AGRICULTURAL PRODUCTIVITY AND ECONOMIC GROWTH IN SELECTED WEST AFRICAN COUNTRIES: A PANEL EVIDENCE

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Keywords

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Abstract

Research Problem:
Agriculture accounts for roughly 65% of employment and 20% of GDP in West Africa, yet agricultural total factor productivity remains below the global average, while poverty, food insecurity, and inflation persist. Existing studies have examined climate change and agriculture or agriculture and growth largely in isolation, often using single-country evidence with limited sub-regional generalisability. The long-run effect of agricultural productivity on economic growth, controlling for demographic and capital factors, remains unclear.
Methods/theory:
Using an ex-post-facto research design, this study analyses annual panel data for six West African countries; Nigeria, Ghana, Burkina Faso, Sierra Leone, Senegal, and Côte d'Ivoire from 1986 to 2024, sourced from the WDI and World Bank Climate Change Knowledge Portal. Grounded in Schultz's Transforming Traditional Agriculture theory and a modified Cobb-Douglas framework, the study employs panel Fully Modified Ordinary Least Squares (FMOLS), alongside unit root tests, and Westerlund cointegration tests.
Results:
Agricultural productivity (0.29) positively and significantly affects real GDP per capita, Human capital (0.198) and capital formation (0.174) also exert positive effects, whereas rural population growth (−0.149) has a significant negative effect.
Conclusion:
Agriculture remains a growth engine in West Africa, although constrained by weak productivity-enhancing investment and demographic pressure.
Key Contribution to Knowledge:
The study provides recent sub-regional panel evidence using a cointegration-based estimator and integrates demographic and capital controls into the agriculture–growth relationship.
Recommendation:
Governments should expand investment in mechanisation,

extension, research, modern inputs, education, skills development, and rural development to enhance agricultural productivity and reduce demographic pressure on agricultural land.

1. Introduction

The issue of sustainable and inclusive economic growth has continued to be a challenge for governments in West Africa, both before and after the COVID-19 pandemic. Despite the numerous development programs, agricultural interventions, poverty reduction initiatives and policy measures put in place by national governments and international development institutions, the sub-region is still grappling with deep-rooted poverty, food insecurity, unemployment and rising cost of living. In West and Central Africa an estimated 55 million people are projected to face hunger, due to high staple-food prices, conflict and inflation (Reuters, 2024). These challenges hinder progress to achieve SDG 1 (No Poverty) and SDG 2 (Zero Hunger). Weak employment opportunities and unstable economic conditions hinders progress to SDG 8 (Decent Work and Economic Growth). These persistent challenges have raised the demand for policies that can deliver sustained economic growth, improved livelihoods, and more resilient food and productive systems.

Agriculture occupies a central position due to its significant contribution to employment, livelihoods, food supply, foreign exchange earnings and economic activity. The sector constitutes about 65% of employment and 20% of Gross Domestic Product (GDP) in West Africa (Ogundari, 2021). The sub-region is also a huge player in meeting Africa's food needs, accounting for about 30% of the continent's total food requirements (FAO, 2020). Thus, improving agricultural productivity is important not only for food security but also for employment generation, poverty reduction, rural transformation and aggregate economic growth. But the importance of agriculture is not a simple matter of the amount of agricultural production. Its role in development depends increasingly on how efficiently land, labour, capital, technology, water and other inputs are turned into agricultural output.

The policy environment therefore places more emphasis on transforming agriculture from predominantly traditional and low productivity production systems to more productive, commercially orientated, technology supported and climate resilient systems. Such transformation would require investment in mechanisation, better seeds and other modern inputs, irrigation, agricultural research and extension, rural infrastructure, storage and processing facilities, market access and human capital. These policy priorities are especially critical in West Africa where the sector remains highly vulnerable to climate and structural constraints. Thus, the effectiveness of agricultural policy depends not only on the expansion of agricultural production but also on the ability of economies to increase productivity and to translate productivity gains into wider improvement in income and economic welfare.

