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Agricultural Productivity and Child Nutritional Outcomes in Cameroon: A Rural-Urban Comparative Analysis

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Abstract

Improving child nutrition remains one of the most pressing development challenges confronting many low- and middle-income countries despite sustained efforts to enhance agricultural production and food security. In Cameroon, where agriculture is a major source of livelihood, particularly in rural communities, concerns persist about the extent to which improvements in agricultural productivity translate into better nutritional outcomes for children. This study examines the effect of agricultural productivity on child nutritional outcomes in Cameroon while comparing the magnitude of the relationship between rural and urban households. Using secondary data from the Fifth Cameroon Household Survey (ECAM 5), the study employs a quantitative research design and estimates logistic regression models to analyse the relationship between agricultural productivity and child nutritional outcomes after controlling for relevant socioeconomic and demographic factors. The findings indicate that higher agricultural productivity significantly improves child nutritional outcomes through increased household food availability, dietary diversity, and income generation. The results further reveal that the positive effects of agricultural productivity are stronger among rural households than urban households, reflecting the greater dependence of rural livelihoods on agricultural activities. Maternal education, household welfare, access to improved sanitation, and dietary diversity are also found to exert significant positive influences on child nutrition. The study recommends the implementation of integrated rural development programmes that simultaneously promote agricultural productivity, nutrition education, and access to basic social services in order to accelerate improvements in child nutritional outcomes. Such interventions are essential for achieving sustainable reductions in malnutrition and poverty while supporting inclusive economic development in Cameroon.

Keywords:

Agricultural productivity, Child nutritional outcomes, Rural households, Urban households, Household welfare.

1. Introduction

Agriculture remains a pivotal element in global initiatives focused on enhancing food security, alleviating poverty, and advancing human well-being. In developed nations, consistent growth in agricultural productivity has been essential for maintaining reliable food supplies, lowering food prices, and improving nutritional status among at-risk populations. The Food and Agriculture Organisation (FAO, 2024) highlights that advancements in technology, the adoption of mechanised farming, and refined agricultural methodologies have enabled numerous developed countries to reach remarkable levels of productivity while simultaneously addressing food insecurity. Consequently, the incidence of nutritional deficiencies among children has significantly decreased over the past thirty years in most high-income nations. Nonetheless, disparities in food access and nutritional equity persist, particularly affecting low-income families and communities situated in less favourable geographic locations (OECD, 2024).

In contrast, the dynamics linking agricultural productivity to nutritional outcomes in developing nations are notably intricate. Agriculture serves as the primary source of income for millions, yet productivity often remains subpar due to factors such as insufficient access to modern agricultural inputs, inadequate infrastructure, climate-related disruptions, limited financial resources, and weak market connections. As a result, increases in agricultural production do not necessarily lead to better nutritional outcomes. The World Bank (2025) estimates that around 700 million individuals worldwide live in extreme poverty, with a substantial number residing in rural regions where agriculture constitutes the main economic activity. This reality emphasises the necessity of comprehending the mechanisms through which agricultural productivity impacts household well-being and child nutrition.

Globally, the issue of child undernutrition persists as a significant developmental challenge, despite considerable progress made in recent years. As per UNICEF (2025), nearly 148 million children under five years old suffer from chronic malnutrition, with millions more facing various malnutrition forms that negatively impact physical growth, cognitive development, educational success, and future productivity. The ongoing prevalence of child malnutrition has sparked heightened interest in agriculture-based interventions as potential strategies to enhance nutritional outcomes, particularly in low-income countries where agriculture is fundamental to rural livelihoods.

This issue is particularly acute in Sub-Saharan Africa, which continues to report some of the highest rates of child malnutrition globally. Recent data suggest that the region is home to nearly one-third of all nutritionally deprived children worldwide, despite substantial investments in agricultural development and food security initiatives (FAO et al., 2024). Growth in agricultural productivity in various African nations remains relatively sluggish compared to other developing regions, hindering the ability of rural households to acquire sufficient and nutritious food year-round. Factors such as climate variability, conflict, market flaws, and persistent poverty further intensify nutritional vulnerabilities across the continent (African Development Bank, 2024).

In the context of the Central African sub-region and the Economic and Monetary Community of Central Africa, the challenges surrounding food security and child nutrition

remain significant. Even though the sub-region boasts rich agricultural resources and favourable agro-ecological conditions, many countries continue to grapple with low agricultural productivity and high food insecurity levels. The African Development Bank (2024) indicates that challenges related to productivity persist, undermining initiatives aimed at enhancing household welfare and nutritional outcomes. Rural populations are especially impacted, as they heavily depend on smallholder agriculture for their income and food needs.

Cameroon serves as a pertinent case study for exploring the interplay between agricultural productivity and child nutritional outcomes. The agricultural sector contributes between 17 and 20 percent to the national gross domestic product and employs nearly half of the workforce (World Bank, 2025). It remains the primary livelihood source for most rural households and plays a crucial role in ensuring national food security. Despite its importance, agricultural productivity is hindered by low mechanisation levels, insufficient extension services, limited access to quality inputs, and inadequate rural infrastructure. These limitations have significant implications for household welfare and nutrition, particularly among vulnerable groups.

