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EFFECT OF POVERTY LEVEL AND FOOD INSECURITY STATUS ON POULTRY FARMERS' RESPONSE TO HIGH FEED COSTS IN SOUTH-WEST NIGERIA

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ABSTRACT

The rising cost of feed is a major challenge in Nigeria's poultry industry. It impacts production costs and threatens the industry's sustainability and food security. Implementing effective coping strategies for rising feed costs is crucial for poultry enterprises. This study examines poverty level, food insecurity status, and poultry farmers' coping strategies to high feed costs in South-West, Nigeria. A multistage sampling procedure was employed for this study. Three states (Lagos, Ogun, and Oyo) were purposively selected from the six states in the South-West of Nigeria. In the second stage, 575 poultry farmers from all Poultry Association of Nigeria zones were selected using a simple random sampling technique. Data on the production activities of poultry farms were collected from the farmers using a structured questionnaire. Data were analyzed using descriptive statistics, mean per capita household expenditure, household food insecurity access scale, double log regression, multinomial logistic regression, and stochastic frontier production models at $p< 0.05$. The results of data analysis showed that 48% of the poultry farmers adopted mixed farming to cope with the rising feed cost while 24.7%, 16.1% and 6.2% adopted the use of finished feed, downsizing their flock size and at the verge of exiting the venture, respectively, while 5.2% did not change strategy. At a poverty line of ₦48,500/year, 70.7% of the poultry farmers were poor. The results also indicated that 25.8% of the poultry farmers were food secure, 1.6%, 27.2% and 45.4% were mildly, moderately and severely food insecure, respectively. The multinomial logit analysis results showed that sex ($p<0.1$), age ($p<0.05$), education ($p<0.01$), farm size ($p<0.05$), food security status ($p<0.01$), and access to credit ($p<0.01$) were factors for coping with rising feed costs in South-west Nigeria. The study concludes that the more educated the poultry farmers are the likely they will adopt the most suitable strategies to reduce the effect of rising feed costs. The study recommends that poultry farmers should engage in mixed farming which enables them to be in production.

Key words: Adopted strategies, Food security, Poverty level, Poultry farmers, Feed costs

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INTRODUCTION

Livestock plays a crucial role in the global economy and food security. The livestock industry supports the livelihoods of a significant portion of the world's population and contributes to protein supply. With at least 1.3 billion people worldwide relying on livestock for their livelihoods, it is an essential aspect of agriculture in the industrialized and developing countries [1].

In industrialized countries, livestock contributes to approximately 40% of the overall agricultural output, highlighting its importance to the economy and food systems. In developing countries, livestock's role in the economy accounts for 20% of agricultural output [1]. The difference between livestock production in industrialized and developing nations can be attributed to various factors including the level of industrialization, technology and infrastructure available in different regions. In 2019, the poultry industry contributed 25% to Nigeria's agriculture Gross Domestic Product, Central Bank of Nigeria [2].

The poultry sub- sector in Nigeria has suffered a gross neglect, which has dampened it potential to lift majority of poultry farmers out of poverty [3].

Statistical evidence showed that the rate of poverty in Nigeria has persistently been on the increase. According to the National Bureau of Statistics, forty percent of the people in Nigeria live below the poverty line of 137,430 naira ($381.75) a year and this represents 82.9 million people [4].

The majority of the world's food insecure are rural smallholder farmers and inhabit the developing world [5]. About 23.8% of food insecure people worldwide live in sub-Saharan Africa (SSA) [6]. Eighty percent of the 23% live in rural areas, work as peasants, are landless labourers and pastoralists often labelled as resource- poor [7].

The cost of feed per unit output is significantly higher for poultry; this calls for reduction of feed cost and improved credit access to enhance the purchase of feeds and increase the flock size [8, 9, 10].

Implementing effective coping strategies is crucial for poultry farmers to maintain profitability by optimizing resource allocation. By mitigating the impact of high feed costs, farmers can allocate their resources more efficiently into other aspects of their poultry venture, such as improving housing conditions, enhancing biosecurity measures, investing in better equipment, expanding production capacity, or even diversifying into value-added products. Proper coping strategies enable farmers to optimize their operations and make informed decisions to achieve long-term sustainability and profitability.

