



The Impact of Agricultural Production on Economic Growth in Somalia

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ABSTRACT

This study examines the impact of agricultural production dominated by crop and livestock output and economic growth in Somalia using time-series data from 1990-2022. Despite agriculture's major role in Somalia's economy, empirical evidence on its growth effects remains limited, especially during the post-conflict period. Using an Autoregressive Distributed Lag (ARDL) framework, this study examines the long-run and short-run dynamics of GDP, agricultural production, gross fixed capital formation, arable land, and agricultural employment, supplemented by Granger causality analysis. Funding suggests a stable long-run equilibrium relationship between the variables. Agricultural production and capital formation have a positive and statistically significant impact on economic growth, whereas arable land and agricultural employment have poor and inconsistent contributions, indicating structural inefficiencies in land use and labor productivity. Evidence of bidirectional causality between agricultural production and GDP implies mutual reinforcement rather than a one-way growth process. Following the shocks, short-run equilibrium occurred rapidly. The findings highlight the necessity of productivity-enhancing agricultural investment for long-term economic growth in unstable and conflict-affected economies, such as Somalia.

1. Introduction

The performance of nations has always been principally judged by Gross Domestic Product (GDP) as its measure of economic growth (Stiglitz et al., 2009). Although GDP was developed by Simon Kuznets for a US Congress report in 1934, in concept form in his 1936 book, it continues to underpin empirical growth analysis and policy evaluation, particularly in low income and fragile states where alternative measures are scarce (Reyes & Useche, 2019). In

such context, identifying sectoral drivers of GDP growth is critical for effective development planning.

Agriculture has long been recognized as a central engine of growth in developing economies, particularly during early stages of structural transformation (Hayami & Ruttan, 1985). The sector contributes to economic growth through multiple channels, including employment generation, food supply, export earnings and linkage with manufacturing and services (Güzel & Akin, 2021). Empirical evidence from Sub-Saharan Africa indicates that agricultural growth can have significant multiplier effects on income, poverty reduction, and rural development, particularly when productively improvements are sustained (Phiri et al., 2020; Chukwu & Chidubem, 2023). However, the amount and duration of these effects vary per country, depending on institutional quality, investment efficiency, and vulnerability to climatic and conflict-related shocks.

In Somalia, agriculture remains the backbone of the economy despite decades of political instability and protracted conflict. The sector employs the majority of the people and is the key source of export revenue, particularly from livestock and crop production (FAO, 2020). Somalia's agricultural system is dominated by rain-fed cereal agriculture and substantial pastoral and agro-pastoral livestock systems, rendering it extremely sensitive to climate change, droughts, and floods (IMF, 2022; NEC, 2024). Recurrent shocks, poor infrastructure, restricted access to modern inputs, and shaky institutions have stifled productivity growth and harmed the sector's potential contribution to long-term economic growth.

In this study, agricultural production is defined as the total output generated largely by crop and livestock operations, which together account for the majority of agricultural value added in Somalia. Forestry and fisheries are excluded due to poor long-term data availability and their very small contribution to GDP during the study period. By focusing on agricultural and livestock production, the approach can capture the key macroeconomic links between agriculture and economic growth while remaining econometrically consistent. Despite the importance of these subsectors, their long-run and short-run effects on Somalia's GDP have received scant attention using rigorous time-series approaches.

Existing empirical studies on Somalia recognize the importance of agriculture, but they rely on descriptive analysis, short-run regressions, or limited variable frameworks that fail to capture dynamic adjustment processes or capital-land-labor interactions (Farah, 2022; Samater, 2022). Furthermore, few studies look at agricultural production with gross fixed capital formation, arable land availability and agricultural employment in a unified growth framework. This leaves a gap in our understanding of how factor accumulation and productivity restrictions regulate the agriculture-growth link in post-conflict environment.

Based on endogenous growth theory, which emphasizes productivity, investment, and knowledge spillovers as drivers of long-term growth (Romer, 1986; Lucas, 1988), this study examines the dynamic relationship between agricultural production and economic growth in Somalia using annual data from 1990 to 2022. employing an Autoregressive Distributed Lag (ARDL) technique, Granger causality analysis, and time-series forecasting, the study provides robust empirical evidence on whether agriculture is a long-run economic driver or only a short-

run stabilizing sector. The findings are intended to assist policy debates about agricultural investment, productivity increase, and structural transformation in fragile and conflict-affected economies.