The theoretical basis for this transformation is provided by Schultz's Transforming Traditional Agriculture theory. Schultz maintains that traditional agriculture, with its technological limit, can be productive but to boost productivity substantially, investment in modern inputs, technology, knowledge and human capital is needed. This perspective suggests that agricultural transformation is not only about the quantity of traditional inputs but also about the quality and productivity of the factors employed in agriculture. This theoretical proposition is particularly relevant in West Africa where agricultural systems are vulnerable to insufficient technology,

restricted access to modern inputs, poor infrastructure, inadequate extension services and constraints on human capital. The theory thus provides a useful framework to examine if increases in agricultural productivity can lead to broader economic growth. In this study we extend this view by incorporating agricultural productivity, human capital, rural population growth and capital formation into a modified Cobb-Douglas framework.

The efficiency of agricultural output is the efficiency of turning inputs like land, labour, water, seeds, fertiliser and capital into output. It can be measured as output per unit of land or labour, or more generally as total factor productivity (Desai, 2017; Adekanmbi & Olaniyi, 2026). The growth of agricultural productivity in West Africa remains a concern despite its importance. Evidence shows that the rate of productivity growth has slowed down while per-capita gross domestic product (GDP) has in some cases grown faster than per-capita agricultural GDP. This could imply a possible reduction in the relative contribution of agriculture to overall economic growth (Opadeji & Oke, 2026). This is because of the inter-related structural constraints including political instability and conflict, soil degradation, climate change, erratic rainfall, water scarcity, limited access to productive inputs, poor rural infrastructure, increasing poverty and weaknesses in food systems (Ogbonna et al., 2013; UNECA, 2012). These constraints could be a hindrance for farmers to adopt productivity enhancing technologies, and could also mean that the extent to which improvements in agriculture translate into growth is limited (van Niekerk, 2020; Adekanmbi & Olaniyi, 2026).

Many West African economies have experienced periods of decent aggregate GDP growth but poverty, food insecurity and economic vulnerability remain widespread (King & Ramlogan-Dobson, 2015; Ogundari & Awokuse, 2018). This raises an important empirical question of whether higher agricultural productivity leads to better aggregate economic performance and how large is this effect when other demographic and productive factors are controlled for.

The answer is particularly important because agricultural productivity works through several potential channels. Higher productivity can lead to increased output and income on farms, reduce production costs, improve food availability, create employment, stimulate agro-processing and other non-farm activities, and boost domestic and export markets. Such benefits, however, may be limited by rapid growth of population in the rural areas, inadequate human capital and insufficient capital formation. If productivity does not increase sufficiently, a growing rural population could increase pressure on agricultural land, while shortages of education and skills can inhibit the capacity of farmers to embrace new technologies. Similarly, lack of investment in physical capital, including irrigation, roads, storage, processing facilities, and other infrastructure may impede the transmission of gains in agricultural productivity to broader economic growth.

Several studies have investigated agriculture–growth nexus using different perspectives; however, significant gaps remain. Most studies focuses either on climate change and agriculture or on agriculture and economic growth, using single-country evidence which limits its generalisability to West Africa (Wade & Jennings, 2016; Du et al., 2017; Cui, 2020). Empirical evidence on Sub-Saharan Africa produced mixed results; Ogundari (2021) found a significant negative relationship in their study on 35 countries from 1981 to 2010 which is consistent with the findings of Adekanmbi and Olaniyi (2026). However, Christopher et al. (2024) found a significant positive relationship in their study on Nigeria.

The research problem examined in this study is therefore derived from the intersection

of three conditions in West Africa: the continuing economic and livelihood significance of agriculture, the continuing weaknesses in agricultural productivity and uncertainty about the extent to which productivity gains translate into aggregate economic growth. However, the existing studies provide useful evidence and there is limited recent sub-regional evidence of the relationship between the two over a long period of time across a range of West African economies while controlling for human capital, rural population growth and capital formation. Results from studies with larger samples of Sub-Saharan Africa cannot be generalised to West Africa, where there is significant variation in agricultural systems, climate, demographic pressures, institutional environments, and levels of economic development. Thus, an in-depth analysis is required to assess whether agricultural productivity acts as a growth-enhancing mechanism under the particular structural conditions of West Africa.

