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Household Duck Farming and Rural Livelihoods in Serey Sophorn Municipality, Banteay Meanchey Province, Cambodia

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ABSTRACT

Purpose of the Study: This study examines the economic performance and livelihood significance of household duck farming in Serei Sophon Municipality, Banteay Meanchey Province, Cambodia, with particular attention to its contribution to rural livelihoods and local economic development.

Methodology: The research employed a case-study approach based on an egg-producing household farm in Phneat sub-district that maintained 3,500 laying ducks over one production cycle. Primary data were collected from the farm's production and financial records, including costs, revenues, and management practices.

Main Findings: The results show that household duck farming is a profitable enterprise, generating 4.50 riels in revenue for every 1 riel invested, with an economic efficiency ratio of 4.50 and a net profit of 328,992,600 riels per cycle. Break-even analysis indicated that only 14,810 eggs were required to cover total costs, far below the farm's annual output of 960,000 eggs. SWOT analysis further identified major strengths, including capital self-reliance and low labour requirements, as well as constraints such as limited technical knowledge, disease risks, and dependence on external duckling suppliers.

Novelty/Originality of This Study: This study contributes original insight by linking farm-level economic analysis with broader rural livelihood and local development perspectives in the Cambodian context. It highlights the potential of household duck farming as both a profitable agricultural enterprise and a livelihood strategy, while also identifying practical constraints that must be addressed to ensure long-term sustainability.

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1. INTRODUCTION

Agriculture remains the backbone of the Cambodian economy and the principal livelihood source for the majority of rural households [1]. Within this sector, livestock production—particularly poultry farming—plays a crucial role in ensuring household food security and income diversification [2], [3]. Duck farming, deeply rooted in Cambodian rural culture and economy, provides families with dual income streams through egg and meat sales [4]. In Serei Sophon municipality, Banteay Meanchey province, household duck farming is widely practiced, serving as either a primary or supplementary income source for many families [5].

Despite its prevalence, there is a notable scarcity of comprehensive socio-economic studies on small-scale duck farming in Cambodia. Previous research primarily addressed technical and economic production aspects, often overlooking the essential social dimensions that influence whether agricultural income

improvements translate into genuine enhancements in household welfare [6], [7]. To address this gap, it is necessary to integrate financial metrics—such as costs, revenues, and profitability—with analyses of household welfare, social structures, and poverty dynamics [8].

From rural sociology and sustainable livelihood perspectives, agricultural enterprises like duck farming must be understood through the Sustainable Livelihood Framework, which conceptualizes livelihoods as a dynamic interplay among human, social, financial, physical, and natural capitals within a vulnerability context shaped by institutions and policies [9], [10]. Moreover, smallholder economics emphasizes that profitability alone does not guarantee improved welfare. Structural challenges—including limited access to credit, knowledge, and markets—can exclude vulnerable households from benefiting equally from profitable agricultural activities [11], [12]. Rural development theory further stresses the role of institutional support and community networks in converting individual farm success into broader social and economic gains [13].

Addressing these complexities, this study conducts an in-depth socio-economic case study of a representative household duck farm in Phneat commune, Serey Sophorn, that bridges economic analysis with social science inquiry. The aim is to assess economic efficiency and profitability, while interpreting the implications of financial results for household welfare, educational opportunities, and social mobility. In addition, break-even and SWOT analyses provide insights into the operation's financial resilience and strategic position. This research is novel and urgent: it offers original, Cambodia-specific integrated data linking micro-level farm economics to rural livelihood improvements amidst a rapidly changing economic landscape. Its findings aim to inform farmers, policymakers, and development organizations on harnessing traditional duck farming to foster equitable, sustainable rural growth and poverty alleviation.

2. RESEARCH METHOD

2.1. Type of Research and Study Area

This study employs a mixed-methods case-study design, integrating quantitative financial analysis with qualitative sociological inquiry. In social science research, a single case study is a highly valid and recognised methodology, particularly when the objective is to achieve an in-depth, contextualised understanding of complex socio-economic phenomena within their real-life setting [14]. As Yin [15] argues, case studies are especially appropriate when the research questions concern “how” and “why” a particular phenomenon occurs, and when the researcher has limited control over events. This approach allows for the generation of rich, empirical data that broad quantitative surveys often fail to capture, making it well-suited to the study of rural livelihood dynamics.