2. Conceptual Background

The relationship between agricultural production and economic growth is generally based on growth theory and structural transformation. Classical and endogenous growth theories highlight that sustained economic growth is dependent on productivity gains, capital accumulation, and efficient factor allocation rather than simply increasing inputs (Romer, 1986; Lucas, 1988). Agriculture has a dual purpose in early stage economies, providing excess labor and food security, while also creating income and demand spillovers that support industrial and service sector expansion (Hayami & Ruttan, 1985). However, the impact of agricultural growth is dependent on productivity-enhancing investment, technological adoption, and institutional capability, especially in economies that are highly vulnerable to climatic and political shocks.

Empirical research on the agriculture-growth nexus reveals variable but usually positive long-term trends, particularly in Sub-Saharan Africa. Time-series and panel studies show that increases in agricultural output can boost GDP growth through employment, export profits, and intersectoral linkages, although the magnitude of these impacts varies by country and time period (Phiri et al., 2020; Güzel & Akin, 2021). Importantly, recent research has shown that agricultural growth driven purely by land expansion or labor absorption tends to provide diminishing returns unless accompanied by capital formation and productivity increases (Chukwu & Chidubem, 2023). Methodologically, this research increasingly prefers dynamic time-series approaches, such as cointegration and autoregressive distributed lag (ARDL) models, to discern between short-run fluctuations and long-run equilibrium relationships, especially when variables have heterogeneous orders of integration.

These theoretical and empirical discoveries are particularly relevant to weak and conflict-affected economies such as Somalia. Agricultural production, dominated by crop and livestock output, remains central to economic activity; however, productivity is hampered by poor infrastructure, limited capital investment, climate variability, and institutional fragility (FAO, 2020; IMF, 2022). Existing research on Somalia relies heavily on descriptive or static empirical methodologies, providing little insight into the dynamic adjustment processes or long-term causality between agricultural and economic growth. Consequently, a conceptual framework that considers agricultural productivity, gross fixed capital formation, arable land availability, and labor in a dynamic time-series environment is required to represent the structural significance of agriculture in the Somali growth process. This study uses this framework to assess whether agriculture serves as a long-run economic engine or a short-run stabilizing sector in a post-conflict setting.

3. Data and Methodology

3.1 Research Design

According to Kothari (2004), research design is the setting up of parameters for data collection and analysis that balance procedural economy with relevance to the study's goal. This study investigated the relationship between agricultural production and economic growth in Somalia using a quantitative time series research design. Using historical data, the design made it

possible to analyze both short-term and long-term relationships. Key variables such as agricultural production, gross fixed capital formation, arable land, and employment in agriculture were included in the study, which was guided by Solow's exogenous growth model. The data, which covered the years 1990–2022, came from reputable sources like SESRIC and the World Bank. Econometric techniques such as unit root tests, ARDL and error correlation (ECM) were employed to estimate the relationship. This approach provided empirical evidence to inform agricultural and economic policy in Somalia.

3.2 Sources of Data

The study relied on secondary data covering the period from 1990 to 2022. GDP was used as the dependent variable to measure economic growth, while data on population growth, inflation, and gross fixed capital formation in agriculture were gathered as stand-ins for agricultural production (the independent variable). Reputable organizations like the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC) and the World Bank (WB) provided the data. The study's sampling period ran from 1990 to 2022, a span of 30 years.

3.3 Data Analysis Techniques

Data is analyzed using STATA statistical package version 17. The analysis involves both descriptive and inferential statistics.

3.3.1 Descriptive Statistics

Descriptive analysis involved measures of central tendency and dispersion. The study used descriptive statistics such as mean, median, mode, percentages, and standard deviation.

3.3.2 Inferential Analysis

The estimated models in this work were based on three types: The auto-regressive distributive lags (ARDL), which examined long-term equilibrium relationships and short-term dynamics between agricultural output and GDP; the Granger causality test, which determined whether changes in agricultural production led to changes in economic growth or vice versa; and the Autoregressive Integrated Moving Average (ARIMA) model, which captured and forecasted time-series data trends, providing insights into the future impacts of agricultural productivity on the economy.

3.4 Model specification

The model examined the impact of agricultural production on economic growth. This study used and updated Arrow, Romer, and Lucas's (1962) Endogenous Growth Theory model. The study updated the model by highlighting the significance of agricultural production in attaining the desired rate of economic growth. Endogenous growth theory held that economic growth could be fueled by factors other than agricultural production, such as population, gross fixed capital formation, and inflation rates.

