The Effect of Recurrent Budget Expenditure on the Growth of Agricultural Sector in Tanzania

Sikwese, N.G.[1], J.J. Mmasa[2] and L. Mwinuka[2]

[1]Planning and Coordination Division, Rungwe District Council
[2]Department of Economics, The University of Dodoma - Tanzania

*Corresponding author's e-mail: sikwese076@yahoo.co.uk; Phone:: +255 653 567 254

Abstract

Establishing a correlation between the public agricultural expenditure and agricultural growth basing on the budgetary process is vital. The paper attempts to analyze the effect of recurrent budget expenditure on the agricultural sector growth in Tanzania. The relevant times series data from 2004 to 2018 were obtained from secondary sources. After the preliminary test for unit roots, the Augmented Dickey–Fuller test was employed to determine both the short and long run relationship co-integrating Error Correction Mechanism and Autoregressive Distributed Lag model. The recurrent expenditure in agricultural sector have positive long-run relationship effect to the respective sector. It was revealed that when there is 1% point increase in agricultural recurrent expenditure to budget percentage ratio, the growth rate increases by 0.3326%. Moreover, even incensement of 1% point increase in the agricultural recurrent expenditure; the sector's contribution on the Gross Domestic Product declined from 46.4 to 28.8% in 2004 and 2018 respectively and the agricultural sector growth increased from 4 to 5.9% in 2004 and 2018 respectively. The study recommends that the Tanzania government needs to increase more budget allocation and review its associated policies to develop the agricultural sector.

Keywords: Recurrent budget, public expenditure, agricultural growth, agricultural sector

Introduction

Agricultural growth refers to growth in agriculture that contributes to the Gross Domestic Product (GDP) growth, foreign earnings and income poverty reduction (URT, 2016). Recurrent budget in Tanzania refers to as the total allocation of both other charges and personnels emoluments that facilitate operational costs and payment of salaries to the civil servant (URT, 2015). More than 3 billion people – almost half of the world's population – live in rural areas. Roughly, 2.5 billion of these rural people derive their livelihoods directly or indirectly from the agricultural sector and productivity is very low (Sibanda and Workneh, 2020; FAO, 2012). Agriculture development is a crucial aspect in the world economy for the industrial revolution in developing countries (MAFAP, 2013). Global incremental agricultural investment is prerequisite to meet the Millennium Development Goal (MDG) of reducing or halving poverty by 2015 (Fan and Rosegrant, 2008). All over the world, agriculture plays a great role in the economic growth and agricultural activities contribute 4% of the global GDP and 25% in some of developing countries (World Bank Group, 2019). Developing countries need more than $ 14 billion incremental budget for agriculture investment to tackle poverty, more importantly sub-Saharan Africa (SSA) required an incremental budget ranging from $ 3.8 to 4.8 billion in agriculture investment (Fan and Rosegrant, 2008).

Agriculture forms the backbone of most African economies, it accounts for about 32 % of the continent's GDP and it is thus key to the growth and development prospects of the African countries (AGRA, 2013). More than two-thirds of African citizens, the majority of who are smallholder farmers depend on agriculture for their incomes as it creates employment to both urban and rural population (FAO, 2012). Africa has experienced the demographic growth that entails the transformation from the traditional agriculture into the modernized one with a view to meet the industrial needs , curb the employment crisis, as well as ensuring a sustainable food security. National census data of SSA indicates that the number of people employed primarily in agriculture has increased over time (Jayne *et al.,* 2017).

Tanzania like other African countries adopted the World Bank led structural adjustment policies and it has been facing a similar downfall in terms of agricultural productivity that resulted from low investment in the sector ratified the Maputo declaration and started the implementation immediately (Kaarhus *et al.,* 2010). The agricultural sector forms the backbone of the Tanzania's economy, it contributes about 30% of the GDP, it employed 66% of Tanzanians who engage themselves in agricultural activities and 70 % of Tanzania industries depend on agricultural raw materials (URT, 2018). It is important to invest and spend on agriculture in order to achieve the growth rate of 6% per annum and subsequently reduce rural poverty by 2025 and enhance food security and nutrition (URT, 2020).

