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Article

Empirical Insights into the Prevalence and Determinants of Food Insecurity Among Egg Marketers in Southwest Nigeria

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Abstract: (1) Background: As achieving a food-secure planet by 2030 faces multifaceted challenges, poultry production remains a key solution for sustainable livelihoods and household food security. This study investigates the food security status, incidence, food insecurity drivers, and the coping strategies of egg marketers in Southwest Nigeria. (2) Method: Primary data, including socioeconomic and food insecurity indices, were collected from 203 poultry egg marketers across two Agricultural Development Programme (ADP) zones using a three-stage sampling procedure. Data analysis employed descriptive statistics for socio-economic characteristics and the Foster, Greer, and Thorbecke methods for food insecurity status. (3) Result: The mean age of the respondents was 41.2 years, with 76.4% married and an average household size of 5. The food insecurity line was ₦7,259.34 per month. The food insecurity incidence (F_0) was 0.42, indicating that 42% of marketers were below the food security line, while 58% were food secure. The food insecurity depth (F_1) was 0.11, indicating that 11% were affected, and the severity (F_2) was 0.03, indicating that 3% were severely food insecure. About 40% reduced their meals to cope, while 39.4% sought help from friends and family. (4) Conclusion: Policymakers should provide targeted support, credit access, and educational opportunities for this demographic to mitigate food insecurity risks.

Keywords: food security; marketing; poultry; egg; economics; coping; Foster Greer Thobcke

1. Introduction

Food is necessary for all humans and is fundamental to healthy and productive living. As a result, birthing and sustaining a food-secured planet will remain on the Bunsen burner if the Earth does not become desolate. Food insecurity, defined as a lack of access to sufficient, safe, and nutritious food, affects two billion people [1], with approximately 811 million undernourished worldwide [2]. Owing to the inadequate consumption of nutritious food for healthy living, food insecurity has remained a pervasive issue of global concern, affecting 11.6% of the world's population in 2022-2023 [3,4]. Although it is a global cankerworm, food insecurity exhibits differing levels of severity and underlying causes across different regions and communities. Contributing around 25% to GDP and employing 70% of the workforce, agriculture remains a non-oil linchpin of the economy and a way of life for Nigerians [5]. The country grapples with multifaceted problems addressing food insecurity in various regional populations, particularly in rural regions where traditional peasant farmers contribute 90% of Nigeria's food and fiber production [6]. Within the Southern region of Nigeria lies

Oyo State, which contributes significantly to the nation's food supply and is attributed to the nation's poultry hub. Poultry products, including eggs, are essential protein sources crucial for survival and economic livelihood [7]. Protein deficiency can lead to health issues such as kwashiorkor and muscle wasting [8]. The Recommended Daily Allowance (RDA) for protein is 0.833 grams per kg body weight per day, irrespective of age [9]. Eggs derived from chickens are nutritious, easy to prepare, and economical, providing a well-balanced nutrient for mankind nationwide [10,11]. Moreover, their low caloric value, high protein quality, and ease of digestibility render chicken eggs useful in many therapeutic adult diets [12]. Consequently, egg marketing and consumption can reduce dietary protein inadequacy. This underscores the need for effective marketing techniques for the supply of poultry products [13], leading to increased income and reduced food insecurity among egg marketers with far-reaching implications for the broader community.

