

# An Empirical Analysis of Effect of Exchange Rate on Sesame Subsectors Output in Nigeria: 1980-2016.

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**Abstract:** This study made use of Vector error correction model to analyse effect of exchange rate on sesame output in Nigeria from 1980-2016. Secondary data consisting of annual times covering a period of 37 years (1980-2016) were obtained from World Bank development indicators data base, food and agriculture organization. United Nations conference trade and development (UNCTAD), Impulse response and Variance decomposition. The result of direction of growth showed that the coefficient of exchange rate (-0.005) was negative and significant at 5% level and this implies that exchange rate decelerated over the period. The result also showed that the direction of growth of sesame (0.000) was positive and significant at 1% level. This means that the direction of growth of sesame accelerated over the period under review. The result of coefficient of determinant ( $R^2$ ) was 0.3726 indicating that 37.26% variation in sesame output was explained by exchange rate in the previous year, labour in the previous year, sesame output in the previous year, and public agriculture spending in the previous year. The study showed that a unit increase in public agriculture spending will decrease sesame output by 0.345% and 0.01% respectively. Further, the study showed that sesame output responded positively to itself, labour and public agriculture spending in both long and short run. The result also showed that sesame output responded negatively to exchange rate in both long and short run over the period under review. The result further showed that in the long run sesame output contributed to itself by 75.57 %, exchange rate contributed to sesame output by 0.26 %, labour contributed by 10.045 and public agriculture spending by 14.12 % over the period under review. The result also showed that in the short run sesame output contributed to itself by 78.26 %, exchange rate contributed to sesame output by 0.45 %, labour contributed by 8.68 % and public agriculture spending by 12.59 %.

**Keywords:** Exchange rate, sesame output, vector error correction model

## INTRODUCTION

Agricultural sector in the early 1960s served as the major source of employment, income and foreign exchange earnings for Nigeria. As at 1961, Nigeria was the leading exporter of groundnut with a world's share of 42%. The country also had 27% of the world's palm oil export, 18% of cocoa and 1.4% of cotton as the major West African cotton exporter. Up to the early 1970s, agriculture accounted for well over 80 percent of Nigeria's Gross Domestic Product (GDP) and the major value of the country's exports (Oluigbo, 2012 and Nwalem et al, 2015). Unfortunately, the future, potentials and prospect of agricultural sector was lost immediately after the discovery of crude oil in the late 1960s and the huge financial gains benefitted from it made the government to shift its priority from agriculture to crude oil and relied on food importation as a means of feeding her citizens. The "glory" of agriculture however declined over the years hence Nigeria dominance in the export of groundnut was eclipsed by China, United States of America (USA) and Argentina as at 2008. Indonesia and Malaysia took over in palm oil; Cote d'voire and Ghana also become the

leading exporter of cocoa while Mali and Bukina Faso led cotton exports (Azih, 2011 and Nwalem et al, 2015 ). Based on the aforementioned importance of agriculture to the Nigeria economy, there is a need study the effect of exchange rate on sesame subsector output.

Sesame is one of the cultivated oil seed crops in the world. According to Onyibo (2005), since its introduction to Nigeria after the Second World War, it has been regarded as a crop of insignificant importance compared to groundnut and other cash crops. Sesame is widely grown in the Northern and Central part of the country initially as a minor crop until 1974, when it become one of the major cash earner in many northern states such as Benue, Gombe, Kogi, Jigawa, Kano, Nasarawa, Katsina, Plateau, and Yobe States as well as the Federal Capital Territory. The demand for sesame and its products is growing both at the National and International levels. Sesame seeds (approximately 50 percent oil and 25percent protein) are used in baking, candy making, in cooking and salad oil and margarine. The oil can also be used in manufacture of soaps, paints, perfumes, insecticides and pharmaceuticals. Sesame meal, left after the oil is pressed from the seed, is an excellent high protein (34-50percent) feed for poultry and livestock (Oplinger 2007 and Nwalem et al, 2015).

