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Research Article

From Availability to Utilisation: Does Staple Food Production Reduce Child Stunting in the ECOWAS Countries

Eruba Dimgba[1], Christopher Ifeanyi Ezekwe[2, *]

[1]Niger Delta Development Commission (NDDC), Port Harcourt, Nigeria
[2]Department of Economics, Rivers State University, Port Harcourt, Nigeria

Abstract

Staple food production is widely promoted as a pathway to food security in West Africa, yet child stunting remains high across the region. In this light, we examine whether staple food production reduces child stunting in ECOWAS countries, shifting the analysis from food availability to food utilisation. We use panel data for 10 ECOWAS countries, including Benin, Burkina Faso, and Côte d'Ivoire. Ghana, Guinea, Mali, Niger, Nigeria, Senegal and Togo over 2001-2024. We measure staple food production by yields of five crops (cassava, rice, maize, millet, and sorghum) and include budgetary allocation to agriculture as a policy variable. Cross-sectional dependence, unit root, and cointegration tests confirm a long-run relationship among the variables. The model is estimated as a panel autoregressive distributed lag (ARDL) model, and the Hausman test favours the pooled mean group (PMG) estimator. The results show that higher cassava and maize yields significantly reduce child stunting in the long run. Similarly, budgetary allocation to agriculture significantly reduces child stunting in the long run. Rice and sorghum yields, by contrast, are weakly and positively associated with stunting, and millet has no significant effect. In the short run, none of the variables has a significant average effect on child stunting. The country-level estimates also differ widely, as the same crop can raise stunting in one country and lower it in another. These findings partly support the food availability decline theory. The amount of food produced matters, as do the types of food produced and whether they enter children's diets. In West Africa, increasing output alone is therefore unlikely to achieve SDG target 2.2 unless production policies are also linked to food access and utilisation. Given these findings, we recommend that national governments and ECOWAS, through the ECOWAP and CAADP frameworks, prioritise cassava and maize productivity by increasing farmers' access to improved and biofortified varieties of these crops, such as vitamin A cassava and maize, along with fertiliser and extension services.

Keywords

Child Stunting, Staple Crops, Food Security, Food Utilisation and ECOWAS

*Correspondence: Christopher Ifeanyi Ezekwe (christopher.ezekwe@ust.edu.ng)

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1. Introduction

Food security remains a major policy concern across developing economies, particularly in Africa, consistent with the Sustainable Development Goal of ending hunger and all forms of malnutrition by 2030. The Food and Agriculture Organisation (FAO) [24] describes food security as a situation in which all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The concept rests on four connected pillars, namely availability, access, utilisation and stability, each of which depends heavily on how well staple food systems perform [3]. Of the four, utilisation is the most demanding because it asks whether available, accessible food translates into adequate nutritional status. Child stunting, which reflects chronic undernutrition, therefore offers a useful test of whether more food leads to healthier children.

Staple crops are central to this question because they provide most of the calories people consume and help countries achieve self-sufficiency and steady prices [47]. Higher staple output has been linked to greater food availability, higher incomes, and more stable prices, which in turn improve access and stability [1, 18, 24]. In the Economic Community of West African States (ECOWAS), cassava, rice, maize, millet and sorghum account for the bulk of household calorie intake [31]. Cassava is the second largest source of dietary energy after cereals [22], rice has grown from a minor cereal into a main staple [9], maize is a priority crop under the Malabo Declaration [55], and drought-resistant millet and sorghum provide 15% to 25% of calorie intake in Sahelian countries [29].

Despite these efforts, hunger remains a persistent issue in the region. Approximately one in four people within ECOWAS suffers from undernutrition [57], and over 38 million individuals in West Africa experienced severe food insecurity in 2023 [26]. Staple output varies widely across countries and years because of unreliable rainfall, rising temperatures, pests, poor access to improved seeds and fertiliser, and weak infrastructure [7, 30]. Armed conflict in Burkina Faso, Mali and Nigeria has disrupted farming and markets [57], while COVID-19 and the Russia-Ukraine war pushed staple prices up and made them more volatile [58]. Because many households spend more than 60% of their income on food [23], such price shocks quickly lower the quality of their diets [14]. Most member states also spend less than the 10% of national budgets agreed under the Maputo Declaration, and Kamenya et al. [31] report that higher public spending did little to reduce undernourishment or child stunting. These patterns suggest that producing more food does not by itself guarantee better-nourished children.

