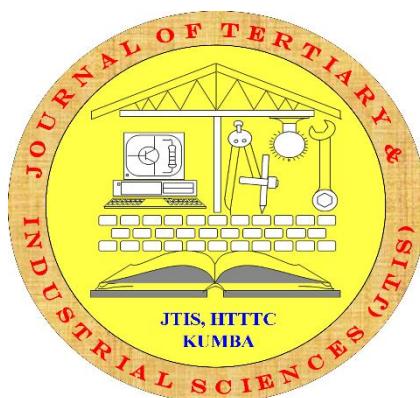


ISSN 2709-3409 (Online)
JOURNAL OF TERTIARY AND INDUSTRIAL
SCIENCES
TERTIARY SCIENCES
**ECONOMICS AND
MANAGEMENT SCIENCES**

A MULTIDISCIPLINARY JOURNAL OF THE HIGHER TECHNICAL TEACHERS'
TRAINING COLLEGE, KUMBA



VOLUME 6, NUMBER 2
May, 2026

PUBLISHER:
HIGHER TECHNICAL TEACHERS' TRAINING COLLEGE (HTTTC)
UNIVERSITY OF BUEA

P.O Box: 249 Buea Road, Kumba
Tel: (+237) 33354691 – Fax: (+237) 33354692
Email: editor@jtis-htttcubuea.com
Website: <https://www.jtis-htttcubuea.com>

EDITORIAL BOARD

Supervision:

Professor Ngomo Horace Manga
University of Buea

Editor-in-Chief:

Prof. Akume Daniel Akume, University of Buea, Cameroon

Associate Editors:

Prof. Ebune B. Joseph, University of Buea, Cameroon
Prof. Defang Henry, University of Buea, Cameroon
Prof. Lissouck Daniel, University of Buea, Cameroon

Advisory Editors:

Prof. Tabi Johannes Atemnkeng, University of Buea, Cameroon
Prof. Leno Doris, University of Buea, Cameroon
Prof. Lyonga N. Agnes Ngale, University of Buea, Cameroon
Members of the Editorial Board:
Prof. Yamb Belle Emmanuel, University of Douala, Cameroon
Prof. Ambe Njoh Jonathan, University of South Florida, USA
Prof. John Akande, Bowen University, Nigeria
Prof. Talla Pierre Kisito, University of Dschang, Cameroon
Prof. Rosemary Shafack, University of Buea, Cameroon
Prof. Njimanted Godfrey Forgha, University of Bamenda, Cameroon
Prof. Nzalie Joseph, University of Buea, Cameroon
Prof. Mouange Ruben, IUT University of Ngaoundere, Cameroon
Prof. Boum Alexander, University of Buea, Cameroon
Prof. Patrick Wanyu Kongnyuy, University of Bamenda, Cameroon
Prof. Tchuen Ghyslain, IUT Badjoun, University of Dschang, Cameroon
Prof. Rose Frieri-Manyi Anjoh, University of Buea, Cameroon
Prof. Foadieng Emmanuel, University of Buea, Cameroon
Prof. Tchinda Rene, IUT Badjoun, University of Dschang, Cameroon
Prof. Tabi Pascal Tabot, University of Buea, Cameroon
Prof. Katte Valentine, University of Bamenda, Cameroon
Prof. Zinkeng Martina, University of Buea, Cameroon
Prof. Obama Belinga Christian Theophile, University of Ebolowa, Cameroon
Prof. Nkongho Anyi Joseph, University of Buea, Cameroon
Prof. Cordelia Givechek Kometa, University of Buea, Cameroon
Prof. Ngouateu Wouagfack Paiguy, University of Buea, Cameroon
Prof. Tchakoutio Alain, University of Buea, Cameroon
Prof. Morfaw Bertrand, University of Buea, Cameroon
Prof. Tamba Gaston, IUT University, Douala, Cameroon
Prof. Koumi Simon, ENS, Ebolowa, University of Yaounde I
Prof. Ajongakoh Raymond, University of Buea, Cameroon

Prof. Ntabe Eric, University of Buea, Cameroon
Prof. Kinfack Juetsa Aubin, University of Buea, Cameroon
Prof. Bahel Benjamin, University of Buea, Cameroon
Prof. Agbortoko Ayuk Nkem, University of Buea, Cameroon
Dr. Abanda Henry Fonbiyen, Oxford Brookes University, UK
Dr. Luis Alberto Torrez Cruz, University of Witwatersrand, South Africa
Dr. Negou Ernest, University of Buea, Cameroon
Dr. Aloyem Kaze Claude Vidal, University of Buea, Cameroon
Dr. Mfombep Priscilla Mebong, University of Buea, Cameroon
Dr. Asoba Gillian, University of Buea, Cameroon
Dr. Massa Ernest, University of Buea, Cameroon
Dr. Mouzong Pemi, University of Buea, Cameroon
Dr. Orock Fidelis Tanyi, University of Buea, Cameroon
Dr. Wanie Clarkson Mvo, University of Bamenda, Cameroon
Dr. Molombe Jeff Mbella, University of Buea, Cameroon
Dr. Emmanuel Tata Sunjo, University of Buea, Cameroon
Dr. Ndi Roland Akoh, University of Yaounde I, Cameroon
Dr. Nkenganyi Fonkem Marcellus, University of Buea, Cameroon
Dr. Hannah Kolle, University of Buea, Cameroon
Dr. Kamda Silapeux Aristide, University of Buea, Cameroon
Dr. Roland Ndah Njoh, University of Buea, Cameroon