As a raw export commodity, sesame seed from Nigeria is enjoying a rising profile in the world market where overall global demand has risen to 3.3 million tons. Sesame, like other raw agricultural communities, has over 15percent margin in terms of value added products compared to other crops (RMRDC, 2004). Thus huge market potential exists for sesame. Owing to its previous status as a minor crop, there has been little research efforts on the crop (Nwalem et al,2015). Exchange rates' influences on trade have since been recognized by Economists, and as such agricultural producers have been more sensitive and interested in the role of exchange rates in commodity output and prices. The strong dollar is seen as a major culprit in low farm prices Kristinek (2001) .

According to Edward Schuh as quoted by Kristinek (2001) argued that the overvalued dollar caused the decline in agricultural exports due to their relative expense in other countries. The overvalued dollar led to depressed prices and lower farm profits, causing an undervaluation of farm resources and oversupply of output. Hence, the need to analyse the effect of exchange rate on sesame subsector output in Nigeria.

## **METHODOLOGY**

**Study area:** Nigeria derives its name from river Niger, it got her independence in 1960 and it is located at western region of Africa. Nigeria has a land mass area of 923,768.00 sq kilometres and lies between latitude 40 and 140 North of the equator and longitudes 30 and 140 East of the Greenwich meridian. It is bounded on the West by the Republic of Benin on the North by the Republic of Niger and on the East by the Federal Republic of Cameroun. On the North-East border is lake Chad while also extends into the Republic of Niger and Chad and touches the Northernmost part of the Republic of Cameroun. On the South, the Nigerian coast-line is bathed by the Atlantic Ocean (Nwalem et al, 2018).

Agriculture was central to Nigeria's economic structure till the early 1990s. Her agricultural sector has become a vital area for the Nigerian economy. According to the 2009 estimates, the sector provides employment to more than 70% of the working population but contributes only 33.4% of the total national production. The country has not been able to satisfy internal demand and has to import a considerable amount of food products. Nigeria's economic structure is largely oil-based. The economy has stumbled for years due to political unrest, corruption and poor fiscal policies. However, since the restoration of democracy and introduction of economic reforms, the country's agricultural sector is growing at a fast pace.

### **Method of Data Collection**

Following Nwalem et al (2018), Secondary data consisting of annual times covering a period of 38 years (1978-2016) will be obtained from World Bank development indicators data base, food and agriculture organization. United Nations conference trade and development (UNCTAD), Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS) .

**Techniques of Data Analysis: Growth model was used to ascertain direction and growth rates.** VECM (vector error correction model) was used to analyse effect of exchange rate on sesame output. Impulse response was used to examine response of sesame output to a unit shock in exchange rate and Variance decomposition was used to assess contribution of exchange rate to sesame output overtime.

### **Model Specification**

#### **VECM model for the effect of exchange rate on response of agricultural subsector output**

In order to estimate the relationship between the variables if cointegration is found, the corresponding vector error correction equation will be estimated as

$$\ln AG_{t-i} = \beta_0 + \beta_1 \ln EX_{t-i} + \beta_2 \ln Lb_{t-i} + \beta_3 \ln PAG_{t-i} + ECT_{t-i} + \varepsilon_t$$

$AG_{t-i}$  = Agricultural subsector (Rice, cassava, Cocoa, Groundnut, Sesame) output (tons)

$EX_{t-i}$  = Exchange rate

$Lb_{t-i}$  = labour (Number of person involved in the agriculture sector)

$PAG_{t-i}$  = Public Agricultural spending (Naira)

