

Economic Determinants of Agricultural Productivity in Nigeria

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Abstract: The study examined the economic determinants of agricultural productivity in Nigeria from 1981 – 2017, using ARDL technique. The outcome of the study confirms the long run linkage among the variables of the model. The estimated ARDL result reveals that the labor force and real exchange rate influence agricultural productivity positively, while the inflation rate are negatively in Nigeria. Hence it is recommends that the government and policy makers should encourage and assist farmers through agricultural programs and seminar Like (Anchor Borrowers, introducing new yield pest side, insecticide and newly agricultural techniques of production as well as agricultural mechanization) and programs such as operation feed the Nation (OFN), agricultural credit guarantee scheme fund (ACGSF) especially in Rural areas in order to increase more agricultural productivity in Nigeria.

Keywords: Economic Determinants, Agricultural Productivity, Labor forces, Exchange Rate, and Inflation Rate.

I. INTRODUCTION

Economic determinant in Nigeria is essentials for viable agricultural productivity, farmers are particularly in need of such instrument such as (capital labor forces and Real Exchange Rate) for instance record shows that 70% of the total population in Nigeria before political independences they depend on agricultural activities but because of the existed crude oils and seasonal pattern of the instruments which include climate change inadequate budget to agricultural sector and low agricultural equipment's the decline in food production will occur due to poor planting materials and the uncertainly they are facing. Consequently, food production profiles in Nigeria has been at lower Rate this lead to a rise in importation of agricultural product, Economic determinant enhance productivity and promotes standard of living of farmers , Numerically even though the agricultural sector in Nigeria contribute 42% of the GDP by providing the employment and a means of livelihood for more than 60% of the productivity engaged population it receives less than 10% of the annual budgetary allocation, thus under finding in this regard in central to decline in agricultural output in Nigeria . as a follows up the Nigerian agricultural development, Bank of agriculture and cooperatives Bank Limited which is mean to provide credits facilities to famers so as to increase more agricultural productivity in Nigeria. However, Adagio and Dittos (2014) described Economic determinant as a way of measuring value goods and services. Mood and Onasapnome (2012) stressed that economic determinants are important for agricultural productivity due a reason they enable farmers to

launch and enlarge their farms to accelerate income and productivity. The crucial role of economic determinant in agricultural productivity can also be appraised from the perspective of the quality of problems emanating from the lack of it, in recent faring activities in Nigeria provision of economic determinant are not adequate but efficient utilization of such instrument become an essential for increase agricultural productivity. The role of economic determinant is closely related to providing needed resources which farmers cannot sources from their own available funds (capital) in respect to this, the provision of economic determinant has become one of the most important government activities in the promotion of agricultural productivity in Nigeria (Olagunju & Adeyemo, 2011).

However, agricultural productivity has an essential role in accelerating the performance of a nation's economy, hence it is important for government to emphasize on the diversification measures as well as the provision of credit facilities to farmers for agricultural productivity, employment and sustenance of the economy in general.

Nevertheless, it is on this background that this paper is set to answer two questions: Does labor force (APPW) influence agricultural productivity in Nigeria?

Does real exchange rate (EXCHT) have significant effect on agricultural productivity in Nigeria? And lastly, does inflation rate (INFL) affect agricultural productivity in Nigeria? An overview of empirical literature reviews on the selected variables it was presented in Section Two of this paper. Section Three contains methodology while data presentation and discussion of result are presented in Section Four. Section Five contains conclusion and policy recommendations.

II. LITERATURE REVIEW

This section helps us to establish an appropriate model to explain the transmission mechanism in Nigeria by reviewing works of different authors on how these channels affect the economy. Oyakhicomen and Ziebach (2018) studies that effect of agricultural production and economic performance in Nigeria from 2000 to 2010, the study used multiple linear regression model (MLRM), the result shows that, the agricultural production has contributed to the Nigerian economic growth positively and significantly and subsequently lead to reduction of rural areas poverty by providing plenty of jobs opportunities (employment) and other sources of income to the rural dwellers, the study also

provide the evidence about the hypothesis that more agricultural production leads to higher economic growth and reduces the poverty amongst the Nigerian farmers.

