An Empirical Analysis of the Contribution of Agricultural Sector to Nigerian Gross Domestic Product: Implications for Economic Development

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Abstract

The main focus of this study was Nigerian economy and agricultural contribution. The approach used for this research was mainly desk study, data collection from secondary origin. Internet resources were also consulted. Data available were analyzed using tools such as descriptive statistics and inferential analysis such unit root test-stationarity test, co integration regression and error correction model (ECM) were performed. Generally, the descriptive statistics shown Nigerian economy had grown over the period of 32 years and this is obvious in the wider gap between the minimum and maximum values of the GDP and agricultural output respectively. The unit root test results shows that the GDP and Agric. Output variables are stationary at level while inflation is stationary at first difference. The coefficient of R^2 was about 0.96 and the coefficient of agricultural output was found positive and statistically significant at 1% level. The coefficient of ECM (u-1) was significant at 1% level and this implies that GDP co-integrated with agricultural output and inflation.

Keywords:Economic Development, Nigerian Gross Domestic Product and Agricultural Sector

Introduction

The study of economic**s** development theories have shown evidences that agricultural revolution is cogent and fundamental pre-requisite condition for sustainable economic development (Lewis 1954). Development economists are in support of the position that agricultural sector has a very vital role in the economic development process of a nation, emphasizing that agricultural productivity is fundamental for a sustainable development strategy, (Lewis 1954, Rostow, 1960). According to Lewis, industrialization depends upon the agricultural growth and productivity with both industrial and agrarian revolutions always correlate. Moreover, agriculture plays active and major roles in the industrialization and modernization of a domestic economy. This could be traced to the interrelation and multiplicative effect between food supply and industrial activities (purchasing power, labour, capital and investment), (Mellor (1979). Also, Abayomi (1992) observed that increasing agricultural productivity has been most important for successful industrialization.

Generally, there are positive relationship between agriculture and industrialization. Agricultural sector influences the economic growth process; increases the supply of food and fiber for domestic consumption, supply excess farm human resources to the industrial sector. Agricultural sector generate foreign exchanges through exports, increasing domestic saving and rural purchasing power, (Poonyth et al, 2001)

Nigerian economy in the 1960s, agriculture contributed over 80 percent of the export earnings and employment; about 65 percent of the GDP (gross domestic product) and about 50 percent of the government revenue, despite the dependence of most of Nigerian farmers on traditional tools and indigenous farming methods (Federal Republic of Nigeria 2000, Lawal, 1997:195). This contribution to the Nigerian economic growth has however declined over the years. The contribution of agriculture to the GDP was about 50% in 1970 and 34% in 2003, (CBN 2003) and currently lesser than 34%. This disparity is significant and underrates the important role agricultural sector played in the past which petroleum sector has replaced. At present, agriculture sector accounts for less than 30 percent of the GDP, (World Bank 2014). Although agriculture no longer serves as the leading contributor to Nigeria's gross national product and leading foreign exchange earner due to phenomenal growth in the petroleum sector of the economy as (Ingawa 1979) observed, agriculture is still the dominant economic activity in terms of employment and linkages with the rest of the economy (NNPC 2004).

Moreover, from theoretical point of view and under ideal condition, it is expected that any nation experiencing rapid economical growth and development, the percentage of the contribution of agricultural sector would be reducing while food importation at the same time reducing. Is this theory applicable to Nigeria economy situation where there has been continuous rising food import bill leading to the persistent huge deficit in the balance of payments over the years (Ugwu, 2007)?

Some development economists attempted to point out that this reduction in agriculture's GDP share is partly the result of post-farm gate activities (series of value-chain activities) while agriculture's share fell relative to industry and services sectors, but it grew in absolute terms, evolving increasingly complex linkages to non-

agricultural sectors. (Kuznets 1968; Kalecki 1971; Adelman 1984; Ranis 1984; and Vogel 1994) highlighted the interdependence between agricultural and industrial development and the potential for agriculture to stimulate industrialization.