Against this background, the objective of this study is to investigate the effect of agricultural productivity on economic growth of selected West African countries from 1986 to 2024. Specifically, the study aims at: (a) examining the long run effect of agricultural productivity on real GDP per capita in some West African countries; (b) establishing the extent of human capital contribution to economic growth within the framework of the agricultural productivity-growth nexus; (c) assessing the effect of rural population growth on economic growth; and (d) analysing the role of capital formation in economic growth, controlling for agricultural productivity.

The study seeks to answer the following research questions:

1. What is the long-run effect of agricultural productivity on economic growth in selected West African countries from 1986 to 2024?
2. What effect does human capital have on economic growth when agricultural productivity considered in selected West African countries from 1986 to 2024??
3. How does rural population growth affect economic growth in the selected West African countries?
4. What is the contribution of capital formation to economic growth within the agricultural productivity–growth relationship?

This study makes a number of contributions to the literature. Firstly, it offers recent sub-regional evidence for the period 1986-2024 for six West African countries: Nigeria, Ghana, Burkina Faso, Sierra Leone, Senegal and Côte d'Ivoire. The choice reflects differences between Anglophone and francophone economies, and between Sahelian and coastal agro-climatic environments. Second, the study examines agricultural productivity in a broader growth context that includes human capital, rural population growth and capital formation, thus recognising that the growth effects of agriculture may depend on complementary productive and demographic conditions. Third, the study uses the panel cointegration techniques and the Fully Modified Ordinary Least Squares (FMOLS) estimator to examine the long-run relationship among the variables. This is in line with the theoretical proposition of the study that agricultural transformation and productivity increases can have an impact on long-run economic performance.

2. Literature Review

The literature on the relationship between agricultural productivity and economic growth is long and changing. Both classical and modern theories shape our understanding of the field. The fundamental argument of Schultz's (1964) Transforming Traditional Agriculture is that productivity in traditional

farming systems is constrained by limited access to technology, modern inputs and human capital. In this vein, the Lewis dual-sector model (Lewis, 1954) envisioned development as the transfer of labour from agriculture to sectors with higher productivity, a process called structural transformation. The transformation framework has been theoretically extended to specify how farm size, wage gaps and trade costs affect the speed and extent of agricultural transformation especially in low- and middle-income countries (Deininger, Jin & Ma, 2022; Christopher, et al., 2023). The empirical evidence on the agriculture-growth linkage is still mixed in Africa. Ogundari (2021) found a negative long-run effect of agricultural TFP on economic growth using panel data for 35 Sub-Saharan African countries. On the contrary, Adeleke et al. (2024); Christopher, et. al. (2024), found a significant positive relationship between agricultural productivity and growth in Nigeria and the ECOWAS sub-region. Badiane and Makombe (2014) also highlight the differential impacts of agriculture-led development policies. Gollin (2023) argued that productivity gains must be supported by institutional and structural reforms to achieve sustained and inclusive growth. Further evidence from Wollburg et al. (2024) and Dablanan, Fuglie, and Goyal (2026) indicates that countries such as Ghana and Senegal achieved productivity growth thanks to strategic investments in agricultural research, infrastructure, and value chains.

However, these studies also caution that such gains are not uniform and that there is considerable degree of heterogeneity both between and within countries. The number of single country analyses has grown, but there is a recognised need for multi-country, panel-based studies to capture the heterogeneity of development experiences across West Africa. Climate change and environmental change are now seen as key drivers of agricultural outcomes and economic growth (Belford et al. 2020). For country-specific data from Nigeria and other African contexts on the statistically significant, negative long-run consequences of climate change on productivity and growth, see Arogundade et al. (2024) and Okonkwo et. al (2026). Christopher, et al. (2023) provide an additional distillation of a stream of studies emphasising the critical importance of climate adaptation and investment in local agriculture R&D and institution building to improve resilience. The interface between human capital, demographic pressures and rural development has been a major issue in the literature.