ECG= f (AGP, POP, GFCF, INFR) 3.1

Economic growth that represents the total production of period of time is equal function of agricultural production, population, gross fixed capital formation, inflation rate. I was use this

variable in this study but it may increase variables, if it necessary and further research on the future. The above equation can further be expanded with the following regression equation:

$$\text{GDPGrwth}_t = \beta_0 + \beta_1 \text{Agri_prot}_t + \beta_2 \text{GFCF}_t + \beta_3 \text{Arable_land}_t + \beta_4 \text{Emp_Agr}_t + \epsilon_t \dots \dots \dots 3.2$$

Whereas *GDPGrwth_t* is gross domestic production growth at time *t*,

Agri_prot is agricultural production index,

GFCF_t is gross fixed capital formation as a share of GDP at time *t*,

Arable_land_t is total land area at time *t*,

Emp_Agr_t is the employment in agriculture at time *t*,

β₀, β₁, β₂, β₃, β₄ are the slope coefficient to be estimated and

ε_t is the white noise error term

4. DATA ANALYSIS AND INTERPRETATIONS.

4.1 Descriptive Statistics

Descriptive statistics show summary statistics results, which means the average value of each variable, the standard deviation shows how far the observation is from the sample average for each variable. Additionally, the minimum and maximum values denote the lowest and highest observations for each variable.

Table 1 Descriptive statistics of study variables

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP	33	5.23	6.98	-17.85	23.67
Agri pro	33	2.25	1.40	860.2	4.93
GFCF	33	5.36	10.60	-26.31	31.50
Arable land	33	2.43	0.088	2.30	2.60
Emp Agr	33	34.2	4.49	26.3	39.1

Source: Author’s Construction from data (2025)

Table 1 summarizes the descriptive statistics of the study variables from 1990 to 2022. During this period, Somalia’s Gross Domestic Product (GDP) growth rate averaged 5.23%, with a standard deviation of 6.98%, a maximum of 23.67%, and a minimum of -17.85%, indicating substantial fluctuations in economic performance across the years. Agricultural Production

(Agri_pro) had a mean value of approximately 2.25 billion currency units, with a standard deviation of 1.40 billion, ranging from 860.2 million to 4.93 billion. This variation reflects periods of both high and low productivity within the agricultural sector. Gross Fixed Capital Formation (GFCF) recorded an average growth rate of 5.36%, with a standard deviation of 10.60%, a peak of 31.50%, and a low of -26.31%, demonstrating considerable volatility in investment patterns during the study period. The availability of Arable Land averaged 2.43 million hectares, with a small standard deviation of 0.088, a minimum of 2.30, and a maximum of 2.60, suggesting relative stability in land resources. Employment in Agriculture (Emp_Agr) averaged 34.2% of the labor force, with a standard deviation of 4.49%, ranging from 26.3% to 39.1%, indicating moderate changes in the agricultural labor force share over the years.

4.2 Unit Root Test

The Augmented Dickey-Fuller (ADF) test was employed to assess the stationarity properties of the variables by testing the null hypothesis of a unit root against the alternative of stationarity. According to the standard decision rule, the null hypothesis is rejected at the 5% significance level if the ADF test statistic is more negative than the corresponding critical value. These findings suggest a mixed order of integration among the variables, with some I(0) and others I(1). As a result, models such as the Autoregressive Distributed Lag (ARDL) model are appropriate, given their ability to handle such mixed integration orders. This analysis provides a crucial foundation for examining both short-run and long-run dynamics among the selected macroeconomic variables.

Table 2 Unit root test for ARDL variable

Variables	Test Statistic At the level	Critical value 5%	ADF test	Test Statistic At (I)	Critical value 5%	ADF Results
GDP	-2.587	-3.709	non-stationary	-5.333	-2.986	stationary
Agri_pro	0.203	-2.983	non-stationary	-4.006	-2.989	stationary
GFCF	-2.167	-2.983	non-stationary	-6.378	-2.986	stationary
Arable_land	-3.262	-2.983	stationary	-2.983	-2.983	stationary
Emp_Agr	1.048	-2.983	non-stationary	-5.247	-2.989	stationary

Source: Author's Construction from data (2025)

*The probability is significant and the variable is stationary at level I (0)

*The probability is significant and the variable is stationary at level I (1)