Existing studies only partly explain this problem. Research on agriculture and food security in sub-Saharan Africa has mostly examined agricultural output as a whole [12, 40, 42, 54] and has concentrated on availability and access measures such as undernourishment and food supply. Little work follows the link from availability through to utilisation, and even less separates staple production by crop to see whether some crops matter more than others for child nutrition. Staples differ in nutrient content, in how much of the harvest is sold rather than eaten, and in where they can be grown, so looking only at total output may hide effects that matter for policy.

This study therefore asks whether staple food production reduces child stunting in ECOWAS countries. It separates production into cassava, rice, maize, millet and sorghum and estimates the effect of each on the prevalence of stunting among children under five, which is SDG indicator 2.2.1 and part of FAO's utilisation dimension. The study adds to existing work in three ways. First, it moves the empirical focus from food availability to nutritional outcomes. Second, it offers crop-level evidence that can help set priorities under regional programmes such as the Comprehensive African Agriculture Development Programme (CAADP). Third, it shows whether policies aimed mainly at raising output are enough to meet SDG target 2.2 in West Africa. The rest of the paper reviews the literature, describes the data and methods, presents the results, and draws policy conclusions.

2. Review of Related Literature

The food availability decline (FAD) theory is associated with Malthus [36] and later with Ehrlich [20], Myrdal [41], and Brown [13]. It holds that famine and food insecurity arise mainly from a fall in the quantity of food available, caused by lower production or disrupted distribution. Drought, war, pests and weak investment in agriculture reduce output, and hunger follows when supply falls below what people need. FAD therefore relates most closely to the availability pillar of food security, and it shaped post-war policy at the FAO and the World Bank, which saw higher agricultural output as the main defense against famine. Applied to this study, FAD predicts that higher cassava, rice, maize, millet, and sorghum output should lower stunting by increasing food per person. The theory has been criticised as too simple. It cannot explain why some groups starve during famines while others do not [15], and it ignores market failures, asset losses and household coping strategies [17]. Sen [52] challenged FAD by arguing that famine often results from people's inability to obtain food rather than from food shortages. Entitlements are the bundles of goods a person can command through production, trade, their own labour, and inheritance or transfers. Hunger occurs when these entitlements fall short of what is needed. Drèze and Sen [19] later stressed the role of public action and social protection in restoring lost entitlements. Production remains one source of entitlement, so higher staple output can improve food security by raising farm incomes or household stocks. The main lesson for this study is that food being available does

not mean households can obtain it. Critics argue that the theory pays too little attention to political violence and state neglect [16] and that it works poorly in conflict settings where markets and legal systems break down [17].

A growing body of research has focused attention on the determinants of child stunting, with recent studies giving particular attention to food systems. Although these studies vary in setting, data and methods, from expert consensus and cross-sectional surveys to panel and spatial models, they generally identify similar drivers of child stunting. This section reviews evidence from countries such as Indonesia and Nigeria, where stunting remains widespread, and agriculture continues to shape household diets. For instance, Prayitno et al. [48] studied how food availability, access and utilisation affect stunting prevention in Bondowoso Regency, East Java, Indonesia. They surveyed 113 mothers of stunted children aged 0-59 months and analysed the responses using partial least squares structural equation modelling (PLS-SEM). Each of the three food security dimensions had a significant positive effect on mothers' stunting prevention practices, and availability had the largest effect. The study recommended making improved food security central to local efforts and implementing community-based nutrition programmes in similar farming districts.

In a related study, Prihtanti et al. [38] used data from 35 districts and cities in Central Java Province between 2021 and 2023 to test whether agricultural output and food prices explain differences in stunting. Following the Chow and Hausman tests, they estimated a fixed effects panel model. Rice production, paddy field area and the egg price index were significant, while horticultural, broiler chicken and cow milk production were not. Although stunting had fallen across the province, some areas still had high rates. The study concluded that producing more food is not enough on its own and that agricultural policy needs to be paired with measures that make food affordable and improve nutrition education. Amare and Balana [8] investigated whether climate-related shocks to farm productivity affect children's height-for-age (HAZ), weight-for-age (WAZ) and stunting. They combined nationally representative household panel data with long-term temperature and rainfall records and estimated two-stage fixed-effects models, relying on exogenous weather variation to address endogeneity. Productivity shocks lowered both HAZ and WAZ and raised the probability of stunting. The effects were stronger in households with poor market access and less education, and they operated mainly through a fall in the food households produced for their own consumption. The study recommended climate-smart agriculture, alongside investment in markets and education, to make smallholders more resilient.