Growth of the agricultural sector in Tanzania remained at an average annual growth of 4.4 % since 1961 up to 2018, challenged by a number of factors including poor input supply, low investments in the sector, inadequate extension officers, prices of agriculture outputs, bad weather condition as well as dependence on rain fall. Also, due to constrains of poor access to financial credits and relatively low sector budget allocation. The sector experienced a maximum growth of about 6% in 2005, minimum growth of about 2.7% in 2017. Due to this low and declining of production and productivity, the agricultural sector contribution to GDP declined from 46.4% in 2004 to 28.2% in 2018 (URT, 2019). Since, 2003 the Tanzania agricultural budget allocation decreased from 5.6 to 4.7% 2018 from the national budget (URT, 2020), which affect the implementation of planned intervention. The highest allocation the agricultural sector ever attained in Tanzania was 7.8% in 2010/11 (Fig. 1).

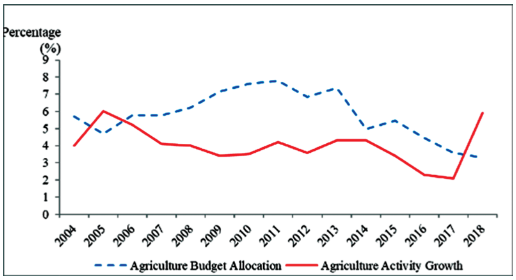

Figure 1: Trend of the agricultural sector budget versus agricultural sector growth 2004-2018

The agricultural sector in Tanzania is composed of a number of sub-sectors; namely crops, livestock, fisheries, forestry and forestry products. Tanzania is endowed with 94.5 million hectares of land whereby 44 million hectares are arable land, only 15.5 million hectares (35%) are currently under cultivation (URT, 2016). Of the 29.4 million hectares potential for irrigation, about 461,326 hectares are under irrigation. Forest constitutes about 38.8 million hectares (40%) of the total land area, shares of total export earnings about 5.9% (URT, 2016). A large number of Tanzanians, about 55%, remain dependent on agriculture in sustaining their livelihoods, about 75% of the poor and 15 % others indirectly (World Bank Group, 2019). Currently, the agriculture sector contributes about 30% of the real GDP and it absorbs 66 % of the total country's labour force (URT, 2018).

Agriculture will continue being one of the main drivers of inclusive growth in the Tanzanian economy and a major source of productivity gains to support the desired structural transformation, and the creation of new jobs (World Bank Group, 2019). However, the agricultural sector in Tanzania faces a lot of challenges of resources allocation in the sectoral budget, the Tanzania government put more effort on the expansion and improvement of irrigation infrastructure, utilization of modern agriculture inputs and mechanization (URT, 2015). However, the agricultural sector experienced fluctuation trend of budget allocation from the national budget from 5.6% during the financial year (FY) 2003/04 to 4.7% in FY 2017/18 thereby affecting agricultural growth (ANSAF, 2018), the more the public spending on agriculture sector, the more the performance improvement of the agricultural e growth (Adofu *et al.,* 2012).

The findings of the study revealed that the recurrent budget on agriculture had a positive impact on agricultural growth. Agricultural recurrent expenditure increase has positive effect on the GDP increases by 0.33% in the long-run. In this regard, the paper attempts to contribute on the linkage among key variables, such as financial resource allocation, physical and human resources within the agricultural sector via agricultural outputs in crop production, livestock, fisheries, forestry and hunting basing on the effectiveness and efficiency utilization of resources and provide essential inputs for the policy -makers in areas of ring fence of agriculture priorities that stimulate agricultural sector productivity.

Theoretical and conceptual standpoint

The conceptual framework was used to show the relationship of the key study variables. In this paper, the independent variable that was used was agricultural public expenditure in the sector that tend to affect agricultural growth (Fig. 2). The study was guided by the relevant theories namely; the theory of budgetary process, Musgrave-Rostow's theory, endogenous growth theory, and budgetary incrementalism theory. While a series of empirical studies on budgetary allocation, governmental expenditure, agricultural public expenditure and agricultural growth were used to guide the used analytical process. The study takes these as guiding theories and analytical points without completely disregarding other external factors and/or criticisms by integrating important items into the variables and model selection and testing. Thus, the study conception was based on the theoretical review and key variables are presented using Figure 2.

