Capital Inflow, Exchange Rate and Agricultural Output: Evidence from Sub-Saharan African Region

Lateef Adewale Yunusa & Mayowa Ebenezer Ariyibi

Olabisi Onabanjo University

ABSTRACT

The numerous roles played by the agricultural sector across the globe has made it imperative to enquire into the hardship encountered by the participants of the sector in sourcing for fund and procurement of inputs needed for further production across the Sub-Saharan African region. This study however investigated the influence of capital and exchange rate on agricultural output in Sub-Saharan African nations from 1998-2018 using panel system-GMM estimation technique. The study found capital inflow to be positively related to agricultural output in SSA nations while exchange rate revealed a negative relationship with agricultural output in SSA nations.

Decomposing the capital into private and public capital suggest that private capital is positively related to agricultural output while public capital is negatively related to agricultural output in SSA nations. The interactive role of capital and exchange rate on agricultural output is highly keen to the success of the agricultural sector in the SSA nations, since they both contribute to the agricultural output.

Keywords: NA

Classification: DDC Code: 823.914 LCC Code: PR6052.R246

Language: English

London Journals Press

LJP Copyright ID: 146425
Print ISSN: 2633-2299
Online ISSN: 2633-2302

London Journal of Research in Management and Business

Volume 22 | Issue 6 | Compilation 1.0

Capital Inflow, Exchange Rate and Agricultural Output: Evidence from Sub-Saharan African Region

Lateef Adewale Yunusa[α] & Mayowa Ebenezer Ariyibi[σ]

ABSTRACT

The numerous roles played by the agricultural sector across the globe has made it imperative to enquire into the hardship encountered by the participants of the sector in sourcing for fund and procurement of inputs needed for further production across the Sub-Saharan African region. This study however investigated the influence of capital and exchange rate on agricultural output in Sub-Saharan African nations from 1998-2018 using panel system-GMM estimation technique. The study found capital inflow to be positively related to agricultural output in SSA nations while exchange rate revealed a negative relationship with agricultural output in SSA nations.

Decomposing the capital into private and public capital suggest that private capital is positively related to agricultural output while public capital is negatively related to agricultural output in SSA nations. The interactive role of capital and exchange rate on agricultural output is highly keen to the success of the agricultural sector in the SSA nations, since they both contribute to the agricultural output. The authorities in the SSA nations should maintain an appreciating exchange rate and make policies that will attract additional investors in order to increase the availability of capital, agricultural output, decrease unemployment and poverty level in SSA region.

Author α σ: Department of Banking and Finance Faculty of Administration and Management Sciences Olabisi Onabanjo University Ago-iwoye, Ogun State, Nigeria Emails: yunusalateef@gmail.com; ariyibimayowa@gmail.com Corresponding author: ariyibimayowa@gmail.com

I. INTRODUCTION

Agricultural outputs have been contributing to the gross domestic product of most developing economies across the globe and Africa. Agriculture served as a source of foreign exchange earnings, creation of investment outlets both locally and internationally, employment opportunities, intermediation function between the owners and users of funds and provision of material needed for further productions. Some of the developing economies diversified their income source from crop exportation into crude oil exportation which led to the reduction in crop exportation and gross domestic product of the economy (Adeola & Ikpesu, 2016). The reduction in the crop exportation led to divestment by the investors from crop production into the oil sector which has triggered the scarcity of fund.

Problem of shortage of fund has restricted the progression of the agricultural sector, leading to a decline in the sectors output. Agricultural sector output can be promoted by the government in developing economies through the provision of credit facilities to the sector (Osinubi & Akinleye 2006) which enables the procurement of modern farm implements and other necessary inputs needed to transform the farm product from subsistence to commercial quantity. Adequate funding of the agricultural sector helps to create more employment and reduce poverty across Africa as this sector happens to be one of the largest employers of labour in Africa (Ajuwon & Ogwumike, 2013) because the sector has the capacity to absorb and reduce poverty twice as other sectors. Alternative source of improving the agricultural output in the Sub-Saharan African countries is the attraction of capital. It is to be noted that empirical evidences from literatures

failed to reach a consensus on the magnitude of the impact of capital inflow on agricultural output in African context which is very important to the investors, government and regulators. More so, it was discovered that only the study of (Ikpesu & Okpe, 2019) carried out a single-country study to investigate the relationship between capital inflow, exchange rate and agricultural output in Nigeria. No cross-country study has investigated the relationship between capital inflow, exchange rate and agricultural output in Sub-Saharan African countries, this backdrop inform this study.

Literatures reviewed identified the constraints to the free flow of capital as decline in savings and fluctuation in exchange rate which directly affect the output and growth in the economy (Verter, 2017; Ikpesu & Okpe, 2019). Theoretically, investment is a function of savings, poor savings culture reduces the funds available for investment in the economy, a spillover effect of reduction in the agricultural output in an economy. More so, the unwilling attitude of the financial institutions whose core function is provision of credit and the government past nonchalant attitude toward the agricultural sector in the developing economies also forced the farmers to source for fund externally (Rahji & Adeoti, 2010 as cited in Adeola & Ikpesu, 2016). The dwindling funding available to agricultural sector in Sub-Saharan African countries has made it imperative for the sector in Sub-Saharan nation to extend its sourcing of fund outside the shore of its economy which is aimed at increasing the output of the agricultural sector.

Capital inflow is however expected to contribute positively to agricultural output in the economy as evidenced by previous studies (Ikpesu & Okpe 2019; Verter, 2017; Oloyede, 2014; Taurai, 2014; Ajuwon & Ogwumike, 2013; Obansa & Maduekwe, 2013; Weerapong, 2006). Contrarily, capital inflow was discovered to contribute negatively to agricultural output as evidenced by previous work of (Djokoto, 2012; Epaphra, 2016; Epaphra & Mwakalasya, 2017; Yusuff, Afolayan, & Adamu, 2015).