RESEARCH METHODOLOGY
Study area
This study mainly focuses Nigerian economy and agricultural contribution. Nigeria is endowed with an area of 923,769 km2 and a population of over 168.8 million people (2006, NPC). It is surrounded on the West by the Republic of Benin and the Republic of Niger; on the East by the Republic of Cameroon; on the North by Niger and Chad Republic's and on the South by the Gulf of Guinea. The climate is equatorial and semi-equatorial. There are two seasons; the wet and dry season and agriculture production mostly depends on natural rainfall and is a major employer of labour, and the mainstay of the Nigerian economy besides her dependence on oil.
Data collection
The approach used for this research was mainly desk study, data collection from secondary origin. Internet resources were also consulted. This also involved the collection of time series data on gross domestic product (GDP) and output of agricultural products and inflation rates. The study focused on data/information available on world bank website (world development indicators: Nigerian world bank data information, official government statistics released 6 April, 2014).The time series data used for this study covered period from 1982 to 2013 when the data for the variables used were balanced.
Data analysis
In this study, data available were analyzed using tools such as descriptive statistics - time series graphs to study the trend of growth of the included variables, mean, median, standard deviation e.t.c. Also, inferential analysis such unit root test- stationarity test, co integration regression and error correction model (ECM) were performed.
Model Specification
Unit Roots Test
 The usage of ordinary least squares (OLS) methodology on time series data usually requires that the data be stationary to avoid the problem of spurious regression, Noula (2013). According *Damodar* (2004), a variable is said to be stationary if it's mean, variance and auto covariance remains constant no matter at what point we measure them. A process is said to be stationary when it has a constant and time independent mean, a finite and time independent variance, and the covariance between successive terms is time independent. A series is therefore stationary if it is the outcome of a stationary process. The most common example of a stationary series is the white noise which has a mean of zero, a constant variance and a zero covariance between successive terms.
        The following decision rule is used;
* If the ADF test statistic is greater than the critical value, then the series is stationary.
*If the ADF statistic is less than the critical value, the series is non-stationary.
If the series is non stationary at level form, then, the test is carried out successively on the differenced series until it becomes stationary. The order of integration is then established

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \, \Delta Y_{t-i} + \varepsilon_t$$

where ε_t is a pure white noise error term and where $\Delta Y_{t-1} = \{(Y_{t-1}) - (Y_{t-2})\}$
Co-integration Regression:
        The implicit function:
GDP = f (AgOutput, inflation)
        The explicit function:
GDP = β_o + β_1Agric. + $\beta_2$inflation
Error Correction Model (ECM)
ΔGDP = β_o + $\beta_1\Delta$Agric. + $\beta_2\Delta$inflation + ECM-1 + μ
Where:
GDP = Gross Domestic Product
Agric. = agricultural Output
β_o = Intercept
β_1 = estimation coefficient of agricultural Output
β_2 = estimation coefficient of inflation
Empirical Results
Descriptive statistics of included variables
Table 1 presents some descriptive statistics for the gross domestic product, agricultural output and inflation within the period under review. From the table, it can be observed that the average of GPD was about $106billion with

standard deviation of about \$139 while agricultural sector recorded mean of about \$29.5billion with standard deviation of \$31.5billion. The higher value of standard deviation implies that generally Nigerian economy had grown and experienced wide variation considerably over the period of 32 years and this is evident in the wider gap between the minimum and maximum values of the GDP and agricultural output respectively. The mean inflationary trend was about 20% with standard deviation of about was about 18% while the minimum and maximum inflation experienced over the period under consideration are 5.4% and 72.8% respectively.

Table 1

Parameters/variable	GDP (billion $)	AGRIC-OUTPUT(billion $)	INFLATION (%)
Mean	106.0645	29.49322	20.37891
Median	35.84657	11.88495	12.54679
Maximum	522.6379	113.5275	72.83550
Minimum	15.78900	5.117719	5.382224
Std. Dev.	139.0572	31.47668	18.55415
Skewness	1.898142	1.428967	1.518549
Kurtosis	5.352908	3.748723	3.961090
Jarque-Bera	26.59726	11.63783	13.53022
Probability	0.000002	0.002971	0.001153
sum	3394.065	943.7829	652.1250
Sum Sq. Dev.	599444.0	30714.22	10671.96

Trend of Gross Domestic Product and Agricultural Contribution in Nigeria
Figure 1a below displays the trend of the annual gross domestic product and agricultural output over the years under consideration. In the early 1980s and late 1990s, it is evident graphically that there has been high level of correlation between the Nigerian gross domestic product and agricultural output. This implies that within these periods agricultural sector contributed tremendously to the Nigerian economy. Thereafter, it is obvious from early 2000s that there have been wider gap between the two variables. These periods coincided with two events that might be responsible for the lower rate of agricultural sector to the economy. Firstly, transition from military government to civilian government (this implies the change in government and economy policies. Secondly, this period usher in era of rapid grow of information and communication technologies in Nigeria, i.e. GSM, internet. These periods, many investors might have shifted their investment base from agricultural sector to ICT, where they would have more return on capital invested.

