MACROECONOMIC POLICY VARIABLES AND NIGERIA'S AGRICULTURAL OUTPUT 1980 TO 2011

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Abstract

The study examined the effect of agricultural policy variables on Nigeria's agricultural output for the period 1981 to 2011. Data used were the annual aggregate output of agriculture at 1990 constant basic prices, Federal Government of Nigeria (FGN) recurrent and capital expenditure on agriculture, cultivated land area, value of non-oil export, value oil export, domestic lending rate and foreign exchange rate. The data were obtained from the Central Bank of Nigeria (CBN, 2012). Four policy regimes were identified and data were analyzed by the use of descriptive statistics and analysis of covariance (ANCOVA). Part findings were that: the differential intercept coefficients were significant in all three policy regimes, relative to the benchmark period, indicating significant increases in agricultural output over the year; hectarage cultivated and export of crude oil had significant positive effect on agricultural output; FGN capital expenditure on agriculture, export of non-oil and effective exchange rate have no significant effect on agricultural output. We concluded that although agricultural output is on the upward trend, not all agricultural policy variables are supportive of the trend. It is therefore recommended that proper review/identification of agricultural policy variables and that effective management of the same be carried out to facilitate the realization of the desired performance level.

Key words: *Policy regime, policy variable, differential intercept coefficient, agricultural output.*

Introduction

Agricultural development as an integral part of national development is generally believed to propel economic growth. According to Panwal and Patrobas (2011), agriculture is fundamental to the sustenance of life and it is the bedrock of economic development. Agriculture accounts for about 40% of Nigeria's GDP and employs over 60% of the active population (CBN, 2012). Nigeria has the potential to become a major player in the global economy, especially in Africa, given her rich agricultural resource endowment. However, the growth rate of the sector has failed to keep pace with the needs of the rapidly growing population. Manyoung *et al* (2005) observed that the agricultural sector has been growing at a very slow rate and that less than 50% of the country's cultivable land is being cultivated. The effect of this on the economy is increased incidence of and severity of poverty and rising import bills on food and industrial raw materials (Ugwu and Kanu, 2012). In response to the dwindling performance of the sector, successive governments have, over the years, initiated numerous policies and programmes aimed at restoring agriculture to its pride of place in the Nigerian economy. The question however remains as to how effective these policies were in bringing about the desired growth and development of the sector? The objective of this study is to determine the effectiveness of agricultural policies on agricultural output over the years, given the hypothesis that government

policies, as indicated by the various policy variables, have no significant effect on agricultural output.

Review of Agricultural Policies

Four policy regimes were identified for the purpose of this study on the basis of political administration. These are: (A) 1981 To 1985 (B) 1986-1998 (C) 1999-2006 And (D) 2007-2011.

The 1981-1985 Pre-SAP Period

This period was characterized by direct government participation in agriculture and the extensive use of policies that affected both the price and non-price incentive structures of the sector (Ileso, 2000**)**. This era witnessed enormous financial investment in agricultural programs, policies, projects and institutions (Ugwu and Kanu, 2012). Agricultural policies during this period were largely designed to facilitate agricultural marketing, reduce agricultural costs and enhance agricultural product prices as incentives for increased agricultural production (Manyoung *et al.,* 2005). Six national commodity boards were establishment: one for each of Cocoa, Groundnut, Palm produce, Cotton, Rubber and Food Grains; 11 River Basin Development Authorities (RBDAs) were established with the responsibility of developing the country's land and water resources; fertilizer procurement and distribution was centralized and National Network Of Agro Service Centres was created across the nation to facilitate the distribution of modern inputs and the creation of a National Seed Service (NSS). The National Accelerated Food Production Project (NAFPP) and the Agricultural Development Projects (ADPs) were expanded in this period to facilitate farmers' adoption of new technology. Varying rates of subsidy on fertilizer, improved seeds and actual cost of hiring tractor services were implemented during this period. Import duty on tractors and agricultural equipment was reduced. Macroeconomic policies were also supportive as budgetary allocation to agriculture was substantially increased and there were incentives by way of accelerated depreciation allowances on agricultural capital investment which ultimately translates to a reduction in taxable income and profits. There was tax relief on incomes from new agricultural enterprises as an incentive to investors (Manyoung *et al,* 2005).

The 1986-1998 SAP and Post-SAP Period

The Structural Adjustment Programmes (SAP) may have a known start year but this cannot be said of the end year. Key policy measures in the 1986- 1998 era were the removal of all government subsidies on food and other agricultural products and government disengagement from the procurement and distribution of agricultural inputs. Agricultural production for export was promoted for both traditional and non traditional agricultural products. Import restrictive measures on food and other locally produced agricultural based raw material were put in place. Increased budgetary allocation to agricultural development projects was, however, sustained during this period.

