



Food Security, Information and Communication Technology (ICT) and Economic Growth in ECOWAS

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ABSTRACT

ICT is essential in securing food security by supplying farmers with crucial information, such as weather forecasts and crop pricing, and for educating them about modern farming practices. Therefore, the important issue of concern in this study is to what extent food security interacts with ICT to promote economic growth in ECOWAS? And, what is the causality between food security and economic growth in ECOWAS? Hence, the objectives would be to investigate the extent to which food security interacts with ICT to promote economic growth in ECOWAS and assess the causality between food security and economic growth in ECOWAS. The study employed secondary data over the sample period of 2001 to 2022 as sourced from the World Bank World Development Indicators. After establishing the interaction effect between food security and ICT to promote economic growth in ECOWAS, the study on the basis of Granger Causality, found that there is bidirectional causality between food security and economic growth. Hence, based on the findings of the study, it is recommended that there should be utilization of mobile technology for agricultural extension services, investment in agricultural skills training, and job creation programs by the governments of ECOWAS countries. These would equip farmers with the capacity to utilize ICT for maximum agricultural output and enhance regional cooperation and trade.

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INTRODUCTION

Food security has become an issue of concern to economies of the world, due to a number of factors, such as population increase, climate change, and water scarcity (Food and Agriculture Organization, 2010). Meanwhile, the achievement of food security is a prerequisite for the sustainability of economic growth in an economy. Without a plan to ensure food security, nations will be forced to pay a significant portion of the costs associated with boosting domestic food production and reducing their reliance on food imports. A large reliance on food imports will result in food security issues with high rates of chronic malnutrition, restrictions on the development of human capital, high poverty rate, decreased labor

productivity, decreased life expectancy, and decreased economic growth.

However, it has been discovered that information and communication technology (ICT) is relevant to and useful in all facets of life, including banking, education, business, agriculture, religion, politics, and communications. Many observers and economic pundits in agriculture agree that knowledge is a prerequisite to achieving food security. Therefore, ICT has the potential to give the necessary information for enhancing food security. ICT thus encompasses a wide range of both conventional and contemporary media and is defined as the collection of hardware and software utilized for data production, preparation, transfer, and storage

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via devices like computers, radio and televisions (Norad, 2017). In addition, the agriculture industry has already undergone significant changes as a result of the proliferation of mobile phones in rural areas. In the context of developing nations with weak infrastructure, lowering this cost encourages market access, makes financial inclusion and risk management easier, and may be at the core of a revolution in agricultural extension.

Ugwuishiwi, Udanor and Ugwuishiwi (2018) claim that in a developing nation like Nigeria, farmers can be informed through the use of mobile phones, traditional media like community radio or television, computer, geographic information systems, printed documents, e-mail, SMS, or the Internet, among other things, to disseminate information that enables even small-scale farmers who are illiterate to use ICTs. A farmer who has access to the most recent information regarding his farming operation is more likely to be well-informed and be ahead of his colleagues. Particularly when it comes to getting instant information on food security and agricultural sustainability. Many services, including extension assistance, are offered to farmers using ICTs in the global agriculture and food sectors by ICT businesses, multinational farm input companies, large machinery manufacturers, as well as small and medium farm input providers. Using ICTs, supermarkets and agricultural product buyers participate in the food value chain. Farmers' cooperatives, international organizations, civil society, and governments also use ICTs to successfully disseminate information on a variety of agricultural topics.

Hence, food security is achievable in ECOWAS, given the vast agricultural resources in the region, including abundant labour. Consequently, employing technology to achieve food security may translate to high rates of economic growth, which will be in the interest of ECOWAS. Therefore, in line with the issues of concern raised in this study, the important questions this study stands to address are: to what extent does food security interact with ICT to promote economic growth in ECOWAS? And, what is the causality between food security and

economic growth in ECOWAS? Therefore, the objectives would be to investigate the extent to which food security interacts with ICT to promote economic growth in ECOWAS and assess the causality between food security and economic growth in ECOWAS. On the basis of the above, the present study contributes to the literature on food security and economic growth in the context of Sub-Saharan Africa in general and ECOWAS in particular.

The study consists of five sections. Following the background to the study, section two discusses relevant literature, while section three outlines the theoretical framework and methodology of the study. The presentation of the results of the analysis and their discussion was done in section four. And, Section five summarises the study, conclusion, and policy recommendations based on the findings.

LITERATURE REVIEW

There is a plethora of studies that explain how the use of ICT will propel Africa's change and lead to food security. For instance, by deploying ICT and engaging in innovative activities, food security is supported by ICT and agricultural innovation (e-agriculture) in three main areas: production, postharvest storage, and the supply value chain (Anser, 2021). It should be highlighted that although production is crucial for guaranteeing food security, other elements like access to food and usage are also significant (Anser, 2020). To ensure food security, ICT is essential for supplying farmers with crucial information, such as weather forecasts and crop pricing, and for educating them about contemporary farming practices. Using the system-GMM, Anser (2021) examined the relationships between social inclusion, innovation, and food security in 15 West African nations and discovered that one of the factors influencing food security in Africa is innovation.

