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Importance of agriculture resources to economic growth in Nigeria: Econometric analysis between 1981 and 2017

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Abstract
Fishery, crop and livestock production are an important aspect of agricultural production. Increasing resources pre-supposes increase productivity, food consumption, healthy living, employment and food security. A simple multiple regression model is used to analyse the data between 1981 and 2017 to reveal the contributions of fishery, crop and livestock resource to agricultural production growth in Nigeria. The 37 year period revealed that the variables were stationary, individually and jointly significantly to Agricultural output (AGOUT). The independent variables jointly explained 75% of AGOUT while the remaining 25% could be due to the effect of extraneous variables not captured in the model.

Keywords: Agriculture resource, economic growth, relationship and econometric analysis

1. Introduction
Agriculture activity is an essential phenomenon to the rural populations due to the fact that it does not only continue to contribute directly or indirectly to economic growth but contributes in a micro way to reducing poverty, increase purchasing power, livelihood and income diversification of many rural dweller (Yelwa and Adams 2014; Matthew and Mordecai, 2016) [26, 15]. The Micro-economic relevance of agriculture in the share of the economy is visible through supply of agro-product, agro-food supply chains, raw- materials and in foreign exchange provision to mention just a few which cannot be ignored. These contributions have backward and forward linkages to many sectors in the economy. The backward linkages to agricultural activity are in supply of farming tools and implements like tractors, farm implements etc. while forward linkages are seen in agricultural resource supply to the economy in terms of farm products. Although developed economist believe that informal sector like agricultural sector contributes little to economic growth (Julio, 2014) [11] informal agricultural sector cannot be over - estimated in developed economies (Abayomi, 1997) [1].
More than 90% of the rural dwellers are small holder farmers and close to 95% of them are residence in Africa (F.A.O. 2018) [7]. The population characteristics shows that more than half of the population density of several Sub-Sahara Africa countries live below poverty line including Nigeria who is judged to harbor the poorest people in the world currently (Kazem, 2018) [12] needs to develop, maximize and sustain her population for economic growth and prosperity. The enormous natural resources of Nigeria cover a land area of 924,000km, about 220 nautical miles Exclusive Economic Zone, 853km coastline, about 38,000 kilometre square of the continental shelf (Ozigbo, *et. al.,* 2014; NBS 2017) [25, 16]. The enormous natural resources in Nigeria means if better managed, with more than 60% of the rural population residing in rural areas (Olajide, *et al.,* 2012; Nordling, 2017) [20, 14] the sector could be the engine of change and a source for sustained economic growth. Agriculture is vital in the supply of raw materials to industries globally as it is believed that it contribute to global industrial revolution through factor contribution, product contribution, market contributions and foreign exchange contribution (Olajide, *et al.,* 2012; Matthew and Mordecai, 2016) [20, 15].

2. Literature review
Rostow (1960) [22] and Chikwana (2010) [5] opined that agriculture is a sector that helps to supply

surplus pool of labour which will not put a stop to farm production. Agriculture is conscious effort aimed at modifying some portions of Earth's surface through land tillage for the cultivation of crops, rearing and raising of livestock for global sustenance and economic gain (Rubenstein, 2003) [23]. Agriculture is a word used to indicate ways in which crop, plants and domestic animals uphold the overall human population by providing it with food and other raw material products (Harris and Fuller, 2014) [10]. Ahmed (1993) [3] sees agriculture activity as a purposeful production of food, livestock and tendering of plants and animals. Oji-Okoro (2011) [19] is of the view that agriculture resource has been an essential sector in the Nigerian economy in the past decades despite the oil boom. Oluwasami (1966) [22] believes that a strong and efficient would not only enable a country to feed its growing population but will generate employment, foreign exchange revenue and provide raw materials for industries but will eradicate poverty, unemployment and food insecurity. In the same view**,** Okolo (2004) [19] and Ogen (2007) [15] believes that the sector has multiplier effect on the socio-economic activities and sees it as the most important sector in Nigerian economy. The sector holds the potentials for long term growth of the economy contributing between 20 to 35 percent to the Gross Domestic product (GDP) and employs 65 per cent of the labour force in Nigeria (Emeka 2007; Chikwana, 2010 & 2014; Sulaimon, 2014; Olaoye *et.al.*, 2016) [5, 24, 17]. Abayomi (1997) [1], Abdullahi (2002) [2] and World Bank (2007) believe that agriculture sector contributes to the development of an economy in through four major ways (product, factor, market and foreign exchange contribution.