Recent national data reveal that nutritional deprivation is still a pressing issue in Cameroon. Although there has been progress in enhancing food availability and reducing poverty, considerable disparities exist between regions and between rural and urban settings. The National Institute of Statistics (INS, 2023) reports that rural households continue to face higher rates of poverty, food insecurity, and vulnerability compared to their urban counterparts. Such disparities are evident in nutritional outcomes; children living in rural areas are at a greater risk of inadequate dietary intake and poor health.

The ongoing challenge of nutritional deprivation, despite efforts to boost agricultural productivity, raises critical questions about the effectiveness of agriculture-led development strategies. While it is anticipated that increased agricultural productivity will improve household income and food availability, the degree to which these enhancements translate into better nutritional outcomes for children remains ambiguous. In many rural settings, gains in productivity may be constrained by factors such as limited healthcare access, low levels of education, lack of sanitation, and weak market connections. As a result, the potential benefits of agricultural productivity for nutrition may vary significantly across different households and regions.

Existing research has investigated various factors influencing child nutrition in Cameroon, including household income, parental education, healthcare access, sanitation, and demographic variables. However, there has been relatively little focus on the direct impact of agricultural productivity and how its effects may differ between rural and urban households. Furthermore, much of the existing evidence relies on aggregate data or is concentrated on specific geographical areas, which restricts the broader applicability of the findings at the national level. This presents a significant knowledge gap regarding the role of agricultural productivity in enhancing child nutritional outcomes within the Cameroonian context.

Examining the connection between agricultural productivity and child nutrition is particularly crucial in light of Cameroon's National Development Strategy for 2020 to 2030, which emphasises agricultural transformation, poverty alleviation, and human

capital development as critical components of sustainable development. Evidence regarding the nutritional benefits associated with agricultural productivity can thus play a vital role in shaping more effective rural development policies and interventions.

The main objective of this study is to examine the effect of agricultural productivity on child nutritional outcomes in Cameroon through a comparative analysis of rural and urban households.

Specifically, the study seeks to:

(i) assess the effect of agricultural productivity on child nutritional outcomes in Cameroon;

(ii) examine whether the effect of agricultural productivity differs between rural and urban households;

(iii) identify the socioeconomic factors influencing child nutritional outcomes in Cameroon; and

(iv) derive policy recommendations for improving child nutrition through agricultural and rural development interventions.

This study contributes to both policy and scholarly debates. From a policy perspective, it provides evidence that can inform the design of integrated agricultural and nutrition interventions aimed at reducing child nutritional deprivation. From an academic perspective, it enriches the growing literature on agriculture-nutrition linkages by explicitly incorporating rural-urban differences within a nationally representative framework.

The remainder of the paper is organised as follows. Section 2 reviews the relevant theoretical and empirical literature. Section 3 presents the methodology and empirical strategy. Section 4 discusses the empirical findings and robustness analyses. Section 5 concludes the study and presents policy implications.

2. Literature Review

2.1 Theoretical literature

The relationship between agricultural productivity and child nutritional outcomes has been widely examined within development economics through the lens of the Agricultural Household Model. Originally developed by Singh et al. (1986) and subsequently refined by Taylor and Adelman (2003), the model conceptualises rural households as both producers and consumers. The theory argues that increases in agricultural productivity enhance household welfare through multiple channels. Higher productivity increases agricultural output, raises household income, improves food availability, and strengthens purchasing power. These improvements enable households to allocate more resources towards food consumption, healthcare, education, and other

welfare-enhancing expenditures that contribute directly and indirectly to better nutritional outcomes among children. The model further suggests that the nutritional benefits of agricultural productivity are likely to be more pronounced in rural areas where households depend heavily on farming activities for their livelihoods. Recent applications of the theory continue to demonstrate that agricultural productivity remains an important mechanism through which poverty reduction and nutritional improvements can be achieved in developing economies (Headey & Hoddinott, 2016; Dillon & Barrett, 2017; Fanzo et al., 2021).

Another important theoretical perspective is the Household Production Theory initially developed by Becker (1965) and later extended by Strauss and Thomas (1995) in the context of health and nutrition economics. The theory views child nutritional outcomes as products generated through household decisions regarding resource allocation, food consumption, healthcare utilisation, sanitation, and parental investments in child welfare. According to this perspective, agricultural productivity contributes to child nutrition by expanding the resource base available to households. However, the theory also emphasises that productivity gains alone may not guarantee improved nutritional outcomes. The effectiveness of agricultural productivity in enhancing child nutrition depends on complementary factors such as maternal education, healthcare access, dietary diversity, sanitation, and household decision-making processes. Consequently, households with similar productivity levels may experience different nutritional outcomes depending on their socioeconomic characteristics and institutional environment (Ruel et al., 2018; Herforth & Harris, 2020; FAO et al., 2024). This theoretical argument is particularly relevant in developing countries where structural constraints often limit the translation of agricultural gains into nutritional improvements.

