EFFECT OF NAIRA DEPRECIATION ON NIGERIAN AGRICULTURAL EXPORT VOLUME AND FARMERS' INCOME IN NIGERIA

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ABSTRACT
This research analyzed the effect of Naira depreciation on agricultural export volume in Nigeria (1972- 2020). Specifically, the research examines the effect of naira depreciation on agricultural export volume and determines the effect of naira depreciation on farmers' income. The research used secondary data obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, Food and Agricultural Organization (FAO), and Nation Bureau of Statistics (NBS). The data were analyzed by making use of the Augmented Dickey-Fuller (ADF) unit root test, Co-integration and Error Correction Model (ECM). The empirical findings showed that whereas naira devaluation had no significant impact on agricultural export volume in the short run, it had a significant positive influence on it over the long run. The reason was that the export stimulating effect of naira depreciation on agricultural export volume is being nullified due to the suppressing effect of the depreciating naira on the import of agricultural intermediate input because Nigeria is a nation that depends on imports. Furthermore, the result also showed a positive significant effect of naira depreciation on farmers' income in the long run and a negative significant effect on farmer's income in the short run revealing that an increase in the unit of naira depreciation would result in a 1.2% decrease in farmer's income in Nigeria. This is due to the general reduction in the purchasing power of consumers (farmers) concerning the inflationary effect of the depreciating naira. Therefore, it is advised that the Federal Government, the Central Bank of Nigeria, and other economic stakeholders develop feasible and workable monetary policies that would reduce Naira depreciation and effectively regulate it, thereby mitigating inflation and increasing Nigeria's Agricultural export volume and farmers' income. The Federal Government should also improve the amounts of single-digit credit advances given to agricultural producers in Nigeria since they lack the resources to produce enough agricultural items for export that would boost the state's economy, farmer's income and standard of living. An increase in funding through agricultural credit would result in a corresponding increase in agricultural output with an attendance effect on the growth and productivity of agricultural sub-sectors in Nigeria.

Keywords: Depreciation, Naira Depreciation, Agricultural Export Volume and Farmers' Income

1.0 INTRODUCTION

According to Pettinger (2017), a country's currency losing value in comparison to one or more foreign currencies is said to have undergone currency depreciation. This frequently occurs in a system of fluctuating exchange rates where the value of the official currency is not maintained. There have been several heartbreaks and tears as a result of the unstable and unpredictable relationship of Naira with the US dollar (as well as other foreign currencies) (Fewanhimi, 2015). In the 1970s and early 1980s, one naira was about equal to two dollars, in the 1990s - it had dipped to ₦9.9 for a dollar, by the year 2000, it had increased to above ₦85 for a dollar, in 2010, it was ₦122, in 2020 it was ₦380. Currently, the bank rate for the currency is over ₦823 to a dollar (Exchange Rates.org.uk, 2023). According to Bisola (2022), the excessive demand for foreign currency inflow, the instability of the crude oil market, the speculative activities and dubious practices of authorized dealers, the expansionary monetary and fiscal policies that increase demand pressure in the market, the insufficient funding of the foreign exchange market, the excessive demand for foreign currency inflow, the instability of the market for crude oil, and the economy's contribution to the gross domestic product not being particularly outstanding, due to the unstable export foundation and built-up import dependency of the manufacturing sector as many Nigerians favour imported goods over those produced domestically, are the causes of Naira depreciation. Typically, Nigerians prefer items made elsewhere even when they are easily produced locally because most assume those Made-in-Nigeria products are typically thought to be fraudulent and of poor quality. In addition, low productivity in industries and the agricultural sector causes naira depreciation because Nigeria's production and manufacturing of goods are not supported by local infrastructure. It is difficult to produce goods in Nigeria due to poor transport infrastructure, insufficient power

and an unfavourable business climate (Fewanhimi, 2015).

