MALAYSIAN JOURNAL OF AGRICULTURAL ECONOMICS

Original Research Article

Towards Sustainable Quail Egg Production in Nigeria: Producers' Profitability and Policy Interventions

Ayodeji Babatunde Ogundeji[1]*

[1]Department of Agricultural Economics, Faculty of Agriculture, University of Ibadan, Nigeria.

*Corresponding authors: ayodejibukunmi@gmail.com

Abstract: Quail egg production has emerged as a viable livelihood strategy in Nigeria, offering nutritional benefits and economic opportunities for smallholder farmers. However, systemic challenges threaten its sustainability and scalability. This study assesses quail egg production, focusing on profitability, institutional constraints, and policy gaps. Using a mixed-methods approach, data were collected through structured surveys of 150 quail farmers, key-informant interviews with 15 policymakers and stakeholders, and desk reviews of Nigerian agricultural policies. Descriptive statistics, thematic analysis, profitability metrics, and Policy Analysis Matrix (PAM) were employed to analyse data collected. Key findings reveal significant profitability disparities across production scales, with small-scale farmers achieving a benefit-cost ratio of 1.09 compared to 1.24 for large-scale producers. Critical challenges include exclusion from national agricultural policies, limited access to formal credit, and inadequate extension services. The PAM results underscore Nigeria's quail sector as socially profitable but privately stifled by policy distortions. Reforms to realign input and output prices with global standards could unlock ₦55.38 per unit of divergence, enhancing rural livelihoods, food security, and equitable economic growth. Qualitative insights underscore frustrations among farmers, who face exploitative middlemen, gender disparities in loan access, and rising feed costs. The study concludes that quail farming remains marginalized due to political-economic biases favouring larger livestock sectors. To unlock its potential, policymakers must integrate quail production into national agendas, prioritize gender-responsive credit programs, and revitalize extension services through mobile-based platforms. By addressing institutional neglect, Nigeria can replicate global successes, transforming quail farming into a pillar of sustainable agricultural development.

Keywords: Quail egg production; policy gaps; institutional support; smallholder farmers; Nigeria; agricultural sustainability.

Citation: Ogundeji, A. B. (2025). Towards Sustainable Quail Egg Production in Nigeria: Producers' Profitability and Policy Interventions. Malays J Agric Econ 2025; 32(1): a0000603. https://doi.org/10.36877/mjae.a0000603

Received: 6th February 2025

Received in Revised Form: 6th June 2025

Available Online: 15th July 2025

Published: 3rd September 2025

1. Introduction

Quail farming has emerged as a transformative sub-sector within Nigeria's poultry industry over the past decade. Originating as a niche enterprise, quail production has gained momentum due to the bird's rapid growth cycle, high egg yield, and adaptability to small-scale farming systems (Musa *et al.*, 2020). Quail eggs, celebrated for their nutritional superiority—rich in protein, vitamins, and antioxidants—have become a sought-after commodity in urban markets, selling for up to five times the price of chicken eggs in regions like Akure South, Ondo State (Adeyemo *et al.*, 2019). This surge in demand is driven by increasing health consciousness among Nigerian consumers and cultural beliefs attributing medicinal properties to quail eggs, such as alleviating hypertension and improving immune function (Ogunwole *et al.*, 2021). The economic potential of quail farming is significant. A single quail hen can lay 250–300 eggs annually, requiring minimal space and feed compared to chickens, making it an ideal venture for resource-constrained smallholders (Ogunlade *et al.*, 2021). The sector also offers employment opportunities for youth and women, who constitute over 60% of small-scale quail farmers in Southwest Nigeria (Ojo & Adebayo, 2022). Furthermore, quail farming aligns with Nigeria's Agricultural Promotion Policy (APP) 2016–2020, which emphasizes diversification of livestock production to enhance food security and rural livelihoods (Federal Ministry of Agriculture and Rural Development, 2016). However, the industry faces systemic challenges that threaten its sustainability. High mortality rates (30–40%) due to poor disease management, exorbitant feed costs (accounting for 60% of production expenses), and inadequate access to veterinary services have stifled productivity (Okunade *et al.*, 2022). Additionally, quail farming remains conspicuously absent from Nigeria's mainstream agricultural policies. For instance, the National Livestock Transformation Plan (NLTP), launched in 2019 to modernize livestock production, excludes quails from its scope, focusing instead on cattle, poultry, and swine (Nigerian Agricultural Policy Document, 2016). This policy neglect has left quail farmers reliant on informal networks for training and financing, perpetuating cycles of low productivity and market fragmentation (Lawal *et al.*, 2021).

Despite its profitability and potential to alleviate poverty, quail egg production in Nigeria operates in a policy vacuum. Emerging producers in Akure South and similar regions grapple with institutional neglect, including limited access to credit, outdated extension services, and a lack of quail-specific regulatory frameworks. For example, only 12% of quail farmers in Ondo State have received government-backed training, compared to 45% of poultry farmers (National Bureau of Statistics, 2022). Meanwhile, feed costs—a critical production input—