$ECT_{t-i}$  = Error correction Term

$\varepsilon_t$  = error term

Apriori expectation,  $\beta_1 < 0$ ,  $\beta_2$  and  $\beta_3 > 0$

## RESULTS AND DISCUSSION

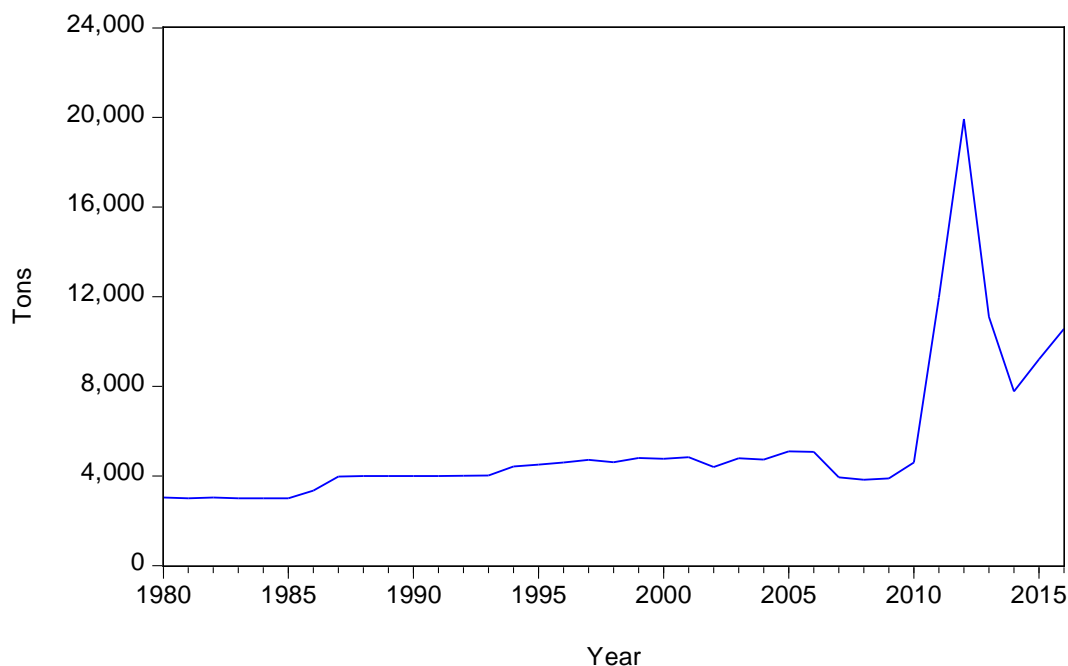
### TREND OF SESAME OUTPUT

The trend of sesame is presented in table 1 and figure 5. The result showed that sesame output ranged between 2999 metric tons to 6256228 metric tons with a mean of 5340.270 metric tons. This could be due to the following reasons: the variety of sesame seed planted, the types of farm equipment used in sesame production, the time of planting and harvesting of sesame seeds, pest and diseases control measure taken, the level of foreign direct investment and gross domestic investment on sesame production and finally government programmes initiatives on sesame production could influence the output of sesame.

Specifically, from the graph in figure 5 below, there were fluctuations in sesame output between the period of 1992 to 2004. This implies that during these periods the output of sesame were not steady, it was changing on yearly basis with a slight difference. These fluctuations could be due to: lack of nutrient in the soil resulting over usage of a particular piece of land, inadequate application of fertilizer, planting of local variety of sesame could result in the fluctuations of output. The result also showed that sesame output were stagnant between the period of 1988 to 1991, 4000metric tons. This implies that during these periods, the output of sesame were neither decreasing nor increasing. It could be that during this period same pattern or method of sesame production was maintained by the farmers or that sesame sector were neglected during these periods.

The result further showed that sesame output witnessed a decline in output within the period of 1980 to 1985, from 3037 metric tons to 2999 metric tons, 2006 to 2010, from 5076 metric tons to 4603 metric tons and 2013 to 2014, from 11102 metric tons to 7769 metric tons respectively. This implies that during these periods sesame output did not contribute much to the nations GDP and this could have a negative impact on the Nigeria economy because the strength of any nation's economy is measured by her aggregate production, that is the GDP. The decline in sesame output could be due to pest and disease attack on the crops, environmental factors as well as poor funding of the sesame subsector.