Osundina & Osundina (2016) cited by Bisola (2022) further affirm that the depreciation of the naira causes inflation, making imports more expensive resulting in demand-pull inflation due to a limited supply of imports since it cost more to import, making it more difficult for Nigerian agri-companies to import raw material and machinery needed for agricultural production, which can limit their ability to export at a profit. Firstly, there is concern that long-term depreciation may result in lower productivity due to the decline in incentives. Secondly, rapid depreciation may scare away foreign investors, which can lead to a decline in foreign direct investment thereby reducing the availability of capital for production and reducing farmers' ability to expand and export. This situation can negatively impact the confidence of foreign investors, making them less likely to invest in Nigerian agricultural projects, which can reduce the availability of capital for production and further reduce the volume of exports or farmers' ability to expand and export. It makes Nigerian agricultural products less competitive in international markets, as they become more expensive for foreign buyers, resulting in a decrease in demand for Nigerian agricultural products, resulting in lower export volumes. Nweke (2020) opines that the devaluation of the naira can also reduce the profitability of exports, making it less attractive for farmers to focus on producing for the export market; it can also lead to currency volatility, which can make it more difficult for Nigerian farmers to predict the value of their exports and plant their production accordingly. This can create uncertainty and make it harder for farmers to make long-term investment decisions. It can also increase the costs of imported inputs, which can make exporting less profitable.

When the naira depreciates, it increases the cost of importing raw materials and agricultural inputs, such as machinery, pesticides and fertilizers, which can drive up production costs and reduce competitiveness for Nigerian farmers in global markets, increasing the difficulty for farmers to obtain credit from banks and other financial institutions, decreasing their profitability, savings, and investments, and limiting their ability to make investments in their farms and boost production. Depreciation of naira can also lead to higher food prices, as the cost of imports and transportation increases. This can put a strain on the finances of both farmers and consumers, making it more difficult for farmers to sell their products and make a living. Naira depreciation can also reduce the value of government subsidies and other support programs for farmers, making it more difficult for farmers to access the resources they need to be successful, and this can have a significant impact on their incomes and the overall agricultural sector (Eme & Johnson, 2010).

Akpaeti *et al.,* (2018) employ the co-integration and Error Correction Model (ECM) using time series data spanning from1970-2017, in an empirical analysis of Farmers' Income, Investment and Inflation in Nigeria. He reveals that the rate of inflation has a positive growth rate, which has a negative influence on farmers' income and investment in the long run. This is because inflation, which is brought on by the naira depreciation, discourages investments and prevents investors from engaging in the agricultural sector, which will harm the nation's economy and financial system. Robles & Torero (2010) observe that a 10% increase in input costs decreased farmers' net income by 2.3% In the short-run, for the first one to two years and by 1.2% in the long run. Devaluation-related inflation has significantly reduced consumer purchasing power, leading to import substitution and expanded export opportunities, also contributing to rising inflation. The rapid and significant currency depreciation, however, may frighten foreign investors, who may decide to withdraw their portfolio investments from the country out of concern that the currency would continue to collapse.

Ogho & Alhabib (2017) in their study on the effect of naira devaluation (or depreciation) on Niger Delta agricultural value chains finds that devaluation produces enhanced export prospects and import substitution, which assist government trade policies. However, the CBN stepped in to strengthen the naira, diminishing some of the competitive benefits brought about by the depreciation. This highlights the discrepancy between the monetary and trade policies of the Nigerian government and supports the long-standing unwritten policy for a strong naira. In another study, Akpaeti *et al.,* (2014a) using time series data spanning from 1970 to 2009 on the trend evaluation of agricultural export crops (cocoa, palm kernel and palm oil) in Nigeria finds that compared to the pre-financial sector time, the growth rate of agricultural exports is larger and statistically significant at 5% probability level during the period of financial sector reform except in palm kernel. This result collaborates with a similar work of Akpaeti *et al.,* (2014b) on the impact of financial sector reforms on the Nigerian agricultural export performance and despite evidence that states that Nigeria is producing more basic foods than it did a decade ago, consistent agricultural production has been unable to keep up with the high demand (CBN, 2005) caused by a population that is projected to expand at a rate of 2.55% (United Nations, 2022). This results in the sector depending highly on the importation of

agricultural products from other countries. Thus, the over-dependence of Nigeria on importing agricultural products is detrimental as a drop in the naira has resulted in higher costs of sales and other operational and manufacturing costs, and as the population of the nation grows, so does the need for imported commodities.

