

The Influence of the Agriculture Sector to Gross Domestic Product Contributions on Tax Revenue Performance in Kenya

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Abstract

This study investigated the influence of the contribution of the agriculture sector to tax revenue performance, with a focus on its roles in enhancing tax mobilization and supporting economic growth. The study was grounded in two key theoretical frameworks: the Cost-of-Service Theory and the Benefits Theory, which guide the exploration of the relationship between sectoral economic contributions and tax revenue outcomes. A time series research design was employed, using secondary data from the Kenya Revenue Authority and the Kenya National Bureau of Statistics for the financial years 2014 to 2024. The agriculture sector's current contribution to GDP had a significant positive effect on tax revenue performance ($\beta = 289.391$, $p = 0.000$), while its first lag showed significant negative effects ($\beta = -396.566$, $p = 0.000$) and the second lag demonstrated partial recovery ($\beta = 213.961$, $p = 0.000$). This study concludes that Kenya's agriculture, services, and manufacturing sectors all significantly influence tax revenue performance, but with distinct temporal patterns. Regarding the effects of agriculture sector's on tax revenue performance, cyclical effects on tax revenue performance, to mitigate the negative adjustment effects, the Kenya Revenue Authority (KRA) should develop and deploy a digital platform for farmers, particularly those in large-scale cash-crop farming, to declare and pay taxes based on projected annual income.

Keywords: *Agriculture sector to GDP Ratio, Tax Revenue Performance, GDP*

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1. Introduction

The agriculture sector encompasses activities related to the cultivation of crops, livestock production, forestry, fishing, and aquaculture. This sector forms the backbone of many developing economies, contributing significantly to employment and food security (KNBS, 2024). According to Chilima (2021), sectoral contributions to gross domestic product represent the proportion of total economic output attributable to different sectors of the economy. It is the proportion of total economic output attributable to different sectors, involving the distribution of economic activity across these sectors and their impacts on the overall economy (Albimana & Hemedb, 2022).

Despite the growth in Kenya's economy, tax revenue performance has not kept pace with this progress. In 2023, the GDP grew by 5.6 percent, yet the tax revenue-to-GDP ratio has shown a concerning decline, dropping from 18.2 percent in 2013/14 to 15.1 percent in 2021/22 (Government of Kenya, 2023). The agricultural sector, although a key contributor to Kenya's GDP, generates a disproportionately low share of tax revenues, approximately 3 percent (Government of Kenya, 2023). According to Albimana and Hemedb (2022), it further define it as the extent to which tax systems capture and maintain revenue in proportion to economic output. Additionally, Ibrahim and Jairo (2023) define tax revenue performance as the balance between tax, policy, tax collection efficiency, and economic activities. These definitions suggest that tax revenue performance is a multi-dimensional concept shaped by sectoral contributions, policy framework, administrative capacity, and broader economic conditions.

Given its complex nature, tax revenue performance can be assessed from multiple perspectives. The sectoral contribution perspective evaluates how GDP shares from various sectors influence tax yields (Mapunda et al., 2023). The per capita income perspective links higher income levels to increased tax contributions (Wijaya et al., 2024). From a tax policy viewpoint, the focus is on how changes in tax structure and administration affect revenue generation (Chilima, 2021). The economic growth perspective highlights how economic expansion broadens the tax base and enhances collection (Anwar & Wijaya, 2023).

Among these, the tax-to-GDP ratio is widely used, providing a consistent method for comparing tax performance across countries and over time (Ha et al., 2022; Ibrahim & Jairo, 2023; Wulandari & Wijaya, 2023). Building on these perspectives, the tax-to-GDP ratio is frequently used as an operational indicator in empirical research. This ratio standardizes tax revenue performance across different economic contexts by relating it to the size of the economy. For instance, Wulandari and Wijaya (2023) highlight its ability to reflect both tax collection efficiency and the underlying economic structure. Similarly, Albimana and Hemedb (2022) underscore its utility in capturing how effectively tax systems mobilise revenue in proportion to economic output. Given its reliability and comparability, this study adopts the tax-to-GDP ratio as the key measure of tax revenue performance.