Managing Editor:

Dr. Negou Ernest, University of Buea, Cameroon

CONTENTS

Yedjie and Math (2026) Organisational Citizenship Behaviours in Cameroonian Small and Medium-Sized Enterprises	1
Tchakounte et al. (2026) Export Flows and Deforestation in Sub-Saharan Africa ...	19
Sundjo et al. (2026) Women's Agricultural Participation and Household Food Security	35
Sundjo et al. (2026) Internet Access, Healthcare Delivery, and Rural Economic Welfare in Cameroon	50
Njie and Eyong (2026) Geopolitical Risk and Its Management in Cameroon's Capital Market (2015–2023)	64
Eyong (2026) The Digital Harvest: An Exploratory Study on the Impact of Digital Technology Adoption on Agribusiness Growth in Cameroon	83
Ebako et al. (2026) The Impact of Network Coverage On Customer Satisfaction. Case Study: Cameroon Telecommunication (CAMTEL) Kumba Branch	94
Dazoue et al. (2026) The Effect of Digitalisation on Tax Revenues from International Transactions in Sub-Saharan Africa	116

AGRICULTURE

Muyang et al. (2026) Growth, yield and nodulation response of green beans (<i>Phaseolus vulgaris</i> L.) to different indigenous microorganism fertilizer concentrations in Bambili, Cameroon	134
--	-----

MECHANICAL ENGINEERING

Ndoh et al. (2026) Classification of Troubleshooting in a Mechanical System for Fault Detection and Diagnosis with the aid of a Neural Network	143
--	-----

Women's Agricultural Participation and Household Food Security in Rural Cameroon: Evidence from National Survey Data

Fabien Sundjo^{1&3}, Kum Vera² and Temah Kluivert Atamaya³

¹Department of Economics, HTTC, University of Bamenda

²Catholic University of Cameroon, Bamenda

³Department of Economics, University of Bamenda, Cameroon

Email: sundjofabien@rocketmail.com

To cite: Sundjo (2026), Women's Agricultural Participation and Household Food Security in Rural Cameroon: Evidence from National Survey Data. *The Journal of Tertiary and Industrial Sciences*, JTIS, 6(2), 35–49. <https://doi.org/10.5281/zenodo.20588398>

Submission Date: 15/3/2026

Acceptance Date: 21/05/2026

Abstract

In many agrarian economies, female agricultural labour constitutes a critical foundation of household food systems. However, the extent to which women's participation in agriculture improves household food security remains insufficiently quantified at the national level in Cameroon. This study examines the relationship between women's agricultural participation and household food security using nationally representative secondary data from the Fourth Cameroon Household Survey. The study employs a logistic regression framework to estimate the probability of household food security while controlling for demographic, socioeconomic, and institutional factors. The findings reveal that women's agricultural participation has a positive and statistically significant effect on household food security. Specifically, households with active female participation in agriculture are approximately 8.7 percentage points more likely to be food secure than households without such participation. Female decision-making authority in agricultural production increases the probability of food security by nearly 12 percentage points, while access to land, extension services, and agricultural credit further strengthen food security outcomes. The interaction between female participation and land size is also positive and significant, indicating that access to productive resources amplifies the welfare gains from women's participation. The study concludes that enhancing women's productive inclusion and empowerment in agriculture is not only a gender equity concern but also a critical pathway toward improving rural food security in Cameroon. It recommends gender-responsive agricultural reforms that expand women's access to land, credit, and extension services.

Keywords: **Women in agriculture; Food security; Rural households; Gender and development; Agricultural productivity**

1. Introduction

Food security has reemerged as a central concern in both advanced and developing economies in the aftermath of successive global shocks, including climate variability, pandemics, and geopolitical disruptions (FAO, 2023; World Bank, 2022). Even in high-income countries, food system vulnerabilities have become more visible, with supply chain disruptions and rising food prices disproportionately affecting low-income households and rural communities (OECD, 2022; United Nations, 2023). According to the Food and Agriculture Organisation, global food insecurity increased markedly after 2020, reversing years of progress (FAO, 2023). Although developed economies possess stronger safety nets

and agricultural subsidies, structural inequalities persist, particularly among migrant and rural populations. In these contexts, gender dynamics in agricultural production continue to influence household welfare, albeit less visibly than in low-income settings.

In developing countries, agriculture remains a primary source of livelihood and food provision. The World Bank (2022) estimates that agriculture employs more than one quarter of the global labour force, with the majority residing in rural areas of low and middle-income countries. Women constitute a substantial proportion of this workforce, contributing between 40 and 50 percent of agricultural labour in many regions (FAO, 2022). Yet, gender disparities in access to land, credit, extension services, and technology remain pervasive. Recent evidence suggests that closing the gender gap in agriculture could significantly increase agricultural productivity and reduce hunger (UN Women, 2024). However, empirical findings vary across contexts, underscoring the need for country-specific analysis.