The result also showed an increasing trend over the period under review. It increased along the periods as follows: between 1986 to 1988, from 3343 metric tons to 3977 metric tons, 2005 it was 5102 metric tons, 2011 to 2012, from 11967 metric tons to 19932 metric tons and 2015 to 2016, from 9209 to 10569 metric tons respectively. It could also be due to favourable weather conditions and good governmental programmes and projects on sesame production.



**Figure 1: Trend of sesame output**

**Table 1: Summary Statistic**

Variable	Sesame	ExchRate
Minimum	2999.000	0.500000
Maximum	19932.00	253.5000
Mean	5340.270	74.41622
Observations	37	37

### Growth Rate and Direction of Growth

The result of the growth rate and direction of growth is presented in table 2 and 3. The result of direction of growth showed that the coefficient of exchange rate (-0.005) was negative and significant at 5% level and this implies that exchange rate decelerated over the period. The result also showed that the direction of growth of sesame (0.000) was positive and significant at 1% level. This implies that the direction of growth of sesame accelerated over the period under review. The acceleration in the growth of sesame could be due to the fact that the farmers adopted the use of improved variety of sesame seeds. It could also be proper funding of sesame project by the relevant stakeholders. Early planting of sesame seeds and conducive environmental conditions could also accelerate growth of sesame.

Further, the result showed the growth rate was positive for exchange rate 38.08% for instantaneous growth rate and 46.34% for compound growth rate. Conversely, the result also showed that the growth rate of sesame was negative for instantaneous and compound growth rate, that is, -0.03% and -0.02 respectively.

**Table 2: Instantaneous and Compound Growth Rate**

	Instantaneous %	Compound Growth %
Exchange rate	38.08	46.34
Sesame	-0.03	-0.02

**Table 3: Direction of Growth**

	Sesame	Exch Rate
Constant	8.098	-1.195
@Trend	-0.000	0.380
@Trend <sup>2</sup>	0.000	-0.005
t-value	(2.004)**	(-10.64)***
R <sup>2</sup>	0.616	0.973
F-value	29.942	667.974
Akaike criterion	0.271	0.693
Durbin-watson stat	0.748	0.798
Pro(f-statistic)	0.000	0.000
Decision	Accelerated	Decelerated

\*\*\* and\*\* are significant at 1% and 5% level of significance respectively.

**Stationarity Test (Unit Root Rest)**

The result of the stationarity test is presented in table 4. The result indicates that all the variables were stationary at first difference, this means that they are cointegrated of order one (1(1))

**Table 4: Augmented Dickey-Fuller Unit Root Test Result**

Variables	Level		First difference		Decision
	t-statistic	Probability	t-statistic	Probability	
Sesame	1.01	0.9957	-4.71	0.0006	1(1)
Public Agric	-1.06	0.7162	-5.64	0.0001	1(1)
Exch Rate	-1.87	0.3407	-5.16	0.0002	1(1)
Labour	-0.00	0.9522	-9.75	0.0000	1(1)

\*\*\*, \*\* and \* indicate stationary at 1%, 5% and 10% level of significance respectively

Source:

### Cointegration test between exchange rate and sesame output

The result of the cointegration test between exchange rate and sesame is presented in table 5. The result indicates that trace statistic (55.10) was greater than the critical value (42.91) implying that there is a long run relationship between exchange rate and sesame output with one cointegrating equation.