Furthermore, Akerele et al. [6] analysed the effect of food price changes on the nutrition of children under five in Nigeria, using the 2013 and 2016 waves of the Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA). They estimated correlated random-effects probit and fixed-effects models. Stunting rose between the two waves, while wasting and underweight fell. Higher prices of fish, eggs, beef, rice and cooking oil were linked to more stunting; higher maize and garri prices were linked to more wasting; and higher prices of milk, maize and rice were linked to more underweight. Small increases in yam and bean prices did not worsen child nutrition. Rising household income and women's say in financial decisions both reduced undernutrition. The study recommended agricultural policies that consider nutrition and address the high cost of animal protein and key staples. Ahmed et al. [2] mapped the prevalence of childhood stunting and its determinants across Nigeria's second-level administrative areas. Using the 2018 Nigeria Demographic and Health Survey (N = 12,627) and a Bayesian geostatistical model, they estimated national prevalence at 41.5% (95% CrI: 26.4%-55.7%), with rates ranging from 2.0% in Shomolu, Lagos State, to 66.4% in Biriniwa, Jigawa State. Children who were perceived as small at birth or who had three or more bouts of diarrhoea in the two weeks before the survey were more likely to be stunted. Stunting was less likely among children whose mothers had formal education or were overweight, and among those from wealthier households, homes using improved cooking fuel, urban areas and places with moderate rainfall. The study suggested redirecting health services to the poorest parts of northern Nigeria. The studies reviewed broadly agree that food production, food prices, and household characteristics shape child stunting. In Indonesia, stunting is linked to food availability and the prices of key foods. In Nigeria, higher prices for animal protein and staple foods, low maternal education, and household poverty all increase the risk of stunting. However, the literature has several limitations. Some studies rely on cross-sectional data or short panels, limiting causal inference; only Amare and Balana [8] use a clear strategy to address endogeneity. The Nigerian evidence is based on data collected between 2013 and 2018 and therefore does not capture recent price and policy changes. Additionally, Prayitno et al. [48] measured prevention behaviour rather than stunting itself. These gaps point to the need for further research, particularly across the ECOWAS sub-region.

3. Data and Methodology

3.1. Variables Description and Measurement

This study uses panel data for 10 ECOWAS countries from 2001 to 2024, a period chosen based on data availability. All data were obtained from the Food and Agriculture Organisation (FAO) database [25]. The dependent variable is child stunting, defined as low height-for-age among children under five years of age. Stunting prevents children from reaching their full physical and cognitive potential. It reflects chronic or recurrent undernutrition, usually linked to poor nutrition, frequent illness, or inadequate feeding and care in early life. Within the food security framework, it falls under the utilisation pillar. Stunting is measured as the percentage of children

under five who are stunted. The explanatory variables are the yields of five staple crops: cassava, rice (paddy), maize, millet and sorghum. Crop yield is the quantity of a crop harvested per unit of land and indicates land productivity under prevailing climatic, soil and farming conditions. Each yield is measured in tonnes per hectare (t/ha), calculated as total production in metric tonnes divided by harvested area in hectares. The variable description and measurement are summarised in Table 1.

Table 1. *Summary of description and measurement.*

Variable	Description	Measurement	Source
Child stunting	Low height-for-age among children under five	% of children under 5 who are stunted	FAO [25]
Cassava yield	Cassava output per hectare harvested	t/ha	FAO [25]
Rice yield	Paddy rice output per hectare harvested	t/ha	FAO [25]
Maize yield	Maize output per hectare harvested	t/ha	FAO [25]
Millet yield	Millet output per hectare harvested	t/ha	FAO [25]
Sorghum yield	Sorghum output per hectare harvested	t/ha	FAO [25]

Source: Authors' compilation (2026).