The dynamic nature of the international environment makes it important for the foreign investor to be abreast of the risk in the international environment due to the fluctuation in the exchange rate. The exchange rate is a measure of international competitiveness among nations of the world and helps in allocation of resources between local and foreign commodities (Osigwe & Obi, 2016). Theoretically, decrease in the purchasing power of a country's local currency increase the demand for its local commodity while increase in the purchasing power of a country's local currency decrease the demand for its local output by foreigners. Depreciation of a country's currency does not only increase the export but also decrease the external reserve and attract more capital inflow which increases the cost of farm implements because larger volume of local currency will be chasing fewer foreign implements (Ikpesu & Okpe 2019). Prior literature revealed that exchange rate impact agricultural output negatively (Ikpesu & Okpe 2019; Olarinde & Abdullahi, 2014; Ajuwon & Ogwumike, 2013; Epaphra & Mwakalasya, 2017) while the work of (Verter, 2017; Oloyede, 2014) opines that exchange rate is positively related to agricultural output. It is to be noted that capital cannot solely determine the agricultural output obtainable in an economy without interacting with other variables, one of which is the exchange rate. This interactive role of these variable makes it imperative to investigate the role of exchange rate on agricultural output in SSA region.

It was observed from the literatures reviewed that most of the previous studies only accounted for the private component of the capital inflow which is FDI but ignored the public component. Ikpesu & Okpe (2019) incorporated both private and public capital inflow in their study but limited the scope of their study to Nigeria. This study contributes to the existing knowledge by investigating the influence of capital inflow, private capital inflow, public capital inflow and exchange rate on agricultural output in Sub-Saharan African countries using the GMM estimation technique.

This empirical study provides an outstanding perception of researchers from different part of the world. The study however provide solution to the following questions. Does higher capital

inflow affect the agricultural output in the Sub-Saharan African countries. Does depreciation in exchange rate reduces the agricultural output in the Sub-Saharan African countries. Does higher private and public capital inflow increase the agricultural output in Sub-Saharan African countries. In a nutshell, the findings of this study revealed that capital inflow is positively related to agricultural output in the SSA countries, private capital inflow is positively related to the agricultural output in the SSA countries while public capital inflow is negatively related to the agricultural output in the SSA countries.

Additionally, the result revealed that depreciation of exchange rate reduces the agricultural output while the appreciation of exchange rate increases the agricultural output in SSA nations. The rest of this paper is structured as follows; Section 2 is the literature and theoretical review, Section 3 deals with the methodology. Section 4 deals with the results and discussions and the last section deals with conclusion.

III. LITERATURE REVIEW

The previous studies reviewed provided evidences on the importance of capital inflow and exchange rate as determinants of output in an economy. The endogenous growth theory opined that capital is one of the determinants of output in an economy. Availability of capital to the farmer is very essential for attaining growth in agricultural output as well as the sector in every economy.

Growth in agricultural output was reported to be positively related to capital inflow (Ikpesu & Okpe 2019; Verter, 2017; Oloyede, 2014; Taurai, 2014; Ajuwon & Ogwumike, 2013; Obansa & Maduekwe, 2013; Weerapong, 2006) which implies that increase in capital inflow enables the farmers to procure the input needed for their output. Despite the positive evidences of capital inflow on agricultural output, some researchers were of contrary opinion that capital inflow reduce the agricultural output as evidence by work of (Djokoto, 2012; Epaphra, 2016; Epaphra & Mwakalasya, 2017; Yusuff, Afolayan, & Adamu, 2015).

Theoretically, appreciation of exchange rate increases the agricultural output while the depreciation of exchange rate decreases the agricultural output. Previous empirical studies reviewed showed that exchange rate affect the agricultural output negatively (Ikpesu & Okpe 2019; Olarinde & Abdullahi, 2014; Ajuwon & Ogwumike, 2013; Epaphra & Mwakalasya, 2017) which is contrary to the findings of (Verter, 2017; Oloyede, 2014) where they discovered that exchange rate impact agricultural output positively which implies that depreciation of the exchange rate reduce the cost of farm inputs which increases the purchasing power of the farmer. However, reduction in purchasing power of the farmer prevent the farmer from procuring the needed input which leads to reduction in agricultural productivity.

More so, this study segregated the capital inflow into private and public capital inflow in order to ascertain the individual influence of private and public component of capital inflow on agricultural output in Sub-Sahara African countries. Increase in both private and public capital inflow are expected to increase the agricultural output in Sub-Sahara African countries which is evidenced by the findings of (Ikpesu & Okpe, 2019; Osigwe & Obi, 2016) that private capital inflow increase the agricultural output but contrary to the findings of (Obansa & Maduekwe, 2013) which found that private capital inflow reduces the agricultural output. Similarly, public capital was found to have a positive impact on the agricultural output in an economy as opined by (Ikpesu & Okpe 2019; Obansa & Maduekwe, 2013).

Human capital is another key determinant of output based on the endogenous growth model which is very crucial in the model regardless of the method of production adopted by an economy which could either be labour intensive or capital intensive. Procurement of farm implement without availability of necessary personnel with the technical know-how reduces the output.

Increase in the labour increases the agricultural output in an economy as evidenced by the previous work of Ikpesu and Okpe (2019) where a

positive impact of labour on agricultural output was reported.

Furthermore, this study presents the perceptions and findings of past researchers across the globe in order to expand and contribute to the present study on the relationship between capital inflow, exchange rate and agricultural output in Sub-Saharan African countries. Ikpesu & Okpe (2019) examined the influence of exchange rate, inflow of capital on output of agricultural products in Nigeria. Annual time series data was sourced from 1981 to 2016 which was estimated using autoregressive distributed lag (ARDL) estimation technique. The study reported existence of short and long-run cointegration among the variables in the study. The empirical result revealed that private and public capital inflow is positively related to agricultural output.