The 1999-2006 Period

A new agricultural policy document was launched in 2001 to replace the 1988-2000 agricultural policy (FMARD, 2001). One key aspect of the policy was that government was to play mainly supportive roles while investments in the sector were to be left to private sector initiative. The 'Presidential Initiatives On Agriculture (PIA)' which was designed to promote growth in the production, processing, marketing and utilization of the various target crops, livestock and fisheries was put in place. The National Economic Empowerment Development Strategies (NEEDS) was initiated in 2004 to facilitate the achievement of the minimum annual growth rate of 6% per annum in agriculture. Farmers had expanded access windows to agricultural credit. Agricultural research was strengthened while agricultural training was revitalized. Finally, the agricultural input supply and distribution system was reviewed to take advantage of concessional arrangement provided by the World Trade Organisation (WTO), European Union, and African, Caribbean and Pacific States Agreement (EU-ACP).

The 2007 – 2011 Period

In the main, the NEEDS policies on agriculture as highlighted under the 1999 – 2006 period subsisted during this period notwithstanding the change in government.

Materials and Methods

The study location is Nigeria country. Nigeria lies between latitude $4^{o}$and 14^{o} north of the equator and longitude 3^{o} and 15^{o} east of the Greenwich Meridian. The July 2014 projected estimate of Nigeria's human population stands at 177,155,754 persons (CIA, 2014) and a land mass of 937,052.16 km^2. The country is entirely within the tropical zone. There are two seasons; the wet and dry seasons.

The study covers the period 1981 to 2011. Data used were the annual aggregate output of agriculture and the gross domestic product (GDP) of Nigeria at 1990 constant basic prices for the period reviewed. They were obtained from the Central Bank of Nigeria (CBN) statistical bulletin, (2012). The policy variables used were such as were common to all four policy regimes under review, namely: recurrent expenditure, capital expenditure, cultivated land area, value of non-oil export, value oil export, and domestic lending rate and foreign exchange rate. They were analysed by the use of descriptive statistics and dummy variable regression with a mixture of quantitative and qualitative independent variables, that is, analysis of covariance ANCOVA (Gujarati & Porter, 2009). The policy variables were used as covariates of the dummies of policy regimes in the regression models. The policy era 1981 to 1985 was used as the benchmark period.

The explicit form of the dummy regression model is given as:

$$y = b_1 + b_2 D_2 + b_3 D_3 + b_4 D_4 + b_5 x_i + e$$

Where:

y = agricultural GDP,

D_2 =1, if policy regime is 1986 to 1998, = 0 otherwise

D_3 = 1, if policy regime is 1999 to 2006, = 0 otherwise

D_4 = 1, if policy regime is 2007to 2011, = 0 otherwise.

x_i = policy variables in regime progression.

e = error term.

The *A Priori* expectations were that agricultural output will correlate positively with recurrent and capital expenditures, cultivated land area, volume and price of non-oil export and negatively with lending rate. All things being equal, exchange rate will have a positive correlation with agricultural output assuming an elastic supply of agricultural output. We hypothesize that the policy indicators under review do not have significant effect on agricultural output in the different policy era reviewed.

Results and Discussion

Trend In Agricultural Output

The contributions of agriculture to GDP ranged from 33.63 % in 1981 to 39.20 % in 2012 (CBN, 2012). Figure 1 shows that increases in agriculture GDP kept pace with increases in national GDP until about year 2000 when a sharp rise in Nigeria's GDP was not matched by a similar growth in agricultural contribution to national GDP. The gap kept widening throughout the period under review. The sectoral growth could be attributed to the joint effect of all the policy variables. In what follows we attempted to identify the effect of each policy variable on agricultural output, negative or positive, and the magnitude of the coefficient of the respective policy variables.