3.2. Model Specification

The model draws on the food availability decline (FAD) theory, which links undernutrition to falls in domestic food supply. Following Prayitno et al. [48] and Prihtanti et al. [38], and extending their framework to a multi-country dynamic panel, child stunting is expressed as a function of staple crop yields and public spending on agriculture:

$$CSTN = f(CASY, RICY, MAZY, MILY, SOGY, BAAR) \quad (1)$$

where CSTN is child stunting (%); CASY, RICY, MAZY, MILY and SOGY are the yields of cassava, rice, maize, millet and sorghum, respectively (t/ha); and BAAR is budgetary allocation to agriculture (US$ million). The pooled regression form of Equation (1) is:

$$CSTN_{it} = \beta_0 + \beta_1 CASY_{it} + \beta_2 RICY_{it} + \beta_3 MAZY_{it} + \beta_4 MILY_{it} + \beta_5 SOGY_{it} + \beta_6 BAAR_{it} + \varepsilon_{it} \quad (2)$$

where β_0 is the intercept, β_1-β_6 are homogeneous slope coefficients and ε_{it} is the error term. The subscript $i = 1, \ldots, 10$ indexes the selected ECOWAS countries and $t = 2001, \ldots, 2024$ indexes years. To capture both short- and long-run dynamics, Equation (2) is re-specified as a panel autoregressive distributed lag (PARDL) model in error-correction form:

$$\Delta CSTN_{it} = \varphi_i(CSTN_{i,t-1} - \theta'_i X_{it}) + \Sigma^{p-1}_{j=1} \lambda_{ij} \Delta CSTN_{i,t-j} + \Sigma^{q-1}_{j=0} \delta'_{ij} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (3)$$

where X_{it} is the vector of regressors (CASY, RICY, MAZY, MILY, SOGY and BAAR); θ_i contains the long-run coefficients; λ_{ij} and δ_{ij} are the short-run coefficients; φ_i is the error-correction (speed-of-adjustment) term, which is expected to be negative and significant if a long-run relationship exists; p and q are the optimal lag orders; μ_i is the country-specific effect; and ε_{it} is the remainder disturbance.

3.3. Method of Data Analysis

Equation (3) is estimated using the mean group (MG) estimator of Pesaran and Smith [45] and the pooled mean group (PMG) estimator of Pesaran et al. [46]. The MG estimator allows all coefficients to vary across countries and averages them. The PMG estimator allows short-run coefficients, error-correction terms and intercepts to vary across countries, but restricts the long-run coefficients to be the same for all. The Hausman test is used to choose between the two. Both estimators suit heterogeneous dynamic panels with a moderately long time dimension, such as the present one. Three pre-estimation tests are conducted. First, the cross-sectional dependence (CD) test of Pesaran [43] checks whether the countries are correlated. The test is based on the average pairwise correlation of residuals from the country-specific regressions, and such correlation is likely among ECOWAS members because they share climatic conditions, trade links and regional policies. Second, if cross-sectional dependence is present, we test stationarity with the cross-sectionally augmented Dickey-Fuller (CADF) test of Pesaran [44] at the 5% level. The CADF test augments the standard ADF regression with cross-sectional averages of the lagged level and first differences of the series, which makes it robust to cross-sectional dependence. Third, the error-correction-based cointegration test of Westerlund [56], which also allows for cross-sectional dependence,

tests for a long-run relationship among the variables.

4. Results and Discussion

4.1. Descriptive Statistics

Table 2 shows the descriptive statistics for each variable in the study.

Table 2. *Summary Statistics of the Variables.*

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
CSTN	240	30.717	8.563	15.600	51.900
RICY	240	2.568	0.841	1.101	4.731
MAZY	240	1.655	0.530	0.261	3.335
MILY	240	0.862	0.264	0.349	1.848
SOGY	240	0.946	0.274	0.252	1.712
BAAR	240	18.590	4.612	8.421	32.430

[1] Note: CSTN = child stunting (%); FIMP = [define]; CASY, RICY, MAZY, MILY and SOGY = cassava, rice, maize, millet and sorghum yields (t/ha); BAAR = budgetary allocation to agriculture [unit].
Source: Authors' computation (2026) using Stata 15.