Al-Mansur (2017) analyzed the impacts of agricultural productivity on economic growth in Nigeria, over the period of 1996 – 2013 by employing ordinary least squares method (OLS) the outcome illustrates that the per capital real agricultural productivity has a significance positive impact on per capital real gross domestic products, while other variables have insignificant negative impact on real gross domestic product, the study also recommend that government should give a special incentive to farmers like provision of adequate infrastructural facilities in order to boost the agricultural productivity in Nigeria. Nook and Joseph (2017) examined the agricultural financing Nigerian economic growth, over the period of 1981 to 2016, the study employed auto-regressive distributed lags model (ARDL), the result showed that, the loans and labor employed had contributed positively and significantly to economic growth while other variables that were tested have no significant effects to economic growth, the study suggested that, the government should provide the infrastructural facilities that will stimulate the farmers to produce more agricultural products. Jools and Deco (2017) studied the socio-economic factors influencing loan repayment among farmers in Oyo State, over the period of 2010 to 2013 they adopted the Multiple Linear Regression Model and Augmented Dickey Fuller Test, the result revealed that only farming experiences has positive effects in socio economic factors while other variables have negative effects on socio-economic factors, the study suggested that the government should be able to change the procedure and strategy of loan given to the farmers.

Oluasola (2017) studies the effects of integrating small holders' food crop farmers into the national policy for commercialization and larger scale agriculture in Nigeria, over the period of 1990 – 2015. He employed augmented dickey-fuller test (ADF) and error correction mechanism model (ECM), the result showed that the food crops farmers contributed to the Nigerian national policy positively, while other farmers fail to do that, this is because some of the farmers are illiterate and lack farming experiences and does not read beyond primary school level of education, the study suggested that the government should provide adequate infrastructural facilities in order to provide more output by the farmers. Legacy and Dodoma (2017) examined the impact of agricultural expenditure and agricultural output on economic growth in Nigeria, over the period of 1980 to 2015, the study adopted units root test, augmented square methods (OLS) the result showed that the agricultural expenditure and agricultural outputs positively affect the real gross domestic products in Nigeria, while other variables negatively affect economic growth in Nigeria the study also recommended that, the government should increase its expenditure in the agricultural sector in order to boost the agricultural output by the farmers.

Olojedeao and Emeroleco (2016) study the socio economic determinants of agricultural production among women farmers in Abia state, over the period of 2001 to 2011, the study employed Ordinary Least Square Method (OLS) and unit root test, the result showed that the occupation, farm size and income exerted increase agricultural production, the study also recommended that the government and private sector should play their attention in assisting the women farmers. Awan and Alan (2016) investigate the influence of agricultural productivity on economic value in Nigeria from 1972 to 2012 by employing the auto-regressive distributed lags model (ARDL) and ordinary least square method (OLS). The result show labor and capital are positively influencing economic performance in Nigeria while the remaining inflation that were tested are negative affect the economic growth in Nigeria and also the study suggested that the government should ensure to employ labor forces by increasing the higher education in both agricultural sector and industrial sector in order to increase the agricultural productivity that leads to economic growth.

Ogun Dari and Awoke (2015) assess the contribution of agricultural productivity to food security in sub-Saharan African countries, covering the period of 1980 to 2009 by adapting the ordinary least square method (OLS) and the result showed that an increase in agricultural productivity contributed positively and significantly to all measures of food security considered in the research while a decrease in agricultural productivity has negative effect on all measures of food security considered in the study. Odebolt and Tummy (2015) analyze the effect of agricultural to economic progress in Nigeria, from 1960 to 2011. The study employed casualty test and Johannes Granger procedure, the result shows that the agricultural sector positively influence economic progress with a percentage the study also recommended that the government should provide needed materials to the farmer's more especially rural farmers in order to encourage them.

