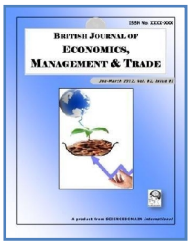

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# Does Real Effective Exchange Rate Matters for Agricultural Output in Nigeria? A Cointegration Approach

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***Authors' contributions***

*This work was carried out in collaboration between both authors. Author VEO did the literature search and statistical analysis and the author DOO did the introduction. Both authors read and approved the final manuscript.*

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## ABSTRACT

**Aims:** The paper empirically investigated the Real Effective Exchange Rate and agricultural productivity in Nigeria.
**Study Design:** Case study.
**Methodology**: The cointegration technique with its implied ECM was applied to estimate the data which covered the period between 1980 and 2011.
**Results:** The result shows that the Real Effective Exchange Rate has significant impact on the level of agricultural output in Nigeria. The result shows that the prices of exports and real agricultural exports have positive and significant impact on agricultural output. The result also showed a satisfactory speed of adjustment.
**Conclusion:** The study shows that the Real Effective Exchange Rate matters for agricultural output in Nigeria. The result thus recommends policy to stabilize the Real Effective Exchange Rate to facilitate improvement in agricultural output.

*Keywords: Agricultural output; Real Effective Exchange Rate; Real Agricultural exports; export prices; cointegration.*

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## 1. INTRODUCTION

One of the most significant events in Nigeria over the past decade was the devaluation of the Nigerian currency with inception of the Structural Adjustment Programme (SAP) in 1986. The major aim for SAP is to reorganize the pattern of productivity with particular focus on boosting agricultural exports. The foreign exchange reforms that facilitated depreciation of the value of the currency was expected to increase the domestic prices of agricultural exports and therefore boost domestic production.

The relative prices of imports and exports between Nigeria and other trading partners (Real Effective Exchange Rate) has significant impact on the level of agricultural output. The Real Exchange Rate also has impact on agricultural incentives that could overwhelm those from sectoral policies [1]. The attempt by government to increase the external competitiveness has made the Real Effective Exchange Rate (REER) policies, a critical determinant of the performance of the economy in general and agricultural productivity in particular. The real exchange rate's level, relative to an equilibrium real exchange rate level, and its stability have been shown to importantly influence export growth, consumption, resource allocation, employment and private investments [2]. Because of this important role the REER plays in the economy, emerging economies, in particular, are encouraged to conduct their policies so as to get this macroeconomic relative price right. The 'right' REER is one that does not stray too far from its equilibrium value. Since independence Nigeria has experienced poor economic performance attributed to external as well as domestic factors, mostly due to policy failures. A major focus of the liberalization of the exchange rate was as an engine for agricultural development. This is because changes in the REER throw all commodity market, including agricultural sector out of equilibrium. This could lead to changes in domestics agricultural production, consumption, exports, imports as well as the supply and demand of foreign exchange.

The liberalization policy, including that of exchange rate seems to have stimulated economic growth, but this has also put pressure on the agricultural sector in Nigeria. Thus, Nigerian farmers are finding it difficult to compete with farmers from other parts of the world. In the last few years, the agricultural sector has not performed up to expectations, due to several years of low level of international competitiveness measured by the REER. This low level of international competitiveness provided little room for agricultural sector in Nigeria to compete internationally with foreign agricultural produce. The appreciation of the REER was responsible for this. Thus, low agricultural productivity implies reduced income and unemployment since the agricultural sector generates most of the country's employment. This low level of agricultural productivity in Nigeria is one of the reasons why Nigeria still hosts one of the highest poverty rate in the world. This instability of the REER has been responsible for the low level of agricultural output. The objective of this study is thus to empirically assess the implications of changes in the REER on agricultural output in Nigeria. This is significant since the agricultural sector plays a vital role in the economic development of Nigeria. The agricultural sector contributes to the Gross Domestic Product and employs about 86 percent of the rural householders in the country [3] and [4]. This paper thus explores possible impact of REER on agricultural output in Nigeria. Other than this introductory section, the paper is divided into the following section, the rest of the paper is divided into three sections. The second section is on the literature review while the third section is on the statistical procedure. The fourth section is on results and findings and the fifth section concludes this paper.