Nigeria's agricultural exports structure and amount have changed as a result of the naira's depreciation, which has also increased the price of these exports. It has also resulted in considerable rises in the costs of key agricultural inputs over time, particularly those of specific relevance to farmers across the nation such as fertilizers and crop protection goods, affecting prices along all of the agricultural industry's value chains, energy prices such as power and fuel which are a major cost factor for processors along the value chains for palm oil, cassava, and aquaculture as well as for some primary producers in the poultry value chain are mostly influenced by foreign exchange cost factors, and Farmers in Nigeria are significantly having trouble getting these products due to price rises and insufficient local manufacturing capability (Bisola, 2022).

Naira depreciation also reduces Foreign Direct Investment, thereby reducing the availability of capital for production, and further reducing farmer's ability to export due to insufficient capital. On this note, farmers are struggling financially since they lack the resources to produce enough agricultural items for sale that would boost the state's economy, farmers' income and level of living (Obiageli, 2020). Naira depreciation therefore, increases the cost of production in the industry by driving up the price of raw materials, forcing farmers to cut down on their production or make use of cheaper-lower-quality inputs, which results in lower yields and profit. Also, the potential of shifting increased production costs to consumers through higher product pricing is constrained by competitive imports, which lowers farmers' rate of return. The government also spends more money to buy agricultural goods and services from other countries, rather than encourage the farmers by supplying them with the major resources needed to become a force to be reckoned with in terms of agricultural products' contributions to the economy of the country. Most research carried out failed to analyze overtime the effect of naira depreciation on Nigerian agricultural export volume and Farmers' income it is on this foundation that the study seeks to breach the gap and also add to existing literature, providing empirical evidence by specifically examining the effects of naira depreciation on Agricultural export volume and determining the effect of naira depreciation on farmers' income from1972-2020.

2.0 RESEARCH METHODOLOGY

2.1 The Study Area

This study was conducted in Nigeria. Nigeria is a country in West Africa that has western borders with the Republic of Benin, eastern borders with Chad, and Cameroon, and northern borders with Niger, Its southern beach also runs along the Gulf of Guinea. Nigeria is a tropical nation with a consistently humid and wet environment. Nigeria, which has a surface area of 923,768 km^2, has two main rivers: the Niger, from which it derives its name, and the Benue, which is the Niger's forerunner. The highest peak in the country, Chappal Waddi (or Gangirwal), is found in Taraba State's Gashaka-Gumti Public Park in the Adamawa Mountains, just beyond the Cameroonian border. Its elevation is 2,419 m (7,936 ft.). Abuja, the nation's capital, is situated in the country's centre, and Lagos, the main port, the largest metropolis, and the financial hub, are both located nearby. Nigeria is thought to include over 250 other ethnolinguistic groups in addition to the official languages of English, Hausa, Yoruba, and Igbo, with an estimated population of 219.7 Million people as of January 2022 (Country Meters, 2022). The favourable soil and weather condition of Nigeria makes it possible for about 70 % of the total population to engage in agriculture (Country Reports, 2021).

2.2 Sources and Types of Data

For this investigation, secondary data were used. The information was gathered from the Food and Agricultural Organization (FAO), the National Bureau of Statistics (NBS), and the Central Bank of Nigeria's (CBN) statistical bulletin. Due to the long-term series data, the data spans the years 1972 through 2020.