Table 2 presents the summary statistics for the variables. The panel is balanced, with 240 observations covering 10 ECOWAS countries over 2001-2024. Child stunting averaged 30.72% and ranged from 15.60% to 51.90%. A mean above 30% falls in the "very high" prevalence category under the WHO-UNICEF thresholds, indicating persistent chronic undernutrition across the sample and wide differences between countries and over time. Cassava recorded the highest mean yield (11.98 t/ha) among the staple crops, consistent with its central place in West African diets. It was also the most variable, with a coefficient of variation of about 0.48 and yields ranging from 3.52 to 32.59 t/ha. Mean yields of rice (2.57 t/ha) and maize (1.66 t/ha) were modest, while millet (0.86 t/ha) and sorghum (0.95 t/ha) had the lowest yields. This pattern is typical of rain-fed cereal systems that rely on few modern inputs. Relative dispersion for the cereals was similar, with coefficients of variation of roughly 0.29-0.33. Budgetary allocation to agriculture averaged 18.59, with a standard deviation of 4.61, and ranged from 8.42 to 32.43. The coefficient of variation of about 0.25 indicates moderate variation in public support for agriculture across countries and years.

4.2. Cross-Sectional Dependence Test

Countries in a regional bloc such as ECOWAS often share climatic, trade and policy shocks, so the residuals of a panel model may be correlated across countries. This was tested using the cross-sectional dependence (CD) test of Pesaran [43]. The null hypothesis is cross-sectional independence, and the alternative is cross-sectional dependence. The test result also determines whether first- or second-generation panel unit root tests are appropriate. The results are reported in Table 3.

Table 3. *Pesaran Cross-Sectional Dependence Test [43].*

Model	CD statistic	p-value	Decision
CSTN = f(CASY, RICY, MAZY, MILY, SOGY, BAAR)	4.299***	< 0.001	Reject H_0

[2] Note: H_0 is cross-sectional independence. *** denotes significance at the 1% level.
Source: Authors' computation (2026) using Stata 15.

The CD statistic of 4.299 is significant at the 1% level, so we reject the null hypothesis of cross-sectional independence. The countries in the panel are therefore cross-sectionally dependent, meaning that a shock in one country is likely to spill over to others. First-generation unit root tests assume independence and would give unreliable results here, so we use the cross-sectionally augmented Dickey-Fuller (CADF) test of Pesaran [44], which allows for cross-sectional dependence, for the panel unit root test.

4.3. Panel Unit Root Test

Given that the CD test confirmed cross-sectional dependence, stationarity was examined using the second-generation cross-sectionally augmented Dickey-Fuller (CADF) test of Pesaran [44]. The test augments the standard ADF regression with cross-sectional averages of the lagged level and first differences of the series, which removes the influence of common shocks. The null hypothesis is that the series contains a unit root. Each variable was tested in levels and, where necessary, in first differences. The results are reported in Table 4.

Table 4. Pesaran CADF Panel Unit Root Test [44].

Variable	Level	First difference	5% critical value	Order of integration
CSTN	−2.210*** (0.008)	-	−2.330	I(0)
CASY	−1.968 (0.249)	−2.540*** (0.006)	−2.330	I(1)
RICY	−1.632 (0.661)	−2.588*** (0.003)	−2.330	I(1)
MAZY	−1.956 (0.261)	−2.777*** (<0.001)	−2.330	I(1)
MILY	−1.945 (0.273)	−2.730*** (0.001)	−2.330	I(1)
SOGY	−1.604 (0.694)	−2.352** (0.027)	−2.330	I(1)
BAAR	−2.394** (0.019)	-	−2.330	I(0)

[3] Note: H_0 is that the series has a unit root. Figures in parentheses are p-values. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. - implies not tested, as the series is stationary in levels.
Source: Authors' computation (2026) using Stata 15.

The CADF panel unit root test results showed that child stunting (CSTN) and budgetary allocation to agriculture (BAAR) are stationary in levels, with p-values of 0.008 and 0.019, respectively, and are therefore integrated of order zero, I(0). Cassava, rice, maize, millet, and sorghum yields are non-stationary in levels but become stationary after first differencing. These variables are integrated of order one, I(1). Thus, the CADF results show a mixed order of integration, a pattern also reported in recent panel studies [5, 33, 51]. Since none of the variables is integrated of order two, I(2), the panel ARDL framework is appropriate, as it accommodates a mix of I(0) and I(1) regressors.

4.4. Panel Cointegration Test

The residual-based test of Kao [32] examined whether the variables share a long-run equilibrium relationship. The test applies Dickey-Fuller-type statistics to the residuals of a panel regression. The null hypothesis is no cointegration, and the alternative is that all panels are cointegrated. The results are reported in Table 5.

Table 5. Kao Panel Cointegration Test [32].