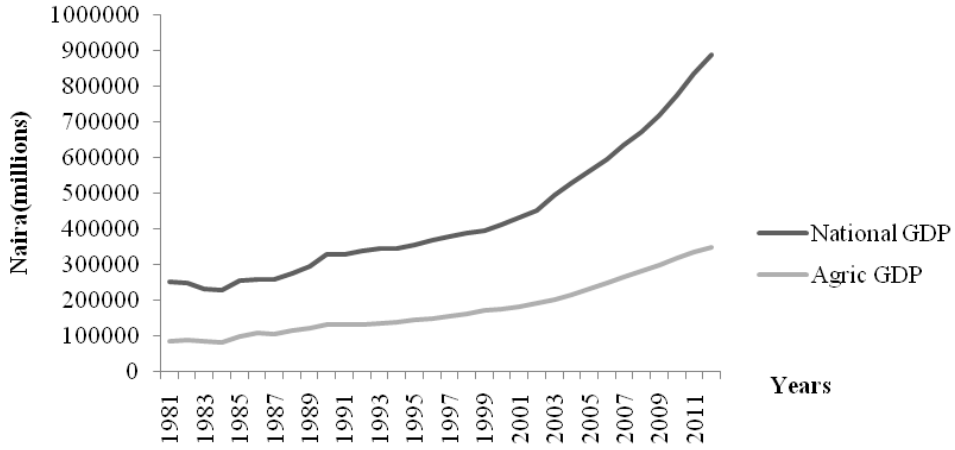

Fig 1. Trends in National GDP and Agricultural Sector GDP

Effect of recurrent expenditure on Agricultural output

Table 1 shows that all the differential intercept coefficients were positive and statistically significant (p = 0.01), that is, significantly different from the benchmark intercept which was ₦86,796.54. (R^2 = 0.92, F 77.10 p = .00). Further, that the differential intercepts show growth in the sector during the tenure of the successive governments. Federal government recurrent expenditure, which was the covariate in this model, affected agricultural output negatively, though not statistically significant.

Table 1: Agricultural GDP in Relation to Policy Regime and Recurrent Expenditure

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	86796.535	9752.470		8.900	.000
	D2	45779.031	11480.739	.316	3.987	.000
	D3	118587.739	13883.908	.725	8.541	.000
	D4	219951.917	19003.681	1.130	11.574	.000
	FGN recurrent expenditure on agric	-.178	.367	-.042	-.486	.631

a. Dependent Variable: Agric GDP at 1990 constant basic prices(Million Naira)

R^2 0.92, F 77.01, P = .00

A unit increase in recurrent expenditure could result in a 0.18 unit decrease in agricultural output. The result may be traced to the large proportion of funds allocated to agriculture which fails to reach the farmers by way of farmers' inputs like fertilizer and improved seeds but misappropriated in administration. It was in this regard that Oziengbe (2013) observed that government recurrent expenditure has been inefficient and that excess of it has a depressing

effect on the Nigerian economy. The need for prudence in budgetary management of recurrent expenditure is therefore indicated.

Effect of capital expenditure on Agricultural output

Table 2 shows the regression result of the dummies on agricultural GDP controlling for capital expenditure on agriculture by the Federal Government of Nigeria (FGN). The differential coefficient for D_4 was deleted from further analysis by the SPSS computer software for reason of having a "missing correlation".

Table 2: Agricultural GDP in Relation to Policy Regime and Capital Expenditure

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	86438.130	8829.904		9.789	.000
	D2	44862.938	10397.671	.488	4.315	.000
	D3	102568.263	13966.912	1.030	7.344	.000
	FGN Capital expenditure	.420	.267	.182	1.573	.130

a. Dependent Variable: Agric GDP at 1990 constant basic prices(Million Naira)

R-Squared 0.84, F = 39.62 P = 0.00

The differential coefficients of D_2 and D_3 were, however, statistically significant ($P< 0.01$). The model has an R^2 of 0.84; F = 39.62 at $P <0.01$. The Table 2 shows that capital expenditure does not have a significant positive effect on agricultural output. Federal government capital expenditure in agriculture is an indirectly productive investment. It can be a proxy for agricultural technology (Onyebinama, 2012). Increased capital expenditure such as provision of adequate electricity, water supply, and motorable roads is expected to act as incentives for farmers to invest in agriculture and thereby raise output. Ekpo (1995) determined the influence of different categories of public expenditure on private investment. One of his findings was that social services crowd in private investment while expenditure in real activities like manufacturing and construction crowd out private investment. That federal government capital expenditure failed to bring about significant increase in agricultural output is therefore worrisome and may raise the question as to the proper appropriation of the expenditure.

Effect of cultivated hectarage on Agricultural output

The hectarage cultivated was positively and significantly related to agricultural GDP (Table 3). The benchmark coefficient for land was negative (-385554.46) but not statistically significant ($P >0.05$).

Table 3 Agricultural GDP in Relation to Policy Regime and Cultivated land hectarage

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-385554.462	194250.168		-1.985	.058
	D2	37895.865	10875.587	.261	3.484	.002
	D3	93396.791	14494.078	.571	6.444	.000
	D4	176120.042	19832.515	.905	8.880	.000
	Cultivated area (ha)	6.680	2.744	.211	2.434	.022

a. Dependent Variable: Agric GDP at 1990 constant basic prices(Million Naira)

R-Squared 0.936, F = 95.11, P = 0.00

The various agricultural land use promotion programmes like the Agricultural Development Projects of the late 1970s and the River Basin Development Authorities could be said to have significant positive effect on land use and output as indicated by the differential coefficient of D_2 and D_3. Thus, increases in land area cultivated by one unit brings about 6.68 unit increase in agricultural output (p = 0.02). It should be noted that the land mass available for agriculture in any country is not infinitely expandable; more so as emerging nations sustain increases in agricultural output through technological innovation and not physical farm land expansion (Isiorhovoja, Wategire, & Idoge 2007).

