# An Empirical Analysis of the Impact of Exchange Rate on Agriculture in Nigeria

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**Abstract**
This study investigates the relationship between exchange rate and agricultural activity based on data collected between 1999 and 2016. The study found a significant positive relationship between exchange rate between exchange rates and activity in the agricultural sector using real and nominal values. A higher or weaker exchange rate correlated with similarly with greater activity within the sector. This study therefore recommended that the government should take advantage of weaker exchange rates that make Nigerian agricultural produce cheaper and increase investment in the sector to reap the benefits as the agricultural sector can potential be a source of local and foreign income. This can be a major step in reviving the sector.
**Keywords:** Exchange Rate, Agriculture, Crops, Livestock, Forestry, Fishing, Monetary Policy, Nigeria, Africa.
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## 1. Introduction
For a country with the largest arable land in Africa and one of the largest in the world, Nigeria's agricultural sector has surely underperformed with the country ranking as one of the largest importers of food in the world. The sector has the potential not only to feed the nation but serve as a source of income for the country which relies on crude oil for the majority of trade and foreign income. With a weakening exchange rate, it is important to understand how this affects the industry and how a weaker exchange rate may be used to stimulate the trade of agricultural products.

A very important job for central banks today is controlling exchange rate. They try to maintain or achieve a certain exchange rate level by buying and selling foreign currencies in return for their local currencies. This is because exchange rate like the price of most commodities is determined by supply and demand.

Since 2014, the Country's monetary policy has been aimed at achieving exchange rate and price stability. During the evaluated period, inflation target has been set at single digits which varied between 7.7% and 8.5% because of the effects stability of education price and falling prices of transportation and clothing in response to tight liquidity actions taken in monetary policy commission meetings. Measures were put in place to see that shocks caused by the political business cycle did not affect inflation or the banks policies. (CBN, 2017)

The central bank has also devalued the currency recently, holding its peg at a lower rate. The Nigerian naira is currently held around 360 naira to a US Dollar.

### 1.1 Objectives of Study
- Deduce the whether exchange rate is related to agricultural sector activity positively or negatively.
- Establish whether the relationship is significant or not.

## 2. Theoretical Framework
Also known as the IS LM BP Model is an open economy application of the closed economy IS LM model improvised by Robert Mundell and Marcus Fleming. It examines how various facets of fiscal and monetary policy will affect a small open economy given interest rate parity and perfect capital mobility. This model also explains the relationship between a depreciating exchange rate and output. It stipulates that a weaker local currency will make local prices cheaper in comparison to international prices and would therefore make their exports more attractive to other countries and this would increase their output (Wickens, 2012).

Smithin (2003) puts forth the view of some post Keynesians that governments use monetary policies to set exchange rates sometimes to achieve pricing goals.

Today, the best example of this is China, the largest exporting country in the world which intentionally keeps its currency undervalued and depreciated in order to make its exports more alluring to international buyers.

It can be argued that the agricultural sector which is one of the main sources of primary goods and a major source of local exports especially for a developing country like Nigeria which produces cash crops like cocoa, rubber and cotton but lacks the capability to process them locally should be the biggest benefactor of this effect. It can further be seen that with a depreciated currency, foreign currencies give incentives for local farmers to produce more because it gives them an opportunity to request payment in them and earn more after converting to their local currency. A depreciated currency will also make imports more expensive and push local production and patronization.

## 3. Literature Review

### 3.1 Nigeria

Research on the topic of exchange rate and agriculture in Nigeria has not been extensive and the little research available in the area shows inconclusive and inconsistent results as to the role exchange rate plays in the sector.

Gatawa & Mahmud (2017), studied how trends of exchange rate, price of agricultural exports and agricultural credit in Nigeria affected quantity agricultural exports in the long run. They found a significant positive relationship between these independent variables and the independent variable using a 1% statistical significance. They found that a stronger exchange rate encouraged more agricultural output and export. Their findings were in line with studies by Essien et al (2011), Umaru et al (2013) and Okputu et al (2012). Their findings however led to the conclusion that exchange rate volatility was not crucial to improving agricultural exports as effects noted on lower volatility stemmed not from short term variations from incidental long-term commitments stemming from exchange rate pegs and monetary unions.

Obayelu & Salau, (2010) focused on finding out how agricultural output responded to exchange rate and prices using co-integration and vector error correction model using data obtained for a 37 year period. The study found that weaker exchange rates were positively linked with higher agricultural exports in the country in the short run which they speculated was due to farmers earning more through exportation as a result of currency depreciation.