Nigeria is experiencing a deepening food insecurity crisis. A silent outbreak of hunger is ravaging the country with food insecurity at its epicenter. These assertions are corroborated by the Food and Agriculture Organisation (FAO) database and the Nigerian GHS. Though a leading economy in Africa, Nigeria has led statistics of hunger and food insecurity due to inadequate supply of animal protein [14,15]. Staggering statistics reveal that Nigeria ranks 103rd out of 116 countries in the 2021 Global Hunger Index (GHI), highlighting the severity of food insecurity in the country [16]. Regionally, the poverty rate in Southern Nigeria, though lower than 57.9% in the North [17], still has records of food-insecure regions like the Southeastern [18], leaving a cankerworm slowing economic development. As of 2019, the daily per capita protein intake of Nigeria stands at 45.4 g, remaining below the FAO of 53.8g and the global protein intake of 64 g, an indication that the country is protein-deficient ([19–21]. Small-scale farmers and marketers of agriproducts in Nigeria face an uphill task against food insecurity owing to inadequate storage facilities, poor transport infrastructure, and limited access to credit [22]. Egg marketers struggle for stable access to reliable and affordable eggs, creating a gap in availability and leading to food insecurity among consumers [23]. Low animal protein consumption reduces egg marketers' income and economic power. In remote areas, livestock products are difficult to sell, undermining income opportunities [24]. This study contributes to the literature by examining the socioeconomic characteristics of egg marketers, assessing their food security status, and identifying influencing factors. By understanding the complexities of egg marketing and food security, policymakers can develop effective interventions to improve egg marketers' livelihoods and enhance food security in Nigeria.

Egg marketers are a demographic often overlooked in food security discussions. Current literature on food insecurity fails to adequately investigate the specific drivers of food insecurity and coping mechanisms among egg marketers in developing countries, particularly Nigeria. Most studies, including the FAO, have noted a neglect of the complexities of food marketing systems and the unique factors influencing marketers, focusing more on general agricultural or household factors [25,26]. Therefore, understanding the socioeconomic dynamics affecting egg marketers is essential for developing targeted interventions. Additionally, a detailed examination of the drivers of food insecurity can inform policy directives aimed at improving food security among this demographic. This study addresses these critical gaps, providing actionable insights for policymakers that would enhance the livelihoods of egg marketers in southwest Nigeria.

This study builds on the food security theory to understand food insecurity. The Food and Agriculture Organization establishes food security as a state in which all people have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active, healthy life. This concept has traditionally been analyzed through four pillars: availability, access, utilization, and stability [27]. Availability requires the physical presence of food in a region, through local production or imports, which is determined by agricultural output, climate conditions, and supply chain logistics [28]. For egg marketers, availability depends on poultry farms' capacity for production and the efficiency of distribution networks. Accessibility focuses on the physical and economic ability to obtain food, which is influenced by income level and market access [29]. Egg marketers' food security can be affected by access challenges that may arise from market fluctuations,

price volatility, and transportation barriers. Utilization emphasizes the proper biological use of food with a preference for a nutritive diet, food safety, and good health and sanitation practices [30]. Egg marketers may face challenges because of their ability to maintain food quality and to manage safety standards. Stability considers how consistently food is available and accessible over time in the face of economic shocks, natural disasters, and political instability [27]. This is especially relevant for egg marketers whose livelihoods are vulnerable to market and environmental fluctuations. Overall, egg marketers' food security can be directly affected by the availability and stability of egg supplies. Supply chain disruptions or production issues can decrease egg availability and cause fluctuations in egg prices, making it more difficult for consumers to access and afford eggs [31]. In addition, the utilization aspect is equally important, as it encompasses the proper handling and marketing practices that ensure that eggs maintain their nutritional value and safety for consumers.

2. Materials and Methods

This study investigated food insecurity among egg marketers in Oyo State, Southwestern Nigeria. Oyo State is the national poultry hub because it has the highest concentration of poultry farmers. The most common agricultural products in the state are livestock production, such as poultry; cash crops, such as cocoa and oil palm; and arable crops, such as maize, yam, rice, cassava, and cocoyam. These products are edible to humans, raw materials for agro-allied industries, provide monetary value to farmers, and are a source of foreign exchange. Egg marketing constitutes a significant component of the poultry industry in Oyo State, providing employment opportunities and contributing to the local economic growth.