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Applying the best coping strategies to combat the high cost of feed empowers poultry farmers to allocate their resources more efficiently and strategically, leading to improved profitability, competitiveness and long-term sustainability.

In view of the problems mentioned in the previous paragraphs, this study was conducted to address the poverty level and food security status and their effects on poultry farmers' response to changing feed costs in south-west Nigeria.

MATERIALS AND METHODS

This study was carried out in South-West, Nigeria involving the following six states: Ekiti, Ondo, Osun, Ogun, Oyo and Lagos. The National Population Commission reported that 27,511,892 people live in South-West, Nigeria comprising of 14,049,594 male farmers and 13,462,298 female farmers [11]. The major occupation of the people in the study area is agriculture. The other occupations of the people in the study area include trading, driving and carpentry.

Study Population, Method of Data Collection, Sample size and Sampling Technique

The population of the farmers registered by Poultry Association of Nigeria (PAN) in the respective three states of Ogun, Oyo, and Lagos were three hundred and sixty-three (363), three hundred and twenty-one (321), and four hundred and thirty (430), respectively, totalling 1,114 farmers. These states were selected due to the high concentration of poultry farmers in the states. This population was drawn from the Oyo, Ogun and Lagos state chapters of the Poultry Association of Nigeria (PAN).

Yamane's [12] formula was used to determine the sample size of poultry farmers for each state given the population of the farmers in the states.

Yamane's formula is given as follows.
$n= N/[1+N(e)^2]$
where:
n = sample size
N = population
e = random error term (which is 0.05)

From this, the sample size (n_1) for Ogun State was computed as:
$n_1 = 363/[1+363(0.05)^2]$
$= 363/1.908 = 190.25$, rounded up to 190 poultry farmers.
The sample size (n_2) for Lagos State:
$n_2 = 321/ [1+321(0.05)^2]$
$= 321/1.803 = 178.04$ rounded up to 178 poultry farmers,
while the sample size n_3 for Oyo State is:

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$n_3 = 430/ [1+430(0.05)^2]$
$= 430/2.075 = 207.23 = 207$ poultry farmers.

A multistage sampling procedure was adopted for this study for the selection of poultry farmers. The first stage was purposive selection of three (Lagos, Ogun and Oyo) states from the six (6) states in the South-West Geopolitical zones in Nigeria. This was based on the concentration of poultry farmers in those states. The second stage involved purposive selection of three poultry association zones from each state.

The last stage involved random selection of 575 poultry farmers from the nine poultry association zones from the three states. However, of the 575 poultry farmers sampled and interviewed, data analysis was based on 515 respondents who provided useful information. The primary data were collected through the administration of a well-structured questionnaire on a cross-section of 575 randomly selected poultry farmers in the study area.

Method of Data Analysis

The analytical tools adopted in this study were descriptive and inferential statistics. The descriptive statistical tools consist of frequency distributions and percentages. The Household Food Insecurity Access Scale was adopted for measuring the food security status of the farmers, and the poverty line was captured to dichotomize non-poor and the poor households with the use of mean per capita household expenditure (MPCHHE), while Multinomial Logistic Regression Model was used to determine the drivers of poultry farmers' response to changing feed costs.

Measuring Poverty Status of the Poultry Farming Households

The relative poverty line was estimated based on the expenditure profile of the respondents on basic needs (food and non-food items). Total household per capita yearly expenditure was used as proxy for standard of living. In order to calculate the per capita household yearly expenditure, total yearly expenditure was divided by household sizes, while the mean per capita household yearly expenditure was calculated by dividing total per capita household yearly expenditure by number of respondents, in line with Obayelu [13].

$$\text{Mean PCHHE} = \frac{\text{Total } Per\ Capita \text{ yearly Expenditure or housholds}}{\text{Total numbr of households}} \ldots\ldots\ldots\ldots (1)$$

Obayelu [13] reported that two-thirds of the MPCHHE is chosen as the poverty line. The non-poor threshold is the region that is greater than two-thirds of MPCHHE, while the moderate poverty line ranges from one-third to two-thirds of MPCHHE, the core poor threshold is the region less than one-third of MPCHHE. This study, therefore, partitioned the respondent poultry farmers into non-poor, (those above

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the two-thirds of household of the mean per capita expenditure), and poor (those below two-thirds of MPCHHE).