The marketing and sales of farm products, where farmers have easy access to markets, is another significant area where ICT and innovation assure food security. Farmers can obtain information on market prices, inputs, and locations where they can sell their produce for



higher prices. For instance, farmers in Uganda who got pricing information via radio raised their crop revenues by up to 55%, according to Svensson and Yanagizaw's (2019) research. Similarly, the adoption of mobile phones among grain sellers in Niger, according to Aker (2010), has allowed them to access price information over a wider area and sell grains in more markets. In order to increase traders' ability to buy and sell through markets and increase consumers' access to food, grain price dispersion was decreased by 10% to 16%. All facets of the food system and the value chain of agricultural produce find use in information and communication technology.

Oluwatayo and Ojo (2019), citing Zyl, Alexander, Graaf, Mukherjee and Kumar (2012), state that ICT is used in three key areas of the food production value chain. The pre-cultivation, crop cultivation, and post-harvest stages are described here. The authors claim that ICT can be used for a variety of pre-cultivation tasks, such as crop selection, land selection based on topography and soil analysis, among other things, calendar definition for planning farm operations based on weather, activity, and season, and access to credit and input markets. ICT is utilized for input management, water management, fertilization, pest control, and land preparation and sowing at the second stage. The third stage includes, among other things, marketing, shipping, packaging, and food processing. All of this aim to increase productivity and advance food security.

Some African nations, including Senegal, Ghana, Uganda, Cameroon, Kenya, Tanzania, Malawi, Zambia, Botswana, Gabon, and Zimbabwe, as well as many others, have embraced the idea of using ICT in agriculture sustainability and food security. ICT can be used to increase food security in a number of ways, as noted by Lashgarara, Mirdamadi, Hosseini and Chizari (2008), these include (i) improving access to real-time market information, (ii) encouraging agricultural diversification, and (iii) enhancing the knowledge base of small agricultural businesses by enhancing access to global knowledge bases, such as the internet. In the same vein, in an attempt to measure the impact of food security on economic growth directly and through poverty, life

expectancy, and total employment, it was discovered by Manap and Ismail (2019) that food security has an impact on economic growth, especially in dry-land developing countries. This research has identified that food security has a significant positive impact on food security, as an increase in food security increases economic growth. Nonetheless, food security also has an impact on economic growth in terms of life expectancy, total employment, and poverty, whereas life expectancy and total employment with better food security have a positive impact on economic growth, reducing poverty, achieving food security and enhancing economic growth.

Similarly, Adegboye (2018) asserts that the paper on food security as a path to sustainable economic development demonstrates the significance of food security and how it may lead to sustainable economic growth. The article makes the urgent call for public policy makers to recognize food security as a critical component of sustainable economic growth and to muster the political will necessary to boost food production, implement food policies, and eventually achieve food security for all. Osabohien, R., Osabohien, E. & Urhie, E. (2018), in their joint study on food security, institutional framework and technology using the ARDL approach concluded from their result that there's a high level of food insecurity which results from low little or no attention to food production which is caused by the reliance on the oil sector which is the country's major export hence there is a need for a policy to change the trend.

Anser (2021) investigated into how the adoption of information and communication technologies (ICTs) and governance interact to affect food security in West Africa. The study used a panel data of 15 West African countries within the sample period of 2005 and 2018, as collated from World Development Indicators (WDI) and World Governance Indicators (WGI). Using the generalized method of moments (GMM) technique. The results demonstrate that excellent governance, which include, effective administration and effective anti-corruption control can increase food security by 12% to 20%.



The results also indicate that a 1% increase in ICT usage might increase food security by 12% to 15%. The association between governance and ICT use is positive and substantial in describing the level of food security. This suggests that the relationship between ICT and governance (government effectiveness) may have a 15% positive impact on food security, while the link between ICT and the prevention of corruption may have an 8% beneficial impact. The report closes by advising that good governance and ICT adoption are essential to enhancing food security in West Africa. In addition, the performance of the agricultural sector was investigated in the study of Osabohien, Osabuohien and Urhie (2019), the authors looked at Nigeria's institutional setting in relation to food security. According to the study, huge investments in agricultural production and expanded finance options will boost food security by 2% and lower Nigeria's under-nutrition rate by 18%. According to Olofin, Olufolahan and Jooda (2015), the inadequate institutional structure has prevented many Nigerian farmers from obtaining finance.

Tinta *et al.* (2018) examined the advantages of global value chains over regional integration in promoting economic growth and ensuring food security. The study investigates whether countries should employ policies to promote regional commerce or devise ways to increase international trade. Two models with panel fixed effects are estimated in the study. The results show that regional integration needs to be strengthened and better promoted in order to enhance each country's ability to switch from discontinuous to sustained growth. For ECOWAS countries, increasing trade is not a more effective way to spur economic growth. Nevertheless, backward integration has a positive effect on food security, thereby suggesting that participating in the value chain has spillover effects on a country's food security. A joint effect of intra-regional trade and value chains trade can boost food security. This strategy optimizes economic growth and food security.

Aminou *et al.* (2020) highlight the strategic importance of rice in ensuring food security in West Africa. However, the region's

dependence on rice imports has been growing due to an ongoing and structural deficit. Domestic rice value chains in the region face challenges related to technology, finance, and coordination. Consequently, West Africa is highly susceptible to disruptions in international and local trade, such as those caused by the COVID-19 pandemic. Building upon existing evidence on the state of domestic rice value chain upgrading in West Africa, the study aims to anticipate the effects of the COVID-19 pandemic on the resilience of rice value chains and their ability to sustain food security in the region. The authors propose several policy options to assist West African governments in mitigating the impacts of the COVID-19 crisis on food security.