A three-stage sampling technique was used to select two hundred and three respondents (203) from the study area; The first stage involved the random selection of Ibadan-Ibarapa and Oyo Agricultural Development Programme (ADP) zones from the four ADP zones of Oyo state. In the second stage, the Ibadan East Local Government Area (LGA), Oluyole LGA, Oyo West LGA, and Atisbo LGA were selected randomly from the Ibadan-Ibarapa and Oyo Agricultural Development Program (ADP) zones, respectively. The third stage involved a snowball selection of two hundred and three (203) egg marketers from the selected LGAs for this study. Using a semi-structured questionnaire that aligns with the research objectives, trained enumerators, possessing expertise in the poultry egg industry, collected data by eliciting relevant responses from the respondents.

Enumerators and extension agents were involved in this study to facilitate interviews with prospective participants (respondents) that transcend ethnic, political, socioeconomic, and religious divides. There was no direct or indirect use of animal subjects or human clinical trials involved in arriving at the findings of this article. Respondents gave written consent after the aim and objectives of the study were disclosed, as well as assurance of anonymity and information confidentiality.

The analyses were performed using descriptive statistics, Foster-Greer-Thobcke (FGT), and the Probit regression model.

The authors of this article used generative artificial intelligence (GenAI) in the literature review to generate requisite citations, which were verified.

Foster Greer Thobcke

The food insecurity status of the egg marketers was analysed using the Foster-Greer-Thobcke (FGT) food security index. It was used to analyse objective three. The degree of food insecurity was estimated using the Foster, Greer, and Thobcke (FGT) [32] equation shown as:

FGT = 1/N * sum(G_i^alpha) (i)

The FGT parameter takes values equal to 0, 1, and 2 depending on the degree of concern about food insecurity, where alpha = 0, it is incident (incidence) alpha = 1, it is deep (depth) alpha = 2, it is severe (severity)

- N is the total number of sampled egg marketers,
- G is the number of individual egg marketers below the food insecurity line,

Z is the food insecurity line or threshold.
yi is the individual income of the egg marketers. [33]
Therefore,
Fi = per capita food expenditure for the ith egg marketer
2/3 means the per capita/ food expenditure of all egg marketers
Where Fi = food security index
Where Fi>1= food security ith egg marketer
Where Fi< 1 = food insecure ith egg marketer

Probit Regression Model

A probit model was used to **investigate** factors affecting food security among egg marketers in Oyo State, Nigeria. The dependent variable was the egg marketers’ bivariate food insecurity status, which takes values of 0 for food-secure egg marketers and food-insecure egg marketers take values of 0. According to the model, the Y value is determined by a latent, continuous variable that is not observed, having a credible error term distribution and reasonable probability. This was used to analyse objective four.

The following is the model specification:

$$Y^* = X^i\beta + \varepsilon_i \tag{ii}$$

Where $\varepsilon \sim N(0,1)$. Then Y is noted as a measure of the positivity of this latent variable:

Y = (Food secure = 0, Food insecure = 1), X means explanatory variables of Vector B = Coefficients
ei = Random error while the explanatory variables are part of the model are: X1 = Gender (D = 1 if male; 0 if not), X2 = Marital status (D = 1 if married; 0 if not),

X3 = Household head age (Years), X4 = Number of years spent in school (D = 1, if Yes; 0 if not), X5 = Educational level (D = 1, if Yes; 0 otherwise), X6 = Marketing experience (D = 1, if Yes; 0 if not), X7 = Household size (Number), X8 = Occupation (D = 1, if farming; 0 if not), X9 = Non-food expenditure items (N), X10 = Informal credit access (D = 1, if Yes; 0 if not), X11 = Formal credit access (D = 1, if Yes; 0 otherwise), X12 = Remittances access (D = 1, if Yes; 0 otherwise), X13 = Dependency ratio.

3. Results

The result in Table 1 shows the percentage and frequency of the respondent distribution by gender, age of respondents, household size, marital status, level of education, year spent in school, religion, years of experience, household income, and monthly family contribution of the respondent.

Table 1. Socioeconomic Characteristics of Egg Marketers in the Study Area.