Methodology

The study applied a documentary review approach and the time series data. The paper used data for the period 2004 to 2018 of public expenditure on government spending in agriculture recurrent, government spending on irrigation infrastructure and government spending on agricultural research. The data were mainly collected from the Ministry of Agriculture, Ministry of Finance and Planning, National Bureau of Statistics (NBS), Bank of Tanzania and the President's Office Regional Administration and Local Government Authority (PORALG).

The study employed Error Correction Model (ECM) to predict the influence of independent variables to the dependent variable. The data collated was tested for stationarity by using Augmented Dickey–Fuller test (ADF) of unit root and co-integration for long run linear relationship by using Johansen Co-integration test to avoid misleading results. Data was analyzed by using STATA and Microsoft Excel

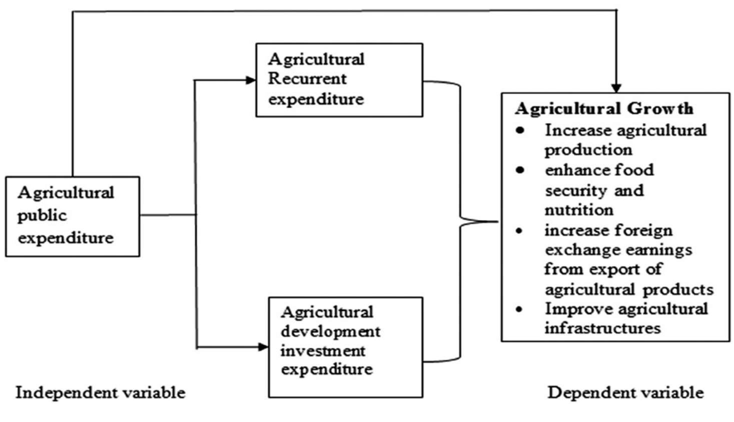

Figure 2: Conceptual framework

Source: Researcher Conception from the Theoretical Empirical Literature Review (2022) was later applied to manage the tabulation of collated agricultural budget and agricultural expenditure relationships. The collected, processed and analysed data was presented in of form of table and graphs. In this regard, the ECM was employed on first model and Autoregressive Distributed Lag model (ARDL) was employed for an extended model capturing specific allocations on the development budget

Granger Causality test

Granger Causality means the relationship between time series (Granger, 1969) it used to determine the causal relationship between one time series integrating second series.

$$Y_t = \alpha_{01} + \sum_{i=1}^{p} \alpha_{1i} Y_{t-i} + \sum_{i=0}^{q} \alpha_{2i} X_{t-i} + e_{1t} \quad \text{(i)}$$

$$X_t = \alpha_{02} + \sum_{j=1}^{p} \alpha_{1i} Y_{t-j} + \sum_{j=0}^{q} \alpha_{2i} X_{t-j} + e_{2t} \quad \text{(ii)}$$

In this study, the agricultural public expenditure variables integrating with agricultural growth.

Unit root test

In this case, ADF was employed for each series over the sample period. This test (ADF) is an improvement of the previous Dickey-Fuller's test which assumed that the error terms are not correlated (i.e.cov(u_t,u_{t-1})=0), the test can be conducted even when the errors are correlated through "augmenting" normal DF by adding the lagged difference terms of the dependent variable (i.e.$\sum \Delta Y_{t-i}$) as follows.

$$\Delta Y_t = \beta_0 + (p-1) Y_{t-1} + \sum_{i=1}^{m} \Delta Y_{t-i} + u_t \quad \text{(iii)}$$

If (ρ-1)=0 meaning statistically not significant different from zero it implies that ρ=1 and then we fail to reject the null hypotheses on the presence of unit root problem (Y_t series is not-stationary).

Application of ARDL Approach

The ARDL models were put forward, Model I with only three series and Model II as an extension to Model I where development budget was disaggregated to research and development (R&D) and irrigation budget.