Generally, in my view, agriculture involves the production of plants, animals, fruit crops and organisms for the consumption/ utilization of plants, animals or organism. It also helps to sustain and balance the global eco-system. The importance of resource endowment in a nation depends on the weight attached to it. The significance of agriculture resource in bringing about economic growth and sustainable development of Nigeria gave rise to the main objective of the study.

2.1 Objective of the study

To examine the contribution of agricultural resource to economic growth in Nigeria. The parameters used for measurement are Gross Domestic Product (GDP) at current basic price will measure Agricultural output (AGOUT) as a proxy for economic growth. GDP at current basic price data is either inflation free data or inflation corrected which shows real GDP growth within the year. Independent parameters include aggregate production of fish, crop and livestock production resources. These parameters play key roles in agricultural productive activity.

2.1.1 Hypothesis

H_0: Agricultural resource does not contribute to economic growth in Nigeria.

2.2 Methodology/Materials

2.2.1 Study area

Nigeria has about 200 million people and covers an area of 923,769 square kilometres (made up of 909,890 square kilometres of land area and 13,879 square kilometres of water area). Geographically, Nigeria is situated between Longitude 3^0 and 14^0 East and Latitude 4^0 and 14^0 North Latitude. Nigeria is nearly equally divided between Christianity and Islamic religion. The climate is equatorial and semi-equatorial characterized by high humidity and substantial rainfall. There are two seasons in Nigeria (wet and dry seasons) and covered by three major types of vegetation; Forest, Savannahs and Montane land (NBS 2017) [16]

2.2.3 Sources of data

The study intends to uses secondary data from Central Bank in Nigeria (CBN) 2017 bulletin production. Total Agricultural Output (AGOUT) at a current basic price will proxy for GDP or economic growth. The time-series data cover 37 years between 1981 and 2017. The period chosen was constrained by data availability and the period is also long enough to empirically test the significance or the extent to the parameters contributes to the economic growth. To prevent having a spurious data, Augmented Dickey Fuller (ADF) Test was used for stationary test, coefficients of determination (R^2) was used to measures the proportion of variability in the model, F-statistic analysis measured the overall and the combined significance of the estimated parameters while Durbin Watson was used to detect the presence or absence of autocorrelation in the model (Gujarati, 2006) [9]. The statistical package used was E-views econometric software.

2.2.4 Model specification

Ordinary least square (OLS) simple multiple regression method was used to specify the model. Economic growth is the dependent variable proxy by total agriculture resource output. The independent variable are crop, fish and livestock resource output. The model specified as:

AGOUT = f(CROP, FISH, LSTOCK)

With a linear relationship such as: AGOUT = $\beta o + \beta_1 Crop + \beta_2 Fish + \beta_3 LStock + U$

AGOUT = Total Agriculture resource output

CROP = Aggregate crop sector resource output.

FISH = Aggregate fishery sector resource output

LSTOCK =Aggregate live stock sector resource output

3. Regression Result and Discussion

AGOUT = β0 + β1CROP + β2FISH + β3LSTOCK

Dependent Variable: AGOUT

Method: Least Squares

Date: 04/14/19 Time: 14:51

Sample: 1981 2017

Included observations: 37

Table 1: Dependent Variable: AGOUT

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.316491	0.593219	0.533515	0.5973
CROP	1.005796	0.000702	1432.202	0.0000
FISH	0.956013	0.028580	33.45070	0.0000
LSTOCK	1.082455	0.011810	91.65910	0.0000
R-squared	0.750000	Mean dependent var		5711.869
Adjusted R-squared	0.680000	S.D. dependent var		7304.458
S.E. of regression	2.670627	Akaike info criterion		4.904309
Sum squared resid	235.3642	Schwarz criterion		5.078463
Log likelihood	-86.72972	F-statistic		89769906
Durbin-Watson stat	1.258199	Prob(F-statistic)		0.000000

Source: Author's calculation, 2019.