Variables	Frequency	Percentage	Mean
Age (Years)			
≤ 30	15	7.4	
31-40	90	44.3	
41-50	80	39.4	
Above 50	18	8.9	31.23
Gender			
Male	55	27.1	
Female	148	72.9	
Marital Status			
Single	10	4.9	
Divorced	22	10.8	
Separated	16	7.9	
Married	155	76.4	

Household Size (Number of person)		
1-3	47	23.2
4-6	124	61.0
7-9	26	12.8
10-12	6	3.0
5.0		
Level of Education		
Primary	12	5.9
Secondary	108	53.2
Tertiary	83	40.9
Household Income ₦		
≤ 40,000	83	40.9
40,001-60,000	42	20.7
60,001-80,000	41	20.2
80,001-100,000	16	7.9
100,001-120,000	7	3.4
Above 120,000	14	6.9

This study’s results represent a total of 203 sampled respondents, and a majority (73% and 94% respectively) are female and have at least secondary school degrees, as corroborated by [34–36]. The average age (31 years) of the sampled poultry egg marketers, however, does not align with the findings of [35,37] of an average age of 43 years among commercial egg farmers in Southwestern Nigeria.

Table 2 presents a descriptive analysis of food insecurity among poultry egg marketers in the study area, utilising three distinct indices.

Table 2. Summary of the Food Insecurity Indices for egg marketers in the study area.

	Food Insecure		Food Secure	
	Index	Percentage	Index	Percentage
F0	0.42	42	0.58	58
F1	0.11	11	0.89	89
F2	0.03	3	0.97	97

The three insecurity indices have been employed to assess the level of food insecurity, namely: Food insecurity Incidence F0, depth or gap of Food insecurity F1, and severity or intensity of Food insecurity F2, under the Foster, Greer, and Thorbecke [32]. The per capita food expenditure for 203 respondents was ₦1,473,645.04. However, the mean per capita food expenditure was ₦7,259.34, with the food security line of ₦5,026.57. Table 2 presents that the food insecurity incidence (F0) was 0.42. This implies that 42% of the egg marketers were less than the threshold of food security, while 58% were food secure. The data revealed a significant prevalence of food insecurity among poultry egg marketers in the study area. The depth or gap of food insecurity (F1) was 0.11, which implies that 11% of the egg marketers fell below the food security line and needed to increase their income to meet the food security line. A value of 0.11 suggests that, on average, food-insecure respondents consume 11% less food than dietary energy requirements. Therefore, each food-insecure egg marketer needs about 11% of their calorie requirements, other than their per capita income. The degree or intensity of Food insecurity (F2) was 0.03, which implies that 3% of the egg marketers were severely food insecure. However, the presence of a small but significant proportion of severely food-insecure (F2)

respondents highlights the vulnerability of this population group. This is consistent with the findings of [38] that food insecurity remains a major challenge in southern Nigeria.

Table 3 presents the result of a probit model examining the drivers of food insecurity among poultry egg marketers in the study area.

Table 3. Estimate of significant socio-economic characteristics relationship with Food Insecurity using the Probit model.

Variables	Marginal effect (Coefficient)	z-value	Prob /z/
Gender	-0.101	-1.06	0.195
Age	0.012	1.44	2.108
Household size	0.239	6.16***	0.000
Year of experience	-0.026	-2.08**	0.038
Income	-0.000	-3.52***	0.000
Years spent in school	-0.029	-1.63	0.138
Credit	0.057	0.63	0.334

