

A Macroeconomic Analysis of Agricultural Sector in Nigeria

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ABSTRACT

This paper attempts to study the Nigerian agriculture industry as a panacea to growth as well as an anchor to the diversification agenda of the present government. To do this, the time series data of the four agriculture subsectors of crop production, livestock, forestry and fishery were analysed as stimulus to the Real GDP from 1981-2016 in order to explicate the individual contributions of the subsectors to the RGDP in order to guide the policy thrust on diversification. Using the Johansen approach to cointegration, all the variables were found to be cointegrated. With the exception of the forestry subsector, all the three subsectors were seen to have impacted on the real GDP at varying degrees during the time under review. The crop production subsector has the highest impact, however, taking size-by-size analysis, the livestock subsector could be of much importance due to its ability to retain its value chain and high investment returns particularly in poultry. Therefore, it is recommended that, the government should intensify efforts to retain the value chain in the crop production subsector, in order to harness its potentials optimally through the encouragement of the establishment of agriculture cottage industries. Secondly, the livestock subsector is found to be the most rapidly growing and commercialized subsector. Therefore, it should be the prime subsector to hinge the diversification agenda naturally. Lastly, the tourism industry which is a source through which the impact of the subsector is channeled to the GDP should be developed, in order to improve the impact of such channel to GDP with the sole objective to resuscitate the forestry subsector.

Keywords: Diversification, Cointegration, Agriculture-subsectors

1 Introduction

Agriculture was considered the engine of growth of the Nigerian economy prior to independence up till the point of oil was found commercially (PwC, 2017; Shitu, 2017). For instance, available indices show that it accounted for 57% and 64.5% of the Gross Domestic Product GDP and export earnings of Nigeria respectively from 1960 to 1969. However, its contribution to the GDP continues to decline with an increase in the flow of oil money. This is because the country relegated the agricultural sector and shifted focus to the petroleum sector. However, the recent crude oil price crash has necessitated a re-think about the economic future of the country considering diversification strategy with agriculture as the central focus point.

The Nigeria economic diversification programmed is anchored on the agriculture sector because of its potential to create jobs, boost domestic demand, and generate significant foreign exchange (Okereocha, 2017). Also, it is widely acknowledged that, growth generated by agriculture promises to be more poverty-reducing than GDP growth recorded in non-agricultural sectors. For instance, Diao *et al.* (2012) as cited in Claire, (2015) show that agriculture-led growth decreases poverty by many folds greater than the decline resulting from growth emanating from sectors other than agriculture in some selected Sub-Saharan African Countries: 1.3, 1.6, 3.1 and 4.3 for Ethiopia, Nigeria, Rwanda and Kenya in respective order. Agricultural sector is considered as the largest non-oil contributor to GDP, for instance in 2016, agriculture accounted for 24.4% of Gross Domestic Product (GDP) (PrinceWaterhouseCoopers PWC, 2017).

This is not unconnected with the fact that Nigeria is naturally-agriculturally-profiled. Out of its total land mass of over 90 million hectares, only 10 million is considered non-arable. It is equally aquatically advantage with almost a thousand kilometers of coastline spread over 10 million hectares, and cheap readily available workforce of over 100 million people. These according to (Arokoyo, 2012 in Oyakhilomen & Zibah, 2014) gives the country edge over the production of virtually all kinds of agricultural products. **Its abundant labour force is largely attracted to the sector with** over half of it accommodated in various agri-business endeavors as well as accounting for 40% of the share of GDP, all before 1960 that is prior to oil (Aremu, 2014). Regrettably, in the year 2015, PWC (2017), reports that agriculture contributes 24.4 % of the GDP and grew at 4.1% annually. Despite this, it is paradoxical that Nigeria is still not self-sufficient as it imports far exceeds its exports agriculturally particularly food items. For instance, available data from PwC (2017) show that during the year 2016, the total exports of the agricultural sector was \$1.4 billion but food import bill alone hit \$5.3 billion. Other paradoxes are that Nigeria ranks 84th out of 119 countries and 92nd out of 113 countries in the 2017 Global Hunger Index GHI and in Food Security Index respectively. These and other negative economic indices such as low-income level, high poverty level, high number of malnourished children prevalent among the population particularly among the rural dwellers are not only worrisome but perplexing.