Real exchange rate is negatively related to agricultural output. Domestic investment is positively related to agricultural output. Labour is also positively related to agricultural output in Nigeria. Kim and Zhang (2016) found that aggregate capital flow is pro-cyclical in developed economies but counter-cyclical in developing economies. Private capital inflow was found to be pro-cyclical in developing and developed economies but public inflow was counter-cyclical in developing and developed economies. They further opined that developed economies use more of private capital inflows while developing economies use more of public capital inflow. They also concluded that public capital inflow is essential in period of financial crisis.

Olarinde & Abdullahi (2014) analysed the influence of macroeconomic variables on crop production in Nigeria, the study reported existence of cointegration among the variables both in the short and long-run. The empirical findings revealed that government expenditure on agricultural output positively impact agricultural output, inflation negatively influence agricultural output, agricultural credit to farmers negatively influence the agricultural output, interest rate positively influence agricultural output, exchange rate negatively influence the agricultural output.

Adeola & Ikpesu (2016) investigated the influence of bank lending on agricultural production in Nigeria, the empirical result revealed that money supply and commercial loan were positively related to agricultural production in Nigeria.

Anetor, Ogbechie, Kelikume & Ikpesu (2016) investigated the influence of credit on agricultural production in Nigeria. The causality result revealed that the agricultural credit guarantee scheme doesn't affect agricultural output. The empirical result shows that agricultural credit guarantee scheme fund is negatively related to agricultural output, commercial loan and advances is positively related to agricultural output in Nigeria.

Weerapong (2006) Investigated the determinants of agricultural output in the East Asian economies using panel data of seven countries covering the period of 1987 to 2003 were estimated using the fixed effect regression model. The empirical findings revealed that FDI, land, import, export, trade influence agricultural output positively while trade and crisis influence agricultural output negatively. Wondemu & Potts (2016) also analysed the influence of real exchange rate on export diversification promotion in Tanzania and Ethiopia. The empirical result revealed that trade and factor productivity have positive impact on the real exchange rate while trade openness, government consumption and reserve have negative impact on real exchange rate. The study found that undervaluation of exchange rate promote export in Tanzania while overvaluation of exchange rate reduces the volume of export in Ethiopia.

Verter (2017) investigated the influence of foreign aid on agriculture output in Nigeria. The empirical result revealed that agricultural official development assistance is positively related to agricultural output. Domestic commercial loan is also positively related to agricultural output.

Exchange rate is positively related to agricultural output in Nigeria. Climate change is negatively related to agricultural output in Nigeria. Osigwe & Obi (2016) analysed the influence of remittances on the Nigeria Naira's real exchange rate using

annual time series data. The empirical result revealed that remittance received, trade openness, nominal exchange rate, term of trade and real GDP growth positively influence real exchange rate while government consumption and inflation have negative influence on real exchange rate in Nigeria.

Djokoto (2012) analysed the influence of foreign direct investment influx in agriculture on food security in Ghana using annual data, the empirical result shows that agricultural growth rate, captured democracy, foreign direct investment is negatively related to the food security while government expenditure and export of manufactured product were positively related to food security. Epaphra (2016) analysed the impact of foreign direct investment (FDI) on different sectors in Tanzania using time series data. The findings show that FDI is negatively related to agricultural sector output but positively related to mining sector output, manufacturing sector output, construction sector output, transport sector, storage and communication sector output in Tanzania. Epaphra & Mwakalasya (2017) analysed the influence of FDI on Agriculture as well as the influence of agriculture on economic growth in Tanzania using the Error Correction Modelling technique. The empirical result of the agricultural growth model depicts that FDI, growth, real exchange rate, inflation and trade negatively affect agricultural output while the economic growth model revealed that FDI, capital formation and trade positively affect economic growth while agriculture, real exchange rate, inflation and labour negatively affect trade in Tanzania. Kareem *et al.* (2013) investigated the factors that affect agricultural output in Nigeria using OLS technique. The empirical findings revealed that interest rate, commercial bank loan, FDI and import of food are positively related to agricultural output. GDP has a negative relationship with agricultural output in Nigeria.

Oloyede (2014) found that foreign direct investment and exchange rate have positive and significant impact on agricultural output in Nigeria while interest rate exert a negative but insignificant impact on agricultural output in Nigeria.

Yusuff, Afolayan, & Adamu (2015) investigated the effect of FDI on agricultural sector and economic growth in Nigeria using the vector autoregression (VAR) estimation technique. The empirical findings revealed that foreign direct investment to agricultural sector is positively related to the agricultural sector growth in the short-run but negatively related to the agricultural sector growth in the long-run in Nigeria. Taurai (2014) found that foreign direct investment, population, government expenditure, trade openness and credit to agricultural sector have are positively related to agricultural productivity while inflation is negatively related to agricultural output in Zimbabwe. Ajuwon & Ogwumike (2013) examined how risk affect the influx of foreign direct investment on the agricultural output in Nigeria. The empirical findings revealed that average rainfall, external debt, per capita income, export, political stability, exchange rate volatility have a negative impact on agricultural output while inflation, investment, lending rate is positively related to agricultural output. Obansa & Maduekwe (2013) found that treasury bill rate, multilateral debt, development stock, FDI and debt servicing have statistical impact on agricultural output. Official development assistant, Paris and London assistance, FDI and debt servicing have positive influence on agricultural output while development stocks, multilateral debt, treasury bill, domestic savings, agricultural foreign private investment and agricultural capital influence agricultural output negatively.