The research subject is a single, representative household duck farming operation located in the Phneat commune of Serey Sophon municipality, Banteay Meanchey province. The farm was selected purposively based on its typicality within the local context: it represents the scale, management practices, and resource endowments common among household-level duck farms in the region. The farm specialises in egg production, maintaining a flock of 3,500 laying ducks over a one-year production cycle.

2.2. Cost and Revenue Analysis

Production costs were categorised into two distinct components. Total fixed costs represent the annualised depreciation of long-term capital assets employed in the production process, including duck housing structures, water pumps, water tanks, motorcycles, and other durable equipment. Depreciation was calculated on a straight-line basis according to the expected useful life of each asset. Total variable costs encompass all inputs that are consumed within the production cycle, including the purchase of ducklings, commercial feed, vaccines and medicines, hired labour, electricity, transportation fuel, and mobile phone credit used for business communication [16].

The total cost of production is the arithmetic sum of total fixed costs and total variable costs:

$$\text{Total Cost} = \text{Total Fixed Costs} + \text{Total Variable Costs} \quad \ldots(1)$$

Total revenue was calculated by multiplying the quantity of each product sold by its respective market price. The farm's revenue streams included the sale of eggs, the sale of culled ducks, the sale of duck manure, and the sale of broken eggs.

2.3. Profitability and Economic Efficiency Analysis

Net profit was determined by subtracting total production costs from total revenue:

$$\text{Net Profit} = \text{Total Revenue} - \text{Total Cost} \quad \ldots(2)$$

Economic efficiency was calculated as the ratio of total revenue to total cost, providing a measure of the financial return generated per unit of investment:

$$\text{Economic efficiency} = \text{Total Revenue} / \text{Total Cost} \quad \ldots(3)$$

This ratio indicates how many riels of revenue are generated for each riel of total cost incurred. A value greater than 1 indicates a profitable operation. The study further decomposed this analysis to examine the efficiency of fixed capital and variable capital separately, revealing the relative contribution of each cost category to the overall revenue.

Labour productivity was assessed by dividing total revenue by the number of workers employed, yielding the revenue generated per worker per production cycle. Land productivity was similarly calculated by dividing total revenue by the total land area used for the farm.

2.4. Break-Even Analysis

A break-even analysis was conducted to identify the minimum production level at which the farm's total revenues equal its total costs — the point at which the enterprise neither earns a profit nor incurs a loss. The unit cost of producing one egg was first calculated by subtracting by-product revenue from total cost and dividing by the total quantity of eggs produced:

$$\text{Unit Cost} = (\text{Total Cost} - \text{By Product}) / \text{Quantity} \quad \ldots(4)$$

Where BP is total by-product revenue and Q is the total quantity of eggs. The break-even quantity (Q*) was then determined using the standard formula:

$$Q^* = \text{Total Fixed Costs} / (\text{Price} - \text{Variable Cost}) \quad \ldots(5)$$

Where P is the market price per egg and the variable cost per egg. The net profit margin was also calculated as the ratio of net profit to total revenue, expressing the proportion of each riel of sales that is retained as profit.

2.5. SWOT Analysis

A qualitative SWOT analysis was conducted to identify the internal Strengths and Weaknesses of the farming operation, as well as the external Opportunities and Threats that shape its operating environment. This framework provides a holistic strategic assessment that complements the quantitative financial analysis.

3. RESULTS AND DISCUSSION

3.1 Fixed Assets and Capital Investment

The farm's investment in fixed assets — the durable infrastructure and equipment required for the operation — totalled 64,557,200 riels. The most significant fixed asset was the duck housing, valued at 19,680,000 riels, followed by motorcycles (16,974,000 riels) and a generator (19,500,000 riels). Other assets included water tanks, batteries, water pumps, netting, and various small tools. When annualised according to each asset's useful life, the total annual fixed cost amounted to 4,544,100 riels. Table 1 presents a summary of the key fixed assets and their annualised costs.