2.3 Method of Data Collection

Secondary data on Interest Rate (INT), Inflation Rate (INFL), Official Exchange Rate (OER), Government Expenditure on Agriculture (GEA), Agricultural Loan (AGL) and Farmers' Income (FIC) were obtained from the CBN statistical bulletin and FAO. However, agricultural gross domestic product (ARGDP) was presented as a proxy variable for Agricultural productivity and was obtained from CBN statistical bulletin. Furthermore, data on Relative Export Prices (REP) was computed by multiplying the sum of data obtained on Agricultural Export Value based on Prices (AEVP) of four major agricultural export commodities in Nigeria (cocoa bean, cocoa butter, sesame seed, oil palm) by the official exchange rate for each year from 1972-2020. Similarly, data on Agricultural Export Volume (AEV) were computed by multiplying the sum

of data obtained on Agricultural Export Value based on Quantity (AEVQ) for four major agricultural export commodities in Nigeria (cocoa bean, cocoa butter, sesame seed, oil palm) by the official exchange rate for each year for the period under review. However, data on Naira Depreciation (ND) was obtained by determining the percentage change of the quote currency (Naira) relative to its based currency (Dollar) where a positive change signifies appreciation and negative change signifies depreciation as shown in equation two (2).

2.4 Analytical Technique

Data obtained were specifically analyzed based on objectives.

Objective one: to examine the effects of naira depreciation on Agricultural export volume, a co-integration approach and Error Correction Model (ECM) were employed. The model for the equation was specified as:

$$\Delta LNAEVt = \beta_0 + \beta_1\Delta LNAGL_t + \beta_2\Delta LNAGL_{t-1} + \beta_3\Delta INFL_{t-1} + \beta_4\Delta INFL_{t-2} + \beta_5\Delta INT_{t-1} + \beta_6\Delta ND_{t-2} + \beta_7 \Delta LNOER_{t-1} + \beta_8 \Delta LNREP_t + \beta_9 ECM_{t-1} + U_t \quad \text{..... (1)}$$

Where:

LNAEV = Log of Agricultural Export Volume (₦)
LNAGL = Log of Agricultural Loan (₦)
INFL = Inflation Rate (%)
INT = Interest Rate (%)
ND = Naira depreciation rate (%)
LNOER = Log of Official Exchange Rate (₦)
LNREP = Log of Relative Export Prices (₦)
ECM = Error Correction model
U = Stochastic Error Term; β_0 = Intercept term ; $\beta 1 \ldots \beta_6$ are parameters to be Estimated.

To obtain the values for the Naira depreciation rate (ND), the values of the official exchange rate of the Nigerian naira to the U.S. dollar for the period under review were fitted into the Equation below to determine the percentage change of the quote currency (Naira) relative to the base currency (Dollar). Where a positive change indicates appreciation and a negative change indicates depreciation (Edward, 2006) as follows:

$$\frac{(V1-V2)}{(V2)} \; X \; \frac{100}{1} \quad \text{..... (2)}$$

Where
V_1= starting rate
V_2 = final rate

Objective two: to determine the effect of Naira depreciation on farmers' income a co-integration approach and Error Correction Model (ECM) were employed. The model for the equation was specified as:

$$\Delta LNFIC_t = \Theta_0 + \Theta_1\Delta LNREP_t + \Theta_2\Delta LNREP_{t-1} + \Theta_3\Delta LNREP_{t-2} + \Theta_4\Delta LNGEA_t + \Theta_5\Delta LNGEA_{t-2} + \Theta_6\Delta LNAGRDP_t + \Theta_7\Delta LNAGRDP_{t-1} + \Theta_8\Delta INFL_{t-1} + \Theta_9 ECM_{t-1} + U_t \text{ ---------- (3)}$$

Where:

LNFIC = Log of Farmer's income ((₦)
LNREP = Log of Relative Export prices (₦)
LNGEA = Log of Government expenditure
LNAGRDP = Log of Agriculture Real Gross Domestic (As a proxy for Agricultural Productivity)
INFL = Inflation Rate (%)
ND = Naira depreciation rate (%)
ECM = Error Correction Model
U = Stochastic Error Term; β_0 = Intercept term $\beta_1 \ldots \beta_6$ are parameters to be Estimated.

