DETERMINANTS OF HOUSEHOLD FOOD SECURITY AMONG SMALL RUMINANTS FARMING HOUSEHOLDS IN OSUN STATE, NIGERIA

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Abstract
This study examined the determinants of household food security among small ruminant farmers in Osun State, Nigeria. A cross-sectional survey design was adopted, and a multi-stage sampling technique was used to select 286 respondents. Data were collected using structured interview schedules and analyzed using descriptive statistics, Pearson correlation, multiple regression, and analysis of variance (ANOVA). Results revealed that about 70% of households experienced varying degrees of food insecurity. Socio-economic characteristics such as education, income, flock size, and farming experience had significant positive effects on household food security, while household size had a negative effect. Economic security indicators, including income, asset ownership, and income diversification, showed strong positive relationships with food security. The ANOVA results further indicated significant differences in food security across agricultural zones. The study concludes that improving income, livestock productivity, and access to resources is essential for enhancing household food security. It recommends improved access to credit, strengthened extension services, and support for income diversification among small ruminant farmers.

Keywords: *Food security; Small ruminants; Economic security; Rural households.*

Introduction

Food security remains a major global development concern and is essential for human survival, health, and productivity. It is achieved when individuals have consistent access to sufficient, safe, and nutritious food needed for an active and healthy life (Food and Agriculture Organization [FAO], 2023). Despite global efforts, food insecurity continues to affect millions of people, particularly in developing countries. Recent estimates show that over a quarter of a billion people face acute hunger worldwide, highlighting the persistence of the problem (Food Security Information Network, 2023). Food security is not only about availability but also accessibility, utilization, and stability, all of which are often disrupted by poverty, conflict, and climate change (FAO, 2021; Maxwell & Smith, 1992).

In Nigeria, household food security remains a critical challenge, especially among rural populations. Household food security refers to the ability of a household to secure adequate food for all members at all times, either through production or purchase (Omonona, B. T., Agoi, G. A., & Adetokunbo, G., 2011). However, many households struggle to meet this requirement due to poverty, environmental degradation, and limited access to productive resources (World Bank, 2021; Fikire & Zegeye, 2022). Although agriculture is a major source of livelihood, a significant proportion of households cannot afford adequate meals despite government interventions (Obayelu & Osho, 2020). The situation is worsened by climate variability, population growth, and rising food prices, which reduce food access and stability (Dharmaraju, R., Mehta, V., Singh, D., & Kumar, P., 2018; Osho, 2020). Rural households are particularly vulnerable due to their dependence on subsistence farming and limited access to markets and infrastructure (Aboaba, K. O., Adeyemi, A. A., & Ogunleye, K. Y., 2020; Babatunde, R. O., Omotesho, O. A., & Sholotan, O. S., 2007).

Small ruminant farming plays a crucial role in improving household food security, particularly in rural areas. Small ruminants such as goats and sheep are widely kept because they require low capital, adapt easily to harsh conditions, and reproduce quickly (Fadiyimu, A. A., Alokan, J. A., & Adeyemo, R., 2016; Yakubu, A., Salako, A. E., & Imumorin, I. G., 2024). They provide income, high-quality protein, and serve as a financial buffer during economic shocks (Adesogan, A. T., Havelaar, A. H., McKune, S. L., Eilittä, M., & Dahl, G. E., 2020; Abdul, A., Mohammed, S., Bello, M., & Lawal, A., 2024). In addition, livestock contributes to livelihood diversification and enhances household resilience (Herrero, M., Thornton, P. K., Gerber, P., & Reid, R. S., 2013; Thornton, 2010). However, despite these benefits, many small ruminant farmers still experience food insecurity, suggesting that livestock ownership alone does not guarantee adequate food access.

Existing studies on food security in Nigeria have largely focused on crop production or generalized rural households, often overlooking livestock-based systems (Omonona, B. T., Agoi, G. A., & Adetokunbo, G., 2011; Idris-Adeniyi, 2021). Consequently, there is limited empirical evidence on how socio-economic characteristics, economic conditions, and farm-level factors influence food security among small ruminant farmers. Furthermore, farmers face constraints such as limited access to credit, poor extension services, and weak market linkages, which may affect productivity and food security outcomes (Yusufu, M. B., Adebayo, E. F., & Mohammed, A., 2015). Given Nigeria's commitment to achieving Sustainable Development Goal 2 (Zero Hunger), there is a need for context-specific studies that address these gaps. This study therefore examines the determinants of household food security among small ruminant farmers in Osun State, Nigeria.