Test	Statistic	p-value
Modified Dickey-Fuller t	−6.393***	< 0.001
Dickey-Fuller t	−2.620***	0.004
Augmented Dickey-Fuller t	−1.434*	0.076
Unadjusted modified Dickey-Fuller t	−2.128**	0.017
Unadjusted Dickey-Fuller t	−1.846**	0.033

[4] Note: Series: CSTN, CASY, RICY, MAZY, MILY, SOGY and BAAR; N = 10; T = 22. H_0: no cointegration; H_1: all panels are cointegrated. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.
Source: Authors' computation (2026) using Stata 15.

The results showed that four of the five statistics reject the null hypothesis of no cointegration at the 5% level. In particular, the modified Dickey-Fuller (−6.393) and Dickey-Fuller (−2.620) statistics are significant at the 1% level, and the unadjusted modified Dickey-Fuller (−2.128) and unadjusted Dickey-Fuller (−1.846) statistics are significant at the 5% level. The augmented Dickey-Fuller statistic (−1.434) is significant only at the 10% level. Taken together, the results indicate that child stunting, staple crop yields and budgetary allocation to agriculture have a long-run equilibrium relationship across the panel, which justifies estimating the long-run coefficients in the panel ARDL model. This is consistent with studies that report a long-run relationship between food production and child stunting [11, 28, 35, 50, 53].

4.5. Model Estimation

Given that the variables are cointegrated and integrated of mixed orders, the panel ARDL model in Equation (3) was estimated using the MG and PMG estimators. Table 6 reports

both sets of estimates, and the Hausman test in Table 7 was used to choose between them.

Table 6. *MG and PMG Estimates of the Child Stunting Model.*

Variable	MG	PMG
Short-run coefficients		
Error-correction term	−0.009	−0.035***
	(0.864)	(< 0.001)
ΔCASY	0.173	0.616
	(0.430)	(0.264)
ΔRICY	0.005	0.064
	(0.967)	(0.388)
ΔMAZY	0.282	−0.091
	(0.193)	(0.616)
ΔMILY	−0.091	−0.288
	(0.860)	(0.225)
ΔSOGY	0.204	−0.124
	(0.668)	(0.765)
ΔBAAR	−0.007	−0.003
	(0.705)	(0.758)
Constant	1.735	−0.691
	(0.510)	(0.120)
Long-run coefficients		
CASY	3.168	−5.490***
	(0.561)	(0.001)
RICY	84.870	9.850*
	(0.314)	(0.083)
MAZY	−39.790	−19.790***
	(0.354)	(0.006)
MILY	55.840	3.002
	(0.309)	(0.658)
SOGY	46.740	43.680*
	(0.185)	(0.060)
BAAR	0.753	−0.699**
	(0.382)	(0.013)
Observations	230	230

[5] Note: Dependent variable is CSTN. Figures in parentheses are p-values. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.
Source: Authors' computation (2026) using Stata 15.

Table 7. *Hausman Test for MG versus PMG.*

Test	Statistic	p-value	Decision
Hausman $\chi^2(6)$	3.08	0.714	PMG preferred

[6] Note: H_0: the PMG restriction of homogeneous long-run coefficients is valid.
Source: Author's computation (2026) using Stata 15.