3.0 RESULTS AND DISCUSSION

3.1 The Effect of Naira Depreciation on Agricultural Export Volume

Times series data are typically non-stationary, which causes spurious regression when used for analysis. To convert the non-stationary variables to stationary variables, a unit root test must be done. The study used an Augmented Dickey-Fuller method to see if there exists a unit root among the variables. As displayed in Table 1, the unit root test was carried out on all variables in the real form, utilizing a functional form with a linear trend that is constant and a justification. The ADF unit root test lag length criteria are determined using the Akaike information criterion (AIC) so the max lag strength used for the unit root test as specified by AIC is 3. The ADF test displayed in the table reveals that at level, only Famers Income (FIC), Government Expenditure on Agriculture (GEA), Inflation Rate (INFL), Weather (WK) and Naira Depreciation rate (ND) are stationary, all other variables (Agricultural Export Volume (AEV), Agricultural Loan (AGL), Agricultural Productivity (ARGDP), Interest Rate (INTL), Official Exchange Rate (OER), Relative Export Prices(REP)) are not stationary at level but at first different. The result of the ADF unit root test states that the analysis of specific variables at the level can result in spurious regression estimates. Since each variable is integrated in a distinct order, this research uses the test of Johansen co-integration to investigate if there exists a long-run relationship among the variables. If it exists, it, therefore, means the research can go ahead to estimate a short-run error correction model for objectives one and two, otherwise, a normal ordinary least square regression will be used. However, from the result of the co-integration test, there exist long-run relationships

between the variables. Hence, based on the research objectives, the next section discusses the co-integration result and the error correction model.

Table 1: Result of Augmented Dickey-Fuller (ADF) Unit Root Test

Variables	Deterministic Component	Level	Lags	First Difference	Lags
AEV	Constant and linear trend	0.0285	0	6.5992***	1
AGL	Constant and linear trend	5.5158	8	-3.9369*	0
ARGDP	Constant and linear trend	-1.3010	0	-5.2467***	0
FIC	Constant	-3.6621*	0		
GEA	Constant and linear trend	-4.4026*	0		
INFLA	Constant	-4.1027**	1		
INT	Constant	-2.7275	3	-3.9560**	3
ND	Constant	-3.7638**	0		
OER	Constant and linear trend	1.3743	2	-5.2578***	1
REP	Constant and linear trend	-0.2579	4	-6.2335***	3
WK	Constant	-7.0085***	0		

Source: *Data from Central Bank of Nigeria (CBN) Food and Agricultural Organization FAO, climate knowledge, computed by author, 2022. Notes ***, ** and * indicates 1%, 5% and 10% significant level respectively*. Variables are as defined previously.

Tables 2 and 3 respectively display the result of the Johnson co-integration test for agricultural export volume. As shown in the Table, the trace and maximum Eigenvalues test both show a 5 % level of significance of three and two co-integrating equations present. This is proof that these variables have been correlated throughout time in Nigeria. As a result, the long-term relationship between the variables would be monitored by the Error Correction Model (ECM) and linked to any short-term deviations (Lorde *et al.*, 2009).

Table 2: Trace test of Johansen co-integration for agricultural export volume

Hypothesized No. CE(s)	Eigenvalue	Trace Statistic	0.05 Critical value	Prob **
None*	0.8604	237.6034	150.5585	5.3795
At most 1*	0.6624	147.0112	117.7081	0.0002
At most 2 *	0.5422	97.0582	88.8038	0.0111
At most 3	0.4257	61.1131	63.8761	0.0835
At most 4	0.3072	35.5988	42.9152	0.2212
At most 5	0.2744	18.7106	25.8721	0.2981
At most 6	0.0823	3.9544	12.5179	0.7486

Trace test indicates 3 co-integrating equations at the 0.05 level *denotes rejection of the hypothesis at the 0.05 level **Mackinnon-Haug-Michelis (1999) p-values.