Model I:

$$\Delta Agr\_gdp_t = \alpha_0 + \alpha_{11} Agr\_gdp_{t-1} + \alpha_{21} Agr\_rcrnt_{t-1} + \alpha_{31} Agr\_dvlp_{t-i} + \sum_{i=1}^{p} \alpha_{4i} \Delta Agr\_gdp_{t-i} + \sum_{i=0}^{q_1} \alpha_{5i} \Delta Agr\_\mathrm{rcrnt}_{t-i} + \sum_{i=0}^{q_2} \alpha_{6i} \Delta Agr\_\mathrm{dvlp}_{t-i} + e_{1t} \quad \text{(iv)}$$

Model II:

$$\Delta Agr\_gdp_t = \gamma_0 + \gamma_{11} Agr\_gdp_{t-1} + \gamma_{21} Agr\_rcrnt_{t-1} + \gamma_{31} lnirrgtn_{t-i} + Y_{41} lnR\&D_{t-i} + \sum_{i=1}^{p} \gamma_{5i} \Delta Agr\_gdp_{t-i} + \sum_{i=0}^{q_1} \gamma_{6i} {}'' Agr\_rcrnt_{t-i} + \sum_{i=0}^{q_2} \gamma_{7i} {}'' lnirrgtn_{t-i} + \sum_{i=0}^{q_2} \gamma_{8i} {}'' lnR\&D_{t-i} + e_{1t} \quad \text{(v)}$$

Where p and q_i are the chosen lags, α_0 and γ_0 are the intercepts, e_1t is the white noise term. The remaining coefficients describe short-run and long-run relations. Then α_{11}, α_{21},and α_{31} are for Model I's corresponding long-run coefficients while γ_{11}, γ_{21}, γ_{31} and γ_{41} are Model II's corresponding long-run coefficients, the short-run effects are captured by the coefficients for the first differenced variables such as, α_{4i}, α_{5i} and α_{6i} in Model I while γ_{5i}, γ_{6i}, γ_{7i} and γ_{8i} are the corresponding short-run coefficients for Model II respectively. The point as to why other independent variables in their level forms are in lags instead of contemporaneous is because during the long-run Y_{t-i}=Y_t and X_{t-i}=X_t all the indicators are in their stead states that do not change.

F-Bounds test for co-integration

In this study, to look for long run linear relationship between variables of interests, the F-Bounds Test for Co-integration by Pesaran, Shin and Smith (2001) was employed which helps to determine if the series are co-integrated regardless of their integration order being homogeneous or not in contrast with Johansen's co-integration test which requires all series to be integrated of order one I(1). Thus combination of I(0) and I(1) can be tested which enables us to apply for ECM if series are co-integrated or apply ARDL for only short-run effects.

The F-Bounds Test for Co-integration conditional on ARDL (p, q) can be expressed as follows;

Hypothesis:

H_0: α_{1i}=α_{2i}=0, (Where, i=1, 2)

H_1: α_{1i}≠α_{2i}≠0

$$\Delta Y_t = \alpha_{01} + \alpha_{11} Y_{t-1} + \alpha_{21} X_{t-1} + \sum_{i=1}^{p} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=0}^{q_1} \alpha_{2i} \Delta X_{t-i} + e_{1t} \quad \text{(vi)}$$

$$\Delta X_t = \alpha_{02} + \alpha_{12} Y_{t-1} + \alpha_{22} X_{t-1} + \sum_{i=1}^{p} \alpha_{1i} \Delta Y_{t-i} + \sum_{i=0}^{q_1} \alpha_{2i} \Delta X_{t-i} + e_{2t} \quad \text{(vii)}$$

In this case if bound test's estimated F-statistic is less than lower bound I(0) critical value at a given level of significance in this case 5% then there is no co-integration equation and thus stick to short-run model which is ARDL model. If the F-statistic is greater than the upper bound I(1) critical value at 5% level of significance then we reject the null hypothesis and thus there is a long-run (co-integration) relationship enabling us to combine short-run impacts to the speed of adjustment towards long-run equilibrium through (ECM) an extension to ARDL model. If the F-statistic falls between the lower bound I(0) and upper bound I(1) then, the test is inconclusive.