Moreover, this research work further analyzed the growth rate of GDP and agricultural sector output in Nigeria within the period under consideration as shown in Figure 1b. Generally in the 1980s, the analysis revealed that agricultural growth rate was greater than GDP growth rate in Nigeria, but this was interrupted in early 1990s and was later restored between mid of 1990s and mid of 2000s. However, it should be noted that the marginal rate of growth in agricultural sector was at a decreasing rate when compared with the earlier level. The decline in marginal growth rate in agricultural output continues till GDP growth rate eventually exceeds agricultural sector. Overall there exist negative relationship between GDP and agricultural output as evident in correlation coefficient of -0.081. This situation calls for a serious attention for economic reasons.

From theoretical point of view it is expected that the rate (percentage) of contribution of agricultural sector to the overall economy would be reducing while food importation (food import bill) at the same time would be declining, Xinshen et al. (2007). But this theory is not applicable to Nigeria economy situation where there has been continuous rising food import bill leading to the persistent huge deficit in the balance of payments over the years (Ugwu, 2007). Also, Farm and Food, (2012) reported that Nigeria's food imports are growing at an unsustainable rate of 11% per annum. This implies negative effects on the Nigeria economy and GDP growth might not be sustainable

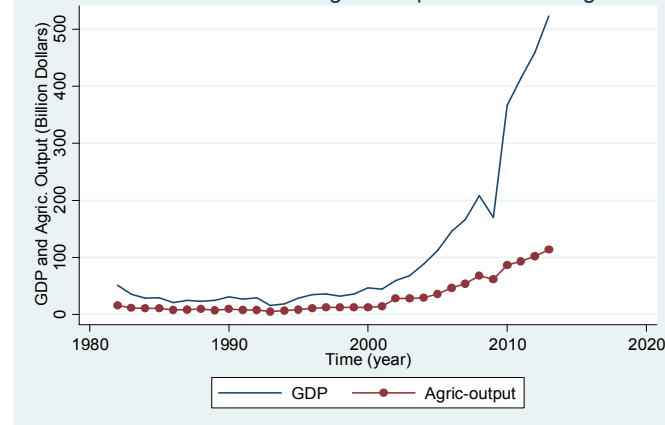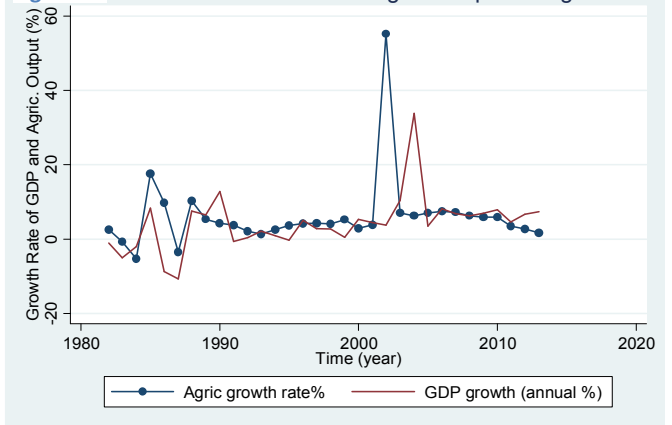Figure 1a Pattern of GDP and Agric. Output Growth in Nigeria

Figure 1a Growth Rate of GDP and Agric. Output in Nigeria

Annual Trend of Agricultural Contribution to Nigeria GDP

For better understanding of the significant contribution of Agricultural sector to the Nigerian's economy, the proportion of the contribution of Agricultural sector to the economy in percentage was considered as shown in figure 2. The analysis was generally characterized with erratic in the pattern of contribution of Agricultural sector to GDP. The variation ranges from 25% to 38% between early 1980s and late 1990s and reached the peak of about 48% during early 2000s. Thereafter, there has been persistent decline in the proportion of Agricultural sector contribution to the Nigerian economy. This implies that the growth observed in the nation's economy has been derived from other sectors, particularly, oil sector and servicing sector (information and communication technology, transportation e.t.c). This scenario might been responsible for increase in food importation bills



Figure 1 Annual Trend of Agric. Contribution to GDP (%)
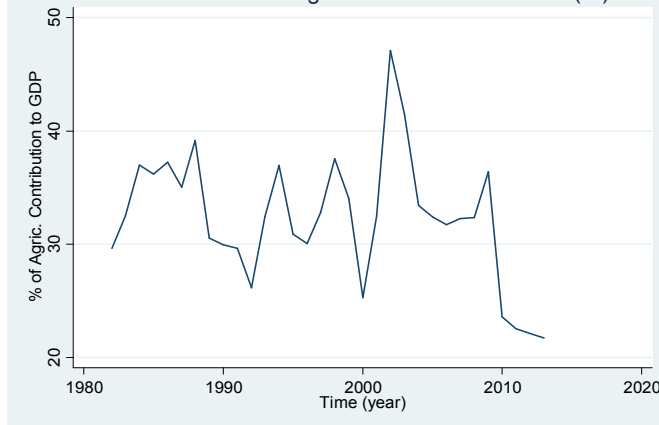
Effects of Growth in GDP and Agricultural Output on Inflation Rate in Nigeria

