CEREAL PRODUCTION AND THE FACTORS THAT INFLUENCE IT: EVIDENCE FROM THE ECONOMIC COMMUNITY OF WEST AFRICAN STATES (ECOWAS)

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Abstract

The relevance of cereals to Sub-Saharan African countries as they are consumed in large quantity in addition to serving as inputs in the production of other products has made studies that influence their production paramount. This study examined the factors that influence cereal production in some selected ECOWAS countries. The paper used annual secondary data obtained from the data bank of the World Bank Development Indicators over the period from 1993 to 2020. The framework of analysis is the panel random effect which was adopted based on the result of the Hauseman test. The study revealed that agricultural raw materials import and land under cereal production impacted positively on cereal production. However, while fertilizer consumption and arable land had a positive but non-significant impact on cereal production, the impact of rural population growth was negative and significant. The study equally found food import to impact negatively on cereal production, but the result was not significant. Consequently, the study recommends that governments in these countries should subsidize fertilizer and improve land under cereal production while modernizing agricultural practices.

Keywords: Agricultural raw materials, arable land, cereal production, fertilizer consumption

JEL Classification: C33, Q18, R11

1. INTRODUCTION

To ensure food security is among the major policy thrusts of developing countries as it has been observed that the welfare of the people is directly tied to food intake. As observed by Nzeh (2023), life expectancy is enhanced if the output of food is increased, especially nutritional food. To reduce food shortage, cereals play a vital role as they are consumed in large quantity in addition to their nutritional content and the use of their residue in livestock production (Ismaila, *et al.*, 2010). As observed by Garba *et al.* (2020), meeting national and international demand and supply for cereal production is a serious issue that requires global attention. The study noted that to boost cereal production, factors such as rainfall/irrigation, fertilizer application, land used for cereals production and crop rotation practices, among others need to be considered. In particular, food insecurity in Africa calls for drastic measures to tackle. As observed by Raheem *et al*. (2021), even though Africa has much agricultural potential, for the last thirty years, the continent remains a net importer of agricultural products. The Organization of Economic Corporation and Development (OECD, 2020) cited in Raheem *et al*. (2021), contended that about 85% of food was imported into Africa from 2016 to 2018, while millions of people in the continent face acute food insecurity. In sub-Saharan Africa (SSA), large population has led to high cereals demand, and this has been observed by van Ittersum *et al.* (2016) who noted that the demand for cereals in SSA is estimated to be very high by 2050 owing to shifts in dietary habits and high human population growth. Among the countries in the SSA, the Economic Community of West African States (ECOWAS) countries due to their low-income level and high population require increased productivity in cereals to improve their food shortage. The Food and Agricultural Organization ranked majority of the ECOWAS countries among the low-income food-deficit countries, including Benin, Burkina Faso, Chad, Côte d'Ivoire, Senegal, Sierra Leone, Niger, Togo, among others. ECOWAS was formed in 1975 to serve as a regional and economic bloc with the formation of a single large trading bloc and the promotion of economic integration as its main objectives. The countries that comprise the economic bloc are Ghana, Senegal, The Gambia, Ivory Coast, Togo, Liberia, Benin, Nigeria, Côte d'Ivoire, Chad, Guinea, Guinea Bissau, Cape Verde, Mali and Niger.

In this study, the aim is to contribute to the debate on the factors that influence cereal production with a focus on eight ECOWAS countries, namely: Nigeria, Mali, Benin, Burkina Faso, The Gambia, Côte d'Ivoire, Ghana and Guinea. The choice of countries included in the study is determined mainly by data availability. Empirical literatures have considered some variables as determinants of cereal production such as land available for cereal cultivation (Akanni *et al.,* 2020), bank lending and domestic capital (Enilolobo *et al.,* 2022), improved seed, age, fertilizer, farm size, irrigation, education and family size (Ayele & Melaku, 2019) and rainfall, trade openness, inflation rate and fertilizer input import (Ketema, 2020). Majority of these studies are carried out on a country-specific basis mainly in Nigeria, Ethiopia, Pakistan and Ghana. To the best of the knowledge the authors, there is no known study carried out in this regard in the ECOWAS countries. Furthermore, three determinants of cereal production which were not captured in earlier papers reviewed are included in the present study, namely: agricultural raw materials import, rural population growth and food import. Since the countries sampled in the study lack technological knowhow, most of the inputs used in cereal production are imported such as tractors, irrigation equipment, de-stoning machines for rice production, pesticides, and organic fertilizer, among others. Therefore, inability to capture the importation of agricultural inputs in a study of this nature could distort the major determinants of cereal production in the selected countries. Also, the growth of rural population could put much pressure on available land for cereal production as these lands may be put to other uses. This is more so when considering that in these countries, the younger generation consider farming as drudgery. Food import is also a major factor that influences cereal production in the developing countries. The negative impact of food import is that it displaces the domestic production of foods through the price effect and such accounts for the major reasons these countries are using different forms of protectionist policy to reduce food importation in their territories. From the foregoing, this study enlarges the frontiers of knowledge in this area of research and the findings will provide policy directions to countries in this economic bloc and other developing countries that face acute food insecurity.