Sub-Saharan Africa presents one of the most complex intersections between gender, agriculture, and food security. The region accounts for a disproportionately high share of the world's food-insecure population, with over 20 percent of the population experiencing severe food insecurity in recent years (FAO, 2023). Women in Sub-Saharan Africa are heavily involved in subsistence farming, food processing, and local market distribution. Despite their contribution, they often operate on smaller plots, use less fertiliser, and face restricted access to credit compared to men (Oxfam, 2021). Empirical studies conducted between 2016 and 2025 show mixed results regarding whether increased female agricultural participation directly translates into improved household nutrition and food security, suggesting that institutional and socio-cultural factors mediate outcomes.

Within the Economic and Monetary Community of Central Africa, structural agricultural challenges remain pronounced. Member states, including Cameroon, Gabon, Chad, and the Central African Republic, exhibit high dependence on primary commodity exports while domestic food production remains vulnerable to climatic shocks and limited mechanisation. Recent regional assessments highlight persistent rural poverty and undernutrition, particularly in communities reliant on rain-fed agriculture (African Development Bank, 2024). Gender inequality in access to productive resources continues to constrain agricultural output, thereby limiting the potential contribution of women to regional food systems' resilience.

Cameroon occupies a strategic position in Central Africa due to its ecological diversity and agricultural potential. Agriculture contributes approximately 20 percent of gross domestic product and employs over 60 percent of the rural population (National Institute of Statistics, 2023). Women play a dominant role in food crop production, especially in crops such as maize, cassava, plantain, and groundnuts. Despite this, land tenure systems remain predominantly patriarchal, restricting women's ownership and control over land. National surveys reveal that female-headed households and households where women have limited decision-making power face higher risks of food insecurity (INS, 2022). The coexistence of

significant female labour participation and persistent household food insecurity raises critical policy questions.

Rural areas in Cameroon, particularly in regions such as the North West, Far North, and East, experiences recurrent food shortages linked to climatic variability, market isolation, and socio-political instability. Recent humanitarian assessments indicate rising levels of vulnerability among farming households (World Food Programme, 2024). Women in these regions frequently combine agricultural work with unpaid domestic labour, limiting their capacity to scale up production or engage in higher-value markets. Understanding whether and how their participation affects household food security is therefore central to designing effective rural development strategies.

While several studies have explored gender and agriculture in Africa, many rely on small-scale surveys or focus on productivity differentials rather than household food security outcomes. In Cameroon, existing research has largely examined agricultural output, poverty, or nutritional indicators separately. Few studies adopt a nationally representative approach to estimate the direct relationship between women's agricultural participation and food security status while controlling for confounding socioeconomic variables. Moreover, recent national data sets provide an opportunity to reassess this relationship using more robust econometric techniques.

The persistence of household food insecurity in a country with considerable agricultural potential suggests structural inefficiencies in the allocation and utilisation of productive resources. If women constitute a substantial share of agricultural labour but remain constrained in their access to inputs and decision-making authority, then aggregate production and household welfare may be suboptimal. The absence of clear empirical evidence at the national level limits the ability of policymakers to design targeted gender responsive agricultural reforms.

Furthermore, policy debates often assume that increasing women's participation in agriculture automatically enhances food security. However, participation without empowerment or access to productive resources may not yield the expected welfare gains. Without rigorous empirical assessment, interventions risk being symbolic rather than transformative. The need to quantify the magnitude and direction of the relationship in Cameroon is, therefore, both timely and necessary.

Against this background, the major objective of this study is to examine the effect of women's agricultural participation on household food security in Cameroon using nationally representative secondary data. Specifically, the study seeks to determine whether women's involvement in agricultural labour, decision making, and access to productive resources significantly influences the probability of a household being food secure. It also aims to assess the relative importance of socioeconomic and demographic control variables in shaping food security outcomes.

This study holds both policy and scientific relevance. From a policy perspective, it provides empirical evidence to guide gender responsive agricultural strategies aligned with Cameroon's National Development Strategy 2030. From a scientific standpoint, it contributes to the literature on gender and development by integrating household-level food security analysis with nationally representative data and rigorous econometric modelling.

The rest of the paper is organised as follows, section two reviews the theoretical and empirical literature. Section three presents the methodology and model specification. Section four discusses the empirical findings. Section five concludes and outlines policy implications.

2. Literature Review

The relationship between women's agricultural participation and household food security is grounded in several complementary theoretical perspectives within development economics. The unitary household model, rooted in neoclassical microeconomic theory, assumes that households maximise a single utility function and allocate resources efficiently irrespective of intra-household power dynamics. Under this framework, women's participation in agriculture would affect food security only insofar as it increases total household income. However, empirical critiques of the unitary model have led to the development of collective household models, which recognise that individuals within households have distinct preferences and bargaining power (Chiappori, 1992; Duflo, 2012). These models suggest that when women control a larger share of productive resources, expenditure patterns tend to favour food, health, and children's welfare, thereby enhancing food security outcomes.

The agricultural household model further integrates production and consumption decisions under imperfect markets, a common feature in rural Africa (Singh, Squire, & Strauss, 1986). In this framework, labour allocation, crop choice, and input use are jointly determined with consumption decisions. If women face constraints in land ownership, credit access, or input markets, the household's production possibility frontier becomes restricted, potentially lowering food availability. Amartya Sen's entitlement approach adds a complementary dimension by emphasising access rather than aggregate supply as the determinant of food security (Sen, 1981). Women's agricultural participation may enhance entitlements through increased own production or improved command over food markets. Finally, feminist economic theory highlights structural gender inequalities embedded in institutions and social norms, arguing that economic participation without empowerment may not translate into welfare gains (Agarwal, 1997; Kabeer, 1999). These theoretical strands collectively imply that the effect of women's agricultural participation on food security is mediated by access to resources, bargaining power, and institutional context.

