LGJDX ISSN No: 1008-0562 Journal Of Liaoning Technical University Natural Science Edition

FEEDING STRATEGIES AMONG PIG FARMING HOUSEHOLDS AMID HIGH COST OF FEED IN SOUTHWESTERN NIGERIA: IMPLICATIONS FOR FOOD SECURITY

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Abstract

The study examined the effects of response options adopted against high cost of pig feed on food security of farmers in southwestern Nigeria. A multi stage sampling procedure was used to select 480 pig farming households and the data from the sample were collected through a structured questionnaire. Both descriptive statisctics and multinomial logit regression were used to analyse the data. Findings showed that majority of the respondents were male, married and in their middle age. Futhermore, respondents who used commercial feeds were the most food secure and also the least severely food insecure, while respondents who rationed feed (skipping meal times and reducing meal size) were the least food secure as well as most severely food insecure. Findings showed that farming households' food security status was significantly determined by gender, maritals status, access to credit, membership of farmers group, training attendance, use of compounded feed, use of commercial feed, access to extension services, underfeeding, age, household size and pig farming experience. The findings especially underfeeding (reducing pig feed size and skiping pig feed portion) can be addressed by subsidising commercial feed prices for farmers and/or intensifying feed formulation trainings for farmers so that they can produce feed on their own at a relatively cheaper cost and in adequate quantity to discourage underfeeding of the pigs.

Keywords: feeding strategies, pig, high cost, food security, southwestern Nigeria.

Introduction

About 70% of Nigeria's active population depends on agriculture for their livelihoods, making it a vital sector of the country's economic growth. As a sector of agriculture, the livestock industry is very important to Nigeria's socioeconomic growth, accounting for 15% of the agricultural value chain and roughly 3-4% of GDP. It contributes significantly to food security, household income, and employment (FMARD, 2016; FMARD, 2020).

Nigeria's pig farming subsector has drawn more attention lately since it has the potential to greatly raise smallholder farmers' incomes throughout Sub-Saharan Africa. Pigs are a more practical choice for small-scale farmers since they can be raised on comparatively tiny land

plots, unlike other animals like cattle, goats, and sheep (Ndyomugyenyi & Kyasimire, 2015; Tatwangire, 2014). With the ability to give birth twice a year and an average litter size of at least ten piglets per farrowing, pigs are also extremely productive (Tatwangire, 2014). Additionally, pre-weaning mortality rates in pigs are generally low, with fewer than two piglets born every farrowing (Okello et al., 2015). Around 550,000 jobs are supported by the Nigerian pork sector throughout the value chain, and between 2012 and 2018, local pork output increased by 1.4% yearly, from 248,900 to 271,000 tonnes. Pork consumption, on the other hand, increased at a marginally faster pace of 1.9% during the same time period, reaching 280,000 tonnes (FMARD, 2020).

Nigeria produces an estimated 7.1 million pigs and 283,793 thousand tonnes of pork annually, mostly in the southeast, southwest, and north-central regions where the production of pork is supported by cultural and religious beliefs. Depending on the area, pig farming is carried out under intense, semi-intensive, and extensive management systems. Nigerian pig farming appears to have a bright future because of a number of variables, including the country's expanding population, urbanisation, conflicts between farmers and herders that impact the supply of beef, and the prohibition on importing chicken. Furthermore, there is a strong drive to decrease lard imports, as Nigeria is the world's fifth-largest importer, spending more than 57 million naira on imports each year (FMARD, 2020).

The high cost of feed, which in the majority of pig farming systems accounts for 60–80% of the entire cost of production, is a significant obstacle to the industry despite its potential for expansion. Farmers' incomes and, consequently, the sector's viability are negatively impacted by this high cost of feed (Ouma *et al*., 2015; Okai, 2019; Oladoyin, 2023). The pig and poultry sectors' growing usage of conventional and commercial feed supplies, together with conflicting needs from human consumption, have been blamed for the rising cost of feed (Katongole *et al*., 2012; Ouma *et al*., 2015). For smallholder farmers, the rising cost of feed creates an affordability gap, making it difficult to provide pigs with the best nutrition possible. Additionally, research shows that the high cost of feed has caused significant disruptions in the livestock production industry in southwest Nigeria, with many farmers on the verge of quitting, which could result in a decline in revenue and even unemployment (Afodu *et al*., 2024). Given that food insecurity has been connected to decreased earnings and fewer job prospects, this circumstance makes the danger of food insecurity even worse (Mei *et al*., 2020; Enakhe & Tamuno, 2021).