PROFILE OF SELECTED ECOWAS COUNTRIES

Among the ECOWAS countries, Nigeria is the most populous and has the biggest economy. As observed by Dankumo, Riti and Ayeni (2015), about 75% of total land area in Nigeria which amounts to about 68 million hectares has potential for agriculture, but the cultivated area is about 33 million hectares. In a similar vein, the

Food and Agricultural Organization (FAO, 2023) noted that the agriculture land area in Nigeria is 70.8 million hectares and the major crops grown in the country are cassava, millet, beans, yam, rice and guinea corn. On the other hand, the major cereals grown in Nigeria are sorghum, corn, pear millet, rice and sugar cane and majority of these cereals are grown in the country's savannah agro ecological zone. In another vein, from 1965 through 1986 Mali experienced deficit in grains arising from some factors such as policy that constrained agricultural production, changing dietary habits and a rapid population growth. However, as agriculture got policy reforms around 1987 and coupled with the support from the Western donor nations, agricultural production received a boost. Cereal production got boosted after the liberalization of producer prices coupled with irrigation and adequate rainfall. Cereals grown in Mali include pearl millet, sorghum, groundnut, corn, rice and cowpeas. Benin is mainly a rural society and with a large population that rely on employment in the agricultural sector. Among the major crops cultivated in the country are groundnuts, shea nuts, cocoa, cashew nuts, rice, tomatoes and corn. Despite government's efforts to diversify the economy of the country away from agriculture, Benin remains underdeveloped as it depends on subsistence agriculture. Since it shares borders with Nigeria in the east, the country reaps from Nigeria's anti-import policies mainly the ban placed on rice and other food importation as these products enter Nigeria from Benin through the land borders.

Subsistence farming predominates in Burkina Faso and the persistent drought in the country makes agricultural production to depend on rainfed. Since the county depends much on favorable weather conditions, agriculture in Burkina Faso is vulnerable to changes in climate and variability in weather. Cereals produced in the country include millet, sorghum and corn. In the northern part of the country which experiences dryness, millet is produced in large quantity while in the humid south, corn is predominantly produced. Just like Burkina Faso, agricultural production in the Gambia is subsistent and depends on rain-fed, thereby exposing the rural farmers to low productivity. Major cereals produced in the Gambia are millet and corn. Other crops predominant in the country are cotton, groundnuts, sesame and livestock. In Cote d'Ivoire, the major staple and export crop products are rubber, bananas, coffee, cassava, cotton, oil palm, yams, cocoa, sugar and timber. Among these crops, the country produces palm oil, coffee and cocoa beans in large quantity. Côte d'Ivoire has two large agro-ecological zones, namely: the northern savannah zone, where crops such as livestock and cotton are produced in large quantity as well as the fertile forest zone of the south, where the production of coffee and cocoa predominates. Cereal production in Ghana does not meet domestic demand, leading to importation to argument domestic supply. However, cereals such as rice and corn are produced in relatively large quantity such that they are consumed locally in large quantity. Also, while peas and beans are the most produced pulses, the most cultivated oilseed is groundnut. In Guinea, major cereals that serve as staple food for most of the population are wheat, millets, rice, sorghum and corn. While corn is the most important cereal, the second most important cereal is sorghum. Even though the production of rice is high in the country, it remains the most imported cereal.