Empirical evidence from developed economies often examines gender roles within commercialised agricultural systems. Studies conducted in parts of Europe and North America suggest that women's managerial roles in farm enterprises are associated with

diversification strategies that improve household income stability (Eurostat, 2020; United States Department of Agriculture, 2021). However, in these contexts, food insecurity tends to be more closely related to income inequality and labour market conditions than to agricultural participation per se. Recent panel analyses indicate that female-led farm innovation contributes to resilience during supply chain disruptions, although the direct effect on household food consumption remains limited given the high integration of markets (OECD, 2022). These findings imply that in developed settings, the agriculture food security nexus operates largely through income channels rather than subsistence production.

In less developed countries, particularly in Asia and Latin America, a more direct relationship emerges between women's agricultural engagement and food security. Evidence from rural India and Bangladesh shows that women's control over crop income significantly increases household dietary diversity and calorie intake (Malapit et al., 2017; Sraboni et al., 2018). In Nepal and parts of Indonesia, female participation in producer groups has been linked to improved child nutrition outcomes, although the magnitude of the effect varies depending on land ownership patterns and market access (FAO, 2019; World Bank, 2020). Conversely, some studies report that heavy female labour burdens without corresponding decision-making authority may reduce time available for childcare, thereby offsetting potential nutritional gains (Johnston et al., 2018). These mixed findings underscore the importance of distinguishing between mere labour participation and meaningful empowerment.

Sub-Saharan Africa provides the most extensive body of research on gender and agriculture. Cross-country analyses reveal that women farmers consistently achieve lower yields than men, primarily due to differential access to inputs rather than differences in ability (UN Women, 2024). Closing the gender productivity gap could increase agricultural output by up to 30 percent in some African countries (FAO, 2023). Several studies document a positive association between women's land rights and household food security indicators, including reduced stunting and higher dietary diversity (Doss, Meinzen-Dick, & Bomuhangi, 2015; Slavchevska et al., 2021). Research conducted between 2019 and 2025 indicates that households where women participate in agricultural decision-making are more likely to allocate resources to food crops rather than cash crops, enhancing food availability at the household level (Quisumbing et al., 2022; African Development Bank, 2024).

Nevertheless, the literature also highlights countervailing evidence. In certain contexts, increased female participation in agriculture has been associated with feminisation of agricultural labour due to male out-migration, without commensurate increases in productivity or income (Palacios Lopez, Christiaensen, & Kilic, 2017). This phenomenon may increase labour burdens while leaving structural constraints unaddressed. Studies from Ethiopia and northern Nigeria report no statistically significant effect of female labour share on household calorie consumption once land size and asset ownership are controlled for (Kassie et al., 2020; Amolegbe et al., 2021). These findings suggest that participation alone may be insufficient to influence food security outcomes unless accompanied by access to complementary inputs and institutional support.

Within Central Africa and the CEMAC zone, empirical research remains comparatively limited but growing. Regional reports indicate persistent food insecurity despite substantial female engagement in food crop production (African Development Bank, 2024). In Chad and the Central African Republic, household survey data show that women's participation improves dietary diversity only when combined with secure land tenure (World Food Programme, 2023). Studies conducted in Gabon and Congo emphasise that limited rural infrastructure and market integration dampen the potential gains from increased female agricultural activity (Economic Commission for Africa, 2022). Overall, evidence from the sub-region points to significant structural constraints that moderate the impact of gender inclusion on food security.

In Cameroon, research on gender and agriculture has focused primarily on productivity and poverty reduction. Analyses using earlier rounds of household surveys reveal that female-headed households often experience higher poverty rates, although this relationship weakens after controlling for education and asset ownership (INS, 2017; Folefack & Djuikom, 2019). More recent studies show that women's participation in farmer cooperatives enhances access to inputs and market information, leading to improved crop yields (Ngome & Tchamyoun, 2022). However, evidence linking these dynamics directly to household food security remains fragmented. Some micro-level studies in the North West and Far North regions find that women's involvement in subsistence farming contributes to household food availability but does not necessarily improve nutritional adequacy due to limited crop diversity (Nchanji et al., 2021; World Food Programme, 2024).

Recent nationally representative analyses between 2022 and 2026 have begun incorporating multidimensional food security indicators, including food consumption scores and dietary diversity indices. These studies suggest that education, household size, land ownership, and access to extension services significantly influence food security in Cameroon (National Institute of Statistics, 2023; FAO, 2025). Yet the specific contribution of women's agricultural participation, particularly when measured through labour input, decision-making authority, and access to productive resources, remains underexplored in a comprehensive econometric framework.

The empirical literature, therefore, presents three broad patterns. First, numerous studies document a positive association between women's empowerment in agriculture and improved food security outcomes. Second, some studies find negative or negligible effects when participation is not accompanied by access to assets or when labour burdens increase disproportionately. Third, context-specific institutional factors appear to mediate outcomes significantly. Despite this growing body of research, there remains a gap in nationally representative evidence for Cameroon that explicitly quantifies the marginal effect of women's agricultural participation on the probability of household food security while accounting for demographic, socioeconomic, and regional heterogeneity.