(Ogundari and Awokuse, (2018) found that improvements in education and health are strongly associated with improvements in agricultural productivity and therefore economic growth. On the micro level, Andersson Djurfeldt et al. (2018) show that both intensification and diversity are central to wider rural change and both are beneficial to agrarian households. However, evidence in King and Ramlogan-Dobson (2015) and Dada et al. (2024) shows that rapid growth in rural populations without a similar rise in productivity leads to land fragmentation, underemployment and declining marginal returns, thus reducing the development impact of agriculture. A critical synthesis and comparison of these works reveals that the field is characterised by both empirical and theoretical gaps. Many existing studies focus narrowly on a single country or fail to properly account for the effects of demographic, capital and climate variables. The literature also emphasises that the importance of agriculture is well understood, but the precise mechanisms, especially how agriculture interacts with other factors such as human capital and climate change to influence growth, are less explored rigorously in a panel-data context. Moreover, very few studies explicitly connect theoretical models of structural transformation with empirical analysis at sub-regional level using robust econometric techniques.

This study fills these gaps directly. It draws on a wide and up-to-date literature, organises insights thematically and provides a critical comparison and synthesis of a range of scholarly perspectives. The paper uses recent multi-country panel data covering six West African countries (1986-2024), includes demographic, capital and climate variables and anchors the empirical approach on robust theoretical frameworks. In so doing, it provides new evidence on the long-run relationship between agricultural productivity and economic growth, explains how human capital and demographic pressure influence this relationship, and fills specific gaps in previous single-country and narrowly focused studies.

3. Methodology

The study adopts an ex-post-facto research design using annual panel data for six West African countries Nigeria, Ghana, Bcurkina Faso, Sierra Leone, Senegal, and Côte d'Ivoire covering 1986 to 2024. These countries were purposively selected to reflect the economic, climatic, and institutional diversity of West Africa, spanning both Anglophone and Francophone blocs and Sahelian and coastal agro-climatic zones. Data were sourced from World Development Indicators (WDI, 2024) and World Bank Climate Change Knowledge Portal (2024). The key variables relevant for this study include real GDP per capita (dependent variable, measuring economic growth), agricultural value added (AGR, the core productivity variable), human capital (HUG, represented by secondary school enrolment), rural population growth (RPO) and gross capital formation. This gives a broad representation of sub-regional trends in the results, while also providing strength in empirical investigation.

3.1 Model Specification

Following the theoretical framework, the long-run relationship between agricultural productivity and economic growth is specified as:

$$GDPit = Y + \varphi 1GDPit\text{-}r + \varphi 2AGRit + \sum_{ñ=1}^{2} \delta ñ\ CNñ,it\text{-}r + ñi + Xt + Uit \quad \ldots\ldots 1$$

$$GDPit - GDPit = Y + \varphi 1(GDPit\text{-}r - GDPit\text{-}2r) + \varphi 2(AGRit\text{-}AGRit - r) + \sum_{ñ=1}^{2} \delta ñ\ (CNñ,it\text{-}r - CNñ,it\text{-}2r) + (xt - xt\text{-}r) + (uit - uit - r) \quad \ldots\ldots 2$$

where GDP_{it} denotes real GDP per capita for country i in year t, AGR_{it} is agricultural value added, CN captures control variables (human capital, rural population growth, and capital formation), η_i represents country-specific effects, X_t is a vector of exogenous macro variables, and U_{it} is the idiosyncratic error term. The lag length for the model was determined using a combination of Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC), ensuring robustness to autocorrelation and dynamic structure. The selected lag minimizes information criteria across countries and variables, with additional sensitivity checks performed. Climate variables; specifically average annual temperature and precipitation are explicitly included in the FMOLS regression which allows the model to control directly for climate effects when estimating the long-run impact of agricultural productivity and other variables on economic growth.

To account for potential endogeneity and serial correlation, the model is estimated in first-differenced form and via the panel Fully Modified Ordinary Least Squares (FMOLS) estimator, which corrects the conventional OLS estimator using long-run covariance matrices; country-specific FMOLS estimates are then averaged to obtain the panel estimate. Prior to estimation, the Levin–Lin–Chu and Fisher-type panel unit root tests were used to

establish the order of integration of the series, and Kao, Pedroni, and Westerlund cointegration tests were used to confirm the existence of a long-run equilibrium relationship among the variables, justifying the use of FMOLS.

Description and Sources of Data

A concise overview of the data is given in Table 1, which also includes the names of the variables, data sources, and remarks utilised in this investigation of economic development, agricultural production, and climate change. The variables utilised are continuous country-level indicators, informed by empirical literature and theories.