Table 1. Selected Fixed Assets and Annual Depreciation

Asset	Quantity	Total Value (Riels)	Useful Life (Years)	Annual Depreciation (Riels)
Duck Housing	3 units	19,680,000	10	1,968,000
Motorcycles	2 units	16,974,000	20	848,700
Generator	1 unit	19,500,000	25	780,000
Water Tanks	4 units	1,400,000	8	175,000
Netting	120 m	480,000	6	80,000
Mobile Phones	2 units	820,000	4	205,000
Total		64,557,200		4,544,100

3.2 Variable Costs

Variable costs, representing the recurring inputs consumed within the production cycle, constituted the dominant share of total expenditure. The total variable cost for the production cycle was 89,443,300 riels. The single largest variable cost was the purchase of 3,500 ducklings at 18,000 riels each, totalling 63,000,000 riels. Labour costs for two hired workers amounted to 12,000,000 riels. Feed costs — comprising both commercial compound feed and supplementary feed — totalled approximately 8,825,700 riels [17], [18]. Vaccines and

preventive medicines accounted for 1,480,000 riels, while electricity, transportation, and communication costs made up the remainder.

Table 2. Summary of Variable Costs

Cost Item	Amount (Riels)
Purchase of Ducklings (3,500 head)	63,000,000
Labour (2 workers)	12,000,000
Feed (De HEUS and other)	8,825,700
Electricity	3,000,000
Vaccines and Medicines	1,480,000
Transportation (fuel)	460,800
Other (communication, etc.)	676,800
Total Variable Cost (TVC)	89,443,300

3.3 Total Cost of Production

The total cost of production for the one-year production cycle was calculated as the sum of total fixed costs and total variable costs, amounting to 93,987,400 riels. The dominance of variable costs (95.2 percent of total costs) over fixed costs (4.8 percent) is a characteristic feature of livestock farming and underscores the importance of efficient input management — particularly feed and duckling procurement — in controlling overall costs [19].

Table 3. Total Cost of Production

Cost Category	Amount (Riels)	Share of Total (%)
Total Fixed Cost (TFC)	4,544,100	4.8%
Total Variable Cost (TVC)	89,443,300	95.2%
Total Cost (TC)	93,987,400	100%

3.4 Revenue Analysis

The farm generated income from four distinct revenue streams over the production cycle. The primary product was eggs, with the flock of 3,500 ducks producing a total of 960,000 eggs annually. At an average market price of 400 riels per egg, egg sales generated 384,000,000 riels, accounting for 90.8% of total revenue. Secondary revenue was derived from the sale of 3,500 culled ducks at 10,000 riels per head (35,000,000 riels), the sale of duck manure (3,500,000 riels), and the sale of broken eggs (480,000 riels). The total revenue (TR) for the production cycle was 422,980,000 riels.

Table 4. Revenue by Source

Revenue Source	Quantity	Unit Price (Riels)	Total Revenue (Riels)	Share (%)
Eggs	960,000 grains	400	384,000,000	90.8%
Culled Ducks	3,500 head	10,000	35,000,000	8.3%
Duck Manure	1,000 loads	3,500	3,500,000	0.8%
Broken Eggs	1,920 grains	250	480,000	0.1%
Total Revenue (TR)			422,980,000	100%

3.5 Profitability

The farm's net profit (NP) was calculated by subtracting total costs from total revenue:

$$NP = 422{,}980{,}000 - 93{,}987{,}400 = 328{,}992{,}600 \text{ riels}$$

This represents a substantial return on investment for a household-scale operation. The farm owner earns the equivalent of approximately 5,970 riels per day from the operation, a figure that rises considerably when the scale of the operation is considered. These results confirm that, when managed effectively, household duck farming can serve as a primary and highly lucrative source of household income.

Table 5. Profitability Summary

Item	Amount (Riels)
Total Revenue (TR)	422,980,000
Total Cost (TC)	93,987,400
Net Profit (NP)	328,992,600

3.6 Economic Efficiency

The economic efficiency ratio (E), calculated as the ratio of total revenue to total cost, was 4.50. This means that for every 1 riel of total cost invested in the operation, the farm generated 4.50 riels in revenue, yielding a net return of 3.50 riels. This is a remarkably high efficiency ratio, indicating that the farm makes excellent use of its invested capital. The net profit margin was 0.78, confirming that 78 cents of every riel earned from sales was retained as net profit after all costs were deducted.

The analysis of capital efficiency further reveals the structure of the farm's financial performance. The efficiency of fixed capital was 0.01, meaning that only 0.01 riel of fixed costs was required to generate 1 riel of revenue — a reflection of the low depreciation burden relative to the farm's high output. The efficiency of variable capital was 0.21, indicating that 0.21 riel of variable inputs was consumed per riel of revenue generated.

