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Unlocking the Potential of Small-Scale Poultry Farmers: A Cost-Benefit Analysis of Exotic and Noiler Chicken Production

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Abstract

Small-scale poultry farming has the potential to enhance food security and livelihoods in the Niger Delta. However, farmers face challenges in optimizing profitability due to high production costs, limited access to credit, and market inefficiencies. This study conducts a cost-benefit analysis of Exotic and Noiler chicken production to provide insights into their economic viability and help small-scale farmers make informed decisions. A total of 450 poultry farmers were chosen using a multistage sampling method. Primary data were collected through using structured questionnaires. The collected data were analyzed using descriptive and inferential statistics. The study specifically analyzes production costs, profitability, and key constraints affecting farmersThe study found that 65% of poultry farmers were men, with an average age of 41 years, and 70% had over five years of farming experience. Most farmers (60%) operated on a small scale, managing fewer than 500 birds. Production systems varied significantly: 50% of Noiler farmers practiced extensive farming compared to only 15% of Exotic farmers, while 55% of Exotic farmers adopted the intensive system compared to 10% of Noiler farmers. Cost analysis revealed that Exotic chicken production had significantly higher expenses (₦8,942.60 per bird) compared to Noiler chickens (₦5,236.84 per bird), with a statistically significant difference ($p = 0.005$). The BCR was higher for Noiler chickens (1.50) than for Exotic chickens (1.31), indicating greater cost efficiency. Profitability was positively influenced by access to credit, veterinary services, and farming experience, while major challenges included high feed costs, disease outbreaks, limited credit access, and poor market linkages. The findings provide actionable insights for policymakers, extension agents, and poultry farmers by highlighting the economic advantages of Noiler chicken production over Exotic breeds in small-scale farming. The study underscores the need for targeted interventions, such as improving access to financing, reducing feed costs, and enhancing market linkages, to boost the productivity and profitability of small-scale poultry enterprises in the Niger Delta.

Keywords
Poultry Profitability, Exotic Chickens, Noiler Chickens, Small-Scale Poultry Farming, Constraints in Poultry Farming

1. Introduction

In contemporary poultry farming, the production of Exotic and Noiler chickens has become an important topic for both scholarly investigations and practical applications, particularly because of its significant implications for agricultural sustainability and economic viability in the worldwide poultry sector. The incorporation of these breeds into poultry systems is critical for tackling food security and improving the livelihoods of smallholder farmers, especially in developing regions where poultry is a key source of revenue and nutrition (FAO, 2023; Akinwumi et al., 2022; Mottet et al., 2022; Gbigbi, 2020). Despite the importance of poultry farming, challenges persist, particularly in understanding the profitability and operational constraints associated with Exotic and Noiler chicken production. This gap in knowledge hampers the development of effective strategies for optimizing productivity and ensuring the long-term sustainability of poultry farming systems. The historical background, genetic diversity, and current uses of Exotic and Noiler chickens call for an in-depth analysis to comprehend their roles in agricultural progress.

Exotic chickens, which include a range of selectively bred strains from diverse geographical regions, have gained attention for their superior production traits. These breeds typically exhibit enhanced growth rates, high egg production, and better feed conversion efficiency. However, their integration into local poultry systems has proven to be complex. The interaction between traditional farming practices, modern breeding techniques, and evolving market demands presents challenges in managing input costs, production efficiencies, and disease control (Oyebanji et al., 2020; Akinsola et al., 2021; Gbigbi, 2017). Additionally, the economic feasibility of raising Exotic chickens is influenced by fluctuating feed prices, changing consumer preferences, and the potential for disease outbreaks (Alabi et al., 2019). While Exotic breeds promise higher productivity, their high input costs and management requirements may limit their profitability for smallholder farmers.

Noiler chickens, developed through the crossbreeding of indigenous African breeds with modern broiler lines, have been introduced as a more sustainable and resilient option for smallholder farmers. The primary aim of the Noiler breed is to improve productivity while retaining the adaptability of local breeds, which is crucial for farmers who face environmental and economic constraints. Noilers are expected to offer a balanced approach, with lower input costs and better disease resistance than Exotic chickens (Bamidele et al., 2019). However, challenges such as the lack of a clear understanding of their economic viability, slow market penetration, and inconsistent production practices pose obstacles to their widespread adoption (Yakubu et al., 2021).

Despite these distinct advantages, a critical gap exists in the comprehensive understanding of the profitability and challenges faced by poultry producers using these two chicken breeds. There is limited research specifically focusing on the cost-benefit analysis of raising Exotic and Noiler chickens, particularly in the Niger Delta, where smallholder poultry farmers play a significant role in local economies. This lack of insight into production costs, profitability, and the operational hurdles faced by farmers obstructs the development of evidence-based strategies for sustainable poultry farming (Gheyas et al., 2021; Bettridge et al., 2018).

Additionally, market volatility, rising feed prices, climate change, and resource constraints further exacerbate the difficulties poultry farmers face in maintaining profitability. The evolving dynamics of the poultry market, along with environmental factors that impact production, require innovative management strategies and effective policy support to ensure the long-term success of both Exotic and Noiler chicken production. Given the importance of poultry farming in addressing food security challenges, especially in regions like the Niger Delta, where there is an increasing demand for animal protein, this study seeks to fill the knowledge gap regarding the profitability, limitations, and prospects of Exotic and Noiler chicken production. By providing a comprehensive analysis of the cost structures, profitability indicators, and operational barriers, this research offers valuable insights that can guide policymakers, farmers, and stakeholders in developing effective strategies for improving poultry productivity and sustainability. The study also contributes to bridging the knowledge gap in poultry economics by highlighting the economic trade-offs between Exotic and Noiler chickens, thereby supporting evidence-based decision-making in agricultural development. Ultimately, the findings will help small-scale poultry farmers enhance profitability, overcome operational challenges, and contribute to broader food security goals in the face of climate change and resource constraints (FAO, 2023; Mottet et al., 2022; Ajayi et al., 2020).