III. METHODOLOGY

3.1 Model Specification

This study is hinged on the endogenous growth theory of Solow (1950). The theory opines that output in an economy is a function of Capital, labour and technology. The Solow model is expressed as:

$$y = f(K, L, A) \quad (1)$$

Based on the theory, agricultural output depends on material inputs/farm implements which serves as inputs. These inputs represent technology in our model because farm activities are been

executed with the use of modernized technological inputs. More so, procurement of farm input is often affected by appreciation and depreciation of the exchange rate of a nation in relation to its trading partners currency (Yunusa, 2020) which necessitate the incorporation of exchange rate into our model.

In order to attain the effect of labour and political will on agricultural output, the model is modified and expressed as:

$$y = f(K,\ L,\ A,\ Exchange\ Rate) \tag{2}$$

The Solow model is premise on the assumption of Cobb–Douglas production function, the modified Solow model in equation (4) is thus expressed in Cobb–Douglas form and expressed as:

$$y_t = f(K_t^{\alpha}, L_t^{\beta},\ A_t,\ Exchange\ Rate_t) \tag{3}$$

Where y_t is the output at time t, K_t^{α} is the Political Will at time t, L_t^{β} is the Labour at time t, A_t is the Agricultural Input, $Exchange\ Rate_t$ is the exchange rate at time t. The model is restated in panel forms and expressed as:

$$y_{i,t} = \beta_0 + \beta_1 EMP_{i,t} + \beta_2 AMI_{i,t} + \beta_3 EXC_{i,t} + \beta_4 GFC_{i,t} + \mu_{i,t} \tag{4}$$

$$y_{i,t} = \beta_0 + \beta_1 EMP_{i,t} + \beta_2 AMI_{i,t} + \beta_3 PWL_{i,t} + \beta_4 EXC_{i,t} + \beta_5 GFC_{i,t} + \mu_{i,t} \tag{5}$$

$$y_{i,t} = \beta_0 + \beta_1 MEP_{i,t} + \beta_2 FEP_{i,t} + \beta_3 AMI_{i,t} + \beta_4 EXC_{i,t} + \beta_5 GFC_{i,t} + \mu_{i,t} \tag{6}$$

$$y_{i,t} = \beta_0 + \beta_1 MEP_{i,t} + \beta_2 FEP_{i,t} + \beta_3 AMI_{i,t} + \beta_4 PWL_{i,t} + \beta_5 EXC_{i,t} + \beta_6 GFC_{i,t} + \mu_{i,t} \tag{7}$$

$$y_{i,t} = \beta_0 + \beta_1 EMP_{i,t} + \beta_2 PWL_{i,t} + \beta_3 AMI(EXC)_{i,t} + \beta_4 GFC_{i,t} + \mu_{i,t} \tag{8}$$

Where y is the agricultural output,EMP is the employment of labour, AMI is the agricultural raw materials, PWL is the political will, EXC is the exchange rate, GFC is the gross fixed capital formation and μ is the error term.

3.2 Data and Estimation Techniques

This study used annual panel data covering 29 Sub-Saharan African countries from 1990 to 2018, namely, Benin, Burkina Faso, Burundi, Cameroon, Congo Republic, Cabo Verde, Ethiopia, Gabon, Ghana, Guinea, Gambia, Kenya, Liberia, Lesotho, Madagascar, Mauritania, Mauritius, Malawi, Namibia, Nigeria, Rwanda, Senegal, Sierra Leone, Togo, Tanzania, Uganda, South Africa, Zambia And Zimbabwe. The data used for this study were obtained from the International Financial Statistics and World Development Indicator (WDI). Data on Exchange rate was obtained from International Financial Statistics while data on agricultural output, political will, employment of labour in agriculture, agricultural raw materials, male employment in agriculture and female employment in agriculture were obtained from WDI.

This study employed the panel estimation technique in order to estimate the impact of the independent variables on the dependent variable. It is to be noted that it is imperative to carry out unit root test in order to ascertain the order of integration of the variables.

This study estimated the dynamic panel data system generalised method of moment (GMM) (Arellano and Bover, 1995; Blundell and Bond 1998) which was based on the prior model developed by (Arellano and Bond 1991) where differencing of all the regressors was introduced and called difference GMM. The model of Arellano and Bond was based on the following assumptions; that the observation is greater than the time (N>T), linearity in relationship, inclusion of lagged value of the dependent variable as independent variable, regressors are not strictly exogeneous, fixed individual effects and problem of autocorrelation & heteroskedasticity within a variable (Roodman, 2009). Imposing the strict exogeneity assumption leading to violations and discrepancy in our fixed-effect model which leads to generation of a single equation dynamic GMM estimators by using a common factor

representation (Blundell and Bond, 1998). The dynamic panel output model is expressed as:

$$y_{i,t} = \rho + \omega y_{i,t-1} + \theta_1 A_{i,t} + \theta_2 K_{i,t} + \theta_3 L_{i,t} + \theta_4 EXC_{i,t} + \theta_5 GCF_{i,t} + \mu_{i,t} \quad (9)$$

$$i = 1 \ldots\ldots n,\ t = 1 \ldots\ldots T$$

ρ is the constatnt parameter, ω and θ are the output elasticities.

The violation of the assumption of strict orthogonality led to the introduction of varying parameters by taking the semi-derivatives of the variables to account for variances in units and measurements.

$$\varepsilon_{i,t} = \mu_{i,t} + \upsilon_{i,t} \quad (10)$$

The disturbance term $\varepsilon_{i,t}$ comprise of two orthogonal components; the fixed effects that is time-invariant which is $\mu_{i,t}$ and the idiosyncratic shocks which is represented by $\upsilon_{i,t}$ which is assumed to be independent and normally distributed with zero (0) mean and constant variance.

Adjustment of the agricultural output is expected to be affected by factors such as political will, employment of labour in agriculture, agricultural raw materials, male employment in agriculture, female employment in agriculture, gross capital formation and exchange rate. Agricultural output adjustment to changes in these factors is dependent on two basic conditions, first is the passage of time which give rise to the introduction of the lagged values of the factors as independent variables, and second is the equilibrium of agricultural output and the previous year actual output which led to the introduction of the dynamic GMM in which lag of the dependent variable is also included as independent variable in the model.

