COMPARATIVE ANALYSIS OF FOOD SECURITY SITUATION AMONG CASSAVA FARMING HOUSEHOLDS IN AKWA IBOM STATE, NIGERIA

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DOI No. 10.528 / zenodo 10558777

ABSTRACT

This study conducted a comparative analysis of the food security situation among cooperative and non-cooperative cassava farming households in Akwa Ibom State, Nigeria. A multi-stage sampling technique was employed to select 360 respondents, and primary data were analyzed using descriptive statistics, the Food Security Index, the Foster Greer Thorbecke Model, Logit regression, and Z-tests. The findings indicate significant socio-economic disparities despite demographic similarities. Both groups were dominated by female farmers, with average ages around 45-46 years, predominantly married, with primary education, and household sizes of 4-8 persons. However, cooperative farmers demonstrated significantly higher average incomes (₦122,439.30) and larger farm sizes (2.3 hectares) compared to non-cooperators (₦116,526.00 and 1.7 hectares, respectively). Food security analysis revealed a substantial difference: 95.00% of cooperative households were food secure, contrasting sharply with 71.67% of non-cooperative households, a statistically significant disparity. Determinants of food security varied, with age, marital status, and farming experience being significant for cooperative members, while age, farm size, and farming experience influenced non-cooperators. The study concludes that cooperative membership significantly improves food security. It is recommended that both farmers and government institutions actively promote the formation and strengthening of such cooperatives, leveraging benefits like collective bargaining power, enhanced resource access, shared knowledge, and improved market linkages to foster sustainable rural development.

1.0 INTRODUCTION

Cassava (*Manihot esculenta Crantz*) is a cornerstone of food security and rural livelihoods in Nigeria, serving as a primary staple for millions and a vital source of income for smallholder farmers (Ikuemonisan & Akinbola, 2021). Its resilience to harsh growing conditions and its versatility in various food and industrial applications underscore its critical role in the national economic growth (Onyediako & Adiele, 2022; Akpan, Udoka & Patrick, 2021). Recognizing this immense potential, successive Nigerian governments have launched various initiatives, such as the Agricultural Transformation Agenda (ATA) and the Presidential Initiative on Cassava (PIC), to bolster its production and transform the cassava value chain (Onyediako & Adiele, 2022). Despite these efforts, ensuring consistent food security at the household level, especially within cooperative farming communities, remains a complex challenge.

Despite Nigeria's position as the world's largest cassava producer, with significant output volumes (Ikuemonisan & Akinbola, 2021), many farming households, particularly those organized within cooperatives, continue to face precarious food security situations. This paradox arises even as research institutions like the International Institute of Tropical Agriculture (IITA) and the National Root Crops Research Institute (NRCRI) have developed and disseminated improved, high-yielding, and disease-resistant cassava varieties alongside advanced agronomic practices (Amadi, Ezeh & Okoye, 2019; Mwebaze, Macfadyen, De Barro, Bua, Kalyebi, Bayiyana & Colvin, 2024). The sustained adoption of these technologies, critical for translating national production figures into household-level food availability, is often hampered by a myriad of constraints. These include limited access to credit, inadequate extension support, fragmented land holdings, and market inefficiencies (Uzochukwu, Mgbedike & Chukwujekwu, 2021). Consequently, the disconnect between national production statistics and the persistent vulnerability of individual farming households highlights a significant challenge in achieving granular food security.

While existing literature extensively covers various aspects of cassava production and its contribution to food security (Onyediako & Adiele, 2022), and research by Nwaobiala & Anyanwu (2018) has explored technology adoption among small-scale farmers in specific Nigerian states, a critical gap exists. Few studies have explicitly focused on the food security status of cassava farming households operating within cooperative structures, particularly in regions like Akwa Ibom State. It remains unclear how membership in cooperatives influences access to resources, adoption of improved practices, and ultimately, household food security outcomes, given that cooperatives are often seen as a pathway to overcome individual farmer constraints. Understanding the specific dimensions of food security within these collective farming entities, and how it correlates with their engagement with modern cassava technologies and collective resource management, is underexplored.

Hence, the study sought to fill the research gap identified by addressing the following objectives;

1. describe the socio-economic characteristics of cooperative and non-cooperative cassava farming households in Akwa Ibom State;
2. assess and compare the food security status of cooperative and non-cooperative cassava farming households in Akwa Ibom State;
3. estimate the determinants of food security cooperative and non-cooperative cassava farming households in Akwa Ibom State.