Food Security Status of Poultry Farming Households

Swindale [14] and Gathiaka [15] reported a reduction in food intake due to lack of resources using the Household Food Insecurity Access Scale. This study, therefore, adopted the Household Food Insecurity Access Scale used previously in other developing countries and yielded substantial accurate results in assessing the food security status of the poultry farming households. The Household Food Insecurity Access Scale (HFIAS) incorporates three fundamental components that is, uncertainty and anxiety over food, perceptions that food is of insufficient quantity and quality.

The HFIAS categorized the food security of poultry farmers into Food Secure, Mildly Food Insecure, Moderately Food Insecure, and Severe Food Insecure. This was achieved by adopting the procedure of Coates *et al.* [16].

Descriptive statistics (frequency and percent) was used to analyze the coping strategies.

Analysis of the Determinants of adopted strategies to Changing Poultry Feed Costs with Multinomial Logistic Regression Models (MLRM)

The Multinomial Logistic Regression Model (MLRM) is a statistical model used for analysing and predicting outcomes for categorical dependent variables with more than two categories. In this case, the model was used to analyze the poultry farmers' response to rising feed costs, as adopted by Ibrahim *et al.* [17] and Mpuga [18].

The dependent variable Q_{it} represents the response strategies adopted by the farmers, which can take on one of j categories (1, 2, … k). In this study, there were five distinct categories:

1. Farmers who did not change strategy
2. Farmers who used finished feeds as their response
3. Farmers who adopted mixed farming
4. Farmers who downsized the size of their flock
5. Farmers on the verge of exiting the poultry business
6.

The farmers on the verge of exiting the poultry business are farmers who, after the last circle of production, might sell off their remaining stock and equipment and close their operations.

The model estimates the probability of each category of the dependent variable occurring based on the values of the independent variables.

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Let Pr (Q_{it} = M/X) be the probability of observing outcome M given X, the probability model for Q_{it} can be constructed as:

$$\Pr(Q_{it} = M/X) = \frac{\exp\beta_0 + \beta_1 X_{2i} + \cdots \ldots \ldots \ldots \beta_k X_{mi}}{\sum_{j=1}^{k} \exp\left(\beta_{o\wedge} + \beta i_j X_{2i} + \cdots \ldots . + \beta_{kj} X_{ni}\right)} \ldots \ldots \ldots \ldots \ldots \ldots (2)$$

For j = 1, 2, … 5. The parameters are not all identified since more than one set of parameters generates the same probabilities of the observed outcomes, unless constraints are imposed on the model. This was achieved by setting parameters, of the first-choice category j=1, of no change in strategy to be all zero: $\beta_{01}=\beta_{11}=\beta k_1=0$. In other words, parameters of the first-choice category were used as the reference/base against which the other choices were compared. In this study, the first-choice category against which others are compared is coded as the zero adoption. The log likelihood function for the multinomial logit can be written as:

$$l = \sum_{i=1}^{n} \sum_{j=1}^{k} qij \, Log\left(P_{ij}\right) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3)$$

Where q_{ij} is a dummy variable that takes the value 1 if observation i has chosen alternative j; 0 otherwise. The first-order conditions are:

$$\frac{\delta l}{\delta \beta_{kj}} = \sum_{i=1}^{n} \left(qij - Pi_j\right) X_{kj} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4)$$

As suggested by Maitra [19], the coefficients in this model are difficult to interpret, so the relative probability of Y=j in relation to the base category Y=0 is given by the Relative Risk Ratio (RRR) or odds ratio. This parameter estimates measure the impact of a unit increase in the relevant explanatory variable on the log odds ratio of the particular state in relation to the baseline category, that is, the state of no change in response. An odds ratio equal to 1 suggests that the explanatory variable leaves the dependent variable unchanged. If the odds ratio is greater (less) than 1, it implies that the effect of explanatory variable is to increase (reduce) the dependent variable [20].