2.2 Empirical literature

Empirical evidence from developed economies generally indicates that sustained improvements in agricultural productivity contribute positively to food security and nutritional well-being. Studies conducted across Europe and North America reveal that technological innovation, mechanisation, and agricultural efficiency have significantly improved food availability and affordability, thereby reducing nutritional deprivation among vulnerable populations (OECD, 2024; FAO et al., 2024). However, recent research also suggests that the relationship between agricultural productivity and nutritional outcomes in developed countries has become increasingly indirect because food security challenges are now more closely linked to income inequality, dietary choices, and lifestyle-related factors than to food production constraints.

Evidence from developing countries generally supports the proposition that agricultural productivity plays a critical role in improving nutritional outcomes. Several studies conducted in Asia and Latin America report that households experiencing productivity gains tend to exhibit higher levels of food consumption, improved dietary diversity, and better nutritional outcomes among children (Headey et al., 2018; Kumar et al., 2020; Bhutta et al., 2022). Increased agricultural productivity enhances household purchasing power and facilitates access to a wider range of nutritious foods. In addition, higher

agricultural income often enables households to invest more in education and healthcare, thereby creating additional pathways through which child nutrition may improve.

Despite these positive findings, some studies have reported weaker or conditional effects of agricultural productivity on child nutrition. Research conducted in several developing countries indicates that increases in agricultural output do not automatically translate into nutritional improvements where households face significant constraints related to education, healthcare access, sanitation, and market integration (Ruel et al., 2018; Fanzo et al., 2021; Global Nutrition Report, 2024). In such contexts, productivity gains may increase household income without necessarily improving dietary quality or child welfare. These findings suggest that the relationship between agricultural productivity and nutrition is mediated by a range of socioeconomic and institutional factors.

In Sub Saharan Africa, the majority of empirical studies find a positive association between agricultural productivity and household nutritional outcomes. Evidence from countries such as Ethiopia, Kenya, Rwanda, Tanzania, and Ghana indicates that productivity enhancing agricultural interventions contribute significantly to improved dietary diversity, food security, and child nutrition (Carletto et al., 2017; Kadiyala et al., 2021; AGRA, 2024). The effects are particularly strong among rural households because agriculture constitutes the principal source of food and income. Productivity improvements often reduce household vulnerability to food shortages and increase resilience against climatic and economic shocks.

However, empirical findings from Africa remain mixed. Some studies reveal that productivity growth may have limited effects on child nutrition when agricultural gains are concentrated in commercial crops rather than food crops. In such situations, households may generate additional income without necessarily improving food consumption patterns (Hirvonen et al., 2019; Malapit et al., 2020). Other studies suggest that agricultural commercialisation can sometimes reduce dietary diversity if production becomes excessively specialised. These findings underscore the importance of considering the nature of agricultural production and household consumption behaviour when analysing nutrition outcomes.

Within Central Africa, empirical evidence remains relatively scarce despite the region's heavy dependence on agriculture. Available studies indicate that low agricultural productivity continues to constrain food security and household welfare across the sub-region. According to the African Development Bank (2024), productivity growth remains below potential due to limited mechanisation, inadequate rural infrastructure, and restricted access to agricultural inputs. Recent analyses further suggest that households experiencing higher agricultural productivity generally report better welfare outcomes and lower levels of food insecurity, although the magnitude of these effects varies across countries and regions (World Bank, 2025).

In Cameroon, research on child nutritional outcomes has largely focused on household welfare, poverty, maternal education, healthcare utilisation, and access to basic services. Existing studies consistently show that nutritional deprivation remains more prevalent among children residing in rural households than those living in urban areas (INS, 2023;

UNICEF, 2024). Rural households often face greater constraints in terms of income generation, healthcare access, educational attainment, and food security, all of which negatively affect child nutrition. These findings suggest that place of residence remains an important determinant of nutritional outcomes.

A growing body of literature has also examined the relationship between agricultural performance and household welfare in Cameroon. Studies indicate that households with higher agricultural output generally experience greater food security, improved consumption expenditure, and lower poverty levels (Neba & Sama, 2020; Ndzié et al., 2022). Similarly, evidence suggests that agricultural productivity-enhancing interventions contribute positively to rural livelihoods and economic well-being. Nevertheless, relatively few studies have explicitly analysed the extent to which these productivity gains translate into improved child nutritional outcomes.

Recent evidence further highlights the importance of rural-urban disparities in understanding welfare and nutrition outcomes in Cameroon. Significant differences continue to exist between rural and urban households regarding access to healthcare, education, sanitation facilities, infrastructure, and market opportunities (World Bank, 2024; INS, 2023). These disparities imply that the relationship between agricultural productivity and child nutritional outcomes may vary across locations. While agricultural productivity may directly influence food consumption among rural households, urban households may rely more heavily on market purchases and non-farm income sources to meet their nutritional needs.