Table 3: Johansen co-integration maximum eigenvalue test for agricultural export volume

Hypothesized No. CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical value	Prob**
None*	0.8604	90.5922	50.5998	2.8744
At most 1 *	0.6624	49.9530	0.0116	0.0116
At most 2	0.5422	35.9450	0.0915	0.0916
At most 3	0.4257	25.5142	0.2574	0.0257
At most 4	0.3072	16.8882	0.4671	0.4672
At most 5	0.2744	14.7561	0.2071	0.2072
At most 6	0.0823	3.9544	0.7486	0.7487

*Trace test indicate 2 equation of co-integrating at the 0.05 level *shows hypothesis rejection at 0.05 level **Mackinnon-Haug-Michelis (1999) p-values*

As shown in Table 4, Error Correction Model (ECM) analysis was used to determine whether there is a significant short-run relationship between Naira depreciation and agricultural export volume, the ECM result for agricultural export volume shows the value of R^2 to be 0.664, indicating that the variable explains about 66% of agricultural export volume. F-statistics of 7.714 ($p<0.05$) shows they are both significant and the statistics value (2.03) of Durbin-Watson indicates that there is no autocorrelation detected and the model is a very good fit. It also demonstrates that the error correction term coefficient that measures the rate of long-run equilibrium adjustment is statistically significant and is correctly signed (negative). For significant variables, the result for the ECM reveals that past value of inflation **(**INFL**)** and relative export prices **(**LNREP**)** are negative and statistically significant in the short-run at 5%. The implication here is that an increase in inflation and Relative export prices will reduce the possibility of increasing Agricultural export volume in the country by 0.79% and 50% respectively. This is because an increase in both variables (inflation and relative export prices) creates an unfavourable condition for the exchange of Nigerian major agricultural export products at the world export market. It is worthy of note that inflation causes a major increase in the cost of intermediate input for agricultural production in the country and this additional cost incurred by agricultural producers is reflected in the relative export prices for these commodities thereby causing a fall in the quantity of these commodities demanded due to increase prices. This result agrees with that of Parusa & Istiqomah (2018) who posit that inflation has a negative significant effect on exports but contradicts that of Adubi & Okunmadewa (1999) who affirm that export volume is positively impacted by rising export prices. On the other hand, Agricultural Loan (LNAGL) is positive at a 5% level of significance, and in the short-run, it determines Agricultural export volume in Nigeria. This indicates that an increase in this variable will increase agricultural export volume by 56% because an increase in funding through agricultural credit will result in a corresponding increase in agricultural output with attendance effect on the growth and productivity of agricultural sub-sectors in Nigeria This result agrees with that of Efobi & Osabuhien (2011) who reveal that Agricultural credit guarantee scheme fund and non-oil export sector has a correlation that is positive between them. Furthermore, among other variables (Official Exchange Rate (LNOER) and Interest Rate (INT)), the effect of Naira Depreciation (ND) on agricultural export volume is statistically insignificant. The reason is that the stimulating effect naira depreciation has on agricultural export volume is being nullified by the suppressing effect of naira depreciation on the import of agricultural intermediate inputs due to the inflationary effect of naira depreciation because Nigeria is an import-dependent country. This result follows that of Nweke *et al*., (2020) who posit that the performance of non-oil exports is unaffected by exchange rate depreciation in the short-run, and that of Akinbode & Ojo (2018) who state that in the short-run and long-run, there is an insignificant effect of exchange rate volatility on agricultural export due to the inelastic nature of agricultural commodities.

Table 4: Error Correction Model (ECM) Result for Agricultural Export Volume

Variables	Coefficient	Std. Error	t- statistics	Prob.**
C	0.0283	0.0646	0.4378	0.6642
D(LNAGL)	0.5608	0.1707	3.2864**	0.0023
D(LNAGL(-1))	0.1618	0.1507	1.0741	0.2901
D(INFL(-1))	-0.0043	0.0035	-1.2131	0.2332
D(INFL(-2))	-0.0079	0.0034	-2.2792**	0.0289
D(INT(-1))	0.0252	0.0158	1.5934	0.1200
D(ND(-2))	-0.0049	0.0036	-1.3592	0.1828
D(LNOER(-2))	-0.0042	0.0038	-1.0887	0.2837
D(LNREP)	0.5045	0.1584	-1.0838**	0.0030
ECM1(-1)	-1.192	0.1700	-7.0139***	0.0000
R-squared	0.6648		Mean dependent var	0.1529
Adjusted r-squared	0.5787		S.D dependent var	0.4977
S.E. of regression	0.3228		Akaike info criterion	0.7699
Sum squared resid	3.6482		Schwaz criterion	1.1714
Log-likelihood	-7.3226		Hannan-Quinn criter.	0.9196
F-statistics	7.7144		Durbin-Watson stat	2.0300
Prob(F-Statistic)	0.0000			