Due to the critical role of taxation, identifying factors that potentially impact tax revenue is essential and therefore of significant interest to scholars. Researchers have employed various methods to study different countries and regions, revealing a range of factors influencing tax revenue.

1.1 Problem Statement

The primary source of state income in Kenya is tax revenue, which is critical for financing government programs and ensuring fiscal stability. Tax revenue performance should be proportionate to the economic contributions of different sectors. This means sectors that contribute more significantly to gross domestic product, such as services and industry, should ideally generate higher tax revenues (Anwar & Wijaya, 2023). Additionally, tax revenue should demonstrate stable or growing trends over time, reflecting robust economic activity and effective tax policies.

It should not be highly volatile due to economic cycles or changes in tax policy (Ibrahim & Jairo, 2023). Moreover, the tax system should be adaptable to economic changes and challenges. This includes adjusting to shifts in sectoral contributions or changes in per capita income. A flexible tax system can better respond to evolving economic conditions, ensuring

that tax revenues remain stable and aligned with the current economic landscape (Wijaya et al., 2024).

2. Literature Review

2.1 Theoretical Review

2.1.1 Cost-of-Service Theory

The cost-of-service theory, attributed to classical economists such as Adam Smith, has been elaborated by various scholars over time (Jhingan, 2004). This theory posits that the cost of government services should be covered by those who benefit from them. Essentially, it views taxes as analogous to prices individuals pay for specific services received from the state (Jhingan, 2004). According to the theory, there should be a direct relationship between the cost of these services and the amount paid in taxes by individuals. Furthermore, only those who benefit from government services should be taxed, with the tax burden reflecting the cost of those services (Jhingan, 2004). However, critiques of this theory highlight its limitations, particularly in addressing public welfare services like healthcare and education, where benefits are broad and not easily quantifiable. Additionally, defining and measuring the exact cost per individual for many state-provided services poses significant challenges (Anwar & Wijaya, 2023).

The cost-of-service theory provides a relevant framework for examining how economic sector contributions impact tax revenue performance. According to this theory, tax contributions should correspond to the benefits received from government services. This principle aligns with assessing how different sectors, such as manufacturing or agriculture, influence tax revenue. If sectors contribute differently to GDP and receive varying levels of state services, the theory implies that tax revenue should reflect these contributions and the extent of services provided. Furthermore, the theory offers insights into sector-specific taxation. It suggests that sectors making significant contributions to GDP could justify higher tax levels if they receive more substantial benefits from government services. For example, sectors benefiting from extensive public infrastructure might have a stronger rationale for higher tax contributions, supporting the idea that the cost of services should be directly linked to the level of taxation.

2.2.2 Benefits Theory of Taxation

Due to the limitations of the cost-of-service theory, the benefits theory was developed (Cooper, 1994). This theory posits that taxes should be proportional to the benefits individuals receive from government services. It suggests an exchange relationship between taxpayers and the government: taxpayers fund social goods through taxes in return for benefits provided by the government (Cooper, 1994). However, it is challenging to quantify the benefits received from government services, rendering this theory less applicable (Ha et al., 2022).

The benefit theory informs the study by emphasizing the relationship between the benefits received from government services and the taxes paid. According to this theory, taxes should be proportional to the benefits individuals derive from government services. This suggests that there should be a direct exchange between taxpayers and the government, where individuals fund public goods through taxes and, in return, receive benefits from the state.

The Benefits Theory of Taxation is a principle of public finance that argues that individuals should pay taxes in proportion to the benefits they receive from government services. Under this approach, taxation is seen as a kind of exchange relationship between the state and its

citizens, similar to a market transaction. According to Dalton (1954), the theory assumes that taxpayers contribute to government revenue based on the extent to which they enjoy public goods such as infrastructure, security, and administrative services. For instance, a person who uses public roads frequently or benefits more from business-friendly policies should bear a higher tax burden compared to those who benefit less.