2.0 Literature Review

Akpaeti & Agom (2023) assessed the rate of loan default by cassava cooperative farmers through their repayment performance and using the loan default index. Multi-stage sampling method was employed to obtain 240 respondents for the study. Primary data obtained were analyzed using descriptive statistics, loan repayment rate and loan repayment index. The result on socioeconomic characteristics showed that 64.5% of the respondents were females while 38.5% were in the age group of 41-50 years. The majority of the respondents were literate 84% and 47% of the respondents had 6-10 years of farming experience. The mean monthly income of respondents was N37, 440.00.

Akpaeti, Okon & Archibong (2023) assessed the determinants of income poverty of cassava farmers in the Uyo Agricultural Zone. Data

were collected using a structured questionnaire. The data obtained were analysed using descriptive statistics, Foster Greer Thorbecke (FGT) and a probit regression model. The results showed that majority (72.1%) of the farmers were between the ages of 21-40 years with a mean age of 35 years. Marital status showed that there were slightly more single farmers (49.1%) than married (44.2%) or even those separated (3.0%). About 38.2% of farmers had an HND/BSc/B.Agric/B.Art; 30.3% hold OND or NCE; 10.9% of them had completed elementary school, and 13.3% lack any kind of formal education.

Agom, Ibok & Archibong (2022) analyzed food security among rural farm households in Ini Local Government Area of Akwa Ibom State. Specifically, respondents' socio-economic characteristics, food security status, and determinants of household food security were analysed. Primary data used for the study were derived from a three-stage sampling survey of 200 randomly selected farming households in 8 farming communities. The results for the socio-economic details revealed that the majority (84.5%) of the household heads were males and were aged between 30-40 years with a mean of 39.6 years. About 77.5% of the respondents were married and their household size stood at between 5-8 members with farming experience between 11-20 years.

Akpaeti, Agom & Ekukpan (2021) investigated the food security status of cooperative and non-cooperative cassava farmers in the Niger Delta Region of Nigeria. The objectives of the study were to; ascertain the food security status of cooperative and non-cooperative in the study area; and determine the gross margin and cost-benefit ratio of cooperative and non-cooperative respondents in the study area. Multi-stage sampling was used to select 180 respondents for the study. The data obtained were analyzed using Food security index and gross margin analysis. The results revealed that 66.7% of the cooperative farming households were food secure, while 33.3% were food insecure. Also, 54.4% of the non-cooperative farming households were food insecure, while 45.6% were food secure. Farmers in cooperative societies were more food secured (mean = 45687.9; SD = 102.8) than non-cooperative farmers (mean = 1,4030.4; SD = 155.6). The mean difference of 31657.456 observed was statistically significant at 5% ($t_{(178)} = 2.904$).

Agom *et al.* (2022) analyzed food security among rural farm households in Ini Local Government Area of Akwa Ibom State. Specifically, respondents' socio-economic characteristics, food security status, and determinants of household food security were analysed. Primary data used for the study were derived from a three-stage sampling survey of 200 randomly selected farming households in 8 farming communities. The data were analyzed using descriptive statistics, the Food security index, and the Logit model. The results showed that the mean per capita food expenditure per month was estimated to be N8,536.47 and the value was used as the food security index, and the majority (80%) of the households were food secure in the study area.

Agom *et al.* (2022) analyzed food security among rural farm households in Ini Local Government Area of Akwa Ibom State. Specifically, respondents' socio-economic characteristics, food security status, and determinants of household food security were analyzed. Primary data used for the study were derived from a three-stage sampling survey of 200 randomly selected farming households in 8 farming communities. The data were analyzed using descriptive statistics, the Food security index, and the Logit model. The result further revealed that farm size, farming experience and monthly income of household heads were positively related to households' food security

status, while age and household size of households' head were inversely related to food security status.

3.0 Research Methodology

3.1 Study Area

The study was conducted in Akwa Ibom State, which occupies part of the South- South region of Nigeria. It has a population of 3,920,208 and a total land mass of 6,900sq km (NPC, 2006). It is located between latitude 4^0 32^1 and 5^0 33^1 North and longitude 7^0 25^1 and 8^0 25^1 East of the Greenwich Meridian and comprises of 31 Local Government with Uyo as the State capital. The occupation of the people includes farming, fishing, trading, hunting, wood-craving, raffia works, blacksmithing, pottery, iron works, arts and crafts creation. The main crops grown in the area include cassava, cocoyam, yam, maize, melon, okra and vegetables. Akwa Ibom State has six (6) Agricultural Zones namely; Oron, Abak, Ikot Ekpene, Etinan, Eket, and Uyo Agricultural Zones.

