International Journal of Development and Management Review 20(1): 2025 Copy Right: ©2025 Author(s)
Available Online at http://ajol.info/index.php/ijdmr/index; www.ajol.info; www.ajosdemar.com
Original Research p-ISSN 1597 – 9482; e-ISSN 2734 – 3316

THE IMPACT OF BANK CREDIT ON AGRICULTURAL GROWTH (AgDP) IN TANZANIA

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Abstract
This study analyzes the impact of agricultural credit on Tanzania's agricultural growth from 2005 to 2018, using ARDL and Markov switching regression models to capture both short-term and long-term effects, and fluctuations across different economic periods. Findings indicate a significant long-term positive impact of agricultural credit on agricultural GDP, whereby short-term effects are negative, highlighting the need for efficient credit use to optimize benefits. Additionally, the study identifies other significant determinants of agricultural GDP: the exchange rate positively influences long-term agricultural GDP; government spending positively affects it in the short-term; FDI boosts long-term agricultural growth but has a negative short-term impact; and previous season's agricultural production positively impacts agricultural GDP in both terms. The study suggests increasing agricultural credit supply, addressing exchange rate fluctuations, encouraging FDI, and promoting high-value crop specialization to enhance agricultural GDP in all terms. Recommendations include improving credit market efficiency and reducing bureaucratic inefficiencies to expedite credit disbursement.

Keywords: Agricultural credit, Agricultural GDP, ARDL, Markov Switching Model, Tanzania

Doi: *https://dx.doi.org/10.4314/ijdmr.v20i1.1*

Background of the study

Agriculture is a crucial sector in the economic development of developing economies, particularly in sub-Saharan Africa (SSA), where it accounts for a significant portion of the Gross Domestic Product (GDP). According to *Jayne et al., (2019)*, agriculture contributes 32% of the total output in SSA, making it the largest contributor to GDP in the region. Agricultural growth is four times more effective in raising income among the poorest than other sectors. Unfortunately, several factors, such as COVID-19, extreme weather conditions, and conflicts, have disrupted agricultural-driven growth, leading to an increase in hunger and food prices, particularly in SSA (Jayne & Sanchez 2021).

The importance of the agricultural sector in SSA's economy cannot be overemphasized, but the growth has not been felt equally across the region. Many countries in SSA have lagged due to insufficient improvements in agricultural mechanization, extension services, access to credit, and financial markets. This disparity in agricultural growth across the region has resulted in unequal economic development, with some countries experiencing more significant growth than others (Sakho-Jimbira & Hathie 2020).

In Tanzania, agriculture is the second-largest contributor to the overall GDP after the construction sector and contributes 28.8% of the national GDP activities at current prices (BoT 2019b). Agriculture is also responsible for 30% of foreign exchange earnings. Furthermore, the agricultural sector provides employment for close to 50% of the population in Tanzania, and this trend is expected to continue until 2025 (Wineman *et al.,* 2020). Although the sector had the largest growth rate of banks' credit, receiving 40% of the total credit, it only received 8.7% of the total credit disbursed. This indicates that the sector still faces several challenges that limit its potential for growth (BOT 2021).

Despite the sector's importance, agricultural growth rates in Tanzania have lagged, averaging less than 4% in the last five years. The agricultural value added as a percentage of the gross domestic product (GDP) has steadily declined from 28.7% in 2017 to 25.9% in 2021. This diametrically opposes the growth in formal bank credit, which raises concerns about the impact of agricultural credit on agricultural growth in Tanzania (BoT 2022).

Various macroeconomic factors have contributed to this slow growth in Tanzania's agricultural sector. The sector heavily relies on rainfall, which is unpredictable and has become increasingly erratic due to climate change. The volume of production has also been low due to poor land management practices, lack of modern technologies, and inadequate irrigation infrastructure. Moreover, the government's spending on the sector has been insufficient, and there has been a low volume of exports due to various trade barriers (Jambo 2017). Access to credit has also been a significant constraint, limiting smallholder farmers' access to capital, inputs, and modern technologies (BOT 2019a, 2021). Additionally, limited access to markets and inadequate transport infrastructure also constraints the growth of the agricultural sector in Tanzania. Smallholder farmers, who make up a significant portion of the country's agricultural sector, often face difficulties accessing markets due to poor infrastructure and high transport costs (Ngowi 2022).

To address these challenges and stimulate agricultural growth, the Tanzanian government has implemented various policies and initiatives. One such initiative is the Agricultural Sector Development Program (ASDP), which aimed to increase productivity and competitiveness in the agricultural sector through improved access to inputs, technology, and markets. The program also seeks to promote private-sector investment in agriculture, encourage smallholder commercialization, and improve rural livelihoods (Advocates 2019).

In addition to government-led efforts, various development partners both multilateral and bilateral have also played a role in supporting Tanzania's agricultural sector. The International Fund for Agricultural Development (IFAD), for example promoted sustainable agricultural practices through initiatives like the Agricultural and Fisheries Development Programme which seeks to improve the productivity enhance commercialisation of selected crop seeds fisheries and aquaculture (IFAD 2021). African Development Bank (AfDB) supported the sector through the food system support project (FSSP) to increase smallholder farmers' horticultural productivity (Tiba 2023). Other development partners, such as the World Bank, the United States Agency for International Development (USAID), and the European Union (EU), have also contributed to Tanzania's agricultural sector through various projects in improving the agricultural value chain (EU 2023).

Overall, while the agricultural sector remains an important contributor to Tanzania's economy, it continues to face various challenges that limit its growth potential. Through the implementation of targeted policies and initiatives, and with the support of development partners, Tanzania can work towards addressing these challenges and unlocking the full potential of its agricultural sector.

Problem Statement

Tanzania, like many developing countries, recognizes the importance of agricultural growth for economic development. To enhance the development of the sector and eventually agricultural growth, the government has introduced various policies and programs at the national level, including the Agricultural Sector Development Strategy (ASDS), Kilimo Kwanza, Agricultural Sector Development Programme (ASDP I and II), and the National Strategy for Growth, Reduction for Poverty (NSGRP), National Microfinance Policy (2000), and National Trade Policy 2017 (Isinika *et al.,* 2016). Despite these efforts, agricultural credit is still cited as an obstacle hindering growth, with commercial banks accounting for the largest share of formal lending to the agricultural sector.

The Tanzanian government has undertaken several initiatives to address the constraint of agricultural credit, including Smallholder Credit Guarantee Schemes, administered through the Tanzania Agricultural Development Bank (TADB), and convincing formal financial institutions to increase their loan portfolio to the agricultural sector. However, out of the 52 registered commercial banks in Tanzania, only 26 banks operate a credit portfolio in agriculture, with only an average of 10% of share lending directed to agriculture(BoT 2019b). Although the major four financial institutions, Cooperative Rural Development Bank (CRDB), National Microfinance Bank (NMB), Tanzania Agricultural Development Bank (TADB), and

Tanzania Investment Bank (TIB), have the largest focus on agriculture finance, they still account for less than 10% of the loans portfolio (BoT 2022).