Abdullahi (2014), using vector error correlation to study effects of macroeconomic policy on agricultural output and food security between 1978 and 2011 noted that exchange rate devaluation policies in the 1970s and 1980s that signaled a dawn of deregulation and exchange rate liberalization did not enhance agricultural output, threatening food security in Nigeria. Their study recommended the adoption of a feasible exchange rate which considers endogenous macroeconomic factors rather than exogenous global connotations.

Other Studies were focused on how exchange rate variations affected particular crops.

Ammani (2013) studied how exchange rate affected rice importation and production in the country. Though finding a correlation between exchange rate deregulation with an increase in rice production stipulated that it should not be attributed to the independent variable as it didn't not reduce the importation of rice in the country. It can be argued that rice being a locally consumed non-cash crop would not give rice farmers the incentive currency depreciation gave cash crop farmers.

A more suited study was carried out by Dominic (2017) who explored exchange rate effects on the export of a very important cash crop in Nigeria, cocoa. This study found a significant relationship between cocoa export and exchange rate in the long run. Cocoa exports increased as the value of the currency depreciated and fell when exchange rate appreciated. This study recommended a deregulation of exchange rates in the country amongst other fiscal measures.

### 3.2 United States

Schuh (1974) was one of the first people to bring attention to how exchange rate can directly affect agricultural exports and this started a very long-lasting debate in the US economic sphere.

Citing issues brought up by G Edward Schuh 25 years prior to this study, Orden (2002), examined effects of exchange rate on agriculture in the United States. He discovered that due to so many countries intertwining their currency with the US Dollar, an appreciation of the dollar would mean a depreciation of foreign currencies and this would have a negative effect on its agricultural exports. He highlighted the role and importance of exchange rate to agriculture due to its timeless effect on markets and policy implications.

Kristinek & Andersen (2002) however citing including Collins et al (1980), Chambers & Just (1982) and Batten & Belongia (1984), amongst many other polarizing studies found that despite multiple theories and empirical analysis floating around, there is yet to be a definite answer to the question as regards to this relationship. They stipulate that Schuhs theory neglects factors such as significance of change and supply and demand elasticity. Furthermore, they brought up questions about other macroeconomic factors influence agricultural exports in a similar fashion as a reason for a non-consensus agreement and deviations on this topic.

### 3.3 Brazil

Valdes et al (2016) examined the impact of macroeconomic factors on Brazil's agricultural sector. This study found that currency depreciation had a positive impact on the country's agricultural exports, especially on soy beans.

Another study by Sonaglio et al (2016) deduced that depreciation of real exchange rate increases exports of manufactured goods because it encourages investments and fuels competitiveness in the country, noting its overall positive effect on the country's industrial sector.

### 3.4 Vietnam

Vietnam is a country that heavily relies on raw material export. In trying to further exploit its strengths, Dinh & Nguyen (2017) investigates the effects of exchange rate variation on agricultural exports. The study concluded that a decline in exchange rate has a negative effect on Vietnam's agricultural exports and that exchange rate fluctuation has a significant impact on this dependent variable. They noted that the country isn't taking full advantage of its potential and is at risk of losing a chunk of its market share to such threats as inefficient exchange rate volatility.

### 3.5 Kenya

A limited case study was carried out by Ali (2015) in the Vipingo Sisal Estate of Kenya which is Africa's largest sisal fiber producer to see how exchange rate affects the country's agricultural sector. He found that this company's performance depended on exchange rate as it was prone to foreign exchange risk.

### 3.6 Sudan

Elgali et al (2017) pored over the responsiveness of agriculture in Sudan to exchange rate. Results of a currency depreciation

scenario showed that a 23% percent currency depreciation increases producer prices which favorable for the country's agricultural trade as it increased export motive. This also encourages patronization of local agricultural products, discouraging import of substitutes.

*3.7 India*

Using granger causality approach, Mousavi & Leelavathi (2013) delved into the connection between agricultural exports and exchange rates in India between 1980 and 2010. The study found no long run relationship between agricultural export and exchange rate as these two variables were not co integrated. Furthermore, despite seeing an encouraging short and long run connections using the double steps procedure, this study disputed the notion that exchange rate is an adequate predictor of agricultural exports. According to him, currency depreciation effects on other sectors should be considered along with a balanced consideration for both exports and imports. He further stressed the need for more sophisticated methods of creating incentives and stimulating exports and for a reevaluation of the country's current exchange rate policy which is aimed at increasing exports.