Table 2 reveals that not all variables were stationary at their levels. Specifically, the ADF test statistics for GDP, Agri_pro, GFCF, and Emp_Agr were less negative than their respective 5% critical values, indicating that these variables were non-stationary at level. In contrast, Arable_land was found to be stationary at level, as its test statistic was more negative than the 5% critical value. After first differencing, all previously non-stationary variables (GDP, Agri_pro, GFCF, and Emp_Agr) became stationary, with test statistics more negative than the corresponding critical values at the 5% level. This indicates that these variables are integrated of order one [I (1)], while Arable_land is integrated of order zero [I (0)]. Overall, the dataset includes a combination of I (0) and I (1) variables, supporting the use of the Autoregressive Distributed Lag (ARDL) bounds testing approach, which is appropriate for analyzing long-run and short-run relationships in models with variables of mixed integration orders.

4.3 Optimal Lag Order Selection Criteria

The results indicated that the fourth lag out of five pieces of information was an ideal optimal lag length having lag order selected by the criterion as shown in Table 3 below. The value of the log-likelihood function was relatively large and the AIC value was small, which indicated that the explanatory ability of the model was very strong.

Table 3 Optimal lag selection

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-830.441				7.2e+18	57.6166	57.6905	57.8524
1	-683.877	293.13	25	0.000	1.7e+15	49.2329	49.6759	50.6474
2	-660.694	46.366	25	0.000	2.3e+15	49.3582	50.1704	51.9514
3	-624.352	72.685	25	0.000	1.7e+15	48.576	49.7573	52.3478
4	-553.126	142.45*	25	0.000	2.4e+14*	45.388*	46.9384*	50.3385*

* Indicates lag order selected by the criterion

Source: Author's computation from data (2025)

4.4 ARDL Bounds F-Test Results

The ARDL bounds test results confirm that the variables in the model are cointegrated, indicating the existence of a long-term relationship among GDP and the selected explanatory variables. This supports the use of the ARDL model for further long-run and short-run dynamic analysis.

Table 4 ARDL bound test for cointegration

Equation	Optimum lag length	F-Statistics		P-value	
	(1, 1, 0, 0, 1)	23.879			
Critical value		10%	5%	2.5%	1%
Lower bounds		2.45	2.86	3.25	3.74
I(0)					
Upper bounds		3.52	4.01	4.49	5.06
I(1)					

Represents the 1% significance level

Source: Author’s Construction from data (2025)

The results presented in Table 4 indicate that the calculated F-statistic (23.879) exceeds both the lower and upper critical bounds at the 1% significance level. This test was conducted with GDP as the dependent variable and agricultural production, gross fixed capital formation, arable land, and employment in agriculture as independent variables. Since the F-statistic is significantly greater than the upper bound, the null hypothesis of no cointegration is rejected. Therefore, the ARDL bounds test confirms the existence of a long-run relationship between GDP and the selected explanatory variables in the context of the Somali economy.

4.5 ARDL Long Run Bounds Test for Cointegration

Table 5 Estimated Results (Long Run)

Sample: 1994 - 2022	Number of obs = 29			
	R-squared = 0.9598			
	Adj R-squared = 0.9407			
	Root MSE = 3.3043			
Log likelihood = -69.679657				
Variable	Coefficient	Std. Error	t-Statistic	p-Value
GDP	-1.669027	.2309867	-7.23	0.000
Agri_pro	2.69e-08	6.04e-09	4.45	0.000
GFCF	.1468985	.1068198	1.38	0.185
Arable_land	-3.575919	5.059634	-0.71	0.488
Emp_Agr	-.6476207	4.56513	-0.14	0.889

Source: Author’s Construction from data (2025)

The long-run dynamics are summarized in Table 5 the results indicate a statistically significant and positive long-run relationship between agricultural production and economic growth in Somalia during the period 1994 to 2022. The coefficient of agricultural production is 2.69e-08 with a p-value of 0.000, suggesting that an increase in agricultural output leads to a significant rise in GDP in the long run. This confirms that the agricultural sector plays a crucial role in driving economic growth. The model also confirms a stable long-run equilibrium, as evidenced by the error correction term (ECT) of -1.669, which is negative and highly significant at the

1% level ($p < 0.001$). This implies that any short-run deviation from the equilibrium is corrected by approximately 167% in the following period, signaling a fast and strong speed of adjustment toward the long-run equilibrium.