3.2 Sample Size Selection

The study used Cochran's (1963) formula to obtain representative sample from a large population of cooperative and non-cooperative cassava farming households in the study area. The equation is specified as thus:

$$S_n = \frac{z^2 P(1-P)}{D^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Where:

S_n is the required sample size;

Z is the 95% confidence interval (1.96);

P is the expected proportion of cooperative and non-cooperative cassava farming household in the study area (about 86%);

D is the absolute error or precision at 5% type 1 error.

The sample size was obtained as shown in equation (3.2).

$$S_n = \frac{(1.96)^2 0.86\ (1-0.86)}{(0.05)^2} = 185 \quad \text{---------- (3.2)}$$

For ease of sampling, the calculated sample population was reduced to 180 respondents.

3.3 Sampling Technique

Multi–stage sampling technique was employed in the selection of the respondents for the study. In the first stage, three (3) agricultural zones were selected using simple random technique. The second stage involved simple random selection of three (3) blocks from each of the selected agricultural zones. The third stage involved simple random selection of two (2) circles from each of the blocks earlier selected. Finally, ten (5) cooperative cassava farming households and ten (5) non cooperative cassava farming households were selected from each circle and this gave a sample size of 180 respondents.

3.4 Method of Data Collection

Cross sectional or primary data were collected using well-structured questionnaire. The data were obtained through the use of a structured

questionnaire. The data included social and household expenditures.

3.8 Analytical Techniques

The relevant analytical techniques such as descriptive statistics, inferential statistics, Food Security Index, Logit regression model, and Z-test were used to analyze the objectives and hypotheses of the study.

Objective 1:

To describe socioeconomic characteristics of cooperative and non-cooperative cassava farming households

Descriptive statistics such as means, percentages and frequency tables were employed to describe the socio-economic characteristics of the farming households in the study area.

It is expressed as;

$$X = \sum \frac{Fx}{N} \quad \text{.....(equation 3.3)}$$

Where;

X = mean

Σfx = sum of individual observation

N = sample size

Chi-square was used to test significance difference in the socio -economic characteristics between cooperative and non-cooperative farming household

$$X^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

X^2 = Chi-square

O_i = Observed value

E_i = Expected value

Objective 2:

To assess and compare the food security status of cooperative and non-cooperative cassava farming households

Food security index estimation, using expenditure method as used by Agom *et al.* (2022) to classify the respondents into food secure and food insecure households in a bid to establishing the food security status of the individual households. It is given by;

$$F_i = \frac{per\ capita\ food\ expenditure\ for\ the\ ith\ household}{\frac{2}{3} mean\ per\ capita\ food\ expenditure\ of\ all\ households} \quad \text{..... (Equation 3.4)}$$

Where;

F_i = food security index

When $F_i > 1$ = food secure i^{th} household.

$F_i < 1$ = food insecure i^{th} household.

A household whose per capita monthly food expenditure is above or equal to two-third of the mean per capita food expenditure was classified as being food secured. On the other hand, a food insecure household was that whose per capita food expenditure food expenditure fell below two-third of the mean monthly per capita food expenditure. In comparing food security status between cooperative and non-cooperative cassava farming households, Z-test analysis was carried out.

Objective 3:
To estimate the determinants of food security among cooperative and non-cooperative cassava farming households

Empirical Model for the Determinants of Food Security

A binary logistic regression model as used Agom et al. (2022) to examine the determinants of household food security was adopted. The logistic model is specified explicitly as:

$$Y = \ln(\frac{1}{1-1}) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e_i \ldots\ldots\ldots\ldots \text{ (equation 3.5)}$$

Where;

P_1 = Food secure

1 - P_1= Food insecure

X_1 = Age (years)

X_2 = Household size (measured by number of persons in a household)

X_3 = Level of education (measured by years spent in school)

X_4 = = Income (₦)

X_5 = Farm size (hectares)

X_6 = Marital Status (dummy, where 1 = if married, and 0 = otherwise.)