With respect to the trends in some of the relevant variables used in the study, FIGURE 01 reveals that among the countries sampled, the country that produced the highest cereal within the study period is Nigeria. Beginning from 2002, the country experienced continuous rise in the trend of cereal production, and this got to a peak in 2008 after which the trend lowered. The trend rose again beginning from 2014 but reduced in 2017 and got to another peak in 2019 after which it descended. Mali is another country with rising cereal production with the trend rising steadily from 2008. Following Mali in cereal production is Guinea whose cereal production though did not improve much within the study period. The trend of cereal production for other countries was flat all through the study period, even though Gambia produced the least cereal among the other countries.

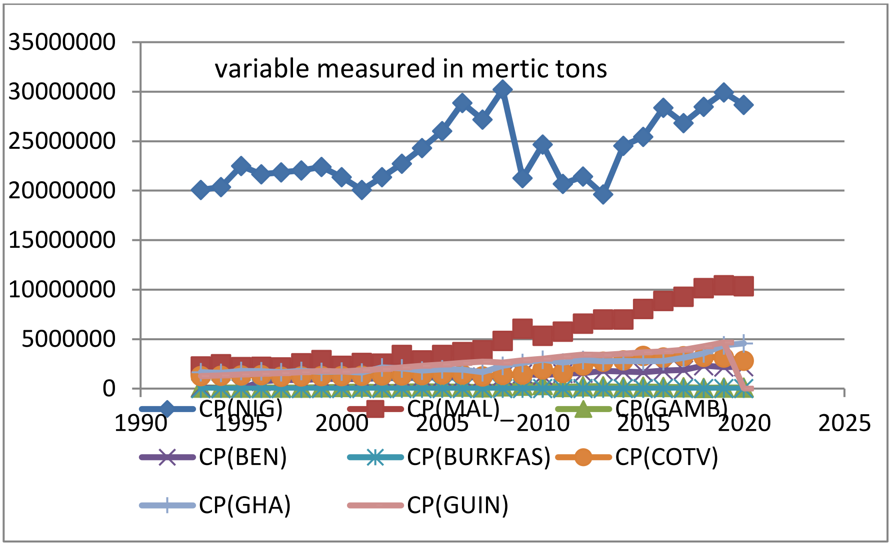

***Figure 1**: Trend in Cereal Production for the Selected Countries.*
Source: World Development Indicators (2022)

Note: CP – cereal production, NIG – Nigeria, GAMB – Gambia, BEN – Benin, BURKFAS – Burkina Faso, COTIV – Cote d ‘Ivoire, GHA – Ghana, GUIN – Guinea

The trend in land under cereal production is evaluated to know how the sampled countries allocate their lands for cereal cultivation over the sample period. Just like the trend in cereal production, the trend in land under cereal production in Figure 2 indicated that Nigeria allocated highest land for cereal cultivation than other countries in the sample. Little wonder that the country produced more cereal than the other countries within the study period. Nigeria allocated more land in 1999 and 2008, but afterwards land allocation became flat throughout the study period. Next to Nigeria in land allocated for cereal production are Mali and Burkina Faso. However, from 2011 all through the sample period, Mali allocated more land than Burkina Faso, retaining the second position after Nigeria. Gambia allocated less land for cereal production compared to other countries sampled in the study and it is therefore no wonder that the country was the least in cereal production compared to other countries within the sample period.