Given these difficulties, there is increasing worry that the high price of pig feed could make it more difficult to meet the Sustainable Development Goal (SDG) 2 of the UN, which is to end hunger by 2030. In light of the growing cost of feed, this study aims to investigate the feeding practices used by pig farmers in southwest Nigeria and evaluate the effects they have on the food security situation of these households. The precise implications of high pig feed costs on the food security of pig farmers in the area have not, as far as the researchers are aware, been studied. Therefore, by examining the connection between feeding practices and food security among pig farming households in southwest Nigeria, this study seeks to close this information gap.

Methodology

Study Area

The study was carried out in the southwest geo-political zone of Nigeria, which is made up of Lagos, Ogun, Oyo, Osun, Ondo and Ekiti states. It has a mix of costal, forest and savana landscapes as well as a tropical climate featuring rainy and dry seasons. It lies approximately between latitude 6^0N to 9^0N and longitude 2.5^0E to 6.5^0E. it is bordered by the Atlantic ocean to the south, the North central zone to the North, the south-south zone to the East, and the republic of Benin to the west. The total population in 2006 was 27,722,432 and was estimated at 46,706,662 in 2016 (NPC 2006). It is a major agricultural hub in Nigeria cultivating both cash and food crops as well as producing livestock including cattle, goat, sheep and agriculture.

Data and sampling procedure

Primary data for this study were collected through the use of a structured questionnaire and interview schedule administrated on pig farming households in the study area. A multistage sampling procedure was employed for selecting the respondents. The first stage involved a simple random sampling of three states (Ogun, Osun and Ondo) from the six states that made up the southwestern Nigeria. The second stage involved a simple random selection of eleven, seven and six local Government Areas (LGAs) from Osun, Ogun and Ondo states respectively. The third stage involved a simple random selection of five towns/ communities from the selected LGAs. At the final stage, snowball sampling was used to select four pig farmers from each of the selected communities/towns. In all, four hundred and eighty pig farmers were sampled in the study area.

Data analysis procedures

The study used descriptive statistics including tables, frequencies, percentages and mean, Household Food Insecurity Access Score and Multinomial Logit Regression model.

Descriptive statistics

The data collected from the respondents were analysed using descriptive statistics such as frequency counts, percentages and mean. This tool was used to describe the socio economic characteristics of the respondents in the study area.

HOUSEHOLD FOOD INSECURITY ACCESS SCORE (HFIAS)

The Household Food Insecurity Access Scale (HFIAS) questionnaire was used in this study to categorize households into their respective food security categories following Coates etal., (2007). It is a tool used to measure food insecurity in households over the past four weeks. It assesses the degree of food access issues experienced due to resource constraints. The questionnaire consists of nine main questions, followed by frequency-based sub-questions. These questions focus on three key areas of food insecurity:

(1) Anxiety and Uncertainty - Worrying about not having enough food; (2) Insufficient Food Quality - Being unable to eat preferred foods, Eating a limited variety of foods, and Eating foods that are not socially acceptable; and (3) Insufficient Food Intake - Eating smaller meals

than needed, Eating fewer meals in a day, Not having food in the house, Going to sleep hungry, and Going an entire day without eating.

Each question is followed by a frequency response (Rarely, Sometimes, Often) to gauge the severity of the issue. The results are then used to classify households into different levels of food insecurity (secure, mildly insecure, moderately insecure, or severely insecure). The Household Food Insecurity Access Score (HFIAS) is calculated by assigning numerical values to responses and summing them to assess the severity of food insecurity using the following procedure:. (1) Scoring the Responses - Each of the nine questions has a corresponding frequency-of-occurrence question. Responses are scored as follows: The total HFIAS score is the sum of all responses, with a possible range of 0 to 27 (higher scores indicate greater food insecurity); (2) Categorizing Households into Food Insecurity Levels - After scoring, households are classified into four food insecurity levels based on their responses: (1) Food Secure - No affirmative responses or only occasional worry about food, (2) Mildly Food Insecure - Worries about food, Sometimes unable to eat preferred foods, Rarely reduces quantity or skips meals, (3) Moderately Food Insecure - Eating less variety of foods, and Reducing meal sizes or skipping meals sometimes or often, and (4) Severely Food Insecure - Frequently skipping meals or running out of food, and Going a full day without eating. (See Coates *et al*., 2007).