Scudahinn wachukwu and Akan (2014) analyze the determinant of agricultural export growth in Nigeria, covering the period of 1960 to 2010 by employing the Auto – Regressive Distributed Lags Models (ARDL) the result showed that, capital gross domestic products and inflation have a significant positive relationship with export intensity, while other variables have no significant effects on growth on export the study recommended that the government should provide a needed materials that affects export in order to promote more agricultural products to exports. Alabiadeolu and Reuben (2014) investigate the determinants of agricultural productivity in Nigeria, over the period of 1990 to 2010 by employing the augmented dickey-fuller and ordinary least square method (OLS). The result revealed that, they had contributed significantly and positively to the systematic variation in the growth of agricultural products; also the study suggests that, the government and private sector should focus their attention on effective's procurement and timely

distribution on agricultural sector as well as the provision and maintenance of special assistance to the Nigerian farmers.

Chaudhry and Ampoule (2013) investigated the total factor productivity on economic growth in Pakistan, covering the period of 1985 to 2005 by adopting the Multiple Linear Regression Model (MLRM, and Augmented Dickey – Fuller Test). The result revealed that the labor forces employed, capital and real gross domestic products has contributed significantly and positively to economic growth in agricultural productivity, while the remaining variables have negative insignificant effects on growth of agricultural productivity in Pakistan, the study recommended that the government should provide a special assistance to farmers in order to encourage them.

Aiyana, Oluwayemisi and Bolarin (2012) studies the determinants of credits constraints conditions and production efficiency amongst farming households in south western Nigeria covering the period of 1980 to 200o. The study employed error correction mechanism model (ECM) and the result finds out that the educational qualification and family size are positively and significantly affects the production efficiency while other variables like farm size and farming experiences have negative effects to production efficiency, the study also recommended that, the government should assist the farmers by giving them agricultural input in order to provide more agricultural products. Alabi and Reuben (2012) investigate the determinants of agricultural productivity in Nigeria, over the period of 1960 – 2004 by employed Johansen Granger Co-integration procedure (JGCP), the result showed that the annual rainfall, fertilizer and labor forces employed had contributed significantly to the systematic variation on agricultural productivity in Nigeria, the study also suggested that the government should ensure to encourage the farmers by providing them the needed assistance in order to produce more agricultural productivity in Nigeria that lad to economic growth and development in Nigeria. Udah and Nwachukwu (2012) examined the determinants of agricultural domestic products in Nigeria, covering the period of 1960 to 2010 by adopting Auto-Regressive Distributed Lags (ADRL) and the Ordinary Least Square Method (OLS) the result sowed that, the agricultural labor, infrastructural development and total factor productivity have positive significant relationship with agricultural growth domestic product, the study also recommended that the government should provide the infrastructural facilities that will promotes massive agricultural products and leads to increase in the growth of domestic products in Nigeria. .

Murara and Ruigu (2010) analyze the determinants of agricultural productivity in Kenya, covering the period of 1970 – 2000 by adopting the error correction mechanism model (ECM). The result revealed that an increase in government expenditure annual rainfall and labor forces caused an increase in agricultural productivity on Kenya positively and significantly, the study also recommends that the government should ensure to contribute and invest in

agricultural sectors through budgetary allocation. Suleiman and Nwosi (2009) examined the farm level determinant of agricultural commercialization over the period of 1980 to 2001, the study adopted the auto-regressive distributed lag model (ARDL), the result revealed that the labor and fertilizer have contributed to agricultural commercialization significantly and positivity while other variable that were tested have contributed to agricultural commercialization negatively, the study also recommended that the government should encourage the farmers by giving them needed materials that used to provide more agricultural commercialization. Anagoge Agbasi and Okoli (2008) examined that socio-economic factors influencing agricultural production amongst cooperatives farmers in Anambra State, by using time series data from 1975 to 2002, the study employed multiple linear regression model (MLRM) , the result showed that the income and age of respondents have no significant effect on agricultural production, while other variables have significant positive effect on agricultural production, the study also recommended that the government should ensure to provide the agricultural credits to farmers and support the agricultural mechanization.

III. METHODOLOGY AND DATA

The data of this study was gathered from central Bank of Nigeria (CBN, 2017). However, agricultural productivity is dependent variable which is the proxy AGDP while labor force, real-exchange rate, and inflation rate are independent variables in the study.