Source: Computed by author, **2022 ***, **, * indicate 1%, 5% and 10% significant revel respectively**

3. 2: The Effect of Naira Depreciation on Farmers' Income

Table 5 and Table 6 respectively show an estimated co-integration test result. Both tables show the trace and maximum eigenvalue tests indicating the presence of three co-integrating equations among variables used, at a 5% significance level indicating a long significant relationship amongst variables. The Error Correction Model (ECM) would therefore monitor the long-run relationship among the variables and align it to any changes that might occur in the short run following Lorde *et al*., 2009.

Table 5: Johansen Co-Integration Trace Test for Farmers' Income

Hypothesized No. CE(s)	Eigenvalue	Trace Statistic	0.05 Critical value	Prob. **
None*	0.8268	247.3639	159.5297	0.0000
At most 1 *	0.7253	168.4782	125.6154	0.0000
At most 2 *	0.6141	110.3375	95.7537	0.0034
At most 3	0.4459	67.4875	69.8189	0.0757
At most 4	0.3708	40.9227	47.8561	0.1911
At most 5	0.2145	20.0735	29.7971	0.4179
At most 6	0.1141	9.2068	15.4947	0.3466
At most 7	0.0801	3.7547	3.8415	0.0527

*Trace test indicates 3 co-integrating equations at the 0.05 level *shows hypothesis rejection is at the 0.05 level **Mackinnon-Haug-Michelis (1999) p-values.*

Table 6: Johansen Co-Integration Maximum Eigen Value Test for Farmers' Income

Hypothesized No. CE(s)	Eigenvalue	Max Eigen Value	0.05 Critical value	Prob. **
None*	0.8268	78.8857	52.3626	0.0010
At most 1 *	0.7253	58.1407	46.2314	0.0018
At most 2 *	0.6141	42.8500	40.0776	0.0237
At most 3	0.4459	26.5647	35.8769	0.2874
At most 4	0.3708	20.8493	27.5843	0.2854
At most 5	0.2145	10.8667	21.1316	0.6606
At most 6	0.1141	5.4521	14.2646	0.6840
At most 7	0.0801	3.75471	3.8415	0.0522

Max Eigenvalue test indicates 3 co-integrating equations at the 0.05 level
*denotes rejection of the hypothesis is at the 0.05 level
**Mackinnon-Haug-Michelis (1999) p-value

An Error Correction Modeling (ECM) analysis was used as shown in Table 7, to examine if Naira depreciation and farmers' income have a significant short-run relationship existing between them. The results from Table 7 show an R^2 value of 0.712 indicating that about 71% of farmers' income is explained by the variables. F-statistics of 8.65 ($p<0.05$) reveal they are both significant and the value of 2.030 for Durbin Watson's statistics implies that the model is a very good fit and it does not indicate the presence of autocorrelation in the model. For significant variables, the coefficient of agricultural productivity and inflation is negative and statistically significant at 5% each respectively. This implies that an increase in the unit of agricultural productivity decreases farmers' income. This is due to the lack of cooperation among farmers and their failure to learn how to grow higher-yielding crops, as well as the monopolization of agricultural commodity buyers due to farmers' inability to bargain for better prices. Farmers' inability to switch to more lucrative crops due to a lack of knowledge also contributes to their inability to make more money despite productivity increases. Similarly, the result also shows that an increase in a unit of inflation will lead to a reduction in farmer's income by 1.4% caused by the decline in the purchasing power of the farmers. This result contradicts that of Akpaeti *et al.*, (2019) who discovered a positive correlation between inflation and farmers' income.