Multinomial Logit Model

The Multinomial Logit (MNL) Model is a commonly used model in discrete choice analysis. One of its key assumptions is Independence of Irrelevant Alternatives (IIA), that is, the relative odds of choosing between two alternatives are unaffected by the presence or absence of other alternatives (Greene, 2003). This means that if a new option is introduced, it should not change the odds between the existing choices. MNL was employed in this study because the dependent variable is categorical and polytumous as pig farming households assumed one of a number of food security categories based on some socioeconomics characteristics and other factors influencing their assumption of a certain food security category. Following Obayelu *et al*., 2023 the MNL model is written as equation 1.

$$\mathrm{P}\ (F_i = j) = \frac{exp(b_j X_i)}{\sum_{j=0}^{J} exp(b_j X_i)} \qquad 1$$

Where *P* (F*i* = *J*) is the probability of assuming severely food insecure, moderately food insecure and mildly food insecure with food secure as the base category, J is the number of food category that a household could assume, J = 0 is food secure, X_i are the independent variables, *bj* is a independent variable vector to be estimated.
On rearranging the foregoing logit equation with the aid of algebra, we have:

$$P_i = \frac{e^z}{1+e^z} = \frac{1}{1+e^{-z}} \qquad 2$$

$$\mathrm{L} = \ln\left(\frac{P_i}{1-P_i}\right) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + \varepsilon \qquad 3$$

L = log odds of best food security category relative to other food security categories.
The odd ratio Pi / (1 – Pi) can be obtained from equation 3.

$$P_1 = P_1, P_2, P_3, P_4,$$

P_0.....probability of assuming food secure category.
P_1.....Probability of assuming severely food insecure
P_2.....Probability of assuming moderately food insecure
P_3.....Probability of assuming mildly food insecure
$1 - P_I$...the alternative food security categories
$P_k \dots \dots \dots P_2, P_3, P_4,$
ε.....Error term.

The independent variables are: X_1 = Gender, X_2 = Marital status, X_3 = Access to credit, X_4 = Membership of farmer's group, X_5 = Frequency of training attendance, X_6 = Compounded feed, X_7 = commercial feed, X_8 = Access to agricultural extension service, $X_9 = Alternative\ feed$, $X_{10} = Rationing$ $X_{11} = Years\ of\ Schooling, X_{12} = Age, X_{13} = Household\ size, X_{14} = pig\ farming\ experience.$ β_1 – β_6 are the coefficients corresponding to independent variables

Results and discussion

Socio-economics characteristics of pig farmers

Table 1 presents the results of the socio-economic characteristics of the respondents. The age of majority of the respondents was below 60years and their average age was about 50years. This implies that they are in economically active age. Also, majority (87.9%) of the respondents were male. The result suggest that pig farming is a male-dominated enterprise probably due its resource-intensive requirements (land, labour, capital and time) which area are more likely to afford. Similarly, there are more married respondents (87.1%) than single in the sample. This implies that the married respondents would complements each other's efforts in managing the pig farm.

Furthermore, average years of schooling of the respondents was about 10years. These suggest that the respondents are educated and are more likely to take informed cost-effective production and marketing decisions. The average household size of the respondents was about 7 members. This suggests a fairly large household size which could exert pressure on the resources available to the households.

Additionally, the average years of experience of the respondents in pig farming was about 9 ½ years. This suggests that respondents are experienced and their experience is likely to influence them in selecting a cost-effective feeding strategy that could also generate products that attracts premium price that yields optimum income.

Table 1: Socio-economic characteristics of the respondents.