## 2. LITERATURE REVIEW

There is increasing literature on the response of agricultural output to exchange rate. In the last few years, agricultural producers are observed to be more sensitive and interested in the role of exchange rate in commodity prices [5]. The issue of whether exchange rate movements have effects on agricultural productivity has attracted significant attention in the literature. The issue was brought into international focus by the introduction of the SAP in Nigeria with the liberalization of the exchange rate.

Economists have long recognized the significance of exchange rates influence on trade [6]. Rapidly expanding global economy and constantly changing international trade laws and technology has increased the relevance of REER in the valuing of farm products and agricultural equipment. The shift to a market determined exchange rates was of great importance because of the emergence of a well-integrated capital markets [6]. Changes in monetary policy induced international capital flows which in turn resulted to changes in the value of the US currency. These changes in the value of the US dollar had an impact on the level of imports and exports of agricultural products. Agriculture, thus bear the result of the changes in monetary and fiscal policies. [7] noted that the process of reviving price support policy to accommodate a strong US dollar occurred about the time that the dollar depreciated. This devaluation as noted by [7] restored U.S exports, decreased excess shocks and contributed to allowing the easing of acreage supply controls, which was good for agriculture. Exchange rate changes create a difference in foreign and domestic prices of a single good and monetary shocks have non-neutral effects that explain some of the differences in agricultural prices. Macroeconomic conditions often play a large role in domestic agricultural policies and therefore a role in world market competitiveness and trade relations. [7] noted that such structural policy implications of exchange rate movements coupled with their direct effects on markets are likely why exchange rates are important to agriculture. [8] investigated the role of exchange rate in the United States corn exports. Using the cointegration technique, they found no long run relationship among exchange rate, price, sales and export of United States Corn. The impact of exchange rate movements and tariff rate reduction on disaggregated import prices was the focus of [9] empirical investigation. Using the Error Correction Mechanism (ECM), the study showed that in the short run, exchange rate exhibits positive and more than complete pass-through to significant import prices of consumer and capital goods. [10] studied the impact of Real Exchange Rate on the demand for Kenya's exports. Bounds testing and the Autoregressive Distributed Lag (ARDL) approaches as well as the ECM were used. The result showed that the RER has positive effects on Kenya's exports in the short run. However, the effects were insignificant. [11] empirically studied exchange rate volatility and export trade in Nigeria. He used the cointegration technique with data covering the period between 1970 and 2007. the result showed a stable long run equilibrium relationship among the fundamental variables. [12] investigated the impact of exchange rate reforms on Sudan's economy. Their study revealed that depreciation of exchange rate improved the Gross Domestic Product, due to improvement in the balance of trade, regardless of deterioration in total absorption level and also that agricultural exports benefit more from depreciation than the industrial sector. They also found that appreciation resulted in deterioration of Gross Domestic Product and improvement of private consumption. [13] assessed agricultural response to prices and exchange rate in Nigeria. They applied the cointegration and Vector Error Correction (VEC) methodology. The result showed that food and export prices as well as the RER jointly explained 57 percent of the variation in agricultural output in the short run and 87 percent variation in the long run. The study further showed that food crop prices and exchange rate are passed on immediately to agricultural output. [14] investigated agricultural productivity

and macroeconomic variable fluctuation in Nigeria. Using cointegration technique and ECM, the result showed that industry capacity utilization rate and nominal exchange rate have positive impact on agricultural productivity in both the short run and long run. Lots of studies have been carried out on the impact of exchange rate on trade and only few on the impact of exchange rate on agricultural productivity in Nigeria. However, no study have been carried out on the impact of the REER on agricultural productivity in Nigeria. This is the gap this study intends to fill. This study also employed modern econometric technique and covered a wider scope which covers the behaviour of REER and agricultural productivity in the Pre-SAP, SAP and post-SAP periods.

## 3. MATERIALS AND METHODS

The conventional approach to time-series econometrics is based on the implicit assumption of stationarity of time-series data. A recent development in time-series econometrics has cast serious doubt on the conventional time-series assumptions. There is substantial evidence in the recent literature to suggest that many macroeconomic time series may possess unit roots. That is, they are non-stationary processes. A time-series integrated of order zero I(0), is level stationary, while a time-series integrated of order one, I(1), is stationary in first difference. Most commonly, series are found to be integrated of order one, or I(1). The implication of some systematic movements of integrated variables in the estimation process may yield spurious results. In the case of a small sample study, the risk of spurious regression is extremely high. In the presence of I(1) or higher order integrated variables, the conventional t-test of the regression coefficients generated by conventional OLS procedure is highly misleading [15].