The Hausman statistic ($\chi^2(6) = 3.08$; $p = 0.714$) does not reject the null hypothesis that the long-run coefficients are homogeneous across countries. Therefore, the PMG estimator is consistent and more efficient than the MG estimator, and the discussion is based on the PMG results. The error-correction coefficient (−0.035) is negative and significant at the 1% level, confirming a stable long-run relationship between child stunting, staple crop yields, and budgetary allocation to agriculture. However, only about 3.5% of any deviation from the long-run equilibrium is corrected each year, implying that gains in crop yields and agricultural spending would take a long time to mitigate stunting. None of the short-run coefficients is statistically significant. On average, changes in crop yields and agricultural spending have no immediate effect on child stunting. This is not surprising, as stunting reflects cumulative nutritional deprivation in early childhood, and higher output or public spending needs time to raise household incomes and improve diets. Weak implementation of agricultural budgets may also delay their impact. In the long run, cassava yield has a negative effect on child stunting that is significant at the 1% level: a 1 t/ha increase is associated with a 5.49% fall in stunting prevalence. This is consistent with the food availability decline theory, which links domestic food supply to household food security, and with cassava's role as a staple across much of West Africa. It agrees with earlier studies that found higher cassava production reduces malnutrition [39, 49, 53]. Maize yield also reduces child stunting in the long run (−19.79; $p = 0.006$), so a 0.1 t/ha increase is associated with a fall of about 2 percentage points in stunting prevalence. This fits the agricultural household model, in which higher output raises both household income and food consumption. The result is in line with studies linking maize production to better child nutrition in Africa and other developing regions [4, 10, 21, 27, 34, 37, 59]. By contrast, the long-run coefficients of rice (9.85) and sorghum (43.68) are positive but significant only at the 10% level, and the millet coefficient is not significant. Higher yields of these crops have thus not translated into lower stunting. One possible reason is that much of the additional output is sold rather than eaten at home, or does not reach the most vulnerable households. These weakly significant results should be interpreted with caution. Budgetary allocation to agriculture has a negative long-run effect on child stunting that is significant at the 5% level (−0.699; $p = 0.013$). This supports the public investment view that government spending on agriculture raises farm productivity and rural incomes, which

in turn improves child nutrition. The finding is.

Table 8. *Country-Specific Short-Run PMG Estimates.*

Country	EC	ΔCASY	ΔRICY	ΔMAZY	ΔMILY	ΔSOGY	ΔBAAR	Constant
Benin	−0.01***	0.001	−0.06**	0.88**	−1.01**	0.48***	−0.002**	0.71***
	(<0.001)	(0.342)	(0.026)	(0.012)	(0.039)	(0.004)	(0.016)	(0.003)
Burkina Faso	−0.03***	5.56**	0.63**	−1.22**	−1.61	0.83	0.03***	−4.01
	(<0.001)	(0.025)	(0.036)	(0.042)	(0.679)	(0.538)	(<0.001)	(0.228)
Côte d'Ivoire	−0.07***	0.43***	0.19***	−0.49**	0.20	0.58	−0.01***	0.19
	(<0.001)	(<0.001)	(0.004)	(0.013)	(0.735)	(0.730)	(0.005)	(0.930)
Ghana	−0.01***	−0.14***	0.03	0.24	0.02	−0.24	−0.01***	−1.37***
	(<0.001)	(<0.001)	(0.483)	(0.263)	(0.941)	(0.339)	(<0.001)	(<0.001)
Guinea	−0.01***	0.24**	0.001	−0.25	−1.39	−3.72	−0.04***	0.21
	(<0.001)	(0.027)	(0.999)	(0.610)	(0.779)	(0.489)	(<0.001)	(0.195)
Mali	−0.01***	0.04***	0.04	−0.29**	0.39	0.46	0.02***	−0.25
	(<0.001)	(<0.001)	(0.495)	(0.013)	(0.472)	(0.318)	(0.002)	(0.274)
Niger	−0.02***	−0.06***	−0.01	0.42***	0.36	0.29	0.04***	−1.80***
	(<0.001)	(<0.001)	(0.104)	(<0.001)	(0.780)	(0.774)	(<0.001)	(0.004)
Nigeria	−0.02***	0.09***	0.13*	−0.31***	0.10***	0.19*	−0.01	0.31
	(<0.001)	(<0.001)	(0.069)	(0.005)	(0.004)	(0.081)	(0.165)	(0.142)
Senegal	−0.01***	−0.03***	−0.30***	0.17***	0.07	−0.22*	−0.07***	−0.74***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(0.383)	(0.068)	(<0.001)	(<0.001)
Togo	−0.01***	0.04***	−0.001	−0.04	−0.02	0.12	0.02***	−0.16**
	(<0.001)	(0.003)	(0.983)	(0.707)	(0.369)	(0.769)	(<0.001)	(0.014)

[7] Note: Dependent variable is CSTN. Figures in parentheses are p-values. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.
Source: Authors' computation (2026) using Stata 15.