have risen by 30% since 2020 due to inflation and supply chain disruptions, yet no subsidy programs target quail producers (Central Bank of Nigeria, 2023). Without institutional support, smallholders struggle to adopt modern technologies, such as automated incubators or biosecurity measures, which could reduce mortality rates by 50% (Adeyinka *et al.*, 2020). Furthermore, the absence of standardized quality controls has led to market distrust, with middlemen exploiting price disparities between rural producers and urban consumers (Oluwatayo & Oluwatayo, 2020). These challenges are compounded by climate vulnerabilities, as irregular rainfall patterns in Southwest Nigeria disrupt feed crop production, exacerbating cost volatility (Ajayi & Ajala, 2021). This study pursues three primary objectives, namely: (a) To assess quail egg producers' profitability, (b) To evaluate the existing agricultural policy interventions in quail egg production, and (c) To examine institutional constraints in credit access, extension services, and infrastructure that hinder the growth of quail farming. The significance of this research is multifaceted. First, it addresses a critical knowledge gap by providing empirical data on the policy and institutional barriers faced by quail farmers, a sub-sector often overlooked in academic and policy discourses. Second, the study aligns with the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty) and SDG 2 (Zero Hunger), by advocating for inclusive policies that empower smallholders (UNDP, 2023). Third, the study contributes to Nigeria's National Agricultural Technology Adoption Plan (NATAP) 2022–2027, which prioritizes the adoption of climate-smart livestock practices (Federal Ministry of Agriculture and Rural Development, 2022).

2. Literature Review

The analysis of quail egg production in Nigeria is anchored in two complementary theoretical frameworks: institutional theory and the sustainable livelihoods framework (SLF). These lenses provide a robust foundation for understanding how policies, institutions, and socio-economic dynamics shape agricultural practices.

2.1 Institutional Theory

Institutional theory provides a critical lens for understanding how formal and informal rules, norms, and structures shape economic and social behaviour (North, 1991). In agricultural systems, institutions—ranging from government policies to local cooperatives—determine resource allocation, market access, and production efficiency (Ostrom, 2009). However, in Nigeria, institutional neglect of quail farming has created systemic barriers that constrain livelihoods and sectoral growth.

The exclusion of quail farming from Nigeria's National Livestock Transformation Plan (NLTP) exemplifies institutional marginalization. While poultry and cattle farmers benefit from subsidized vaccines, insurance schemes, and credit facilities, quail producers lack comparable support, forcing them into informality (Lawal *et al.*, 2021). For instance, quail farmers in Akure South face mortality rates of 30–40% due to limited access to veterinary services, compared to 10–15% for Thai farmers who receive state-subsidized animal healthcare (Srisuvan *et al.*, 2019). This policy gap directly reduces incomes, as preventable diseases diminish egg yields by up to 25% (Adeyinka *et al.*, 2020).

Contrasting Nigeria's approach with successful models reveals stark disparities. In Brazil, quail farming is integrated into the National Poultry Plan, which offers tax incentives for feed imports and grants for hatchery modernization (Da Silva *et al.*, 2020). Similarly, India's National Mission on Agricultural Extension provides quail farmers with mobile-based advisory services, reducing production costs by 20% (Kumar *et al.*, 2022). Nigeria's NLTP, however, lacks quail-specific provisions, leaving farmers to rely on fragmented informal institutions such as trader credit systems, which charge exorbitant interest rates (25–30%) and perpetuate debt cycles (Olagunju *et al.*, 2021).

In the absence of formal support, quail farmers depend on kinship networks and local cooperatives for resource sharing. For example, 68% of farmers in Ondo State collectively purchase feed to reduce costs (Ojo & Adebayo, 2022). While these networks enhance short-term resilience, they lack scalability. Informal mechanisms cannot replicate the benefits of formal policies—such as large-scale feed subsidies or export market linkages—limiting farmers' ability to transition from subsistence to commercial production (Musa *et al.*, 2020).

To address these gaps, Nigeria must:

1. Integrate quail farming into the NLTP, ensuring access to subsidies and insurance.
2. Strengthen extension services with quail-specific training on disease management.
3. Formalize credit channels through partnerships with microfinance institutions.

2.2 Sustainable Livelihoods Framework (SLF)

The Sustainable Livelihoods Framework (SLF) provides a comprehensive structure for analyzing how individuals utilize available assets to build resilient livelihoods amidst institutional and environmental challenges (Scoones, 1998). This framework is applied here to analyze quail farmers' adaptive strategies, livelihood assets, and institutional barriers in Nigeria. The SLF comprises five key capital assets, livelihood strategies, transforming

structures, and outcomes (DFID, 1999). Each component is examined below in the context of quail farming:

1. Natural Capital: This comprises of productive land, water, and biodiversity (Scoones, 2009). Quail farming's low land requirements make it viable for smallholders (Adeyemo *et al.*, 2019). However, climate-induced feed shortages (e.g., rising maize prices) degrade this asset (Ajayi & Ajala, 2021).

2. Financial Capital: This comprises savings, credit access, and income streams (Ellis, 2000). Only 12% of farmers have access formal credit; most rely on predatory lenders (CBN, 2023). Policies like Nigeria's Anchor Borrowers' Program exclude quail producers, thereby limiting investment (Emokaro & Ekunwe, 2020).

3. Social Capital: This comprises of networks, cooperatives, and trust relations (Woolcock, 2001). Cooperatives enable purchasing feed in bulk, but weak ties to processors hinder access to export markets (Oluwatayo & Oluwatayo, 2020).

4. Human Capital: This comprise of skills, health, and labor (Ajayis, 2009). Farmer training is sporadic, as only 8% of farmers receive government extension support on disease management (NBS, 2022). The high mortality rates (30–40%) reflect knowledge gaps (Adeyinka *et al.*, 2020).

5. Physical Capital: This comprises infrastructure and production tools (DFID, 1999). Poor road infrastructure increases post-harvest losses (Ogunlade *et al.*, 2021).