Muto and Yamano (2019) investigated the impact of mobile phone-based money transfer services in rural Kenya's agriculture sector. Their study expands the current literature by examining how these services, facilitated by mobile phones and new ICT tools, contribute to financial intermediation and the inclusion of marginalized individuals. Using a propensity score matching technique, the researchers analyzed the effects of mobile phone-based money transfer services on agricultural input use, commercialization, and household incomes among 379 randomly selected farm households in three Kenyan provinces. The results demonstrate that utilizing these services led to a significant increase in annual household input use by \$42, agricultural commercialization by 37%, and annual household income by \$224. The study concludes that mobile phone-based money transfer services effectively address the market failure farmers face in accessing financial services, and it discusses the implications for policy and practice.

Ebrima and Mohamed (2022) conducted an econometric analysis to examine the impact of climate change on food security, economic growth, population growth, and the agriculture sector in the Gambia. They used data from 1971 to 2020 obtained from the World Development Indicators (WDI) open data bank. Various statistical approaches such as Vector Auto Regression (VAR), Granger Causality, Autoregressive Distributed Lag (ARDL), and Error



Correction Models (ECM) were employed to analyze the data. The findings indicate a positive relationship between food security growth and the agriculture sector, while rainfall variation is negatively correlated with food security. In the short term, population growth has a significant negative impact on food security, but its impact becomes insignificant in the long term. The study recommends policy interventions, including increasing tree planting for better agriculture and environmental conditions, implementing food security programs, poverty reduction initiatives, enhancing adaptive capacity indicators, providing quality and affordable education, improving governance and institutions, and considering an export-oriented economy, as agriculture plays a crucial role in food security in rural Gambia.

Orer *et al.* (2020) aimed to contribute to a better understanding of how ICTs can be adopted in ECOWAS' agriculture, focusing on the mechanisms, potential, and limitations involved. Their analysis also emphasized the significance of e-Agriculture, which utilizes improved ICT processes to drive agricultural and rural development. The review highlighted that the "ultimate consumers" of ICTs play a crucial role in determining the requirements and key success factors for ICT development and implementation in the economic subzone. Ultimately, the study recommends collaborative efforts between the government and NGOs to conduct an informative campaign. This campaign should not only raise awareness but also promote the application of ICTs, enhance power supply, provide more affordable network options, facilitate the translation of technology into local languages, and increase ICT training and utilization in ECOWAS agriculture, with a specific focus on the rural economy.

Seydou *et al.* (2014) carried out a study to investigate the factors affecting household food security in Niger. Based on survey data covering 500 households, drought, high food prices, poverty, soil infertility, disease and insect attacks are reported by the respondents to be the main causes of food insecurity. The empirical results from logistic regression revealed that the gender of the head of household, diseases and pests,

labor supply, flooding, poverty, access to market, the distance away from the main road and food aid are significant factors influencing the odds ratio of a household having enough daily rations. Another important finding is that female headed households are more vulnerable to food insecurity compared to male-headed households. The findings of this study provide evidence that food insecurity continues to affect the Nigerian population.

The reviewed studies suggest that food security is a major issue in most countries of the world and therefore exists significant research interest on the topic. However, there are limited studies relating to food security and growth in ECOWAS as a region in Sub-Saharan Africa with potential to drive the food security agenda for Sub-Saharan Africa on account of the abundant agricultural resources as well as labour, amongst other opportunities. In addition, while there are studies relating ICT to growth, studies relating ICT to growth through food security in general and in ECOWAS in particular are non-existent to the best of the researcher's knowledge. Thus, in bringing together the literature on ICT and growth and food security and growth, the present study fills the aforementioned research gap in the literature.

Theoretical Framework

For this study, the adopted theory is the theory of access. This theory distinguishes between the ability to use resources for one's own benefit and the right to access them. If structural and relational mechanisms like capital, technology, labor, knowledge, authority, market mechanisms, social relations, and identity are absent, people may have the right to access a resource but not necessarily be able to use it productively (Ribot and Peluso, 2018). According to McKay and Colque (2016), using resources requires access mechanisms that go beyond legal requirements or titles; in the absence of such mechanisms, people are excluded. Hence, a farmer, for instance, might be able to use the land but not have access to labor or the money to hire labor.

METHODOLOGICAL APPROACH

Model Specification

This study adapted a modified version of the model specification from Arcand (2001). The modified model specification is expressed below in its general form:

$$GDPPCGR = f(FPROD, MCS, LABF, GFCF, TRPN) \quad (3.1)$$

Where, GDPPCGR represents Gross domestic product per capita growth rate (Proxy for

$$GDPPCGR_{it} = \beta_0 + \beta_1 FPROD_{it} + \beta_2 MCS_{it} + \beta_3 (FPROD * MCS)_{it} + \beta_4 LABF_{it} + \beta_5 GFCF_{it} + \beta_6 TRPN_{it} + \varepsilon_{it} \quad (3.2)$$