The country-specific short-run estimates in Table 8 show negative and significant error-correction coefficients across all ten countries, confirming that each converges to its long-run equilibrium. However, adjustment is slow. Côte d'Ivoire adjusts fastest, at about 7% a year, followed by Burkina Faso (3%) and Niger and Nigeria (2%). Benin, Ghana, Guinea, Mali, Senegal and Togo adjust at only about 1% a year, so deviations from equilibrium persist for long periods. Because the variables are measured in levels, each crop-yield coefficient indicates the percentage-point change in stunting associated with a 1 t/ha increase in yield. In Benin, rice and millet yields reduce stunting in the short run: a 1 t/ha increase lowers stunting by 0.06 and 1.01 percentage points, respectively. Maize (0.88) and sorghum (0.48) yields are associated with higher stunting, while cassava has no significant effect. Agricultural spending has a small but significant negative effect (−0.002), highlighting the value of public investment in agriculture. The results for Burkina Faso and Côte d'Ivoire are mixed. In both countries, higher cassava and rice yields are associated with higher short-run stunting: by 5.56 and 0.63 percentage points per t/ha in Burkina Faso, and by 0.43 and 0.19 points in Côte d'Ivoire. Higher yields therefore do not automatically improve nutrition, possibly because of market constraints, dietary patterns or unequal access to food. By contrast, maize yield reduces stunting in both countries, by 1.22 and 0.49 points per t/ha, respectively. Agricultural spending lowers stunting in Côte d'Ivoire (−0.01) but raises it in Burkina Faso (0.03), which may reflect differences in how agricultural budgets are allocated and implemented.

In Ghana, cassava is the only crop with a significant short-run effect, reducing stunting by 0.14 points per t/ha, underscoring its role in household food security. Agricultural

spending also lowers stunting in Ghana (−0.01). Cassava yield likewise reduces stunting in Niger (−0.06) but increases it in Mali (0.04) and Guinea (0.24). Maize yield reduces stunting in Mali (−0.29) but raises it in Niger (0.42). These contrasts reflect country-specific differences in food systems and diets. In Nigeria, cassava and millet yields increase stunting in the short run (0.09 and 0.10 points per t/ha, respectively), while maize yield reduces it (−0.31). Agricultural spending has no significant short-run effect. Not all staple crops improve child nutrition in the short run, and yield gains must reach household diets to matter. The results further showed that cassava and rice yields reduce stunting in Senegal (−0.03 and −0.30 points per t/ha, respectively), whereas cassava yield increases it in Togo (0.04). Agricultural spending reduces stunting in Senegal (−0.07) but is associated with a small increase in Togo (0.02). The country-level differences point to the need for country-specific policies and further country-level research.

5. Conclusion and Policy Insights

In this study, we examine whether staple food production reduces child stunting in 10 ECOWAS countries from 2001 to 2024, shifting the focus of food security analysis from availability to utilisation. We use crop-level yields of cassava, rice, maize, millet and sorghum, together with budgetary allocations to agriculture. The findings indicate that staple food production can reduce child stunting, but only in the long run, and that effects vary across crops. Higher cassava and maize yields significantly reduce stunting in the long run. Similarly, budgetary allocation to agriculture significantly reduced child stunting in the long run. Rice and sorghum yields, by contrast, are weakly and positively associated with stunting, and millet has no significant effect. In the short run, none of the variables has a significant average effect on child stunting. The country-level estimates also differ widely, as the same crop can raise stunting in one country and lower it in another. These findings partly support the food availability decline theory. The amount of food produced matters, as do the types of food produced and whether they enter children's diets. In West Africa, increasing output alone is therefore unlikely to achieve SDG target 2.2 unless production policies are also linked to food access and utilisation. Given these findings, we recommend that national governments and ECOWAS, through the ECOWAP and CAADP frameworks, prioritise cassava and maize productivity by increasing farmers' access to improved and biofortified varieties of these crops, such as vitamin A cassava and maize, along with fertiliser and extension services. Again, ECOWAS member states should move towards the Maputo and Malabo commitments to allocate at least 10% of public expenditure to agriculture, ensuring a larger share goes to smallholder productivity, rural infrastructure and nutrition-linked programmes, with closer monitoring of how the funds are used to boost productivity and reduce child stunting.

Abbreviations

ECOWAS	Economic Community of West African States
FAO	Food & Agriculture Organisation
SDG	Sustainable Development Goal
FAD	Food Availability Decline
CAADP	Comprehensive African Agriculture Development Programme
PMG	Pooled Mean Group
MG	Mean Group

Author Contributions

Eruba Dimgba: Conceptualization, Data curation

Christopher Ifeanyi Ezekwe: Formal Analysis, Methodology

Conflicts of Interest

The authors declare no conflicts of interest.

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