This begs the question; is the potentiality of the agricultural sector fully harnessed in Nigeria? Certainly, no. The solution to this problem lies in the overhauling of the entire agricultural sector in the country. However, the sector comprises of four subsectors which includes crop production, livestock, fishery and forestry each of which has different impact in the areas of employment, wealth creation, poverty reduction, food security, returns on investment, revenue source to the government, foreign exchange earnings etc. The Agricultural Promotion Policy of 2016-2020 considered this sector, as a focal point of our diversification programme, it is therefore very imperative to understand the different contributions of these subsectors, in order to determine the optimal investment that should go into each subsector. However, several related works have been conducted about the empirical relationship between the agriculture sector and the GDP in Nigeria. For instance, in an effort to do this, Gbaliye, Ogundipe, Osabuohien, Olugbire, Adeniran, Bolaji-Olutunji, Awodele & Aduradola (2013) examined the relationship between agricultural products (exports) and the GDP in Nigeria. They established that, a 1% increase in agricultural exports will trigger 5.9% increase growth in GDP. Similarly, Oyinbo & Rekwot (2014) in their work indicated that agricultural production is very instrumental in promoting the economic prosperity in Nigeria over the years. This is because, they found agriculture to have resulted in the expansion of economic activities by 3.3% whenever it increases by a percentage point.

In Udah, Nwachukwu, Nwosu, Mbanasor, & Akpan (2015), the sectorial impact of agricultural growth on aggregated agricultural sector growth in Nigeria revealed a lopsided pattern of growth in the Nigeria agriculture sector with crop production accounting for 86% growth in the sector during the period 1961 to 2010. The study advocated for the use of vertical integrated approach to balance the parity between crop subsector and the rest of the subsectors. It is also empirically verified by Uzonwanne (2015) that, the Nigerian economy is seen to be healthy and vibrant through the periods of huge investment and concentration on agriculture over the years. In a similar but separate study, Olaniyi, Mathew, Ogunleye and Oladokun (2015) deployed the Error Correction Model in order to understand the influence of agricultural sector on the Nigeria GDP level. The study concludes that agricultural sector is a big booster to the economy as its impact positively and significantly to the GDP. This assertion is also affirmed by Riti, Gubak & Madina (2016), as they report that the Nigerian agriculture sector is capable of boosting the output level by 3.5% as its productivity increases by a percentage point.

A case was made for diversification into agriculture in the work of Kemi, (2016) as she maintained that diversification into agriculture positively impacts on the economy. The descriptive statistical method and correlation analysis revealed that agricultural sector contributes to economic development in Nigeria by employing around 71% of Nigeria's, provides 76% of food to the nation's basket, contributes 32% of foreign exchange earnings and supply 28% of industrial raw materials. It also reduces poverty by 34%. The

work of Austin, Gabriel & Ukachukwu (2017) agree with that of Kemi, (2016) which led to the recommendation of agriculture as the agent of diversification. Also, Shitu (2017) pinpoints agriculture as the best option for diversifying a recessionary Nigerian economy. This is because the increased and sustained levels of savings, expenditure and capital investment in the sector will quicken recovery and induce increased agricultural productivity in the economy thereby leading to forward and backward integration in the economy.

Summarily, the aforementioned literature appraised acknowledged the positive impact of agriculture towards the economic progress of Nigeria. Notwithstanding, to assume that the four subsectors contributed equally to GDP in Nigeria may be misleading because the sector is highly concentrated on crop production, which accounts for 90% output while fishery, forestry and livestock, account for the remaining 10% (PWC, 2017). To this end, works reviewed so far concentrated on aggregated contributions of agricultural sector to Nigeria's GDP. This work aimed at assessing disaggregated contributions of the four subsectors to Nigeria's GDP, in order to help give a policy direction on the diversification efforts of the government in the sector. Therefore, this study is to bridge this gap, by examining the individual contributions of crop production, livestock, fishery and forestry subsectors on aggregate output level of Nigeria.

2 An Overview of the Nigerian Agricultural Sector

2.1 Crop Production Subsector

The crop production subsector is arguably the largest subsector of the Nigerian agriculture sector as it accounts for 90% of the sector's growth. According to CBN (2012), from 1960 to 2011, the crop production subsector, has remained the largest as it accounts for over 80% of the sector's GDP on the average. Odetola & Etumnu, (2013) accorded giant stride to the peasant or small-holder farmers who are engaged largely in the production of food staples such as; rice, maize, beans, yam etc. It was further stated that the subsistent farmers produce 90% of our food product produced within Nigeria. Two notable crops that Nigeria is known for in this subsector are rice and cassava. The FAO (2018) rates Nigeria not only Africa's first in rice consumption but also ranks it among the largest if not the first in both production and importation of rice. Rice is the first major revenue earner to the farmers than any other cash crop in the country. Empirics from FAO (2018), have shown that, production hit approximately two million metric tons during the year 2008 whereas importation dwarfed this number by a million MT. Commenting further, the Food and Agriculture Organisation declared Nigeria as the global champion in cassava farming. Several challenges have been identified as bottleneck to the sector, among which are; seasonality reliance, lack of fertilizer, shortage in extension services, low capital and financial exclusion of farmers etc.