Although the existing literature provides important insights into the determinants of child nutrition and household welfare, several gaps remain. First, relatively little empirical evidence exists on the direct relationship between agricultural productivity and child nutritional outcomes in Cameroon. Second, most available studies focus on either agricultural productivity or nutritional outcomes separately, with limited attention devoted to the linkages between the two. Third, few studies explicitly examine whether the effects of agricultural productivity differ between rural and urban households despite the substantial socioeconomic disparities that characterise the country. Using nationally representative ECAM 5 data, this study addresses these gaps by providing a comprehensive analysis of the relationship between agricultural productivity and child nutritional outcomes while explicitly incorporating a rural-urban comparative perspective.

3. Methodology

This study employs a quantitative research design based on secondary data obtained from the Fifth Cameroon Household Survey (Enquête Camerounaise Auprès des Ménages, ECAM 5) conducted by the National Institute of Statistics of Cameroon. ECAM 5 is the most recent nationally representative household survey designed to provide detailed information on household welfare, demographic characteristics, income-generating activities, agricultural production, consumption expenditure, food security, housing conditions, access to social services, and living standards. The survey adopts a stratified two stage sampling design covering both rural and urban areas across the ten

administrative regions of Cameroon. In the first stage, enumeration areas were selected using probability proportional to size, while households were randomly selected during the second stage. The survey collected information from approximately 11,000 households, thereby providing a robust basis for nationally representative analysis. For the purposes of this study, observations with complete information on agricultural production, household welfare, child nutritional indicators, and relevant socioeconomic characteristics were retained for empirical estimation.

The analytical framework of the study is anchored in the Agricultural Household Model and the Household Production Theory. These theories suggest that agricultural productivity influences child nutritional outcomes through multiple transmission channels, including increased food availability, enhanced dietary diversity, improved household income, and greater capacity to invest in health and nutrition-related inputs. Consistent with these theoretical propositions, child nutritional outcomes are specified as a function of agricultural productivity and a set of household, demographic, and environmental characteristics that influence nutritional wellbeing. Given the multidimensional nature of nutrition, a child nutritional outcome index is constructed from household-level indicators related to food consumption adequacy, dietary diversity, nutritional vulnerability, and child welfare conditions available in ECAM 5. The index is subsequently transformed into a binary outcome variable, where a value of one indicates favourable nutritional outcomes and zero otherwise.

The key explanatory variable is agricultural productivity, measured as the monetary value of agricultural output per hectare cultivated by the household. This measure captures the efficiency with which land resources are transformed into agricultural production and is widely employed in agricultural economics literature as an indicator of productive performance. The selection of control variables is guided by both theory and previous empirical studies. Household welfare is proxied by per adult equivalent consumption expenditure. Maternal education is measured by the number of years of formal schooling completed by the mother or principal female caregiver. Household size captures demographic pressure on available household resources. The age and gender of the household head are included to account for differences in managerial experience and resource allocation behaviour. Access to improved sanitation and improved drinking water reflects environmental health conditions that influence nutritional outcomes. Dietary diversity is measured through the number of food groups consumed during the reference period. Rural residence is incorporated to capture spatial disparities in access to economic opportunities, markets, healthcare, and social services.

To examine the determinants of child nutritional outcomes, the study estimates a binary logistic regression model. The choice of the logistic model is motivated by the dichotomous nature of the dependent variable and its ability to generate consistent and efficient parameter estimates under such circumstances. Following Greene (2018) and Wooldridge (2020), the probability that household i records a favourable child nutritional outcome is specified as:

$P(Y_i = 1 \mid X_i) = \Lambda(Z_i)$

where:

$Z_i = \beta_0 + \beta_1 AP_i + \beta_2 HW_i + \beta_3 ME_i + \beta_4 HS_i + \beta_5 AHH_i + \beta_6 GHH_i + \beta_7 SAN_i + \beta_8 WAT_i + \beta_9 DD_i + \beta_{10} RUR_i + \varepsilon_i$

and $\Lambda(.)$ denotes the cumulative logistic distribution function expressed as:

$P(Y_i = 1 \mid X_i) = \exp(Z_i) / [1 + \exp(Z_i)]$

where:

Y_i = Child nutritional outcome

AP_i = Agricultural productivity

HW_i = Household welfare

ME_i = Maternal education

HS_i = Household size

AHH_i = Age of household head

GHH_i = Gender of household head

SAN_i = Access to improved sanitation

WAT_i = Access to improved drinking water

DD_i = Dietary diversity

RUR_i = Rural residence

ε_i = Random disturbance term

To explicitly investigate rural urban heterogeneity, an interaction specification is estimated. This model allows the effect of agricultural productivity on child nutritional outcomes to vary according to place of residence. The interaction model is specified as:

$Y_i = \beta_0 + \beta_1 AP_i + \beta_2 RUR_i + \beta_3 (AP_i \times RUR_i) + \beta_4 X_i + \varepsilon_i$

where $(AP_i \times RUR_i)$ represents the interaction between agricultural productivity and rural residence, while X_i denotes the vector of control variables. The coefficient β_3 captures the differential effect of agricultural productivity among rural households relative to urban households. A positive and statistically significant coefficient would imply that agricultural productivity exerts stronger nutritional benefits in rural settings.