Objectives of the Study

The distinct goals of this research are to:

1. Evaluate the socioeconomic characteristics of poultry farmers engaged in raising exotic and Noiler chickens.
2. Examine the farming systems and input costs associated with exotic and Noiler chicken production.
3. Evaluate the potential profits from raising exotic and Noiler chickens.
4. Determine the elements that impact the profitability of poultry farmers raising exotic and Noiler chickens.
5. Examine the difficulties faced by poultry farmers in producing exotic and Noiler chickens.

Hypothesis

H01: There is no major difference in the average profits generated from the exotic and Noiler chickens.

2. Materials and Methods

The study was conducted in the Rivers, Delta, and Bayelsa states located in the Niger Delta region of Nigeria. A total of 450 poultry farmers were chosen using a multistage sampling method. The initial phase involved the deliberate selection of three states, followed by the random selection of three Local Government Areas (LGAs) within each state. Afterwards, farmers were randomly chosen from the identified LGAs. Primary data were collected through using structured questionnaires that focused on socioeconomic information, production inputs, constraints, and profitability metrics. The collected data were analyzed using descriptive statistics, Gross Margin (GM), Net Farm Income (NFI), Benefit-Cost Ratio (BCR), and multiple regression analysis. Gross Margin (GM): GM is computed by deducting Total Variable Costs from Total Revenue. Net Farm Income (NFI): NFI is calculated by subtracting Total Costs from Total Revenue. Benefit-Cost Ratio (BCR): BCR is obtained by dividing Total Revenue by Total Costs. Multiple Regression:

This technique is used to analyze the factors that affect profitability. Descriptive statistics: This method is used to evaluate constraints within production.

Operating Ratio (OR)

The operating ratio is a major financial metric to assess the efficiency of agricultural operations. This metric is determined by dividing operating expenses by net sales revenue, and is frequently presented as a percentage. A reduced operating ratio signifies enhanced operational efficiency, indicating that the farm is incurring lower operating expenses in relation to its revenue.

Operating ratio is given as:

Operating Ratio (OR) = (Total variable cost)/ (Total income)*100/1

The formula for calculating the student's t-test, as outlined by Koutsoyiannis (2003), is given as follows:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{SD_1}{n_1}} + \sqrt{\frac{SD_2}{n_2}}}$$

At n1 + n2 -2 degrees of freedom

Where

X1 = Mean X1 variable

X2 = Mean X2 variable

SD1= Standard deviation of X1 variable

SD2= Standard deviation of X2 variable

n1 = Number of exotic chicken farmers

n2 = Number of noiler chicken farmers

Level of significance 0.05

3. Results and Discussion

Socioeconomic attributes

Table 1 presents a summary of the socioeconomic attributes of poultry farmers.

Gender Distribution

The gender distribution indicates that 58% of poultry farmers are male, while 42% are female. This aligns with recent studies in Nigeria, which consistently show a higher male participation in poultry farming. For instance, Sulaiman et al. (2023) attribute this disparity to cultural traditions that often position men in superior roles concerning agricultural decision-making. In contrast, Edafe et al. (2023) highlight that male farmers typically have better access to resources such as land and financial capital, which facilitates larger-scale farming operations compared to their female counterparts. However, the significant presence of women 42% in poultry farming is noteworthy, as emphasized by Michael et al. (2022), who argue that poultry farming remains a viable venture for women, particularly in small-scale contexts. Desta (2021) further underscores the importance of women's engagement in poultry farming for alleviating household food insecurity and enhancing income generation.

Age of Farmers

The average age of 41 years indicates that poultry farming in the region is primarily characterized by individuals in mid-life. This finds support in the observations of Gbigbi (2021), who noted that farmers in their late 30s and early 40s are more inclined to participate in commercial poultry farming. Similarly, Gbigbi et al. (2024) study on assessing barriers and sources of adaptation finance in the context of climate change revealed mean age of farmers to be 43 years. According to Okafor et al. (2021), this age group is generally regarded as economically active, capable of adopting contemporary farming practices, and more inclined to seek financing options to expand their enterprises compared to younger or older farmers. Udoh et al. (2024) reported an average age of 44 years among poultry farmers, indicating that most are in their active and productive years, which aligns with the findings of Gbigbi (2021) and Okafor et al. (2021). Akinbili et al. (2021) found that the average age of poultry farmers was approximately 43.30 years, reinforcing the notion that these farmers are generally in their economically active phase. A study by Okwuokenye et al. (2024) indicates that the majority of poultry farmers are younger, specifically within the 31-40 years age bracket, challenging the assertion that mid-life individuals dominate this sector. Another study by Ukwu et al. (2024) found a significant number of poultry farmers were under 40 years, suggesting a trend towards younger individuals entering the poultry farming sector.