Where, GDPPCGR: Gross domestic product per capita growth rate (Proxy for Economic growth), FPROD: food production index (Proxy for food security), MCS: Mobile cellular subscription (Proxy for ICT), LABF: Labour force, GFCF: Gross fixed capital formation, TRPN: Trade openness. β_0 is the intercept term, $\beta_1 - \beta_6$ represent the partial coefficients of food productivity, Mobile cellular Subscription, Labour force, Gross fixed capital formation, and Trade openness. ε is the error term, i refers to individual countries (1 -14), and t is the time period (2001-2022). From equation (3.2), FPROD, MCS, and FPROD*MCS are the central variables of interest

$$\alpha_0 > 0, \alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 > 0, \alpha_5 > 0 \quad (3.3)$$

$$\beta_0 > 0, \beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 > 0, \beta_5 > 0, \beta_6 > 0 \quad (3.4)$$

$\alpha_1, \beta_1, > 0$: This implies that food productivity is expected to have a positive effect on economic growth in ECOWAS, as the variables result in increased growth on account of improved food security. Food Security may aid labour productivity, address hunger, poverty and so on.
 $\alpha_2, \beta_2, > 0$: This implies that ICT measured by MCS is expected to have a positive effect on economic growth in ECOWAS, as it is utilized in the economies of countries for increased growth.
 $\beta_3, > 0$: This implies that Food Productivity interacting ICT measured by MCS is expected to have a positive effect on economic growth in ECOWAS, as it boosts is the economies of countries for increased growth.

Economic growth); FPROD: food production index (Proxy for food security); MCS: Mobile cellular subscription, (Proxy for ICT); LABF: Labour force, GFCF: Gross fixed capital formation and TRPN represents Trade openness. Therefore, equation (3.1) forms the basis for the model for this study, which is to investigate the effect of the interaction of food security and ICT on economic growth in ECOWAS.

for the present study, while Labour force, Gross fixed capital formation, and Trade openness are control variables. FPROD*MCS is the interaction of food security and Mobile Cellular Subscriptions (proxy for ICT).

A Priori Expectation

According to economic theory or empirical data, a priori expectations state the parameters' anticipated signals and relevance. The following are anticipated signals for the model's equation-specified parameters based on theoretical justification.

$\alpha_3, \beta_4, > 0$: This implies that Labour is expected to have a positive effect on economic growth in ECOWAS, as it is utilized in productive activities in the domestic economy of ECOWAS countries. $\alpha_4, \beta_5, > 0$: This implies that GFCF is expected to have a positive effect on economic growth in ECOWAS, as it is utilized in productive activities in the domestic economy of ECOWAS countries.

$\alpha_5, \beta_6, > 0$: This implies that Trade Openness is expected to have a positive effect on economic growth in ECOWAS, as it results in an expanded market with which ECOWAS countries trade with other countries and also a stimulant for



greater production by local enterprises in the domestic economy, as they have an incentive to produce more for greater profitability.

Estimation Techniques

For the study, panel data regression analysis is employed in respect of the stated

research objective. The appropriate panel data analysis technique – fixed effects- was determined based on the outcome of the Hausman test. In respect of research objective two, Granger causality is employed.

Definition of Variables and Data Source

Table 1.1: Definitions, Sources and Measurement of Variables

Variable	Definition	Sources	Measurement
GDP per capita Growth (GDPGR)	This is the rate of change of Gross Domestic Product (GDP) from one year to the next.	World Bank World Development Indicators (WDI)	Percentage
Food Productivity (FPROD)	It covers food crops that are considered edible and that contribute nutrients	World Bank World Development Indicators (WDI)	In decimal figures
Mobile Cellular Subscriptions (MCS)	The number of individuals who subscribe to MCS.	World Bank World Development Indicators (WDI)	Per 100 Individuals
Labour Force (LABF)	This is economically active population of a country.	World Bank World Development Indicators (WDI)	In Millions
Gross Fixed capital Formation (GFCF)	The investment in fixed capital.	World Bank World Development Indicators (WDI)	In Billions of Naira
Trade Openness (TRPN)	This refers to the outward or inward orientation of a given country's economy.	World Bank World Development Indicators (WDI)	% of GDP

Source: Author's compilation (2025)

RESULT AND DISCUSSION

This entails the descriptive and trend analysis of data, then empirical testing using appropriate econometric methods. This section includes two sections: descriptive and econometric analysis. While descriptive analysis explains the pattern of selected variables and how they compare across countries, the econometric

analysis helps to estimate the specified model, as well as the causality analysis.

Trend Analysis of data

The trends of selected variables by country, as well as averages for ECOWAS countries over the period of 2001 to 2022, are presented and discussed in this section of the study.

Distribution of Average Food Production Index of ECOWAS countries

Figure 1 is the distribution of the average food production index of ECOWAS countries over the period of 2001 to 2022.