Table 5: unrestricted Cointegration Rank Test Result on Sesame output

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.595	55.107	42.915	0.002
At most 1	0.405	23.412	25.872	0.098
At most 2	0.138	5.233	12.517	0.563

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Source: Eview computation, 2018

### Effect of exchange rate on sesame output

The result of the effects of exchange rate on sesame output is presented on table 6. The result showed one cointegrating equation. The result of the cointegrating equation showed that coefficient of determinant ( $R^2$ ) was 0.3726 indicating that 37.26% variation in sesame output was explained by exchange rate in the previous year, labour in the previous year, sesame output in the previous year, and public agriculture spending in the previous year. Specifically, the coefficient of exchange rate (0.22) was positive but not statistically significant; therefore, the null hypothesis which states that exchange rate has no significant effect on sesame output in Nigeria is accepted. The result further showed that in the long run, public agriculture spending and labour were the only variable that significantly affected sesame output. Specifically, the coefficient of public agriculture spending (-0.345) was negative and significant at 1% level. This implies that a unit increase in public agriculture spending will decrease sesame output by 0.345%. The decrease in sesame output could be due to the bureaucratic process involved in the disbursement of public funds and distribution of agrochemicals to the prospective sesame farmers in Nigeria. This finding conforms to study of Usman (2010) and Ighodaro and Okiakhi (2010) who found that government total capital expenditure has negative effect on economic growth. However, it differs with Ekpo (1995), who found that capital expenditure on transport, communication, agriculture, health and education positively influence private investment

in Nigeria, which invariably enhanced the growth of the overall economy. Also , the coefficient of labour (-8.32) was negative and significant at 1% level. this implies that a unit increase in labour will decrease cocoa output by 8.32%. This could be due to rural urban migration by the active youths that forms the labour force, thereby leaving farming activities in the hands of aged men and women in the village

In the short run, exchange rate, public agriculture spending and labour was the only variable that significantly affected sesame output. Specifically, the coefficient of public agriculture spending (-0.01) was negative and significant at 10% level. This implies that in the short run, a unit increase in public agriculture spending will decrease the output sesame by 0.01%. This could be due to the fact that the short run period is always the period that is too small for planning and the use of public funds that entails rigorous bureaucratic procedures may not provide a satisfactory result. This finding is consistent with Chih-Hung Liu, et al. (2008) who found that total Government expenditure does cause the growth of GDP. However, it is inconsistent with Mwafaq (2011), who found that government expenditure at the aggregate level has positive impact on the growth of GDP . Also , the coefficient of labour (-3.51) was negative and significant at 1% level. This implies that a unit increase in labour will decrease cocoa output by 3.51%. This could be due to rural urban migration by the active youths that forms the labour force, thereby leaving farming activities in the hands of aged men and women in the village. It could also be that labour was used beyond its optimum level.

**Table 6: Effect of Exchange Rate on Sesame Output**

D(D(LNSSAME(-1)))	1.000000			
D(LNLABOUR(-1))	-8.32***			
	[-4.50]			
D(LNEXCRATE(-1))	0.22			
	[ 1.09]			
D(PUBCAGRIC(-1))	-0.34***			
	[-3.96]			
C	0.25			
Error Correction:	D(D(LNSESA ME),2)	D(LNLABOURD ,2)	D(LNEXCHRAD TE),2)	D(PUBLICAG RIC),2)
CointEq1	-0.73***	0.09***	0.31	1.61***
	[-3.73]	[ 2.92]	[ 2.07]	[ 2.86]
D(D(LNSSME(-1)),2)	0.21	-0.05	-0.05	-0.87**
	[ 1.09]	[-1.63]	[-0.35]	[-1.59]
D(LNLABOUR(-1),2)	-3.51***	-0.23	4.68***	6.60**
	[-2.88]	[-1.12]	[ 5.03]	[ 1.89]
D(LNEXRATE(-1),2)	-0.19	-0.02	-0.23**	0.24
	[-1.19]	[-0.71]	[-1.89]	[ 0.53]
D(PUBAGRIC(-1),2)	-0.10**	0.01**	0.01	-0.31**
	[-1.73]	[ 1.69]	[ 0.36]	[-1.87]
C	-0.00	0.00	0.00	0.02
	[-0.02]	[ 0.08]	[ 0.17]	[ 0.11]