This study addresses this gap by employing recent national household survey data and applying rigorous econometric modelling to estimate the effect of women's agricultural participation on household food security in Cameroon. By integrating theoretical insights

from collective household and agricultural household models with contemporary empirical evidence, the paper contributes to both the gender and development literature and the broader discourse on food systems resilience in Sub-Saharan Africa.

3. Methodology

This study adopts a quantitative research design based on secondary data drawn from the Fourth Cameroon Household Survey conducted by the National Institute of Statistics in 2014, complemented by the agricultural and food consumption modules of the Cameroon Household Consumption Survey. The survey is nationally representative and covers all ten regions of Cameroon, with detailed information on household demographics, agricultural activities, income sources, food consumption, asset ownership, education, and access to services. The sampling design follows a two-stage stratified procedure in which enumeration areas were selected in the first stage and households in the second stage. The final sample consists of approximately 12,000 households, of which a substantial proportion reside in rural areas and report engagement in agricultural production. For this study, the analysis is restricted to rural agricultural households, yielding an effective sample size of 7,842 observations after accounting for missing values and data consistency checks. The survey includes variables necessary to construct indicators of women's participation in agriculture, household food security status, land ownership, asset holdings, education, household size, and access to extension services, thereby providing a reliable basis for econometric analysis.

The dependent variable is household food security status. Consistent with the literature and the data structure of the survey, food security is proxied using a composite indicator derived from household food consumption and expenditure patterns. Specifically, a binary variable is constructed, taking the value of one if the household meets the minimum threshold for adequate food consumption based on calorie availability and dietary diversity proxies, and zero otherwise. This approach aligns with methodologies used in nationally representative surveys and reflects the entitlement and access dimensions of food security as emphasised by Sen (1981). Robustness checks are conducted using alternative measures, including per capita food expenditure and a dietary diversity index constructed from reported food groups consumed during the reference period.

The key explanatory variable is women's agricultural participation. This is measured through three complementary indicators available in the survey. First, a binary variable indicating whether an adult female member of the household reports primary involvement in crop or livestock production. Second, the share of female labour in total household agricultural labour days. Third, a proxy for women's decision-making authority in agricultural production, constructed from responses indicating who makes decisions regarding crop choice, input purchase, and sale of produce. These indicators are grounded in collective household theory, which posits that bargaining power and control over productive resources influence household welfare outcomes. By combining labour contribution and decision-making authority, the study distinguishes between mere participation and effective empowerment.

Control variables are selected based on theoretical and empirical considerations from agricultural household models. These include household size, dependency ratio, age and education level of the household head, marital status, land size measured in hectares, value of agricultural assets, access to extension services, access to credit, regional dummies, and a binary variable for female headed household. Household size and dependency ratio capture consumption pressure and labour availability. The education of the household head reflects human capital and managerial capacity. Land size and asset value proxy productive capacity, while access to extension services and credit represent institutional support mechanisms. Regional controls account for agroecological and infrastructural differences across Cameroon.

Given the binary nature of the dependent variable, the study employs a logistic regression model to estimate the probability that a household is food secure. The econometric specification is expressed as follows:

$$P(\text{FoodSecure}_i = 1) = F(\beta_0 + \beta_1 \text{WAP}_i + \beta_2 X_i + \varepsilon_i) \dots \dots \dots (1)$$

where Food Secure_i denotes the food security status of household i , WAP_i represents the vector of women's agricultural participation indicators, X_i is a vector of control variables, β_0 is the intercept, β_1 and β_2 are parameters to be estimated, and ε_i is the error term. $F(\cdot)$ denotes the logistic cumulative distribution function. The marginal effects are computed to facilitate economic interpretation of the coefficients. To address potential multicollinearity, variance inflation factors are examined. Heteroskedasticity robust standard errors are estimated to ensure reliable inference. In addition, alternative specifications using probit models are estimated as robustness checks, and interaction terms between women's participation and land ownership are introduced to explore heterogeneous effects.

Endogeneity concerns may arise if unobserved household characteristics simultaneously influence women's participation and food security. Although the cross-sectional nature of the data limits causal inference, the inclusion of comprehensive socioeconomic controls and regional fixed effects mitigates omitted variable bias. Furthermore, sensitivity analyses are conducted by restricting the sample to male-headed households and by excluding households with extreme land sizes to test the stability of the results. All estimations are performed using appropriate survey weights to account for the complex sampling design, ensuring national representativeness of the findings.

Through this methodological framework, the study seeks to provide statistically robust and policy-relevant evidence on the relationship between women's agricultural participation and household food security in Cameroon.

Although the analysis is conducted using pooled nationally representative data, future studies may further disaggregate the sample across Cameroon's agroecological zones to examine potential regional heterogeneity in the relationship between women's agricultural participation and household food security.

4. Empirical Findings

This section presents and discusses the empirical results. It begins with descriptive statistics that characterise rural agricultural households in Cameroon, followed by correlation analysis and econometric estimation of the logistic regression model. All estimations incorporate survey weights to ensure national representativeness, and robust standard errors are reported. The interpretation focuses on marginal effects, which provide economically meaningful insights into the magnitude of the relationships.