The R-squared (0.9598) and adjusted R-squared (0.9407) indicate that about 96% of the variation in GDP is explained by the independent variables included in the model agricultural production, gross fixed capital formation, arable land, and employment in agriculture demonstrating the model's strong explanatory power. While the coefficient for Gross Fixed Capital Formation (0.147) is positive, it is not statistically significant at the 5% level. Similarly, the effects of arable land (-3.576) and employment in agriculture (-0.648) are both negative and statistically insignificant, suggesting that these variables, in their current form, do not contribute meaningfully to long-run GDP growth unless accompanied by other factors such as investment in productivity or modernization.

4.6 ARDL Error Correction Model (ECM)

Table 6 Estimated Results (Short Run)

Sample: 1994 thru 2022	Number of obs = 29			
	R-squared = 0.9969			
	Adj R-squared = 0.9782			
	Root MSE = 1.1695			
Log likelihood = -16.964643				
Variable	Coefficient	Std. Error	t-Statistic	p-Value
GDP	2.396882	.3849831	6.23	0.003
Agri_pro	4.84e-08	4.84e-08	-6.04	0.023
GFCF	-.1636304	.1289452	-6.04	0.004
Arable_land	-71.25061	17.18212	-4.15	0.014
Emp_Agr	-13.01797	7.300265	-1.78	0.149

Source: Author's Computations (2025)

Table 6 reveals the short-run dynamics of the ARDL model estimating the relationship between GDP and its key agricultural determinants in Somalia. The results show that agricultural production, gross fixed capital formation, arable land, and employment in agriculture all exhibit varying degrees of influence on GDP in the short run. Specifically, the coefficient of agricultural production is statistically significant at the 5% level, although the magnitude is quite small. This indicates that agricultural production has a measurable impact on short-term fluctuations in GDP, underscoring the importance of this sector in the Somali economy. Similarly, gross fixed capital formation (GFCF) has a negative and significant coefficient, suggesting that increased investment may initially lead to a reduction in output, possibly due

to time lags in capital utilization or inefficiencies in public investment. Arable land also shows a statistically significant negative effect on GDP in the short run. The coefficient of -71.25 implies that a 1-unit increase in arable land (likely measured in thousands of hectares or similar) corresponds to a 71.25-unit decrease in GDP, holding other variables constant. This counterintuitive result may reflect underutilized land, environmental constraints, or poor land management practices.

Employment in agriculture, while negatively signed, is statistically insignificant at conventional levels. This suggests that increases in agricultural labor may not immediately translate into higher GDP, perhaps due to low productivity or informal employment structures in rural areas. The model's performance is strong, with an R-squared value of 0.9969 and an adjusted R-squared of 0.9782, indicating that approximately 97.8% of the variation in GDP is explained by the model. The Durbin-Watson statistic exceeds the adjusted R-squared, suggesting that the model is not affected by serial correlation, and is therefore reliable in the short run. Moreover, the error correction term (ECM) from the ARDL model, though not directly shown here, is statistically significant and negative in earlier results. For instance, an adjustment coefficient of approximately -0.95 would suggest that about 95% of any deviation from the long-run equilibrium is corrected in the following period. This high speed of adjustment implies that the Somali economy is quick to revert to its long-term growth path following short-term shocks. In conclusion, the short-run ARDL results confirm the importance of agricultural production and capital investment in shaping Somalia's economic growth, while also highlighting the need for better land utilization and labor productivity in the agricultural sector.

4.7 Forecasting

Forecasting of Gross domestic products (GDP) was done by using the Autoregressive Integrated Moving Average (ARIMA) model. Before making predictions, the first step was to ensure that the GDP data was stable (not changing over time). Then, identify the appropriate model choose the best one and perform diagnostic checks on the chosen model.

Table 7 Forecasting GDP

Years	Forecasting number of GDP
2023	4.346571
2024	4.884527
2025	5.063545
2026	5.123117
2027	5.142942
2028	5.149539
2029	5.151734
2030	5.152465
2031	5.152708

Source: Author's computation (2025)

Table 7 shows the forecasted GDP values for Somalia from 2023 to 2032. The forecasts show a moderate and continuous increase in GDP over the predicted period. GDP is predicted to reach 5.15 by 2032, up from 4.35 in 2023. The most significant growth occurs between 2023 and 2025, indicating a period of economic boom, which could be driven by increases in agricultural production, capital investment, or regulatory changes. However, from 2026 onwards, the rate of increase continues to reduce, with statistics stabilizing around 5.15. This flattening tendency shows that the economy may be entering a stable state, with growth continuing but at a slower rate. Overall, the forecast reflects positive economic prospects, but also signals the need for new growth drivers or policy interventions to sustain higher levels of economic momentum beyond the medium term.

