# Exchange rate and agricultural output performance in Kenya

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## ABSTRACT

The purpose of this research was to examine the effect of exchange rates on the performance of agricultural output in Kenya from the year 1986 to 2023. The theoretical framework that guided this research was the export-led growth theory. The research applied the time series analysis and causal study design. The secondary data used was filtered on many sources of government data, such as economy surveys and the Kenya National Bureau of Statistics (KNBS). The study used the VECM model to analyze both short-run and long-run impacts by using Stata as the statistical program to test the quantitative data. Based on the healthy VECM that was developed, the findings revealed that the exchange rate had a positive significant short-run relationship with agricultural output. However, in the long run, the exchange rate and agricultural output had a negative and statistically significant relationship. This implied that a 1% increase in the exchange rate would result in a 0.127% decrease in agricultural output. Also, agricultural land influenced agricultural output negatively in the short run. However, in the long run influenced agricultural output positively, suggesting that expansion of land increases productivity. The findings suggest that the depreciations in the exchange rates would lead to a rise in the agricultural productivity of the country in the short run but negatively influence agricultural output in the long run due to a high increase in imported input prices. Hence, the policymakers ought to implement appropriate policies that aim at stabilizing the exchange rate, therefore making production cheaper, and also the government should encourage the people to use the local inputs.

**Keywords:** Agricultural Land, Agricultural Output, Exchange Rate, Exchange Rate Depreciation

## I. INTRODUCTION

Agriculture is a vital part of Kenya's economy, says the Kenya National Bureau of Statistics (KNBS). It offers a solid foundation for Kenya's economy and accounts for around 22.4% of the country's Gross Domestic Product [GDP]. Forty percent of Kenyans work in agriculture with that number rising to around seventy percent in rural areas. Indirectly, via relationships with related industries, the agriculture sector is expected to contribute approximately 27% to the country's GDP (Food and Agricultural Organization [FAO], 2023). Crop production, livestock raising, forest management, and aquatic life cultivation are all part of Kenya's agricultural landscape. Food security, international commerce, poverty reduction, and rural employment and incomes have all been greatly enhanced by Kenya's agricultural sector, which is the backbone of the country's economy (Government of Kenya, 2019). To attain food security and reduce poverty, the agricultural sector is of the highest importance, according to the Sustainable Development Goals (SDG) (Mabiso et al., 2012). The agricultural sector's impact on Kenya's GDP has a direct bearing on the country's economic performance as a whole. Periods of higher economic growth have been associated with periods of higher agricultural growth (PricewaterhouseCoopers [PwC], 2023). On average, between 2013 and 2017, the agriculture industry contributed 21.9% to the GDP, according to Wankuru et al. (2019). At least 56% of the workforce was employed in this sector in 2017. The government's Big Four development agenda is aiming to guarantee full food and nutritional security for all Kenyans by 2018, and the agricultural sector is a crucial part of this objective.

Kenya Vision 2030 designates the agricultural sector as essential for achieving the projected annual economic growth rate of 10 percent. The growth of the agricultural sector is strongly linked to the whole economy; a 1 percent rise in agriculture is anticipated to yield a 1.6 percent increase in total GDP (Government of Kenya, 2019). The agricultural sector, as the foundation of the Kenyan economy, has significantly improved rural employment, incomes, food security, international trade, and poverty reduction (Government of Kenya, 2019). This industry continues to be

the principal contributor to GDP in most developing countries, including Kenya. The Kenyan government's decade-long agricultural growth strategy seeks to enhance productivity and income for smallholder farmers, augment value addition for agricultural output, and boost household food security (Njeru, 2021, FAO, 2023). In 2004, the government launched the Strategy for Revitalizing Agriculture (SRA) to address challenges in the agricultural sector (Adongo, 2020). The strategy aimed to transform the agricultural industry into a profitable commercial enterprise that would attract private investment and ensure national food security (FAO, 2008). The phenomenon was observed in 2007, when sector growth above the target of 3.1, reaching a maximum of 6.1 percent (Government of Kenya, 2010). In 2008, the Agricultural Sector Development Strategy (ASDS) was instituted in response to post-election violence that impeded growth, with the objective of attaining a 10 percent yearly rise (Adongo, 2020). The ASDS plan aimed to augment income and employment while positioning the agricultural sector as a crucial contributor to the projected 10 percent annual growth rate specified in the economic pillar of Vision 2030 (Government of Kenya, 2010).