Table 1 Definition of Variables and Sources of Data

Variables	Definition	Data Source
Economic growth (Real GDP)	Dependent variable, proxying economic growth	World Bank World Development Indicators (WDI, 2024)
Human Capital (HUG)	Proxied by secondary school enrolment	World Bank World Development Indicators (WDI, 2024)
Rural Population Growth (RPO)	Annual percentage growth rate of rural population.	World Bank World Development Indicators (WDI, 2024)
Temperature (TEMP)	Temperature denotes the yearly mean surface temperature (expressed in degrees Celsius).	World Bank Climate Change Knowledge Portal (2024)
Rainfall (RAI)	Rainfall denotes the yearly average precipitation (quantified in millimetres) acquired by a nation.	World Bank Climate Change Knowledge Portal (2024)
Carbon Emission (Co2)	Carbon emission per metric ton (CO2 emissions (kg per 2010 US$ of GDP)).	World Bank World Development Indicators (WDI, 2024)
Agriculture (AGR)	Agricultural productivity is quantified by the value added in agriculture (encompassing forestry, hunting, and fishing) as a percentage of GDP. (current US$))	World Bank World Development Indicators (WDI, 2024)

Source: Authors, 2026.

4. Results and Discussion

Schultz's theory of Transforming Traditional Agriculture is the basis of this study's analysis. Schultz believes that agricultural productivity in traditional societies is limited by the failure to adopt modern technology and the lack of capital and the failure to invest in human capital. Schultz argued that productivity gains were possible through the introduction of modern inputs, the improvement of education, and the possibility for farmers to make economically rational decisions. Schultz's theory was originally formulated to explain mid-20th century agriculture, but this study adapts and extends the theory to contemporary West African economies where agricultural systems are confronted by the familiar and the new, including climate change, demographic pressures, and changing capital markets.

Schultz's insights are uniquely combined with the realities of modern West African agriculture in this study. Previous applications

have typically focused on the binary switch from traditional to modern agriculture, while the present study explicitly includes variables reflecting human capital (education), capital formation, demographic dynamics and climate variability. This adaptation recognises that productivity is not only a function of technology adoption but also depends on human resources, capital investment and environmental conditions in today's context. The study also links Schultz's theory with the modified Cobb–Douglas production function, thereby operationalising theoretical constructs as empirical variables. These include agricultural value added (for productivity), secondary school enrolment (for human capital), gross capital formation, rural population growth and climate variables (temperature and precipitation).

But the limits of Schultz's theory are reached in the contemporary context. As a product of mid-century traditional agriculture, it does not explicitly address the complex nature of globalised markets, rapid technological change, urbanisation and the multi-sectoral dynamics now present in West African economies. The stress on input adoption in the theory may also underestimate the roles of institutions, infrastructure and market access in determining productivity today. Recognizing these limitations, this study draws on endogenous growth theory as a complementary perspective. Endogenous growth models (Romer, 1990; Lucas, 1988) emphasise the significance of human capital accumulation, innovation and knowledge spillovers in sustaining long-run growth, which are increasingly relevant for modernising agricultural sectors.

4.1 Correlation Analysis

Correlation analysis will be carried out to determine the nature and strength of the relationships between the study variables and to check for possible multicollinearity. The results indicate that none of the explanatory variables has a correlation above ±0.80 which indicates absence of serious multicollinearity and justifies their inclusion in the econometric model. Real GDP per capita is generally weakly correlated with the explanatory variables. Human capital and resource costs are weakly positive in association with economic growth, whereas carbon emissions, temperature, precipitation, and agricultural production are weakly negative in association. Climate variables also display some relationships, particularly between temperature and carbon emissions, while precipitation has generally weak associations with other variables.

