dimowo, F. A. (1997), *The Structure of the Nigerian Economy (1960-1997)*, Joanee Educational Publishers Ltd, Onitsha, Nigeria.
3. Binswanger, H., Townsend, R. and Tshibaka T. (1999), Spurring Agriculture, Land and Rural Development. In Proceedings of the Conference on "Can African Claim the 21st Century?" Held in Abidjan, in July 1999.
4. Ekwere, G. E. and Edem, I. D. (2014), Evaluation of Agricultural Credit Facility in Agricultural Production and Rural Development. *Global Journal of Human-Social Science: B Geography, Geo-Sciences, Environmental Disaster Management*, vol. 14, is. 3, pp. 18–26.
5. Oyeyinka, R. A. (2002), Impact of (NACRDB) Smallholder Direct Loan Scheme on Farmers in Oyo State, Nigeria, Ph.D. Thesis, University of Ibadan, Nigeria.
6. Ogieva, E. (2003), *Comprehensive Agricultural Science*. A. Johnson publishers Ltd, Lagos, Nigeria.
7. World Bank (1996), Nigeria Poverty in the Midst of Plenty: The Challenges of Growth with Inclusion: A World Bank Poverty Assessment. World Development Sources. Washington, available at: <http://documents.worldbank.org/curated/en/582991468759320261/Nigeria-Poverty-in-the-midst-of-plenty-the-challenge-of-growth-with-inclusion-a-World-Bank-poverty-assessment>.
8. Okunmadewa, F. (2003), Poverty and Agricultural Sector in Nigeria in *Poverty Reduction and the Nigeria Agricultural Sector Elshaddai Global*, ed. Okunmadewa F., Ventures Limited, Nigeria.
9. Ogunfowora, B. (1993), Analysis of fertilizer supply and demand in Nigeria in *Alternative pricing and distribution systems for fertilizers in Nigeria: Proceedings of a symposium organized by the Federal Agricultural Coordinating Unit*, eds. N. B. Mijindadi, D. O. A. Phillip and P. Jayaraman, Ibadan, Nigeria.

10. Rhaji, M. A. (2008), An Analysis of the Determinants of Agricultural Credit Approval/Loan size by commercial banks in south-western Nigeria. *Nigeria Agricultural Development Studies*, no. 1(1), pp. 17–26.
11. Shepherd, W. G. (2002), *Market Power and Economic Welfare*, Random House, New York, USA.
12. Olomola, A. S. (1997), *Agricultural finance*, eds. A. O. Philips and S. Tunji Titilola, NISER, Ibadan, Nigeria.
13. Adegaye, A. J. and Dittoh, J. S. (1985), *Essentials of Agricultural Economics*, Centre for Agricultural and Rural Development, Ibadan, Nigeria.
14. Akinrinola, O. O. and Okunola A. M. (2014), Evaluation of Effects of Agricultural Insurance Scheme on Agricultural Production in Ondo State. *Russian Journal of Agricultural and Socio-Economic Sciences*, is. 4(28), pp. 3–8. <http://dx.doi.org/10.18551/rjoas.2014-04.01>.
15. Dickey, D. A. and Fuller, W. A. (1979), Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, vol. 74, pp. 427–431.
16. Johansen, S. (1988), Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, vol. 12, no. 2–3, pp. 231–254.
17. Hendry, D. F. (1995), *Dynamic Econometrics*, Oxford, Oxford University Press, Great Britain.

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