This theory is often justified on grounds of equity and fairness, since it ties tax obligations directly to the utility derived from government spending. As Musgrave and Musgrave (1989) explain, the benefits principle mirrors the idea of “pay-as-you-use,” where public expenditure is distributed among citizens according to the share of services they enjoy. In practice, it provides the rationale for certain taxes such as tolls, license fees, and fuel levies, where users directly finance the cost of the facilities they consume.

2.2 Empirical Review

2.2.1 Agriculture Sector Contribution

Albimana and Hemedb (2022) investigated the determinants of tax revenues in East African Community member countries. The study focused on the agricultural, manufacturing, and service sectors' contributions to gross domestic product, alongside economic growth, measured as the annual percentage change in gross domestic product. The dependent variable was tax revenue, measured as the ratio of tax revenue to gross domestic product. The study adopted a panel data methodology and targeted four East African Community member countries: Kenya, Uganda, Rwanda, and Tanzania.

It used secondary data from the World Bank Development Indicators database, covering the period from 2010 to 2020. The data was analyzed using panel data regression techniques, specifically the Fixed Effects Model and the Random Effects Model. The results of the study indicated that economic growth positively influenced tax revenue, suggesting that higher growth rates led to increased tax revenues. Conversely, the agricultural sector had a negative impact on tax revenue, highlighting challenges in effectively taxing this sector.

The manufacturing and service sectors, however, showed insignificant effects on tax revenue, suggesting that current policies were not sufficient to enhance tax performance in these areas. Anwar and Wijaya (2023) analyzed the effects of the share of agriculture and foreign direct investment on tax revenue in the Association of Southeast Asian Nations. The study used tax revenue as the dependent variable, with the share of agriculture and the share of services as the independent variables. Tax revenue was operationalized as central tax revenue as a percentage of GDP. The share of agriculture was defined as the income from the agricultural sector relative to GDP. The share of services was measured as the income from the service sector relative to GDP. The study used panel data from 10 Association of Southeast Asian Nations Indonesia, Malaysia, Singapore, Thailand, Philippines, Vietnam, Myanmar, Laos, Brunei Darussalam, and Cambodia covering the period from 2012 to 2019.

The secondary data were sourced from the World Bank. The study employed a descriptive quantitative approach, utilizing panel data regression analysis with an econometric model estimated by panel-corrected standard errors. The results from the study suggested that the performance of the agriculture sector did not significantly influence tax revenues relative to gross domestic product. In contrast, the services sector demonstrated a significant positive relationship with tax revenues relative to gross domestic product.

2.3 Conceptual Framework

A conceptual framework is a structured set of broad ideas and principles derived from relevant fields of study, which are used to guide and structure research (Saunders & Tossey, 2015). In this research, the independent variables included the agriculture sector contribution to GDP, while the dependent variable is tax revenue performance. The schematic diagrams provided not only guided the study but also illustrated the interrelationships among the key variables, as depicted in Figure 1.

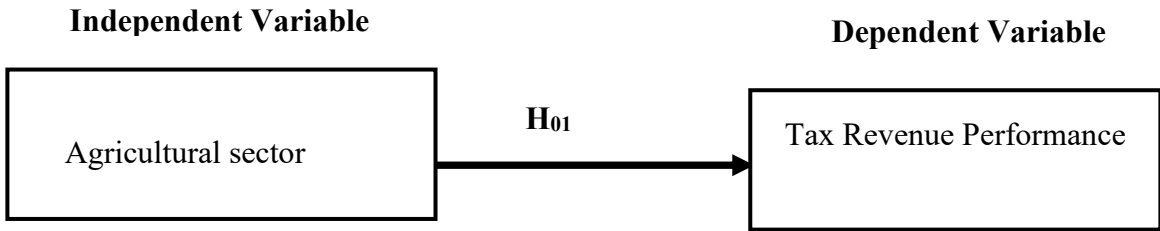


Figure 1: Conceptual Framework

3. Methodology

This research adopted an explanatory research design to explain the type of relationships between variables and investigate the causal relationship between them. Additionally, this research design allows for the collection of a large quantity of data regarding the population being studied. The study also used a longitudinal research design as the data collected was a combination of time series and cross-sectional and was used to analyse the changes in patterns of the independent variables. This study used secondary time series data that were collected on an annual basis for 11 years, the financial years 2014 to 2024, from the Kenya Revenue Authority and the Kenya National Bureau of Statistics. This period was selected, as it was the most recent and corresponds with the reforms being carried out at KRA. The study utilized unit root tests, the Schwartz Information Criterion, and the Auto-Regressive Distributed Lag model for analysis