The result reveals that all the variables are stationary at level except LSTOCK that is stationary at 1st difference. This is substantiated by the ADF test statistic in comparison to the critical values – with test statistic greater than the critical

value (taking absolute values) at 5% significant level.
From the estimated regression result, the coefficients of the independent variables are all positively related to AGOUT i.e. CROP, FISH and LSTOCK. All the explanatory variables are individually and jointly significantly to AGOUT i.e predicator variables jointly explained 75% of AGOUT while the remaining 25% could be due to the effect extraneous variables which are not captured in the model.

3.1 The R-square (R^2) = 0.750000
The multiple coefficients of determination (R^2) measures the proportion of variability in the AGOUT that is accounted for by CROP, FISH and LSTOCK. The R^2 results shows a high and strong positive relationship between AGOUT and the independent variables in the model. Thus, the model has good fit with about 75% changes in the AGOUT due to CROP, FISH and LSTOCK while 25% change in AGOUT is explained by other factors not captured in the model.

3.1.1 F-Statistics = 89769906
The F- statistic measures the overall or combined significance of the estimated parameters of the model. From the result, the F_{cal} = 89769906 and Prob(F-statistic) is less than 5% leading us to *reject the null hypothesis of insignificant model* implying that the independent variables are significant explanatory factors of AGOUT.

3.1.2 Durbin watson (DW) and decision rule
From the D-W = 1.258199 suggests the presence of a little autocorrelation in the model. If we compare result of Durbin Watson (1.258199) with R^2 (0.750000), it shows that D.W is greater than R^2 which implies that it is not spurious and good for forecasting and prediction.

3.2 Unit root stationarity test result (Summary)

Table 2: Summary result of unit root test for variables in the equation

Time Series	ADF Statistics	Critical Value	Stationary Status
AGOUT	3.772950	3.6289	I(0)
		2.9472	
		2.6118	
CROP	3.707600	3.6289	I(0)
		2.9472	
		2.6118	
FISH	5.494046	3.6289	I(0)
		2.9472	
		2.6118	
LSTOCK	3.650237	4.2505	I(1)
		3.5468	
		3.2056	

3.2.1 Unit root test for agric output (@ level)

Table 3: Result of unit root test for agric output at level

ADF Test Statistic	3.772950	1%	Critical	Value*	-3.6289
		5%	Critical	Value	-2.9472
		10%	Critical	Value	-2.6118
*MacKinnon critical values for rejection of hypothesis of a unit root.					

3.2.2 Augmented dickey-fuller test equation
Dependent Variable: D(AGOUT)
Method: Least Squares
Date: 04/14/19 Time: 14:36
Sample (adjusted): 1981 2017
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGOUT(-1)	0.074218	0.019671	3.772950	0.0007
D(AGOUT(-1))	0.196260	0.190417	1.030681	0.3104
C	165.8667	100.9737	1.642672	0.1102
R-squared	0.673899	Mean dependent var		683.7835
Adjusted R-squared	0.653517	S.D. dependent var		753.5101
S.E. of regression	443.5370	Akaike info criterion		15.10926
Sum squared resid	6295202.	Schwarz criterion		15.24257
Log likelihood	-261.4120	F-statistic		33.06450
Durbin-Watson stat	1.970197	Prob(F-statistic)		0.000000

3.2.3 @ 1st diff

Table 4: Result of unit root test for Agric output at 1st difference

ADF Test Statistic	-4.050122	1%	Critical	Value*	-4.2505
		5%	Critical	Value	-3.5468
		10%	Critical	Value	-3.2056
*MacKinnon critical values for rejection of hypothesis of a unit root.					