Application of OLS in our estimation could lead to "dynamic panel bias" which occur due to correlation between the lagged value of the dependent variable and the fixed effects in the error term which leads to the violation OLS assumption which is necessary for attaining an unbiased estimate, leading to endogeneity problem. Introduction of lagged variable as an instrument in the strict orthogonal assumption helps in solving this problem which is incorporated in the system GMM (Blundell and Bond, 1998; Roodman, 2009).

This study therefore estimated the impact of political will and labour on agricultural output in Sub-Saharan African countries using the System GMM based on the satisfaction of some assumptions. The dynamic GMM model is expressed as:

$$y_{i,t} = \alpha + \beta_3 Y_{i,t-1} + \beta_1 X_{i,t} + \beta_2 Z_{i,t} + \varepsilon$$

$y_{i,t}$ is represent agricultural output

$\beta_3 Y_{i,t-1}$ represent the lagged value of the agricultural output

$\beta_1 X_{i,t}$ represent the independent variables which are political will, employment of labour in agriculture, agricultural raw materials, male employment in agriculture, female employment in agriculture

$\beta_2 Z_{i,t}$ represent the control variables which are gross capital formation and exchange rate.

IV. RESULTS AND DISCURSION

This section comprises of the descriptive statistics, correlation matrix, the unit root test and the GMM result. The descriptive statistics is revealed in table one.

Table 1: Descriptive Statistics of Parameters

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
ago	597	9.21549	0.6006536	7.809687	11.06718
pwl	607	1.259814	0.3359039	0.3198867	1.89786
emp	609	1.630976	0.2840179	0.6627578	1.965216
mep	609	1.634259	0.2576385	0.7371131	1.943208
fep	609	1.608421	0.3559388	0.4821587	1.985718
ami	528	0.0607285	0.2974615	-0.833841	1.266762
exc	598	2.136938	0.7692887	-1.625142	9.827566
gfc	515	9.321027	0.6282011	7.639185	10.95196

Source: Authors Computation

Table 1 reveals the descriptive statistics of the datasets, a wide difference exists between the mean and standard deviation of all the variables used in the study. The average value also falls between maximum and minimum values. The correlation coefficients of the variables are shown in table 2.

Table 2: Correlation Matrix

Variable	*ago*	*pwl*	*emp*	*mep*	*fep*	*ami*	*exc*	*gfc*
ago	1.0000							
pwl	0.2433	1.0000						
emp	0.2487	0.8697	1.0000					
mep	0.2599	0.8828	0.9844	1.0000				
fep	0.2551	0.8250	0.9759	0.9253	1.0000			
ami	-0.0145	0.0421	-0.0564	-0.0394	0.0835	1.0000		
exc	0.2001	0.3785	0.4072	0.4363	0.3545	0.0522	1.0000	
gfc	0.7372	-0.3876	0.3024	-0.2988	-0.2669	-0.1245	0.0403	1.0000

Source: Authors Computation

The correlation coefficients in table 2 revealed that there is no likelihood of occurrence of multicollinearity among the variables used in this study as showed by the correlation coefficients.

The test in table 3 reveals the traits of the dataset used in the study order to ascertain the level of stationarity of the variables which helps to avoid a spurious result. The Fisher unit root was preferred because the study used an unbalanced panel. The null hypothesis of the Fisher test is that "all panels contain a unit root" while the alternate hypothesis is that "at least one panel is stationary". The unit root result is presented in table three.

Table 3: Fischer *Unit Root*

Variables	ADF- Fischer	Im-Pesaran-Shin	Order of Integration
ago	109.2393 (0.0001)	-4.2640 (0.0000)	I(0)
exc	90.6557 (0.0039)	-2.3655 (0.0090)	I(0)
gfc	39.4662 (0.9309)	0.1709 (0.5678)	I(1)
pwl	207.9351 (0.0000)	-3.9728 (0.0000)	I(0)
emp	39.0078 (0.9738)	0.9723 (0.8346)	I(1)
mep	38.4457 (0.9777)	0.1473 (0.5586)	I(1)
fep	62.4172 (0.3221)	1.2685 (0.8977)	I(1)
ami	130.4109 (0.0000)	-4.3556 (0.0000)	I(0)

Source: Authors Computation

Table three (3) shows the ADF- Fischer and Im-Pesaran-Shin unit root test result. The two test results shows that variable *ago*, *exc*, *pwl* and *ami* are stationary at level I(0) while variable *gdi*, *emp* , *mep* and *fep* are non-stationary at level but after first differencing, they became stationary at first difference I(1). The unit root test result further helps to revealed the covariance nature of the data set in a study (Adekunle, 2020). The study further estimated the two-step dynamic system generalized method of moment (GMM) because of its ability to capture the uniqueness of the traits of these data and relying on the empirical works of (Adekunle, 2020; Roodman, 2009 for further consultations). GMM result for the models are presented in the table 4.