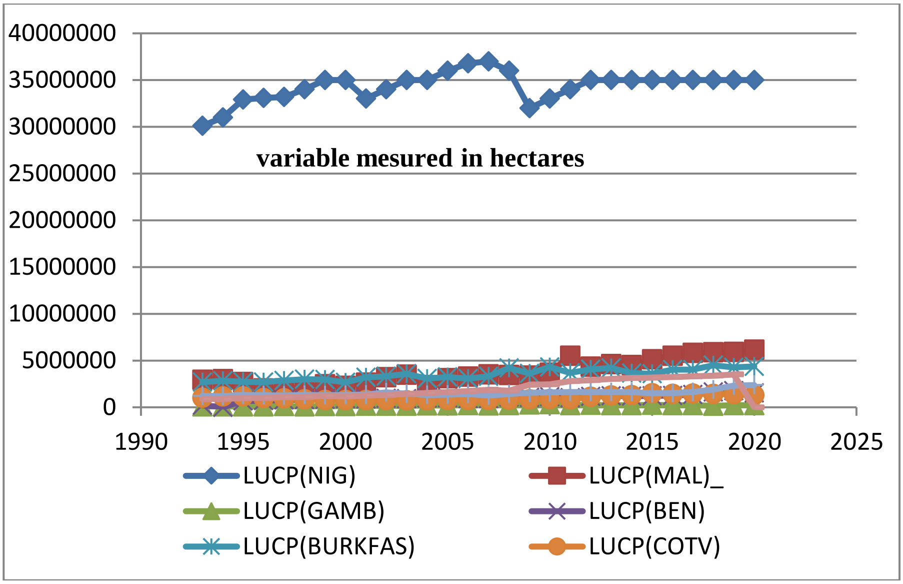

Figure 2: *Trend in Land under Cereal Production in the Sampled Countries*
Source: World Development Indicators (2022)

Note: LUCP – land under cereal production

With respect to growth in rural population, evidence from Fig. 3 reveals that between 1993 and 1998, Cote d 'Ivoire had the highest rural population growth compared to other countries. Also, between 1999 and 2002, Benin had the highest rural population growth in relation to other countries. Beginning from 2007 through 2015, Burkina Faso had the highest rural population growth but from 2016 all through the sample period, Guinea's rural population growth was highest. The countries with the least rural population growth within the sample period were Nigeria, Ghana and Gambia. That Gambia had low rural population growth as well as having the least cereal production is an indication that perhaps the country had limited manpower to boost cereal production. The contrary can be said of Nigeria whose rural population growth was low, but its cereal production was high. It could be argued that low rural population growth discourages much pressure on agricultural lands.

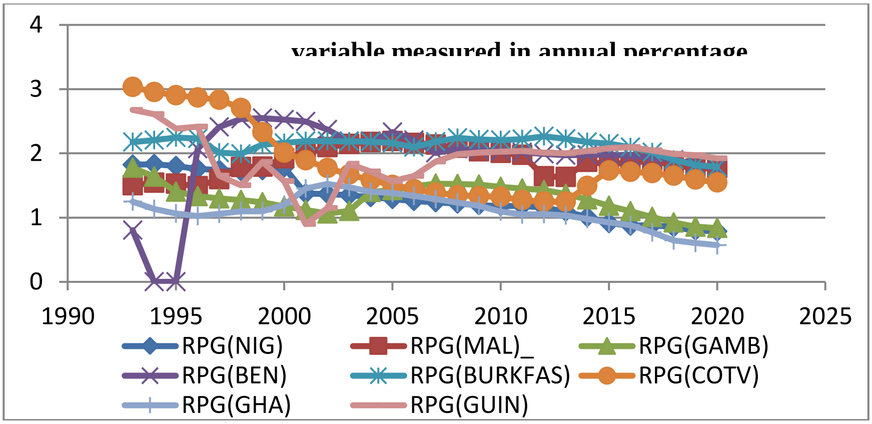

Figure 3: *Trend in Rural Population Growth in Sampled Countries*
Source: World Development Indicators (2022)

Note: RPG – rural population growth

In Fig. 4, the trend in fertilizer consumption shows that from 1993 through 2005, fertilizer consumption was more in Cote d 'Ivoire compared to other countries sampled in the study. Ghana also had high fertilizer consumption, especially in 2012 and from 2017 throughout the study period. Other countries that had relatively high fertilizer consumption, especially beginning from 2013 are Benin and Burkina Faso. It should be noted that the country with the highest cereal production, namely Nigeria, was among the countries with the least fertilizer consumption. In another vein, Gambia, which had the least cereal production consumed the least fertilizer.