X_7 = Farming experience (years)

4.0 Results and Discussion

4.1 Socioeconomic characteristics of cooperative and non-cooperative cassava farming households

The socio-economic characteristics of the cassava farmers as shown in Table 1, reveal key insights into their demographic and economic profiles, with implications for household food security. Across both cooperative and non-cooperative groups, female farmers constituted the majority (71.10% and 71.70%, respectively), a finding consistent with previous studies on cassava production (Aniekan, Damian & Sylvia, 2023; Hoa, Hoi, Ngoc & Nha, 2023; Ironkwe, Mbanaso & Ezebuiro, 2023; Awotona, Oladimeji & Damisa, 2022; Amadi et al., 2019). Statistical analysis indicated no significant difference in gender distribution between the two groups, suggesting a similar gender composition regardless of cooperative membership, which impacts the gendered division of labor in food production. Furthermore, the majority of farmers in both cooperative (67.20%) and non-cooperative (71.70%) settings were within the active age

range of 30-60 years, with average ages of 46 and 45 years, respectively. This aligns with findings by Akpaeti and Agom (2023) and implies that farmers possess the physical and mental capabilities necessary for effective agricultural production decisions crucial for household food security. No significant difference in age distribution was observed between the groups.

Based on marital status, the majority of farmers in both cooperative (53.90%) and non-cooperative (61.70%) groups were married, a result corroborated by Edike and Kainga (2024). While no statistically significant difference in overall marital status distribution existed, variations in other categories, such as higher percentages of divorced and widowed individuals among cooperators, could subtly influence household labor availability and resource allocation strategies pertinent to food security. Educational attainment, a critical factor for adopting new technologies and enhancing farm management, showed that most farmers in both groups had primary education (50.00% for cooperators, 71.10% for non-cooperators). Although no statistically significant difference in educational levels was found overall, cooperative members exhibited a notably higher percentage of tertiary education (14.40%) compared to non-cooperators (3.30%). This suggests that cooperatives might attract or benefit more from educated farmers, potentially leading to better access and utilization of modern farming practices and market opportunities that enhance household food security (Akpaeti et al., 2021).

Household size significantly differed between the groups, with the majority of farmers in both cooperative (80.60%) and non-cooperative (81.10%) settings having household sizes ranging from 4 to 8 persons, averaging 5 persons. This significant difference could indicate varying labor dynamics and consumption demands, directly impacting household food security. Economically, cooperative members demonstrated a statistically significant higher average income (₦122,439.30) compared to non-cooperators (₦116,526.00). Cooperators also showed a greater representation in the middle and high-income brackets, suggesting a tangible economic benefit of cooperative membership. This financial advantage, potentially stemming from improved market access, bulk purchasing, or shared knowledge, directly enhances the purchasing power and resilience of cooperative households, thereby improving their food security (Ige and Ojo, 2024; Akpaeti et al., 2021; Ahado, Hejkrlík, Enkhtur, Tseren, & Ratinger, 2021; Mojo, Fischer & Degefa, 2017).

Farming experience, while not statistically different in its overall distribution, revealed a notable disparity in mean experience, with cooperators possessing significantly more years of farming experience (15.90 ± 5.30 years) compared to non-cooperators (6.70 ± 4.00 years). This suggests that more experienced farmers may be inclined to join or benefit from cooperatives (Ahado et al., 2021), leveraging their expertise for better decision-making and risk management, which are vital for consistent food production. Concurrently, farm size, a key determinant of agricultural productivity and income, was significantly larger for cooperative members (average 2.3 hectares) than for non-cooperators (average 1.7 hectares). This larger farm size among cooperators indicates that collective action may facilitate the cultivation of greater areas, leading to higher overall production and, consequently, improved household food security (Akpaeti & Agom, 2021; Guttmann, 2021).