Variables	Frequency	Percentage	Mean
Age (years)			
≤40	62	12.9	50.13
41-50	202	42.1	
51-60	148	30.8	
Above 60	68	14.2	
Sex			
Female	58	12.1	
Male	422	87.9	
Education (years)			
Less than 6	106	22.1	9.88
7-12	244	50.8	
13 and above	130	27.1	
Household (number)			
1-4	58	12.1	6.85
5-8	298	62.1	
9 and above	134	25.8	
Marital status			
Single	28	5.8	
Married	418	87.1	
Widow/Widower	34	7.1	
Pig Farming experience			
Below 10	260	54.1	9.46
10-19	154	32.1	
Above 19	66	13.8	

Source: Computed from field data, 2021

Pig farming households' food security status

Table 2 shows the results of pig farming households' categorization obtained from household food insecurity access secure (HFIAS). The results showed that 45.1%, 44.1%, 40% and 28.9% of respondents who used commercial feed, compounded feed, alternative feed and "rationed" feed were food secure respectively. This suggests that they did not express anxiety/worry about obtaining food. The results indicated that respondents who used commercial feed were the most food secure while those that "rationed" feed were the least food secure.

Also, 19.4%, 30.9%, 30% and 35.6% of respondents who used commercial feed, compounded feed, alternative feed and "rationed" feed were severely food insecure respectively. This suggests that the commercial feed users have the fewer of their members being severely food insecure than any other group while the pig farmers who "rationed" feed have more of their members being severely food insecure than any other feed strategies group.

This implies that farmers who "rationed" feed expressed worries about their food ability of the farmers to leverage endowments to use a cost-effective feeding strategy that generate products attracting premium security condition than any other feeding strategies farming households.

Overall, 38.3% of the respondents sampled were food secure that is they did not show any worry of anxiety about what they would eat.

These results could be due to the prices and ultimately optimum income capable of assuring access to adequate food. This is consistent with Caballero (2022) who reported that animal performance and profitability can be achieved when nutrition expertise is available.

LGJDX Journal Of Liaoning Technical University Natural Science Edition
ISSN No: 1008-0562

Table 2: Classification of pig farming households according to food security status

Food security status	Cut-off point based on affirmative answer to the 9 frequency of occurrence questions	Alternative feed		Commercial feed		Rationed feed		Compounded feed		Pooled sample	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
FS	Less than 1	16	40	56	45.1	52	28.9	60	44.1	184	38.3
MIFIS	1.1- 4	0	0	20	16.1	24	13.3	0	0	44	9.2
MOFIS	4.1-6	12	30	24	19.4	40	22.2	34	25.0	110	22.9
SFI	Greater than 6	12	30	24	19.4	64	35.6	42	30.9	142	29.6
Total		40	100	124	100	180	100	136	100	480	100

Source: Computed from field data, 2021

Notes: Food Secure-(FS), Mildly Food Insecure (MIFIS), Moderately Food Insecure (MOFIS) and Severely Food Insecure (SFI)

Factors Influencing food security of Pig farming Households in the study Area.

Table3 presents the results of multinomial logit regression model which was used to examine factors influencing choice of feeding strategy adopted by pig farmers in the study area. The probability greater than chi square is equal to 0.000. This suggests that at least one of the explanatory variables significantly influences the choice of feeding strategy. Also Log likelihood = -510.02053 meaning that the model fits the data very well and Pseudo r^2 = 0.2250 indicating a very good fit with respect to the model. Gender has a negative coefficient and significantly influences severe food insecurity (at $P < 0.05$). This suggests that, in comparison to the base group, families headed by women are more likely to fall into the "severely food insecure" category than households headed by men. This might be the case because men are more likely than women to earn higher incomes, which may allow them to have greater access to food. This finding contradicts Lutomia *et al.* (2019), who discovered that female-headed households are more likely to be food secure than their male counterparts, but it is consistent with Kassie *et al*. (2014), who found that female-headed households were likely to be less food secure than their male-headed counterparts.

The likelihood that a household will fall into the category of "moderately food insecure" is positively correlated with marital status, with a significant effect at P 0.05. According to this, married households are more likely than single households to fall into the "moderately food insecure" group. The strain of feeding numerous "mouths" that comes with marriage may help to explain this. These results run counter to those of Olarinde *et al.* (2020), who found that married household heads are more likely to be food secure than unmarried ones, despite their
substantial impact on food security.