R-squared	0.372	0.589	0.653	0.465
Adj. R-squared	0.256	0.513	0.589	0.366
Sum sq. resids	3.268	0.098	1.902	26.758
S.E. equation	0.347	0.060	0.265	0.995
F-statistic	3.207	7.748	10.172	4.699
Log likelihood	-8.672	49.178	0.255	-43.365
Akaike AIC	0.889	-2.616	0.348	2.991
Schwarz SC	1.161	-2.344	0.620	3.263
Mean dependent	-0.000	0.000	0.008	0.006
S.D. dependent	0.403	0.086	0.414	1.250
<hr/>				
Determinantresidcovariance(dofadj)	1.67E-05			
Determinant resid covariance	7.48E-06			
Log likelihood	7.459338			
Akaike information criterion	1.244889			
Schwarz criterion	2.514653			
<hr/>				

NB: values in bracket are t-statistics

#### **Impulse response for the effects of exchange rate on sesame output**

The result of the unit shock of exchange rate on sesame output over time is presented in figure 2. The graph showed that sesame output responded positively to itself, labour and public agriculture spending in both long and short run. This implies that sesame output, labour and public agriculture spending in the previous year will increase sesame output by 1% in both long and short run. The result further showed that sesame output responded negatively to exchange rate in both long and short run over the period under review. This implies that a unit increase in exchange rate in the previous year will decrease sesame output by 1% in both long and short run.