Table 4: GMM Result

Variable	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*
$ago_{i,\,t-1}$	0.8830225 * (0.0731397)	0.9426038 * (0.0485049)	0.900545 * (0.0247166)	0.9187858 * (0.0525472)	0.958088 * (0.0173555)
$emp_{i,\,t}$	0.0166305 (0.0139171)	-0.0477362 (0.0525969)			-0.0346398 (0.0389692)
$ami_{i,\,t}$	-0.0223713 (0.0208141)	0.0096478 (0.0066705)	0.0130232 (0.0085888)	0.0204369 ** (0.0104496)	
$pwl_{i,\,t}$		0.0837539 * (0.0292334)		0.1375857 (0.0820593)	0.0388306 (0.0333753)
$mep_{i,\,t}$			0.1071533 (0.1480049)	-0.0290735 (0.098888)	
$fep_{i,\,t}$			-0.0562225 (0.0980601)	0.0242645 (0.0756916)	
$ami(exc)_{i,\,t}$					0.0032957 (0.0047626)
$exc_{i,\,t}$	0.0805739 (0.0541607)	-0.0002586 (0.0245654)	-0.0186452 (0.0223099)	0.0209094 (0.0260658)	
$gfc_{i,\,t}$	0.0356914 * (0.0148287)	0.0408081 (0.0210307)	0.0216388 (0.0120304)	0.0709811 ** (0.0318943)	0.0296399 ** (0.0135081)
$\alpha_{i,\,t}$	0.5559287 (0.4414577)	0.1343522 (0.3029615)	-0.2403711 (0.1520994)	-0.1150769 (0.3119662)	0.1304668 (0.2075649)
Observation	414	414	414	414	494
Number of Countries	29	29	29	29	29
Number of instruments	231	231	231	231	232
Wald chi2	800865.54 *	46624.79 *	702457.65 *	22461.46 *	20323.44 *
AR (1)	0.007	0.023	0.016	0.033	0.005
AR (2)	0.643	0.587	0.616	0.557	0.703
Sargan test Chi (2)	0.560	0.510	0.538	0.483	0.392

*Note: The dependent variable is the agricultural output, natural logarithm of all the variables were used. Standard errors are reported in brackets. Level of significance was reported as * and ** representing 1 and 5 percent respectively*

The coefficients of the lagged dependent variable *ago* across the models are positively and statistically significant indicating that the agricultural output has been consistence. An increase in the lagged value of agricultural output increases the present agricultural output in SSA region. Contrarily, a reduction the in the lagged agricultural output worsen the present agricultural output in SSA region which is not good for the region.

Furthermore, the first model shows that employment in the agricultural sector (*emp*) is positively related to agricultural output thereby increasing the volume agricultural produce available for consumption in the region. An increase in the level of employment in the agricultural sector increase the agricultural output by 0.0166 increase in the agricultural output in the SSA region. The coefficient of agricultural raw material (*ami*) shows an inverse relationship with agricultural output, thus, decreasing the

agricultural produce available for consumption in the sector. This means a percentage increase in the agricultural raw material reduce the agricultural output in the SSA region by 0.0224.

The coefficient of exchange rate (*exc*) shows a direct relationship with agricultural output, thus, rise in the exchange rate increase the agricultural output in SSA region. The implication of this is that depreciation of exchange rate appears to increase the agricultural productivity in SSA region. Gross capital formation (*gcf*) exhibit a significant positive relationship with agricultural output in the region, promoting productivity in the agricultural sector in the SSA region.

Additionally, in the second model, we introduced the political will (*pwl*) into our model which shows the willingness of the government to support the agricultural sector or not. The coefficient of labour employment and agricultural raw materials are negatively and positively related to agricultural output respectively, thus, decreasing and increasing agricultural output by 0.0477 and 0.0096 respectively. The coefficient of political will is positively related to agricultural output in the region, thus, increasing the agricultural produce available for consumption in the region as a result of the government support directed towards the agricultural sector. This means a percentage increase in the political will increase the agricultural output in the SSA region by 0.0838. Inclusion of the political will reduced the labour employment but increased the agricultural raw material which represent the level of technology introduced into the agricultural sector.

Also, in the third model where we introduced male employment in agriculture (*mep*) and female employment in agriculture (f*ep*) but isolated the labour employment, the coefficient of the male employment in agriculture is positively related to agricultural output while the coefficient of female employment is negatively related to agricultural output in SSA region. A unit increase in the male employment increase agricultural output by 0.1072 while an increase in the female employment in agricultural sector decrease agricultural output by 0.0562 in the SSA region. The implication of this is that male employment in agricultural sector promote productivity while female engagement decreases the agricultural output in the SSA region.

However, introduction of political will into model three (3) which gives rise to model four (4) shows that female employment in agricultural sector promote agricultural output compared with their male counterpart which exert a negative influence, leading to a reduction in the output of the sector. The implication of this is that government support in agricultural sector increased the female output in the sector, possibly encouraged more female participation in the sector. the coefficient of the male employment in agriculture is negatively related to agricultural output while the coefficient of female employment is positively related to agricultural output in SSA region. A unit increase in the male employment decrease agricultural output by 0.0291 while an increase in the female employment in agricultural sector increase agricultural output by 0.0243 in the SSA region. the coefficient of political will is positively related to agricultural output, thus, an increase in political will increase the agricultural output by 0.1375 in the SSA region. Government support in agricultural sector has afforded the female farmers more opportunity which resulted in increased in the agricultural output in the SSA region.

The fifth model which shows the interactive role of agricultural raw material and exchange rate on agricultural output indicate the interaction of these variables has increased the agricultural productivity in SSA region. A unit increase in labour employment in agricultural sector decreased the agricultural output by 0.0347 while increase political will increased agricultural output in SSA by 0.0388. The coefficient of interaction of agricultural raw material and exchange rate increase the agricultural output by 0.0033 in SSA region. The implication of this is that purchase of agricultural input for enhancing the farmers productivity which are mostly imported from developed countries are highly dependent on fluctuation of exchange rate, appreciation of domestic currency is expected to increase the purchasing power of the local farmers

while depreciation of the exchange rate limits the number of farms implements that can be imported from the developed nations. Thus, the interaction has enhanced the productivity in the agricultural sector in SSA region. The reliability of the instruments used in the study are shown in $AR(1)$, $AR(2)$ and Sargan test. The serial correlation test $AR(1)$ indicate the existence of serial correlation at first order while the $AR(2)$ shows absence of serial correlation at second order in the three models which informs the acceptance of the null hypothesis of no serial correlation in the second order $AR(2)$. The Sargan test revealed that all the instruments are exogenous which informs the acceptance of the null hypothesis which implies that the instruments used in the study are independent of one and others across the models.