Error correction model

The ECM was used to capture both short-run and long-run impacts on agricultural growth contribution to the GDP. Given the existence of co-integration, all terms in ECM are now stationary, so the standard regression techniques with their associated statistical inferences are valid (Green, 2008). The Granger representation theorem Engle and Granger (1987) states that if a set of variables such as Y_t and X_t are co-integrated, then there exists a valid error correction representation of the data. The ECM under Autoregressive distributed lag process can be expressed as follows:

$$\Delta Y_t = \alpha_0 + \alpha_1 \sum_{i=1}^{p} \Delta Y_{t-i} + \alpha_2 \sum_{i=0}^{q} \Delta X_{t-i} + \delta ECT_{t-1} + e_t \quad \text{(viii)}$$

Where;

α_1: Short-run elasticity of dependent variable on its lagged value

α_2: Short-run elasticity or effects of other variables

δ: Speed of adjustment of short-run disequilibrium towards the long-run equilibrium

Also, $ECT_{t-1}=(Y_{t-1}-\beta_0-\beta_1 X_{t-1})$ considering that in the long-run all the variables are in their steady state regardless of lagging length presentation. Though the natures of these budgetary series are subjected to lag effects rather than contemporaneous effect in the short-run, implying that there is no direct effect of X_t on Y_t in the same period, the effects of present shocks are realized in the next periods.

On our case the corresponding error correction equations can be expressed as follows

Model I:

$$\Delta Agr\_gdp_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{4i} \Delta Agr\_gdp_{t=1} + \sum_{i=0}^{q_1} \alpha_{5i} \Delta Agr\_rcrnt_{t-i} + \sum_{i=0}^{q_2} \alpha_{6i} \Delta Agr\_dvlp_{t-1} + \delta ECT_{t-1} + e_{1t} \quad \text{(ix)}$$

Model II:

$$\Delta Agr\_gdp_t = \gamma_0 + \sum_{i=1}^{p} \gamma_{5i} \Delta Agr\_gdp_{t-1} + \sum_{i=0}^{q_1} \gamma_{6i} \Delta Agr\_rcrnt_{t-i} + \sum_{i=0}^{q_2} \gamma_{7i} \Delta lnirrgtn_{t-i} + \sum_{i=0}^{q_2} \gamma_{8i} \Delta \ln R\&D_{t-i} + \varphi ECT_{t-1} + e_{1t} \quad \text{(x)}$$

Whereby, δ and φ are the corresponding speed of adjustment term towards the long-run equilibrium for the respective Model I and Model II.

Table 1: Description of the key variables used

Variable	Description
Agr_gdp	Agriculture GDP (in percent)
Agr_rcrnt	Recurrent expenditure in agriculture (Tanzania shilling in billion)
Agr_dvlp	Development expenditure in agriculture (Tanzania shilling in billion)
irrgtn	Irrigation budget expenditure (Tanzania shilling in billion)
R&D	Research and Development expenditure (Tanzania shilling in billion)
ECT	Error Correction

Results

Unit root test and the order of integration

ADF unit root test was used to test stationarity on the level series and on the first differenced series to determine the integration order. The ADF test estimated results in Table 2 portrays that the variable Agr_rcrnt is stationary I(0) at its level form given that its test statistic is greater than corresponding critical value or less than critical value in its absolute values at 5 percent level of significance

F-Bounds test for co-integration

Given the fact that the series were integrated of different orders such as the combination of I(0) and I(1) from ADF unit root test statistics, then proceeding step was to check if the series were bound together in the long-run or simply if there were any long-run relationships among the series by using Bounds co-integration test developed by Pesaran, Shin and Smith (2001) through ARDL approach which can even serve the purpose of error correction model for

Table 2: Augmented Dickey-Fuller (ADF) test results

Variables	Levels		First Difference		Integration order
	Test Statistics	Critical Value	Test Statistics	Critical Value	
Agr_gdp	-2.278	-3.000	-3.356**	-3.000	I(1)
Agr_rcrnt	-4.444***	-3.000	-4.848***	-3.000	I(0)
Agr_dvlp	-2.754	-3.000	-5.105***	-3.000	I(1)

Note: *** "0.05" and *** "0.01" indicates the rejection regions of null hypothesis at the respective levels of significance*

different lag length and different integration order compared to the Vector Autoregressive (VAR) approach like Vector Error Correction Mechanism (VECM). As a rule of thumb, co-integration analysis requires an optimal lag length through selection criterions. On this case with ARDL mechanism which allows multiple lag length, the test was done by using Akaike Information Criteria (AIC) and Schwarz Bayesian Information Criteria (SBIC) where the optimal lags for the first model were 1 for Agr_{gdp}, respectively.

values of lower and upper bound or greater than lower and upper bounds in its absolute values at 0.05 level of significance and hence it enables to reject the null hypothesis of no co-integration. Thus, given the combination of I(0) and I(1) are co-integrated then, they enabled us to apply for Error Correction Mechanism (ECM) applied through adding lagged error term in the short-run ARDL equation to capture both short-run effects and short-run disequilibrium speed of adjustment towards a long-run equilibrium.