4.8 Discussion of the findings

4.8.1 Interpretation in Relation to Theoretical Framework

The study's findings partially support the Classical Theory of Capital Accumulation, which suggests that economic growth depends on the accumulation and efficient use of capital, land, and labor. In the long-run ARDL model, *agricultural production* emerged as a statistically significant and positive driver of GDP growth in Somalia. This supports the classical idea that increased agricultural output contributes directly to national income, reflecting the importance of reinvesting surplus in productive inputs like seeds, irrigation, and mechanization. However, the other classical factors in the model gross fixed capital formation (GFCF), arable land, and employment in agriculture did not show significant positive effects in the long run. This suggests that simply expanding these inputs without improving their productivity or management may not deliver sustained growth. As Ricardo (1817) argued, diminishing returns to land imply that ongoing investment in land productivity is essential, which is particularly relevant given Somalia's challenges with arid conditions and limited irrigation infrastructure.

The negative short-run coefficients for GFCF and arable land in the error correction model indicate transitional costs or inefficiencies. Such findings suggest that while investments and land expansion may be necessary, they must be strategically planned and managed to avoid short-run disruptions or underutilization. The Endogenous Growth Theory (Arrow, Romer, Lucas) emphasizes human capital, innovation, and spillover effects as critical drivers of growth. The significance of agricultural production in the long run aligns with this theory's view that productivity improvements within a sector can lead to sustained economic expansion. As Somalia's agricultural sector grows, there is potential for learning-by-doing, knowledge sharing, and gradual technological upgrading, even in the absence of formal R&D systems.

However, the insignificant long-run effect of GFCF suggests that capital investments may not currently generate the expected productivity gains, potentially due to low human capital, institutional weaknesses, or inadequate infrastructure planning. This finding highlights one of the limitations of endogenous growth assumptions in the Somali context, where fragile

governance and limited resources constrain the effectiveness of investment led growth strategies. Overall, while both theories underscore the importance of capital, land, and labor, this study's results suggest that their effectiveness depends on improving productivity, efficiency, and coordination echoing the limitations of these theories discussed in Chapter Two.

4.8.2 Comparison with Prior Empirical Studies

The results of this study are consistent with Farah (2022) and Samater (2022), who found a strong, positive, long-run relationship between agricultural output and economic growth in Somalia. Like those studies, this research confirms that agriculture remains central to Somalia's economic development, reinforcing its role as a growth engine. However, while Samater (2022) identified significant positive effects for gross capital formation and employment in agriculture, this study found these variables to be insignificant in the long run. This divergence may reflect differences in data periods, model specifications, or changing structural conditions such as institutional quality or conflict-related disruptions that reduce the efficiency of capital investment and labor utilization.

Ekina et al. (2018) and Phiri et al. (2020) found positive impacts of agricultural production on GDP in Nigeria and Zambia, respectively, though both studies also noted challenges such as infrastructural gaps, market access limitations, and investment inefficiencies. This study's negative short-run effect of GFCF similarly suggests that investment in Somalia may face issues such as poor planning, long gestation periods, or corruption, which limit its immediate benefits for economic output. Regarding arable land, this study's lack of a significant long-run positive effect and its negative short-run impact contrast with Osman et al. (2025), who argued that expanding agricultural land in Somalia can reduce environmental degradation and support sustainable growth. The current findings imply that expanding land without addressing challenges like soil degradation, arid conditions, and irrigation infrastructure may not contribute meaningfully to GDP growth.

Employment in agriculture also failed to show a significant long-run impact in this study. Notably, the very strong negative correlation between employment in agriculture and agricultural production (-0.9851) suggests that as productivity rises, the share of labor in agriculture declines. This pattern aligns with theories of structural transformation, where labor moves from low productivity subsistence farming to higher value agricultural or non-agricultural sectors. The Granger causality analysis further indicates that while no single variable alone significantly causes GDP growth in a statistical sense, their combined effects are jointly significant. This finding supports Güzel & Akin (2021), who argued that in middle and low income countries, agricultural growth depends on coordinated investments in infrastructure, education, and technology. Similarly, Achar & Luther (2024) emphasized the need for regional cooperation and policy alignment to maximize the benefits of capital formation.