Educational Attainment

The result reveals that 65% of poultry farmers have completed secondary education, which aligns with the findings of Oyelami et al. (2022), who indicated that a majority of poultry farmers in Nigeria have at least completed their secondary education. Education considerably contributes to the adoption of innovative methods and technologies in

poultry farming. Per Chiekezie et al. (2023), farmers with formal education are better positioned to access training and extension services, thereby enhancing productivity and profitability. The high prevalence of secondary education among poultry farmers also implies a reasonable level of literacy, which assists efficient record-keeping, financial management, and decision-making in agricultural practices, as noted by Olutumise et al. (2023). A study by Ninh (2021) indicates that 51.3% of poultry workers have completed secondary education, reinforcing the notion that secondary education is prevalent among poultry farmers in Nigeria. The study emphasizes that education enhances agricultural production by enabling better management of farming techniques. According to a recent study by Issa et al. (2021), a significant portion of poultry farmers possesses secondary education, which is crucial for effective record-keeping and decision-making in agricultural practices. A study conducted by Ezekiel & Adebayo (2024) found that while many farmers had completed secondary education, a notable percentage lacked formal education altogether, suggesting that educational attainment may be lower than previously reported. Additionally, research by Abanigbe et al. (2024) and Njoku et al. (2024) suggests that despite a high prevalence of secondary education among poultry farmers, there remains a gap in access to advanced agricultural training, which may limit their ability to adopt innovative practices effectively.

Experience in Poultry Farming

The majority of farmers (70%) possess over five years of experience, suggesting that an important proportion of the respondents are well-versed in poultry farming. This level of experience aids in improved risk management and operational efficiency, as supported by Ologbon et al. (2021), who found that farmers with greater experience are generally more skilled at addressing challenges such as disease outbreaks and fluctuating feed prices. Longo (2024) asserts that experience is a critical factor in the profitability of poultry farming, as it enables farmers to make well-knowledgeable decisions regarding their farm operations. A study by Owolade and Akinwale (2019) found that the average experience among poultry farmers was approximately 8.01 years, indicating a strong familiarity with poultry farming practices, which supports the notion that experienced farmers can manage challenges effectively. According to Udoh et al. (2024), the average experience in poultry farming was reported as 9 years, reinforcing the idea that a substantial number of farmers are equipped to handle operational challenges due to their extensive experience. In same vein, a study by Gbigbi & Isiorhovoja (2022) indicated that 47.0% of the respondents had between 15 and 19 years of experience, suggesting that while many farmers have considerable experience, a significant proportion may be newer entrants into the industry. Additionally, Maikasuwa et al. (2021) reported an average experience level of only 4 years among some poultry farmers in their study, indicating a trend towards newer farmers entering the sector.

Farm Size

The result indicates that 60% of poultry farmers manage farms with fewer than 500 birds. This finding is aligned with Anyaegbu et al. (2020), who observed that the majority of poultry farmers in Nigeria manage small-scale operations due to restricted access to financial resources and land. The limited farm size reflects the limitations in expanding operations, which is frequently hindered by inadequate access to credit, as detailed by Balana & Oyeyemi (2022). Besides, Adebayo et al. (2022) reported that 68% of poultry farmers in southwestern Nigeria operate small-scale farms with fewer than 500 birds. The study emphasized that limited access to credit and high input costs are key factors restricting expansion. Ojo et al. (2023) found that small-scale poultry farming remains dominant in rural areas, with about 72% of farmers managing flocks under 500 birds due to limited land ownership and financial resources. Eze et al. (2021) observed that approximately 60% of poultry farmers in southeastern Nigeria operate on a small scale, citing high feed costs and inadequate infrastructure as primary barriers to scaling up. Nwosu et al. (2023) found that an increasing number of farmers are transitioning to medium- or large-scale operations due to improved access to agricultural loans and cooperative support programs. Ibrahim et al. (2022) reported that while small-scale farms are still common, about 40% of poultry farmers surveyed had expanded their operations to manage flocks exceeding 500 birds due to government intervention programs. In recent years, Akpan et al. (2024) highlighted a growing trend toward larger commercial poultry farms as farmers gain better access to credit facilities and modern farming technologies. Otiwa et al. (2024) have highlighted the significant role of poultry farming in Nigeria, supporting millions of households and contributing substantially to the country's agricultural GDP. However, the sector faces challenges such as rising feed costs and regulatory issues, which must be addressed to ensure sustainability. Despite these challenges, there are opportunities for young entrepreneurs to establish medium-scale farms, potentially with flocks between 500 and 1,000 birds, as part of innovative business models in poultry farming.

Table 1. Socioeconomic Characteristics of Poultry Farmers

Characteristic	Frequency	Percentage (%)
Gender (Male)	261	58
Gender (Female)	189	42
Average Age (Years)	41.2	
Educational Level (Secondary)	292	65
Experience (>5 years)	315	70
Farm Size (Below 500 birds)	270	60

Production Systems and Input Costs for Exotic and Noiler Chicken Farming

The results from the production systems indicate a notable difference in the allocation of extensive, semi-intensive, and intensive farming methods between farmers raising Exotic and Noiler chickens.

Extensive System

The extensive system is more prevalent among Noiler farmers (50%) when compared to Exotic chicken farmers (15%). The p-value (0.001) signifies that this difference is statistically major at the 1% level. This indicates that Noiler farmers tend to use free-range systems, which require fewer resources, while Exotic farmers generally avoid this system due to the increased management and feeding requirements of Exotic breeds. This finding is supported by Nwaubani et al. (2023), who also reported that smallholder farmers prefer the extensive system for breeds such as Noiler chickens due to its lower input needs. Adebayo et al., (2022) also noted that traditional breeds are often raised in extensive systems because of their adaptability to local conditions.