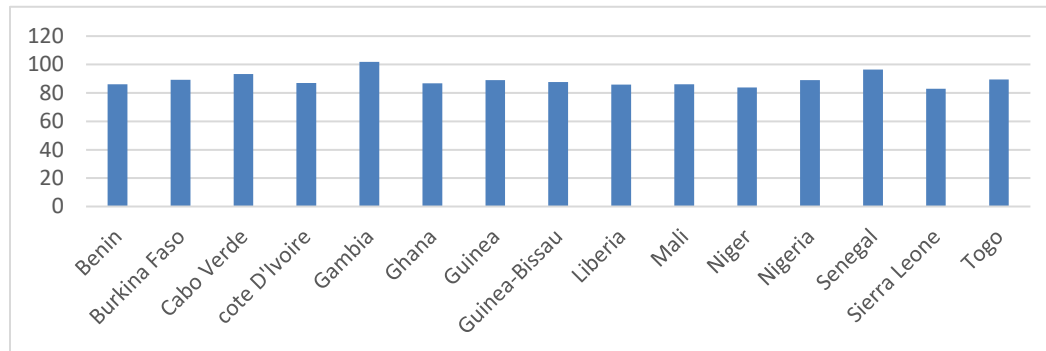


Figure 1 Average of Food production index (2014-2016 = 100) by country

Source: Authors' Construct using MS Excel 2016

From Figure 1, Gambia has the highest average food production index in ECOWAS at 100, while the country with the lowest average food production index is Sierra Leone at 80. Thus,

on average, all ECOWAS countries have high production indices. The high indices should translate to high food security of ECOWAS countries.

Distribution of the Average of GDP per capita Growth rate of ECOWAS countries

Figure 2 is the distribution of the average GDP per capita growth rate of ECOWAS countries over the period of 2001 to 2022. Ghana has the highest average GDP per capita Growth rate in ECOWAS at 3, while the country with the

lowest average GDP per capita Growth rate is Liberia at -0.5. Thus, on average, ECOWAS countries have a fair GDP per capita Growth rate, except Gambia with an extremely low growth and Liberia with negative growth.

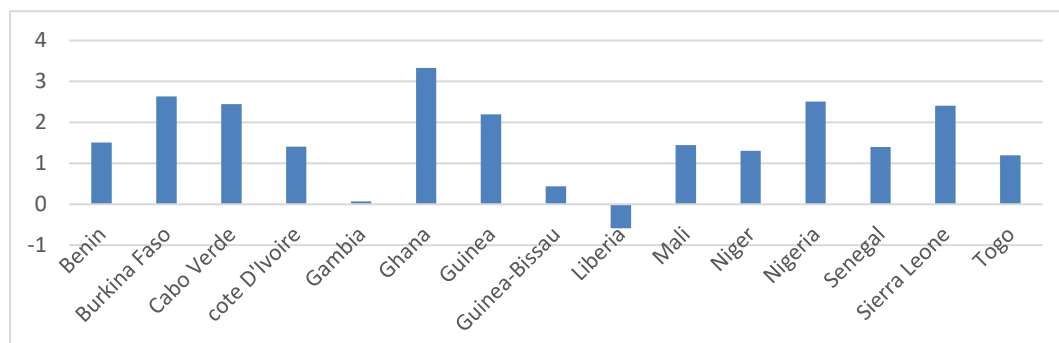


Figure 2 Average of GDP per Capita Growth Rate by country

Source: Authors' Construct using MS Excel 2016

Distribution of Average Mobile Cellular Subscriptions Per 100 in ECOWAS countries

Figure 3 is the distribution of average mobile cellular subscriptions of ECOWAS countries over the period of 2001 to 2022. Cote d'Ivoire has the highest average mobile cellular

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subscriptions in ECOWAS at 75, while the country with the lowest average mobile cellular subscriptions is Niger at 25. Thus, on average, all ECOWAS countries have a high number of

subscriptions. The high subscription should translate to high mobile cellular usage by ECOWAS countries.

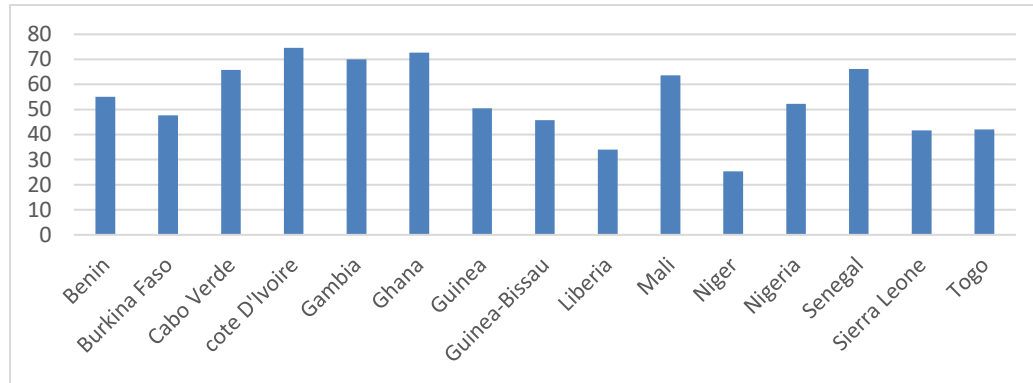


Figure 3 Average of Mobile Cellular Subscriptions Per 100 by country for ECOWAS
Source: Authors Construct using MS Excel 2016

Trend of Average GDP Per Capita Growth and Mobile Cellular Subscriptions of ECOWAS

The trend of Average GDP Per Capita Growth and Mobile Cellular Subscriptions of ECOWAS is depicted in Figure 4.4. It can be observed that mobile cellular subscriptions were on the steady rise from 2001 onwards, highlighting the increasing Mobile Cellular Subscription penetration in ECOWAS countries between 2001 and 2014. However, from 2015 onwards, Mobile