3.2.4 Augmented Dickey-Fuller Test Equation
Dependent Variable: D(AGOUT,2)
Method: Least Squares
Date: 04/14/19 Time: 14:38

Sample(adjusted): 1981 2017
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGOUT(-1))	-1.030838	0.254520	-4.050122	0.0003
D(AGOUT(-1),2)	0.138194	0.187065	0.738746	0.4658
C	-550.8047	204.7908	-2.689597	0.0116
@TREND(1981)	64.94561	16.12463	4.027728	0.0004
R-squared	0.449507	Mean dependent var		71.33436
Adjusted R-squared	0.394458	S.D. dependent var		546.4419
S.E. of regression	425.2225	Akaike info criterion		15.05323
Sum squared resid	5424424.	Schwarz criterion		15.23280
Log likelihood	-251.9050	F-statistic		8.165541
Durbin-Watson stat	1.921087	Prob(F-statistic)		0.000402

3.3 Unit root test for crop (@ Level)

Table 5: Result of unit root test for crop output at level

ADF Test Statistic	3.707600	1% Critical Value*	-3.6289
		5% Critical Value	-2.9472
		10% Critical Value	-2.6118
*MacKinnon critical values for rejection of hypothesis of a unit root.			

3.3.1 Augmented dickey-fuller test equation

Dependent Variable: D(CROP)
Method: Least Squares
Date: 04/14/19 Time: 14:40
Sample(adjusted): 1981 2017
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CROP(-1)	0.075218	0.020288	3.707600	0.0008
D(CROP(-1))	0.169968	0.191754	0.886388	0.3820
C	154.3569	98.88116	1.561035	0.1284
R-squared	0.616391	Mean dependent var		602.3367
Adjusted R-squared	0.592416	S.D. dependent var		684.8208
S.E. of regression	437.2055	Akaike info criterion		15.08050
Sum squared resid	6116757.	Schwarz criterion		15.21382
Log likelihood	-260.9088	F-statistic		25.70917
Durbin-Watson stat	1.960079	Prob(F-statistic)		0.000000

3.3.2 @ 1ST DIFF

Table 6: Result of unut root test for crop output at 1st level

ADF Test Statistic	-4.211116	1% Critical Value*	-4.2505
		5% Critical Value	-3.5468
		10% Critical Value	-3.2056
*MacKinnon critical values for rejection of hypothesis of a unit root.			

3.3.3 Augmented dickey-fuller test equation

Dependent Variable: D(CROP,2)
Method: Least Squares
Date: 04/14/19 Time: 14:41
Sample(adjusted): 1981 2017
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CROP(-1))	-1.093108	0.259577	-4.211116	0.0002
D(CROP(-1),2)	0.171577	0.187721	0.913998	0.3680
C	-505.2576	192.9574	-2.618494	0.0137
@TREND(1981)	59.91721	14.60783	4.101720	0.0003
R-squared	0.464390	Mean dependent var		65.02948
Adjusted R-squared	0.410829	S.D. dependent var		543.3198
S.E. of regression	417.0386	Akaike info criterion		15.01437
Sum squared resid	5217636.	Schwarz criterion		15.19394
Log likelihood	-251.2442	F-statistic		8.670294
Durbin-Watson stat	1.924031	Prob(F-statistic)		0.000271

3.4 Unit root test for fish (@ Level)

Table 7: Result of unit root test for fish output at level.

ADF Test Statistic	5.494046	1% Critical Value*	-3.6289
		5% Critical Value	-2.9472
		10% Critical Value	-2.6118
*MacKinnon critical values for rejection of hypothesis of a unit root.			