With a significant ($P < 0.05$, $P < 0.01$ and $P < 0.05$) impact on the likelihood of falling into the categories of "severely food insecure," "moderate food insecurity," and "mildly food insecure," respectively, the coefficient of access to credit is negative. This suggests that compared to the base category, households without access to finance are more likely to fall into the "severe food secure" category. This might be because credit plays a crucial role in both production and consumption, which eventually improves food security. This supports the findings of Oni *et al*. (2022), who found that food security is positively impacted by credit availability.

Both the "severe food insecure" and "mildly food insecure" categories are strongly impacted by the negative coefficient of membership to the farmers' group ($P < 0.01$). This suggests that, in comparison to the base category, household heads who do not fall into the farmers' group are more likely to fall into the "severe food insecure" and "mildly food insecure" categories. From the perspective of training, loans, subsidised inputs, "palliatives," and access to production and marketing information, this could be explained. This result is comparable to that of Addai *et al*. (2024), who showed that membership in farmer organisations significantly improved food and nutritional security for farm households.

With a significant ($P < 0.05$, $P < 0.01$ and $P < 0.01$) impact on the likelihood of falling into the "severely food insecure," "moderately food insecure," and "mildly food insecure"

categories, the training frequency coefficient is negative. This implies that, in comparison to the base group, farmers who attend fewer trainings are more likely to fall into the "severe food insecure," "moderate food insecure," and "mildly food insecure" categories. This might be the case because farmers who participate in training are more likely than their peers to have the tools necessary to overcome obstacles in marketing and production in order to increase their income. According to Ragasa *et al*. (2022), farmers who received training gathered more fish per square meter than those who did not, and they also saw a greater gain in profit and, consequently, food security.

Commercial feed has a negative coefficient and a substantial ($P < 0.01$) impact on "mildly food insecure." This suggests that, in comparison to the base category, households that do not consume commercial feed are more likely to fall into the "mildly food insecure" category. This might be the case because animals provided commercial feed that has the proper amount and proportion of feed ingredients perform better (meatiness, reproduction, and low mortality) and hence fetch greater prices than animals fed other feeds. The outcome is comparable to that of Amankwah *et al*. (2018), who demonstrated that the adoption of commercial feeds boosts aquaculture income and lowers poverty (and consequently food insecurity) among fish farming households after adjusting for observable family factors.

The risk of families falling into the category of "mildly food insecure" is considerably ($P < 0.05$) influenced by the positive coefficient of compounded feed. This suggests that, in comparison to the base group, households with pigs fed compounded feed are more likely to fall into the "mildly food insecure" category. The incapacity of the home to provide pig feed that is comparable to commercial feed may be the cause of this. The outcome is consistent with Ragasa *et al*. (2022), who found that farmers who attended feed formulation training had increases in productivity and profitability (and thus, food security).

The likelihood of falling into the category of "severe food insecurity" is considerably ($P < 0.05$) impacted by the negative coefficient of access to extension services. This suggests that compared to the base category, households without access to agricultural extension services are more likely to fall into the "severe food insecure" category. This might be the result of agricultural extension agents teaching farmers better farming practices that could increase their revenues. These results contradict those of Ehiwario *et al*. (2024), who discovered that food security was more likely to be experienced by farmers who had less interaction with extension agents than by farming households that had greater interaction with extension agents. The risk of falling into the "severely food insecure" and "moderately food insecure" categories, respectively, is significantly impacted by the positive coefficient of ratio ($P < 0.01$, $P < 0.1$). This suggests that, in comparison to the base category, households that ration feed for their pigs are more likely to fall into the "severe food insecure" and "moderate food insecure" categories. This may be because the pigs' performance and, in turn, the money they make from sales are impacted by the insufficient nourishment they receive (either by skipping meals or by reducing the amount of their meals). Similar findings were made by Gule and Geremew (2022), who found that underfeeding waste feed results in poor growth, low productivity, and consequently low income, all of which contribute to food poverty.

Age has a negative coefficient that significantly ($P < 0.05$) affects the likelihood of falling into the "severe food insecure" category. This suggests that, in comparison to the base group, older households are less likely to fall into the "severe food insecure" category. This could be because elderly households have probably made investments in assets and human capital that are now yielding results. These results support those of Oni *et al*. (2022), who found that as people age, the likelihood of experiencing food insecurity decreases.