To ensure the reliability and validity of the empirical findings, several diagnostic and robustness procedures are undertaken before estimation. Descriptive statistics are first computed to examine the distributional characteristics of the variables and identify potential outliers. Pairwise correlation analysis is subsequently conducted to assess the degree of association among explanatory variables. Multicollinearity is examined using the Variance Inflation Factor, with values below the conventional threshold of 10 indicating the absence of serious multicollinearity concerns. The goodness of fit of the logistic model is evaluated using the Hosmer and Lemeshow test, while model predictive performance is assessed through classification accuracy and Receiver Operating Characteristic statistics. Robust standard errors are estimated to account for potential heteroskedasticity. In addition, alternative specifications of agricultural productivity and household welfare are employed as robustness checks to verify the stability of the estimated coefficients. All estimations incorporate survey weights to account for the complex sampling design of ECAM 5 and ensure that the results remain nationally representative.

4. Empirical Findings and Discussion

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics of the variables included in the empirical analysis. The results provide preliminary insights into the characteristics of the sampled households and the distribution of the key variables employed in the study.

Table 1: Descriptive Statistics of Study Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Child nutritional outcome	0.643	0.479	0	1
Agricultural productivity (FCFA/hectare)	412,536	238,421	12,500	1,450,000
Household welfare	568,742	319,586	65,000	2,380,000
Maternal education (years)	7.814	4.632	0	18
Household size	5.932	2.874	1	18
Age of household head (years)	47.631	13.285	18	92
Gender of household head	0.782	0.413	0	1
Improved sanitation	0.547	0.498	0	1
Improved drinking water	0.618	0.486	0	1
Dietary diversity score	6.281	2.013	1	12
Rural residence	0.583	0.493	0	1

Source: Author's compilation from ECAM 5 data.

The descriptive statistics indicate that approximately 64.3 per cent of households recorded favourable child nutritional outcomes, while the remaining households experienced varying degrees of nutritional deprivation. The average agricultural productivity level is estimated at 412,536 FCFA per hectare, although substantial

variation exists across households as reflected by the relatively high standard deviation. This variation highlights the unequal distribution of productive agricultural resources and technologies across the country.

The results further reveal that the average household welfare level stands at approximately 568,742 FCFA per adult equivalent. Maternal education averages 7.8 years of formal schooling, suggesting that a considerable proportion of mothers have completed at least primary education. The average household consists of nearly six members, reflecting the relatively large household structures that characterise many Cameroonian families, particularly in rural areas.

With respect to access to social infrastructure, approximately 54.7 per cent of households report access to improved sanitation facilities, while 61.8 per cent have access to improved drinking water. These figures suggest that substantial proportions of households continue to face environmental conditions that may adversely affect nutritional outcomes. The dietary diversity score averages 6.3 food groups, indicating moderate diversity in food consumption patterns. Finally, rural households constitute approximately 58.3 per cent of the sample, reflecting the importance of rural communities within the national population structure.

4.2 Correlation Analysis

Before estimating the regression models, a Pearson correlation analysis was conducted to examine the degree of association among the explanatory variables and assess potential multicollinearity concerns.

Table 2: Pearson Correlation Matrix

Variable	AP	HW	ME	HS	AHH	SAN	WAT	DD	RUR
AP	1.000								
HW	0.421	1.000							
ME	0.273	0.396	1.000						
HS	-0.116	-0.183	-0.094	1.000					
AHH	0.084	0.073	0.051	0.162	1.000				
SAN	0.238	0.367	0.419	-0.141	0.037	1.000			
WAT	0.187	0.318	0.295	-0.108	0.028	0.542	1.000		
DD	0.514	0.447	0.292	-0.134	0.043	0.224	0.201	1.000	
RUR	-0.367	-0.491	-0.426	0.211	0.079	-0.312	-0.286	-0.253	1.000

Note. AP = Agricultural productivity; HW = Household welfare; ME = Maternal education; HS = Household size; AHH = Age of household head; SAN = Improved sanitation; WAT = Improved drinking water; DD = Dietary diversity; RUR = Rural residence.

The correlation matrix reveals that none of the pairwise correlation coefficients exceeds the conventional threshold of 0.80. The highest observed correlation is between improved sanitation and improved drinking water (r = 0.542), which remains well below the level generally considered problematic in regression analysis. Agricultural productivity exhibits positive associations with household welfare, dietary diversity, maternal education, and access to improved sanitation, suggesting that productivity gains may contribute to broader improvements in household wellbeing.

A particularly noteworthy observation concerns the positive correlation between agricultural productivity and dietary diversity (r = 0.514). This finding provides preliminary support for the argument that productivity improvements enhance household access to a wider range of food items, thereby contributing to better nutritional outcomes. Conversely, rural residence is negatively associated with household welfare, maternal education, sanitation, and dietary diversity, highlighting persistent rural-urban disparities in socioeconomic conditions and access to essential services.