4. Results and Discussion

4.1 Descriptive statistics

4.1.1 Contribution of the agriculture sector to GDP

Table 1 shows that for the descriptive statistics for the quarterly percentage contributions of Kenya’s agricultural, service, and manufacturing sectors to GDP from Q1 2014 to Q4 2024 reveal notable trends and variability across sectors. The agricultural sector had a mean contribution of 2.6% (M = 0.026, SD = 0.002), with a median of 2.6%, indicating a symmetrical distribution (Kenya National Bureau of Statistics [KNBS], 2023). The sector’s contributions ranged from a minimum of 2.3% to a maximum of 3.0%, demonstrating relatively stable but modest growth. The skewness value of -0.020 suggests a near-normal distribution, while the kurtosis of 2.074 indicates lighter tails than a normal distribution, implying fewer extreme fluctuations (Field, 2018).

Table 1: Descriptive statistics of independent variable

	Agricultural Sector
Mean	0.026
Median	0.026
Maximum	0.030
Minimum	0.023
Std. Dev.	0.002
Skewness	-0.020
Kurtosis	2.074
Sum	1.060
Sum Sq. Dev.	0.000
Observations	44

4.1.2 Tax Revenue Performance

Table 2 shows the descriptive statistics for year-to-year (YOY) tax revenue performance growth from Q1 2014 to Q4 2024, revealing key trends in fiscal revenue fluctuations. Over the 40 quarters, the mean growth rate was 10.6%, indicating moderate but positive revenue expansion on average. The median growth rate was slightly higher at 11.1%, suggesting a right-skewed distribution, though the skewness coefficient of -0.041 confirms near-symmetry in the data (Field, 2018). The maximum growth rate peaked at 24.2%, while the minimum was -2.2%, reflecting occasional fiscal contractions amid overall growth (Wooldridge, 2020).

Volatility in tax revenue performance is evident from the standard deviation of 6.2%, indicating moderate dispersion around the mean (Gujarati & Porter, 2009). The kurtosis value of 2.683 suggests a distribution with lighter tails than a normal distribution (mesokurtic), implying fewer extreme deviations than expected (Tabachnick & Fidell, 2019). The cumulative sum of growth rates over the decade was 422.4%, with a total sum of squared deviations of 0.148, reinforcing variability in quarterly performance. These findings highlight both consistency and periodic instability in tax revenue growth, which may reflect economic cycles, policy changes, or administrative efficiency (Saez & Zucman, 2020).

Table 2: Tax Revenue Performance

	Tax Revenue Performance YOY
Mean	0.106
Median	0.111
Maximum	0.242
Minimum	-0.022
Std. Dev.	0.062
Skewness	-0.041
Kurtosis	2.683
Sum	4.224
Sum Sq. Dev.	0.148
Observations	44

Time series analysis assumes that data is stationary, meaning it has a constant mean and variance over time. To test for stationarity, this study employed unit root tests, specifically the Augmented Dickey-Fuller (ADF).

Table 3: Unit Root Test

Variables	t-statistic	Sig	1%	5%	10%
Tax Revenue Performance	-8.179	0.000	-3.627	-2.946	-2.612
Agricultural sector to GDP ratio	-4.161	0.003	-3.627	-2.946	-2.612

The results in Table 3 indicate that all variables are stationary at their levels, as the absolute values of their t-statistics exceed the critical values at 1%, 5%, and 10% significance levels. Specifically, tax revenue performance -8.179, p-value =0.000, agricultural sector to GDP ratio -4.161, p-value =0.003, have statistically significant p-values ($p < 0.05$), rejecting the null hypothesis of non-stationarity.