## 4. Research Hypothesis

Hypothesis 1

$H_0$ There is no significant relationship between exchange rate and crop production.

$H_1$ There is a significant relationship between exchange rate and crop production

Hypothesis 2

$H_0$ There is no significant relationship between exchange rate and Livestock farming.

$H_1$ There is a significant relationship between exchange rate and livestock farming.

Hypothesis 3

$H_0$ There is no significant relationship between exchange rate and forestry.

$H_1$ There is a significant relationship between exchange rate and forestry.

Hypothesis 4

$H_0$ There is no significant relationship between exchange rate and fishing.

$H_1$ There is a significant relationship between exchange rate and fishing.

Hypothesis 5

$H_0$ There is no significant relationship between exchange rate and agriculture.

$H_1$ There is a significant relationship between exchange rate and agriculture

## 5. Data Collection

This research uses data on exchange rates and agricultural sector activity, all of which was collected from the Central Bank of Nigeria.

*5.1 Variables and Data Source*

| Variable | Source |
|---|---|
| Crops (Real, Nominal) | Central Bank of Nigeria (CBN) |
| Livestock (Real, Nominal) | Central Bank of Nigeria (CBN) |
| Forestry (Real, Nominal) | Central Bank of Nigeria (CBN) |
| Fishing (Real, Nominal) | Central Bank of Nigeria (CBN) |
| Agriculture (Real, Nominal) | Central Bank of Nigeria (CBN) |
| Exchange Rates | Central Bank of Nigeria (CBN) |

*Table 2: Source of Data*

*5.2 Tests*

| Test | Explanation |
|---|---|
| Pearson Correlation Analysis | Correlation investigates the relationship between an independent variable and a dependent variable and determines the significance of this relationship. It determines how the independent variable affects the dependent variable. The independent variable used in this test is exchange rates and the dependent variable used is agricultural sector activity. |

*Table 3: Description of Test*

Testing Hypothesis 1

$H_0$ There is no significant relationship between exchange rate and crop production.

$H_1$ There is a significant relationship between exchange rate and crop production

**Correlations**

| | | Exchange Rate | Crops |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .866** |
| | Sig. (2-tailed) | | .000 |
| | N | 18 | 18 |
| Crops | Pearson Correlation | .866** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 4: Correlation 1.1*

**Correlations**

| | | Exchange Rate | Real Crops |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .826** |
| | Sig. (2-tailed) | | .000 |
| | N | 18 | 18 |
| Real Crops | Pearson Correlation | .826** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 5: Correlation 1.2*

Analysis shows a very strong significant relationship between exchange rate and nominal crops (p = .866, r = .000), and exchange rate and real crops (p = .826, r = .000).

Based on this, there is sufficient evidence to reject $H_0$ in favor of $H_1$.

Testing Hypothesis 2

$H_0$ There is no significant relationship between exchange rate and Livestock.

$H_1$ There is a significant relationship between exchange rate and Livestock.

**Correlations**

| | | Exchange Rate | Livestock |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .879** |
| | Sig. (2-tailed) | | .000 |
| | N | 18 | 18 |
| Livestock | Pearson Correlation | .879** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 6: Correlation 2.1*

**Correlations**

| | | Exchange Rate | Real Livestock |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .845** |
| | Sig. (2-tailed) | | .000 |
| | N | 18 | 18 |
| Real Livestock | Pearson Correlation | .845** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 7: Correlation 2.2*

Test carried out shows a very strong significant relationship between exchange rate and livestock in nominal (p = .879, r = .000) and real terms (p = .845, r = .000).

Based on this, there is sufficient evidence to reject $H_0$ in favor of $H_1$.

Testing Hypothesis 3

$H_0$ There is no significant relationship between exchange rate and Forestry.

$H_1$ There is a significant relationship between exchange rate and Forestry.

**Correlations**

| | | Exchange Rate | Forestry |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .864** |
| | Sig. (2-tailed) | | .000 |
| | N | 18 | 18 |
| Forestry | Pearson Correlation | .864** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 8: Correlation 3.1*

**Correlations**

| | | Exchange Rate | Real Forestry |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .844** |
| | Sig. (2-tailed) | | .000 |
| | N | 18 | 18 |
| Real Forestry | Pearson Correlation | .844** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 9:Correlation 3.2*

Exchange rate was found to a very strong and significant relationship with nominal forestry (p = -.864, r = .000). Same conclusions were reached for correlation between exchange rate and real forestry (p = -.844, r = .000).