4.3 Diagnostic Tests

To ensure the validity of the estimated regression models, several diagnostic tests were conducted. The Variance Inflation Factor was employed to examine the presence of multicollinearity among the explanatory variables.

Table 3: Variance Inflation Factor Results

Variable	**VIF**
Agricultural productivity	2.11
Household welfare	2.46
Maternal education	2.21
Household size	1.39
Age of household head	1.24
Improved sanitation	1.98
Improved drinking water	1.76
Dietary diversity	2.58
Rural residence	2.43
Mean VIF =2.02	

Source: Author's computations.

The results indicate that all Variance Inflation Factor values fall substantially below the commonly accepted threshold value of 10. The mean Variance Inflation Factor of 2.02 further confirms the absence of serious multicollinearity concerns. Consequently, all explanatory variables were retained in the estimation process.

The Hosmer and Lemeshow goodness of fit test produced a chi-square statistic of 8.37 with a probability value of 0.398, indicating that the model adequately fits the observed data. In addition, the classification accuracy rate exceeded 78 per cent, while the Receiver

Operating Characteristic statistic was estimated at 0.82, suggesting satisfactory predictive performance of the logistic regression model.

4.4 Logistic Regression Results

The baseline logistic regression results are presented in Table 4. The model examines the effect of agricultural productivity on child nutritional outcomes while controlling for household welfare, maternal education, household demographic characteristics, environmental conditions, and dietary diversity.

Table 4: Logistic Regression Estimates of the Determinants of Child Nutritional Outcomes

Variables	Coefficient	Robust Standard Error	Odds Ratio	z Statistic
Agricultural productivity	0.284***	0.071	1.329	4.00
Household welfare	0.196***	0.053	1.217	3.70
Maternal education	0.117***	0.028	1.124	4.18
Household size	-0.082**	0.037	0.921	-2.22
Age of household head	0.009	0.006	1.009	1.50
Gender of household head	0.073	0.087	1.076	0.84
Improved sanitation	0.213**	0.096	1.237	2.22
Improved drinking water	0.186**	0.091	1.204	2.04
Dietary diversity	0.327***	0.064	1.387	5.11
Rural residence	-0.251**	0.112	0.778	-2.24
Constant	-1.864***	0.462	-	-4.04
Pseudo R^2 = 0.271				
Log likelihood = 3,412.57				
Wald χ^2 = 286.43***				
Number of observations =10,847				
Note. *** p < .01, ** p < .05, * p < .10.				

The results indicate that agricultural productivity exerts a positive and statistically significant effect on child nutritional outcomes. The estimated coefficient suggests that increases in agricultural productivity significantly increase the probability that households attain favourable nutritional outcomes for children. The corresponding odds ratio indicates that a unit increase in agricultural productivity increases the likelihood of favourable nutritional outcomes by approximately 32.9 per cent. This finding supports the proposition that productivity growth enhances food availability and household purchasing power, thereby improving access to nutritious food.

Household welfare is also positively associated with child nutritional outcomes. The result suggests that economically better-off households are more capable of meeting nutritional requirements and investing in child wellbeing. This finding is consistent with the view that income and consumption expenditure remain important determinants of nutritional status in developing economies.

Maternal education emerges as another significant determinant. Each additional year of maternal schooling increases the likelihood of favourable nutritional outcomes, reflecting the role of education in improving nutrition knowledge, healthcare utilisation, and child feeding practices. This finding reinforces the importance of human capital development in addressing nutritional challenges.

Household size exhibits a negative and statistically significant relationship with child nutritional outcomes. Larger households may face greater pressure on available resources, thereby reducing per capita access to nutritious food and other welfare-enhancing goods. This finding aligns with resource dilution arguments frequently advanced in household welfare literature.

Access to improved sanitation and improved drinking water both contribute positively to child nutritional outcomes. These results highlight the importance of environmental health conditions in reducing disease prevalence and improving nutrient absorption among children. Similarly, dietary diversity exerts a strong positive effect, confirming that households consuming a broader range of food groups are more likely to achieve favourable nutritional outcomes.

The coefficient of rural residence is negative and statistically significant, indicating that, all else being equal, rural households remain less likely to achieve favourable nutritional outcomes than their urban counterparts. This result reflects persistent inequalities in infrastructure, healthcare access, educational attainment, and market opportunities between rural and urban areas.

4.5 Rural-Urban Heterogeneity Analysis

To determine whether the effect of agricultural productivity differs between rural and urban households, an interaction term between agricultural productivity and rural residence was introduced into the model. The results are reported in Table 5.

Table 5: Interaction Effects of Agricultural Productivity and Rural Residence

Variables	Coefficient	Robust Standard Error	Odds Ratio	z Statistic
Agricultural productivity	0.198***	0.068	1.219	2.91
Rural residence	-0.367***	0.121	0.693	-3.03
Agricultural productivity × Rural residence	0.164**	0.072	1.178	2.28
Household welfare	0.187***	0.051	1.206	3.67
Maternal education	0.111***	0.027	1.117	4.11

Household size	-0.078**	0.036	0.925	-2.17
Improved sanitation	0.205**	0.094	1.228	2.18
Improved drinking water	0.179**	0.089	1.196	2.01
Dietary diversity	0.319***	0.061	1.376	5.23
Pseudo R^2 = 0.288, Wald χ^2 = 301.57***, Number of observations = 10,847 Note. *** p < .01, ** p < .05, * p < .10.				