The likelihood of experiencing "severe" or "moderate" food insecurity is significantly influenced by household size, which has a positive coefficient ($P < 0.05$ and $P < 0.01$). This suggests that, in comparison to the base category, large households are more likely to fall into the "severe food insecure" and "moderate food insecure" categories. This is to be expected, as a large household would put pressure on the amount of food provided per person. The results are in line with those of Samim *et al*. (2021), who discovered that a farming home's food security is more stressed when there is a high dependency ratio among its members, which is a sign of a large household size. However, the results go against the findings of Nnaji *et al*. (2022), who found that large households are more likely than small households to be food secure.

The chance of families falling into both the "severe" and "moderate" food insecurity categories is significantly ($P < 0.01$) influenced by the negative coefficient of farmers' experience maintaining pigs. This suggests that, in comparison to the base category, households with less experience in pig farming are more likely to fall into the "severely food insecure" and "moderate food insecure" categories. This may be related to the fact that years of experience in pig farming may have an effect on production, which in turn may affect the amount of money required to obtain food. These results are consistent with those of Olarinde *et al*. (2020), who show that agricultural experience increases the likelihood that households will have access to food.

LEJDX ISSN No: 1008-0562 Journal Of Liaoning Technical University Natural Science Edition

Table 3: Result of multinomial logit analysis

Variable	Severely food insecure			Moderately food insecure			Mildly food insecure		
	coefficient	Z-value	p>|z|	coefficient	Z-value	p>|z|	coefficient	Z-value	p>|z|
Constant	-2.7112 (1.8384)	-1.47	0.140	-3.5008 (2.0799)	-1.68	0.0092*	0.9062 (2.0696)	0.44	0.661
Age	-0.0237 (0.0224)	-1.06	0.290	-0.0755 (0.0263)	-2.88	0.004**	0.0343 (0.0289)	1.19	0.236
Gender	-0.8069 (0.3268)	2.47	0.014**	0.3250 (0.3610)	0.90	0.368	0.2080 (0.3558)	0.58	0.559
Marital status	0.1479 (0.3379)	0.44	0.662	-0.8337 (0.3587)	-2.32	0.020**	0.3587 (0.3733)	-0.96	0.337
Education	-0.0375 (0.0664)	-0.57	0.572	0.0710 (0.0754)	0.94	0.346	-0.0722 (0.0766)	-0.94	0.346
Household size	0.1901 (0.0665)	2.86	0.04**	0.0362 (0.0736)	4.92	0.000***	-0.1453 (0.0894)	-1.62	0.104
Access to credit	-1.7730 (0.7741)	-2.29	0.022**	-3.6306 (0.8160)	-4.45	0.000***	-1.7955 (0.7746)	-2.32	0.020**
Membership of farmers' group	-1.2941 (0.3190)	-4.06	0.000***	-0.5023 (0.3615)	-1.39	0.165	-1.7425 (0.4082)	-4.27	0.000***
Pig farming experience	-0.0788 (0.0252)	-3.13	0.002***	-0.1402 (0.0285)	-4.92	0.000***	0.0187 (0.0290)	0.65	0.519
Frequency of training attendance	-1.6124 (0.6585)	-2.45	0.014**	-3.9568 (0.7500)	-5.28	0.000***	-5.3712 (0.9294)	-5.78	0.000***
Access to extension services	-0.9183 (0.3966)	-2.32	0.021**	-0.1729 (0.4785)	-0.36	0.718	-0.2460 (0.4938)	-0.50	0.618
Commercial feed	-0.4288 (0.5732)	-0.75	0.454	-0.8380 (0.5523)	-1.52	0.129	-2.7726 (0.5628)	-4.93	0.000***
Compounded feed	-0.6162 (0.6493)	-0.95	0.343	-1.2466 (0.6603)	-1.89	0.059*	-1.8235 (0.6415)	-2.84	0.004**
Alternative feed	0.6663 (0.4467)	1.49	0.136	-0.7092 (0.5666)	-1.25	0.211	-0.9533 (0.6785)	-1.41	0.160
Rationing of feed	1.7847 (0.3985)	4.48	0.000***	0.8187 (0.4465)	1.83	0.067*	0.5585 (0.4450)	1.26	0.209
Number of observation = 480									
Prob > chi^2 = 0.0000									
Log likelihood = -510.02053									
Pseudo r^2 = 0.2250									
Base categorical variable	Food secure								