The agricultural development strategy of the nation for 2010-2020 aimed for an annual growth rate of 7 percent in agriculture and a 30 percent reduction in food insecurity (International Fund for Agricultural Development [IFAD], 2020). In 2017, the country attained an annual growth rate of 3 percent, which was below the sector's anticipated growth of 7 percent (Kenya National Bureau of Statistics. [KNBS], 2017). Between 2008 and 2012, the sector experienced an annual growth rate of 0.98 percent, albeit a significant surge of 6.6 percent in 2010. This arose from the advantageous weather conditions that endured (Oduor, 2019). Consequently, it decreased to 1.5 percent in 2011 due to erratic weather patterns and increased agricultural production expenses (KNBS, 2013). Between 2013 and 2017, the agricultural sector represented an average of 21.9 percent of GDP, with a minimum of 56 percent of the total labor force employed in agriculture in 2017 (Wankuru et al., 2019). With contributions of 18.9% in 2018, 19.4% in 2019, and 21% in 2020, agriculture was the backbone of the economy. Even though the Kenya Vision 2030 called for a 7% yearly growth rate, the nation only managed 3% growth in 2017 (KNBS, 2017). From 2017 to 2021, the agricultural sector's share of total growth fell 0.4% (KNBS, 2022). Inadequate rainfall, which limited agricultural production, was said to be the cause of the slowed growth. Because of unfavorable weather that reduced the output of crops and cattle, Kenya's agricultural industry saw a fall in growth rate from 5.2% in 2020 to 0.1% in 2021 (Central Bank of Kenya [CBK], 2022). The agriculture sector's success has been affected by adverse macroeconomic variables such as exchange rate, government policies, and other reasons. The decrease in performance of the agricultural sector has been attributed to different factors including exchange rate policy.

The amount of the original currency that needs to be converted in order to buy other currencies is called the exchange rate, according to Schiller (2008). As an example, Ncube and Ndou (2011) state that currency rates impact both the relative prices of local and foreign commodities and the demand for home goods by customers abroad. The value of one currency relative to another affects the cost of goods and services both at home and abroad. The value of one currency relative to another can rise or fall depending on fluctuations in exchange rates (Kimani, 2016). Kenyans exchange rate has had abrupt movements since the mid-1980s. The nominal shilling-dollar rate moved from as small as 16 per dollar in the mid-1980s to one hundred per dollar in the early 2020s, showing a long run depreciation and high volatility over time, and policy responses such as the liberalization in the early 1990s and macroeconomic stabilization. This currency movement change the relative prices affecting farmers, exporters and producers, that is, the depreciation of the currency can result to export competitiveness but can also increase the cost of imported inputs making production expensive. Also, exchange rate volatility also raises uncertainties and can reduce investment in input and technology. Theoretically, it is argued that currency depreciation do promote exports of the country by making the export affordable to the international markets.

The flow of foreign income to the nation arising from the increased exports leads to increase in domestic investment and increased production resulting to increased productivity in the country. However, appreciation of the currency rate increases the import cost, which can result to decline in sector productivity. The production cost would increase due to increased input cost, therefore reducing the productivity of the agricultural sector. The nation's economy is profoundly affected by governmental policies, making them crucial. By considering the performance of the agricultural sector in different times of exchange rate reforms, it would be valid to ask “what is the impact of exchange rate on Kenya’s agricultural output performance?” Being able to understand the effect of exchange rate policy on the growth of agricultural sector is important in formulating appropriate exchange rate policy that will boost the sector and increase productivity. Studies have investigated the effect of exchange rate on the agricultural output performance; however the findings have shown mixed effects. Several competing theories and lines of evidence provide credence to this viewpoint. The currency rate affects the performance of Kenya's agriculture business, according to Adongo et al. (2020). The long-term impact of the exchange rate on agricultural productivity is another matter entirely. According to Tunggal and Kadir (2015), a number of macroeconomic variables influence agricultural output. These include net exports, government spending, interest rates, currency rates, inflation rates, and money supply. Gatawa and Mahmud (2017) indicated that agricultural export volumes were positively influenced by the

official exchange rate and agricultural loans in the short run. Whether or not, exchange rate has had a positive or negative affect on the Kenya's agricultural output has remained a puzzle. Therefore, this underlines the need to conduct a study to evaluate how exchange rate influences agricultural output in Kenya.