3.1 Estimation techniques

3.1.1 Econometrics Model

The econometric model of AGDP is specified as follows:

$$agdp = \alpha_0 + \alpha_1 appw + \alpha_2 exch + \alpha_3 inf l \dots\dots\dots(3.1)$$

Transforming Equation (3.1) into log-log model, gives us

$$\ln agdp = \alpha_0 + \alpha_1 \ln appw + \alpha_2 \ln exch + \alpha_3 \ln inf l \dots\dots\dots(3.2)$$

An ARDL, with aim to establish the links among the variables as shown in Equation (3.3).

$$\Delta \ln agdp_t = \alpha_0 + \alpha_1 \ln agdp_{t-1} + \alpha_2 \ln appw_{t-1} + \alpha_3 \ln exch_{t-1} + \alpha_4 \ln inf l_{t-1} + \sum_i^p \gamma_i \Delta \ln agdp_{t-i} + \sum_j^p \phi_j \Delta \ln appw_{t-j} + \sum_p^p \phi_p \Delta \ln exch_{t-p} + \sum_k^p \chi_k \Delta \ln inf l_{t-k} + \ell_t \dots\dots\dots(3.3)$$

where $\ln agdp$ is the logarithm of agricultural productivity, $\ln appw$ the logarithm of labor force, $\ln exch$ is the logarithm of exchange rate, $\ln inf$ is the logarithm of inflation, and subscript t represents the time frame of the study.

3.2 Short run coefficients

In order to determine error correction model so as to the dynamic nature of the variables. Therefore, the Schwarz Bayesian criterion (SBC) is selected. The following is presented as short run coefficient equation.

$$\Delta \ln agdp_t = + \sum_i^p \gamma_i \Delta \ln agdp_{t-1} + \sum_j^p \phi_j \Delta \ln appw_{t-j} + \sum_p^p \phi_p \Delta \ln exch_{t-p} + \sum_k^p \chi_k \Delta \ln inf_{t-k} + \partial ec m_{t-1} + \ell_t \dots \dots \dots (3.4)$$

3.3 Long run coefficients

The decision rule as recommended by Pesaran et al. (2001) is that, if the calculated F-statistics are higher than the upper and lower critical bounds, the null hypothesis will be rejected which means there is integration relationship among the variables. The equation below indicates a long run coefficient under ARDL model.

$$\ln agdp_t = + \sum_i^p \gamma_i \ln agdp_{t-1} + \sum_j^p \phi_j \ln appw_{t-j} + \sum_p^p \phi_p \ln exch_{t-p} + \sum_k^p \chi_k \ln inf_{t-k} + \partial ec m_{t-1} + \ell_t \dots \dots \dots (3.5)$$

IV. PRESENTATION OF RESULTS AND ANALYSIS

4.1 Summary statistics

The descriptive statistics helps us to ascertain the trends of association among the variables, most importantly the patten of relationship between the Exchange Rate (EXCHT), Labor Force (APPW), Inflation Rate (INFL) and Agricultural Productivity (AGDP).

Variables	AGDP	APPW	EXCHT	INFL
Mean	32.07994	3982.395	82.41176	19.57495
Median	32.71418	2513.697	92.33810	12.87658
Maximum	48.56594	9207.104	296.4347	72.83550
Minimum	20.23572	1193.922	0.617708	5.382224
Std. Dev.	7.062392	2696.070	79.62544	17.44383

The table above summarizes statistics of the variable used in the study. The mean of agricultural productivity (AGDP) is 32.09994 which the lowest compared to the mean of Labor Forces (APPW) and Exchange Rate (EXCHT), 3982.395 and 82.41176, but with respect to Inflation Rate (INFL) the mean value of Agricultural Productivity is highest than the mean value of Inflation rate as 19.57495 respectively. The maximum value of AGDP is lower (48.56594) as compared to maximum value of APPW (9207.104) and INFL (72.83550) while with the respect to EXCHT the maximum is lower as (296.4347) compared to the maximum value. However, the S.D of APPW and EXCHT is highest as compared to AGDP of AGDP is also lower compared to the Standard Deviation of APPW, EXCHT and INFL

Variables	ADF	
	Level	First Difference
AGDP	-	0.000
		(-6.4196)***

APPW	-	0.000
		(-4.644)***
EXCT	-	0.000
		(-3.662)***
INFL	0.023	-
		(-3.884)**

NOTE: *** and ** illustrate 1 and 5 percent level of significance

The above result for unit root test shows that by taking the test majority of the variable are at first difference which covered one percent (1%) level if significance while the minority becomes stationary at level after taking the test which covered five percent (5%) level of significance, this will also cause a mixture variable that cause for the use of ARDL model.