Table 3: Model I's F-Bounds test of co-integration

Null Hypothesis	F-Statistic	Critical Value		Critical Value		
		Lower bound I(0)	Upper bound I(1)	t Statistic	Lower bound I(0)	Upper bound I(1)
k=2	13.741***	3.79	4.85	-5.848***	-2.86	-3.53

Note: *** and *** indicate the rejection regions of null hypothesis at 0.05 and 0.01 levels of significance, respectively*

Based on Table 3, the Bounds test of co-integration on Model I indicates the existence of a long-run relationship between the series given that the model's F-statistic is greater than the critical values of the lower and upper bounds (i.e. I(0) & I(1)) at 0.05 level of significance. This is also supported through t-statistic were also the test statistic is less than the corresponding critical

Long-run Relationship

Table 4 model estimates the results of the ARDL model's long-run relations coefficients can be seen, where the symbols such as *, **, *** represents a significance level of 5, 2.5 and 1%, respectively and the table comprises of both coefficient estimates, Standard Error, t-statistics and p-values. The interpretation for the long-run

Table 4: Model I's long-run relationships

Variables	Agr_gdp			
	Coefficient	**Stand. error**	**t**	**P>|t|**
Agr_rcrnt	0.3326	0.0601	5.53	0.003***
Agr_dvlp	-0.1034	0.0337	-3.07	0.028**
Cons	10.39	4.2976	2.42	0.060

Note: *** and *** indicate the rejection region of null hypothesis at 0.05 and 0.01 levels of significance, respectively* relationship can done as follows given the fact that both coefficients are statistically significant different from zero at 5 percent level of the significance.

The long-run coefficient for Agr_rcrnt is 0.3326 which implies that when there is 1%-point increase in agriculture's recurrent expenditure to budget percentage ratio, the Agr_gdp increases by 0.3326% points under ceteris paribus indicating a positive long-run relationship.

Estimates of short-run coefficients

Also, for the short-run relations, Table 5 provides estimates of short-run coefficients and the speed of adjustment towards the long-run equilibrium as per any short-run distortions. In this case only one short-run coefficient is statistically significant different from zero at a 5% level which is the lagged first difference of recurrent expenditure to budget ratio while the rest are not statistically significant. The coefficient of error term which measures the speed of adjustment is negative and statistically significant at 5% level but greater than 1 and less than 2 which implies over correction of disequilibrium but it is tolerable as long as the model is stable which supports convergence in the long-run.

Granger Causality

By using the spectral granger causality test by Breitung-Candelon (2006) it is observed that in Model I only granger causal unilateral relationship exists from *Agr_rcrnt* to *Agr_gdp* at a frequency level of 0.75 and the rest indicators granger causality does not exist also does not exist in Model II, this can be observed through Table 6 spectral Granger causality test statistics.

H_0: No granger causality

Table 5: Model I's error correction model

Variables	First Difference of Agr_gdp			
	Coefficient	**Stand. error**	**t**	**P>|t|**
ECT_{t-1}	-1.251	0.2139	-5.850	0.002***
ΔAgr_rcrnt_t	0.018	0.0497	0.36	0.733
ΔAgr_rcrnt_{t-1}	-0.232	0.0605	-3.840	0.012**
ΔAgr_dvlp_t	-0.035	0.0238	-1.45	0.206
ΔAgr_dvlp_{t-1}	0.041	0.0320	1.290	0.252
No. of obs	13			
R-Squared	0.9022			
D	2.0515			

Note: *** and *** indicates the rejection regions of null hypothesis at 0.05 and 0.01 levels of significance, respectively.*