***significant at 1% **significant at 5% *significant at 10%.

As shown in the result, household size, respondents’ years of experience in the poultry business, and income were significant influencing factors of food insecurity among egg marketers in Oyo State, Nigeria.. The household size of the egg marketers had a positive and significant effect on food insecurity at a 1% significance level, implying that a unit increase in household size increases the probability of egg marketers’ food insecurity by 23.9%. Thus, larger households are more likely to be food insecure. This supports [39] that poverty or food insecurity increases with larger households. Concerning years of experience, there is a negative and significant influence on the food insecurity of egg marketers in that a unit increase in years of experience in marketing eggs will lower the probability of being food insecure by 0.026. The implication is as poultry egg marketers gain more experience in their egg trade, their likelihood of facing food insecurity decreases. This could be attributed to better market knowledge, improved negotiation skills, or enhanced resource utilisation over time. [40] in a related study on assessing food insecurity and its drivers in Oyo State averred that farmers’ years of experience and income are significant driving factors of food insecurity among farming households.Income exhibits a negative marginal effect (-0.000) and is significant at the 1% level (p=0.000). this suggests that higher level of income are associated with lower probabilities of experiencing food insecurity among poultry egg marketers, reinforcing the notion that financial stability plays a critical role in accessing sufficient food supplies. Similarly, the negative marginal effect of household income suggests that a rise in household income in naira reduced the probability of egg marketers being food insecure. This agrees with an earlier study [41] that key interventions targeted at the income of rural Africa aid the reduction of food insecurity, and improve purchasing power, and [42] that improving income is to be considered in developing food security policies in Nigeria.

Table 4 revealed that 40.4 percent of the egg marketers employed meal reduction as a means of coping with food insecurity.

Table 4. Coping Strategies Adopted Against Food Insecurity Status in the Study Area.

Coping Strategies	Frequency	Percentage
Meal reduction	82	40.4
Accept help from friends and family	80	39.4

Low-cost meal	15	7.4
Skip meal	8	3.9
Fasting	7	3.4
Borrowed Food	6	3.0
Sell Asset	3	1.5
Others	1	0.5

This suggests that egg marketers will likely reduce their food consumption to cope with food security, which is a common mitigating strategy in developing countries like Nigeria [43]. 39.4 percent of the egg marketers accepted help from friends and family to solve the problem of food insecurity. With meal reduction and seeking help from family and friends constituting the most prevalent coping mechanisms (80%), this suggests a strong reliance on social support networks to manage food insecurity [44] and the communal nature predominant in rural Nigerian settings. 7.5 percent of the respondents bought low-cost meal to palliate the food insecurity, 3.9 percent of the respondents employed method of skipping a meal to cope with the food shortage, 3.4 percent of the egg marketers engaged in fasting to cope with food shortage, 3 percent of the egg marketers borrow money as a means of coping with the problem of food insecurity, 1.5 percent of the respondents sell some of their asset to ensure they combat the food deficiency while only 0.5 percent of the respondents engaged in other method such as eating from neighbour to cope with the food insecurity. According to [45], meal reduction, characterised by reduced food quantity and quality, tendency to skip meals, are coping strategies that can reduce food insecurity among women and children.

4. Conclusions

This study investigated the level of food insecurity among poultry egg marketers using three key indices: Food Insecurity Incidence (F0), Depth or Gap of Food Insecurity (F1), and Severity or Intensity of Food Insecurity (F2), based on the Foster-Greer-Thorbecke (FGT) indices. The perception of food insecurity among egg marketers revealed that age, gender, household size, marital status, years of experience in egg marketing, and access to credit were significant determinants. The findings reveal a concerning prevalence of food insecurity, with 42% of the sampled respondents being food insecure (F0=0.42), indicating they fell below the established food security line of ₦7,259.34. The FGT index 1 (F1) suggests a food insecurity depth of 0.11, implying a moderate-income gap for food-insecure households, and that food-insecure households require an 11% increase in income to attain the food security threshold. The FGT index 2 (F2) value of 0.03 highlights that 3% of the households are severely food insecure. Hence, these factors greatly influence the food insecurity status of egg marketers in the study area. The study also sheds light on the fact that meal reduction was the most prevalent coping strategy (40.4%), closely followed by accepting help from family and friends (39.4%) thus, encouraging the need for community support systems to reduce reliance on meal reduction and promote healthier eating habits. This study therefore concludes that egg marketers in the study area are disproportionately affected by food insecurity.

These findings suggest that interventions aimed at improving food security among the study population should focus on both preventing food insecurity (reducing F0) and addressing the depth of the problem for those already affected (reducing F1 and F2)

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