Resolving these problems requires transforming an integrated series into a stationary series by successive differencing of the series depending on the order of integration [16]. However, [17,18] and [19] have argued that the differencing process loses valuable long run information in data, especially in the specification of dynamic models. If some, or all, of the variables of a model are of the same order of integration, following the Engle-Granger theorem, the series are cointegrated and the appropriate procedure to estimate the model will be an error correction specification. [20] supported this view, arguing that error correction formulation minimizes the possibilities of spurious relationships being estimated as it retains level information in a non-integrated form [20]. [19] proposed a general autoregressive distributed lag model with a lagged dependent variable, which is known as the 'error-correction' term. [19] also advocated the process of adding lagged dependent and independent variables up to the point where residual whiteness is ensured in a dynamic specification. Therefore, error correction models avoid the spurious regression relationships.

To guard against the possibility of estimating spurious relationships in the presence of some non-stationary variables, estimation is performed using a general-to-specific Hendry-type error correction modelling (ECM) procedure. This procedure begins with an over-parameterised autoregressive distributed lag (ADL) specification of an appropriate lag. The consideration of the available degrees of freedom and type of data determine the decision on lag length. With annual data, one or two lags would be long enough, while with quarterly data a maximum lag of four can be taken. Under this ECM procedure, the long run relationship is embedded within the dynamic specification.

Based on this theoretical background and on data availability, this study estimates the following relationship:

$AGDP = b_0 + b_1 REER + b_2 RAEXP + b_3 PEXP + Ut$

Where:

AGDP = Agricultural Gross Domestic Product

REER = Real Effective Exchange Rate which is the Nominal Effective Exchange Rate (trade wieighted) deflated by price level differentials

RAEXP = Real Agricultural export, which is the nominal value of agricultural exports deflated by Gross Domestic Product

PEXP = Price of exports denominated in foreign currency. Export prices are equivalent to producer prices paid top producers and quoted by the Central Bank of Nigeria Annual Reports

## 3.1 Data Sources

Annual data from 1980 to 2011 were used for this study. Data on exports, Agricultural Gross Domestic Product and REER were obtained from the Central Bank of Nigeria Statistical Bulletin, Economic and Financial Review, Annual Reports and Statement of Accounts and various issues of the World Bank indicators for Nigeria. Authors also computed some of the data. The data are shown in Table A below:

**Table A. Summary of major macroeconomic indicators**

| Years | AGDP | PEXP | RAEXP | REER |
|---|---|---|---|---|
| 1980 | 3658 | 58 | 1.6860823305 | 548.81 |
| 1981 | 7639 | 88 | 0.0108764572 | 332.54 |
| 1982 | 6838 | 86 | 0.2134998750 | 369.15 |
| 1983 | 7402 | 90 | 0.2778172910 | 378.3 |
| 1984 | 6713 | 65 | 0.2011113328 | 447.88 |
| 1985 | 6034 | 64 | 0.1342312046 | 619.32 |
| 1986 | 65023 | 56 | 0.1060425336 | 555.41 |
| 1987 | 84428 | 88 | 0.1278522567 | 303.26 |
| 1988 | 122074 | 113 | 0.1066660457 | 96.66 |
| 1989 | 85284 | 100 | 0.0601681126 | 97.14 |
| 1990 | 80979 | 151 | 0.1338184750 | 86.51 |
| 1991 | 96784 | 406 | 0.1062806951 | 79.86 |
| 1992 | 106676 | 456 | 0.1762569772 | 69.28 |
| 1993 | 102760 | 577 | 0.2001947752 | 57.47 |
| 1994 | 113498 | 646 | 0.0172639705 | 62.97 |
| 1995 | 119487 | 568 | 0.2237939055 | 116.69 |
| 1996 | 124674 | 918 | 0.1105822042 | 98.93 |
| 1997 | 129607 | 1247 | 0.0074037290 | 121.73 |
| 1998 | 132699 | 1519 | 0.3310401036 | 138.73 |
| 1999 | 121886 | 5227 | 4.7489195806 | 157.83 |
| 2000 | 138754 | 5866.3 | 0.3796160631 | 79.53 |
| 2001 | 143707 | 6083.5 | 0.0156666315 | 80.5 |
| 2002 | 149513 | 6940.6 | 0.2475038337 | 89.48 |
| 2003 | 155935 | 5277 | 0.2778927140 | 89.35 |
| 2004 | 162249 | 4099.7 | 0.2167949156 | 84.51 |
| 2005 | 170815 | 5640.8 | 0.1450274557 | 86.69 |
| 2006 | 127875 | 9884.6 | 0.2060831131 | 100 |
| 2007 | 182661 | 9442.8 | 2.4273432614 | 107.22 |
| 2008 | 190133 | 8261 | 3.0094873885 | 105.15 |
| 2009 | 203410 | 7881.9 | 3.2871915894 | 116.58 |
| 2010 | 216209 | 7563.8 | 3.2486913929 | 124.9 |
| 2011 | 231464 | 8456.21 | 2.9279516032 | 128.43 |