Generally progressive economic growth of any nation is expected to have positive influence on the citizens' standard of living either directly or indirectly. One of the economic variables that serve as measurement of the effect of growth in an economy is the general prices of the goods and service - inflation rate. For this reason, this paper further examined the associations that exist among these variables as shown in figure 3. The analysis revealed that as the GDP growth rate increases the inflation rate decreases across the period and their correlation coefficient was -0.099. This implies that a unit increase in GDP reduces inflation by 0.099 units.

However, the reverse is observed for the relationship between agricultural growth rate and inflation rate with correlation coefficient of 0.061. The implication is that increase in agricultural growth rate induces higher inflation rate. This result was against the aprior expectation. This phenomenon could be caused by; 1. Lower contribution of the agricultural sector to the overall GDP in the Nigerian economy. 2. Higher food importation bills. Generally this condition means poor standard of living.

Figure3

Effects of Growth GDP and Agric. Output on Inflation rate in Nigeria
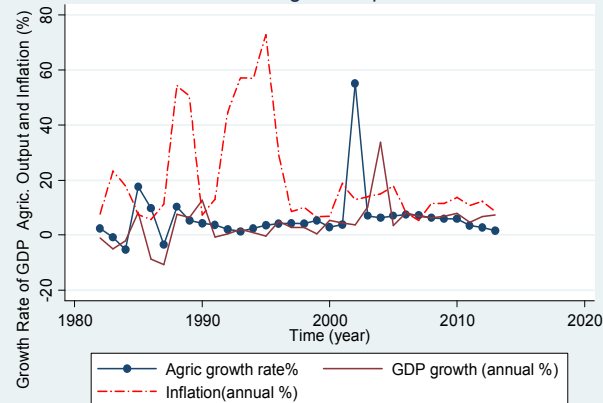
Augmented Dickey-Fuller unit root tests

The unit root test results in table 2 shows that the GDP and Agric. Output variables are stationary at level i.e. I(0) while inflation is stationary at first difference, this implies that inflation exhibits unit root at levels, but became stationary after the first differencing .i.e. Integrated of order one.

Table 2: Unit root test results

Variable	ADF statistic level form	CRITICAL VALUE	Lag length	Phillips-Perror	CRITICAL VALUE	ORDER OF INTEGRATION
GDP	5.0559	-3.6892**	3	4.6911	-3.6617**	1(0)
Agric. Output	4.3851	-3.6702**	1	5.1949	-3.6617**	1(0)
Inflation	-4.9765	-3.6702**	0	-9.0267	-3.6702**	1(1)

* = 5%, ** = 1%

Table 3 presents the regression results of this analysis. The coefficient of R^2 was about 0.96, this implies that about 96% of the included independent variables explain the variation in dependent variable in the model. The coefficient of agricultural output was found positive and statistically significant at 1% level. This shows that agricultural sector is still playing a prominent role to the economic growth of Nigerian economy, despite the fact that the sector has not been given proper attention (Okoruwa et al, 2003). Therefore, agricultural sector needs to be developed to serve as base for other sectors for full development of potential of Nigerian economy.

Table 3: Relationship between Gross Domestic Products, Agricultural output and Inflation
Dependent Variable: GDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGRIC_OUTPUT	4.576746	0.249595	18.33671	0.0000
INFLATION_ANNUAL___	0.533300	0.425303	1.253929	0.2202
C	-35.86421	15.34954	-2.336500	0.0268

R-squared	0.959252	Mean dependent var	107.8280
Adjusted R-squared	0.956341	S.D. dependent var	140.9916
S.E. of regression	29.45975	Sum squared resid	24300.56
Durbin-Watson stat	0.546202	Long-run variance	1644.582

Error Correction Model

The outstanding feature of this model is the well-defined error correction model (ECM). There coefficients of ECM (u-1) was significant at 1% level with a feedback effect of about 32%. The strong significance of the coefficient on the ECM supports the conclusion that GDP cointegrated with agricultural output and inflation. The rate of adjustment is also almost instantaneous,