Semi-intensive System

A major difference (p-value = 0.021) is observed between the groups using semi-intensive systems. While 30% of Exotic chicken farmers adopt this system, 40% of Noiler chicken farmers do so. This demonstrates that Noiler chickens, being more resilient, can be raised in less resource-intensive environments, bridging the gap between extensive and intensive systems. The statistical significance at the 5% level confirms that the difference in preference for semi-intensive systems is not attributable to random variation. This aligns with findings from Adeleye & Kovács (2022), who noted that semi-intensive systems are favored among smallholder farmers as they strike a balance between cost and productivity.

Intensive System

Regarding Exotic chickens, 55% of farmers engage in intensive farming, compared to merely 10% for Noiler chickens. The p-value (0.000) indicates a highly major difference at the 1% level. Exotic chickens, which are primarily raised for commercial purposes, necessitate controlled environments, higher-quality feed, and more diligent monitoring, which requires more intensive production systems. Pius et al. (2021) identified similar trends, observing that Exotic chickens are predominantly raised in intensive systems due to their heightened need for specialized care and feeding regimens. Bekele & Aleme (2023) and Bello et al. (2021) further emphasized that intensive systems are favored for Exotic breeds to optimize their genetic potential for growth and egg production.

Input Costs

The p-values related to input costs indicate notable variations in the expenses linked to Exotic and Noiler chickens, reaffirming the financial discrepancies between these two poultry farming methods.

Chick Purchase Cost: The expense associated with acquiring chicks for Exotic chickens (₦800) is considerably greater than that for Noiler chickens (₦500), with a p-value of 0.015. This distinction is statistically important at the 5% level. The higher price for Exotic chicks signifies their specialized breeding and increased market demand, as noted by Ifanegan et al. (2024). This implies that Exotic chickens, due to their breeding quality, incur a greater acquisition cost, which impacts farmers' production choices. Maruf et al.(2025) likewise found that the enhanced initial expenditure for Exotic chicks is a key factor influencing farmers' production strategies.

Feed Cost: Feed expenditures are substantially higher for Exotic chickens (₦4,500/month) compared to Noiler chickens (₦2,800/month), with a p-value of 0.032. This is statistically important at the 5% level, confirming that Exotic chickens have more complex feed requirements. The variation can be ascribed to the quicker growth and superior feed conversion efficiency of Exotic chickens. Gbigbi & Isiorhovoja (2022) revealed that the enhanced cost of feed for Exotic chickens greatly impacts the overall production costs, categorizing feed as one of the greatest expense areas in commercial poultry farming. Castro et al. (2023) further remarked that the higher feed expenses for Exotic breeds are balanced by their enhanced feed conversion ratios.

Vaccination & Medication Costs: The expenses for vaccination and medication are also considerably different, with Exotic chickens costing ₦600 per bird compared to ₦300 for Noiler chickens (p-value = 0.045). This discrepancy is statistically important at the 5% level, indicating that Exotic chickens, being more vulnerable to diseases in intensive farming scenarios, necessitate more frequent and costly treatments. Rajkumar et al. (2021) observed similar patterns,

suggesting that high-input poultry systems involving Exotic breeds typically encounter enhanced health management costs. Raza et al. (2023) also emphasized the heightened disease susceptibility of Exotic breeds in intensive farming conditions, resulting in increased healthcare expenditures.

Labour Costs: The labour expenses per bird amount to ₦1,200 for Exotic chickens and ₦700 for Noiler chickens, with a p-value of 0.010, indicating statistical significance at the 1% level. This demonstrates that the higher labour costs are not incidental but are closely associated with the more intensive care required for Exotic breeds. Exotic chickens necessitate more specialized labour for feeding, monitoring, and health management, in line with findings from Oyeniyi, et al. (2024), who noted enhanced labour costs in intensive poultry systems. Sennuga et al. (2022) emphasized that the specialized labour needed for Exotic breeds substantially contributes to overall production expenses.

Miscellaneous Costs (Housing, Utilities, etc.): The miscellaneous costs are also markedly different, with ₦1,842.60 for Exotic chickens and ₦936.84 for Noiler chickens (p-value = 0.005), which is statistically important at the 1% level. This difference reflects the increased infrastructure and utility requirements for sustaining large-scale, intensive farming operations necessary for Exotic chickens. Wambua (2023) similarly observed that commercial poultry farmers investing in Exotic breeds generally face enhanced overhead expenses due to the necessity for specialized housing and utilities.

Total Production Costs: The overall production costs for Exotic chickens are priced at ₦8,942.60 per bird, while for Noiler chickens, these costs amount to ₦5,236.84 per bird. These figures are considerably different, as evidenced by a p-value of 0.005. This difference is statistically major at the 1% level, indicating that the cost structure for Exotic chickens is considerably higher than that for Noiler chickens. These results are consistent with earlier research, such as the study conducted by Mutombo (2022), which demonstrated that although Exotic chickens entail higher production costs, they provide enhanced commercial returns in carefully controlled farming environments. Ojo et al. (2021) further emphasized that the increased total production costs for Exotic breeds are warranted by their superior market value and production efficiency in commercial contexts.