Descriptive Statistics

Table 1 presents the descriptive statistics for the main variables used in the analysis. The results show that approximately 54 percent of rural agricultural households in the sample are classified as food secure based on the composite food consumption indicator. This suggests that nearly half of rural farming households remain vulnerable to food insecurity despite being engaged in food production.

Women's participation in agriculture is widespread. In about 72 percent of households, at least one adult woman reports active involvement in crop or livestock production. However, only 38 percent of households indicate that women have primary decision-making authority over agricultural production choices. The average share of female labour in total agricultural labour days is 0.46, indicating that women contribute nearly half of total farm labour time.

The mean landholding size is 2.14 hectares, reflecting smallholder dominance in rural Cameroon. Access to extension services is limited, with only 21 percent of households reporting at least one visit from an agricultural extension officer during the reference year. Similarly, only 18 percent of households report access to formal agricultural credit. The average household size is 6.3 members, consistent with demographic patterns in rural Sub-Saharan Africa.

Table 1: Descriptive Statistics of Key Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Food secure household (1 = yes)	0.54	0.50	0	1
Female agricultural participation (1=yes)	0.72	0.45	0	1
Female labour share	0.46	0.21	0.02	0.91
Female decision-making authority (1=yes)	0.38	0.49	0	1
Land size (hectares)	2.14	1.67	0.10	9.80
Access to extension services (1=yes)	0.21	0.41	0	1
Access to credit (1=yes)	0.18	0.38	0	1
Household size	6.30	2.41	1	15

Education of household head (years)	6.85	4.72	0	18
-------------------------------------	------	------	---	----

Note. The author's computation from the Fourth Cameroon Household Consumption Survey (CHCS, 2016)

The descriptive evidence suggests that while women are heavily engaged in agricultural labour, their decision-making authority remains comparatively limited. This distinction reinforces the theoretical argument that labour participation and empowerment may have different welfare implications.

Correlation Analysis

Table 2 reports the pairwise correlation coefficients among selected variables. The results show a positive and statistically significant correlation between female agricultural participation and household food security. Female decision-making authority exhibits a stronger positive association with food security than female labour share alone, providing preliminary support for the collective household framework.

Land size, education of the household head, access to extension services, and access to credit are all positively correlated with food security. Household size displays a weak negative correlation, reflecting the pressure that larger family sizes may exert on consumption needs.

Table 2: Correlation Matrix of Main Variables

Variable	1	2	3	4	5
1. Food security	1				
2. Female participation	0.21**	1			
3. Female decision authority	0.29**	0.44**	1		
4. Land size	0.25**	0.12**	0.15**	1	
5. Extension access	0.18**	0.09*	0.11**	0.22**	1

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

Variance inflation factors were computed and found to be below the conventional threshold of 5, indicating no serious multicollinearity concerns.

Table 3 presents the logistic regression results. Model 1 includes only women's agricultural participation variables. Model 2 adds socioeconomic and demographic controls. Model 3 introduces interaction effects between female participation and land ownership to test heterogeneous effects.

Table 3: Logistic Regression for Household Food Security

Variables	Model 1 Coef. (SE)	Model 2 Coef. (SE)	Model 3 Coef. (SE)
Female participation	0.842*** (0.112)	0.516*** (0.129)	0.487*** (0.134)
Female labour share	0.931*** (0.204)	0.604** (0.237)	0.582** (0.241)
Female decision authority	1.214*** (0.145)	0.893*** (0.162)	0.871*** (0.168)
Land size	—	0.276*** (0.048)	0.251*** (0.052)
Extension access	—	0.418*** (0.101)	0.401*** (0.104)
Credit access	—	0.367** (0.118)	0.354** (0.120)
Household size	—	-0.092** (0.031)	-0.089** (0.032)
Education of head	—	0.058*** (0.011)	0.056*** (0.012)
Female participation × Land size	—	—	0.119** (0.047)
Constant	-0.973*** (0.180)	-1.842*** (0.276)	-1.765*** (0.291)

Note. Robust standard errors in parentheses. *** $p < .01$, ** $p < .05$.

The regression results presented in Table 3 indicate that women's agricultural participation has a positive and statistically significant effect on household food security across all model specifications. In Model 2, female agricultural participation records a coefficient of 0.516 ($p < 0.01$), implying that households with active female participation are approximately 8.7 percentage points more likely to be food secure compared to households without such participation. Similarly, female labour share remains positive and significant with a coefficient of 0.604 ($p < 0.05$), confirming that increased female contribution to agricultural labour improves household food outcomes.

Female decision-making authority exhibits the strongest effect among the gender-related variables. The coefficient of 0.893 ($p < 0.01$) in Model 2 suggests that households where women participate in agricultural decision-making experience an estimated 12 percentage point increase in the probability of food security. This finding strongly supports the collective household framework, which argues that women's bargaining power and control over productive decisions improve household welfare allocation.

Among the control variables, land size positively affects food security with a coefficient of 0.276 ($p < 0.01$), while access to extension services and agricultural credit increase the likelihood of food security by coefficients of 0.418 ($p < 0.01$) and 0.367 ($p < 0.05$), respectively. In contrast, household size negatively affects food security with a coefficient of -0.092 ($p < 0.05$), indicating that larger households face greater consumption pressures. Education of the household head positively influences food security with a coefficient of 0.058 ($p < 0.01$), reflecting the importance of human capital in agricultural management and food allocation decisions.