Dependent Variable: D(GDP)
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.217800	3.501344	-0.347809	0.7307
D(AGRIC_OUTPUT)	5.730038	0.504651	11.35446	0.0000
D(INFLATION_ANNUAL___)	0.160772	0.192869	0.833582	0.4118
U-1	0.319824	0.115607	2.766469	0.0101

R-squared	0.827887	Mean dependent var		15.20130
Adjusted R-squared	0.808764	S.D. dependent var		39.54064
S.E. of regression	17.29135	Akaike info criterion		8.658204
Sum squared resid	8072.749	Schwarz criterion		8.843234
Log likelihood	-130.2022	Hannan-Quinn criter.		8.718519
F-statistic	43.29132	Durbin-Watson stat		1.594146
Prob(F-statistic)	0.000000			

References

Abayomi YO (1992): "The agricultural sector in Nigeria; the way forward" Central Bank of Nigeria Bullion, Lagos, 21(3):11-24. 1992.

Adelman, I. (1984): 'Beyond export-led growth' World Development, 129, 937-49.

Central Bank of Nigeria (2003): Statistical Bulletin Central Bank of Nigeria. 2003

Chigbu UE (2005): Agriculture as the only saviour to Nigeria dyeing economy retrieved on12[th] July 2005 from http://www.nigerianvillagesquare.com/articles/guest/2005/03/agric-as-only-saviour-to.html

Damodar N. Gujarati (2004): Basic Econometrics, Fourth Edition, The McGraw−Hill Companies, 2004

Farm and food (2012): An Appraisal of the implementation of growth enhancement scheme; National Association of Nigerian Traders – NANTS, volume, issue 4.

Federal Republic of Nigeria: Obasanjo's Economic Direction 1995-2003. Office of the Honourable Minister for Economic Matters, Abuja, Nigeria.2000

Ingawa SA (1979): Socioeconomic study of three villages in Bauchi State, Nigeria (with emphasis on labour utilization), M.Sc. Plan B Paper, Department of Agricultural Economics, Michigan state University.

Kalecki, M. (1971), Selected Essays on the Dynamics of the Capitalist Economy 1933-1970. London: Cambridge University Press.

Kuznets, S. (1968). Toward a Theory of Economic Growth with Reflections on the Economic growth of nations. New York: Norton.

Lawal, A.A. (1997) "The Economy and the State from the Pre-colonial Times to the Present" in Osuntokun, A. and Olukoju, A. (eds.) Nigerian Peoples and Cultures. Ibadan: Davidson.

Lewis, W. A. (1954): Economic development with unlimited supplies of labor. The Manchester School of Economics and Social Studies 22 (2): 139–191.

Mellor, J.W. (1979): New economies of growth. Cornell University Press, Ithaca, New York.

National Population Census (2006): www.nigerianstat.gov.ng

conNigerian National planning Commission (2004): Meeting Everyone's Needs- National Economic Empowerment and Development Strategy Nigerian National Planning Commission, Abuja, 2004

Noula Armand Gilbert, Sama Gustave Linyong , Gwah Munchunga Divine (2013): Impact of Agricultural Export on Economic Growth in Cameroon: Case of Banana, Coffee and Cocoa. International Journal of Business and Management Review Vol. 1, No.1, March 2013, pp.44-71

Poonyth, D., Hassan, R., Kirsten, J.F. and Calcaterra, M. (2001): Is Agricultural sector growth a precondition for economic growth? The case of South Africa. Working paper 2001-01, Department of Agricultural Economics, Extension and Rural Development, University of Pretoria, Pretoria, 0002. South Africa.

Ranis, G. 1984. Typology in development theory: retrospective and prospects. In M. Syrquin, L.Taylor and L. Westphal, eds. Economic structure and performance: essays in honor of Hollis B. Chenery. New York, Academic Press.

Rostow, W.W. (1960). The stages of economic growth: a non communist manifesto. London: Cambridge University Press.

Ugwu DS (2007). "Agricultural Extension Practice in Nigeria." Readings in Agricultural Economics and Extension (ed.). In CJC Akubuilo, Umebali EE, Mgbada JU, Ugwu DS, Egwu WE, Awoke MU.

Ukeje EU(2005): Modernizing small holder agriculture to ensure food security and Gender empowerment: Issues

and policy retrieved from http://www.g24.org/ukeje.pdf on June 20th, 2005

Vogel S. 1994. 'Structural changes in agriculture: production linkages and agricultural demand-led industrialization. Oxford Economic Papers, 1, 136-157.

Xinshen Diao, Peter Hazell, Danielle Resnick and James Thurlow (2007): The Role of Agriculture in Development; Implications for Sub-Saharan Africa. Research report / International Food Policy Research Institute; 153.