Despite these challenges, the Central Bank of Tanzania has taken additional initiatives to reduce the statutory minimum reserve (SMR) requirement for Formal Financial Institutions that are lending to the agricultural sector. These efforts, coupled with persuasion to formal financial institutions, have resulted in an impressive growth rate of credit from a negative rate to 42.1% in 2022 (BoT 2022). Nevertheless, the observed diametrical movements in commercial bank credit and agricultural growth raise questions as to whether agricultural credit has any impact.

The meagrely available macro-level empirical studies on the impact of formal agricultural credit on agricultural output using various methods in different countries have produced diverse results, with some studies suggesting a positive significant impact of agricultural credit on agricultural output (AgDP) (Ahmad *et al.,* 2018; Anh *et al.,* 2020; Chongela 2015; Isaga 2018; Kinuthia 2018; Msulwa 2015). While other studies reject the existence of the relationship by reporting a negative impact of agricultural credit on agricultural output (AgDP) or the impact cannot be directly estimated (Lawal 2019; Meressa 2017; Olowofeso *et al.,* 2017). This lack of consensus on the effect of formal agricultural credit on GDP growth complicates policy decisions and hence calls for further rigorous empirical evaluation with innovative approaches to address this gap.

Against this background, this paper aims to examine the impact of commercial bank credit on agricultural GDP in Tanzania using the innovative methodological approach of combining both two analytical models, the Markov Switching (MS) Regression model, and the Auto Regressive Distributed Lag (ARDL) model. From a methodological point of view, this study asserts a unique feature by combining the Markov Switching Regression model and the ARDL model. Using ARDL, this paper is attempting to extract interactions between agricultural credit and agricultural output and explore whether there is a long-term relationship between formal agricultural credit and growth in Tanzania. Using the MS model, we will examine the behaviour of economic actors during different regimes (slow and fast growth periods) to better model the profound impact of agricultural credit on agricultural output during the two economic regimes.

Despite the numerous policies and programs introduced by the Tanzanian government to enhance the development of the agricultural sector, agricultural credit remains a significant obstacle to agricultural growth. With commercial banks accounting for the largest share of formal lending to the agricultural sector, efforts to improve access to agricultural credit have yielded limited results. To address this issue, this paper examines the impact of commercial banks' credit on agricultural GDP in Tanzania using a unique methodological approach that combines the Markov Switching Regression model and the Auto Regressive Distributed Lag (ARDL) model.

This study makes a strong contribution to the literature on the impact of agricultural credit on agricultural growth in Tanzania. The study employs a unique methodological approach, examines the behaviour of economic actors during different economic regimes, and provides insights into the short-run and long-run relationship between formal agricultural credit and agricultural growth. The findings from this study will be beneficial for policymakers, financial institutions, and other stakeholders in the agricultural sector in Tanzania, and can potentially inform policy decisions to improve access to agricultural credit and promote agricultural growth in the country.

Literature Review

The financial agricultural growth nexus has been the subject of several empirical studies. However, the results have been mixed, with some studies supporting the demand-following hypothesis and others supporting the supply-leading hypothesis. In the case of this study, few empirical studies covered overwhelmingly supported the supply-leading hypothesis. This means that the supply of agricultural credit by financial institutions has a significant impact on the growth of the agricultural sector (Ngong *et al.,* 2022; Nigo & Gibogwe 2023).

The ARDL model has been widely used in literature to examine the causal relationship between agricultural credit and agricultural growth. For example, Chandio, Jiang, Rauf, Ahmad, Amin and Shehzad (2020) used the ARDL model to investigate the impact of agricultural credit on agricultural productivity in Pakistan. The study found that agricultural credit had a positive impact on agricultural productivity in the long run. Similarly, Osabohien *et al.,* (2022)used the ARDL model to analyze the relationship between agricultural credit and agricultural growth in Nigeria. The study found that agricultural credit had a positive and significant impact on agricultural growth.

Several other studies have also used the ARDL model to examine the relationship between agricultural credit and agricultural growth. For example, Anh *et al.,* (2020) analyzed the impact of agricultural credit on agricultural performance in Vietnam using the ARDL model. The study found that agricultural credit had a positive impact on agricultural GDP in the long run. Likewise, Dinh Thanh and Canh (2019) used the ARDL model to investigate the relationship between agricultural credit and agricultural growth in Vietnam. The study found that agricultural credit had a positive impact on agricultural growth in the long run. Paul and Lema (2018) applied recently developed asymmetric ARDL cointegration methodology to assess the relationship between agricultural financing and economic growth in Tanzania. The findings stipulated that positive shocks of agricultural financing have positive significant impact on economic growth.

The Markov switching model is a non-linear time series model that allows for the examination of regime-dependent effects in the relationship between agricultural credit and agricultural growth. For example, Bonga-Bonga and Simo-Kengne (2018) applied the Markov regime-switching model to analyze the relationship between agricultural credit and agricultural growth in South Africa. The study found that the impact of agricultural credit on agricultural growth

was regime-dependent, with the effect being positive in the high-growth regime and negative in the low-growth regime.
Similarly, Irungu *et al.,* (2020) applied the Markov switching vector autoregressive (MS-VAR) model to assess the impact of agricultural credit on agricultural productivity in Kenya. The study found that the relationship between agricultural credit and productivity was state-dependent, with the effect being positive in high productivity regimes and negative in low productivity regimes.

In addition to these studies, several other studies have also applied the Markov switching model to investigate the relationship between agricultural credit and agricultural growth. For example, Cabrieto *et al.,* (2018) analyzed the relationship between agricultural credit and agricultural growth in the Philippines using the Markov switching model. The study found that the impact of agricultural credit on agricultural growth was regime-dependent, with the effect being positive in the high growth regime and negative in the low growth regime. Rahman *et al.,* (2020) applied Markov Switching model to examine how financial development affects economic growth in Pakistan from 1980 to 2017. The results show that finance has a positive impact on economic growth, supporting Schumpeter's theory.

Financial development promotes economic growth in both high and low-growth periods, but its impact is stronger in high-growth periods. This suggests that the relationship between financial development and economic growth varies depending on the growth regime. Other factors that positively impact economic growth are trade openness and government expenditures, while the labor force has a negative impact.to assess the impact of financial development on economic growth in Pakistan. In addition, Fiaz *et al.,* (2022) assessed the impact of macro-economic variables (interest rate, inflation rate, exchange rate, and trade openness) on economic growth in Pakistan using Markov Regime switching (MS) model. The study findings indicate that inflation, interest rate, and trade openness have a negative impact on development, while the real effective exchange rates have a positive effect on development, in both high and low growth regimes. However, the negative impact of interest rate, exchange rate, inflation, and trade openness is more significant during low growth regimes.