3.4.1 Augmented dickey-fuller test equation

Dependent Variable: D (FISH)
Method: Least Squares
Date: 04/14/19 Time: 14:43
Sample (Adjusted): 1981 2017
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FISH(-1)	0.164467	0.029935	5.494046	0.0000
D(FISH(-1))	-0.227885	0.259758	-0.877297	0.3869
C	2.340681	1.491744	1.569090	0.1265
R-squared	0.919490	Mean dependent var		17.83195
Adjusted R-squared	0.914459	S.D. dependent var		22.08715
S.E. of regression	6.459929	Akaike info criterion		6.650930
Sum squared resid	1335.382	Schwarz criterion		6.784246
Log likelihood	-113.3913	F-statistic		182.7343
Durbin-Watson stat	1.834088	Prob(F-statistic)		0.000000

3.4.2 @ 1ST DIFF

Table 8: Result of unit root test of fish output at 1st difference.

ADF Test Statistic	0.269681	1% Critical Value*	-4.2505
		5% Critical Value	-3.5468
		10% Critical Value	-3.2056
*MacKinnon critical values for rejection of hypothesis of a unit root.			

3.4.3 Augmented dickey-fuller test equation

Dependent Variable: D(FISH,2)
Method: Least Squares
Date: 04/14/19 Time: 14:45
Sample(adjusted): 1981 2017
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FISH(-1))	0.059097	0.219138	0.269681	0.7893
D(FISH(-1),2)	-0.426952	0.293936	-1.452535	0.1567
C	-2.949605	4.744501	-0.621689	0.5388
@TREND(1981)	0.282715	0.372170	0.759639	0.4534
R-squared	0.182421	Mean dependent var		2.826030
Adjusted R-squared	0.100663	S.D. dependent var		9.283797
S.E. of regression	8.804138	Akaike info criterion		7.298452
Sum squared resid	2325.385	Schwarz criterion		7.478024
Log likelihood	-120.0737	F-statistic		2.231234
Durbin-Watson stat	1.856237	Prob(F-statistic)		0.105000

3.5 Unit root test for livestock (@ level)

Table 9: Result of unit root test of livestock output at level.

ADF Test Statistic	-0.499152	1% Critical Value*	-3.6289
		5% Critical Value	-2.9472
		10% Critical Value	-2.6118
*MacKinnon critical values for rejection of hypothesis of a unit root.			

3.5.1 Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LSTOCK)
Method: Least Squares
Date: 04/14/19 Time: 14:46
Sample (adjusted): 1981 2017
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LSTOCK(-1)	-0.008773	0.017576	-0.499152	0.6211
D(LSTOCK(-1))	1.020949	0.170291	5.995337	0.0000
C	5.532386	4.565600	1.211754	0.2345
R-squared	0.893580	Mean dependent var		56.29958
Adjusted R-squared	0.886929	S.D. dependent var		57.63636
S.E. of regression	19.38080	Akaike info criterion		8.848259
Sum squared resid	12019.69	Schwarz criterion		8.981575
Log likelihood	-151.8445	F-statistic		134.3484
Durbin-Watson stat	1.859145	Prob(F-statistic)		0.000000

2.5.2 @ 1ST DIFF

Table 10: Result of unit root test of livestock output at 1st difference.

ADF Test Statistic	-3.650237	1% Critical Value*	-4.2505
		5% Critical Value	-3.5468
		10% Critical Value	-3.2056
*MacKinnon critical values for rejection of hypothesis of a unit root.			

2.5.3 Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LSTOCK,2)
Method: Least Squares
Date: 04/14/19 Time: 14:49
Sample(adjusted): 1981 2017
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LSTOCK(-1))	-0.384314	0.145011	-2.650237	0.0127
D(LSTOCK(-1),2)	0.254471	0.183185	1.389143	0.1750
C	-14.93320	10.01482	-1.491110	0.1464
@TREND(1981)	1.949299	0.829344	2.350412	0.0255
R-squared	0.195735	Mean dependent var		2.865722
Adjusted R-squared	0.115308	S.D. dependent var		19.46366
S.E. of regression	18.30714	Akaike info criterion		8.762591
Sum squared resid	10054.54	Schwarz criterion		8.942162
Log likelihood	-144.9640	F-statistic		2.433711
Durbin-Watson stat	1.813520	Prob(F-statistic)		0.084293