### 1.1 Statement of the Problem

The agricultural sector is very vital to the Kenyan economy for it contributes 80 percent of national employment and contributes largely to the GDP growth. The agricultural sector faces several challenges, which include unfavourable macroeconomic variables, climate change, limited access to inputs and financing and poor infrastructure. However, the Kenyan government has implemented several policies and interventions, such as ASDS, ASTGS, and Kenya Vision 2030, which emphasize on adoption of modern farming techniques, enhance farmers' access to finance, promote value addition, and market access. Also through CBK, the government implemented policies to manage exchange rate in the economy. In recent years though, there have been fluctuating trends in the agricultural sector. The contribution of the agricultural sector to the overall growth contracted by 0.4 percent between 2017 and 2021, with the agricultural performance growth declining from 5.2 percent in 2020 to 0.1 percent in 2021. Therefore, this becomes a concern since poor performance in agricultural sector results into food insecurities, low employment among the youths, and increased poverty among the people. The consequences of these effects include, increased school dropout, increased crime rate, and diseases such as malnutrition and depression. There have been studies explaining the effect of various macroeconomic variables on the financial performance of tea sector in Kenya and on economic growth in Kenya; such as Kimani (2016), and Kyalo (2020) respectively, but there are limited studies explaining how the exchange rate affects the agricultural sector in Kenya. Hence there is need to evaluate the effect of exchange rate on agricultural output performance in Kenya.

### 1.2 Research Objective

The study examined the effect of exchange rate on the agricultural productivity in Kenya

## 1I. LITERATURE REVIEW

### 2.1 Theoretical Review

The study was guided by the export led growth theory.

#### 2.1.1 Export Led Growth Theory

Export-Led growth theory posits that the primary driver of economic growth is the expansion of exports. The hypothesis posits that, in addition to augmenting labor and capital, export expansion also stimulates overall economic growth. Furthermore, the growth of exports in a nation will drive domestic firms to focus more on the creation of export items, thereby enhancing the economy's productivity. Exports contribute to the balance of payments and enhance job prospects inside an economy. Trade enables a country to access diverse production processes, so enhancing its production capabilities and accelerating its growth rate. Therefore, a nation can enhance its production based on its comparative advantage and attain economies of scale to access international markets.

According to proponents of the export-led growth theory, exports can boost GDP by inspiring local businesses to adopt more efficient production processes and become more globally competitive. The expansion of agricultural production is one of the main forces propelling developing countries forward (Enoma & Anthony, 2010); consequently, many countries rely on agricultural expansion for employment, food security, foreign exchange, and governmental revenue (Child, 2008). The current study utilizes the Export-led growth theory as a foundational framework, emphasizing output growth through export expansion, such as agricultural production, which leads to enhanced food production, increased foreign earnings, and elevated GDP, thereby improving the standard of living.

### 2.2 Empirical Review

Olubiyi et al. (2019) did a study to investigate how exchange rate movement affects the export of selected agricultural products in emerging African countries. ARDL estimations were carried out and found that movement in exchange rate differs across countries on cocoa, coffee, vegetables, sugar, and fruits exports. In addition, the findings also showed that depreciation of exchange rate in some countries promotes export while in others it discourages export. Therefore, the study focused on a few selected agricultural products, leaving a gap in the exploration of the overall agricultural sector. To address this pressing need, this research will examine how exchange rates have influenced the performance of Kenya's agricultural sector.

Iliyasu (2019) sought to examine the effect of exchange rate on agriculture in Nigeria from 1999 to 2016. Pearson correlation analysis was used for data analysis. The research findings indicated that exchange rate had a

positive significant effect on the activities in the agricultural sector. In addition, exchange rate had a positive correlation with agricultural output. However, this study scope was distinct from the Kenya's agricultural output, therefore this results to a research gap. This study therefore rises to this challenge, examines how exchange rate will influence the performance of the agricultural output in Kenya.

Onwuagana and Areghan (2020) conducted a study to examine the impact of exchange rate and inflation rate on the agricultural development in Nigeria. The study utilized annual time series data from 1986 to 2020. The Ordinary Least Squares (OLS) method was employed. The results showed that agricultural development was positively influenced by the exchange rate and negatively influenced by inflation rate. However, the scope of the study remained distinct from the Kenya's agricultural sector. This leads to a research gap on how exchange rate, resonates with the agricultural sector in Kenya. Therefore, this research aims to investigate the correlation between exchange rates and the performance of Kenya's agriculture sector.