While both the ARDL and Markov Switching models have their strengths in analyzing the relationship between agricultural credit and agricultural growth, they also have weaknesses that make it important to employ both models together. For example, the ARDL model can only examine linear relationships between variables, which may not capture the non-linear and regime-dependent effects of agricultural credit on agricultural growth. On the other hand, the Markov switching model allows for the examination of regime-dependent effects, but it may not capture the short-run dynamics between agricultural credit and agricultural growth.

Using both models together can address these weaknesses and provide a more complete picture of the relationship between agricultural credit and agricultural growth. By combining the ARDL and Markov switching models, researchers can examine both the linear and non-linear effects of agricultural credit on agricultural growth and capture the short-run and long-run dynamics of this relationship. Therefore, this study's employment of both models is justified as

it aims to provide a more comprehensive analysis of the relationship between agricultural credit and agricultural growth.

Theoretical Framework

This study is underpinned by two economic theories, the resource-based theory and endogenous growth theory(Penrose & Penrose 1995; Wernerfelt 1984). Both resource-based theory and endogenous growth theory provide a useful framework for understanding how agricultural credit impacts agricultural growth. Resource-based theory emphasizes the role of resources, including physical and human capital, technological progress, and efficient use of resources, in driving economic growth (Penrose & Penrose 1995; Wernerfelt 1984). In this context, agricultural credit can be viewed as a resource that can be used to finance investments in land, equipment, and inputs, leading to increased agricultural productivity and growth. The efficient use of credit is a key component of the resource-based theory, which suggests that credit can drive growth only if it is utilized efficiently (Barney 1991).

On the other hand, endogenous growth theory emphasizes the importance of investments in physical and human capital, technological progress, and knowledge spillovers in promoting long-term economic growth (Lucas Jr 1988; Romer 1990). Agricultural credit can be used to finance investments in physical and human capital, such as land, equipment, and education and training, thereby leading to increased agricultural productivity and growth. Moreover, agricultural credit can facilitate investments in research and development, which can promote technological progress and knowledge spillovers (Aghion & Howitt 1992; Hayami & Ruttan 1985).

Therefore, combining resource-based theory and endogenous growth theory with ARDL and Markov Switching models can provide a comprehensive framework for analyzing the impact of agricultural credit on agricultural growth. Such a framework can inform policies and investments that promote sustainable growth in the agricultural sector, and thus contribute to overall economic development (Acemoglu & Robinson 2012).

Research Methodology

Conceptual framework

To understand the impact of agricultural credit on Agricultural Gross Domestic Product (AgDP), various macroeconomic variables such as interest rates, exchange rates, foreign direct investment (FDI) in agriculture, volume of exports, volume of production, and government spending in the agricultural sector must be analyzed.

Interest rates are critical to agricultural credit as they affect the cost of borrowing, and thus impact the availability of credit for farmers and agricultural producers. Low-interest rates can encourage borrowing and investment in agriculture, leading to an increase in AgDP. Conversely, high-interest rates can discourage borrowing and reduce agricultural productivity, leading to a decrease in AgDP.

Exchange rates also play an important role in agricultural credit as they affect the competitiveness of a country's agricultural exports in the global market. A weak exchange rate

can decrease the price of exports, leading to a decrease in AgDP. Conversely, a strong exchange rate can increase the price of exports, leading to an increase in AgDP.
FDI in agriculture can provide access to modern technologies, expertise, and financial resources that can increase productivity, enhance the quality of agricultural produce, and lead to an increase in AgDP.

The volume of agricultural exports and the volume of production within the country are also essential determinants of AgDP. A high volume of agricultural exports can indicate the level of competitiveness of a country in the global market, leading to an increase in AgDP. A high volume of production within the country can also lead to an increase in AgDP, creating a surplus of produce and leading to increased revenue for farmers and other actors in the agricultural sector.

Government spending in the agricultural sector is also a crucial variable that affects agricultural growth. Increased government spending in agriculture can provide the necessary funds to improve the sector's productivity, reduce poverty in rural areas, and enhance food security. By investing in rural infrastructure, providing subsidies, and supporting research and development, policymakers can increase agricultural productivity, reduce production costs for farmers, and ultimately lead to an increase in AgDP.

Research design
The study employed time-series quantitative data from Bank of Tanzania. The study was designed to assess the impact of agricultural credit on agricultural growth (AgDP).

Data source
The paper used annual data spanning a 14-year period from 2004 to 2018 as the main dataset for their analysis. The data was obtained from various sources including the Central Bank of Tanzania (BOT), the National Bureau of Statistics (NBS), and government budget speeches. The dataset included information on commercial banks' agricultural credit, interest rates, exchange rates, and volume of exports, as well as agricultural sector GDP and production volume.

To perform a more detailed analysis, the data was disaggregated into monthly iterations. This means that they took the annual data and broke it down into monthly data points. This would allow them to analyze the data at a more granular level and identify any trends or patterns that may not be visible in the annual data. A comprehensive approach to data collection and analysis by using data from multiple sources and breaking it down into smaller time intervals for a more in-depth analysis.

The data collected in this study underwent pre-estimation diagnostics, including descriptive aim was to ensure that the data met the necessary assumptions for the application of the ARDL and Markov Switching models. The ADF test was used to check for the presence of a unit root, which is an indication of non-stationarity. The results obtained from this study are therefore reliable and robust.

Data Processing Analysis

Analytical framework

Economic model specification

To achieve objective of the study, we specified a linear empirical model relating to commercial bank credit and agricultural output (AgDP). The Autoregressive Distributed Lag (ARDL) model is a popular econometric tool that can be used to examine the long-run relationship between two or more variables. The ARDL model can incorporate both stationary and non-stationary variables and can estimate both short-run and long-run effects (Islam 2020; Raifu & Aminu 2020).

On the other hand, the Markov Switching model is a time-series model that allows for regime shifts or changes in the underlying economic conditions over time. In this model, the economy is assumed to switch between different states or regimes, each with its own set of economic parameters. The Markov Switching model can provide valuable insights into how the economy responds to changes in policy or other exogenous shocks (Hamilton & Raj 2002). By combining both ARDL and Markov Switching models, we can capture both the long-term relationships between variables and the short-term dynamics of the economy. The ARDL model can estimate the long-run effects of changes in economic variables, while the Markov Switching model can account for regime changes and the potential for different long-run relationships between variables under different economic conditions.

Overall, using both ARDL and Markov Switching models can help us better understand the complex dynamics of a dynamic economy and provide valuable insights for policymakers and researchers.

ARDL model specification

In the model we omitted inflation factor as it correlates to with interest rate. Our estimation is structured as; we estimate the impact of overall commercial bank credit to agricultural growth (AgDP) empirically modelled as:

$$lnAgDP_t = \beta_0 + \beta_1 lnAgri\_credit_t + \beta_2 lnExchange\_rate_t + \beta_3 lngovt\_spen_t + \beta_4 interest\_rate_t + \beta_5 lnVol\_prod_t + \beta_6 export_t + \varepsilon_t \quad (1)$$

Where:

$AgDP_t$ = Agricultural sector GDP contribution to overall country GDP, measured in Tanzanian shillings,

$lnAgric\_credit_t$ = Logarithm of commercial bank credit to agricultural sector,

$lnExchange\_rate_t$ = Logarithm of exchange rate

$lngovt\_spend_t$ = Logarithm of public spending to the agricultural sector

$lninterest\_rate_t$ = Logarithm of percentage rate at which funds are lent out to farmers.