4.2 Correlation Analysis

The correlation analysis was conducted, and Pearson's correlation coefficients were tested in order to quantify the strength of the relationship between the agricultural sector's contribution to GDP and tax revenue performance.

Table 4: Correlation Analysis

Variables	Tax rev performance	Agricultural sector
Tax rev performance[r]	1.000	
Sig		
Agricultural sector[r]	0.545*	1.000
Sig	(0.004)	

The correlation matrix in Table 4 indicates a positive and significant relationship between the agricultural sector contribution to GDP and tax revenue performance ($r = .545$, p-value $.004 < 0.05$), suggesting that growth in agriculture enhances tax compliance and revenue collection. This aligns with Karingi and Wanjala (2017), who found that agricultural productivity in Kenya significantly boosts formal and informal tax bases, particularly through value-added tax (VAT) and income tax from agro-processing firms.

4.3 Post Estimation Tests

4.3.1 Optimal Lag Length Structure

In autoregressive distributed lag (ARDL) models, determining the optimal lag length is critical for ensuring accurate estimation and reliable forecasting. The selection of optimal lag length in ARDL models was determined using multiple information criteria, as presented in Table 6. Based on a sample of 40 observations, the Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ) were employed to assess the appropriate lag structure. The results indicate that lag order 2 is optimal, as it minimizes all three criteria (AIC = -59.27, SC = -57.72, HQ = -58.72) while also yielding the lowest Final Prediction Error (FPE = 2.21e-31). Additionally, the Likelihood Ratio (LR) test supports this choice, showing a

statistically significant improvement (*LR = 340.38, $p < 0.05$) when moving from lag 1 to lag 2.

Table 5: Lag Order Selection Criteria

Included observations: 40						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	673.6266	NA	5.81e-21	-35.24351	-35.07113	-35.18218
1	939.1751	461.2157	1.16e-26	-48.37763	-47.51575	-48.07098
2	1162.182	340.3786*	2.21e-31*	-59.27272*	-57.72132*	-58.72075*

4.4 ARDL Regression Model

The ARDL model was utilized to determine the effects of the contributions of agriculture on tax revenue performance in Kenya.

The ARDL equation was summarized as follows;

$$\text{TaxRev}_t = 1.090 + 1.510\text{TaxRev}_{t-1} - 0.955\text{TaxRev}_{t-2} + 289.391\text{Agrit}_t - 396.566\text{Agrit}_{t-1} + 213.961\text{Agrit}_{t-2} + 62.635\text{Servicet}_t - 85.128\text{Servicet}_{t-1} - 474.700\text{Mfgt}_t + 627.966\text{Mfgt}_{t-1} - 282.792\text{Mfgt}_{t-2}$$

The ARDL regression results presented in Table 6 reflect the dynamic effects of sectoral contributions to GDP on tax revenue performance in Kenya. The findings indicate strong persistence in tax revenue performance, as evidenced by the significant positive effect of the first lag ($\beta = 1.510$, $p = 0.000 < 0.05$) and a significant negative effect of the second lag ($\beta = -0.955$, $p = 0.000 < 0.05$), suggesting a complex autoregressive pattern in tax revenue trends. This aligns with studies on tax revenue inertia in developing economies, where past revenue performance strongly influences current collections due to institutional and structural factors (Akitoby et al., 2019).

The agriculture sector exhibits significant short- and long-run effects on tax revenue performance. The current period's agriculture-to-GDP ratio has a strong positive impact on tax revenue performance ($\beta = 289.391$, $p = 0.000 < 0.05$), indicating that an increase in agricultural output immediately boosts tax revenue, consistent with findings in Sub-Saharan Africa where agricultural growth enhances VAT and income tax bases (Abidoye & Odusola, 2015).

However, the first lag ($\beta = -396.566$, $p = 0.000 < 0.05$) shows that agriculture-to-GDP ratio has a negative adjustment effect on tax revenue performance, while the second lag ($\beta = 213.961$, $p = 0.000 < 0.05$) partially reverses this effect, suggesting delayed fiscal adjustments. This could reflect tax policy lags or seasonal fluctuations in agricultural income, as observed in Kenya's tax system (KIPRA, 2021).