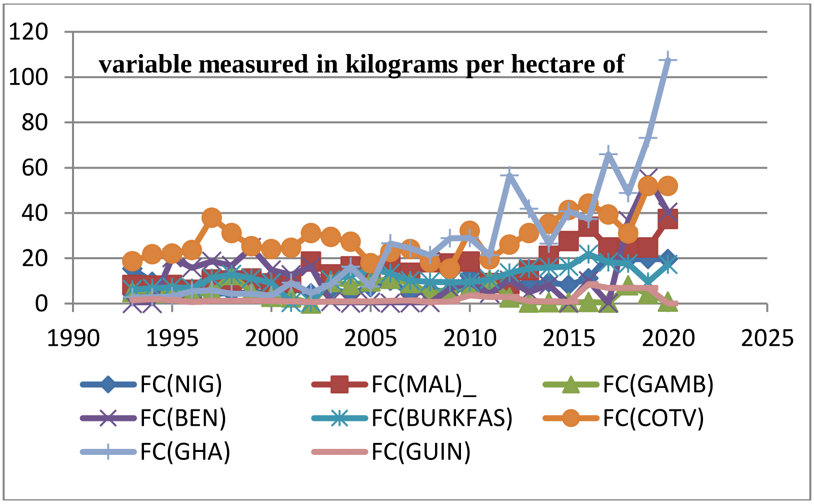

Figure 4*: Trend in Fertilizer Consumption in Sampled Countries*
Source: World Development Indicators (2022)

Note: FC – fertilizer consumption

2. LITERATURE REVIEW

Enhancing food security is among the major policy objectives of developing countries. In terms of crop types, cereals play a very vital role in alleviating food poverty because they are consumed in large quantity in African countries, in addition to their nutritional value. Several studies have therefore sought to investigate the factors that determine cereal production with diverse outcomes. In Nigeria, some studies have been done which indicated some factors that influenced cereal production. Mukhtar *et al.* (2018) revealed that factors such as education level, household size, credit, cooperative membership, improved seed, extension contact and off-farm income improved pearl millet output significantly. However, the factors that were found to impact on output negatively were age and household size. In terms of cereal yield, Garba *et al.* (2020) revealed that land used for cereals production and cereal production were the major determinants of cereal yield. Akanni *et al.* (2020) found that cereal production in Nigeria was Granger-caused by land available for cereal cultivation. However, Enilolobo *et al.* (2022) indicated that the major factors that influenced food security positively were bank lending and domestic capital.

In Ethiopia, some studies have been carried out to examine the factors that influence cereal production. In the southern region of Kecha Birra woreda, Ayele and Melaku (2019) found that improved seed, age, fertilizer, farm size, irrigation, education and family size improved cereal production. However, access to credit and sex were revealed to negatively influence cereal production. In another study for Ethiopia, Ketema (2020) revealed that while rainfall, trade openness, inflation rate and fertilizer input import had positive and significant impact on cereal production in the long run, the impact of drought was negative and significant. The positive impact of fertilizer on cereal production found support in the finding by Ayele and Melaku (2019). In a similar study carried out in Kecha Birra district of Ethiopia, Ayele and Tamirat (2020) revealed that education level, family size of household head, access to credit, household head, use of fertilizer, improved seed, extension service and use of recommended agricultural inputs significantly improved cereal production positively. Another study for Ethiopia by Asfew and Bedemo (2022) revealed that in both the long and short runs, factors such as fertilizer consumption, carbon dioxide emissions, arable land and precipitation improved cereal production significantly, while the effect of change in temperature was adverse.

In Libya, Faraj, Ismail and Ab-Rahim (2020) observed that while wheat production was influenced positively by rainfall even though the result was not significant; the impact of temperature was negative but non-significant. However, a study in Kenya by Kariuki *et al.* (2020) indicated that maize output was determined by a mixed reaction to rainfall and temperature but the impact of change in temperature on maize output was negative. In Turkey, findings by Chandio *et al.* (2020) showed that average temperature adversely affected cereal yield, while the impact of average rainfall was positive both in the long-run and in the short-run periods. Ahsan *et al.* (2020) revealed that in Pakistan, the factors that impacted positively on cereal production are cultivated area, energy consumption, CO2 emissions and labor force. In Mali, Ma¨ıga *et al.* (2021) revealed that while area of land devoted to maize crops and GDP per capita influenced maize production positively, temperature and precipitation that occurs in June and July adversely affected it. A cross-country study by Kumar *et al.* (2021) comprising selected lower-middle-income countries showed that rising temperature reduced cereal production, while rainfall had positive impact on it. In a study for Bangladesh, findings by Chandio *et al.* (2021) indicated that rural labor force, financial development, rainfall and energy consumption impacted positively on cereal production. However, the impact of temperature was not positive within the study period. In Ghana, Tsiboe *et al.* (2022) revealed that factors such as seed, land and agro-ecology of cereal farms contributed positively to cereal production.