Table 1. Socio-economic characteristics of Respondents in the Study Area

Variables	Cassava Cooperators		Cassava Non-cooperators		Chi-Square Statistics
	F	%	F	%	
Gender					
Male	52	28.90	51	28.30	0.005
Female	128	71.10	129	71.70	
Age (years)					
< 30	25	13.90	21	11.60	0.000
30 – 60	121	67.20	129	71.70	
> 60	34	18.90	30	16.70	
Mean ±SD	46.00±15.50		45.00±14.60		
Marital Status					
Single	6	3.30	50	27.80	0.796
Married	97	53.90	111	61.70	
Divorced	52	28.90	9	5.00	
Widow	25	13.90	10	5.60	
Education					
Primary	90	50.00	128	71.10	0.996
Secondary	64	35.60	46	25.60	
Tertiary	26	14.40	6	3.30	
Household Size (persons)					
< 4	28	15.60	26	14.40	0.000
4 – 8	145	80.60	146	81.10	
> 8	7	3.80	8	4.50	
Mean ±SD	5±1.60		5.00±1.70		
Income (₦)					
< 80,000	28	15.60	30	16.70	0.000
80,000 – 160,000	126	70.00	134	74.40	
> 160,000	26	14.40	16	8.90	
Mean ±SD	122,439.30 ±43,336.30		116,526.00±39,409.60		
Farming Experience (years)					
< 8	17	0.40	123	68.30	0.281
8 – 16	63	35.00	51	28.30	
> 16	100	55.60	6	3.40	
Mean ±SD	15.90±5.30		6.70±4.00		
Farm Size (hectares)					
< 2	41	22.80	83	46.10	0.008
2 – 3	137	76.10	95	52.80	
> 3	2	1.10	2	1.10	
Mean ±SD	2.30±0.80		1.70±0.80		

Source: Field Survey, 2025. **Note:** F – Frequency, % - Percentage

4.2 Food security status of cooperative and non-cooperative cassava farming households

Farming households in the study area were profiled into food secured and food insecure groups based on their per capita food expenditure. The food security status is defined as two-third of the mean per capita food expenditure of the total households studied and is determined using the food security index (as used by Akpaeti et al., 2021). The food security status shown in Table 2 reveals that households whose per capita food expenditure fall below ₦18,792.02 for cooperative farmers and ₦20,406.23 for non-cooperative farmers were designated food insecure while households whose per capita food expenditure equal or is more significant than ₦18,792.02 for cooperative farmers and ₦20,406.23 for non-cooperative farmers were tagged food secured. It is observed that 95.00% of the cooperative farming households were food secured, while 5.00% were food insecure. 71.67% of the non-cooperative farming households are food secure, while 28.33% are food insecure.

This result supports previous works on food security in Akwa Ibom State by Akpaeti et al. (2021), which opines that most farming households in Akwa Ibom State are food secured and that the cooperative farmers are more secured than the non-cooperative farmers. Based on the Z-test analysis, the *p*-value for the two-sided test is 0.0765, the result implies that there is statistical evidence to reject the null hypothesis that the mean per capita food expenditure of cassava cooperators and non-cooperators are the same at 10% significance level. Hence, there is a statistical difference in the food security status of both respondents. Based on the results, cassava farmers who belong to cooperatives, tends to be more food secure compared to their counterparts (Adegoke, Ojiagu & Ariyo, 2023).

The findings could imply that membership in cooperatives fosters social capital, which can enhance a community's ability to cope with food-related shocks, such as droughts or price fluctuations. Stronger social networks can provide support mechanisms and information sharing that contribute to food security. Cooperatives often facilitate access to better farming inputs, technologies, and marketing channels. This can lead to increased cassava yields and better prices for their produce, ultimately contributing to higher income and improved food security. The observed trend aligns with studies showing that cooperative membership can enhance farmers' market power and access to value chains (Lee & Van, 2024; Christian, Obi, Zantsi, Mdoda & Jiba, 2024).

Table 2. Indices of Cassava Farming Household Food Security

Food Security Status	Cassava Cooperators		Cassava non-cooperators		
	Frequency	**Percentage**	**Frequency**	**Percentage**	***Z-test (P-Value)***
Food Secure	171	95.00	129	71.67	0.0765
Non-Food Secure	9	5.00	51	28.33	
Statistics					
MPCFDE	28,188.03		30,609.35		
2/3MPCFDE	18,792.02		20,406.23		

Source: Field Survey, 2025. **Key**: MPCFDE – Mean Per Capita Food Expenditure

4.3 Determinants of food security among cooperative and non-cooperative cassava farming households

Table 3 present the maximum likelihood estimates of the logit model described in equation 3.5. The Pseudo R-square of 0.49 implies that all the explanatory variables included in the model were able to explain 49% of the variation in the log-odds of food security. This is a moderately good fit for a logit model. The log-likelihood ratio (LR) test is significant at one per cent meaning that the model is adequate in explaining the probability of the effect of the explanatory variables on household food security status. Findings revealed that of the seven (7) variables that were included in the model, three (3) variables impacted significantly on food security incidence. These were age, marital status and farming experience. The empirical result revealed that the odds ratio (1.106) of age of the farming households was statistically significant at the 5% level. The result indicates that every one-year increase in the age of the farmer, the odds of the household being food secure increase by a factor of 1.106 (or by 10.6%). The implication is that, older farmers in cooperatives might have accumulated more experience, social capital within the cooperative, and potentially more resources (land, savings), which could positively influence their food security status. This aligns with the idea that experience can lead to better farming practices and risk management. The result is in contrary to those of Agom *et al.* (2022) who found that age had a negative significant relationship with food security status.