Table 6: ARDL regression coefficient Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Tax revenue performance (-1)	1.510	0.042	36.384	0.000
Tax revenue performance (-2)	-0.955	0.023	-40.674	0.000
Agricultural sector to GDP ratio	289.391	23.989	12.064	0.000
Agricultural sector to GDP ratio (-1)	-396.566	48.613	-8.158	0.000
Agricultural sector to GDP ratio (-2)	213.961	26.453	8.088	0.000
(Constant)	1.090	0.176	6.184	0.000

4.5 Discussion of Findings

The study sought to ascertain the effect of the contribution of the agriculture sector to GDP on tax revenue performance in Kenya. The correlation matrix indicated a positive and significant relationship between the agricultural sector contribution to GDP and tax revenue performance ($r = .545$, $p\text{-value } .004 < 0.05$), suggesting that growth in agriculture enhances tax compliance and revenue collection. This aligns with Karingi and Wanjala (2017), who found that agricultural productivity in Kenya significantly boosts formal and informal tax bases, particularly through value-added tax (VAT) and income tax from agro-processing firms. The ARDL model found that the agriculture sector had significant short- and long-run effects on tax revenue performance. The current period's agriculture-to-GDP ratio has a significant and positive impact on tax revenue performance ($\beta = 289.391$, $p = 0.000 < 0.05$), indicating that an increase in agricultural output immediately boosts tax revenue, consistent with findings in Sub-Saharan Africa where agricultural growth enhances VAT and income tax bases (Abidoye & Odusola, 2015).

However, the first lag ($\beta = -396.566$, $p = 0.000 < 0.05$) shows that the agriculture-to-GDP ratio has a negative adjustment effect on tax revenue performance, while the second lag ($\beta = 213.961$, $p = 0.000 < 0.05$) partially reverses this effect, suggesting delayed fiscal adjustments. This could reflect tax policy lags or seasonal fluctuations in agricultural income, as observed in Kenya's tax system (KIPPRA, 2021). This aligns with Epaphra and Kaaya (2020), who documented a positive agriculture-tax revenue link in Tanzania. However, the negative lagged effects resonate with Ibrahim and Jairo (2023), who reported a negative long-run impact in East Africa, attributing it to informal agricultural taxation challenges. Contradictory evidence emerges from Albimana and Hemed (2022), who found agriculture's contribution negatively affected tax revenue in Kenya, Uganda, Rwanda, and Tanzania, citing inefficiencies in taxing smallholder farmers. Anwar and Wijaya (2023) found no significant agriculture-tax revenue link in ASEAN, opposing Kenya's results. This divergence may reflect regional policy differences.

5. Conclusion

The study objective was to ascertain the effect of the agriculture sector's contribution to GDP on tax revenue performance in Kenya. The findings conclude that the agriculture sector has a significant short-run positive effect on tax revenue, but with delayed negative adjustments in subsequent periods. This contributes to the field by demonstrating that while agricultural growth initially boosts tax revenue, structural challenges such as seasonality, informality, and policy implementation lags lead to fluctuating fiscal impacts over time. The study provides new insights by highlighting the need for adaptive tax policies that account for agricultural cycles and value chain formalization to stabilize revenue streams. These findings challenge conventional assumptions that agriculture's tax potential is uniformly positive or negative, offering a more nuanced perspective for policymakers in agrarian economies.

6. Recommendations

First, regarding the agriculture sector's cyclical effects on tax revenue performance. To mitigate the negative adjustment effects, the Kenya Revenue Authority (KRA) should develop and deploy a digital platform for farmers, particularly those in large-scale cash-crop farming, to declare and pay taxes based on projected annual income. This system would allow for quarterly estimated tax payments, smoothing revenue streams for the government and preventing large, unexpected tax liabilities for farmers after harvests, thereby improving compliance. To capture revenue more consistently from the sector, policy should strengthen the use of withholding taxes at the point of sale for major agricultural produce. By mandating that licensed buyers (tea factories, coffee cooperatives, and dairy processors), the government can reduce the lag in revenue collection and bring more agricultural transactions into the formal tax net.

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