Institutional policies directly shape asset availability. For example:

- Land Tenure Systems: Women, who dominate quail farming, often lack land titles, restricting expansion (Ojo & Adebayo, 2022).
- Credit Policies: The absence of quail-specific loan products forces reliance on informal credit as the microfinance institutions classify quail farming as "high-risk", hence, denying loan applications (Lawal *et al.*, 2021).
- Extension Services: The 1:1,000 extension officer-to-farmer ratio undermines technology adoption (NBS, 2022).

Farmers adopt coping strategies, such as diversification [as about 45% of farmers combine quail farming with crop production to mitigate risks (Ogunlade *et al.*, 2021)] and collective action [where cooperatives negotiate better feed prices which boost profits but lack scale (Olagunju *et al.*, 2021)]. Despite these efforts, institutional gaps limit outcomes. Only

30% of farmers achieve food security, 70% report income instability, and just 15% accumulate savings for asset growth (UNDP, 2023). The SLF aligns with SDG goals, advocating for policies that bolster smallholders' capacity to withstand economic and environmental shocks (UNDP, 2023).

2.3 Global Perspectives on Quail Production

Globally, quail farming thrives in countries with robust policy backing, advanced research, and market-driven strategies. Contrasting these successes with Nigeria's struggles reveals critical lessons for sustainable scaling. Thailand exemplifies quail production success, contributing 20% of global quail egg exports (FAO, 2021). Government-led initiatives, such as the Thai Quail Development Program, provide subsidies for feed, vaccines, and automated equipment, reducing mortality rates to 10% (Srisuvan *et al.*, 2019). Similarly, Brazil's quail sector grew by 15% annually after integrating quail farming into its National Poultry Plan, which offers tax incentives and export licenses (Da Silva *et al.*, 2020). These countries prioritize research and development (R&D); for example, Japan's Quail Research Institute pioneered breed optimization, increasing egg yield by 40% (Yamamoto, 2018).

In contrast, Nigeria's quail sector lacks comparable institutional support. While Thai farmers receive state-funded training on biosecurity and hatchery management, only 8% of Nigerian quail farmers access government extension services (National Bureau of Statistics, 2022). Feed costs, exacerbated by Nigeria's reliance on imported maize and soybeans, consume 60% of production expenses, compared to 35% in Brazil (Okunade *et al.*, 2022). Additionally, Nigeria's absence of quail-specific quality standards discourages investment, unlike Thailand's stringent export regulations that ensure market competitiveness (Oluwatayo & Oluwatayo, 2020). Nigeria's agricultural policies have long prioritized staple crops and large livestock, neglecting niche sectors like quail farming. The National Livestock Transformation Plan (NLTP), launched in 2019, aims to modernize livestock production but omits quail farming entirely, focusing on cattle, poultry, and swine (FMARD, 2019). This exclusion denies quail farmers access to the plan's NGN 100 billion ($240 million) fund for infrastructure and disease control (Lawal *et al.*, 2021). Consequently, quail producers lack insurance schemes and subsidized veterinary services available to poultry farmers, perpetuating high mortality rates (Adeyinka *et al.*, 2020). The NLTP's oversight reflects a broader policy bias toward traditional livestock, undermining diversification goals outlined in Nigeria's Agricultural Promotion Policy (APP) (FMARD, 2016).

Extension services in Nigeria are chronically underfunded, with a ratio of 1 extension officer per 1,000 farmers—far below the FAO's recommended 1:500 (National Bureau of Statistics, 2022). In Ondo State, only 12% of quail farmers received government training in 2022, compared to 45% of poultry farmers (NBS, 2022). This gap limits knowledge transfer on modern practices, such as using probiotics to reduce feed costs or constructing low-cost cages (Ogunwole *et al.*, 2021). Furthermore, extension programs often overlook gender-specific needs, despite women's dominance in quail farming (Ojo & Adebayo, 2022). Revitalizing extension services through digital platforms and community-based trainers could bridge these gaps, as demonstrated by Kenya's mobile-based advisory systems (Kiprop *et al.*, 2021).

Institutional support for quail farmers in Nigeria remains fragmented, with microfinance institutions and NGOs playing limited roles. Access to credit is a major hurdle, while the Central Bank's Anchor Borrowers' Program (ABP) disbursed NGN 200 billion ($480 million) to farmers in 2022, less than 2% targeted poultry or quail producers (Emokaro & Ekunwe, 2020). NGOs have minimal involvement in Nigeria's quail value chain. While organizations like CARE International support cassava and maize farmers, quail-specific initiatives are rare. Exceptions include the Southwest Poultry Initiative, which trained 200 quail farmers on record-keeping in 2021, yet such efforts lack scalability (Lawal *et al.*, 2021).

3. Methodology

3.1 Study Area

The study was conducted in Akure South Local Government Area (LGA), one of the 18 LGAs in Ondo State, Southwest Nigeria. Akure South is the administrative capital of Ondo State and spans approximately 331 km², with a population of 353,211 (National Population Commission, 2019). The area lies within the tropical rainforest zone, characterized by bimodal rainfall (1,500–2,000 mm annually) and average temperatures of 27°C, creating favourable conditions for poultry farming (Adeyemo *et al.*, 2019). Akure South was selected due to its high concentration of quail farmers, who contribute significantly to the state's agricultural GDP (National Bureau of Statistics, 2022). The LGA's proximity to urban markets enhances commercial opportunities for quail egg production and sales.