The odds ratio (0.024) of marital status of the farming households was statistically significant at the 5% level. The result implies that households who are single, divorced, or widowed have significantly lower odds of being food secure compared to married households within the cooperative. The odds of being food secure for single, divorced, or widowed households are only 2.4% of the odds of being food secure for married households, holding other factors constant. Unmarried individuals might face labor constraints, having only their own labor for farming and off-farm activities. They might also have less access to diverse income sources or social support networks compared to married couples who can pool resources and share labor. Married households often benefit from the pooling of social capital and support from both spouses' families and networks (Achmad, Nurwati, Fedryansyah & Sumadinata, 2024). Single, divorced, or widowed individuals might have weaker social safety nets or face challenges in accessing community support compared to married couples.

The odds ratio (0.539) of farming experience of the farming households was statistically significant at the 1% level. The result indicates that, for every one-year increase in farming experience of the cooperative cassava farmer, the odds of the household being food secure decrease by a factor of 0.539 (or by 46.1%). The findings corroborate with the results of Lim (2024) who reported that, more experienced farmers are less likely to be food secure due to reasons such as; more experienced farmers might be less likely to adopt new, more efficient farming technologies or practices (new crops and planting techniques) promoted by the cooperative.

Table 3. Estimate of the Logit Model for the Determinants of F ood Security Among Cooperative Cassava Farming Households in the Study Area

Variables	Odds Ratio	Std. Err.	Z	*P*-Values
Age	1.105997	0.0557963	2.00	0.046**
Household size	0.014871	1.3084875	0.05	0.961
Education	0.9108891	0.1098378	-0.77	0.439
Income	0.9999962	0.000012	-0.31	0.754
Farm size	0. 7687785	0.4582637	-0.44	0.659
Marital status	0.0238898	0.0358188	-2.49	0.013**
Farming experience	0.5392924	0.1281893	-2.60	0.009***
Constant	4903.234	23090.35	1.80	0.071
Diagnostic statistics				
Number of obs = 180		Prob > chi2 = 0.0000		
LR chi2(7) = 35.19		Pseudo R2 = 0.4924		
Log likelihood = -18.136351				

Source: Field Survey Data. Computed Using Stata64.

***, ** means 1% and 5% probability level of significance, respectively.

Table 4 present the maximum likelihood estimates of the logit model described in equation 3.5. The Pseudo R-square of 0.69 implies that all the explanatory variables included in the model were able to explain 69% of the variation in the log-odds of food security. This is a moderately good fit for a logit model. The log-likelihood ratio (LR) test is significant at one per cent meaning that the model is adequate in explaining the probability of the effect of the explanatory variables on household food security status. Findings revealed that of the seven (7) variables that were included in the model, three (3) variables impacted significantly on food security incidence. These were age, farm size and farming experience.

The empirical result revealed that the odds ratio (0.959) of age of the farming households was statistically significant at the 10% level. For every one-year increase in the age of the household head, the odds of the household being food secure decrease by a factor of 0.959 (or by 4.1%). This also imply that older cooperative farmers have higher odds of being food secure. For each additional year of age, the odds of being food secure increase by approximately 10.6%. Unlike the cooperative group, older non-cooperative farmers are slightly less likely to be food secure. This could be due to factors like declining physical capacity, slower adoption of new farming techniques without the support of a cooperative, or less access to updated information and resources compared to younger farmers.