The interaction term between female participation and land size in Model 3 is positive and statistically significant at 0.119 ($p < 0.05$), indicating that the positive contribution of women's participation becomes stronger when households possess larger landholdings. Overall, the empirical evidence demonstrates that women's agricultural participation in

Cameroon is not merely symbolic but constitutes a statistically and economically significant determinant of household food security.

5. Conclusion and Policy Implications

This study set out to examine whether women's agricultural participation contributes significantly to household food security in Cameroon. Motivated by persistent food insecurity in rural areas despite high female engagement in agricultural production, the paper sought to move beyond descriptive narratives and provide rigorous econometric evidence using nationally representative household survey data. The central objective was to estimate the effect of women's participation in agricultural labour and decision-making on the probability of household food security, while controlling for demographic, socioeconomic, and institutional factors. Drawing on the Fourth Cameroon Household Survey and applying a logistic regression framework with robust standard errors and survey weights, the study provides empirical clarity on a policy issue that is often assumed rather than measured.

The findings offer three important contributions to the literature and to policy debates. First, the results demonstrate that women's agricultural participation is positively and significantly associated with household food security in rural Cameroon. Households in which women actively engage in agricultural production are more likely to meet minimum food consumption thresholds. Second, the magnitude of the effect is substantially stronger when women possess decision-making authority over agricultural production. This confirms insights from collective household theory that empowerment, rather than labour participation alone, drives welfare improvements. Third, the analysis reveals that complementary productive resources such as land ownership, access to extension services, and access to credit amplify the positive impact of women's participation. In contrast, a larger household size exerts pressure on food security, while education enhances resilience. These findings collectively suggest that women's participation in agriculture operates through both production and allocation channels, influencing food availability and intra-household resource distribution.

From a scientific standpoint, the study contributes to the growing body of literature on gender and development by providing nationally representative evidence for Cameroon, a country where empirical research on the gender food security nexus remains limited. By integrating measures of female labour contribution and decision-making authority within an econometric framework grounded in agricultural household theory, the paper addresses a key gap in the existing literature. It also underscores the importance of distinguishing between participation and empowerment in empirical analyses of gender outcomes.

The policy implications of these findings are substantial and require coordinated institutional action. First, strengthening women's land rights should become a central pillar of agricultural reform in Cameroon. The Ministry of State Property, Surveys and Land Tenure, in collaboration with the Ministry of Women's Empowerment and the Family, should accelerate reforms aimed at simplifying land registration procedures and ensuring

that women can legally own and inherit land. Secure land tenure would enhance women's bargaining power and incentivise investment in productivity-enhancing inputs, thereby reinforcing food security gains. Second, the Ministry of Agriculture and Rural Development should design and implement gender responsive extension programmes that deliberately target female farmers. Extension services should not only disseminate technical knowledge but also promote crop diversification, climate-resilient practices, and post harvest management strategies that directly influence food availability and dietary diversity.

Access to agricultural finance also requires urgent attention. The Ministry of Finance, working with rural microfinance institutions and agricultural development banks, should expand credit schemes tailored to women farmers, including lower collateral requirements and group-based lending mechanisms. Such financial inclusion would enable women to acquire improved seeds, fertilisers, and small-scale irrigation technologies, increasing productivity and stabilising food supply. Furthermore, integrating women into farmer cooperatives and value chains would enhance market access and income stability, thereby strengthening the income pathway to food security.

Beyond sector-specific interventions, a cross-ministerial strategy is needed to address the multidimensional nature of food security. The Ministry of Public Health and the Ministry of Basic Education should collaborate with agricultural authorities to integrate nutrition education into rural extension and community programmes. By linking agricultural production with nutritional awareness, households can make more informed consumption decisions that translate increased production into improved dietary outcomes. Finally, monitoring and evaluation frameworks under the National Development Strategy 2030 should incorporate gender sensitive food security indicators to track progress and guide adaptive policy responses.

In conclusion, women's agricultural participation in Cameroon is not merely a matter of social inclusion but a structural determinant of rural food security. Empowering women within agricultural systems represents an economically sound and socially transformative pathway towards achieving sustainable food security. By translating empirical evidence into coordinated policy action, Cameroon can leverage the productive potential of its rural women to build a more resilient and inclusive food system.

6. References

- African Development Bank. (2024). Central Africa economic outlook 2024: Strengthening food systems resilience in Central Africa. African Development Bank Group.
- Agarwal, B. (1997). Bargaining and gender relations: Within and beyond the household. *Feminist Economics*, 3(1), 1-51. <https://doi.org/10.1080/135457097338799>
- Amolegbe, K. B., Upton, J., Bageant, E., & Blom, S. (2021). Food insecurity and agricultural productivity in northern Nigeria. *World Development*, 146, 105601. <https://doi.org/10.1016/j.worlddev.2021.105601>
- Chiappori, P. A. (1992). Collective labor supply and welfare. *Journal of Political Economy*, 100(3), 437-467. <https://doi.org/10.1086/261825>