The multinomial logit model is, however, operationalized empirically in this study with the following equations:

$$Q_{0t} = \alpha_0 + \beta_{10} X_1 + \beta_{20} X_2 + - - - - - + \beta_n X_n + \varepsilon_i - - - - - - - (10)$$
$$Q_{1t} = \alpha_1 + \beta_{11} X_1 + \beta_{21} X_2 + - - - - - + \beta_n X_n + \varepsilon_i - - - - - - - (11)$$
$$Q_{2t} = \alpha_2 + \beta_{12} X_1 + \beta_{22} X_2 + - - - - - + \beta_n X_n + \varepsilon_i - - - - - - - (12)$$
$$Q_{3t} = \alpha_3 + \beta_{13} X_1 + \beta_{23} X_2 + - - - - - + \beta_n X_n + \varepsilon_i - - - - - - - (13)$$
$$Q_{4t} = \alpha_4 + \beta_{14} X_1 + \beta_{24} X_2 + - - - - - + \beta_n X_n + \varepsilon_i - - - - - - - (14)$$

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The dependent variable Qi is when a poultry farmer adopts a response i and zero when otherwise. Thus Q_0, Q_1, Q_2, Q_3, and Q_4 are equal the probabilities that poultry farmers select different responses viz (no change in strategy, use of finished feed, engagement in mixed farming, downsizing of flock size, verge of existing the poultry business).

X_i ---- X_n represent vector of the explanatory variables, where n = 1 β_1-----β_2 represent the parameter coefficients, εi represents the independent distributed error term and α_0, α_1, α_2, α_3 and α_4 show the intercepts or constant terms.

The explanatory variables are as follows:
X_1 = Sex [Male = 1, Female = 0]
X_2 = Age of the Poultry Farmers [in years]
X_3 = Marital Status X_4 = Educational Status [in years]
X_4 = Educational Level
X_5 = Household Size [Number]
X_6 = farm size [Number of birds]
X_7 =Food Security [Food Secure (0), Food Insecure (1)]
X_8 =Poverty Level [Poor = 0, Non-poor = 1]
X_9 = Farming Experience
X_{10} = Cooperative Membership [yes = 1, no = 0]
X_{11} = Access to credit

RESULTS AND DISCUSSION

Results of Empirical Analysis

Distribution of Poultry Farmers based on Poverty Level

Table 1 shows the poverty level of poultry farmers during the period of high cost of feed. It was observed that majority (70.7%) of the poultry farmers were below the poverty line of ₦48,500/year, while 29.3% of the poultry farmers were above the poverty line. This shows that high cost of feed had a negative impact on the poultry farmers because majority of them were below the poverty line. This finding is consistent with the findings of Food and Agriculture Organization [1], that the poultry sub- sector in Nigeria has suffered a gross neglect, implying that its potential to lift majority of peasants out of poverty has almost been completely eroded.

Distribution of Poultry Farmers based on Food Security Status

Table 2 shows the various categories of food security of the respondents. The Household Food Insecurity Access Scale (HFIAS) was used to determine the food security status of the poultry farmers. The HFIAS ranged between 0 and 27. Poultry farmers whose scores ranged between 0 to 1 were classified as food

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secured, those who scored between 2 and 10 were mildly food insecure, scores between 11 to 20 were moderately food insecure, and those who scored between 21 to 27 were classified as severely food insecure in line with Coates *et al.* [16]. It was observed that 25.8% of the poultry farmers were food secure, 1.6% were mildly food insecure, 27.2% were moderately food insecure, and 45.4% were found to be severely food insecure.