## 4. RESULTS AND DISCUSSIONS

The result of the Augmented Dickey Fuller (ADF) and Philip Perron (PP) unit root test results are shown in Table 1 below:

**Table 1. Summary of ADF and PP unit root tests results**

| | ADF | | | PP | | |
|---|---|---|---|---|---|---|
| **Variables** | **Level data** | **1st diff** | **Order of Integration** | **Level data** | **1st diff** | **Order** |
| AGDP | 2.20 | 5.71* | I(1) | 1.54 | 4.23* | I(1) |
| REER | -2.24 | -3.95* | I(1) | -2.39 | -3.81 | I(1) |
| RAEXP | -5.72* | -2.60 | I(0) | -5.70* | -14.76 | I(0) |
| PEXP | -0.39 | -3.82* | I(1) | -0.38 | -4.56* | I(1) |

*NB: * indicates statistical significance at the 1 percent level*

The result of both the ADF and PP unit root test suggests that all the variables except the real agricultural exports were non-stationary. They however became stationary after the first difference was taken. The real agricultural exports was stationary at levels probably because it is a ratio variable. Following [21] and [22], both I(1) and I(0) variables were therefore carried forward to test for cointegration. The result of the Johansen cointegration test which has the advantage amongst others of allowing for more than one cointegrating equation is shown in Table 2 below:

**Table 2. Summary of Johansen cointegration test result**

| **Hypothesized** | | **Trace** | **5 Percent** | **1 Percent** |
|---|---|---|---|---|
| **No. of CE(s)** | **Eigenvalue** | **Statistic** | **Critical Value** | **Critical Value** |
| None ** | 0.760589 | 63.10945 | 47.21 | 54.46 |
| At most 1 | 0.409801 | 21.65184 | 29.68 | 35.65 |
| At most 2 | 0.193460 | 6.360256 | 15.41 | 20.04 |
| At most 3 | 0.004308 | 0.125216 | 3.76 | 6.65 |
| **Hypothesized** | | **Max-Eigen** | **5 Percent** | **1 Percent** |
| **No. of CE(s)** | **Eigenvalue** | **Statistic** | **Critical Value** | **Critical Value** |
| None ** | 0.760589 | 41.45761 | 27.07 | 32.24 |
| At most 1 | 0.409801 | 15.29159 | 20.97 | 25.52 |
| At most 2 | 0.193460 | 6.235039 | 14.07 | 18.63 |
| At most 3 | 0.004308 | 0.125216 | 3.76 | 6.65 |

The result of both the trace statistic and Max-Eigen statistic shows one cointegrating equation. The existence of at least one cointegrating equation permits us to estimate the overparameterize and parsimonious ECM models. The result of the overparameterize ECM is shown in Table 3 below:

**Table 3. Summary of overparameterize ECM result: Modeling: DLAGDP**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLPEXP | 0.158418 | 0.154658 | 1.024311 | 0.3193 |
| DLPEXP(-1) | 1.035993 | 0.186431 | 5.556977 | 0.0000 |
| DLPEXP(-2) | -0.165692 | 0.160770 | -1.030614 | 0.3164 |
| DLREER | 3.693405 | 1.272644 | 2.902150 | 0.0069 |
| DLREER(-1) | 0.005771 | 0.168026 | 0.034346 | 0.9730 |
| DLREER(-2) | 1.030395 | 0.082755 | 12.45122 | 0.0000 |
| RAEXP | 0.967973 | 0.146379 | 6.612795 | 0.0000 |
| RAEXP(-1) | 0.087904 | 0.048041 | 1.829789 | 0.0839 |
| RAEXP(-2) | -0.022925 | 0.054087 | -0.423849 | 0.6767 |
| ECM(-1) | -0.250501 | 0.118824 | -2.108161 | 0.0485 |
| C | 0.074062 | 0.131263 | 0.564222 | 0.5796 |