Furthermore, the ECM result also shows the coefficient of naira depreciation and relative export prices to be negatively significant at 10% respectively, indicating an increase in a unit of naira depreciation which will result in a 1.2% decrease in farmers' income because currency depreciation causes inflation, and the higher the inflation rate is than the wage increase, the lower the real wage and overall income of the farmer, this is in line with Adubi & Okunmadewa (1999) who posit that farmers' incomes decline when exchange rate fluctuations become increasingly unpredictable. The significant negative effect of relative export prices on farmers' income is that farmers reflect the high cost of input used for production in the output of agricultural product prices, which in turn results in a decline in the quantity of these products demanded. Therefore, owing to the perishable nature of the agricultural product and the unavailability of adequate storage and processing facilities for the agricultural product in Nigeria, there will be a loss in the quantity and quality of this product with time, due to infestation of pests resulting in a corresponding loss in revenue due to drastic reduction in product prices by farmers. The result also reveals that the coefficient of government expenditure on agriculture is positively significant at 1% which implies that an increase in a unit of government expenditure will result in a 56% increase in farmer's income. From the result, the error term coefficient measures the rate of adjustment to long-run equilibrium is negatively signed and statistically significant at 1%, indicating about 60% correction of the error with various rates of long-run equilibrium adjustment, implying that in the short run - Naira depreciation affects Farmers' income in Nigeria.

Table 7 Result on ECM for Famers' Income

Variables	Coefficient	Std. Error	t- statistics	Prob.**
C	-0.1262	0.1042	-1.2111	0.2340
D(LNREP)	-0.4608	0.2651	-1.7385*	0.0909
D(LNREP(-1))	0.5675	0.2896	1.9600	0.0580
D(LNREP(-2))	0.4707	0.3530	1.3333	0.1910
D(LNGEA)	0.5467	0.0949	5.7579***	0.0000
D(INGEA(-2))	0.2241	0.1327	1.6881	0.1003
D(LNARGDP)	-1.6537	0.6037	-2.7391**	0.0096
D(LNARGDP(-1))	-0.9295	0.6786	-1.3649	0.1795
D(INFL)	-0.0140	0.0061	-2.2867**	0.0284
D(ND)	-0.0120	0.0069	-1.7366*	0.0912
ECM3(-1)	-0.5989	0.1497	-4.0003***	0.0003

R-squared	0.7119	Mean dependent var	0.1529
Adjusted r-squared	0.6295	S.D dependent var	0.4977
S.E. of regression	0.5439	Akaike info criterion	0.7699
Sum squared resid	10.3526	Schwaz criterion	1.1714
Log-likelihood	-30.9690	Hannan-Quinn criter.	0.9196
F-statistics	8.6468	Durbin-Watson stat	2.0300
Prob (F-Statistic)	0.0000		

Source: Computed by author, **2022 ***, **, * indicate 1%, 5% and 10% significant revel respectively**

4.0 CONCLUSION AND RECOMMENDATION

Having analyzed the effect of naira depreciation on Nigerian Agricultural export volume and Farmers' Income, the inflation rate and relative export price coefficients are found to have a negative significant impact on Nigeria's agricultural export volume in the short run, while the agricultural loan has a significant positive impact. However, among other variables (interest rate and official exchange rate), the naira depreciation rate does not significantly affect the export volume of agriculture in Nigeria in the short-run but in the long-run. Also, the ECM result for farmers' income reveals that the coefficient of relative export prices, agricultural productivity, inflation, and naira depreciation in the short-run have a negative significant impact on farmers' income in Nigeria. Additionally, it is discovered that in Nigeria, the only factor with a significant positive short-run influence on farmer income is the government's expenditure on agriculture. Therefore, it is advised that feasible and workable monetary policies that will reduce Naira depreciation and effectively regulate it, thereby mitigating inflation and increasing Nigeria's Agricultural export volume and farmer's income should be developed by the Federal Government, Central Bank of Nigeria, and other economic stakeholders. The Federal Government should also improve the amounts of credit advances given to agricultural producers in Nigeria since they lack the resources to produce enough agricultural items for export that would boost the state's economy, farmers' income and level of living since an increase in funding through agricultural credit will result in a corresponding increase in agricultural output with attendance effect on the growth and productivity of the sector. Furthermore, for the sake of increasing farmers' income in the nation, there should also be a fiscal policy that ensures government spending on agriculture produces the intended results.

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