3. METHODOLOGY

In modelling the determinants of cereal production, this study modified the work of Ayele and Melaku (2019). Thus, the following panel model specification guided the study:

$$LCP_{it} = \eta_0 + \eta_1 ARMIPT_{it} + \eta_2 FC_{it} + \eta_3 FIMPT_{it} + \eta_4 LARLD_{it} + \eta_5 RPG_{it} + \eta_6 LLUCP_{it} + \varepsilon_{it}$$

where

LCP = log of cereal production, η_0 = the intercept term, $ARMIPT$ = agricultural raw materials import, FC = fertilizer consumption, $FIMPT$ = food import, $LARLD$ = log of arable land, RPG = rural population growth, $LLUCP$ = log of land under cereal production, ε = error term. Subscripts i and t represent the country and time respectively.

The determinants of cereal production in ECOWAS were investigated in this study using the panel random effect model. In this study, the annual dataset that covered the period from 1993 to 2020 was used to examine the determinants of cereal production in the selected ECOWAS countries. Data on all the variables were sourced from the databank of the World Development Indicators (WDI). To enhance easy interpretation of results and normalization, cereal production, arable land and land under cereal production were logged. Table 1 shows the variables used, their measurement and sources. The study chose the panel random effect model after carrying out the Hauseman test. Some pre-diagnostic tests were conducted to ascertain the behavior of the variables used in the study. Such tests include descriptive statistics, stationarity (unit root) and cointegration tests. In testing for stationarity, the study utilized three different panel unit root tests such as: Levin, Lin and Chu (2002) -LLC, Im, Pesaran and Shin (2003) - IPS and the augment Dickey Fuller-Fisher (1981) - ADF-Fisher. The LLC panel unit root test concentrates on testing for common unit root, while both the IPS and ADF-Fisher test for individual unit root. The test for cointegrating relationship among the variables was carried out under two different panel cointegration tests such as the Johansen-Fisher panel cointegration and the Kao residual co-integration tests.

Table 1: *Definition of Variables*

Variable	Abbreviation	Measurement	Source
Cereal production	CP	metric tons	WDI
Agricultural raw materials import	ARMIPT	percentage of merchandise imports	WDI
Fertilizer consumption	FC	kilograms per hectare of arable land	WDI
Food import	FIMPT	percentage of merchandise imports	WDI
Arable land	ARLD	Hectares	WDI
Rural population growth	RPG	annual percentage	WDI
Land under cereal production	LUCP	Hectares	WDI

4. RESULT AND DISCUSSION

The descriptive statistics results in Table 2 revealed that there is closeness between the mean and the median of all the variables which signifies that the variables are symmetric. Food import with the mean value of 18.51 have the highest mean among the series. However, the variable with the lowest mean is agricultural raw materials import with a mean value of 1.05. Comparatively, it is found that the mean of food import is higher than the mean of agricultural raw materials imports, which indicates that the countries sampled in the study import more food than agricultural inputs. In another vein, it is found that, while land under cereal production had the least range, fertilizer consumption had the highest range. The implication is that while land under cereal production exhibited the least volatility within the study period, the volatility of fertilizer consumption was highest.

Table 2: *Results of Descriptive Statistics*

	LCP	**ARMIPT**	**FC**	**FIMPT**	**LARLD**	**RPG**	**LLUCP**
Mean	5.61	1.05	13.93	18.51	6.34	6.26	1.69
Median	6.25	0.75	9.40	17.72	6.49	6.20	1.74
Maximum	7.48	6.52	107.42	52.31	7.56	7.56	3.03
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.57
Std. Dev.	1.93	1.11	14.57	11.98	1.26	0.75	0.50
Skewness	-1.78	2.19	2.33	0.30	-3.97	-2.33	0.05
Kurtosis	4.87	8.48	11.65	2.85	20.55	23.29	2.53
Jarque-Bera	149.89	454.59	890.63	3.56	3420.06	3993.93	2.11
Probability	0.00	0.00	0.00	0.16	0.00	0.00	0.34
Sum	1240.66	233.04	3079.06	4090.80	1401.76	1384.38	374.32
Sum Sq. Dev.	824.17	271.07	46755.32	31617.82	350.15	125.11	55.13

Source: Authors' estimations (2025)

The results of stationarity in Tables 3 revealed that at level, cereal production achieved stationarity under ADF-Fisher at the 5% level of significance. It is also found that agricultural raw materials import achieved stationarity at level under both IPS and ADF-Fisher, respectively. Under LLC, IPS and ADF-Fisher, food import achieved stationarity at level. Thus, all these variables are integrated of order zero, that is they are *I (0)*. In Table 04, after the series were first differenced, they all became stationary. That is, they all became integrated of order one or *I (1)*.