Table 1: Correlation Matrix

Variable	log_rgdp	Loghug	log_rpof	log_CO2	logtemp	logpre	log_agrf
log_rgdp	1.000						
Loghug	0.006	1.000					
log_rpof	0.067	-0.539	1.000				
log_CO2	-0.135	0.714	-0.318	1.000			
logtemp	-0.124	0.325	-0.419	0.267	1.000		

Variable	log_rgdp	Loghug	log_rpof	log_CO2	logtemp	logpre	log_agrf
Logpre	-0.062	-0.027	0.148	-0.178	0.000	1.000	
log_agrf	-0.078	0.200	-0.129	0.134	0.034	-0.001	1.000

Sources: Authors' Computation 2026

4.2 Unit Root Tests

The results in Table 2 below shows that all variables are non-stationary at levels but become stationary after first differencing. Real GDP per capita, resource prices, carbon emissions, agricultural output, human capital, temperature, and precipitation all fail to reject the null hypothesis of a unit root at levels but reject it strongly at first differences. This implies that the variables are integrated of order one, I(1), across both unit root testing approaches. The findings are consistent despite using different panel unit root test which aligns with economic theory.

Table 2: Unit Root Tests

Variables	Levin- Lin-Chin Panel Unit root			Fisher-Panel type unit-root test		
	Levels	1st Diff	Order	Levels	1st Diff	Order
Rgdp	0.4189	-7.1175 *	$i(1)$	11.6878	140.1997*	$i(1)$
Rpof	13.6477	6.4045*	$i(1)$	0.2190	0.4027*	$i(1)$
Co2	4.3799	5.0642*	$i(1)$	5.7677	14.8948*	$i(1)$
Agric	-4.2142	-10.0125*	$i(1)$	76.0635	291.0580 *	$i(1)$
Lnhug	-1.8271**	-62691*	$i(1)$	3.9910	45.5904 *	$i(1)$
Lntemp	-2.4505 *	-20.6930*	$i(1)$	35.7712	252.0956*	$i(1)$
Lnpre	-2.6512 **	-12.7502 *	$\boldsymbol{i(1)}$	10.9435	432.5238*	$\boldsymbol{i(1)}$

Sources: Authors' Computation 2026

Table 3: Panel Cointegration Tests

Test Statistic	Statistic	5% Decision	Inference
Kao cointegration test	-1.8275 (0.0338)	Reject H_0	Cointegration exists
Pedroni cointegration	-11.3332 (0.0000)	Reject H_0	Cointegration exists
Westerlund test	-6.0473(0.0000)	Reject H_0	Cointegration exists

Source: Authors' Computation 2026.

4.3 Panel FMOLS Results

Table 4 presents the long-run panel FMOLS estimates of the effect of agricultural productivity and selected control variables on economic growth in the sampled West African countries. The results shed light on agriculture's role as a channel through which structural conditions shape economic performance in the region.

From the result below, it shows that the coefficient of agricultural productivity (AGR) is positive and statistically significant at the 1 per cent level. The coefficient estimate of 0.286 implies that for every 1 unit increase in agricultural value-added there is an increase of about 0.29 unit in real GDP per capita in the long run. This finding established the importance of the agriculture sector in West African economies, where a significant percentage of the population is active in the industry. The magnitude of the coefficient suggests that advancement in agricultural efficiency through technology, mechanisation, irrigation and climate adaptive techniques can bring about large scale growth benefits and contribute significantly toward poverty reduction and food security.

Human capital (HUG) also positive and statistically significant effect on economic growth again. The coefficient of 0.198 shows that improvements in education lead to an increase in productivity of the agricultural and non-agricultural sectors. Thus, availability of skilled labour contributes to value enhancement and structural evolution.

Rural population growth (RPO) has a negative and statistically significant (−0.149) impact on economic growth. The results indicate that the increase in the rural population without a corresponding increase in productivity results in land fragmentation, underemployment and decreasing marginal productivity, thus constraining growth. Capital formation exert a significant positive (0.174) impact on economic growth. Agricultural infrastructure investment, on rural roads, irrigation, storage, processing plants, enhanced productivity, thus improved economic growth within the study period.

Table 4: Panel FMOLS Results: Dependent Variable:

Real GDP per capita (Economic Growth)

Variable	Coefficient	Std. Error	t–Statistic	Probability
Agricultural Productivity (AGR)	0.286	0.092	3.11	0.002***
Human Capital (HUG)	0.198	0.069	2.87	0.004***
Rural Population Growth (RPO)	−0.149	0.061	−2.44	0.015**
Capital Formation	0.174	0.083	2.10	0.036**
Constant	2.647	0.762	3.47	0.001***
R–squared	0.74			

Variable	Coefficient	Std. Error	t–Statistic	Probability
Adjusted R–squared	0.71			

Note: *** and ** denote significance at 1% and 5% levels respectively.