Cellular Subscription, while continuing to increase, increased only marginally. On the other hand, and as regards the average GDP per capita growth rate of ECOWAS, it has been fluctuating for most of the period of 2001 to 2022, but generally at less than 5%, while the lowest average GDP per capita growth rate was -3% recorded in 2020, possibly reflecting the adverse effects of COVID-19 on ECOWAS country economies

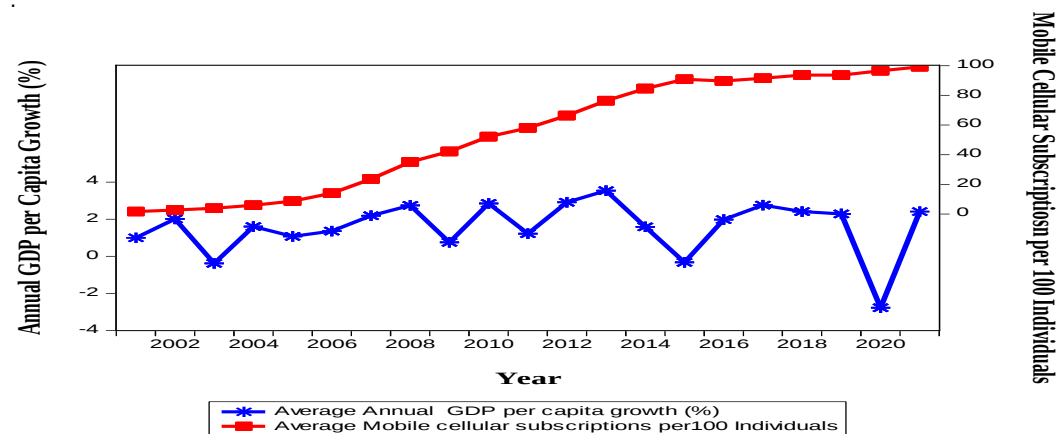


Figure 4 Trend of Average Annual GDP per Capita Growth and Mobile Cellular Subscriptions per 100 Individuals for ECOWAS from 2001 to 2022
Source: Authors' Construct using MS Excel 2016

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Trend of Average Annual GDP per Capita Growth and Food Production Index for ECOWAS

The trend of Average GDP Per capita Gro. with and Food production of ECOWAS is depicted in Figure 4.5. It can be observed that the food production index was on a marginal increase from 2001 to 2005, then in 2006 there was a slight increase till 2010, then declined a little in the year

2011, and continued to increase onwards. On the other hand, and as regards the average GDP per capita growth rate of ECOWAS, it has been fluctuating for most of the period of 2001 to 2021, but generally at less than 5%, while the lowest average GDP per capita growth rate was -3% recorded in 2020, possibly reflecting the adverse effects of COVID-19 on ECOWAS country economies.

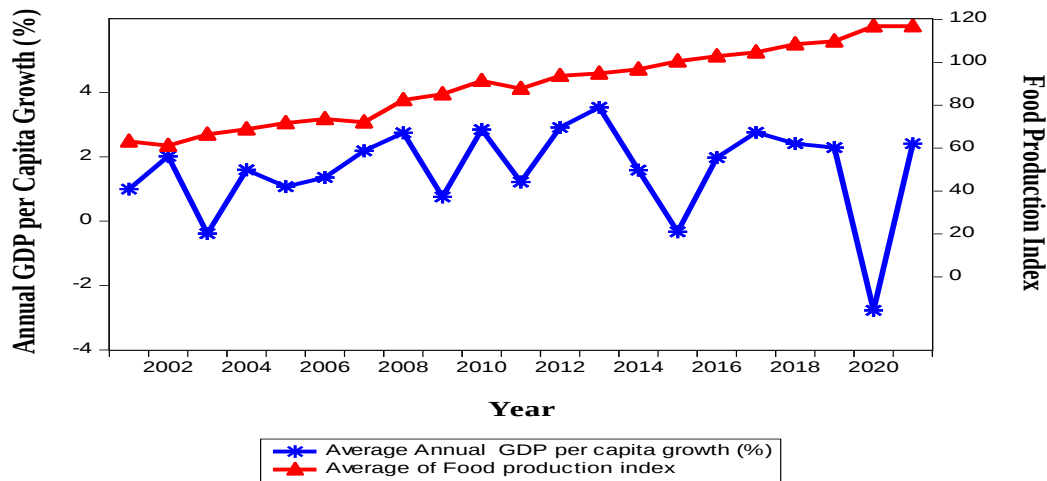


Figure 5 Trend of Average Annual GDP per Capita Growth and Food Production Index for ECOWAS from 2001 to 2022