*, **, *** represent 10%, 5% and 1% level of significance respectively; figures in parenthesis are standard errors

Conclusion

In light of the high cost of feed in southwest Nigeria, this study looked at how feeding practices affected the food security of pig farming households. With significant variations in food security outcomes depending on the type of feed utilised, the findings highlight important factors impacting households' food security status. The findings show that respondents who fed their pigs commercial feeds experienced less severe food insecurity and more food security than those who fed their pigs self-compounded feeds, alternative feeds, or rationed feed.

Food security results were found to be highly influenced by a number of socioeconomic characteristics. One important element was gender: families headed by women were more likely than those headed by men to suffer from acute food insecurity. This result contradicts with Lutomia *et al*. (2019) but is in line with earlier research by Kassie *et al*. (2014). Another factor was marital status; married households were more likely to be classified as "moderately food insecure"—possibly as a result of the added strain of providing for a bigger household. Olarinde et al. (2020) found that married household heads were more likely to be food secure, which is in contrast to this finding.

One important component affecting food security was found to be financial availability. The significance of credit in production and consumption was demonstrated by the higher likelihood of households without credit falling into the "severe food insecure," "moderate food insecure," and "mildly food insecure" categories. This is in line with Oni *et al*. (2022), who highlighted how credit improves food security. Food security was significantly positively impacted by membership in farmers' groups as well; households that did not belong to these groups were more likely to suffer from severe and mild food insecurity. The results of Addai *et al*. (2024), who demonstrated that farmer organisations improve food and nutritional security, are corroborated by this.

Another significant impact was the frequency of trainings; farmers who attended fewer trainings were more likely to be classified as food insecure. According to Ragasa *et al*. (2022), farmers who receive training are more likely to adopt practices that increase their income and production, which in turn improves their food security. Similarly, Amankwah *et al*. (2018) found that using commercial feed was linked to a lower chance of moderate food insecurity because animals fed commercial feeds fared better and produced more money. On the other hand, because it is difficult to formulate feed that is similar to commercial options, households that used compounded feed were more likely to experience mild food insecurity.

With households more likely to suffer from severe food insecurity if they lacked access to agricultural extension services, the study also emphasised the need of these programs. This is in line with research showing that agricultural extension services enhance farming methods, increasing income and production. This finding, however, runs counter to that of Ehiwario *et al*. (2024), who discovered that farmers who had less interaction with extension were more likely to be food secure.

Higher odds of severe and moderate food insecurity were significantly correlated with pig feed rationing. This is because, as Gule and Geremew (2022) have shown, underfeeding pigs has a detrimental effect on their performance, which lowers income and increases food insecurity. In line with Samim *et al*. (2021), it was also discovered that household size had a substantial impact on food security, with bigger households more likely to face severe and moderate food insecurity because of the strain on per capita food availability.

Lastly, food security was significantly influenced by pig farming experience. Because seasoned farmers often had higher production and revenue, which improves food access, households with less pig farming experience were more likely to fall into the "severe food insecure" and "moderate food insecure" groups. This is consistent with the findings of Olarinde *et al*. (2020), who proposed that the likelihood of food security is increased by agricultural experience.

The study suggests a number of actions to increase food security among pig farming households in southwest Nigeria in light of these findings. First, access to financing should be made easier by the government and non-governmental organisations, especially through farmer's organisations. Second, greater training on cost-effective feed formulation and other farming techniques should be offered by expanded agricultural extension services. Third, encouraging family planning may result in smaller households and more food available per person. Fourth, the government and non-governmental organisations might help farmers by providing subsidies for commercial feed to enhance affordability and in turn higher productivity and improved income. Lastly, as education has been shown to have a good impact on the usage of commercial feed, which in turn enhances food security, stakeholders should fund educational programs that encourage improved feed management techniques.

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