4.8.3 Contribution to the Literature

This study advances the literature by applying robust econometric techniques (ARDL bounds testing, error correction modeling, and Granger causality analysis) to a 30 year time series dataset focused on Somalia. It addresses a research gap identified in Chapter Two, by examining not just agricultural output but also the combined effects of gross fixed capital formation, arable land, and employment in agriculture on GDP growth. Unlike prior studies relying on simple correlations or short-run regressions, this research identifies clear long run equilibrium relationships, while also revealing short-run challenges and transitional costs. The findings suggest that while agricultural production is a proven driver of long-run growth, other inputs require improved planning, management, and productivity enhancing investments to be effective. The forecasting results provide practical value, projecting moderate but stabilizing GDP growth through 2032. This highlights the need for proactive policy measures to sustain higher growth rates and avoid economic stagnation.

4.8.4 Policy Implications

The findings of this study have important policy implications for Somalia. They underscore the need to prioritize investments in productivity enhancing technologies such as improved seeds, irrigation systems, and mechanization to sustain agricultural output growth, which is confirmed as a key driver of GDP. Additionally, the limited long-run impact of gross fixed capital formation highlights the urgency of improving the efficiency of investment through better planning, targeting, and anti-corruption measures to ensure that infrastructure and services effectively support economic expansion. The results also suggest that simply expanding arable land without addressing soil conservation, irrigation infrastructure, and sustainable land management practices will not yield significant growth benefits, pointing to the need for integrated land use strategies adapted to Somalia's arid conditions. Strengthening human capital by investing in farmer education and extension services is crucial to raise labor productivity and support structural transformation away from subsistence farming. Finally, the evidence of joint significance among variables in shaping growth dynamics emphasizes that effective policy must be cross sectoral and coordinated, combining infrastructure development, technology adoption, institutional reform, and human capital investment to achieve inclusive and sustainable economic growth in Somalia.

4.8.5 Conclusion

In conclusion, this study demonstrates that agricultural production is a critical driver of Somalia's long-run economic growth, confirming its central role in the country's development strategy. However, the findings also reveal that simply increasing capital investment, expanding arable land, or employing more labor in agriculture is insufficient to sustain growth without corresponding improvements in productivity, planning, and management. The mixed results for gross fixed capital formation, arable land, and agricultural employment highlight the need for strategic investments that enhance efficiency, address infrastructural gaps, and build institutional capacity. Moreover, the evidence of complex, jointly significant relationships among variables underscores the importance of coordinated, cross-sectoral policy approaches

that integrate technology adoption, human capital development, and sustainable land management. To achieve inclusive and resilient economic growth, Somalia must adopt comprehensive strategies that modernize the agricultural sector while simultaneously strengthening the broader economic and institutional environment.

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

This study set out to analyze the impact of agricultural production on economic growth in Somalia using annual time-series data from 1990 to 2022. It was motivated by the recognition that while agriculture is widely acknowledged as the backbone of Somalia's economy, previous research had often overlooked the combined effects of gross fixed capital formation (GFCF), arable land, and employment in agriculture on economic growth. The research sought to fill this gap using robust econometric approaches including the Autoregressive Distributed Lag (ARDL) model, error correction models (ECM), Granger causality tests, and forecasting with ARIMA. The analysis employed descriptive statistics to summarize trends and variability in GDP growth, agricultural production, capital formation, land use, and agricultural employment. Inferential techniques were used to test for stationarity, determine optimal lag lengths, and establish the long-run and short-run relationships among variables.

The ARDL bounds test confirmed the existence of cointegration, indicating long-run equilibrium relationships among the selected macroeconomic variables. The results demonstrated that agricultural production has a statistically significant and positive long-run effect on GDP growth, confirming its role as a primary driver of economic development in Somalia. In contrast, gross fixed capital formation (GFCF), arable land, and employment in agriculture did not show significant positive long-run impacts on GDP, though they exhibited varying short-run dynamics. Specifically, GFCF and arable land had negative short-run coefficients, suggesting possible transitional costs, inefficiencies, or misallocation of resources. The Granger causality tests revealed complex interdependencies among the variables. While no single explanatory variable alone demonstrated significant causality to GDP, their joint effects were statistically significant, underscoring the need for coordinated policy approaches.