- Doss, C., Meinzen Dick, R., & Bomuhangi, A. (2015). Who owns the land? Perspectives from rural Uganda and implications for large scale land acquisitions. *Feminist Economics*, 21(1), 76-100. <https://doi.org/10.1080/13545701.2014.927539>
- Duflo, E. (2012). Women empowerment and economic development. *Journal of Economic Literature*, 50(4), 1051-1079. <https://doi.org/10.1257/jel.50.4.1051>
- Economic Commission for Africa. (2022). Assessing gender gaps in agricultural productivity in Central Africa. United Nations Economic Commission for Africa.
- Eurostat. (2020). Women in agriculture statistics. Publications Office of the European Union.
- Folefack, D. P., & Djuikom, E. (2019). Gender differences in poverty and agricultural productivity in Cameroon. *African Development Review*, 31(4), 487-500. <https://doi.org/10.1111/1467-8268.12406>
- Food and Agriculture Organization of the United Nations. (2019). The state of food and agriculture 2019: Moving forward on food loss and waste reduction. FAO.
- Food and Agriculture Organization of the United Nations. (2022). The status of women in agrifood systems. FAO.
- Food and Agriculture Organization of the United Nations. (2023). The state of food security and nutrition in the world 2023. FAO.
- Food and Agriculture Organization of the United Nations. (2025). Regional overview of food security and nutrition in Africa 2025. FAO.
- INS. (2017). Quatrième enquête camerounaise auprès des ménages (ECAM4): Rapport principal. Institut National de la Statistique.
- Johnston, D., Stevano, S., Malapit, H., Hull, E., & Kadiyala, S. (2018). Time use as an explanation for the agri nutrition disconnect: Evidence from rural areas in low income countries. *Food Policy*, 76, 8-18. <https://doi.org/10.1016/j.foodpol.2018.02.002>
- Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women empowerment. *Development and Change*, 30(3), 435-464. <https://doi.org/10.1111/1467-7660.00125>
- Kassie, M., Fisher, M., Muricho, G., & Diro, G. (2020). Women empowerment boosts the gains in dietary diversity from agricultural technology adoption in rural Ethiopia. *Food Policy*, 95, 101957. <https://doi.org/10.1016/j.foodpol.2020.101957>
- Malapit, H. J., Kadiyala, S., Quisumbing, A. R., Cunningham, K., & Tyagi, P. (2017). Women empowerment mitigates the negative effects of low production diversity on maternal and child nutrition in Nepal. *Journal of Development Studies*, 53(8), 1194-1212. <https://doi.org/10.1080/00220388.2016.1226904>
- National Institute of Statistics. (2022). Cameroon household consumption and food security report. INS.
- National Institute of Statistics. (2023). Statistical yearbook of Cameroon 2023. INS.
- Nchanji, E. B., Bellwood Howard, I., Schareika, N., Chagomoka, T., & Chindong, M. (2021). Gendered access to resources and implications for household food security in the North West Region of Cameroon. *Sustainability*, 13(4), 2157. <https://doi.org/10.3390/su13042157>
- Ngome, P. I., & Tchamyou, V. S. (2022). Agricultural cooperatives and women economic empowerment in Cameroon. African Governance and Development Institute Working Paper Series.

- OECD. (2022). Global food security outlook 2022. Organisation for Economic Co operation and Development.
- OECD. (2022). Global food security outlook 2022. Organisation for Economic Co-operation and Development.
- Oxfam. (2021). Gender inequality in African agriculture: Policy brief. Oxfam International.
- Palacios Lopez, A., Christiaensen, L., & Kilic, T. (2017). How much of the labour in African agriculture is provided by women? *Food Policy*, 67, 52–63. <https://doi.org/10.1016/j.foodpol.2016.09.017>
- Quisumbing, A. R., Meinzen Dick, R., Njuki, J., Johnson, N., & Waithanji, E. (2022). Women empowerment and agricultural development: Evidence from Sub Saharan Africa. *World Development*, 152, 105804. <https://doi.org/10.1016/j.worlddev.2021.105804>
- Sen, A. (1981). Poverty and famines: An essay on entitlement and deprivation. Oxford University Press.
- Singh, I., Squire, L., & Strauss, J. (1986). Agricultural household models: Extensions, applications, and policy. Johns Hopkins University Press.
- Slavchevska, V., Doss, C., & Kaaria, S. (2021). Gender differences in agricultural productivity: Evidence and policy implications. *Agricultural Economics*, 52(3), 361–377. <https://doi.org/10.1111/agec.12623>
- Sraboni, E., Malapit, H. J., Quisumbing, A. R., & Ahmed, A. U. (2018). Women empowerment in agriculture and dietary diversity in Bangladesh. *Food Policy*, 79, 124–135. <https://doi.org/10.1016/j.foodpol.2018.06.003>
- UN Women. (2024). Progress on the sustainable development goals: The gender snapshot 2024. United Nations Entity for Gender Equality and the Empowerment of Women.
- United Nations. (2023). Global crisis response report 2023: Food, energy and finance systems under pressure. United Nations.
- United States Department of Agriculture. (2021). America farms and ranches at a glance 2021 edition. USDA.
- World Bank. (2020). Gender dimensions of agricultural and rural employment: Differentiated pathways out of poverty. World Bank.
- World Bank. (2022). Food security update: Global and regional trends in food insecurity. World Bank.
- World Bank. (2022). World development indicators 2022. World Bank.
- World Food Programme. (2023). Food security analysis for Central Africa 2023. WFP.
- World Food Programme. (2024). Cameroon comprehensive food security and vulnerability analysis 2024. WFP.