2.2 Livestock Subsector

The country's livestock profile from World Bank (2017) reveal that, the livestock sub-sector has been growing at a rate of 12.7%, higher than agricultural growth rate of 6.8% annually. The subsector is vital to the socio-economic development and key for nutritional security, providing 36.5 percent of the proteins consumed by the populace in Nigeria. Majority of Nigerian livestock owners are the rural poor, and a significant proportion of the urban poor as well, and evidence indicate that livestock development would positively contribute to poverty alleviation. Despite the large herd size, apart from eggs, livestock sub-sector's production does not meet the current need. The difference between domestic demand and supply is projected to widen in future (World Bank, 2017). Nigeria currently imports more than 70% of its poultry and 25% of its beef requirement to meet its domestic demand. The North region has the largest population of livestock in the country, about 90% of the country's cattle population and 70% of country's the sheep and goat population (World Bank, 2017). On the other hand, poultry is distributed across Nigeria with greater concentration in the southwest and southeast Nigeria. The livestock sector in Nigeria is highly exposed to a number of natural and humanly induced risks. Major risks include: a) droughts, which are increasing in frequency and intensity, have significant negative implications for pastoral communities; b)

insecurity and conflict, especially in Northern Nigeria and Boko Haram insurgency, increase the fragility of pastoral community and livestock sub-sector; c) pest and diseases leads to high mortality and lower productivity; and d) excessive rainfall and flooding hampering the performance of the sub-sector.

2.3 Fisheries

According to the Food and Agriculture Organization statistics of 2017, Nigeria is ranked 1st in sub-Saharan Africa. Its production was estimated at 21,700 during a year before the new millennium but steadily increased to 316,700 tons in 2015. The FAO statistics further reveal that, an estimate of over a million tons of fishes were produced during the year 2015 out of which catches from marine and inland coastlines had 36% and 33% respectively whereas the remaining 31% was from aquaculture. Although the fishery subsector is a very good source of the proteins to Nigerians, however, it has remained at the bottom of the list in terms of its share to the GDP as its contributed only 0.5% in 2015. With a total bill of USD284 million and USD1.2 billion for exports and imports Nigeria is regarded as a net importer of fish in 2013 (FAO, 2017). This is largely attributable to the fact that almost 80% of the domestic production is generated by low-skilled, poor and subsistent artisanal fishermen within the inland waterways as opposed to a high-tech, capital-intensive aquaculture mode of production. Rondon and Nzeka (2010) as cited in Oyakhilomen and Zibah, (2013) reported Nigeria's fish demand amounting to nearly \$1.8 billion in 2009. The subsector is a major occupational hub particularly to the rural dwellers in the riverine areas such as the Niger Delta region. As at 2018, (FAO) put the number of inland fishermen to be over 700,000 out of which 20% were women. Whereas the Nigeria fishery industry employs 490,000 in 1990, but as the new millennium enters, employment increased to 1.1m, 1.4m, 1.5m in 2010, 2015, 2016 respectively (FAO,2018).

2.4 Forestry

Forest is important in the sense that it houses pharmaceuticals, regulates the atmosphere as it neutralizes the solar heat, protect the soil, provides wax, rubber, pulp, oils and other essential industrial input of economic value. It is regarded as a national economic resource due to its primary nature in the line of production. The trees found here, are not only a source of wood for our furniture or fuel in both the rural and semi urban cities they are more importantly a primary source of inputs to the Pharmaceutical industry. In Nigeria, there exist game reserves and national parks; a total of 32 and 7 respectively with an estimated coverage of over a total of about 4 million as at 2000 (FAO, 2000). Additionally, Larinde and Chima (2018) report that the Nigeria forest repository are: Olokemeji forest reserve, Gambari forest reserve, Omo forest reserve, Akure/Ofosu forest reserves, Idanre forest reserve, Ifon/Owo forest reserves, Eba forest reserve, Ofogbo forest reserve, Obiaruku forest reserve, Ngel-Nyaki forest reserve, Afi River Forest Reserve, IITA forest reserve, Ibadan, Kagoro-Nindam forest reserve, Donga River Basin forest reserve, Upper Orashi forest reserve, Biseni forest reserve, and Akassa forest reserve.