$lnVol\_prod_t = \ Logarithm\ of\ volume\ of\ annual\ agricultural\ production$

$lnexport_t$ = Logarithm of volume of annual exports

ε_t = Error term

T= Time trend, in this case from 2004 to 2018.

Based on model 1, ARDL model would be given by:

$$\Delta lnAgDP_t = \beta_0 + \alpha[lnAgDP_{t-1} - \emptyset_1 lnAgri_{credit_t} - \emptyset_2 lnexchange\_rate_t - \emptyset_3 lngovt_{spend_t} - \emptyset_4 lninterest_{rate_t} - \emptyset_5 lnVol_{prod_t} - \emptyset_6 lnexport_t] + \sum_{i=1}^{p-1} \gamma_i \Delta lnAgDP_{t-i} + \sum_{i=0}^{q-1} \delta_i \Delta lnAgric\_credit_{t-i} + \sum_{i=0}^{q-1} \mu_i \Delta lnexchange\_rate_{t-i} + \sum_{i=0}^{q-1} \theta_i lngovt\_spend_{t-i} + \sum_{i=0}^{q-1} \sigma_i \Delta lninterest\_rate_{t-i} + \sum_{i=0}^{q-1} \vartheta_i \Delta lnVol\_prod_{t-i} + \sum_{i=0}^{q-1} \rho_i lnexport_{t-i} + \varepsilon_t$$

Where; α is the speed of adjustment, $\emptyset_1, \ldots . \emptyset_6$ are long run coefficients while $\gamma_i, \delta_i, \mu_i, \theta_i, \sigma_i, \vartheta_i, and\ \ \rho_i$ are short-run coefficients.

To validate the above specified linear model, Augmented Dickey Fuller (ADF) stationary test was conducted to check stationarity of the data and the results in Table 4.1 revealed that all the variables are stationary in level I (0) except export which is integrated at the first order, I(I). Given the mixed nature of the data comprising of both I (0) and I(I) the use of ARDL thus can be justified.

Table 1: Stationary Test (ADF)

Variable	**Unit root test in levels**		**Unit root test in first difference**		**Order of integration**
	Intercept	**Trend and intercept**	**Intercept**	**Trend and Intercept**	
Log Agric. GDP	10.754**	0.100**	14.509**	0.145**	I (0)
Log Agric_credit	-0.154	-0.044**	0.036	-0.058**	I (0)
Log exchange rate	4.674**	0.042**	8.642***	0.080***	I (0)
Log interest rate	0.492	0.080**	0.549	0.327***	I(0)
Log export	1.959	-0.013	2.090	-0.287**	I(I)
Log Vol_production	12.154 ***	0.017***	11.658**	0.014	I(0)
Log FDI_agric	3.564 **	0.089**	5.828 **	0.128*	I(0)

*, **,*** *Significant at 10, 5, and 1 percent levels, respectively.*

Bounds Test

To test for the existence of long-run relationships bounds test was applied. This is a Wald test (T-statistic) that tests whether all the long-run coefficients are statistically equal to zero. It's conducted under the null hypothesis of no existence of cointegration among the variables in the model. The null hypothesis is stated as follows:

$$H_0: \emptyset_1 = \emptyset_2 = \emptyset_3 = \emptyset_3 = \emptyset_4 = \emptyset_5 = \emptyset_6 = 0$$

The study used the ARDL approach to test for cointegration between agricultural GDP and the explanatory variables. The computed F-statistic was compared with the critical F-values, as revealed by (Pesaran *et al.,* 2001). If the F-statistic exceeds the upper critical value, the null hypothesis is rejected, indicating that the variables are cointegrated. If the F-statistic is lower than the critical value, the null hypothesis cannot be rejected, suggesting the absence of cointegration.

Based on the results of the bound test, shown Table 4.2 below, it has been established that a valid long-term or cointegrating relationship exists between agricultural GDP and agricultural credit at a significance level of 5%. This is evident from the f-statistic value computed, which surpasses the critical values. Consequently, the null hypothesis that a stable long-term relationship exists between the two variables cannot be rejected.

Table 2: Bounds test

Significance levels	
F-statistic	(3.875)
10% (lower bound, upper bound)	(2.26, 3.35)
5% (lower bound, upper bound)	(2.62, 3.79)
2.5 % (lower bound, upper bound)	(2.96, 4.81)
1% (lower bound, upper bound)	(3.14, 4.68)

Markov Switching Model Specification

To account for the regime changes, Markov Switching model was applied from the linear model where only the intercept switches between regimes. Several studies have successfully applied the MS models to investigate financial and economic behaviour of the macroeconomic variables (Awotide *et al.,* 2015; Fiaz & Khurshid 2022).The model is extended by allowing intercept term, slope coefficient and variance of the error term to be regime dependent. The general form of a two-state Markov Switching Regression model can be represented as:

$$AgDP_t = \mu_{0,S_t} + \beta_{1,S_t} Agric\_credit_t + \beta_{2,S_t} int - rate_t + \beta_{3,S_t} export_t + \beta_{4,S_{t_4}} Ex.rate_t + \beta_{5,S_t} FDI - Agric_t + \beta_{6,S_t} Pub - spending_t + \beta_{7,S_t} Vol\_agric.prod_t + \varepsilon_{t,S_t} \quad (2)$$

With $\varepsilon_t \sim ND(0, \sigma_{S_t}^2)$

While

$$\mu_{S_t} = \mu_0 S_{0t} + \cdots + \mu_k S_{kt} \quad (3)$$

$$\sigma_0^2 S_{0t} + \cdots + \sigma_k^2 S_{kt} \quad (4)$$

Where $S_t = 0,1 \ldots, k$ denotes the unobserved state indicator following a first-order Markov-process, which implies that the current regime depends only on the regime prevailing one period ago. Interpretation of the model depends on the value of k.

Terms μ_{S_t} and $\sigma_{S_t}^2$ are, respectively, the state dependent mean or intercept and variance in agricultural credit. Therefore, our MS model distinguishes between different market states by allowing for different levels of economic condition or situation.

The model assumes that the economy switches between two regimes (i = 1, 2), which can represent high and low responsiveness of AgDP to agricultural credit, for example. The probability of switching between regimes is determined by a Markov chain with transition probabilities:

$$P[S_t = j / S_{t-1} = i] = p_{ij}; i, j = 0,1 \ldots . k$$

in state j at time t given that it had been in state i the previous period, and by the rule of probability; $\sum_{j=1}^{k} p_{ij} = 0$ where $i = 0,1 \ldots, k$ and $0 \leq p_{ij} \leq 1$. The transition probabilities are supposed to be constant over time as in the original Hamilton model.