Variables	F-stat	Lag	Sig. Level	Critical values	
				I(0)	I(1)
AGDP, EXTRT, ECHT & INFL	8.46***	4,4	10%	2.72	3.77
			5%	3.23	4.35
			1%	4.29***	5.61***

Note: *** illustrate 1 percent level of significance

The bound test result confirms the long run linkage among the study’s variable as the F statistics values greater than the critical value.

Variable	Coefficient	Standard Error	t-Statistic	Prob.
D(APPW)	0.016**	0.006	2.557	0.018
D(EXCHT)	0.039**	0.039	1.005	0.325
D(EXCHT(-1))	-0.157**	0.065	-2.421	0.024
D(INFL)	0.001	0.037	0.038	0.969
Coined(-1)	-0.877***	0.176	-4.973	0.000

Note: ** and *** represents 5 and 1 percent level of significance

From the table above at short run, the coefficient of D (APPW) and D (EXCHT) are positively related to AGDPP and are statistically significant at one percent level of significant respectively. These indicates that a one-unit increase in (APPW) upsurge the AGDP by 0.016059 by while with respect to D (EXCHT) a one percent increase in (EXCHT) will increase the AGDP by 0.039658 billion naira,

Speed of adjustment based on this the interpretation it is fits the model as it is and is negative and statistically significant at one percent by 1%.

Long Run estimate				
Variable	Coefficient	Standard Error	t-Statistic	Prob.
APPW	-0.005***	0.001	-3.795	0.001
EXCHT	0.121*	0.063	1.913	0.068
INFL	0.001	0.042	0.038	0.969
C	42.044***	2.691	15.621	0.000

Note: ***and * illustrate 1 and 10 percent level of significance respectively.

At long run if labor (APPW) increase by one units AGDP will decrease by 0.005475 billion naira. Therefore, at long run if real exchange rate (EXCHT) increase by one percent AGDP will increase by 0.121967 billion naira. Furthermore, long run if inflation rate (INFL) increases by one percent AGDP will increase by 0.001672.

At long run if labor (APPW) increase by one units AGDP will decrease by 0.005475 billion naira. And long run if real exchange rate (EXCHT) increase by one percent AGDP will increase by 0.121967 billion naira and lastly, at long run if inflation rate (INFL) increases by one percent AGDP will increase by 0.001672.

V. DISCUSSION OF RESULT

From the above interpretations of the result as we can see for unit root test by taking the test majority of the variables are at first difference non station which covered 1% level of significant while the remaining variables are become stationary at level after taking the test which covered 5% level of significance which is the cause a mixture variable that cause the use of ADRL model.

While the respects to short run and long run is short run the two independents variables i.e. labor force (APPW) and real exchange rate (EXCHT) are positively related to dependents variable i.e. agricultural productivity (AGDP) and is statistically significant, thus in the long run the remaining one independent variable which is inflation rate (INFL) re negatively related to dependent variables agricultural productivity (AGDP) and is statistically insignificant.

However, the finding of this result revealed that as the Nigerian economy it is in the short run the association between economic determinant and agricultural productivity are positive while in the long run is negative as a result of this in the long run by holding all the independents variables i.e. APPW, EXCHT, and INFL the dependent variables AGDP will increase by 42.044420 billion naira and by looking their probability values is statistically significant at 1% (0.0000).

Conclusively the result show that out of three independent variables selected tin the study i.e. APPW, EXCHT and INFL two are positively affects the AGDP and a statistically significant APPW, and EXCHT while the remaining are

variables INFL are negatively affects the AGDP and is statistically insignificant.