Distribution of Poultry Farmers by strategies adopted in Responses to High Feed Costs

Table 4 presents the various strategies poultry farmers adopted in response to the high price of feed. It is important to note that different farmers opted for different coping strategies based on their unique circumstances and resources available to them. The strategies observed in the study are as follows:

- No change of strategy: A small proportion of the poultry farmers (5.2%) did not adopt any strategy in response to the high price of feed. This could be due to various reasons, such as lack of awareness, resources, or alternative options. This finding is in line with that of Osma *et al.* [21], who opined that information is important to technology adoption.
- Use of finished feed: Approximately a quarter of the poultry farmers (24.7%) switched to using finished feed to cope with the high price of feed.
- Mixed farming system (47.8%): Some poultry farmers adopted a mixed farming system, integrating crop production or other livestock into their operations.
- Downsizing flock size (16.1%): Another strategy adopted by poultry farmers was to reduce their flock size, which can help lower feed costs and make it more manageable for them to maintain their operations amidst high feed prices.
- Verge of Exiting the poultry business (6.2%): Some farmers chose verge of exiting the poultry business altogether as a way to cope with the high price of feed.

Analysis of Determinants of Strategies Adopted in Response to Changing Feed Costs

The significant Chi-square value of 520.07 associated with the log likelihood ratio indicates that the model has a strong explanatory power, meaning that the variables included in the model collectively explain a significant proportion of the variation in the coping strategies adopted by poultry farmers in the study area.

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Pseudo R^2 is a measure of how well the independent variables in the model predict the outcome variable compared to a baseline model. Specifically, a Pseudo R^2 value of 0.3050 suggests that the independent variables included in the multinomial logistic regression model explain approximately 30.50% of the variance in the outcome variable. This means that around 30.50% of the variation in the response variable can be accounted for by the predictors included in the model.

Use of finished feed

Educational level of the poultry farmers was significant at $p<0.01$ for the use of finished feed with a positive coefficient indicating that poultry farmers who are educated are more likely to adopt this strategy because they are enlightened on the cheapest feed that can yield a greater output. This finding is in line with the finding of Afodu *et al.* [22], who opined that an increase in level of education, will lead to increase in the adoption of production technologies and this will further better the farmers' productivity.

This study revealed that an increase in the level of education of the poultry farmers will lead to 1.48% increase in adopting use of finished feed strategy as compared to the reference category of no change of strategy. This finding is consistent with the findings from the studies of Ibrahim *et al.* [17], who adopted multinomial logit regression model to analyse arable crop farmers' decisions on climate change and the adaptation strategies, noticed that farmers with higher levels of education are more likely to better adapt to climate change by taking up multiple strategies.

The poultry farmers' household size was significant at $p<0.1$ with a negative coefficient, implying that an increase in the poultry farmers' household size would lead to 1.05% decrease in adopting the use of finished feed strategy as compared to the reference category. This finding supports that of Eastwood *et al.* [23] that larger households may have challenges in effectively allocating resources such as land and capital, which can affect productivity and reduce the ability to adopt new strategies.

Farmer size was found to be significant ($p<0.1$) for use of finished feed strategy with a positive coefficient. This finding suggests that the use of finished feed may be more favourable to larger farm owners than adopting a no change strategy, as larger farms may have the financial and technical resources necessary to invest in innovative and cost-saving strategies. This finding is similar to that of Barrett *et al.* [24], who found that larger farms can be more productive because they can better leverage economies of scale. This can happen due to access to better technology, ability to hire specialized labour, or more efficient use of inputs.

Food security status was found to be a significant predictor ($p<0.01$) of the use of finished feed strategy among poultry farmers, with a positive coefficient indicating

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that food-secure farmers are more likely to adopt this strategy compared to those who do not have enough food to meet their needs.

The finding shows that food-secure poultry farmers are 33% more likely to adopt the use of finished feed strategy compared to the no change category, which further emphasizes the importance of addressing food security challenges in promoting sustainable and efficient farming practices. This finding is consistent with the findings of Holden *et al.* [25], that when households are food secure, they may have more capacity to invest in farming technology and practices that enhance productivity. This is because they may not need to divert resources to immediate food needs and can instead plan for the longer term.

The poverty level of the respondents was found to be significant ($p<0.05$) with the use of finished feeds with a negative coefficient. This finding suggests that poverty may be a significant barrier to the adoption of sustainable and efficient farming practices like the use of finished feed, as farmers who are living in poverty may have limited financial resources to invest in innovative strategies that could help reduce the impact of high feed costs. This finding is like that of Thapa [26], who found that poverty can limit a farmer's access to productive inputs such as finished feeds, which is often essential to improving the poultry farmers productivity.