*$R^2$ = 0.65, F statistic = 4.21, AIC = 0.33, SC = 0.84, DW = 2.23*

The result of the overparameterize ECM in Table 3 include two lags of each variable. The parsimonious ECM model was obtained by deleting the insignificant variables from the parsimonious ECM model. The result of the parsimonious or preferred ECM model is shown below in Table 4.

**Table 4. Summary of parsimonious(Preferred) ECM result. Modeling DLAGDP**

| Variable | Coefficient | Std. error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLPEXP(-1) | 0.453696 | 0.077109 | 5.883822 | 0.0000 |
| DLREER | 0.278391 | 0.107894 | 2.580236 | 0.0139 |
| DLREER(-2) | 0.694378 | 0.057300 | 12.11823 | 0.0000 |
| RAEXP | 0.653086 | 0.079786 | 8.185428 | 0.0000 |
| ECM(-1) | -0.407183 | 0.059263 | -6.870795 | 0.0000 |
| C | 0.128385 | 0.078789 | 1.629481 | 0.1168 |

*$R^2$ = 0.72, F statistic = 42.31, AIC = -0.41, SC = -0.61, DW = 2.12*

The result of the preferred ECM indicates that the REER has significantly influenced the level of agricultural productivity in Nigeria. The relatively high elasticity which is almost unity in lag 2 provides an indication that the international competitiveness of the Nigerian economy has some significant influence on the level of agricultural productivity in Nigeria. The result shows that an expansion of real agricultural export in Nigeria by a unit increased the level of agricultural output by 0.65 units. The prices of exports in Nigeria also significantly influenced the level of agricultural productivity in Nigeria. The result shows that an increase in the prices of exports by 1 percent increased the volume of agricultural output by 45 percent. The negatively signed and significant ECM is an indication of a satisfactory speed of adjustment.

The relevant section of the result of the Vector Error (VEC) is shown in Table 5 below:

**Table 5. VEC Result**

| **Cointegrating Eq:** | **CointEq1** | | | |
|---|---|---|---|---|
| LAGDP(-1) | 1.000000 | | | |
| LPEXP(-1) | -0.067110 | | | |
| | (0.01502) | | | |
| | [-4.46920] | | | |
| LREER(-1) | 0.025483 | | | |
| | (0.03311) | | | |
| | [ 0.76972] | | | |
| RAEXP(-1) | -0.358112 | | | |
| | (0.04072) | | | |
| | [-8.79429] | | | |
| C | -9.817252 | | | |
| **Error Correction:** | **D(LAGDP)** | **D(LPEXP)** | **D(LREER)** | **D(RAEXP)** |
| CointEq1 | -0.193981 | 1.111932 | 0.150798 | -6.955688 |
| | (0.36136) | (0.48511) | (0.44872) | (1.50626) |
| | [-0.53680] | [ 2.29214] | [ 0.33606] | [ -4.61785] |

The result of the VEC shows that the real agricultural export equation represents the true cointegrating equation. The others were statistically flawed because they were either not significant or have the wrong sign.

The diagnostic test results comprise those on Jarque-bera normality, Cumulative Sum of Squares (CUSUM) stability test, Breusch Godfrey serial correlation LM test and the white heteroskedasticity test. The results are shown in Table 6 below:

**Table 6. Summary of diagnostic tests results**

| **Breusch-Godfrey Serial correlation LM test** | | | |
|---|---|---|---|
| F Statistic | 0.01 | Probability | 0.94 |
| White heteroskedasticity | | | |
| F Statistic | 0.79 | Probability | 0.64 |
| Jarque-bera normality test | | | |
| Jarque-bera | 1.33 | Probability | 0.52 |

The Breusch Godfrey serial correlation LM test indicates the validation of the null hypothesis that the errors are not serially correlated. The result of the white heteroskedasticity test validated the null hypothesis that the errors are homoskedastic, while the result of the Jarque-bera normality test validated the null hypothesis that the errors are normally distributed. The result of the Cumulative Sum of Squares (CUSUM) stability test is shown in Fig. 1 below:

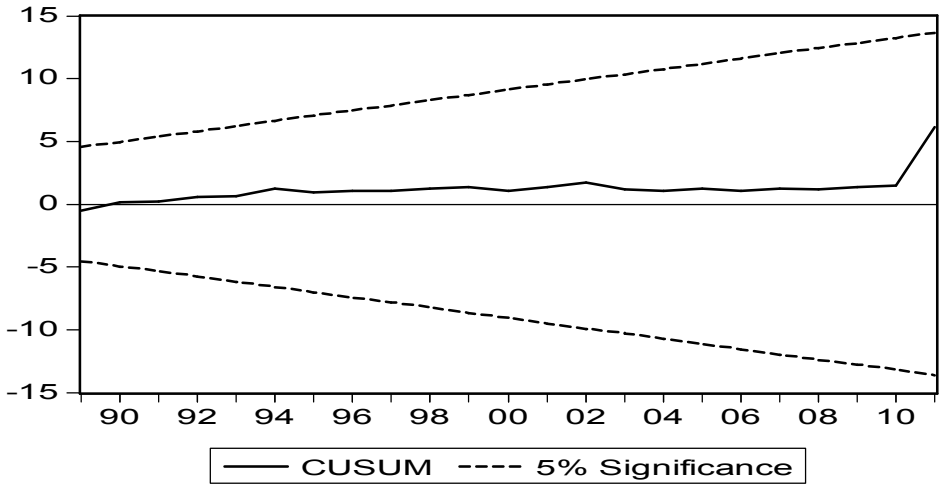


**Fig. 1. CUSUM Stability test result**

The result of the CUSUM stability test indicates that the model is stable since the CUSUM line falls in-between the two 5 percent lines.

The result of the variance decomposition is shown in Table 7 below:

**Table 7. Cholesky variance decomposition**

| **Variance Decomposition of LAGDP:** | | | | | |
|---|---|---|---|---|---|
| **Period** | **S.E.** | **LAGDP** | **LPEXP** | **LREER** | **RAEXP** |
| 1 | 0.236621 | 100.0000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 0.332138 | 94.61806 | 3.987268 | 0.475756 | 0.918911 |
| 3 | 0.449806 | 92.02931 | 5.414584 | 2.054375 | 0.501735 |
| 4 | 0.558434 | 81.30795 | 8.577545 | 5.066569 | 5.047935 |
| 5 | 0.744390 | 82.81292 | 6.797904 | 7.077803 | 3.311374 |
| 6 | 0.962784 | 78.92646 | 8.261191 | 9.581350 | 3.231003 |
| 7 | 1.224839 | 81.81026 | 6.576580 | 9.409710 | 2.203451 |
| 8 | 1.510861 | 79.58577 | 6.878642 | 10.86486 | 2.670726 |
| 9 | 1.806875 | 79.62624 | 6.521362 | 11.59537 | 2.257033 |
| 10 | 2.166856 | 77.83410 | 6.983099 | 12.66893 | 2.513863 |
| **Variance Decomposition of LPEXP:** | | | | | |
| **Period** | **S.E.** | **LAGDP** | **LPEXP** | **LREER** | **RAEXP** |
| 1 | 0.317647 | 6.152757 | 93.84724 | 0.000000 | 0.000000 |
| 2 | 0.541245 | 12.84100 | 77.03968 | 2.683856 | 7.435463 |
| 3 | 0.646209 | 9.488464 | 79.11336 | 2.059656 | 9.338516 |
| 4 | 0.787621 | 6.583622 | 79.24635 | 4.408893 | 9.761140 |
| 5 | 0.912153 | 12.05758 | 73.36334 | 6.052673 | 8.526407 |
| 6 | 1.107680 | 19.30018 | 63.38733 | 7.804873 | 9.507617 |
| 7 | 1.337965 | 30.64069 | 53.21027 | 9.183287 | 6.965752 |
| 8 | 1.604544 | 33.11052 | 48.43488 | 11.08443 | 7.370167 |
| 9 | 1.896329 | 40.35906 | 41.11898 | 12.00779 | 6.514171 |
| 10 | 2.285928 | 43.65300 | 36.16210 | 13.84740 | 6.337499 |