Purpose of the Study

The main purpose of this study is to examine the determinants of household food security among small ruminant farmers in Osun State, Nigeria. The study specifically aims to:

i. **Examine the socio-economic characteristics** of small ruminant farmers in the study area.
ii. **Assess the level of economic security** among small ruminant farmers.
iii. **Determine the level of household food security** among small ruminant farmers using appropriate measures (e.g., HFIAS).
iv. **Analyze the relationship between economic security and household food security** among the farmers.
v. **Identify the socio-economic and farm-level determinants** of household food security among small ruminant farmers.

Research Hypothesis

Ho1: There is no significant relationship between socio-economic characteristics and household food security.

Ho2: There is no significant relationship between economic security and household food security.
Ho3: There is no significant difference in food security across zones.

Research Design

This study adopted a cross-sectional survey research design, which enabled the collection of quantitative data from small ruminant farmers at a single point in time. The design was appropriate for examining the socio-economic, economic, and farm-level factors influencing household food security, as well as establishing relationships among variables.

Population of the Study

The population of the study comprised all small ruminant farmers (goat and sheep producers) in Osun State, Nigeria. These farmers are predominantly smallholders engaged in mixed farming systems and rely on livestock production as a source of income and food.

Sample Size and Sampling Techniques

A multi-stage sampling procedure was used to select a total of 286 respondents. First, six agricultural blocks were purposively selected from the three Agricultural Development Programme (ADP) zones in Osun State based on the concentration of small ruminant farmers. Next, two cells were randomly selected from each block, giving a total of twelve cells. Finally, a systematic random sampling technique was used to select 30% of registered small ruminant farming households from each cell. This approach ensured that the sample was well represented while reducing the chances of sampling bias.

Research Instrument
Primary data were collected using a structured interview schedule designed to gather information on respondents' socio-economic characteristics, economic security, household food security status, and farm-related activities. The instrument was administered in a simple and clear manner so that both literate and non-literate respondents could participate easily, helping to ensure accurate and reliable responses.

Validity of the Instrument
The instrument was subjected to face and content validity by experts in Agricultural Extension and Rural Development to ensure that it adequately captured the study variables and objectives.

Reliability of the Instrument
The reliability of the instrument was established using the test–retest method. The instrument was administered to 30 respondents outside the study area, and a reliability coefficient of 0.72 was obtained, indicating that the instrument was consistent and reliable for data collection.

Procedure of Data Collection
Data were collected through field-based interviews with the selected respondents. Trained enumerators administered the interview schedules with the assistance of Agricultural Development Programme (ADP) officers to ensure accurate identification of respondents.
The use of interview schedules enhanced response rates and minimized issues related to illiteracy. Data collection focused on capturing household-level information on socio-economic characteristics, income, and food security status.

Method of Data Analysis
Data were analyzed using both descriptive and inferential statistical techniques, in line with the study's research questions.

Descriptive Analysis
Descriptive statistics including frequency, percentage, mean, and standard deviation were used to:

- Describe the socio-economic characteristics of small ruminant farmers
- Determine the distribution of household food security status using HFIAS

Household Food Security and Economic Security

- Household Food Security: Measured using the Household Food Insecurity Access Scale (HFIAS), which classifies households into food secure, mildly insecure, moderately insecure, and severely insecure categories.
- Economic Security: Measured using the Household Economic Security Index (HESI):

$$HESI = 1 - {}^{F}/_{I}$$ Where:

F = Household food expenditure

I = Household income

Correlation Analysis

Pearson Product Moment Correlation (PPMC) was used to examine the relationship between economic security indicators (income, assets, and diversification) and household food security status**.**

Regression Model specification
To identify the determinants of household food security**, a** multiple linear regression model was employed.
Model Specification

$$Yi = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \mu iY$$

Where:

- Yi = Household food security status (measured using HFIAS score)
- β0 = Intercept
- β1−β5 = Coefficients of explanatory variables
- μi= Error term

Explanatory Variables

- X1 = Years of formal education
- X2 = Household income (₦)
- X3 = Flock size (number of animals)
- X4 = Farming experience (years)
- X5 = Household size (number of persons)

Functional Form

Food Security=f (Education, Income, Flock Size, Experience, Household Size)

ANOVA (Hypothesis Testing)

Analysis of Variance (ANOVA) was used to test differences in food security status across agricultural zones, supporting hypothesis testing and complementing the regression results.