Moreover, base on this result there are similar work to my work (research) done by some scholars and researchers in the field of this research work which we can see as follows:

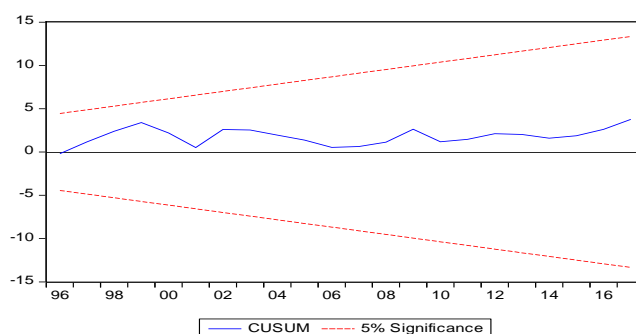
Awan and Alan (2016) studied the influence of agricultural productivity on economic growth, covering the period of 1972 to 2010 by adopting the error correction mechanism method (ECM) auto-regressive distribution lag model (ARDL), the result revealed that out of four selected independent variables that are been tested in the research the three of them are positively and significantly affects the economic growth, while other variables have negative insignificant effects to economic growth.

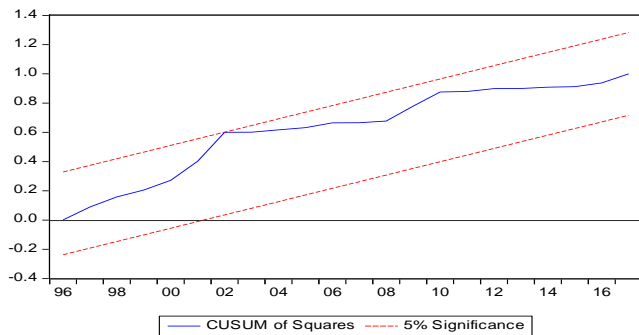
Nook and Joseph (2017) investigate the agricultural financing Nigerian economic growth over the period of 1981 to 2016 the study adopted ARDL and VAR model, the result shows that the extent to which the agricultural financing have improved and promote the agricultural productivity and there by stimulating the economic growth in Nigeria.

Test Statistics	F-statistics	Prob.
Autocorrelation	1.724	0.203
Normality	0.515	0.772
Heteroscedasticity	2.391	0.857

Table 4.4.5 presents the diagnostic test of AARDL model; the result for autocorrelation test indicates that there is no problem of auto correlation because the P- Value of autocorrelation is 0.203 which is greater than 0.05. Similar test for normality shows normal distribution among the residuals with a P-Value of 0.772 which is greater than 0.05. Moreover, the P-Value for heteroscedasticity test is 0.857 which is greater than 0.05 as such the null hypotheses (Ho) should be accepted and concluded that there is constant variance among the error terms therefore, no problem of heteroscedasticity in the residual of the model. This can be shown below

Stability Test





V. CONCLUSION

Proper review of relevant literature and careful analysis of statistical data interpretation and discussion of result enable the research to conclude as follows; The empirical result has shown that between the period of 1981 to 2017, economic determinant contribute to the growth of the agricultural productivity by (42.044420) in Nigeria, so the government and nongovernmental organization should strengthen their effort to increase and provide economic determinant that boost the agricultural productivity in Nigeria. We therefore, conclude that, the three independents variable that were tested in the research the two of them are positively and significantly play a vital role to the improvements of agricultural productivity by yielding the economic growth in Nigeria. While the remaining one variable are negatively contributing to agricultural productivity in Nigeria. This much contribution by agricultural productivity should also devise means of sub sequentially reducing the unemployment and sub-sequentially will increase the output and full employment in Nigeria. It is suggest that government should focus on policies that will increase the agricultural productivity, such policy will have presented by providing the infrastructural facilities that improved the agricultural productivity, encourage farmer by providing them the needed materials and equipment's in order to produce more agricultural productivity in Nigeria and in general both governments and nongovernmental organizations should give a special incentive, initiative and grant credits to farmers like provision of adequate infrastructural facilities and support in order to boost the agricultural productivity as well as agricultural mechanization in Nigeria

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