Farming experience was found to be a highly significant ($p<0.01$) predictor of the use of finished feed strategy among poultry farmers, with a positive coefficient indicating that more experienced farmers are more likely to adopt this strategy. This finding suggests that farming experience may play an important role in promoting the adoption of sustainable and efficient farming practices like the use of finished feed. Experienced farmers may have a greater understanding of the challenges associated with high feed costs and may be better equipped to identify and adopt innovative strategies to cope with these challenges. This finding is like that of Bryan *et al.* [27], who found that more experienced farmers may be more comfortable with experimentation, trying out new coping strategies increase productivity and reduce cost of production.

The finding shows that more experienced poultry farmers are 10.9% more likely to adopt the use of finished feed strategy compared to the no change category. Cooperative membership was found to be a significant ($p<0.01$) predictor of the use of finished feed strategy among poultry farmers, with a positive coefficient indicating that farmers who are members of cooperatives are more likely to adopt this strategy, consistent with the findings of Bernard [28]. According to Bernard [28], cooperatives can help small-scale farmers to market their produce more effectively and obtain better prices.

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Access to credit was found to be a significant ($p<0.05$) predictor of the use of finished feed strategy among poultry farmers, with a positive coefficient indicating that farmers who have access to credit are more likely to adopt this strategy. The finding that access to credit is associated with a 5.22% increase in the adoption of the use of finished feed strategy compared to the no change category. This finding is consistent with the findings of Karlan *et al.* [29] that access to credit can enable farmers to try out new strategies that could increase productivity.

Engagement in mixed farming strategy

Age was found to be a significant ($p<0.1$) predictor of engagement in mixed farming strategy among poultry farmers, with a negative coefficient indicating that younger farmers are more likely to adopt this strategy compared to older farmers. Educational level was also found to be a significant ($p<0.05$) predictor of engagement in mixed farming strategy among poultry farmers, with a positive coefficient indicating that farmers who are more educated are more likely to adopt this strategy. The finding that an increase in educational level leads to a 1.38% increase in the adoption of engagement in mixed farming strategy compared to the no change category.

Food security status was found to be significant at $p<0.01$ for engagement in mixed farming strategy among poultry farmers, with a positive coefficient indicating that farmers who are food-secure are more likely to adopt this strategy. The finding shows that food-secure poultry farmers are 10.2% more likely to engage in mixed farming strategy compared to the no change category.

Poverty level was found to be a significant ($p<0.05$) predictor of engagement in mixed farming strategy among poultry farmers, with a negative coefficient indicating that farmers who are living in poverty are less likely to adopt this strategy. The finding shows that an increase in poverty level will lead to an 8.2% decrease in the adoption of engagement in mixed farming strategy compared to the no change category. Farming experience was found to be a significant ($p<0.05$) predictor of engagement in mixed farming strategy among poultry farmers, with a positive coefficient indicating that farmers who have more experience are more likely to adopt this strategy.

It was observed from the results of this study that an increase in farming experience may lead to a 10.6% increase in the adoption of engagement in mixed farming strategy compared to the no change category. Access to credit was found to be a significant ($p<0.05$) predictor of engagement in mixed farming strategy among poultry farmers, with a positive coefficient indicating that farmers who have access to credit are more likely to adopt this strategy.

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The finding shows that access to credit is associated with a 9.1% increase in the adoption of engagement in mixed farming strategy compared to the no change category.

Downsizing of flock size strategy

The sex (gender) of poultry farmers was found to be significant at $p<0.1$ for downsizing of flock size strategy among poultry farmers, with a negative coefficient indicating that female farmers are more likely to adopt this strategy.

This finding suggests that gender may play an important role in the adoption of sustainable and efficient farming practices like downsizing of flock size. The finding shows that female poultry farmers are 7.5% more likely to adopt downsizing of flock size strategy compared to the no change category. Age was found to be significant at $p<0.05$ for downsizing of flock strategy among poultry farmers, with a positive coefficient indicating that older farmers are more likely to adopt this strategy. The result shows that older poultry farmers are 5.6% more likely to adopt downsizing of flock strategy compared to the no change category.