Table 3: *Panel Unit Root Test at Level*

Variable	**Common Unit Root**	**Individual Unit Root**	
	LLC	**IPS**	**ADF-Fisher**
LCP	0.02(0.50)	-0.46(0.32)	46.60(0.00) *
ARMIPT	-1.20(0.11)	-3.69(0.00) *	41.86(0.00) *
FC	2.60(0.99)	1.197(0.88)	12.67(0.69)
FIMPT	-7.81(0.00) *	-9.39(0.00) *	105.97(0.00) *
LARLD	-0.71(0.23)	-0.75(0.22)	21.90(0.14)
RPG	-1.04(0.14)	0.00(0.50)	14.52(0.55)
LLUCP	-0.30(0.38)	0.67(0.74)	14.82(0.53)

Source: Authors' estimations (2025)

Note: * and** indicate rejection of the null hypothesis at the 5% and 10% level, respectively.

Table 4: *Panel Unit Root Test at First Difference*

Variable	**Common Unit Root**	**Individual Unit Root**	
	LLC	**IPS**	**ADF-Fisher**
ΔLCP	-2.86(0.00) *	-6.23(0.00) *	80.49(0.00) *
ΔARMIPT	-5.89(0.00) *	-8.80(0.00) *	98.65(0.00) *
ΔFC	-4.40(0.00) *	-7.60(0.00) *	84.59(0.00) *
ΔFIMPT	-9.43(0.00) *	-9.28(0.00) *	106.67(0.00) *
ΔLARLD	-7.12(0.00) *	-3.03(0.00) *	49.39(0.00) *
ΔRPG	-7.070(0.00) *	-7.38(0.00) *	82.61(0.00) *
ΔLLUCP	-4.86(0.00) *	-5.91(0.00) *	75.22(0.00) *

Source: Authors' estimations (2025)

Note: * and** indicate rejection of the null hypothesis at the 5% and 10% level, respectively.

As noted earlier, the study adopted two cointegration tests to ascertain the long-run relationship among the variables. The results of the Johansen-Fisher panel cointegration tests in Table 5 show that both the Trace and the Maximum Eigenvalue tests indicated 6 cointegrating equations at both the 5% and 10% level, respectively. Thus, there is evidence of a long-run relationship among the variables. This finds support in the result of the Kao panel cointegration test in Table 6. Since the p-value of the residual is less than 5%, the null hypothesis of no cointegration is rejected under the Kao panel cointegration.

Table 5: *Johansen Fisher Panel Cointegration Test*

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	351.2	0.00	269.1	0.00
At most 1	209.1	0.00	101.9	0.00
At most 2	123.4	0.00	64.76	0.00
At most 3	69.21	0.00	50.47	0.00
At most 4	31.12	0.01	23.97	0.09
At most 5	18.33	0.30	14.40	0.56
At most 6	26.20	0.05	26.20	0.05

Table 6: *Kao Residual Cointegration Test*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID (-1)	-0.48	0.15	-3.18	0.00

To select the appropriate panel model, the study conducted the Hauseman test. The Hausman test is carried out under the null assumption that the random effect is not correlated with the independent variables. The random effect model is chosen if the result of the Hauseman test indicates that the random effect is not correlated with the independent variables. However, if the random effect is correlated with the independent variables, an alternative panel model which is the fixed effect model is chosen. Result in Table 7 revealed that the p-value is higher than the 10% level, implying that the panel random effect model is preferred over the panel fixed effect model.