Source: Authors, Computation 2026.

4.4 Discussion of Findings

The coefficient on agricultural productivity (AGR) is positive and statistically significant at the 1 percent level, with a magnitude of 0.286. This implies that a one-unit increase in agricultural value-added raises real GDP per capita by approximately 0.29 units in the long run. These results underscore the importance of agriculture in West African economies where a large share of the labour force is employed in agricultural activities, and gains in productivity can be achieved through the adoption of technology, mechanisation, irrigation and climate-resilient methods, which can yield large economic benefits, in addition to reducing poverty and increasing food security.

The coefficient of HUG (human capital) is 0.198 and is positive and statistically significant indicating the positive relationship between education and productivity in both agricultural and non-agricultural domains. The more knowledgeable the farmers, the more likely they are to adopt advanced technologies and climate-resilient practices. Again, a more capable labour force would typically encourage value creation and structural change and thus strengthen the links between education and agricultural output for sustainable progress.

In contrast, the coefficient of rural population growth (RPO) is negative and statistically significant (–0.149), indicating that rural population growth has a negative effect on economic growth even when agricultural productivity is included. This is in conformity with land fragmentation, underemployment and falling marginal productivity in rural areas as population growth outstrips productivity improvements.

The capital formation coefficient (0.174) is significant and remarkable. Investments in physical assets such as irrigation systems, storage facilities, rural roads and processing infrastructure, increase productivity and market access, hence increasing the contribution of agriculture to economic growth. The model explains about 74 percent of the variation in economic growth, establishing a long-run relationship among variables in the study period. This negates the findings of Ogundari (2021) on 35 Sub-Saharan African countries. The differences could be attributed to the different national composition, period of study and the explicit inclusion of human capital and capital formation in this study, which seem to affect the correlation between agricultural productivity and overall growth.

The results instead align more closely with Christopher, Nungul and Aigba (2024) who found a positive contribution of agricultural productivity to economic growth in Nigeria, and lend support to the view that agriculture, when accompanied by complementary investment in human and physical capital, functions as a genuine growth engine rather than a drag on West African economies.

5. Conclusion and Recommendations

This study adds to the literature by providing strong panel evidence of the long run relationship between agricultural

productivity and economic growth in six diverse West African countries. Using a modified Cobb-Douglas framework that incorporates human capital, capital formation, demographic and climate variables, the study overcomes the limitations of previous single-country or narrowly focused studies and applies the analysis to Schultz's theory and complementary endogenous growth perspectives. The results reveal that agricultural productivity with investment in education and capital formation has a positive and significant impact on economic growth in the region. But demographic pressures, if not offset by productivity gains and rural transformation, can undermine these benefits and climate variability is an important factor behind the outcomes.

The study's key contribution is its comprehensive and integrative approach, which gives new empirical insights into the mechanisms via which agriculture is linked to economic growth in contemporary West Africa. By explicitly modelling demographic and environmental variables in addition to measures of productivity and human capital, the research emphasises the complex mix of factors that determine growth trajectories in the region.

Based on these findings, a number of actionable recommendations are made. "Policymakers should give priority to investment in agricultural mechanisation, extension services, research and access to modern inputs. Education and skills development should be regarded as vital complements to agricultural efforts that strengthen the sector's capacity to innovate and adapt. Furthermore, rural infrastructure, market access and non-farm employment opportunities need to be improved to reduce demographic pressure on land and to promote sustainable rural livelihoods.

Future research should explore the possibility of disaggregating agricultural productivity by sub-sector, such as crops, livestock, and fisheries, so as to better capture heterogeneity in effects and thus further advance understanding in this field. Further insights into the moderating factors may come from exploring the roles of institutional quality, financial access and technological change. Dynamic panel methods or causal identification strategies would help make inferences about directionality and mechanisms. Moreover, future studies should evaluate the effects of climate adaptation policies and innovations at both national and sub-regional levels.

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