***Table 7 Continues ……***

| **Variance Decomposition of LREER:** | | | | | |
|---|---|---|---|---|---|
| **Period** | **S.E.** | **LAGDP** | **LPEXP** | **LREER** | **RAEXP** |
| 1 | 0.293822 | 4.797572 | 2.814450 | 92.38798 | 0.000000 |
| 2 | 0.512880 | 7.446204 | 9.949954 | 82.04338 | 0.560460 |
| 3 | 0.930048 | 46.97310 | 4.975467 | 47.87124 | 0.180199 |
| 4 | 1.319777 | 61.41371 | 2.510007 | 35.90906 | 0.167226 |
| 5 | 1.732503 | 68.76871 | 1.459644 | 29.65442 | 0.117228 |
| 6 | 2.069806 | 68.14525 | 1.196575 | 29.84148 | 0.816697 |
| 7 | 2.505648 | 68.37303 | 1.128090 | 29.64015 | 0.858722 |
| 8 | 3.028964 | 68.48277 | 1.595958 | 28.85456 | 1.066706 |
| 9 | 3.699890 | 71.68910 | 1.457914 | 26.00909 | 0.843898 |
| 10 | 4.415915 | 72.40742 | 1.737379 | 24.86729 | 0.987918 |
| **Variance Decomposition of RAEXP:** | | | | | |
| **Period** | **S.E.** | **LAGDP** | **LPEXP** | **LREER** | **RAEXP** |
| 1 | 0.986298 | 4.084752 | 29.24911 | 2.900279 | 63.76586 |
| 2 | 1.737860 | 62.03593 | 10.27853 | 1.950558 | 25.73498 |
| 3 | 2.219232 | 61.91643 | 14.47332 | 5.346966 | 18.26328 |
| 4 | 2.774547 | 74.46959 | 9.328473 | 4.390877 | 11.81106 |
| 5 | 3.381829 | 63.92168 | 12.66894 | 10.20489 | 13.20449 |
| 6 | 3.941796 | 69.50822 | 10.60276 | 10.16603 | 9.722991 |
| 7 | 4.986300 | 69.27623 | 10.84808 | 11.69225 | 8.183432 |
| 8 | 5.886118 | 74.36152 | 8.529278 | 11.19329 | 5.915911 |
| 9 | 7.100615 | 72.89010 | 8.847044 | 13.08649 | 5.176370 |
| 10 | 8.091030 | 74.11304 | 8.116957 | 13.34878 | 4.421226 |

*Cholesky Ordering: LAGDP LPEXP LREER RAEXP*

The result of the variance decomposition indicates that other than shocks to itself which was 100 percent in the first period, shocks to REER explains about 5 percent of changes in agricultural output in the fourth period which increased to 11 percent in the 8$^{th}$ period and 13 percent in the last period. Shocks to real agricultural export explained only 5 percent of changes in agricultural output in the 4$^{th}$ period which decreased to about 3 percent in the last period. The result shows that shocks to agricultural output explains about 61 percent of the changes in the REER which increased to 72 percent in the 9$^{th}$ period. This result provides some indications of the significant influence of the REER on agricultural output. Similar result was recorded between the real agricultural export and agricultural output and the price of exports and agricultural output in Nigeria.

## 5. CONCLUSION

This paper has been on the influence of REER on agricultural output in Nigeria. The paper was able to establish that the REER has a positive and significant impact on the agricultural output. A depreciation of the REER by 1 percent increased the agricultural output in Nigeria by about 69 percent. The implication of this is that the international competitiveness of the Nigerian economy matters for improved level of agricultural output in Nigeria. The result further indicates that the real agricultural exports has a positive and significant impact on the level of agricultural output in Nigeria. The result further indicates that the prices of exports has a positive and significant impact on the level of agricultural output in Nigeria. The implication is that previous level of sales and prices have important bearing on the output decision of Nigerian farmers. Thus, the study established that price efficiency has the tendency of increasing the level of agricultural output in Nigeria. The result thus

recommends that the monetary authorities in Nigeria should introduce policy measures to stabilize the REER since it has the tendency of expanding the level of agricultural productivity. This is important since the instability of the REER will reduce the level of agricultural output. To ensure that farmers earn appropriate income from the sales of agricultural products, the government and marketing boards should do more to monitor prices of agricultural exports.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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