Markov switching model answers this question by considering the expected duration for each regime state under the study. Let D_j denote the duration of state j whereby D_j follows a geometric distribution. The expected duration for regime j is given by:

$$E(D_j) = \frac{1}{1-p_{jj}}$$

By estimating this Markov Switching Regression model, we can identify periods of high and low responsiveness of AgDP to agricultural credit in Tanzania, as well as how the relationship between these variables (government spending, exchange rate, interest rate, volume of agricultural production, evolves over time. This analysis can provide insights into the effectiveness of agricultural credit policies and inform future policy decisions in Tanzania.

The Zivot-Andrew's test yielded a value of -2.582, which falls below the critical t-value of -4.420 at a 5% significance level. This result provides evidence supporting the existence of a structural break in the relationship between agricultural credit and agricultural GDP in Tanzania. Specifically, the detection of a structural break in 2014 indicates that a change occurred in the relationship during this period. Several factors may have contributed to this change, including documented alterations in the agricultural finance sector following the launch of the National Financial Inclusion Framework in 2013. This framework was established in response to commitments made at the 16th Conference of Financial Institutions and has facilitated improvements in lending to medium and large-scale agricultural investments. As a result, total credit to the agriculture sector has increased from TZS 700 billion to TZS 1 trillion (BoT 2014). Other macroeconomic factors may have also impacted the agricultural sector, thereby providing further explanation for the observed structural break.

Table 3: Test for Regime shift

	t-statistic
Zivot-Andrews test statistic	-2.582
1% Critical value	-4.930
5% Critical value	-4.420
10% Critical value	-4.110
Allowing for break in trend Chosen break point: 2014	

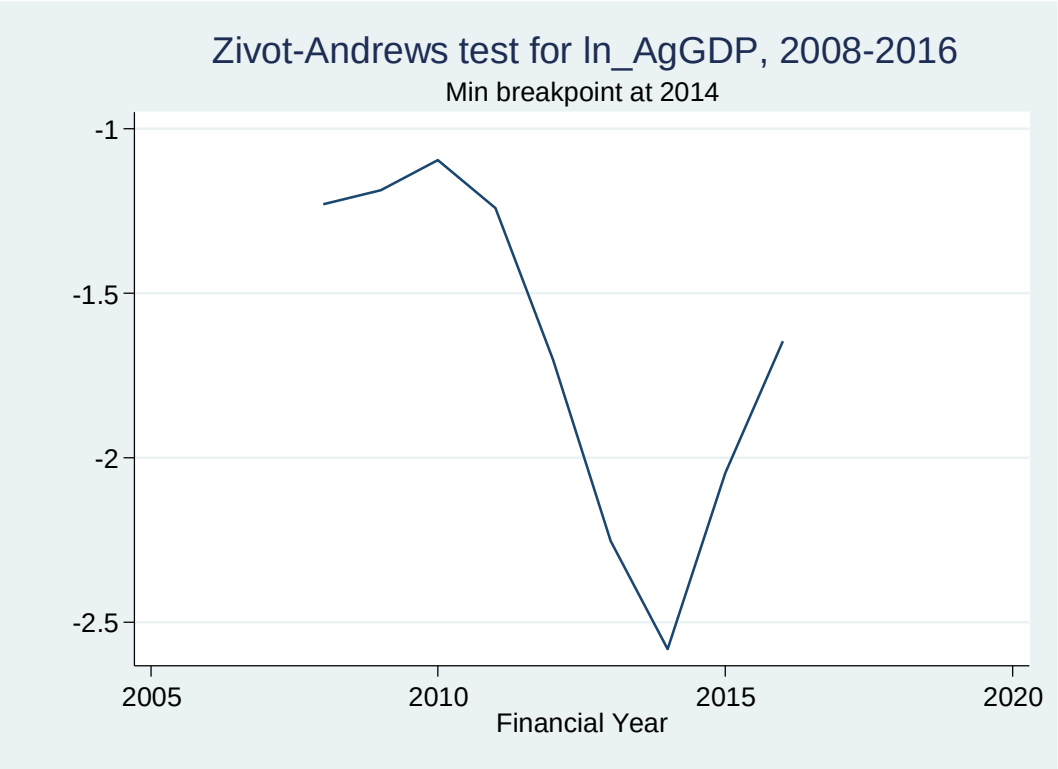

Figure 4.1: Structural Break

Results and Discussion

Table 4: Short-run and Long-run estimation

Ln_AgDP	Coef	Std Error	t	[95% conf	Interval
Long Run					
Ln Agric.credit	5.585	1.065	5.490	-7.680	19.383
ln_exchange	7.220	2.376	3.040	-0.340	14.781
Ln_govt spending	0.014	0.063	0.220	-0.130	0.158
Ln_AgFDI	1.243	0.330	3.770	-2.945	5.432
Interest_sqr	-2.071	0.663	-3.120	-10.496	6.353
ln_prod_vol	4.938	0.068	72.130	4.068	5.808
Ln_export	0.003	0.001	3.540	-0.015	0.009
Short run					
L1. Ln_AgCredit	-1.146	0.198	-5.790	-3.664	1.371
L1. Exc. Rate	-2.621	1.540	-1.700	-7.522	2.280
L.1 Govt. Spending	0.058	0.035	1.650	-0.039	0.051
L1. AgFDI	-1.553	0.266	-5.840	-4.933	1.826
L1. Interest _sqr	-6.265	0.842	-7.440	-16.966	4.436
L1. Prod_vol	1.452	0.024	60.330	1.146	1.757
L1. Export	0.007	0.002	4.000	-0.015	0.030
D2014	-1.116	0.155	-7.190	-3.087	0.855
_cons	24.697	2.050	12.050	-1.356	50.749

Table 5: Impact of Agric Lending on AgricGDP-→Markov Switching Results

ln_AgGDP	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
State1						
ln_AgCredit	0.223	0.010	23.270	0.000	0.204	0.241
Ln_AgGDP	0.008	0.105	0.070	0.940	-0.198	0.214
ln_Exch	0.544	0.093	5.850	0.000	0.362	0.726
ln_Govt_Spending	-0.062	0.013	-4.900	0.000	-0.087	-0.037
ln_Interest	0.225	0.062	3.640	0.000	0.104	0.346
ln_Prod_vol	0.077	0.135	0.570	0.566	-0.186	0.341
ln_Export	0.253	0.029	8.840	0.000	0.197	0.309
_cons	15.870	0.345	45.970	0.000	15.194	16.547
State2						
ln_AgCredit	0.320	0.009	36.350	0.000	0.303	0.337
Ln_AgGDP	0.442	0.089	4.950	0.000	0.267	0.617
ln_Exch	0.754	0.027	28.040	0.000	0.701	0.806
ln_Govt_Spending	0.009	0.002	4.660	0.000	0.005	0.013
ln_Interest	-0.187	0.063	-2.980	0.003	-0.310	-0.064
ln_Prod_vol	-0.028	0.236	-0.120	0.905	-0.490	0.434
ln_Export	-0.804	0.161	-5.000	0.000	-1.118	-0.489
_cons	12.723	0.151	84.380	0.000	12.427	13.018
Sigma	0.009	0.002			0.006	0.013
p11	0.807	0.128			0.455	0.954
p21	0.399	0.257			0.075	0.845
Sample:			2006-2018			
Number of states = 2	AIC					-2.986
Unconditional probabilities: transition	HQIC					-3.151
	SBIC					-2.542
Log likelihood = 28.916						