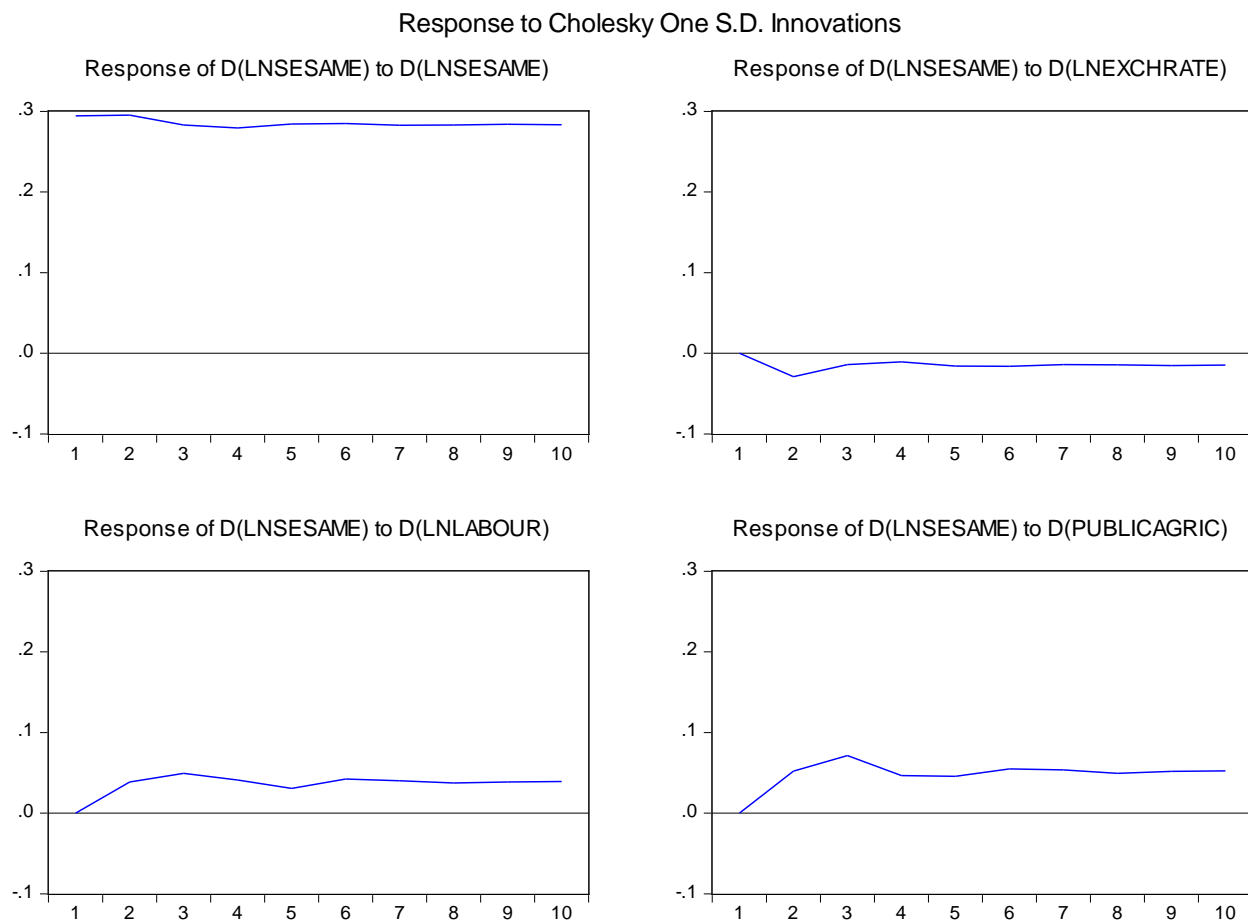


Figure 2: Response of sesame to exchange rate

**Variance decomposition on effect of exchange rate on sesame output**

The contribution of exchange rate to sesame output over time is presented in table 7. The result showed that in the short run (5years), Sesame output contributed to itself by 78.26 %, exchange rate contributed to sesame output by 0.45 %, labour contributed by 8.68 % and public agriculture spending by 12.59 %. The result further showed that in the long run (10years) , sesame output contributed to itself by 75.57 %, exchange rate contributed to sesame output by 0.26 %, labour contributed by 10.045 and public agriculture spending by 14.12 % over the period under review.

Table 7: Variance Decomposition on Sesame Output

Period	S.E.	D(D(LNSESAME))	D(LNEXCHRATE) ATE)	D(LNLABOUR) R)	D(PUBLICAGRIC) GRIC)
1	0.34	100.00	0.00	0.00	0.00
2	0.45	85.49	0.55	5.96	7.97
3	0.51	75.01	0.54	9.56	14.87

4	0.56	76.14	0.50	9.67	13.68
5	0.61	78.26	0.45	8.68	12.59
6	0.67	76.57	0.39	9.46	13.56
7	0.71	75.36	0.35	10.02	14.25
8	0.75	75.82	0.32	9.90	13.95
9	0.79	76.02	0.29	9.83	13.84
10	0.83	75.57	0.26	10.04	14.12

## CONCLUSION AND RECOMMENDATIONS

This study was carried out to analyse effect of exchange rate on sesame output in Nigeria using Vector error correction model. The result found that trend of sesame output undulated and accelerated and exchange rate was decelerated during the period under review. The result also showed that exchange rate has no significant effect on sesame output over the period of study. Furthermore, the result showed that sesame output responded negatively to exchange rate in both long and short run over the period under review. Finally, public expenditure on agriculture contributed mostly to sesame output in both long and short run. Since public expenditure contributed highest in sesame output in both long and short run, the government should disburse more funds and other agricultural inputs to sesame farmers to enhance their productivity.

It was therefore recommended that:

- I. Since exchange rate does not significantly affect sesame output, the central bank of Nigeria should come up with a sound monetary policy such as expansionary monetary that will lower the exchange rate, weaken the financial account and strengthen the current account. This will enable the farmers to purchase farming equipment and inputs to improve their farm output
- II. Targeted programmes aimed at reducing rural and urban migration should be set up, given that labour negatively affect sesame output in both long and short run

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