Table 2. Production Systems and Input Costs for Exotic and Noiler Chicken Farming

Variable	Exotic Chickens	Noiler Chickens	p-value
Number of Farmers	300	150	
Production System (%)			
Extensive (Free-range)	15%	50%	0.001**
Semi-intensive	30%	40%	0.021*
Intensive (Commercial farming)	55%	10%	0.000**
Input Costs (₦/bird)			
Chick Purchase Cost	₦800	₦500	0.015*
Feed Cost (Monthly)	₦4,500	₦2,800	0.032*
Vaccination & Medication Cost	₦600	₦300	0.045*
Labour Cost (Monthly)	₦1,200	₦700	0.010**
Miscellaneous (Housing, Utilities, etc.)	₦1,842.60	₦936.84	0.005**
Total Production Cost (₦/bird)	₦8,942.60	₦5,236.84	0.005**

Profitability of Exotic and Noiler Chicken Production

The outcome provides a comprehensive cost and profitability analysis for Exotic and Noiler chicken farming, based on the production of 500 Exotic birds and 380 Noiler birds. Key profitability indicators, including total revenue, total cost, gross profit, net profit, and the benefit-cost ratio (BCR), offer major insights into the economic viability of both systems.

Total Revenue and Production Scale: The total revenue generated from Exotic chickens (₦5,880,000) is substantially higher than that of Noiler chickens (₦2,982,000), which reflects the greater market demand and higher selling price per Exotic bird (₦11,760), in contrast to Noiler chickens (₦7,855.26). This observation is consistent with the research of Mosobalaje (2021), who indicated that Exotic chickens tend to produce higher revenue due to their swift growth rate and enhanced market value when compared to local breeds such as Noilers. This disparity in revenue illustrates the economic benefits of Exotic chicken farming in markets that prioritize faster-growing birds with superior meat yields.

Variable Cost Components

Feed Cost: Feed cost constitutes the largest portion of variable costs for both systems, accounting for ₦3,450,000 (78%) in Exotic chicken farming and ₦1,560,000 (80%) in Noiler farming. The increased feed costs associated with Exotic chickens can be attributed to their higher feed consumption. This aligns with findings by Adeyonu & Odozi

(2022), who noted that Exotic breeds typically require more specialized feed to achieve optimal growth rates. Conversely, Noiler chickens tend to exhibit greater adaptability and require less feed, making them more cost-effective in terms of feed input, as mentioned by (Kpomasse et al., 2021).

Medication and Veterinary Services: In terms of medication and veterinary services, Exotic chickens incur greater expenses (₦480,000) compared to Noilers (₦180,000). This difference can be attributed to the intensive rearing practices associated with Exotic chickens, which heighten their susceptibility to various health challenges. A study by Sehabudin et al. (2022) indicates that Exotic breeds are more prone to health issues in confined settings, necessitating more frequent veterinary interventions, whereas Noilers show better resilience and lower health-related costs in less intensive environments. This observation agrees with Gonta et al. (2023), who emphasized the need for enhanced veterinary care in higher-risk farming environments.

Labour and Utility Costs: The costs associated with labor and utilities (including water and energy) are significantly higher for Exotic chickens, registering ₦415,500 compared to ₦204,000 for Noiler chickens. This discrepancy highlights the more resource-intensive management required for Exotic chicken farming. According to Odubote (2022), Exotic farms often require improved management practices, including regular feeding, monitoring, and environmental maintenance, which contribute to elevated labor and utility costs. Such resource demands have been observed across various studies, confirming that the economic burden of managing Exotic breeds is substantially higher than that associated with Noiler chickens (Obremski et al., 2023).

Fixed Cost Components

Fixed costs for Exotic chicken farming (₦126,000) are also higher than for Noiler chicken farming (₦46,200), driven primarily by the costs of housing and equipment. Housing for Exotic chickens is more expensive (₦75,000) due to the need for more sophisticated infrastructure to maintain controlled environments that ensure optimal growth. This is supported by Gbigbi (2021), who emphasized that the initial investment in housing and equipment for Exotic breeds is crucial to their productivity but contributes to the higher fixed costs in such operations.

Profitability Analysis

Gross Profit and Net Profit: The gross profit per Exotic bird (₦2,817.40) is slightly higher than for Noiler chickens (₦2,618.74), but the difference in net profit per bird is minimal, with ₦2,817.00 for Exotic chickens and ₦2,610.53 for Noilers. These figures suggest that both systems are profitable, though the Noiler chickens offer similar profitability with lower overall costs. This finding corresponds with the study by Gheyas et al. (2021), who found that Noiler chickens, though yielding lower revenue, provide comparable net income due to their lower input costs, making them an attractive option for small-scale farmers.

Table 3. Cost Components, Revenue, and Profitability for Exotic and Noiler Chicken Production

Cost Component/Revenue	Exotic Chicken (500 Birds)	Noiler Chicken (380 Birds)
Total Revenue	₦5,880,000	₦2,982,000
Variable Cost Components (TVC)		
- Feed Cost	₦3,450,000	₦1,560,000
- Medication/Veterinary Services	₦480,000	₦180,000
- Labour	₦225,500	₦114,000
- Water/Energy	₦190,000	₦90,000
Total Variable Cost (TVC)	₦4,345,500	₦1,944,000
Fixed Cost Components (FC)		
- Housing/Shelter	₦75,000	₦30,000
- Equipment	₦51,000	₦16,200
Total Fixed Cost (FC)	₦126,000	₦46,200
Total Cost (TVC + FC)	₦4,471,500	₦1,990,200
Profitability Indicators		
Gross Profit (Revenue - TVC)	₦1,534,500	₦1,038,000
Net Profit (Revenue - Total Cost)	₦1,408,500	₦991,800
Benefit-Cost Ratio (BCR)	1.31	1.50
Per Bird Profitability		
Average Revenue per Bird	₦11,760	₦7,855.26
Total Cost per Bird	₦8,942.60	₦5,236.84
Gross Margin per Bird	₦2,817.40	₦2,618.74
Net Farm Income per Bird	₦2,817.00	₦2,610.53
Operating Ratio (TVC / Revenue)	0.74	0.65

Benefit-Cost Ratio (BCR): The BCR for Noiler chickens (1.50) is higher than for Exotic chickens (1.31), indicating that Noiler chicken farming is more cost-efficient. This ratio signifies that for every ₦1 invested in Noiler chicken farming, farmers gain ₦1.50 in returns, compared to ₦1.31 for Exotic chicken farming. Gbigbi and Isiorhovoja (2022) found similar results, concluding that local breeds like Noilers often have a higher BCR due to their adaptability, lower production costs, and reduced susceptibility to diseases, making them more economically viable in resource-constrained environments.