Results

Socio-economic Characteristics and their Influence on Household Food Security

The socio-economic characteristics of small ruminant farmers influence household food security, with respondents fairly evenly distributed by sex (52.5% male and 47.5% female), indicating active participation of both genders. The mean age was 52.63 years (±8.42), and most respondents (45.41%) were within the 46–55 age bracket, showing dominance of economically active middle-aged farmers, while a high proportion (84.17%) were married, suggesting the availability of family labour. Furthermore, educational levels were moderate, as most respondents had primary (28.67%) or secondary (28.67%) education, with 27.97% attaining tertiary education, and an average of 9.94 years of schooling, indicating adequate literacy for adopting improved practices. In addition, the average household size was 6 (±2), with 64.17% having 1–5 members, which, although supportive of labour availability, may increase consumption pressure. Similarly, most respondents (87.76%) earned between ₦10,000 and ₦100,000 monthly (mean = ₦65,948.7), reflecting relatively low- income levels; however, engagement in trading (28.67%) and artisan work (25.52%) enhances income diversification. Moreover, farming experience averaged 12.77 years and mean flock size was 16 animals, indicating moderate production capacity. Overall, education, income, experience, and flock size positively influence household food security, whereas household size has a negative effect.

Economic Security and its Relationship with Household Food Security

Economic security was found to be a critical determinant of household food security. Households with stable and diversified income sources exhibited higher levels of food security. Participation in non-farm activities such as trading and artisan work contributed significantly to income stability.

Membership in cooperative societies (54.5%) improved access to credit, inputs, and markets, thereby enhancing economic security. Access to credit (mean ≈ ₦225,253) enabled farmers to invest in livestock production and improve productivity.

Table 1: Correlation between Economic Variables and Household Food Security

Variable	r-value	p-value
Income	0.52	0.000
Assets	0.41	0.003
Diversification	0.39	0.001

Source: Field Survey, 2025

The results show a strong positive relationship between income and food security (r = 0.52, p <

0.01), indicating that higher income improves access to food. Asset ownership and income diversification also significantly enhance food security. These findings confirm that economically secure households are better able to withstand shocks and maintain food access.

Household Food Security status among Small Ruminant Farmers

The distribution of household food security status was assessed using the Household Food Insecurity Access Scale (HFIAS).

Table 2: Household Food Security status (HFIAS Classification)

Category	Percentage (%)
Food Secure	30.0
Mildly Food Insecure	28.0
Moderately Food Insecure	28.0
Severely Food Insecure	14.0

Source: Field Survey, 2025

The findings reveal that approximately 70% of respondents experienced some level of food insecurity, with 14% classified as severely food insecure. This indicates that despite engagement in small ruminant farming, many households still face challenges in accessing adequate food.

The predominance of mild and moderate food insecurity suggests that households often compromise on food quality and quantity rather than experiencing absolute deprivation. This reflects structural constraints such as low income and limited access to productive resources.

Determinants of Household Food Security among Small Ruminants Farmer

To identify the key determinants of household food security, multiple regression analysis was conducted.

Table 3 : Multiple Regression Analysis of Determinants of Household Food Security

Variable	Coefficient (β)	Std. Error	t-value	p-value	Remark
Constant	1.214	0.312	3.89	0.000	Significant
Education	0.312	0.081	3.85	0.000	Significant
Income	0.421	0.095	4.43	0.000	Significant
Flock Size	0.267	0.092	2.90	0.004	Significant
Experience	0.198	0.085	2.33	0.021	Significant
Household Size	-0.254	0.084	-3.02	0.003	Significant

Model Summary

Statistic	Value
R^2	0.68
Adjusted R^2	0.65
F-statistic	29.47
Prob (F-stat)	0.000

Source: Field Survey, 2025

The coefficient of determination ($R^2 = 0.68$) indicates that approximately 68% of the variation in household food security is explained by the included explanatory variables. The Adjusted R^2 (0.65) confirms the robustness of the model after adjusting for the number of predictors.

The F-statistic (29.47, $p < 0.01$) indicates that the model is statistically significant overall, meaning that the explanatory variables jointly influence household food security.

At the individual level:

- Education ($\beta = 0.312$, $p < 0.01$) significantly improves food security, reflecting the role of knowledge and information access.
- Income ($\beta = 0.421$, $p < 0.01$) has the strongest positive effect, indicating that higher income enhances purchasing power and food access.

- Flock size (β = 0.267, p < 0.01) contributes positively, as larger livestock holdings increase income and food availability.
- Farming experience (β = 0.198, p < 0.05) improves efficiency and resource management.
- Household size (β = -0.254, p < 0.01) negatively affects food security due to increased consumption pressure.

Furthermore, the analysis of variance (ANOVA) was conducted to examine whether household food security differed across the three agricultural zones in Osun State.

Table 4: *Analysis of Variance (ANOVA) showing differences in Household Food Security across Agricultural Zones*

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	18.42	2	9.21	5.62	0.004
Within Groups	463.85	283	1.64		
Total	482.27	285			

Source: Field Survey, 2025

The ANOVA result reveals a statistically significant difference in household food security across the agricultural zones (F = 5.62, p < 0.05). This suggests that geographical and structural factors such as access to markets, infrastructure, environmental conditions, and institutional support vary across zones and significantly influence food security outcomes.