Kyalo (2020) set out to investigate the effect of selected macroeconomic variables on economic growth in Kenya using secondary data from 1970 to 2018. Regression analysis and Analysis of Variance [ANOVA] analysis was used for data analysis. The research results suggested that economic growth and exchange rate are strongly related. In addition, foreign direct investment has a positive relationship with economic growth. The study however did not explain the impact of exchange rate on agricultural output also revealed that the higher the inflation rates, the lower the economic growth. The study, however, did not explain the impact of the selected macroeconomic variables on the performance of the Kenya's agricultural output. This knowledge gap calls for studies to further investigate ways in which exchange rate can shape the agricultural sector performance in Kenya. Guided by this knowledge gap, the current study seeks to find out how exchange rate affects the performance of the agricultural output in Kenya.

Gatawa and Mahmud (2017) conducted research to determine the effect of exchange rate fluctuations on agricultural exports (crops) in the Nigerian economy from 1981 to 2014. Autoregressive Distributed Lag (ARDL) and GARCH model was used in this study. The results indicated that agricultural export volumes were positively influenced by the official exchange rate and agricultural loans in the short run, and similar results were found in the long run except for exchange rate, which affected agricultural export volumes negatively in the long run. However, the scope of this study remained distinct from Kenya's agricultural sector. This study leaves behind a gap, inviting more scholars to find out how exchange rate would shape the performance of the agricultural output in Kenya. In the bid to bridge this scholarly gap, the current study examines the relationship between exchange rate and the performance of the agricultural output in Kenya.

Ogutu (2014) examined the influence of the real exchange rate on Kenya's trade balance over the period 1963 to 2013. The study employed regression analysis, incorporating cointegration techniques, vector autoregressive (VAR), and vector error correction models (VECM) to assess both the relationship and impact of the real exchange rate alongside other factors on the trade balance. The findings revealed that the real exchange rate had a positive and significant influence on the trade balance. Therefore, depreciation of the Kenyan currency led to an improvement in trade balances. However, this research took a narrow perspective, omitting the exploration of how the exchange rate fluctuations influence the performance of the agricultural sector in Kenya. To fill this research gap, this study seeks to analyze the relationship between the exchange rate, interest rate, GDP growth rate, inflation rate, and the agricultural sector's performance in Kenya.

## III. METHODOLOGY

The research used a descriptive causal research design to determine the cause-and-effect interaction between the study variables. The study used yearly data from agricultural value added, and exchange rate (Ksh to US) and agricultural land as the control variable. The data was on the dependent variable which is agricultural output performance and independent variables which is exchange rate. The data ran from 1986 to 2023 since this period provides enough historical data on the variables and covers most of the economic changes, and policy reforms in the country. The data was extracted from Kenya National Bureau of statistics database on their websites. The data was then saved in excel spreadsheet which was then imported to Stata. Diagnostic evaluations were conducted to ascertain the model's accuracy.

### 3.1 MODEL SPECIFICATION

The Vector Error Correction Model (VECM) model was used to investigate the relationship between dependent variable Y which is agricultural output and the independent variables $\boldsymbol{X_1}$, which is exchange rate along with the error term $\boldsymbol{\varepsilon}$. The VECM model allows the use of the variables in their original level, but they should be intergrated of order 1(1) only. The VECM models allow the variables to have lags thus capturing dynamic relationships over time. The resulting VECM model was expressed as;

Equation 1: VECM Model

$$y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(I)}$$

Where:

$y_t$ Represents the value of the agricultural output performance
$\beta_0$ Represents the constant of the equation
$\beta_1$- $\beta_3$ represents coefficient of the variables
$X_1, X_{2t}$ Represents the exchange rate and agricultural land
$t$ Represents the time series
$\varepsilon$ Represents the error term which is assumed to be normally distributed

## IV. FINDINGS & DISCUSSION

### 4.1 Descriptive Statistics

Descriptive statistics summarizes major features of the variables, in order to get a preliminary picture of the data set, which includes, mean, median, maximum, minimum, standard deviation, skewness and kurtosis.