Table 6: Spectral granger causality test statistics

Causality		Wald test statistic	p-value
Agr_rcrnt	*Agr_gdp*	11.1875	0.0037***
Agr_rcrnt	*Agr_dvlp*	0.1385	0.9331
Agr_dvlp	*Agr_gdp*	0.6783	0.7124
Agr_dvlp	*Agr_rcrnt*	0.4755	0.7884
Agr_gdp	*Agr_rcrnt*	1.7494	0.4170
Agr_gdp	*Agr_rcrnt*	1.4706	0.4794

Note: *** and *** indicates the rejection regions of null hypothesis at 0.05 and 0.01 levels of significance, respectively.*

Validity and Reliability

Diagnostic Checks

In Model I's post-estimation tests for heteroskedasticity, serial correlation, and the model's parameter stability, both of these tests showed that the estimates were robust with the evidence of no serial correlation provided the Durbin-Watson d-statistic being 2.0515 compare to critical values (upper and lower bounds) supported by Breusch-Godfrey LM test for autocorrelation up to higher order of three on Table 6 below which showed to be not statistically significant which implies a failure to reject the null hypothesis of no serial correlation.

In addition, Table 7 given test statistic shows that the model has constant variance (homoscedasticity) provided the test statistic of Breusch-Pagan/Cook-Weisberg test for heteroscedasticity as well as Cameron and Trivedi's decomposition of IM-test being not statistically significant different from zero and hence we fail to reject the null hypothesis of constant variance which implies that there is no heteroscedasticity problem supported also by white's test for heteroscedasticity.

H_0: No serial correlation

Table 7 above shows no statistically significant which implies a failure to reject the null hypothesis of no serial correlation.

H_0: Homoskedasticity

Table 8 above based on the test statistic shows that the model has constant variance (homoscedasticity).

H_0: No structural break

Table 9 shows the post-estimation check cumulative sum (CUSUM) test for the model's parameter stability which proved to be stable over the time window at the 95% confidence intervals and thus it implies the absence of structural break given its statistics being less than critical values and, thus we failed to reject the null hypothesis of no structural break at a 5% level of significance

Moreover, Figure 3 shows the cumulative sum (CUSUM) test for the model's parameter stability which proved to be stable over the time

Table 7: Breusch-Godfrey LM test for autocorrelation

Lags(p)	Chi^2	Degree of freedom	Prob>Chi^2
1	0.359	1	0.5489
2	5.442	2	0.0658
3	5.595	3	0.1330

Note: *** "0.05" and *** "0.01" indicates the rejection regions of null hypothesis at respective levels of significance*

Table 8: Cameron & Trivedi's decomposition of IM-test

Source	Chi^2	Degree of freedom	Prob >Chi^2
Heteroskedasticity	13.00	12	0.3690
Skewness	3.05	7	0.8807
Kurtosis	1.16	1	0.2822
Total	**17.20**	**20**	**0.6398**

Note: *** "0.05" and *** "0.01" indicates the rejection regions of null hypothesis at respective levels of significance*

Table 9: Cumulative Sum (CUSUM) test for the parameter stability

Statistic	Test Statistics	1% Critical	5% Critical	10% Critical
OLS	0.5621	1.6276	1.3581	1.224
No. of obs	13			

Note: *** and *** indicates the rejection region of null hypothesis at 0.05 and 0.01 level of significance respectively.*

window at 95% confidence intervals and thus it implies that the absence of structural break given its statistics being less than the critical values and thus we failed to reject the null hypothesis of no structural break at 5% level of significance. Therefore, in general the analytical estimates are precise and robust enough to rely on the estimated coefficients.

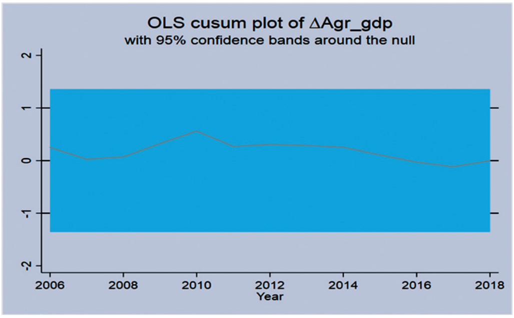

Figure 3: Cumulative Sum (CUSUM) plot for the parameter stability

Discussion and implications

Based on Figure 4, recurrent and development budget allocation depend on each other to facilitate the agricultural sector growth. The study revealed that the highest allocation of 7.8% was disbursed to the agricultural sector in 2011. In this regard, if other elements that can have impact on agriculture are included, such as rural roads, rural infrastructures and others the allocation would be higher enough (MAFAP, 2013) to comply with the Maputo targets (Benin and Yu, 2013). In this regard, the recurrent