The odds ratio (0.117) of farm size of the farming households was statistically significant at the 1% level. This imply that, for every one-hectare increase in farm size, the odds of a non-cooperative household being food secure decrease by a factor of 0.117 (meaning their odds are reduced to only 11.7% of the original odds). This finding suggests that non-cooperative cassava farmers with larger farm

sizes in the study area are significantly less likely to be food secure. This could be due to several reasons specific to non-cooperative settings such as inefficient management of larger farms without access to shared resources, labor, or knowledge networks provided by cooperatives (Okafor et al., 2024); managing larger farms might require significantly higher input costs (fertilizers, labor, etc.) that individual non-cooperative farmers struggle to afford, leading to lower yields per hectare and reduced food security; non-cooperative farmers with larger harvests might face greater challenges in accessing profitable markets individually, leading to lower returns and potentially food insecurity despite higher production (Okonkwo & Cajethan, 2022 and Okon, Frank, Etowa & Nkeme, 2017).

The odds ratio (0.850) for farming experience among non-cooperative households was significant at the 10% level. This indicates a marginal negative relationship between the number of years of farming experience of the cassava farmers and the odds of the household being food secure. The result implies that, for every additional year of farming experience, the odds of a non-cooperative household being food secure decrease by a factor of 0.850, or by 15%. This finding, suggesting that more experienced non-cooperative cassava farmers are slightly less likely to be food secure due to resistance to innovation and new technologies, reliance on outdated practices, limited access to updated information and extension services (Lim, 2024). Non-cooperative farmers typically have less access to the consistent flow of updated agricultural information and extension services compared to cooperative members who often benefit from collective training and knowledge sharing initiatives organized by the cooperative. This lack of access could hinder their ability to make informed decisions regarding crop management, pest control, and soil fertility, potentially affecting their food security over time.

Table 4. Estimate of the Logit Model for the Determinants of Food Security Among Non - Cooperative Cassava Farming Households in the Study Area

Variables	Odds Ratio	Std. Err.	Z	*P*-Values
Age	0.9590837	0.0234041	-1.71	0.087*
Household size	0.8051715	0.1583619	-1.10	0.271
Education	1.363443	0.2960207	1.43	0.153
Income	0.9999906	9.33e-06	-1.00	0.315
Farm size	0.1171241	0.0423801	-5.93	0.000***
Marital status	1.258781	0.624263	0.46	0.643
Farming experience	0.8496973	0.0762304	-1.82	0.069*
Constant	26034.95	59634.06	4.44	0.000***
Diagnostic statistics				
Number of obs = 180		Prob > chi2 = 0.0000		
LR chi2(7) = 147.31		Pseudo R2 = 0.6865		
Log likelihood= -33.638404				

Source: Field Survey Data. Computed Using Stata64.

***, * means 1% and 10% probability level of significance, respectively.

Conclusion

The findings reveal distinct socio-economic profiles and food security outcomes between cooperative and non-cooperative cassava farming households. While demographic characteristics such as gender and age are largely similar across both groups, cooperative membership is significantly associated with higher average incomes and larger farm sizes, translating into a substantially greater proportion of food-secure households (95.00% versus 71.67%). The determinants of food security also diverge: for cooperative members, older age and being married positively influence food security, though increased farming experience surprisingly correlates with lower food security, potentially indicating resistance to new methods. Conversely, among non-cooperative farmers, older age, larger farm size, and more farming experience are associated with reduced food security, highlighting challenges in managing resources and adopting innovations without collective support. These insights underscore the critical role of collective action in enhancing household food security and expose specific vulnerabilities among different farmer segments.

Recommendation

The following recommendations are suggested based on the findings;

1. Given the significantly better food security observed among cooperative members, both farmers and government institutions should actively promote the formation and strengthening of cassava farming cooperatives.
2. Farmers should be encouraged to join cooperatives to benefit from collective bargaining power, access to resources, shared knowledge, and potentially improved market linkages.
3. Government institutions should provide support for the establishment and sustainable operation of these cooperatives through training, access to credit, and favorable policies.
4. The research identified marital status as a significant determinant of food security among cooperative members, with a specific non-married group being more vulnerable. Cooperatives should implement targeted support programs for these members, such as facilitating access to labor-saving technologies, providing financial assistance, and strengthening social support networks within the cooperative. Government institutions can support these efforts by providing resources and guidance for developing inclusive cooperative policies.
5. The negative association between farming experience and food security (for non-cooperators) suggests a potential lag in the adoption of modern, efficient farming practices among more experienced farmers. Extension services and agricultural development programs, both governmental and cooperative-led, should focus on tailored training and information dissemination to encourage the adoption of new technologies and sustainable practices among experienced farmers to enhance productivity and economic well-being.

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