3.2 Sampling and Data Collection

A mixed-methods approach was employed to ensure comprehensive data collection, combining quantitative surveys with qualitative interviews; where quantitative data were

utilized for objective 1 and 2, while qualitative data were adopted for objective 3. The target population included all registered quail farmers in Akure South. A stratified random sampling technique, adapted from Ogunlade *et al.*, (2021), was used to categorize farmers into three strata based on scale: Small-scale (1–500 birds), Medium-scale (501–1,500 birds), and Large-scale (>1,500 birds). The stratification ensured proportional representation across scales. From a sampling frame of 320 registered farmers, 150 respondents (50 per stratum) were selected using a random number generator. This sample size was determined using Cochran's formula for finite populations at a 95% confidence level and 5% margin of error (Cochran, 1977):

$$n = \frac{N}{1 + N(e^2)} \quad (1)$$

Where $N = 320$ and $e = 0.05$.

The employed data collection instruments include structured questionnaires, which were administered face-to-face to farmers, semi-structured interviews conducted with 15 policymakers and stakeholders, including: 8 officials from the Ondo State Ministry of Agriculture, 5 representatives from the Nigerian Association of Chambers of Commerce, Industry, Mines, and Agriculture (NACCIMA), and 2 credit officers. Interview guides focused on policy implementation gaps, institutional support mechanisms, and recommendations for sectoral growth. The social prices for inputs and output were converted to Nigerian local currency (NGN) at the exchange rate of ₦460.00 to one US dollar (world reference currency) which was the prevailing exchange rate at the time of the survey.

3.3 Analytical Tools

Quantitative data were analysed using Stata v.17. Following Olagunju *et al.*, (2021), profitability metrics such as, contribution margin (CM = Total Revenue - Variable Costs), net income (NI = Total Revenue – Total Costs), and benefit-cost ratio (BCR = Total Revenue/Total Cost) were used to assess quail egg producers' profitability.

3.3.1 Thematic coding

The examination of institutional constraints in credit access, extension services, and infrastructure hindering quail farming's growth was operationalized through thematic coding. Response from qualitative interviews were transcribed and analysed via NVivo 12 using a hybrid inductive-deductive approach (Braun & Clarke, 2006):

1. Initial coding: Open coding to identify emerging themes (e.g., "policy neglect").
2. Axial coding: Linking themes to theoretical frameworks (e.g., “institutional theory”).
3. Selective coding: Refining themes into final categories (e.g., "credit access barriers").

3.3.2 Policy Analysis Matrix (PAM)

The PAM evaluated the effectiveness of existing agricultural policy interventions by comparing private profitability and social profitability. The PAM is a Matrix of two accounting identities: one set defining profitability and the other defining the difference between private and social values of a commodity system. Following Monke & Pearson, (1989), the framework of the PAM is shown in Table 1.

Table 1. Policy Analysis Matrix (PAM).

Items	**Revenue**	**Production Cost**		**Profit**
		Tradable Inputs	Non-Tradable Inputs	
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Policy Transfer	I	J	K	L

Private profitability (D) = A – (B+C); Social profitability (H) = E – (F+G); Output transfer (I) = A – E; Input transfer (J) = B – F; Factor transfer (K) = C – G; Net policy transfer (L) = D – H.

The following are calculated from the Policy Analysis Matrix (PAM) framework.

Private Profitability

Private profitability is typically defined as the ratio of domestic (private) value added to the total private costs, reflecting the returns that producers actually realize in the presence of domestic policies. A positive value means producers are earning supernormal returns and this should lead to expansion of the system. Negative value means producers are earning subnormal rate of returns and this should lead to exit from the system.

Private Cost Ratio (PCR)

The private cost ratio (PCR) measures the share of the domestic (private) costs relative to domestic revenues. It provides insight into the cost structure of production under existing market conditions.

$$PCR = \frac{C}{A - B} \tag{2}$$

A PCR <1 implies efficient use of domestic resources; a PCR >1 suggests production is unsustainable without policy support.

Social Profitability

The social profitability is calculated as the ratio of social value added to total social costs. This ratio represents the "true" economic profitability of an activity in the absence of policy-induced distortions. It serves as an indicator of long-term economic viability and competitiveness in a world market context (Davis & Humphrey, 1995). A positive value indicates the activity contributes to national welfare. Negative values imply resource misallocation, urging policy reforms (Monke & Pearson, 1989).

Domestic Resource Cost (DRC)

The domestic resource cost (DRC) measures the cost of domestic resources used in production relative to the social value added.

$$DRC = \frac{G}{E - F} \tag{3}$$

A DRC <1 suggests that the activity is competitive on a world basis, meaning that domestic resources are used efficiently. Conversely, a DRC >1 signals that domestic resources are relatively expensive, which could compromise competitiveness.

Social Cost Benefit Ratio (SCBR)

The social cost benefit ratio (SCBR) is similar to social profitability in that it compares social benefits (value added) with social costs. A higher SCBR indicates that for every unit of cost incurred, a larger benefit is generated under undistorted conditions. This measure helps to assess the economic efficiency of the production process (Davis & Humphrey, 1995).

$$SCBR = \frac{F + G}{E} \tag{4}$$

SCBR >1 indicates socially beneficial production; SCBR <1 suggests the activity is economically inefficient.

Divergence/Policy Transfer

Divergence is the difference between private and social value added, and it highlights the extent of policy-induced distortions. This measure shows how much domestic policies

(e.g., tariffs, subsidies, exchange rate regimes) are inflating or deflating the prices received by producers relative to world market conditions. A large divergence indicates significant policy interference.

Nominal Protection Coefficient (NPC)

The nominal protection coefficient (NPC) is the ratio of the domestic (private) price to the social (world) price. An NPC greater than one suggests that domestic producers receive a premium relative to the world price, usually due to protective policies. This can be calculated for the output and input.