Source: Authors' Construct using MS Excel 2016

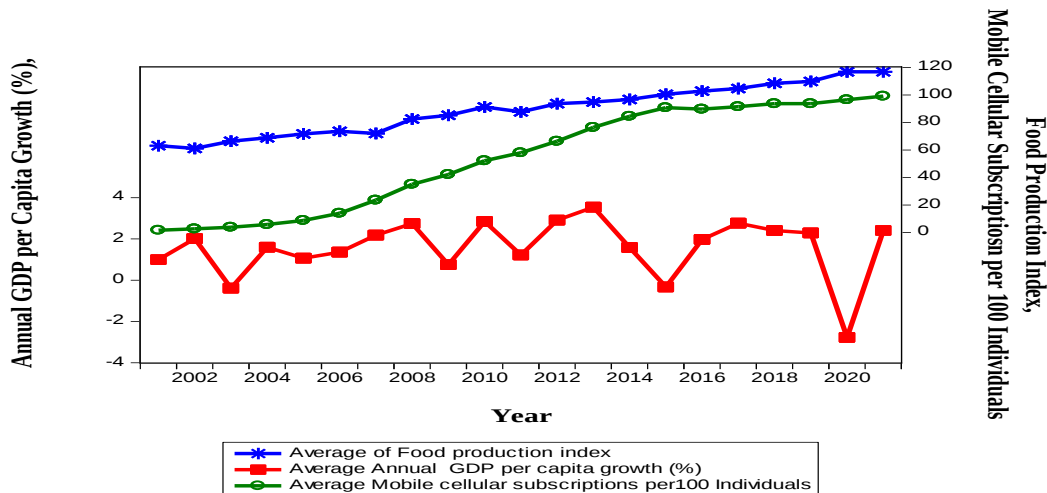


Figure 6 Trend of Average Annual GDP per Capita Growth, Food Production Index and Mobile Cellular Subscriptions per 100 individuals for ECOWAS from 2001 to 2022

Source: Authors' Construct using MS Excel 2016

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Descriptive Analysis

Table 2: Variable Descriptive Statistics

Descriptive Statistic, while s	GDP per capita Growth Rate (%)	Food Production Index (In Decimal Figures)	Mobile Cellular Subscriptions (Per 100 Individuals)	Labour Force (In Millions)	Gross Fixed Capital Formation (In Millions of Naira)	Trade Openness (% of GDP)
Mean	1.734	89.196	55.23	7.885	7027.97	60.24
Median	1.964	91.36	56.48	3.84	1607.35	56.74
Maximum	19.46	181.51	162.17	70.62	145948.0	132.38
Minimum	-22.49	30.86	0.00	0.16	30.54	16.35
Std. Dev.	3.912	22.418	41.567	13.639	18528.82	21.269
Skewness	-0.694	0.476	0.197	3.174	4.330	0.932
Kurtosis	11.42	4.272	1.820	12.150	23.725	6.607
No. of Groups	14	14	14	14	14	14
Observations	294	294	294	294	294	294

Source: Author's computation from STATA13

The mean of GDP per capita growth rate at 1.734% reflects the poor economic growth of ECOWAS countries on average. Further, the median of GDP per capita growth rate is 1.964, while the maximum was 19.46%. On the other hand, the minimum of GDP per capita growth was -22.49%. In addition, GDP per capita growth is negatively skewed, given the skewness of -0.694 and kurtosis of 11.42, reflective of a peaked distribution of GDP per capita growth. The mean of the food production index at 89.196 reflects food production of ECOWAS countries on average. Further, the median of the food production index was 91.36, while the maximum was 181.51. On the other hand, the minimum of the food production index was 30.86.

In addition, the food production index is positively skewed, given the skewness of 0.476 and kurtosis of 4.272, reflective of a peaked distribution of the food production index. The mean of mobile cellular subscriptions at 55.23 reflects low subscriptions of ECOWAS countries on average. Further, the median of mobile cellular subscriptions was 56.48, while the maximum was 162.17. On the other hand, the minimum of mobile cellular subscriptions was 0.00. In addition, mobile cellular subscriptions is positively skewed, given the skewness of 0.197 and kurtosis of 1.820, reflective of a peaked distribution of mobile cellular subscriptions.

The mean of the labour force at 7.885 reflects a poor labour force of ECOWAS countries on average. Further, the median of the labour force was 3.84, while the maximum was 70.62. On the other hand, the minimum of the labour force was 0.16. In addition, the labour force is positively skewed, given the skewness of 3.174 and kurtosis of 12.150, reflective of a peaked distribution of the labour force. The mean of gross fixed capital formation at 7027 reflects the poor gross fixed capital formation of ECOWAS countries on average. Further, the median of gross fixed capital formation was 1607.35, while the maximum was 145948.0. On the other hand, the minimum of gross fixed capital formation was 30.54.

In addition, gross fixed capital formation is positively skewed, given the skewness of 4.330 and kurtosis of 23.725, reflective of a peaked distribution of gross fixed capital formation. The mean of trade openness at 60.24 reflects a low level of trade openness of ECOWAS countries on average. Further, the median of trade openness was 56.74, while the maximum was 132.38. On the other hand, the minimum of trade openness was 16.35. In addition, trade openness is positively skewed given the skewness of 0.932 and kurtosis of 6.607 reflective of a peaked distribution of trade openness.

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ECONOMETRIC ANALYSIS OF RESULTS

Hausman Test

The Hausman test is performed to determine whether panel fixed effects or panel data random effects estimation should be employed in estimating the specified model of the study. The following are the Null and alternative hypotheses for the test:

H_0 : The preferred model is random effects

H_1 : The preferred model is fixed Effects

Where the Hausman test statistic is statistically significant (P-value less than 0.05), then the null hypothesis for the test is rejected and the alternative hypothesis is accepted, and vice versa. Table 4.2 shows the Hausman test results.