Household size was found to be highly significant ($p<0.01$) for downsizing of flock size strategy among poultry farmers, with a negative coefficient indicating that as household size increases, the probability of adopting this strategy decreases. The finding shows that an increase in household size may lead to a 0.53% decrease in the probability of adopting downsizing of flock size strategy compared to the no change category.

Food security status was found to be a significant ($p<0.01$) predictor of downsizing of flock size strategy among poultry farmers, with a negative coefficient indicating that food-secure farmers are less likely to adopt this strategy. The finding shows that food-secure poultry farmers have 0.1458% lower probability of adopting downsizing of flock size strategy compared to the no change category.

Cooperative membership was found to be significant at $p<0.05$ for downsizing of flock size strategy among poultry farmers, with a negative coefficient indicating that an increase in cooperative membership participation will decrease the adoption of this strategy. Access to credit was found to be a significant ($p<0.01$) predictor of downsizing of flock size strategy among poultry farmers, with a negative coefficient indicating that access to credit will decrease the adoption of this strategy. This finding shows that access to credit will lead to a 2.55% decrease in the probability of adopting downsizing of flock size strategy compared to the no change category.

Poultry farmers at the verge of exiting the poultry business strategy

Age was found to be a significant ($p<0.05$) predictor of exiting the poultry business among poultry farmers, with a positive coefficient indicating that older farmers are

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more likely to exit the business. The finding that older poultry farmers have a 3.9% higher probability of adopting this strategy compared to the no change category, further underscores the importance of considering the needs and circumstances of older farmers when promoting sustainable and efficient poultry farming practices.

This analysis indicates that household size is a significant factor in determining whether poultry farmers choose to exit the business. The positive coefficient ($p<0.01$) suggests a strong relationship between larger household size and the likelihood of adopting this strategy. Specifically, with each increase in household size, the probability of deciding to exit the poultry business increases by 8.67%, as compared to those who do not change their strategy.

The analysis shows that food security status is another significant factor in determining whether poultry farmers choose to exit the business or not. The negative coefficient ($p<0.01$) suggests a strong relationship between food security and the decision to remain in the poultry business. Specifically, poultry farmers who are food secure are more likely to continue in the business. The probability of staying in the business for food-secure farmers is 10.99% higher compared to those who do not change their strategy.

This analysis reveals that the poverty level of the respondents also plays a significant role in their decision to exit the poultry business. The negative coefficient ($p<0.05$) indicates a notable relationship between higher poverty levels and the likelihood of adopting the strategy to exit the business. Specifically, as the poverty level increases, there is a 1.99% increase in the probability of adopting the strategy to exit the poultry business compared to the reference category of no change in strategy.

Table 4.15 highlights that farming experience is a significant factor ($p<0.1$) in determining whether poultry farmers choose to exit the business or not, with a negative coefficient. This finding suggests that the more experienced the poultry farmers are, the less likely they are to adopt the strategy of exiting the poultry business as a means of coping with the high price of feed.

The analysis shows that cooperative membership is a significant factor ($p<0.05$) in determining whether poultry farmers choose to exit the business or not, with a negative coefficient. This finding suggests that an increase in cooperative membership participation is associated with a lower likelihood of adopting the strategy of exiting the poultry industry.

The analysis reveals that access to credit Is a significant factor ($p<0.01$) In determining whether poultry farmers choose to exit the business or not, with a negative coefficient. This finding suggests that having access to credit is

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associated with a lower likelihood of adopting the strategy of exiting the poultry industry.

CONCLUSION, AND RECOMMENDATIONS FOR DEVELOPMENT

It was observed from the study that majority of the poultry farmers in the study area were poor, living below two-thirds of MPCHHE, which was estimated to be ₦48,500/year (US$45.03). This has an adverse effect on both the poultry farmers and the economy at large.

The study also revealed that a wide range of the poultry farmers were food insecure, which may affect the poultry farmers' choice of the best coping strategies. The multinomial logit revealed that education, farming experience, access to credit, food security status and cooperative membership positively influenced the adoption of coping strategies. Poultry farmers who were poor, and severely food insecure mostly adopted and used finished feed strategy.