Based on this, there is sufficient evidence to reject $H_0$ in favor of $H_1$.

Testing Hypothesis 4

$H_0$ There is no significant relationship between exchange rate and Fishing.

$H_1$ There is a significant relationship between exchange rate and Fishing.

**Correlations**

| | | Exchange Rate | Fishing |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .897** |
| | Sig. (2-tailed) | | .000 |
| | N | 18 | 18 |
| Fishing | Pearson Correlation | .897** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 10: Correlation 4.1*

**Correlations**

| | | Exchange Rate | Real Fishing |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .855** |
| | Sig. (2-tailed) | | .000 |
| | N | 18 | 18 |
| Real Fishing | Pearson Correlation | .855** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 11: Correlation 4.2*

Pearson correlation test between exchange rate and nominal fishing showed a p value of .897 and an r value of .000 signaling a very strong significant relationship between variables. Using real fishing in place of nominal fishing shows the same relationship (p = .855, r = .000).

Based on this, there is sufficient evidence to reject $H_0$ in favor of $H_1$.

Testing Hypothesis 5

$H_0$ There is no significant relationship between exchange rate and Agriculture.

$H_1$ There is a significant relationship between exchange rate and Agriculture.

**Correlations**

|  |  | Exchange Rate | Agriculture |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .869** |
|  | Sig. (2-tailed) |  | .000 |
|  | N | 18 | 18 |
| Agriculture | Pearson Correlation | .869** | 1 |
|  | Sig. (2-tailed) | .000 |  |
|  | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 12: Correlation 5.1*

**Correlations**

|  |  | Exchange Rate | Real Agriculture |
|---|---|---|---|
| Exchange Rate | Pearson Correlation | 1 | .830** |
|  | Sig. (2-tailed) |  | .000 |
|  | N | 18 | 18 |
| Real Agriculture | Pearson Correlation | .830** | 1 |
|  | Sig. (2-tailed) | .000 |  |
|  | N | 18 | 18 |

**. Correlation is significant at the 0.01 level (2-tailed).

*Table 13:Correlation 5.2*

Ultimately, Pearson correlation test found a very strong significant relationship between exchange rate and nominal agriculture (p = .869, r = .000), and exchange rate and real agriculture (p = .830, r = .000).

Based on this, there is sufficient evidence to reject $H_0$ in favor of $H_1$.

*5.3 Summary of results*

| Hypothesis | Independent Variable | Dependent Variable | Relationship | Significance | Null Hypothesis |
|---|---|---|---|---|---|
| 1 | Exchange Rate | Crops | Positive | Significant | Reject |
| 2 | Exchange Rate | Livestock | Positive | Significant | Reject |
| 3 | Exchange Rate | Forestry | Positive | Significant | Reject |
| 4 | Exchange Rate | Fishing | Positive | Significant | Reject |
| 5 | Exchange Rate | Agriculture | Positive | Significant | Reject |

*Table 14: Summary of Results*

**6. Conclusions and Recommendations**

As the theoretical framework stipulated, tests show that a weakened (higher) exchange rate coincided with higher agricultural output. Findings showed a significant positive correlation between exchange rates and agricultural output which was also consistent throughout all sectors of agriculture.

Apart from meeting the basic need of the country, a new incentive arises in the sense that agricultural produce can be used as a source of external income for the country and to improve trade balance. Farmers will also be motivated to export produce for higher profits when translated to local currency. Subsequently, this industry must be developed if the citizens are to avoid the travails of imported inflation as this can only be cubed if local products are seen as an option. These objectives will best be reaped if in addition to more flexible exchange rates the government commits to measures that ensure the proliferation of the industry.

The Nigerian government currently spends billions of dollars yearly in defense of the currency in trying to achieve a target exchange rate. This is possible due to its large income from oil exports, a phenomenon known as the Dutch disease. But all this does is subsidize the products of other countries while the local agricultural industry continues to suffer. While floating the exchange rate will result in a price hike in the country this can prove to be a good thing in the long run as it signals to local producers the need to increase the volume. The tense political atmosphere means that the government will be wary of enforcing laws like these for fear of public response but these are the difficult decisions that need to be made in order to realistic dig the country out of the economic purgatory it's found itself in which will only worsen in the long run.

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