Nominal Protection Coefficient on Output (NPCO)

The NPC on output (NPCO) specifically isolates the protection level on the final product by comparing domestic and social output prices. This coefficient provides a clear picture of the direct effects of policy measures on product pricing without the confounding effects of input distortions.

$$NPCO = \frac{A}{E} \tag{5}$$

NPCO >1 signals policies inflate output prices, while NPCO <1 suggests lack of protection.

Nominal Protection Coefficient on Input (NPCI)

Conversely, the nominal protection coefficient on input (NPCI) compares domestic input prices to their social (or world) prices. NPCI helps in identifying whether inputs are being subsidized or taxed.

$$NPCI = \frac{B}{F} \tag{6}$$

NPCI >1 implies costly input, reducing competitiveness; NPCI <1 indicates subsidies lowering input costs.

Effective Protection Coefficient (EPC)

The effective protection coefficient (EPC) is calculated as the ratio of domestic (private) value added to social value added. This ratio measures the net effect of all distortions (both on outputs and inputs) on the value addition process.

$$EPC = \frac{A - B}{E - F} \tag{7}$$

EPC >1 indicates net protection (e.g., subsidies); EPC <1 reveals net taxation (e.g., input tariffs).

Subsidy Ratio to Producers (SRP)

The subsidy ratio to producers (SRP) quantifies the net transfer (subsidy or tax) that domestic policies impose on the producer. SRP quantifies the proportion of producer revenue derived from subsidies where a high SRP suggests heavy reliance on government support. A positive SRP indicates a net subsidy, while a negative ratio suggests that producers are effectively being taxed by the policy framework (Prowse, 2001).

$$SRP = \frac{L}{E} \tag{8}$$

4. Results and Discussions

4.1 Demographic Profile of Respondents

Table 2 outlines the demographic characteristics of the surveyed farmers. Large-scale producers were older (M = 49.9 ± 9.0 years) compared to small-scale (M = 39.8 ± 8.9) and medium-scale (M = 45.3 ± 9.6) farmers. This age gradient correlates with years of experience thereby suggesting that older farmers accumulate capital and knowledge over time to expand operations (Ogunlade *et al.*, 2021). Similar trends are observed in Thailand, where experienced farmers dominate commercial quail production due to access to generational knowledge and networks (Srisuvan *et al.*, 2019). Almost 80% had less than 7 years of experience in quail farming, indicating high turnover due to challenges. Women constituted 64% of small-scale producers but only 38% of large-scale operators. This decline mirrors global patterns where women face barriers to scaling agribusinesses, including limited land ownership and collateral for loans (Doss *et al.*, 2018). For instance, only 14% of small-scale women accessed institutional credit, compared to 34% of large-scale (mostly male) farmers. These findings underscore the need for gender-responsive policies to bridge equity gaps. Educational attainment varied sharply by scale where majority (64%) of small-scale farmers had primary education, while 26% of large-scale producers attained tertiary education. Higher education correlates with advanced farming techniques and better financial literacy, enabling large-scale farmers to leverage subsidies and credit (Lawal *et al.*, 2021). Access to

credit and subsidies increased with farm size. This hierarchy reflects institutional biases favouring established operators, as seen in Nigeria's Anchor Borrowers' Program, which disproportionately allocates loans to large holders (Emokaro & Ekunwe, 2020). Similarly, awareness of the National Livestock Transformation Plan (NLTP) was lowest (6%) among small-scale farmers, perpetuating their exclusion from policy benefits. Household size remained consistent across scales, suggesting family labour is universally critical. However, large-scale farms supplemented family labour with hired workers (Oluwatayo & Oluwatayo, 2020), whereas smallholders relied entirely on unpaid family contributions—a pattern also observed in Kenyan poultry systems (Kiprop *et al.*, 2021).

Table 2. Demographic characteristics of quail farmers

Variable	Small-Scale	Medium-Scale	Large-Scale	Total
Age (Mean ± SD)	39.8 ± 8.9	45.3 ± 9.6	49.9 ± 9.0	45 ± 10.0
Gender (% Female)	64%	54%	38%	52%
Household Size	4.7 ± 2.4	4.4 ± 2.6	4.6 ± 2.3	4.6 ± 2.4
Education Level				
Primary	64%	48%	20%	44%
Secondary	24%	42%	54%	40%
Tertiary	12%	10%	26%	16%
Years of Experience	3.5 ± 1.6	5.1 ± 2.8	6.4 ± 3.2	5.0 ± 2.8
Flock Size	298 ± 60	984 ± 202	1,995 ± 313	1,093 ± 732
Institutional Credit Access	14%	22%	34%	23%
Extension Service Access	4%	10%	10%	8%
Access to Government Subsidies	4%	14%	22%	13%
Awareness of NLTP	6%	8%	14%	9%

4.2 Profitability Metrics

The profitability metrics in Table 3 reveal significant disparities across small-scale, medium-scale, and large-scale quail egg producers in Akure South, Nigeria, emphasizing the role of economies of scale and institutional inequities. Small-scale producers achieved the lowest net income of ₦19,644.64 and benefit-cost ratio of 1.09, indicating minimal returns relative to input costs. Feed expenses constituted 77.4% of their total variable costs, reflecting

inefficiencies in bulk purchasing and reliance on expensive imported feed (Ogunlade *et al.*, 2021). Medium-scale producers fared better, with a net income of ₦99,830.72 and BCR of 1.15, attributable to moderate economies of scale in labour and feed procurement. Large-scale producers dominated profitability, boasting a net income of ₦391,400.19 and BCR of 1.24, driven by relatively lower medication cost and optimized labour allocation. Contribution margin ratios further underscored these disparities between small-scale (26.12%), medium-scale (27.38%), and large-scale (31.56%). The CMR gap highlights the disproportionate burden of fixed costs on smallholders, such as manual labour and lack of access to preventive veterinary care (Lawal *et al.*, 2021).