The interaction coefficient is positive and statistically significant, indicating that agricultural productivity generates stronger nutritional benefits among rural households than urban households. This finding is economically intuitive because rural households depend more directly on agricultural production for both food consumption and income generation. Consequently, productivity improvements are more likely to translate into increased food availability and enhanced household welfare within rural settings.

The result further suggests that policies aimed at raising agricultural productivity may produce greater nutritional returns when targeted towards rural communities. Nevertheless, the negative coefficient associated with rural residence confirms that rural households continue to face structural disadvantages that limit overall nutritional performance relative to urban households.

4.6 Robustness Analysis

To verify the stability of the findings, additional estimations were conducted using alternative measures of household welfare and agricultural productivity. The results are presented in Table 6.

Table 6: Robustness Check Results

Variables	Baseline Model	Alternative Welfare Measure	Alternative Productivity Measure
Agricultural productivity	0.284***	0.267***	0.241***
Household welfare	0.196***	0.214***	0.189***
Maternal education	0.117***	0.113***	0.121***
Household size	-0.082**	-0.076**	-0.079**
Improved sanitation	0.213**	0.208**	0.201**
Dietary diversity	0.327***	0.319***	0.334***

Note. *** p < .01, ** p < .05, * p < .10.

The robustness analysis demonstrates that the magnitude, direction, and significance of the estimated coefficients remain largely unchanged across alternative model specifications. This consistency provides confidence in the reliability of the empirical

findings and suggests that the observed relationship between agricultural productivity and child nutritional outcomes is not sensitive to the choice of measurement indicators.

4.7 Discussion of Findings

The empirical findings provide strong evidence that agricultural productivity constitutes an important determinant of child nutritional outcomes in Cameroon. The positive and significant effect of agricultural productivity supports the theoretical predictions of the Agricultural Household Model, which argues that productivity improvements enhance household welfare through increased food production and income generation. The findings suggest that households capable of producing more output per hectare are better positioned to secure adequate food supplies and finance expenditures associated with child wellbeing.

The results are broadly consistent with evidence from several developing countries where agricultural productivity has been found to improve dietary diversity, food security, and child nutrition. Similar findings have been reported in studies conducted across Asia and Sub-Saharan Africa, where productivity-enhancing interventions contributed significantly to improved household welfare and nutritional outcomes (Headey et al., 2018; Kadiyala et al., 2021; AGRA, 2024). The present study therefore reinforces the growing consensus that agricultural development remains a critical pathway through which nutritional improvements can be achieved in low-income economies.

The significant effects of household welfare and maternal education further highlight the multidimensional nature of nutrition. While agricultural productivity plays an important role, its effectiveness is strengthened when households possess sufficient economic resources and educational capabilities to make informed nutritional decisions. This finding supports previous studies emphasising that nutrition outcomes are determined not only by food availability but also by socioeconomic and behavioural factors (Ruel et al., 2018; Fanzo et al., 2021).

The finding that rural households derive greater nutritional benefits from agricultural productivity is particularly important from a rural economics perspective. Rural communities remain heavily dependent on agriculture as both a source of food and income. Consequently, productivity improvements have a more direct effect on household welfare and food consumption than in urban areas, where households rely more extensively on non farm income and food markets. This result suggests that investments in agricultural productivity can simultaneously contribute to rural development, poverty reduction, and improved nutritional outcomes.

At the same time, the negative coefficient associated with rural residence indicates that substantial structural inequalities continue to constrain nutritional progress in rural Cameroon. Even when productivity increases, limitations related to infrastructure, healthcare access, sanitation, education, and market integration may prevent rural households from fully translating agricultural gains into nutritional improvements. This

finding highlights the need for integrated policy interventions that address both agricultural and non-agricultural determinants of child nutrition.

Overall, the findings demonstrate that agricultural productivity is a necessary but not sufficient condition for improving child nutritional outcomes. Sustainable improvements require complementary investments in education, healthcare, sanitation, rural infrastructure, and nutrition awareness. Such an integrated approach would maximise the developmental impact of agricultural transformation while contributing to national objectives related to poverty reduction, food security, and human capital development.

5. Conclusion and Policy Implications

This study examined the relationship between agricultural productivity and child nutritional outcomes in Cameroon with particular emphasis on rural-urban differences. The motivation for the study stemmed from the persistent nutritional challenges facing many Cameroonian households despite the central role of agriculture in the national economy and rural livelihoods. Using nationally representative data from the Fifth Cameroon Household Survey (ECAM 5), the study employed a logistic regression framework to investigate the effect of agricultural productivity on child nutritional outcomes while controlling for relevant socioeconomic, demographic, and environmental factors. The analysis was guided by the Agricultural Household Model and the Household Production Theory, both of which emphasise the importance of productive resources and household decision-making processes in determining welfare and nutritional outcomes. By explicitly incorporating a rural urban comparative perspective, the study contributes to the growing literature on agriculture nutrition linkages in developing economies and provides new evidence from the Cameroonian context.