The long-run results show a significantly positive effect of agricultural credit on agricultural GDP, that is, a percentage increase in the supply of agricultural credit increases the average agricultural GDP by 5.585% keeping other factors constant. The result indicating a significant positive effect of agricultural credit on agricultural GDP, in the long run, implies that agricultural credit helps boost the overall agricultural output in Tanzania in the long term. This could be because the supply of agricultural credit enables farmers to access finance to purchase inputs such as fertilizers, pesticides, seeds, and other capital inputs such as machines and implements which ultimately leads to an increase in agricultural productivity and output. This is in line with Oyedepo *et al.,* (2023) who found a positive relationship between formal commercial bank credit and AgDP.

On the other hand, the results show significant negative effect of agricultural credit on agricultural GDP in the short run suggests that in the short term, the increase in credit access might lead to a decrease in agricultural output. This could be due to various reasons such as delayed implementation of projects or a time lag between credit access and actual utilization. Additionally, if the credit is misused or not utilized effectively, it could also lead to a decrease in agricultural output.

On the other hand, the Markov switching regression results show that agricultural credit has a positive and significant effect on agricultural GDP in both modest-growth and high-growth regimes in Tanzania. During high-growth periods, the effect of agricultural credit on agricultural GDP is stronger, as farmers may be more willing to invest and financial institutions more willing to extend credit. Additionally, supply of formal agricultural credit during high-growth periods may be channeled towards more productive investments, leading to a greater impact on agricultural productivity. However, the positive effect of agricultural credit on agricultural GDP in the modest-growth regime suggests that the supply of agricultural credit is still important for maintaining agricultural productivity.

Overall, it is important to note that the negative short-term effect of agricultural credit on agricultural GDP is not necessarily an indication that the supply of access is not beneficial. Instead, it could be an indication that credit needs to be used effectively and efficiently to realize the full benefits of an increased supply of formal credit to agriculture on output. Also, an important message drawn from these results is that credit is an important driver of agricultural productivity in Tanzania, regardless of the state of the economy but the effect differs between regimes.

When the effect of exchange rate on growth is examined, the ARDL results showed that the exchange rate has a positive and significant impact on agricultural GDP in the long-run but is non-significant in the short-run. This may be due to the time lag between changes in the exchange rate and their impact on the agricultural sector. Additionally, other factors such as weather conditions, input costs, and market demand may have a more immediate impact on agricultural GDP in the short-run. The Markov Switching regression results indicated that the effect of exchange rate on agricultural GDP was positive and significant under both modest and high growth regimes, with a larger impact during periods of high growth. This could be due to increased investment in the agricultural sector during these periods, which improves its competitiveness and performance. The combination of these results suggests that the exchange rate is an important determinant of agricultural GDP in Tanzania, with a larger impact during periods of high growth. However, the impact may take some time to fully manifest, and other factors may have a more immediate impact in the short-run. These findings have important policy implications for promoting the growth and development of the agricultural sector in Tanzania, particularly during periods of high growth.

With regards to the effect of government spending on agricultural GDP, the results revealed that while government spending has a slightly positive and significant effect on agricultural GDP, this effect is only observed in the short run. In the long run, there is no evidence to suggest any impact of government spending on agricultural GDP. One possible explanation for this finding is that the positive impact of government spending on agricultural GDP may be short-lived, limited by bureaucratic inefficiencies, corruption, and poor implementation of policies which characterize the most SSA economies like Tanzania. Other factors such as weather conditions, market demand, and input costs may have a greater impact on agricultural GDP in the long run, thereby reducing the effectiveness of government spending.

The Markov Switching model results also showed contrasting effects of government spending on agricultural GDP under different growth regimes. Under the modest growth regime, government spending had a negative and significant effect on agricultural GDP, while under the high growth regime, it had a positive and significant effect. The study suggests that during periods of modest growth, government spending may be less effective due to limited resources and bureaucratic inefficiencies. However, during periods of high growth, government spending may be more effective in promoting the growth and development of the agricultural sector, possibly due to increased investment in infrastructure development and technological advancements.
Overall, the study's findings suggest that while government spending can provide a short-term boost to the agricultural sector, policies should be focused on addressing long-term structural issues such as infrastructure development, technological advancements, and institutional reforms to ensure sustainable growth in the sector. Policymakers should also tailor policies to address the specific needs and challenges of the sector during different growth periods.

The finding that FDI has a positive impact on agricultural growth in the long-run, but a negative impact in the short-run suggests that it takes time for FDI inflows to have a substantial effect on the agricultural sector. This means that it may take some time for new technology, increased productivity, and employment opportunities associated with FDI to manifest in the agricultural sector. In the short-run, factors such as market volatility which includes fluctuation of price of raw materials; changes in government policies; and supply chain disruptions can hinder the immediate benefits of FDI inflows. From the Markov Switching model, the variable was omitted due to correlation with other independent variables.

The effect of interest rate was also examined, the ARDL model results show that the interest rate has a significant negative effect on agricultural GDP both in the short-run and long-run, but the negative impact is greater in the short-run than in the long-run as shown in Table 4.5. This implies that policies aimed at reducing interest rates may have a more positive impact on agricultural GDP in the long-term, as the negative effects of high interest rates diminish over time. However, in the short-term, policymakers may need to implement measures to mitigate the negative impact of high interest rates on the agricultural sector. On the other hand, the Markov switching model results

indicate that the effect of interest rates on agricultural GDP depends on the economic growth regime. Specifically, during high-growth regimes, interest rates have a significantly negative effect on agricultural GDP, whereas during modest growth regimes, the effect is not significant as indicated in Table 4.6. This implies that considering the prevailing economic conditions when formulating policies related to interest rates and agricultural GDP is vital. During high-growth periods, policies aimed at reducing interest rates may be detrimental to the agricultural sector, while during modest growth periods, interest rates may not have a significant impact on agricultural GDP.

The ARDL results presented in Table 5 provide empirical evidence that supports the theoretical expectation that promoting agricultural exports can lead to increased agricultural GDP in both the short-run and long-run. The positive and statistically significant relationship between the value of agricultural exports and agricultural GDP is not surprising, given that exports can generate additional income for farmers, stimulate investment, and promote high-value crop specialization. Tanzania, like many other Sub-Saharan African countries, has been transitioning towards high-value crops such as fresh vegetables and fruits to capture lucrative prices in export markets, contributing to increased productivity, output, and employment in the agricultural sector (Estmann *et al.,* 2022).