The Pooled Ordinary Least Square (POLS) and Fixed Effect Regression (FER) were further estimated in order to ascertain the validity of the dynamic system GMM leaning on the empirical credence of (Adekunle, 2020; Blundel et al., 2001) they asserted that another way of detecting the validity of dynamic system GMM is by ensuring that the lagged values of the dependent variable in the GMM model falls between estimates of POLS and FER. However, our dynamic GMM result estimates in table 4 lies between the POLS and FER in table 5 and 6 respectively (FER=0.7431< GMM=0.8830<$POLS$=0.9878).

Pooled Ordinary Least Square (POLS) Result

Variable	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*
$ago_{i,\ t-1}$	0.9878187* (0.0070345)	0.9640292 * (0.0088824)	0.9860334 * (0.0072066)	0.9638923 * (0.0088908)	0.9642284 * (0.0080784)
$emp_{i,\ t}$	0.0203721** (.0102896)	-0.0088468 (0.0122064)			0.0078961 (0.010577)
$ami_{i,\ t}$	0.0120657 (0.0066645)	0.0140009 ** (0.0065456)	0.0119372 * (0.0066886)		
$pwl_{i,\ t}$		0.0643489 * (0.0151562)		0.063671 * (0.0155406)	0.0461194 * (0.0123285)
$mep_{i,\ t}$			0.0367449 * (0.0200362)	0.0062738 (0.020964)	
$fep_{i,\ t}$			-0.0079077 (0.0129036)	-0.0111398 (0.0126481)	
$ami(exc)_{i,\ t}$					0.0054065*** (0.0028483)
$exc_{i,\ t}$	0.0030956 (0.0035217)	-0.0007751 (0.0035688)	0.0019042 (0.0036496)	-0.0012506 (0.0036513)	
$gfc_{i,\ t}$	0.0184875 ** (0.0071664)	0.0447401 * (0.0093559)	0.0204132 * (0.0073203)	0.045062 * (0.0093599)	0.0440693 * (0.0082499)
$\alpha_{i,\ t}$	-0.0884827 (0.0350557)	-0.1390194 (0.0363505)	-0.1015023 (0.0365876)	-0.1456302 (0.0373721)	-0.1396294 (0.0361624)
Wald chi2(5)	106744.47*	111216.99 *	106211.05 *	111083.99 *	99523.40 *
Adjusted R^2	0.9962	0.9964	0.9962	0.9964	0.9956
Observations	414	414	414	414	494
Countries	29	29	29	29	29

Source: Authors Computation, 2020

*NB: The dependent variable is the agricultural output, natural logarithm of all the variables were used. Standard errors are reported in brackets. Level of significance was reported as *, ** and *** representing 1, 5 and 10 percent respectively*

Fixed Effect Regression (FER)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
$ago_{i,\ t-1}$	0.7431222 * (0.0330419)	0.7169137 * (0.0321341)	0.7352188 (0.0342829)	0.7132711 * (.0332599)	0.7505996 * (0.0291562)
$emp_{i,\ t}$	-0.0919474 ** (0.035551)	-0.1676292 * (0.0367595)			-0.1242996 * (0.0363744)
$ami_{i,\ t}$	0.0017882 (.0100725)	0.0093519 (0.0097851)	0.0006918 (0.0101586)	0.0087522 (0.0098929)	
$pwl_{i,\ t}$		0.189204 * (0.0336353)		0.1867616 (0.0337076)	0.1544507 * (0.0293837)
$mep_{i,\ t}$			0.025671 (0.0912496)	-0.0513294 (0.0889886)	
$fep_{i,\ t}$			-0.0977443 (0.0703091)	-0.1007528 (0.0677279)	
$ami(exc)_{i,\ t}$					0.0034327 (.0036284)
$exc_{i,\ t}$	0.0374154 (0.0243881)	0.0319035 (0.0234878)	.0405391 .0246711	0.0334185 (0.0237993)	
$gfc_{i,\ t}$	0.0589008 (0.0137736)	0.0807868 (0.0138129)	0.0601983 * (0.013839)	0.0814295 (0.0138704)	0.0959967 * (0.0129259)
$\alpha_{i,\ t}$	1.89948 (0.2863766)	1.83629 (0.2757941)	1.918594 (0.2865883)	1.836181 (0.2764585)	1.419592 * (0.2504996)
F-Stat	357.04 *	326.61 *	297.47 *	279.18 *	492.82 *
Adjusted R^2	0.9869	0.9918	0.9857	0.9911	0.9918
Observations	414	414	414	414	494
Countries	29	29	29	29	29

*Note: The dependent variable is the agricultural output, natural logarithm of all the variables were used. Standard errors are reported in brackets. Level of significance was reported as * and ** representing 1 and 5 percent respectively*

V. SUMMARY AND CONCLUSION

In spite of empirical works on agricultural output, little or no attention has been given to ascertaining the effect of political will and labour on agricultural output in SSA region, making this issue unaccounted for. Scarcity of empirical works on this line of thought makes it crucial to dig deep. This identified lacuna will help to shape our thought and makes forecasting for the stakeholders a seamless task. In this light, this paper investigates the role of political will and labour on agricultural output in in Sub-Saharan African nations from 1998-2018 using dynamic system-GMM estimation technique consisting of twenty-nine (29) cross-sections with a view of estimating the robustness check and short-run dynamics of the model.

The result shows that employment in the agricultural sector is positively related to agricultural output but after inclusion of political will, employment in agricultural sector reduced the agricultural output. Political will which shows the government willingness to support the agricultural sector is positively related to agricultural output. Agricultural raw material exhibits a positive relation with agricultural output in all the model except for model one (1).