Operating Ratio: The operating ratio, which compares total variable costs to revenue, is 0.74 for Exotic chickens and 0.65 for Noiler chickens. This indicates that 74% of the revenue from Exotic chickens goes toward covering variable costs, compared to 65% for Noilers. A lower operating ratio, as seen with Noilers, suggests greater operational efficiency and profitability, as also highlighted by Gbigbi (2017).

Determinants of Profitability

The regression analysis identified the determinants of profitability for poultry farmers (Table 4).

Farm Size (Number of Birds)

The coefficient for farm size (0.342) is positive and highly significant ($p < 0.001$), indicating that an increase in the number of birds significantly improves the profitability of poultry farming. Increasing farm size is a direct pathway to improving profitability. As farms grow, they can achieve cost savings through economies of scale, as also noted by Sani & Mohamed (2020), who emphasize the importance of expanding production capacity to remain competitive. This result suggests that larger-scale poultry operations benefit from economies of scale, where fixed costs such as labour and infrastructure are spread across a greater number of birds, thereby increasing profit margins. Agunbiade et al (2020) similarly found that larger poultry farms tend to be more profitable due to their ability to negotiate better prices for inputs and achieve higher production efficiency. The positive impact of farm size on profitability is consistent with broader agricultural research, which often shows that scaling up production leads to improved financial performance.

Feed Cost

Feed cost has a negative and significant impact on profitability, as shown by the coefficient of -0.276 ($p < 0.001$). The negative effect of feed costs underscores the need for cost-effective feed sourcing and usage strategies. Farmers who can secure cheaper feed inputs or use alternative feed sources may be able to mitigate this major cost factor and improve profitability. This result emphasizes the critical role that feed plays in determining the cost structure of poultry farming. Feed represents the largest portion of variable costs in poultry operations, and any increase in feed prices directly reduces profit margins. This is consistent with findings by Gbigbi & Isiorhovoja (2022); Folajinmi & Peter (2020), who reported that fluctuations in feed prices are a major challenge for poultry farmers, often leading to reduced profitability, particularly when feed prices rise faster than poultry product prices. Efficient feed management, therefore, remains crucial for optimizing profitability in the poultry sector.

Access to Credit

Access to credit is positively and significantly associated with profitability (coefficient = 0.145, $p = 0.003$). Access to both credit and veterinary services plays a crucial role in determining the profitability of poultry farms. This suggests that policies and programs that improve farmers' access to financial services and veterinary care can have a significant positive impact on farm incomes, as supported by Gbigbi (2017), who argue that access to institutional support services is critical for sustaining agricultural productivity. Farmers with access to credit have higher profitability, likely due to their ability to invest in productivity-enhancing inputs, such as quality feed, veterinary services, and improved housing. Gbigbi (2021) found similar results, concluding that credit access improves the financial liquidity of poultry farmers, enabling them to expand production and cover operating expenses more effectively. Credit also allows farmers to take advantage of timely market opportunities, such as purchasing feed in bulk when prices are low, which in turn increases profitability.

Veterinary Services

The coefficient for veterinary services is 0.201 and is highly significant ($p < 0.001$), indicating that access to veterinary services positively affects profitability. Veterinary care reduces mortality and morbidity rates in poultry, leading to healthier flocks and improved production efficiency. According to Ipara et al. (2021), poultry farmers who regularly utilize veterinary services experience fewer disease outbreaks and higher bird survival rates, which directly boosts their profitability. The significance of veterinary services also reflects the growing importance of biosecurity in modern poultry farming, as maintaining flock health is key to sustaining high levels of production.

Years of Experience

Years of experience also positively affect profitability, with a coefficient of 0.068, though its significance is marginal ($p = 0.074$). More experienced farmers are likely to be more knowledgeable about efficient management practices, market trends, and risk management strategies, all of which contribute to enhanced profitability.

Table 4. Determinants of Profitability

Variable	Coefficient	Standard Error	t-value	Significance
Farm Size (number of birds)	0.342	0.058	5.90	0.000 ***
Feed Cost (Naira)	-0.276	0.063	-4.38	0.001 ***
Access to Credit (yes=1)	0.145	0.048	3.02	0.003 **
Veterinary Services (yes=1)	0.201	0.052	3.87	0.000 ***
Years of Experience	0.068	0.037	1.82	0.074 *

Ibrahim et al. (2022) found that experienced farmers are better at optimizing resource use and minimizing losses, especially in volatile markets. While the effect of experience in this study is not as strong as other factors, it underscores the value of accumulated knowledge in improving farm performance over time.

Constraints Faced by Poultry Farmers

Table 5 highlights the major constraints faced by poultry farmers in the production of exotic and Noiler chickens.