**Table 1**

*Descriptive Statistics*

| | Agrivalueadded | Exchangerate | Agriland |
|---|---|---|---|
| Mean | 23.4902 | 71.6464 | 48.0030 |
| Median | 24.2782 | 76.0556 | 47.5561 |
| Maximum | 28.7776 | 139.8464 | 49.7929 |
| Minimum | 16.2550 | 16.2257 | 46.2404 |
| Std. Dev | 3.6841 | 30.2959 | 1.1638 |
| Skewness | -0.1571 | -0.2479 | 0.3381 |
| Kurtosis | 1.7294 | 2.6385 | 1.6213 |

From the descriptive statistics in the table 1 above, the mean value of agricultural output, exchange rate and agricultural land is 23.4902, 71.6464 and 48.0030 respectively. The maximum values of agricultural output, exchange rate, and agricultural land were 28.7776, 139.8464, 49.7929 respectively, while the minimum values were 16.2550, 16.2257, and 46.2404 respectively. The standard deviation of agricultural output, exchange rate and agricultural land were 3.6841, 30.2959, and 1.1638 respectively. The skewness showed that the distribution of agricultural output, and exchange rate were positively skewed indicating that the distributions were asymmetric in nature. However, agricultural land was negatively skewed. The results of the kurtosis indicated that the distribution of agricultural output, exchange rate and agricultural land were platykurtic because they were all less than 3.

### 4.2 Unit Root Test and Cointegration Test

The unit root test was done to the time series data to ensure that the series has a constant mean and variance avoiding spurious results.

**Table 2**

*Unit Root Test*

| | Test statistics | Critical value at 5% | P-value | Status |
|---|---|---|---|---|
| Agrivalueadded | -1.663 | -2.966 | 0.4503 | Non stationary |
| D.agrivalueadded | -6.717 | -2.969 | 0.0000 | Stationary |
| Exchangerate | 0.067 | -2.966 | 0.9637 | Non stationary |
| D.exchangerate | -4.526 | -2.969 | 0.0002 | Stationary |
| Agriland | -1.260 | -2.966 | 0.6474 | Non stationary |
| D.agriland | -7.160 | -2.969 | 0.0000 | Stationary |

The stationarity test was carried out to tests for the presence of unit root for the variables by applying Augmented Dickey Fuller test. All the variables were found to be stationary after first differencing confirming they are integrated of order one, 1(1). The use of VECM model requires that all variables should be integrated of order one 1(1).

### 4.3 Lag Selection Criteria

In time series data lags were used to take care of the data that may be related, from different periods thus taking care of the relationship in the analysis. The primary objective was to determine the lag order that best captures the relationship between data points across different time periods. The appropriate lag selection is the one that minimises the AIC, (Akaike Information Criterion).

**Table 3**

*Lag Selection Criteria*

| Lag | LL | LR | df | P | FPE | AIC | HQIC | SBIC |
|---|---|---|---|---|---|---|---|---|
| 0 | -273.499 | | | | 2324.03 | 16.2646 | 16.3106 | 16.3993 |
| 1 | -185.408 | 176.18 | 9 | 0.000 | 22.2403 | 11.6123 | 11.796 | 12.151 |
| 2 | -174.904 | 21.008 | 9 | 0.013 | 20.6571 | 11.5238 | 11.8453 | 12.4665 |
| 3 | -167.224 | 15.36 | 9 | 0.082 | 23.1383 | 11.6014 | 12.0607 | 12.9482 |
| 4 | -154.213 | 26.022 | 9 | 0.002 | 19.5821 | 11.3655 | 11.9626 | 13.1163 |

From table 3, the results showed that Lag 4 was the optimal lag to be used in the model because it yields the lowest AIC value (11.3655). This was carried out to take care of related data in the model.

### 4.4 Johansen Test for Cointegration

Cointegration means that there is a long run relationship between two or more variables. The study adopted the Johansen test because it accommodates integrated variables of order one and can also detect more than one cointegrating relationship.

**Table 4**

*Johansen test for Cointegration*

| Rank | LL | Eigenvalue | Trace statistics | 5% critical |
|---|---|---|---|---|
| 0 | -172.0912 | | 35.7558 | 29.68 |
| 1 | -160.2440 | 0.5019 | 12.0613 | 15.41 |
| 2 | -154.2861 | 0.2956 | 0.1455 | 3.76 |
| 3 | -154.2133 | 0.0043 | | |

According to table 4, Johansen test was used to carry out cointegration test, at rank 0, the trace statistic was 35.76 > 0.05; therefore the null hypothesis of no cointegration was rejected. At rank 1, the trace statistic was 12.06 < 15.41; therefore, the null hypothesis was not rejected, signifying no cointegration. Therefore, there is one cointegration among the variables.