Table 4.2. Hausman Test Results

Variable	Fixed Effect coefficient estimate (B)	Random Effects Coefficient Estimate (b)	Difference in Coefficient Estimate (B-b)	Standard Error of Difference in Coefficient Estimate
FPROD	0.0325	0.0190	0.0134	0.00606
MCS	-0.0055	-0.0077	0.00216	0.0378
LabF	-0.588	0.125	-0.713	0.214
GFCF	0.000091	-0.000069	0.000160	0.0000437
TRPN	0.0444	0.0386	0.00577	0.0154
Chi ² (4)= 15.77				
Prob (Chi ² (4)) = 0.0033				

Source: Author's computation using STATA 16

Table 4.2 reveals that Fixed effects estimation is the choice estimation technique for estimating the specified panel data model for the present study. This is on account of the statistically significant Hausman test statistic (P-value =0.0033).

Panel Data Estimation Results

The results of panel data estimation of the model is presented in Table 4.3.

Table 4.3: Panel Data Fixed-Effect Regression Results

Dependent Variable	Model
	GDPPCGR
C	-0.322 (0.881)
FPROD	0.046** (0.055)
MCS	0.013 (0.618)
FPROD*MCS	-0.00021 (0.447)
LABF	-0.600*** (0.007)
GFCF	0.000093* (0.108)
TRPN	0.0415** (0.035)
R-Square	0.1050
F-Statistic	3.88
No. of Countries	14
No. of Observations	294

***, **, * denotes significance at 1%, 5% and 10%. P-Values in parenthesis

Source: Author's Computation from STATA13

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The constant in this present study is statistically insignificant. The coefficient of Food Production (FPROD), the proxy for food security in the present study, is 0.046 and it is statistically significant at the 5% level. A unit increase in food production index results in a 0.046 unit rise in GDP per capita growth. Thus, food security is significant for boosting Economic growth in ECOWAS. Mobile Cellular Subscriptions (MCS) the proxy for ICT in the present study, is statistically insignificant. The interaction between Food Production and Mobile Cellular Subscriptions (FPROD*MCS) in the present study is statistically insignificant. The coefficient of Labour force (LABF) in the present study is -0.600 and it is statistically significant at the 1% level.

A unit increase in labour force results in a 0.600 unit rise in GDP per capita growth. There is a negative relationship between labour force

and GDP per capita growth. Thus, the labour force is significant for boosting Economic growth in ECOWAS. The coefficient of Gross Fixed Capital Formation (GFCF) in the present study is 0.000091 and it is statistically significant at 10%. A unit increase in gross fixed capital formation results in a 0.000091 unit rise in GDP per capita growth. Thus, gross fixed capital formation is significant for boosting Economic growth in ECOWAS. The coefficient of Trade Openness (TRPN) in the present study is 0.0415 and it is statistically significant at the 5% level. A unit increase in Trade Openness results in a 0.0415 unit rise in GDP per capita growth. Thus, Trade Openness is significant for boosting Economic growth in ECOWAS.

Granger Causality Test

Pairwise Granger Causality Tests

Sample: 1 294

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
FPROD does not Granger Cause GDPPCGR	292	5.06803	0.0069
GDPPCGR does not Granger Cause FPROD		5.82996	0.0033

From the above Table,, we are looking at FPROD and GDPPCGR, the probability that FPROD does not granger cause GDPPCGR is 0.0069, which is less than the absolute value 5% and that implies that we reject the null hypothesis that FPROD does not granger cause GDPPCGR. On the other hand, the probability that GDPPCGR does not Granger-cause FPROD is 0.0033, which is also less than the absolute value of 5% therefore, we reject the null hypothesis that GDPPCGR does not Granger-cause FPROD. And that implies that there is a two-way causality running from FPROD to GDPPCGR and GDPPCGR to FPROD.

CONCLUSION

This study examines the effect of ICT, food security, and economic growth in ECOWAS from 2001 to 2022. The study used a variety of

methods to achieve the specified objectives. The macroeconomic variables measured were mobile phone subscription, food production index, GDP per capita growth rate, labour force, gross fixed capital formation, and trade openness. The study utilized panel data from 2001 to 2022, sourced from the World Bank's World Development Indicators, which are a major data source for research on ECOWAS. It was discovered that food security and ICT have a positive impact on boosting economic growth in ECOWAS.

RECOMMENDATIONS

It is recommended that ECOWAS enhance food security and foster economic growth in the region by adopting these recommendations. The governments of ECOWAS countries should equip farmers with the capacity to utilise ICT for maximum agricultural output towards promoting



greater food security in ECOWAS, which may then consequently engender greater levels of economic growth. Enhance regional cooperation and trade: To improve food security, ECOWAS member nations should promote regional collaboration and trade in the agricultural sector. This can be accomplished by establishing harmonised policies, regulatory frameworks, and trade agreements that enable the cross-border flow of agricultural products. Reduced trade barriers, streamlined customs procedures, and promotion of regional value chains will increase cross-border commerce in agricultural commodities and promote efficient resource allocation within the region. Increased intra-regional commerce can provide agricultural producers with a bigger market, stimulate economic activity, and promote regional integration and economic progress.

Suggestions for Future Studies

Future studies may compare the findings regarding West Africa with a comparable developing continent, such as Eastern Africa or Sub-Saharan Africa. Further additional proxies of food security may be employed in future similar studies to extend the model and provide confirmation of the validity of the findings of the present study as regards ECOWAS.

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