Table 1: *Distribution of Forest Reserves in Nigeria by Geopolitical Zone (NBS, 2016)*

S/No.	Geo-political zone	Area of forest reserve (h)	Area of forest plantation(H)	% of forest plantation to reserve
1	North East	1,443,112	436,985	30.28%
2	North West	1,971,206	58,925	2.99%
3	North Central	2,220,291	24,990	1.13%
4	South West	1,045,653	322,942	30.88%
5	South East	51,206	16,041	31.33%
6	South South	1,227,539	197,031	16.05%

As seen from table 1 above, there exist a large area of forest reserves across the country but to a very large extent they are not utilized optimally in terms of plantation. The highest percentage area utilized stood at 31.33% in the South East whereas in the North West and North Central the utilization is 2.99% and 1.13% in respective order. This is to say; the forestry subsector has suffered serious neglect and from a lot of deforestation activities. The lost incurred by Nigeria to deforestation is estimated to be N180 Billion annually (Eboh, 2005 in Oriola, 2009).

3 Materials and Methods

3.1 Data Source and Variables Description

The time series deployed for this work is from the World Development Indicators courtesy of the World Bank (2018). The data range from 1980-2016. Real Gross Domestic Product (RGDP) is the dependent variable used in estimating the level of growth of the economy whereas the monetary value of the crop production, poultry, fishery and forestry subsectors are the independent variables used to measure the contribution of each of the subsectors to nominal GDP towards the economic advancement of Nigeria during the period under review.

3.2 Estimation Techniques

Most time series data analyzed in applied econometrics are found to be non-stationary. Co-integration is a technique used to estimate the relationship between these time series as well as putting their short run disequilibrium into perspective as they are reconciled in the long run (Nkoro & Kelvin, 2016). There are a number of ways in determining the long run relationship among variables such as; Granger (1981), Engle and Granger (1987), Autoregressive Distributed Lag (ARDL) co-integration technique or bound test of co-integration (Pesaran and Shin 1995 and Pesaran *et al.* 2001) and, Johansen and Juselius (1990). However, when a variable deviates from its equilibrium in the long term, this affects its short run behavior; as such, the Error Correction Mechanism (ECM) is employed to re-parameterize the short-run and long run behaviors of the underlying variables (Nkoro & Kelvin, 2016). Albeit the number of co-integration estimation techniques in analyzing relationships in economics. This study employed the Johansen and Juselius (1990) approach to co-integration. This decision is informed by the preliminary unit root test conducted in the series as the ADF and PP both show that the data sets of all the variables involved in the study are stationary only after first differencing.

3.3 Model Specification

For this work to achieve its aforementioned aim, that is, to analyze the impact of the four agriculture subsectors on the economic growth of Nigeria, the empirical model is stated as;

$$RGDP = f(\text{crop}, \text{lvstk}, \text{fish}, \text{frstry}) \quad (1)$$

However, to have the variables normally distributed, the model is again specified in a log-linear form as shown below:

$$\log RGDP = \beta_0 + \beta_1 \log CROP + \beta_2 \log LVSTK + \beta_3 \log FISH + \beta_4 \log FRSTRY + \text{ect} \quad (2)$$

Where: RGDP, CROP, LVSTK, FISH and FRSTRY represent the monetary value of Real Gross Domestic Product, Crop production, livestock production, fishery production and forestry production in respective order.

4 Results and Discussion

4.1 Stationarity Test

When conducting a Johansen Cointegration analysis, it is pertinent to ensure that the data sets are stationary after first difference. A variable is said to be stationary if its mean, variance and auto-covariance (at various lags) do not vary with time irrespective of the point at which they are measured (Oluwaseun, Adeyemi,

Evans, Oluseyi, Odunola, , Kofo, Oluwakemi, and Oluwatomi ,2013). Therefore, a test is conducted using the ADF and the Phillips-Perron methods. This is shown in table 2 below

Table 2: Stationarity Test Results

VARIABLES	ADF		PP	
	level	1 st difference	level	1 st difference
RGDP	-2.0065	-4.5455**	-1.2973	-3.6548**
Crop	-1.3095	-5.7329**	-1.3096	-5.7329**
Livestock	0.3344	-4.2222**	0.3344	-4.0790**
Fishery	-0.2916	-7.3920**	-1.5159	-3.6870**
Forestry	-0.1683	-6.0144**	-0.1162	-6.1518**

Note: ** denotes stationarity at 5%

4.2 Johansen Co-integration Test

Having established the I(1) stationarity of the variables under consideration, the next step in to test for co-integrations so as to ensure whether there is or no relationship between the variables. In co-integration test, the trace and Eigen statistic are of paramount importance. The rule of thumb here is that, to reject the null of no co-integration, both the trace and the Eigen statistics must be above the 5% critical values (Oluwaseun, et. al. 2013). Here, both of the statistics affirm the existence of co-integration between the RGDP and the four agricultural subsectors of Nigeria. Having established that the variables of interest are cointegrated, the VECM was estimated and the cointegrating and long-run estimates are presented in table 3 below.