### 4.5 Diagnostic Test

In order to ensure the robustness of our findings, several diagnostic tests were performed on the residuals of the model. These tests include multicollinearity, autocorrelation, heteroscedasticity and normality test among the residual. The results confirmed that the model adheres to the necessary assumptions for valid inferences. Using the Lagrange Multiplier test it confirmed that there was no serial correlation with (0.25>0.05), the null hypothesis that no serial correlation is accepted. Using white test, the results confirmed homoskedasticity (0.736>0.05) thus, the null hypothesis of homoskedasticity is accepted, and no model specification, indicating the model was well specified. Additionary, the normality test showed that the residuals are normally distributed with Jacque-bera test indicating a p-value of 0.303>0.05 therefore fail to reject the null hypothesis indicating the residuals are normally distributed.

### 4.6 Vector Error Correction Model Analysis

The study sought to find out how exchange rate affects the performance of agricultural output. To examine both the short run and long run effect the researcher used VECM model.

**Table 5**

*Vector Error Correction Model Results*

| Variable | Coeffcient | Std. Error | P-value | 95% confidence |
|---|---|---|---|---|
| d.agrivalueadded | 0.2368 | 0.1065 | 0.026 | 0.0280 |
| agrivalueadded (L1) | -0.5363 | 0.2364 | 0.023 | -0.9995 |
| agrivalueadded (L2) | -0.5608 | 0.2237 | 0.012 | -0.9993 |
| agrivalueadded (L3) | 0.1343 | 0.2180 | 0.538 | -0.2929 |
| exchangerate (L1) | 0.1344 | 0.0451 | 0.003 | 0.0459 |
| exchangerate (L2) | 0.0019 | 0.0523 | 0.971 | -0.1007 |
| exchangerate (L3) | 0.0187 | 0.0478 | 0.696 | -0.0751 |
| agriland (L1) | -0.1185 | 0.7499 | 0.874 | -1.5882 |
| agriland (L2) | -0.5869 | 0.6110 | 0.337 | -1.7843 |
| agriland (L3) | -1.3851 | 0.5764 | 0.016 | -2.5148 |
| dexchangerate | 1.0524 | 0.4824 | 0.029 | 0.1070 |
| agrivalueadded (L1) | -0.7875 | 1.0704 | 0.462 | -2.8854 |
| agrivalueadded (L2) | -1.9298 | 1.0131 | 0.057 | -3.9155 |
| agrivalueadded (L3) | 0.6732 | 0.9871 | 0.495 | -1.2615 |
| exchangerate (L1) | 0.3172 | 0.2043 | 0.121 | -0.0833 |
| exchangerate (L2) | -0.1448 | 0.2370 | 0.541 | -0.6094 |
| exchangerate (L3) | -0.2257 | 0.2167 | 0.298 | -0.6504 |
| agriland (L1) | 0.1974 | 3.3958 | 0.954 | -6.4582 |
| agriland (L2) | -1.5198 | 2.7667 | 0.583 | -6.9425 |
| agriland (L3) | -6.4935 | 2.6102 | 0.013 | -11.6094 |
| d agriland | -0.0929 | 0.0273 | 0.001 | -0.1464 |
| agrivalueadded (L1) | 0.1255 | 0.0605 | 0.038 | 0.0069 |
| agrivalueadded (L2) | 0.0276 | 0.0573 | 0.630 | -0.0847 |
| agrivalueadded (L3) | 0.0208 | 0.0558 | 0.710 | -0.0886 |
| exchangerate (L1) | 0.0126 | 0.0116 | 0.276 | -0.0101 |
| exchangerate (L2) | 0.0121 | 0.0134 | 0.367 | -0.0142 |
| exchangerate (L3) | -0.0058 | 0.0123 | 0.636 | -0.0298 |
| agriland (L1) | 0.0265 | 0.1920 | 0.890 | -0.3499 |
| agriland (L2) | 0.2029 | 0.1565 | 0.195 | -0.1038 |
| agriland (L3 | 0.1287 | 0.1476 | 0.383 | -0.1606 |