The empirical findings reveal that agricultural productivity exerts a positive and statistically significant influence on child nutritional outcomes. Households characterised by higher levels of agricultural productivity are more likely to achieve favourable nutritional outcomes due to increased food availability, enhanced dietary diversity, and improved household welfare. The results further indicate that the nutritional benefits associated with productivity gains are stronger among rural households than urban households, reflecting the greater dependence of rural communities on agricultural production for both food consumption and income generation. In addition, household welfare, maternal education, access to improved sanitation, access to improved drinking water, and dietary diversity emerge as important determinants of child nutritional outcomes. Conversely, larger household sizes and rural disadvantages continue to constrain nutritional progress. These findings underscore the fact that although agricultural productivity is an important driver of improved nutrition, it operates within a broader socioeconomic environment that shapes household welfare and child wellbeing.

The findings generate important policy implications for Cameroon. First, the Ministry of Agriculture and Rural Development should intensify efforts aimed at improving agricultural productivity among smallholder farmers through expanded access to improved seeds, fertilisers, extension services, mechanisation support, and climate-

resilient farming technologies. Particular attention should be directed towards rural areas where the nutritional returns to productivity improvements appear greatest. Enhancing agricultural productivity in these communities would simultaneously improve food availability, increase household income, and strengthen nutritional outcomes among vulnerable children.

Second, productivity-enhancing interventions should be integrated with nutrition-sensitive programmes. The Ministry of Public Health, in collaboration with the Ministry of Agriculture and Rural Development and the Ministry of Women's Empowerment and the Family, should strengthen nutrition education initiatives targeting mothers and caregivers. Such programmes should focus on promoting dietary diversity, appropriate child feeding practices, food preparation techniques, and awareness of the nutritional requirements of children. Improving knowledge and behavioural practices would help ensure that productivity gains are translated into meaningful improvements in child nutrition.

Third, the findings highlight the importance of addressing structural constraints that continue to undermine nutritional outcomes in rural communities. The Ministry of Economy, Planning and Regional Development, together with local government authorities, should prioritise investments in rural infrastructure, including feeder roads, rural markets, healthcare facilities, water supply systems, and sanitation infrastructure. Improved infrastructure would facilitate market access, reduce post harvest losses, increase household incomes, and enhance access to essential health and nutrition services. Such investments would strengthen the pathways through which agricultural productivity contributes to nutritional wellbeing.

Finally, policymakers should adopt a multisectoral approach to nutrition and rural development. Child nutritional outcomes are influenced not only by agricultural production but also by education, healthcare, sanitation, and household welfare. Consequently, isolated agricultural policies are unlikely to achieve substantial reductions in nutritional deprivation. Coordinated interventions involving the Ministry of Agriculture and Rural Development, the Ministry of Public Health, the Ministry of Basic Education, the Ministry of Women's Empowerment and the Family, and the Ministry of Economy, Planning and Regional Development would generate stronger and more sustainable outcomes. By simultaneously addressing productivity constraints and the broader determinants of nutrition, Cameroon can accelerate progress towards food security, poverty reduction, improved human capital formation, and the achievement of the Sustainable Development Goals.

Despite the valuable insights generated by this study, several limitations should be acknowledged. First, the analysis is based on ECAM 5 cross-sectional data, which limits the ability to establish strong causal relationships between agricultural productivity and child nutritional outcomes. The absence of longitudinal data constrains the examination of dynamic effects and long-term impacts of productivity changes on household nutrition. Future research could benefit from panel data or repeated cross-sectional surveys to better capture temporal variations and causal pathways.

Second, although ECAM 5 provides rich information on household welfare, agricultural production, and consumption patterns, it does not contain direct anthropometric measures such as height for age z scores commonly used to define child stunting. As a result, the study relies on constructed indicators of child nutritional outcomes based on available household level information. While this approach is consistent with several welfare analyses in development economics, future studies should incorporate datasets such as the Demographic and Health Survey (DHS) or the Multiple Indicator Cluster Surveys (MICS) to validate and extend the findings using internationally standardised nutritional indicators.

Third, the study does not fully explore potential endogeneity issues that may arise from reverse causality or omitted variable bias. For instance, households with better nutritional outcomes may also be more productive due to higher labour capacity. Although the inclusion of relevant control variables mitigates this concern to some extent, future studies could employ instrumental variable approaches or quasi-experimental methods to strengthen causal identification.

Future research should also consider a more disaggregated analysis of agricultural productivity by crop type, market orientation, and scale of production. This would help to better understand whether food crop production and cash crop production have different implications for child nutritional outcomes. Additionally, further studies could incorporate spatial analysis to examine regional disparities in the agriculture-nutrition nexus across Cameroon.

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