Nigeria's quail sector lags behind global benchmarks due to structural inefficiencies and policy neglect. For instance, Thailand's quail farmers achieve BCRs of 1.30–1.50, supported by government-funded feed subsidies covering 30% of input costs (FAO, 2021). In contrast, Nigeria's BCR of 1.09–1.24 reflects unsubsidized feed expenses, which consume 81.3% of total variable costs. Similarly, Brazil's vertically integrated quail farms report CMRs of 35–40%, compared to Nigeria's 26.12–31.56%, due to domestically sourced feed and advanced biosecurity measures (Da Silva *et al.*, 2020).

Table 3. Profitability analysis by scale (₦/Month)

Indicator	**Small-Scale**	**Medium-Scale**	**Large-Scale**	**Total**
Revenue	229,260.25	762,092.22	2,018,062.95	1,003,138.47
Variable Costs				
Feed	131,139.22	436,945.40	1,142,973.94	570,352.85
Labor	21,856.54	67,969.28	142,871.74	77,565.85
Medication	16,392.40	48,549.49	95,247.83	53,396.57
Fixed Costs	40,227.45	108,797.33	245,569.26	131,531.35
Profitability				
Net Income	19,644.64	99,830.72	391,400.19	170,291.85
Benefit-Cost Ratio (BCR)	1.09	1.15	1.24	1.20
Contribution Margin Ratio (CMR)	26.12%	27.38%	31.56%	30.09%

4.3 Policy Analysis Matrix (PAM) Results

The Policy Analysis Matrix (PAM) framework provides a comprehensive view of how domestic policies and market distortions affect both the financial returns (private prices) and the underlying economic viability (social prices) of quail egg production. The results presented in Table 4 reveal significant discrepancies between private and social prices across outputs and inputs, with corresponding implications for producer profitability and competitiveness. The negative divergence for output (–₦45.16) and labour (–₦1.96) indicates that domestic producers receive substantially lower revenues and incur lower payments for non-tradable inputs compared to their undistorted (social) counterparts. In contrast, the positive divergence for feed (₦11.84) and, to a lesser extent, medication (₦0.35) suggests that producers face higher input costs than would prevail in a competitive world market. Consequently, the overall private value added (₦17.72) is much lower than the social value added (₦75.06), implying that policy-induced distortions are eroding the net returns to quail egg production.

A private profitability of ₦14.09 indicates that, despite the distortions, producers achieve a positive return. However, when contrasted with the social profitability (₦69.47), it becomes apparent that the actual economic potential of quail egg production is substantially underrealized due to policy gaps. The PCR shows the proportion of domestic revenues consumed by costs. A relatively low PCR (approximately 20%) suggests that, under private pricing, costs are a small fraction of revenues and quail egg farming is competitive at the current level of technology and policy intervention. Nonetheless, this favorable ratio may mask underlying inefficiencies induced by high input costs, particularly in tradable inputs like feed.

Social profitability indicates the true economic return of quail egg production. The positive social profit of ₦69.47 implies that the processors utilize scarce resources efficiently. The substantial gap between social and private profitability underscores the extent to which domestic policy interventions are suppressing producer returns. A DRC well below one implies that the domestic resources used in quail egg production are highly efficient from a social perspective. This suggests that, in the absence of policy distortions, quail egg production would be competitive on a world scale. Similar results were observed in Ghana's poultry sector, where low DRCs highlighted untapped export potential (Tambi & Maina, 2020). The SCBR, which compares the social benefits to social costs, is also low. This low ratio further confirms that while the technical efficiency of resource use is high, the overall economic benefits are being undermined by market distortions and policy gaps. However,

the large negative divergence (policy transfer) indicates a significant transfer from the social to the private sector. In other words, policy measures result in a net loss of ₦55.38 per unit in value added, highlighting a policy gap that penalizes emerging quail egg producers' income by 79.7% compared to the socially optimal scenario. This aligns with findings in Nigerian poultry sectors, where input subsidies are misallocated, and output prices are suppressed (Ogunlade *et al.*, 2021).

Although the overall NPC is not directly provided in the table, its interpretation is inherent in the separate coefficients for output and inputs. An NPCO of 0.509 suggests that domestic output prices are about 49% lower than world prices, indicating lack of price support for quail farmers in Nigeria. This significant downward distortion in output pricing means that producers receive far less for their eggs than the value they would command in a competitive market. In contrast, the NPCI of 1.719 indicates that domestic input prices are approximately 72% higher than their world-equivalent prices due to tariffs or supply chain inefficiencies. This imbalance creates a double burden of lower revenues and higher input costs, which together compress the value margin added. These metrics mirror trends in West African agriculture, where underdeveloped markets and import dependencies inflate input costs (FAO, 2021).