Effect of non-oil export on Agricultural output

Table 4 shows that non-oil export does not have a statistically significant effect on agricultural output in the periods under review. If agriculture were to be a major component of non-oil export, changes in the export of the commodities involved would be expected to have a significant effect on agricultural GDP. Alternatively and more plausible, if returns from non-oil export were effectively channelled into agricultural production, non-oil export coefficient would not only have a higher magnitude but would also be significant in bringing about growth in the sector. What this might indicate is the need to close the seeming gap between agriculture and export of non-oil and to effectively plough back returns from non-oil export in to agriculture. The model was, however, of a good fit (R2 =0.93; F = 82.01 and P = 0.00).

Effect of oil export on Agricultural output

Crude oil export has a statistically significant positive effect on agricultural output (P =.00) (Table 5). The coefficient of 0.013 is however low. The differential intercept coefficients were significant for all three policy regimes but were low compared to results from other policy variables. The non-integration of the petroleum industry with the agricultural sector might be indicated here.

Effect of lending rate on Agricultural output

Lending rate has the *a priori* expectation of a negative effect on agricultural output. This is confirmed by the empirical result in Table 7 (Beta = - 362.353; P = 0.745) though not statistically significant. An increase in lending rate, which of course means increase in cost of capital, discourages investment in agriculture and for that reason reduces output. Notwithstanding the not statistically significant effect of lending rate on agriculture, the need to properly manage this policy variable for agricultural development cannot be over emphasized. The Agricultural Credit Guarantee Scheme (ACGS) is about the only institutional credit source to farmers that as a matter of policy gives loans to farmers at single digit interest rate. The total number and value of loans to farmers under this scheme have been declining since 2008 (Isiorhovja, 2013), if alternative institutional credit sources are not properly identified and managed by way of interest rate manipulation and incentives, the poor resource base and credit starved farmers may further contract agricultural output.

Table 4: Agricultural GDP in Relation to Policy Regime and Non-oil Export

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	86760.923	9472.969		9.159	.000
	D2	44529.600	11175.894	.307	3.984	.000
	D3	107678.543	13430.267	.658	8.018	.000
	D4	188929.415	22715.330	.971	8.317	.000
	Export of non-oil	.103	.077	.139	1.345	.190

a. Dependent Variable: Agric GDP at 1990 constant basic prices(Million Naira)

R2 = 0.93, F = 82.01, P = 0.00

Effect of foreign exchange rate on Agricultural output

Table 7 shows that all the differential coefficients of agricultural output under the different policy regimes controlling for effective exchange rate were significantly different from the benchmark figure (p = .01). Exchange rate, however, has no significant effect on agricultural GDP (P = 0.127). This might be a corroboration of Obayelu & Salau (2010) finding that the international exchange rate elasticity of supply of Nigeria's agriculture is low.

Table 5 Agricultural GDP in Relation to Policy Regime and oil Export

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	86677.207	5452.662		15.896	.000
	D2	40749.375	6447.855	.281	6.320	.000
	D3	72053.586	9001.077	.440	8.005	.000
	D4	89567.707	18027.601	.460	4.968	.000
	Export of oil	.013	.002	.648	7.611	.000

a. Dependent Variable: Agric GDP at 1990 constant basic prices(Million Naira)

R-Squared 0.98, F = 260.64, P = 0.00

Table 6: Agricultural GDP in Relation to Policy Regime and Lending Rate

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	90399.212	14705.111		6.147	.000
	D2	49190.570	15846.334	.339	3.104	.005
	D3	119111.818	16462.004	.728	7.236	.000
	D4	216183.205	15918.419	1.111	13.581	.000
	Lending rate	-362.353	1103.976	-.025	-.328	.745

a. Dependent Variable: Agric GDP at 1990 constant basic prices(Million Naira)

R-Squared 0.92, F = 76.60, P = 0.00

Table 7: Agricultural GDP in Relation to Policy Regime and Effective Exchange Rate

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	59624.444	19595.897		3.043	.005
	D2	70564.881	19268.222	.486	3.662	.001
	D3	124313.357	13150.803	.760	9.453	.000
	D4	215595.023	13295.908	1.108	16.215	.000
	Effective exchange rate	250.086	158.474	.169	1.578	.127

a. Dependent Variable: Agric GDP at 1990 constant basic prices(Million Naira)

R-Squared 0.93, F = 84.18, P = 0.00

Conclusion

There has been significant growth in Nigeria's agriculture across policy regimes over the years. Only land area cultivated and crude oil export, however, had any significant effect on agricultural output. There is, therefore, apparent need for a proper review and identification of policy variables and for effective management of the same to enable the sector to attain the desired growth in the economy. In addition the loopholes that allow for the misappropriation of public funds need to be address with the urgency it deserves to ensure proper utilization of public funds.

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