Table 3: The Trace statistic and Max. Eigen-values

No. of CE (s)	TRACE		MAX EIGEN-VALUE	
	Statistic	5% critical Value	Statistic	5% critical value
None*	295.4319	69.8188	112.5447	33.8768
At most 1*	182.8872	47.8561	86.7837	27.5843
At most 2*	96.1035	29.7970	68.2001	21.1316
At most 3*	27.9033	15.4947	27.3935	14.2646

Notes: Trace and Max-eigen value shows that there are four co-integrating equations when considering the 5% level

* means null rejected at 95% confidence level.

Table 4: Cointegrating and long run estimates from the VECM on the impact of Nigerian Agriculture subsector on the RGDP

LNRGDP	LNCROP	LNLVSTK	LNFISH	LNFRSTRY
1.0000	0.7285	0.61588	0.2788	-0.0943
	(0.04336)	(0.1524)	(0.02721)	(0.08214)
	[16.7910]	[4.0389]	[10.2510]	[-1.14807]
ECT				-0.45

Note: () and [] are standard errors and t-statistics respectively.

From table 4 above, it could be deduced that the three agriculture subsectors of crop production, livestock production and fishery have made both positive and significant contributions to the economic prosperity of Nigeria. This affirms the a priori expectation. However, the forestry subsector was found to be negatively related with the RGDP during the period under study. This may not be unconnected with the fact that, tourism as an industry which is the highest beneficiary as well as the source through which the impact of the forestry subsector is channeled to the GDP is not fully harnessed and developed in Nigeria. The forest from which wood and other products are obtained have been subjected to severe encroachments, vegetation degradation and dereservation for agriculture, industrial development, urbanisation etc (FAO, 2010). According to the PWC (2017) the crop production subsector accounts for 90% of the agriculture

sector. However, it impacts when juxtaposed with that of livestock as seen in table 4 is dwarfed. This is not unconnected with the massive loss of value chain prevalent in the crop production subsector. On the flip side, the high impact level of the livestock subsector as reported in table 4 could be attributable to the ability of the sector to retain its value chain in the Nigerian economy. Another reason is that the poultry industry as a section of the livestock subsector is rapidly increasing and one of the most commercialized agricultural industry in Nigeria (Adene & Oguntade, 2006). This is because, the average costs is not only low but also guarantees higher profit in view of the fact that poultry meat and eggs tend to be more demanded by the low income earners than that of any other animal (Heise, Crisan & Theuvsen, 2015).

From our estimates, the estimated speed of adjustment from any disequilibrium in the system is found to be at 45% as reported by the Error Correction Term (ECT). Additional diagnostics were undertaken to ascertain the validity of our results. The p-values of the serial correlation LM test and that of the Jaque-Bera test are 0.3221 and 0.1979 respectively. Consequent upon this, the null hypothesis is hereby rejected and opted for the alternative that the model has no autocorrelation and its parameters are also normally distributed at 5% level of significance. Also, 0.1132 p-value of the heteroscedasticity test, affirms that the model is homoscedastic.

5 Conclusions

This study assesses the relationship between the four agriculture subsectors of crop production, livestock, fishery and forestry and the economic growth in Nigeria from 1981-2016 with the view of ascertaining their individual contributions to the real GDP so as to guide policy direction of the diversification agenda hinged on agriculture by the present administration. The study employed the Johansen approach to co-integration. A long run relationship between crop production, livestock, fishery and forestry and the GDP was established. More so, with the exception of the forestry subsector, all the other three subsectors of crop production, livestock and fishery were found to be positively related to the RGDP. The livestock subsector proves to be of more significant impact than the famous crop subsector as par their size in the industry. Sequel to the above stated findings, it is recommended that: the policy-makers should intensify efforts to retain the value chain in the crop production subsector in order to harness its potentials optimally. One sure way to do that is to encourage the establishment of agriculture cottage industries. Also, the livestock subsector as the most rapidly growing and most commercialized subsector should be the prime subsector to hinge the diversification agenda. Lastly, to resuscitate the forestry subsector, the tourism industry which is a source through which the impact of the subsector is channeled to the GDP should be improved.

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