Table 7: *Hausman Test for Period Random Effects*

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	0.000000	6	1.0000

With the result of the Hauseman test indicating that the random effect panel model is preferred, the study estimated the panel random effect model. As indicated in Table 8, the study revealed that agricultural raw materials import had a positive and significant impact on cereal production within the study period. Finding indicates that if agricultural raw materials imports rose by one-unit, cereal production improved 0.43 metric tons. The implication of this result is that the importation of agricultural inputs ranging from pesticides, de-stoning machines for rice production, fertilizers, tractors and other farm implements improved cereal production in these countries within the study period. This result finds support in Ketema (2020) that revealed the positive impact of fertilizer input import on cereal production in Ethiopia. The study also found that fertilizer consumption had a positive but non-significant impact on cereal production. The positive impact of fertilizer consumption on cereal production finds support in the studies in Ethiopia by Ayele and Melaku (2019), Ayele and Tamirat (2020) and Asfew and Bedemo (2022). The World Development Indicators define fertilizer products to comprise of potash, phosphate fertilizers and nitrogenous. However, traditional nutrients such as plant and animal manures are excluded in calculation. Given the above definition, it implies that traditional fertilizers which these countries usually apply on farmlands are excluded and that could be among the reasons for the non-significant impact of fertilizer consumption on cereal production within the study period. The cost of the inorganic fertilizers is usually beyond the reach of the farmers, propelling them to use mainly the organic fertilizers.

Findings revealed that food import had a negative but non-significant impact on cereal production. The implication of food importation is that even though it augments the shortfall in domestic food supply, the price effect of the imported foods on locally produced foods discourages local food production. It is therefore of little wonder that some ECOWAS countries such as Nigeria have placed a ban on the importation of some food items such as rice. Also, to ensure self-sufficiency in domestic rice production, Senegal launched a national program that was aimed at increasing rice production between 2007 and 2015. In a similar vein, Mali championed rice-promotion program with caption, “Initiative riz,” with the objective of raising domestic rice production. In another vein, at the 10 percent level, land under cereal production impacted positively on cereal production and the result is significant. If land under cereal production increased by one-unit, cereal production improved by 0.54 metric tons. The result of the positive impact of land under cereal production finds support in the study for Nigeria by Garba *et al.* (2020) which indicated that land used for cereals production improved cereal yield in Nigeria. Rural population growth was found to impact cereal production negatively and the result was significant. The result of rural population growth indicated that cereal production reduced by 1.30 metric tons if rural population growth rose by one percent. The negative and significant impact of rural population growth on cereal production indicates that, even though most farming activities take place in the rural areas, population growth in the rural enclave hardly encourages cereal production. High population growth in the rural area implies that there is much pressure on available farmlands as most of the lands are converted to other uses.

Table 8: *Results of Period Random Effects*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.66	1.90	1.92	0.05
ARMIT	0.43	0.17	2.51	0.01
FC	0.01	0.01	1.05	0.29
FIMPI	-0.00	0.01	-0.40	0.68
LARLD	0.03	0.20	0.16	0.86
LLUCP	0.54	0.33	1.66	0.09
RPG	-1.30	0.28	-4.59	0.00
R-squared	0.19			
Adjusted R-squared	0.17			
Durbin-Watson stat	0.10			

5. CONCLUSION

This study reveals that while agricultural raw materials import and land under cereal production had positive impact on cereal production, rural population growth impacted on cereal production negatively. The implication of the results of the study is that by encouraging the importation of agricultural inputs and improving land available for cereal production, local cereal production is expected to improve. However, food importation and population pressure adversely affect cereal production. The menace of food insecurity in the sub-Saharan African countries and in particular the West African countries has made these findings relevant. Cereals production plays a huge role in bridging the gap between food supply and food demand since they are usually produced in large quantity. They also constitute the major staple foods consumed by the inhabitants of these countries. The good news is that African soils are fertile for the cultivation of various types of cereals and increased productivity will be possible if the right policy framework is implemented. Consequently, the study recommends that liberal policies on agricultural raw materials importation should be put in place in the short-run, while the long-run measure should target at sourcing the agricultural inputs locally to conserve foreign exchange. This is also applicable to food importation, which should be encouraged only in the short run to cushion the adverse effect of food shortage. Also, while the study is of the view that there is need for the governments in these countries to subsidize fertilizer, its application requires giving proper orientation to farmers using extension services. Finally, the study contends that while land under cereal production should be improved, there is need to modernize agricultural practice and provision of social amenities in the rural areas. All these will attract the rural populace, especially the youths, into farming as well as helping to stem rural-urban drift.

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