Overall, the findings confirm that household food security is influenced not only by socioeconomic and farm-level factors but also by spatial variations within the study area.

Hypothesis Testing

The hypotheses were tested using multiple regression, Pearson correlation, and ANOVA in line with the study objectives.

Ho_1: There is no significant relationship between socio-economic characteristics and household food security.

Regression results (Table 3) showed that education (p = 0.000), income (p = 0.000), flock size (p = 0.004), farming experience (p = 0.021), and household size (p = 0.003) significantly influenced household food security. Since all p-values are less than 0.05, the null hypothesis is rejected. This indicates that socio-economic characteristics significantly affect household food security.

Ho_2: There is no significant relationship between economic security and household food security.

Correlation results (Table 1) revealed that income (r = 0.52, p = 0.000), assets (r = 0.41, p = 0.003), and income diversification (r = 0.39, p = 0.001) are positively and significantly related to food security. The null hypothesis is therefore rejected, showing that economic security plays a key role in improving household food security.

Ho_3: There is no significant difference in household food security across agricultural zones.

The ANOVA result (F = 5.62, p = 0.004) indicates a significant difference across zones. Since p < 0.05, the null hypothesis is rejected, suggesting that location-specific factors influence household food security.

Discussion

The findings of this study reveal that socio-economic characteristics significantly influence household food security among small ruminant farmers. The positive effect of education on food security supports the assertion that education enhances farmers' ability to adopt improved production techniques, access information, and make informed decisions. This aligns with the findings of Pawlak and Kołodziejczak (2020), who emphasized that education improves agricultural productivity and household welfare. Similarly, the significant influence of income on food security corroborates earlier

studies which indicate that higher income enhances purchasing power and access to adequate food (Obayelu & Osho, 2020; FAO, 2023).

The positive relationship between flock size and food security underscores the importance of livestock as a productive asset. Larger flock sizes increase household income and provide direct access to animal protein, thereby improving food availability. This finding is consistent with Adesogan, A. T., Havelaar, A. H., McKune, S. L., Eilittä, M., & Dahl, G. E. (2020), who reported that small ruminants serve as a financial safety net and a reliable source of nutrition for rural households. Likewise, farming experience was found to significantly improve food security, suggesting that accumulated knowledge and skills enhance efficiency in livestock management. This supports the findings of Fadiyimu, A. A., Alokan, J. A., & Adeyemo, R., 2016 (2016), who noted that experience improves productivity and income among smallholder livestock farmers.

Conversely, household size had a negative and significant effect on food security, indicating that larger households face greater consumption pressure, which may outweigh the benefits of additional labour. This finding is consistent with FAO (2021), which reported that high dependency ratios increase household vulnerability to food insecurity.

The correlation results further revealed that economic security variables such as income, asset ownership, and livelihood diversification are positively associated with household food security. This supports the Household Economic Security framework, which posits that stable income and asset accumulation enhance resilience to food shocks. The findings also agree with Adesomoju, O. A., Onemolease, E. A., Wole-Alo, F. I., & Igene, G. O. (2024), who identified income diversification and access to resources as key determinants of food security among smallholder farmers in Nigeria.

Furthermore, the ANOVA results showed significant differences in household food security across agricultural zones, indicating the influence of location-specific factors such as infrastructure, market access, and environmental conditions. This finding is in line with Otekunrin, O. A., Momoh, S., & Ayinde, I. A. (2019), who highlighted the role of regional disparities in shaping food security outcomes in Nigeria.

Overall, the study confirms that household food security is multidimensional and influenced by a combination of socio-economic, economic, and spatial factors. While small ruminant farming contributes to household livelihoods, it is not sufficient on its own to guarantee food security without complementary factors such as income stability, education, and access to productive resources. These findings are consistent with both the Household Production Theory and the Sustainable Livelihood Framework, which emphasize the role of assets, income, and human capital in determining household welfare outcomes.

Conclusion and Recommendations

This study examined the determinants of household food security among small ruminant farmers in Osun State, Nigeria. The findings revealed that a large proportion of farmers experience varying degrees of food insecurity despite engaging in small ruminant production. Household food security was found to be significantly influenced by socio-economic and economic factors, particularly education, income, flock size, and farming experience, while household size had a negative effect. Economic security indicators such as income, asset ownership, and livelihood diversification also showed strong positive relationships with food security. In addition, significant differences in food security across agricultural zones highlight the influence of location-specific factors. Overall, the study concludes that small ruminant farming alone is insufficient to guarantee household food security without improvements in income, capacity, and access to resources. Based on the findings, the study recommends that:

1. Access to credit should be improved to enable farmers invest in livestock production.
2. Extension services should be strengthened to enhance livestock management practices.
3. Income diversification should be encouraged to improve household economic security.

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