Table 5, shows the short term relationship between the variables. The coefficient of the first lag, -0.5363, and the p-value 0.023 < 0.05 and the coefficient of the second lag, -0.5608 and the p-value was 0.012 < 0.05 of agricultural output, illustrated that agricultural output was negative and significantly significant in the short run. This suggested that previous levels of agricultural output exerted a negative effect on the current growth, which implies that the sector fluctuations in the short term tend to correct themselves over time. The coefficient of the first lag, 0.1344, and the p-value 0.003, indicated that in the short run, exchange rate had a positive significant effect on agricultural output in Kenya. This implied that, in the short run, exchange rate depreciation, may influence agricultural productivity positively therefore in agreement with the export-led growth theory. These results are in line with the results found by Ogutu (2014) and Onwuagana and Areghan (2020). However, subsequent lags have shown insignificant effects, indicating that the effect of exchange rate is temporary it does continue over time. Lastly, the coefficient of the third lag of agricultural land was -1.3851 with a p-value of 0.016 < 0.05. This suggested that agricultural land had a negative effect on agricultural output. This implied that agricultural land expansion or reduction, takes a while to reflect in output changes, probably due to land productivity factors and cost adjustment. Other lags in agricultural land had insignificant effect, illustrating that fluctuations in the short run in land use, do not have an immediate effect on the output of the agricultural sector in the longrun 95%.

**Table 6**

*Long-run Vector Error Correction Model Analysis*

| | Coeff | Std. Err | p-value | 95% Coeff |
|---|---|---|---|---|
| Agrivalueadded | 1 | | | |
| Exchangerate | -0.1271 | 0.0308 | 0.000 | -0.1875 |
| Agriland | 6.1755 | 0.7728 | 0.000 | 4.6609 |
| constant | -307.2872 | | | |

Based on the findings in Table 6, the fitted model was:

$$\text{Agricultural output} = -307.2872 - 0.1271 \text{ exchange rate} + 6.1755 \text{ agricultural land} + \varepsilon$$

The findings show that exchange rate had a negative significant effect with agricultural output, with a coefficient of -0.1271 and a p-value of 0.000. Therefore, a 1% increase in exchange rate would lead to 0.127% decrease in agricultural output in the long run. This implied that in the long run, exchange rate depreciation have a negative effect on the productivity of the agricultural sector. According to the results, a weaker domestic currency leads to an increase in agricultural input costs, for example, machinery, fertilizers, and fuel given that most of these inputs are imported. This would results to increase in production in the sector. These results agree with Gatawa and Mahmud (2017) who found that exchange rate had a negative effect on agricultural exports in Nigeria in the long run. Agricultural land had a positive significant effect with agricultural output with a coefficient of 6.1755 and a p-value of 0.000. Therefore, a 1% increase in agricultural land would lead to a 6.1755% increase in agricultural output in the long run. This implied that increase in agricultural land, directly increased the output in the agricultural sector. The strong coefficient shows the importance of the agricultural land availability and utilization determines the output of the agricultural sector in Kenya. The constant -307.2872 indicates that the structural factors that were not captured in the model, might affect the agricultural output in the long term. These structural factors include climatic conditions, poor infrastructure and inefficiencies in policies of the nation.

## V. CONCLUSION & RECOMMEDATION

### 5.1 Conclusion

The study aimed to evaluate the relationship between exchange rate and agricultural output performance in Kenya. The study found that exchange rate had a positive significant relationship with agricultural output performance both in the short run. This indicated that exchange rate depreciation would result to an increase in agricultural productivity in the short run. However in the long run, exchange rate had a negative significant effect on the output in the agricultural sector in Kenya. This implied that, in the long run, exchange rate depreciation, led to negative influence in the agricultural productivity. The agricultural land had a positive significant relationship with agricultural output; therefore expansion of agricultural land will increase productivity in the agricultural sector.

### 5.2 Recommendation

The study recommend that the Kenyan government should implement appropriate policies that aim at stabilizing the exchange rate, to ensure the low input costs in the agricultural sector, making production cheaper for the stakeholders and farmers in the agricultural sector and address structural concerns. The government should also encourage the use of local inputs in the sector, to reduce the effect of exchange rate shocks. Policy makers should also concentrate not only on expanding agricultural land but also enhance productivity and enhance land reform policies. The study examined how exchange rate affected agricultural output, therefore to close the gap on this limitation more studies should be conducted to now concentrate on the specific agricultural commodities rather than general agricultural output.

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