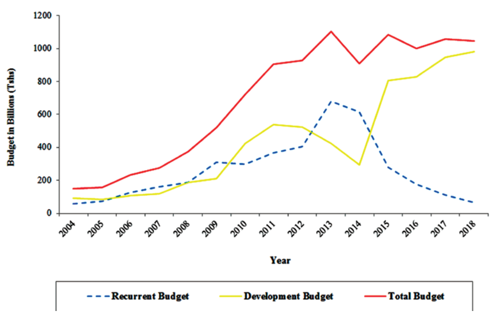

Figure 4: Recurrent and development investment budget trend (2004-2018)

spending used to facilitate the running costs of the respective Ministry's office including recruitment of extension officers and support that goes to agricultural inputs subsidies.

Performance of the agricultural sector has direct relationship with the other sectors including but not limited to industrial sector. The agricultural sector also has backward and forth linkages in the rural and urban areas through provision of employment both in production and industrial areas as well as provision of industrial raw materials (Maingi, 2017). Development of the value chains of agricultural products is likely to accelerate rural investment, facilitating inputs and output markets, storage facilities, strengthening agriculture microfinance institution including AMCOS and SACCOS.

The findings further revealed that recurrent budget on the agricultural sector have a positive impact on agricultural growth. This translates into a great role of the recurrent expenditure on agriculture can facilitate operational costs and other enumerations in the agricultural sector. Supporting food storage facilities and price stabilization mechanism through National Food Reserve Agency (NFRA) is crucial in ensuring food security and inflation control, respectively. This is not surprising as also reported by Mulinge (2016) in Kenya that there was a long-run relationship between recurrent public expenditure and economic growth. As the global population is set to increase and there is renewed interest in ensuring food security, further developments on storage facilities to control post-harvest losses are inevitable (Stathers *et al.,* 2020).

Furthermore, the study found out that an increase in government recurrent expenditure in agriculture to facilitate other charges expense, extension services, and research and development activities also affects economic growth. Since agricultural growth is associated with the use of improved technology that is associated with technological innovation, creativity and adoption. Research and extension services are a key aspect in increasing agricultural productivity. Adofu *et al.* (2012) testified that it is important to increase agricultural recurrent budget allocation with a view to improve the performance of the agricultural sector, hence agricultural growth. Thus, there is a positive relationship between real GDP against the recurrent and capital expenditure for the recurrent public expenditure on government social services (Taiwo and Aboyomi, 2011).

Further investments on agricultural microfinance institutions particularly in rural areas need no reemphasis. Also, it was argued by Anderson *et al.* (2017) and Ita *et al.* (2013) that the relationship between agriculture's public capital expenditure and economic growth is a crucial factor on the agricultural sector growth. The current paper also confirms that there is a long run relationship between variables namely agricultural GDP, agricultural capital expenditure and agriculture loanable fund. In addition to that, there was relatively low investment in rural infrastructure especially the irrigation systems, warehouses, market infrastructures and marketing. Efforts and collaborations between the public and private sectors have a potential role to play.

Conclusion

Recurrent budget in Tanzania represents a total allocation of both other charges and personnel emoluments that facilitate operational costs and payment of salaries to the civil servants. The government should increase recurrent budget allocation to the agricultural sector to cover the running cost and personal emolument, recruitment of the extension officers in order to curb the shortage of extension officers in the Field with a view ensure acceleration of the agricultural growth . Public financing of the agricultural sector have a multiplier effect to the economic growth through tickrile down effect to other productive sectors of trade, industry, transport and infrastructures, hence the sector ensured the availability of industrial raw material, create employment both in rural and urban areas and reduce the burden of the government importation of sugar, wheat and oil food. The study recommends that the Government should reinforce financing of the agricultural sector by also promoting investment in the sector and improve the general rural infrastructure through research development and extension services, rural roads networks, agricultural inputs system, agricultural market development and micro financial institutions.

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Conflict of interest

The authors declare that they have no conflict of interest.

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