Based on the findings from this study, the following recommendations were suggested. Government and the private sectors should come to the aid of the poultry farmers in the study area by subsidizing the prices of the raw materials used in feed production.

Increasing the educational level and welfare of poultry farmers would help the farmers' decision-making on how to respond to the high cost of feed. Government should provide intervention programs to help alleviate food insecurity and reducing poverty among poultry farmers.

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Table 1: Poverty Level

	Frequency	Percent
Non-Poor	151	29.3
Poor	364	70.7
Total	515	100.0

Field Survey 2022

Table 2: Categories of Food Security

Food security status	Cut-off rate based on affirmative response to the 9 food security questions	Frequency	Percentage (%)	Probability
Food Secure	0-1	133	25.8	0.258
Mildly Food Insecure	2-10	8	1.6	0.016
Moderately Food Insecure	11-20	140	27.2	0.272
Severe Food Insecure	21-27	234	45.4	0.454
Total		515	100.0	1.0

Field Survey 2022

Table 3: Poultry Farmers Responses to High Price of Feed

	Frequency		Percent	
	Yes/No	Total	Yes/No	Total
No change of strategy	27.0/488	515	5.2/94.8	100.0
Use of finished feed	127.0/388	515	24.7/75.3	100.0
Engagement in mixed farming	246.0/269	515	47.8/52.2	100.0
Downsizing of flock size	83.0/432	515	16.1/83.9	100.0
Verge of Exiting the poultry business	32.0/483	515	6.2/93.8	100.0

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Table 4: Multinomial Logistic Regression of adopted strategies on predictors, reference strategy is no change of strategy

Predictorss	Use of finished feed		Engagement in mixed farming		Downsizing of flock size		Exiting the poultry Business	
	Marg.Eff	Coeff	Marg. Eff	Coeff	Marg. Eff	Coeff	Marg.Eff	Coeff
Constant		2.4026*		.7096		3.0743**		1.7790
		(1.4211)		(1.1972)		(1.3241)		(1.6134)
Sex	.1108	-.7459	-.0479	-.5878	-.0753	-.4833*	-.0208	-.02031
		(.5738)		(.4150)		(.2431)		(.4136)
Age	.0009	.0086	.013	-.3584*	.056	-.8581**	.039	.0479**
		(.0158)		(.1833)		(.2425)		(.0188)
Marital Status	.0929	-.2010	.0099	-.0164	-.0270	-.0037	-.0874	.0385
		(.2033)		(.0138)		(.0158)		(.2228)
Educational Level	.0148	.1624***	.0138	.2054**	.0459	.1796	.0330	.0499
		(.0258)		(.0964)		(.1145)		(.1389)
Household Size	-.0105	- .2590**	.0345	.1718*	.0525	-.5627***	-.0867	-.1385***
		(.1171)		(.0989)		(.1235)		(0137)
Farm Size	-4.09e-06	.0003*	2.34e-06	-2.94e-06	4.09e06	.00004**	4.82e-06	.0000153
		(.000017)		(.000019)		(.000015)		(.000021)
Food Security Status	.3295	1.8729***	.1018	1.5798***	-.1458	-1.156***	-.0199	-1.8050***
		(.2236)		(.1661)		(.1571)		(.2560)
Poverty Level	-.0837	-1.0786**	-.0820	-.9234**	.1176	.6441	.0199	.9253**
		(.4697)		(.3805)		(.3899)		(.4588)
Farming Experience	.0188	.1942***	.0161	.0942**	.0105	-.0147	-.0435	-.0654*
		(.0415)		(.0293)		(.0327)		(.0385)
Cooperative Membership	.1248	1.376***	.1177	.3649	.21841	1.4087**	-.1748	-.6694**
		(.4368)		(.3247)		(.3715)		(.3292)
Access to Credit	.0522	.1874**	.0909	0.2736**	-.0255	1.0330***	-.1450	-2.808***
		(.1077)		(0.119)		(0.2969)		(.5942)
Log likelihood = -530.3042 Pseudo R2 = 0.3050 chi2(44) = 520.07***								

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***, **, * = significant at 1, 5 and 10 percent, respectively

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