However, the Markov Switching regression analysis found a more nuanced relationship between export value and agricultural GDP. Although there is a positive relationship between agricultural exports and agricultural GDP during modest growth periods, this relationship becomes negative during high growth regimes. This suggests that other factors may impact the relationship between agricultural exports and agricultural GDP, such as changes in the overall economic growth rate.
Taken together, these findings are especially vital in Tanzania and other Sub-Saharan African countries that are promoting the agricultural sector and export-led growth suggesting the need to consider the broader economic context when designing policies that promote agricultural exports and support the agricultural sector. Specifically stated, while promoting agricultural exports can lead to increased agricultural GDP in both the short-run and long-run, it may not be effective during high growth periods. In that regard, strategies such as investment in infrastructure or improving access to credit for farmers, to support the agricultural sector during these periods can prove vital to growth of the sector. In general, a balanced approach that considers short-term and long-term objectives and the broader economic context can be effective in promoting sustainable agricultural growth and economic development.

Conclusion and Recommendation

Conclusion

The findings of this study reveal that agricultural credit, exchange rate, government spending, FDI, and agricultural production are important determinants of agricultural GDP in Tanzania. Specifically, the results confirm a positive and significant impact of agricultural credit on agricultural GDP in the long-run, indicating that the supply of agricultural credit helps boost

agricultural output by enabling farmers to access finance to purchase inputs and capital inputs that ultimately lead to an increase in agricultural productivity and output. However, in the short run, the study found a negative effect of agricultural credit on agricultural GDP implying that credit needs to be used effectively and efficiently to realize the full benefits of an increased supply of formal credit to agriculture on output. The study also found that the impact of agricultural credit on agricultural GDP is positive and significant in both modest-growth and high-growth regimes.

The study also finds that exchange rate has a positive and significant impact on agricultural GDP in the long-run, while government spending has a slightly positive and significant impact on agricultural GDP in the short-run. FDI has a positive impact on agricultural growth in the long-run, while its short-term impact is negative. The volume of agricultural production in the previous season has a positive effect on agricultural GDP in both the short-run and long-run. Finally, promoting agricultural exports can lead to increased agricultural GDP in both the short-run and long-run, although the effect may be limited during high growth periods.

Recommendations

Based on these findings, policymakers in Tanzania should consider the following recommendations:

1. *Increase the supply of agricultural credit:* While the study found that the short-term effect of agricultural credit on agricultural GDP is negative, this does not necessarily mean that the supply of credit is not beneficial. Policymakers should focus on ensuring that credit is used effectively and efficiently to realize the full benefits of an increased supply of formal credit to agriculture on output. Efforts should be made to improve the efficiency of the credit market and reduce bureaucratic inefficiencies that often hinder credit disbursement.
2. *Implement policies to address the effect of exchange rate fluctuations on agricultural GDP*: Given the positive impact of the exchange rate on agricultural GDP, policymakers should consider implementing policies to mitigate the negative effects of exchange rate fluctuations on agricultural production. This could involve the establishment of hedging mechanisms or the development of export diversification strategies that reduce reliance on a single market.
3. *Address long-term structural issues in the agricultural sector*: While government spending can provide a short-term boost to the agricultural sector, policies should be focused on addressing long-term structural issues such as infrastructure development, technological advancements, and institutional reforms to ensure sustainable growth in the sector.
4. *Encourage FDI inflows*: Policymakers should promote policies that encourage FDI inflows to the agricultural sector. This could involve improving the investment climate, providing incentives to foreign investors, and improving the regulatory framework for FDI.
5. *Promote high-value crop specialization*: The findings suggest the need to promote policies that incentivize farmers to increase specialization in high-value crops, as this has been shown to contribute to increased growth from premium export prices and hence improving productivity, output, and employment in the agricultural sector. This should go hand in

hand with provision of training and extension services to farmers, improving access to credit and market information.

6. *Consider the broader economic context when designing agricultural policies*: The differing results from ARDL and MS regressions suggests the need for policymakers and other development stakeholders to consider the broader economic context when designing policies that promote agricultural exports and support the agricultural sector. Strategies such as investment in infrastructure or improving access to credit for farmers, to support the agricultural sector during high-growth periods can prove vital to growth of the sector.

In general, a balanced approach that considers short-term and long-term objectives and the broader economic context can be effective in promoting sustainable agricultural growth and economic development in Tanzania.

References

Acemoglu, D., & Robinson, J. A. (2012). *Why nations fail: The origins of power, prosperity and poverty*. Profile London.

Advocates, N. (2019). *Agricultural Policy Reforms in Tanzania*. AGRA.

Aghion, P., & Howitt, P. (1992). A Model of Growth Through Creative Destruction. *Econometrica*, *60*(2), 323-351. https://doi.org/10.2307/2951599

Ahmad, D., Chani, M. I., & Afzal, M. (2018). Impact of Formal Credit on Agricultural Output: Empirical Evidence from Pakistan. *Sarhad Journal of Agriculture*, *34*(3).

Anh, N. T., Gan, C., & Anh, D. L. T. (2020). Does credit boost agricultural performance? Evidence from Vietnam. *International Journal of Social Economics*, *47*(09), 1203-1221. https://doi.org/https://doi.org/10.1108/IJSE-04-2020-0238

Awotide, B., Abdoulaye, T., Alene, A. a., & Manyong, V. M. (2015). *Impact of access to credit on agricultural productivity: Evidence from smallholder cassava farmers in Nigeria*.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, *17*(1), 99-120.

Bonga-Bonga, L., & Simo-Kengne, B. D. (2018). Inflation and output growth dynamics in South Africa: Evidence from the Markov switching vector autoregressive model. *Journal of African Business*, *19*(1), 143-154.

BoT. (2014, 24-25 November, 2014). FINANCING AGRICULTURE AND AGRI-BUSINESS IN TANZANIA: CHALLENGES AND OPPORTUNITIES. 17TH CONFERENCE OF FINANCIAL INSTITUTIONS, Arusha, Tanzania.

BOT. (2019a). ACCELERATING FINANCIAL SECTOR DEVELOPMENT IN TANZANIA. PROCEEDINGS OF THE 19TH CONFERENCE OF FINANCIAL INSTITUTIONS, Dar es salaam.

BoT. (2019b). *Annual Report*. B. o. Tanzania.

BOT. (2021). THE TANZANIA ECONOMY: RECOVERY FROM COVID-19 PANDEMIC AND BEYOND. PROCEEDINGS OF THE 2019 PANDEMIC AND TH CONFERENCE OF FINANCIAL INSTITUTIONS, DODOMA.

BoT. (2022). *Annual Report*. B. o. Tanzania.