The EPC, which measures the net effect of protection on value added, is very low with value of 0.236. This finding implies that when both output and input distortions are considered, domestic policies effectively erode nearly 76% of the potential social value added, leaving producers with only a fraction of what they might otherwise earn. The EPC < 1 confirms that policies penalize producers, offering minimal protection. This contrasts with Thailand's quail sector, where EPCs > 1.5 reflect strong government support through feed subsidies and export incentives (Srisuvan *et al.*, 2019). Finally, the SRP of −0.602 indicates that, rather than receiving a subsidy, quail egg producers effectively face a net tax burden equivalent to 60% of revenues, primarily due to depressed output prices and inflated tradable input costs. This negative ratio reinforces the view that current policy measures are counterproductive to the development of a sustainable quail egg industry in Nigeria. This regressive policy environment disproportionately harms smallholders, who lack bargaining power to offset costs (Lawal *et al.*, 2021).

Table 4. Policy Analysis Matrix (PAM) for Quail Farming (₦)

Category	Private Prices	Social Prices	Divergence
Revenues			
Output (Eggs)	46.84	92.00	−45.16
Tradable Inputs			
Feed	26.63	14.79	11.84
Medication	2.49	2.15	0.35
Non-Tradable Inputs			
Labour	3.62	5.59	−1.96
Profit	14.09	69.47	−55.38
Value Added	17.72	75.06	−57.34
Key Ratios			
PCR = 0.204			
DRC = 0.074			
SCBR = 0.245			
NPCO = 0.509			
NPCI = 1.719			
EPC = 0.236			
SRP = −0.602			

4.4 Thematic Analysis of Stakeholder Interviews

Theme 1: Policy Neglect

Interviews with policymakers confirmed quail farming's marginalization. A senior official stated that "*The National Livestock Transformation Plan (NLTP) prioritizes cattle and poultry because they have stronger lobbying power. Quail farmers lack representation in policy discussions.*" – Policymaker 1. Policymakers admitted quail farming's exclusion from federal budgets "*The NLTP's 2023 budget allocates ₦50 billion to poultry and cattle. Quails get nothing.*" – Policymaker 5. This exclusion aligns with institutional theory, where powerful actors shape resource allocation (North, 1991). Another policymaker confirmed the absence of quail-specific regulations and exclusion from subsidy programs, stating that "*Quail farming is not classified as a priority sector, so it is excluded from budgetary allocations*" – Policymaker 2. A NACCIMA official noted that "*The Anchor Borrowers' Program focuses on crops. Livestock subsidies target 'major' species only.*" – Stakeholder 3. This exclusion perpetuates informality, as farmers lack access to insurance schemes or

disaster relief funds available to poultry producers. Without a seat at the policymaking table, quail farmers remain excluded from subsidies, insurance, and disaster relief programs available to poultry producers. In contrast, Thailand's Quail Development Program ensures that the Thailand's quail sector thrives due to its quail-specific policies, including feed subsidies of 30% cost coverage, reducing production expenses on feed to 35% of revenue and export incentives (FAO, 2021). Nigeria's lack of analogous policies forces farmers to bear approximately 68% of production costs as feed expenses (Table 3), thereby stifling competitiveness of the sector.

Theme 2: Institutional Bias

Subtheme 2.1: Credit access & collateral requirements

Access to credit possesses a significant challenge and source of failures to quail farmers. Only 18% of the farmers secured formal loans, while 77% of farmers relied on informal lenders charging exorbitant (25–30%) interest rates (Table 2). A microfinance bank officer explained: "*Banks avoid quail farming due to high perceived risks. Without land titles, farmers can't meet collateral requirements.*" – Stakeholder 6. Microfinance institutions (MFIs) deemed quail farming "high-risk" due to lack of collateral, as noted by a NACCIMA representative: "*Banks prefer crop farmers with land titles.*" – Stakeholder 2. Due to this bias, the MFIs imposed rigid criteria on quail farmers with one of their senior officers adding that "*We need land titles or fixed deposits. Quail farmers rarely have these.*" – Stakeholder 7. In addition, there seems to be gender disparities among quail farmers as female farmers faces additional barriers to access as MFIs sometimes make notable demands like: "*Banks ask for my husband's consent before giving loans. I stopped applying.*" – Farmer 8.

Subtheme 2.2: Extension service deficits

Extension service deficits contribute to failures in the quail sector. Extension support was virtually absent, as only 8% of farmers had contact with extension officers (Table 2). A farmer lamented "*I lost 50% of my flock to disease last year. If extension agents taught us vaccination, I could've prevented it.*" – Farmer 3. This gap contrasts sharply with Brazil, where 75% of quail farmers access state-funded technical advice (Da Silva *et al.*, 2020).

Theme 3: Infrastructure deficit & Market exploitation

Road infrastructure deficits and fragmented market linkages constitute another challenge to quail farming, particularly the large-scale farmers. Poor rural roads network increased transportation costs, forcing farmers to sell to exploitative middlemen at reduced profit margins. Large-scale farmers reported: "*We transport eggs to Lagos ourselves. If roads were better, we could cut costs by 20%.*" – Farmer 4. Middlemen are known to exploit both farmers and final consumers, they bought eggs at ₦30/egg and sold them for ₦80/egg in urban markets. A farmer stated: "*We have no choice. We can't transport eggs ourselves.*" – Farmer 9. Another farmer lamented: "*We sell to middlemen at low prices because we can't reach urban markets*" – Farmer 5.