High Feed Cost

High feed cost is the most significant constraint reported by both exotic (65%) and Noiler chicken (55%) farmers. Feed constitutes the largest portion of variable costs in poultry production, making fluctuations in feed prices a critical concern for farmers. The higher feed cost for exotic chicken farmers is likely due to the specific nutritional requirements of exotic breeds, which may require more expensive or specialized feeds compared to Noiler chickens. Alabi et al. (2019) reported similar findings, highlighting that high feed costs limit the profitability and scalability of poultry farms, particularly when prices for poultry products do not rise proportionally to input costs. Additionally, Wada & Gidado (2023) emphasized that volatile feed prices create uncertainty, discouraging investment in poultry farming and reducing farm sustainability. Reducing feed costs or finding affordable feed alternatives could greatly alleviate this constraint.

Disease Outbreaks

Disease outbreaks are the second major constraint, affecting 40% of exotic chicken farmers and 30% of Noiler chicken farmers. Exotic breeds tend to be more vulnerable to diseases due to their intensive rearing systems and high sensitivity to environmental conditions. This makes disease management a more pressing issue for exotic chicken farmers. Adeyonu et al.(2021) found that disease outbreaks, particularly viral and bacterial infections, are common in exotic poultry breeds, leading to significant production losses. In contrast, Noiler chickens, which are hardier and better adapted to local conditions, experience fewer disease outbreaks, reflecting their resilience and suitability for backyard and small-scale farming systems, as noted by Bamidele et al. (2019).

Limited Access to Credit

Limited access to credit is a significant barrier for both exotic (50%) and Noiler (45%) chicken farmers, limiting their ability to invest in necessary inputs and infrastructure. Access to credit plays a crucial role in enabling farmers to expand their operations and adopt improved management practices, as emphasized by Okunade & Salami (2020). Poultry farmers, particularly smallholders, often struggle to secure credit from formal institutions due to stringent collateral requirements and high interest rates. Gbigbi (2017) argued that lack of access to affordable credit hampers the ability of farmers to increase production capacity, improve feed quality, and address biosecurity concerns. Without sufficient credit, farmers are forced to rely on suboptimal practices, which affect the overall productivity of their operations.

Poor Market Access

Poor market access is reported by 35% of exotic chicken farmers and 40% of Noiler chicken farmers. Although Noiler chickens are often produced for local markets due to their dual-purpose nature (meat and eggs), farmers still face challenges in reaching broader or more lucrative markets. Aremu & Amos (2024) noted that poor infrastructure, such as inadequate road networks and lack of transportation services, severely limits market access for rural poultry farmers. This is particularly critical for exotic chicken farmers, who may need to sell their products in urban markets where demand for specialized poultry breeds is higher. Moreover, Yakubu et al. (2019) highlighted the role of market information in improving market access, stressing that access to reliable market data helps farmers align production with consumer demand and secure better prices.

Inadequate Veterinary Services

Inadequate access to veterinary services affects 45% of exotic chicken farmers and 35% of Noiler chicken farmers. Access to veterinary services is vital for preventing and managing disease outbreaks, which are particularly devastating in exotic poultry farming due to the breed's susceptibility to infections. Olutumise et al. (2023) found that inadequate veterinary services contribute to higher mortality rates and reduced productivity, particularly for farmers who lack the financial means to regularly access veterinary care.

Table 5. Major Constraints in Exotic and Noiler Chicken Production

Constraint	Exotic Chicken (%)	Noiler Chicken (%)
High feed cost	65	55
Disease outbreaks	40	30
Limited access to credit	50	45
Poor market access	35	40
Inadequate veterinary services	45	35

For Noiler farmers, the constraint is less pronounced due to the breed's hardiness, though the importance of veterinary services for maintaining overall flock health remains significant. Strengthening veterinary service delivery, particularly in rural areas, could significantly reduce disease-related losses and enhance the profitability of poultry farming.

Comparison between Exotic and Noiler Chicken Constraints

In comparing exotic and Noiler chicken production, it is evident that exotic chicken farmers face slightly more severe constraints across all categories, particularly with feed costs, disease outbreaks, and access to veterinary services. This reflects the intensive nature of exotic chicken farming, which requires greater input investments and management efforts. Conversely, Noiler chickens, which are more adaptable to local conditions, present fewer challenges in terms of disease susceptibility and input costs, making them more suitable for smallholder and low-resource farmers. However, both groups of farmers face significant challenges in accessing markets and credit, which are systemic issues in the broader poultry sector. This finding is in agreement with Sheheli et al. (2023) study on profitability and problems of farmers in duck farming that feeds and disease outbreak is a serious constraint.

Hypothesis test

H01: There is no significant difference in mean profit between exotic chicken and Noiler chicken production.

Mean profit between exotic chicken and Noiler chicken production

The profitability analysis between exotic and Noiler chicken production, as presented in Table 6, offers valuable insights into the financial dynamics of poultry farming. The mean profit for exotic chickens is ₦2,817.00, while Noiler chickens yield a slightly lower mean profit of ₦2,610.53. Despite this difference of ₦206.47, statistical testing indicates that the variation is not significant, suggesting that both production systems can be viewed as relatively comparable in terms of profitability. This finding resonates with previous research by Raufu & Akorede (2020), which found that profit margins among different poultry breeds are often marginal, emphasizing the complex nature of poultry profitability.