Cabrieto, J., Adolf, J., Tuerlinckx, F., Kuppens, P., & Ceulemans, E. (2018). Detecting long-lived autodependency changes in a multivariate system via change point detection and regime switching models. *Scientific reports*, *8*(1), 1-15.

Chongela, J. (2015). Contribution of agriculture sector to the Tanzanian Economy. *American Journal of Research Communication*, *3*(7), 57-70.

Dinh Thanh, S., & Canh, N. P. (2019). Dynamics between government spending and economic growth in China: an analysis of productivity growth. *Journal of Chinese Economic and Business Studies*, *17*(2), 189-212.

Estmann, C., Sørensen, B. B., Ndulu, B., & Rand, J. (2022). Merchandise export diversification strategy for Tanzania: Promoting inclusive growth, economic complexity and structural change. *The World Economy*, *45*(8), 2649-2695.

EU. (2023). *AGRI-CONNECT*. EU. https://agri-connect-tz.com/

Fiaz, A., & Khurshid, N. (2022). Revisiting the macroeconomic variables and economic growth nexus: A Markov regime-switching approach. *Economic Journal of Emerging Markets*, 101-112.

Fiaz, A., Khurshid, N., & Satti, A. u. H. (2022). Revisiting the macroeconomic variables and economic growth nexus: A Markov regime-switching approach. *Economic Journal of Emerging Markets*, 101-112. https://doi.org/10.20885/ejem.vol14.iss1.art8

Hamilton, J. D., & Raj, B. (2002). New directions in business cycle research and financial analysis. *Empirical Economics*, *27*(2), 149-162.

Hayami, Y., & Ruttan, V. W. (1985). *Agricultural Development: An International Perspective* (2 ed.). Johns Hopkins University Press.

IFAD. (2021). *Annual Report*.

Irungu, W. N., Chevallier, J., & Ndiritu, S. W. (2020). Regime changes and fiscal sustainability in Kenya. *Economic Modelling*, *86*, 1-9.

Isaga, N. (2018). Access to bank credit by smallholder farmers in Tanzania: a case study. *Afrika Focus*, *31*(1).

Isinika, A., Mibavu, G., & VanSickle, J. (2016). Agricultural Policy Analysis Studies in Tanzania: A Historical and Thematic Perspective with Implications on Future Policy Research for Crop Production and Marketing. *Tanzania Journal of Agricultural Sciences*, *15*(1).

Islam, M. M. (2020). Agricultural credit and agricultural productivity in Bangladesh: an econometric approach. *International Journal of Food and Agricultural Economics (IJFAEC)*, *8*(1128-2020-1530).

Jambo, N. (2017). *The impact of government spending on agricultural growth: a case of Zambia, Malawi, South Africa and Tanzania* [The impact of government spending on agricultural growth: a case of Zambia, Malawi, South Africa and Tanzania, Stellenbosch: Stellenbosch University].

Jayne, T., Benfica, R., Yeboah, F. K., & Chamberlin, J. (2019). Agricultural Transformation and Africa's Economic Development. *African Economic Development. Emerald Publishing Limited*, 349-375.

Jayne, T. S., & Sanchez, P. A. (2021). Agricultural productivity must improve in sub-Saharan Africa. *Science*, *372*(6546), 1045-1047.

Kinuthia, K. (2018). *Credit Constraints and Agricultural Productivity in Developing Countries: The case of East Africa*.

Lawal, A. I. (2019). Does Commercial Banking Activities Exerts on Agricultural Growth in Nigeria? Evidence from ARDL Framework. *Academic Journal of Interdisciplinary Studies*, *8*(4), 146-153.

Lucas Jr, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, *22*(1), 3-42.

Meressa, H. A. (2017). An econometric analysis of the nexus between banks' sub-sectoral credit allocation and operating profit: Evidence from private commercial banks in Ethiopia. *Developing country studies*, *7*(4), 31-37.

Msulwa, B. (2015). *The impact of credit constraints on agricultural productivity in Tanzania* University of Cape Town].

Ngong, C. A., Onyejiaku, C., Fonchamnyo, D. C., & Onwumere, J. U. J. (2022). Has bank credit really impacted agricultural productivity in the Central African Economic and Monetary Community? *Asian Journal of Economics and Banking*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/AJEB-12-2021-0133

Ngowi, H. P. (2022). Toward Industrialization in Tanzania: What Is the Role of the Agricultural Sector? In *The Palgrave Handbook of Africa's Economic Sectors* (pp. 155-175). Springer.

Nigo, A., & Gibogwe, V. (2023). Impact of financial resources on agricultural growth in Sub-Saharan Africa. *Munich Personal RePEc Archive*. https://mpra.ub.uni-muenchen.de/116397/

Olowofeso, O. E., Adeboye, A. A., Adejo, V. T., Bassey, K. J., & Abraham, O. (2017). Agricultural sector credit and output relationship in Nigeria: Evidence from nonlinear ARDL1. *CBN Journal of Applied Statistics (JAS)*, *8*(1), 5.

Osabohien, R., Mordi, A., & Ogundipe, A. (2022). Access to credit and agricultural sector performance in Nigeria. *African Journal of Science, Technology, Innovation and Development*, *14*(1), 247-255. https://doi.org/10.1080/20421338.2020.1799537

Oyedepo, E. O., OWURU, J. E., RASAKI, M. G., & LOUIS-OKEREKE, B. (2023). Commercial Bank Credit and Agricultural Growth Outcomes in Nigeria: An Empirical Analysis. *Journal of Economics and Financial Analysis*, *6*(2), 1-19.

Paul, F., & Lema, A. (2018). The dynamic synergies between agricultural financing and economic growth of Tanzania. *African Journal of Economic Review*, *6*(2), 46-60.

Penrose, E., & Penrose, T. E. (1995). *The Theory of the Growth of the Firm* (C. N. Pitelis, Ed. reprint ed.). Oxford University Press.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326.

Rahman, A., Khan, M. A., & Charfeddine, L. (2020). Does Financial Sector Promote Economic Growth in Pakistan? Empirical Evidences From Markov Switching Model. *SAGE Open*, *10*(4).

Raifu, I. A., & Aminu, A. (2020). Financial development and agricultural performance in Nigeria: what role do institutions play? *Agricultural Finance Review*, *80*(2), 231-254.

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, *98*(5, Part 2), S71-S102.

Sakho-Jimbira, S., & Hathie, I. (2020). *The future of Agriculture in Sub-Saharan*.

Tiba, D. A. (2023). *ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK FOR THE FOOD SYSTEMS SUPPORT IN TANZANIA MAINLAND AND ZANZIBARFINAL REPORT*.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic management journal*, *5*(2), 171-180.

Wineman, A., Jayne, T. S., Isinika Modamba, E., & Kray, H. (2020). The changing face of agriculture in Tanzania: Indicators of transformation. *Development Policy Review*, *38*(6), 685-709. https://onlinelibrary.wiley.com/doi/epdf/10.1111/dpr.12491