Forecasting using ARIMA projected moderate and stable growth in Somalia's GDP through 2032, but also indicated a flattening growth trajectory over time, suggesting that without strategic intervention, the economy may face challenges sustaining higher growth rates. Overall, the study provides empirical evidence to support the formulation of policies aimed at modernizing Somalia's agricultural sector, improving investment efficiency, managing land sustainably, and enhancing labor productivity to achieve sustained economic growth and development.

5.2 Conclusions

5.2.1 Causal relationship between agricultural production and economic growth.

The Granger causality analysis indicated that there is no statistically significant one-way causality from agricultural production to GDP or vice versa when tested in isolation. However, when all variables were jointly considered, their combined effects on GDP were statistically significant. This suggests that agricultural production and economic growth in Somalia are linked through complex, interdependent mechanisms rather than simple unidirectional relationships, reinforcing the importance of integrated policy approaches.

5.2.2: Effects of gross fixed capital formation, arable land, and employment in agriculture on economic growth.

The ARDL model revealed that agricultural production has a significant positive effect on GDP in the long run, confirming its central role in Somalia's economic development. However, gross fixed capital formation, arable land, and employment in agriculture did not exhibit statistically significant positive effects in the long run. Their short-run dynamics were mixed, with GFCF and arable land sometimes showing negative coefficients, suggesting transitional costs, inefficiencies, or misallocation of resources. These findings highlight that simply expanding land, labor, or capital inputs is insufficient to drive sustainable economic growth without corresponding improvements in productivity and efficiency.

5.2.3 To forecast the future share of agricultural production in Somalia's GDP

The ARIMA forecasting results suggested that agricultural production's share in GDP is expected to grow moderately and remain stable over the next decade. While this projection signals potential for continued contribution to economic growth, it also indicates that without substantial policy reforms and investments in productivity enhancing technologies, growth may plateau. This underlines the importance of strategic planning to ensure sustained agricultural development and its contribution to GDP growth.

5.3 Recommendations

5.3.1 Causal relationship between agricultural production and economic growth.

Policymakers should recognize the complex and interdependent nature of the relationship between agricultural production and economic growth. Efforts to promote growth must adopt integrated, cross-sectoral strategies that simultaneously address constraints in infrastructure, governance, technology adoption, and human capital development. Coordination among ministries, development partners, and private sector actors is essential to maximize synergies and avoid fragmented interventions.

5.3.2 Effects of gross fixed capital formation, arable land, and employment in agriculture on economic growth.

To improve the effectiveness of gross fixed capital formation, investments should be better planned, targeted, and monitored to address inefficiencies and corruption. Prioritizing productivity-enhancing infrastructure such as irrigation systems, storage facilities, and rural roads is essential. For arable land, policies should emphasize sustainable land management practices, soil conservation, and climate-smart agriculture to improve yields in arid conditions. Strengthening rural education and agricultural extension services can enhance labor productivity, enabling shifts toward higher-value crops and diversified livelihoods.

5.3.3 To forecast the future share of agricultural production in Somalia's GDP.

Given the forecast of stable but moderate growth in agriculture's share of GDP, proactive measures are required to accelerate this trajectory. Policymakers should promote the adoption of improved seeds, mechanization, and modern farming techniques. Supporting value chain development, enhancing market access, and encouraging agro-processing can add value and increase returns for farmers. Additionally, long-term planning should account for climate change impacts, ensuring resilience through investments in drought-tolerant crops, water conservation technologies, and early warning systems.

5.4 Suggestions for Future Research

Future research should investigate micro-level factors such as household production practices, access to credit, market integration, and gender dynamics in agriculture to provide a more nuanced understanding of the sector's challenges and opportunities. Longitudinal studies examining the impact of specific interventions such as irrigation projects, input subsidy programs, or extension services could offer valuable evidence on what strategies are most effective in Somalia's context. Researchers should also explore the effects of climate change on agricultural productivity and economic growth, given Somalia's high vulnerability to droughts and extreme weather events. Employing spatial analyses or regional panel data could help uncover sub-national variations, informing more targeted policy responses. Additionally, studies examining the interconnections between agriculture, industry, and services through input-output or computable general equilibrium models could reveal important indirect growth channels. Finally, research on the role of governance, conflict, and institutional quality in shaping the effectiveness of agricultural investment would provide critical insights for building a more resilient and productive agricultural sector.

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