The result of the study also showed that male employment in agriculture increase the agricultural output while female employment decreased the agricultural output in SSA region.

However, inclusion of political will i.e., government support promotes the contribution of female employment in agriculture, leading to increase in agricultural productivity while the male employment in agriculture reduced the agricultural output in SSA region. The result further revealed that the interaction between agricultural raw material and exchange rate promote agricultural productivity in SSA region.

From the result, it is glaring that the way forward to attain an increasing agricultural output is to engage more people in agriculture and ensure a policy that encourage higher female participation in agriculture in order to maintain increase in the agricultural productivity. Government support also contributed positively to the agricultural output in the region. Importation of farm implements enhancing higher agricultural productivity in the region. Our study recommends that more people should be encouraged to participate, particularly, the female in order to harness the female impact on the economy. The government should also support the farmers in acquisition of new farm inputs in order to increase the agricultural productivity in the economy.

REFERENCES

1. Adekunle, I. A. (2020). On the search for environmental sustainability in Africa: the role of governance. *Environmental Science and Pollution Research*, *Prilleltensky 2012*. https://doi.org/10.1007/s11356-020-11432-5
2. Adeola, O. & Ikpesu, F. (2016). An empirical investigation of the impact of bank lending on agricultural output in Nigeria: A vector autoregressive (VAR) approach. *The Journal of Developing Areas*, 50 (6), 89-103. DOI:https://doi.org/10.1353/jda.2016.0140.
3. Ajuwon, O. S. & Ogwumike, F. O. (2013). Uncertainty and Foreign Direct Investment: A Case of Agriculture in Nigeria. *Mediterranean Journal of Social Sciences, 4*(1), 155-165. Doi:10.5901/mjss.2013.v4n1p155.
4. Anetor, F.O., Ogbechie, C., Kelikume, I. & Ikpesu, F. (2016). Credit supply and agricultural production in Nigeria: A vector autoregressive (VAR) approach. *Journal of Economics and Sustainable Development, 7*, (2), 132-143.
5. Arellano, M., and O. Bover. 1995. Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics,* 68: 29–51.
6. Arellano, M., and S. Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies,* 58: 277–297.
7. Blundell, R., and S. Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics,* 87: 115–143.
8. Choi, I. (2001). Unit root tests for panel data. *Journal of International Money and Finance 20*: 249–272.
9. Djokoto, J.G. (2012). Effects of foreign direct investment inflows into agriculture on food security in Ghana. *Journal of Economics and Sustainable Development, 3*,(2), 81-92.
10. Epaphra, M. & Mwakalasya, A.H. (2017). Analysis of foreign direct investment, agricultural sector and economic growth in Tanzania. *Modern Economy, 8*, 111-140. http://dx.doi.org/10.4236/me.2017.81008.
11. Epaphra, M. (2016). Foreign direct investment and sectoral performance in Tanzania. *Journal of Economics and Political Economy, 3*(4), 670-719.
12. Ikpesu, F. & Okpe, A. E. (2019). Capital inflows, exchange rate and agricultural output in Nigeria. *Future Business Journal*, 5:3,1;8. https://doi.org/10.1186/s43093-019-0001-9.
13. Kareem, R.O., Bakare, H.A., Raheem, K.A., Ologunla, S.E, Alawode, O.O. & Ademoyewa, G.R. (2013). Analysis of factors influencing agricultural output in Nigeria: Macro-economic perspectives. *American Journal of Business, Economic and Management, 1* (1), 9-15.
14. Kim, Y. J. & Zhang, J. (2016). International capital flows: Private versus public ∗.
15. Obansa, S. A. J. & Maduekwe, I. M. (2013). Agriculture financing and economic growth in Nigeria. *European Scientific Journal, 9*, (1), 168-204.
16. Olarinde O. M. & Abdullahi, H. (2014). Macroeconomic policy and agricultural output in Nigeria: Implications for food security. *American Journal of Economics,* 4(2), 99-113. DOI: 10.5923/j.economics.20140402.02.
17. Oloyede, B.B. (2014). Impact of foreign direct investment on agricultural sector development in Nigeria, (1981-2012). *Kuwait Chapter of Arabian Journal of Business and Management Review, 3*, (12), 14-24.

18. Osigwe, A.C. & Obi, K. O. (2016). Modelling the impacts of remittances on real exchange rate of Nigeria's Naira. *African Journal of Economic and Sustainable Development, 5*, (1), 1–11.
19. Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal, 9* (1), 86-36.
20. Taurai, Z. (2014). Foreign direct investment (FDI) and agricultural growth in Zimbabwe. B.Sc. Degree project in Department of Agricultural Economics and Development Faculty of Natural Resources Management and Agriculture Midlands State University.
21. Verter, N. (2017). The impact of agricultural foreign aid on agriculture in Nigeria. *Bulgarian Journal of Agricultural Science, 23*(5), 689–697.
22. Weerapong, S. (2006). Do Japanese foreign direct investment and trade stimulate agricultural growth in East Asia? Panel cointegration analysis. Doctoral Thesis. Contributed paper prepared for presentation at International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006.
23. Wondemu, K. & Potts, D (2016). The impact of the real exchange rate changes on export performance in Tanzania and Ethiopia. African Development Bank Working Paper No. 240 August 2016.
24. Yusuff, M.A., Afolayan, O.T. & Adamu, A.M (2015). Analysis of foreign direct investment on agricultural sector and its contribution to GDP in Nigeria. *Journal of Emerging Trends in Economics and Management Sciences (JETEMS), 6*, (2), 94-100.
25. Yunusa, L. A. (2020). Exchange rate volatility and Nigeria crude oil export market. *Scientific African*, *9*, e00538. https://doi.org/10.1016/j.sciaf.2020.e00538.