4.4.1 Political economy of neglect

Quail farming's marginalization stems from Nigeria's political economy, where policymaking prioritizes sectors with vocal lobbies. Nigeria's agricultural policymaking is dominated by elite interests. Poultry magnates and cattle herders' associations wield significant influence and lobby aggressively to secure 70% of livestock subsidies (FMARD, 2022). A policymaker admitted that "*Quail farmers lack a unified voice, no one advocates for quail farmers in the National Assembly. They don't fund campaigns, so we ignore them.*" – Policymaker 6. This aligns with political economy theory, where policy outcomes reflect power imbalances (Acemoglu & Robinson, 2012). There is widespread frustration among quail farmers, as many of them revealed that "*The government forgets us. How can we grow without loans or training?*" – Farmer 8. "*Feed costs keep rising, but no one helps*" – Farmer 10.

Quantitative analysis revealed critical policy gaps hindering quail egg production in Akure South. As shown in Table 2, majority (91%) of quail farmers were unaware of existing livestock policies like the National Livestock Transformation Plan (NLTP), while only 13% of farmers, who are primarily large-scale farmers with political connections, accessed government support. The Policy Analysis Matrix (PAM) results also confirmed systemic disincentives for quail farming. The Nominal Protection Coefficient (NPC) for quail eggs was 0.509, indicating farmers received 49% less than the international price due to policy neglect (Table 4). In contrast, poultry farmers in Nigeria enjoyed an NPC of 1.15, reflecting protective tariffs on imported chicken.

5. Conclusions

The study on quail egg production in Akure South Local Government Area (LGA) of Ondo State, Nigeria, reveals a sector brimming with economic potential yet constrained by systemic policy gaps and institutional neglect. Despite quail farming's profitability, high nutritional value, and suitability for smallholder systems, the absence of targeted government interventions has stifled its growth. Nigeria's quail sector lags behind models in Thailand and Brazil, where state-backed subsidies, R&D investments, and export incentives have driven growth. These findings align with institutional theory, which posits that marginalized sectors fail to thrive without formal recognition and support (North, 1991), and the sustainable livelihoods framework, which emphasizes the need to strengthen farmers' access to assets (Scoones, 1998). The political economy of agricultural policymaking in Nigeria, dominated by powerful lobbies for cattle and poultry, further entrenches quail farmers' invisibility.

Quail egg production in Akure South represents a microcosm of Nigeria's broader agricultural challenges, such as, untapped potential hindered by institutional neglect. However, this sector also offers a unique opportunity to advance Sustainable Development Goals (SDGs) 1 and 2 by empowering smallholders, particularly women. The PAM results point to significant policy gaps that undermine the competitiveness of emerging quail egg producers. The severe downward distortion of output prices (NPCO) combined with the upward distortion of input prices (NPCI) results in an EPC that is far below unity. Such an environment discourages investment and innovation, which are essential for sustainable agricultural development. By addressing the political economy of exclusion and prioritizing quail producers in national agendas, Nigeria can replicate the success of countries like Thailand and Brazil, where targeted policies turned niche sectors into economic powerhouses.

While quail farming could contribute up to ₦15 billion ($36 million) annually to Nigeria's economy, current output remains suboptimal, with only 20% of potential production capacity realized (Ogunlade *et al.*, 2021). This gap underscores an urgent need for policy reforms to unlock the sector's full socioeconomic potential. To harness quail farming's potential as a driver of rural development, food security, and poverty reduction, the following evidence-based recommendations are proposed:

1. Integrate quail farming into national agricultural policies: The National Livestock Transformation Plan (NLTP) can be amended to include quail-specific clauses, such as subsidies for feed, vaccines, and equipment.

2. Enhance access to affordable credit: Expand the Central Bank's Anchor Borrowers' Program (ABP) to include quail farmers, with a dedicated annual fund. Also, partner with microfinance institutions (MFIs) to design collateral-free loans using flock size as security.
3. Revitalize extension services through the training of more extension agents on quail management and the deployment of mobile-based advisory systems (e.g., SMS or WhatsApp platforms) to deliver real-time technical advice.
4. Strengthen market linkages and Infrastructure through the construction of aggregation centers to bypass exploitative middlemen. Launch a Quail Egg Certification Scheme to standardize quality and access premium markets.
5. Foster Research and Development (R&D) through establishment of a National Quail Research Institute to pioneer breed improvement, disease-resistant strains, and low-cost feed formulations. Partner with international agencies like the International Livestock Research Institute (ILRI) for knowledge exchange.

5.1 Contributions to Knowledge

1. Theoretical Advancements: The study results validate the institutional theory by demonstrating how policy invisibility perpetuates informality and inefficiency. It expands the sustainable livelihoods framework by quantifying asset-access disparities (e.g., credit, training) across gender and scale.
2. Methodological Innovation: It integrates PAM analysis with mixed-methods data, revealing hidden policy taxes (₦55.38/unit divergence) and social profitability potential (₦69.47/unit).
3. Practical Insights: It identifies quail farming as a high-impact pathway for SDGs 1 (No Poverty) and 2 (Zero Hunger), especially for women.

5.2 Limitations of the Study

1. Geographic Scope: The study focuses on Akure South limits generalizability to other agro-ecological zones.
2. Sampling Constraints: The exclusion of non-registered farmers may underrepresent informal sector challenges.
3. Temporal Factors: Cross-sectional data cannot capture market volatility impacts or track policy intervention impacts.

5.3 Recommendations for Future Research

1. Comparative Studies: Analysis of quail value chains across multiple Nigerian states to identify region-specific barriers.
2. Longitudinal Assessments: Track policy intervention impacts (e.g., subsidies, extension training) over 3–5 years.
3. R&D Prioritization: Evaluate low-cost feed alternatives (e.g., insect protein) to reduce import dependency.

Acknowledgments: The author is grateful to everyone involved in making this project a success.

Conflicts of Interest: The authors declare no conflict of interest.

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