The increased standard deviation related to exotic chicken profits (₦1,000.00) is greater than that of Noiler chickens (₦600.00), indicating a higher level of variability in profit outcomes for exotic chicken farmers. This variability may arise from several factors, including fluctuations in market demand, volatility in feed prices, and the susceptibility of exotic breeds to diseases, as noted in studies by Yakubu et al. (2021). For instance, farmers may face substantial profits in favorable conditions but also significant losses during adverse market or production situations. In contrast, Noiler chickens, often preferred for their hardiness and lower input costs, present a more stable income option for smallholder farmers. This stability is further supported by Olaniyi (2021), who highlighted that consistent income streams are crucial for mitigating risks in poultry farming, particularly for resource-constrained farmers. The findings suggest that profitability alone should not dictate farmers' choices between exotic and Noiler production systems. Factors such as resource availability, production management, and market accessibility also play critical roles in decision-making. Omole (2021) emphasize the importance of contextualizing profitability within the broader operational framework, encouraging farmers to align their production strategies with their specific conditions and risk profiles. While exotic chickens may offer higher profit potential under optimal conditions, the associated risks and profit variability highlight the need for careful management and strategic planning.

Profit between exotic chicken and Noiler chicken production

The paired samples test results in Table 7 provide a comprehensive evaluation of profitability differences between exotic and Noiler chicken production, revealing a mean profit difference of ₦206.47 in favor of exotic chickens. This difference is noteworthy, particularly given the high standard deviation of ₦800.00, which indicates considerable variability in profit outcomes among farmers engaged in exotic production. The test's t-value of 5.48 and the highly significant p-value of 0.000 suggest that the difference in profitability is statistically robust. However, it's essential to interpret this significance within the broader context of poultry farming dynamics. The significant mean profit difference for exotic chickens aligns with findings from Ojo et al. (2021), who noted that exotic breeds often yield higher returns due to their rapid growth rates and premium market prices.

Table 6. Paired Samples Statistics for Exotic profit and Noiler Profit

Profit Type	Mean (₦)	Std. Deviation (₦)	Std. Error Mean (₦)
Exotic Chicken Profit	2,817.00	1,000.00	46.79
Noiler Chicken Profit	2,610.53	600.00	28.43

Table 7. Paired Samples Test for Exotic profit and Noiler Profit

Paired Differences	Mean (₦)	Std. Deviation (₦)	Std. Error Mean (₦)	t	df	Sig. (2-tailed)
Exotic Profit - Noiler Profit	206.47	800.00	37.68	5.48	449	0.000

Nevertheless, the increased profits are accompanied by certain cost; exotic chickens necessitate stricter management and are more prone to illnesses, as reported by Gbigbi and Isiorhovoja (2022). The considerable variability in profits, as demonstrated by the enhanced standard deviation, emphasizes the financial hazards linked to exotic production, which can vary greatly depending on elements such as feed expenses, veterinary costs, and market demand. On the other hand, Noiler chicken production offers a different financial profile. Although the mean profit for Noiler chickens is lower, their inherent resilience and lower input requirements make them an attractive option for many smallholder farmers. Studies such as those by Yakubu et al. (2021) emphasize that Noiler chickens, being hardier and easier to manage, tend to provide more stable income streams, reducing the economic risks often associated with poultry farming. This reliability is crucial for resource-constrained farmers who may prioritize consistent income over higher, yet riskier, profits.

The confidence interval for the mean profit difference, which ranges from ₦132.60 to ₦280.34, further elucidates the potential advantages of exotic production while also emphasizing the uncertainty that farmers face. While the average profit from exotic chickens appears higher, the overlapping confidence intervals suggest that many farmers may find Noiler production equally viable based on their specific circumstances and market conditions. This reinforces the notion that profitability must be viewed through the lens of each farmer's unique context, risk appetite, and resource availability.

4. Conclusion and Recommendations

This research provides a thorough comparison of the production systems for Exotic and Noiler chickens in the Niger Delta, concentrating on profitability, cost structures, and efficiency. Although Exotic chickens generate a greater total revenue, Noiler chickens exhibit greater cost-efficiency, as evidenced by a higher Benefit-Cost Ratio (1.50 for Noiler chickens in comparison to 1.31 for Exotic chickens). This emphasizes the suitability of Noiler chickens for small-scale poultry farming, particularly because of their reduced production costs. Key factors influencing profitability include farm size, feed expenses, availability of credit, veterinary services, and farming experience. The results indicate that Noiler chicken farming presents a more sustainable and economically viable option for smallholders. Nevertheless, both systems encounter important challenges, such as enhanced feed costs, disease outbreaks, and restricted access to credit and markets, which hinder profitability. Addressing these challenges is critical for improving the long-term sustainability of poultry farming in the Niger Delta and similar areas. Enhancing access to affordable credit, improving veterinary services, and broadening market opportunities will be essential for maximizing the potential of both Exotic and Noiler chicken farming systems, providing valuable insights for poultry industries globally.

Impact of Climate Change on Poultry Production: Future studies could explore how climate change, especially extreme weather patterns such as flooding and heatwaves, affects the productivity of both Exotic and Noiler chicken breeds in the Niger Delta. Assessing the adaptation strategies that small-scale farmers employ in response to changing climatic conditions could provide valuable insights for enhancing poultry resilience.

Access to Credit and Financial Inclusion: Further research could investigate the specific barriers small-scale poultry farmers face when accessing credit and other financial services. A deeper dive into the role of microfinance institutions, cooperatives, and government-sponsored loan programs could help develop strategies to improve financial inclusion for poultry farmers.

Gender and Poultry Farming: Given that a majority of poultry farmers in the study were male, future research could investigate the gender dynamics in poultry farming in the Niger Delta. Understanding the specific challenges and opportunities for female poultry farmers could inform policies aimed at fostering gender inclusivity in agricultural development.

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