4. Recommendation

From the econometric analysis, it is shown that 75% was explained by the independent variable while only 25% was unexplained by the equation. It is therefore recommended that:

- Agriculture policy must be re-visited with a view to increase the production of fishery, crop and livestock.
- It is important also to increase public private partnership between Federal Government in Nigeria and the agricultural resource producers or farmers.
- To achieve a high percentage and increased production, production of agricultural resources needs to go beyond sustenance level to agro-business.
- There is the need to change the orientation about agriculture activity and farmers perception towards agric business.
- There is the need to sensitize farmers on value addition which will provide additional income to farmers.
- Fabrication of local, affordable and available farming equipment be increased to enhance and increase agriculture resource production.
- Training, re-training of farmers on new innovations and improved breeds is needed constantly to increase agricultural productivity.
- There is the need to grow and develop in-stored capacity within the farming groups rather than outside the farming groups.
- Finally, finance provided for the purpose of increased agricultural productivity should be channeled directly to end users either through co-operative and focused groups to reduce diversion of funds to non- agricultural end users.

5. Conclusion

Agriculture neglect is detrimental to the growth of the world economy and cannot be neglected as there are no perfect substitutes for agriculture resources which must be guarded with all sincerity. Agriculture provides a source of labour, employment, foreign exchange, revenue provision and economic growth. Agriculture creates his demand and only needs the right policy to activate the inert potentials and its contributions to growth, development of the world economy in input and raw material supply. To the developing economy, agriculture is important for provision of food, employment, income and for poverty reduction.

Appendix 1:

Year	Agric	Crop	Fishing	Livestock
1981	17.05218	12.81721	0.550365	2.525025
1982	20.12592	14.32407	0.673431	3.962689
1983	23.79782	16.35186	0.987419	5.193151
1984	30.36518	21.49755	0.86799	6.619808
1985	34.23709	25.06649	0.540481	7.162608
1986	35.70264	25.97239	0.769075	7.389413
1987	50.28694	39.65865	0.664765	8.373794
1988	73.76451	61.84864	1.165999	8.889891
1989	88.26413	71.88392	2.414525	11.79099
1990	106.6267	86.9262	3.208541	14.14587
1991	123.2356	101.6458	3.577146	15.57605
1992	184.1157	153.3798	4.7171	23.02748
1993	295.3246	249.1959	5.586232	36.57599
1994	445.2729	377.3083	7.67795	54.30441
1995	790.1416	670.1776	14.50806	97.20229
1996	1070.515	906.8942	22.84405	130.4078
1997	1211.462	1026.291	27.58654	145.0295
1998	1341.041	1133.389	33.45621	158.3143
1999	1426.974	1204.705	38.58902	164.3743
2000	1508.409	1270.629	41.09574	172.1903
2001	2015.422	1699.687	57.19661	228.5579
2002	4251.521	3875.458	68.80796	271.0261
2003	4585.926	4161.566	81.00874	299.2245
2004	4935.264	4419.062	99.00404	360.803
2005	6032.332	5372.204	129.2581	463.42
2006	7513.298	6723.216	149.6392	560.2461
2007	8551.981	7654.22	163.9888	642.2764
2008	10100.33	9039.634	193.7503	758.8398
2009	11625.44	10419.6	221.182	863.4024
2010	13048.89	11683.9	249.7115	979.5641
2011	14037.83	12484.85	284.3294	1115.602
2012	15816	14071.24	322.671	1251.931
2013	16816.55	14862.32	366.7932	1399.485
2014	18018.61	15812.57	425.2501	1573.053
2015	19636.97	17189.97	476.1442	1748.025
2016	21523.51	18883.08	528.3927	1875.783
2017	23952.55	21096.11	624.7917	1974.448

***Source*:** GDP at current basic price CBN statistical bulletin 2017 edition

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