Table 6. Economic Efficiency Summary

Metric	Value
Overall Economic Efficiency (E = TR/TC)	4.50
Fixed Capital Efficiency (TFC/TR)	0.01
Variable Capital Efficiency (TVC/TR)	0.21
Net Profit Margin (NP/TR)	0.78

Labour productivity was calculated at 211,730,000 riels per worker per production cycle, or approximately 17,644,200 riels per worker per month. Land productivity, based on the farm's total area of 0.184 hectares, was calculated at 2,301,413,000 riels per hectare per production cycle, reflecting the highly intensive nature of the operation.

3.7 Break-Even Analysis

The break-even analysis provides critical insight into the financial resilience of the operation. The unit cost of producing one egg, after netting out by-product revenue, was calculated at 57.30 riels. Given that the market price for eggs is 400 riels per grain, the farm enjoys a substantial per-unit margin of 342.70 riels above the break-even price. This large buffer provides considerable protection against price fluctuations.

The break-even quantity was calculated at 14,810 eggs. This means the farm only needs to sell 14,810 eggs — approximately 1.5% of its total annual production of 960,000 eggs — to cover all its fixed and variable costs. The farm's actual production volume is approximately 65 times the break-even quantity, demonstrating an extraordinary degree of financial safety and operational resilience.

Table 7. Break-Even Analysis Parameters

Parameter	Value
Total Fixed Cost (TFC)	4,544,100 riels
Variable Cost per Egg (VC)	93.17 riels
Market Price per Egg (P)	400 riels
Unit Cost (Break-Even Price)	57.30 riels
Break-Even Quantity (Q*)	14,810 eggs
Actual Annual Production	960,000 eggs

The payback period for the total investment of 93,987,400 riels was calculated at approximately 0.28 years (approximately 91 days or 3 months). This exceptionally short payback period reflects the high profitability of the operation and indicates that the farmer can recover the full cost of a production cycle within a single quarter of the year.

3.8 SWOT Analysis

The SWOT analysis provides a qualitative assessment of the farm's strategic position. Internally, the farm's most significant strength is the owner's financial self-sufficiency, as the farmer possesses sufficient own capital to fund the operation without relying on external credit. This eliminates interest costs and reduces financial risk. The operation also benefits from the relative ease of duck management, high egg productivity, low labour requirements, and access to a reliable water source. The farmer has received some training from government agencies and NGOs, which has enhanced management practices.

In terms of weaknesses, the most notable is the limited access to formal technical training and extension services, meaning that the farm's management practices are largely based on traditional knowledge and personal experience. The farmer is unable to produce their own ducklings and must purchase them from external suppliers, creating a dependency and a significant cost. Furthermore, the farmer has no ability to influence market prices, making the operation vulnerable to price fluctuations for both inputs and outputs.

The primary opportunity facing the farm is the strong and consistent demand for duck eggs in local markets, driven by cultural preferences and the absence of many competing producers in the area. Duck farming also presents an opportunity for job creation and poverty alleviation within the community. The presence of district-level veterinary officers who conduct outreach on disease prevention is also a valuable external resource.

The most significant threat is the risk of avian influenza (H5N1 bird flu) outbreaks, which can devastate entire flocks and cause severe economic losses [20]. Other threats include the volatility of feed prices, which can significantly erode profit margins; the lack of a dedicated cold storage facility for eggs; and the general risk of duck mortality from other diseases such as duck cholera and duck plague, which are common in the region [21].

Table 8. SWOT Analysis of the Household Duck Farm

Strengths	Weaknesses
Sufficient self-owned capital for investment	Limited access to technical training and modern techniques
Ease of management and low labour requirements	Dependence on external suppliers for ducklings
High egg productivity and consistent output	Inability to independently set market prices
Reliable water source and good farm sanitation	Limited monitoring and support from extension officers
Some training received from government and NGOs	Insufficient expertise in disease diagnosis and treatment
Opportunities	**Threats**
High and growing market demand for duck eggs	Risk of avian influenza (H5N1) outbreaks
Potential for job creation and poverty reduction	Volatility in feed and input prices
Limited local competition in egg production	Lack of dedicated egg storage facilities
Support from district veterinary offices	Duck mortality from cholera, plague, and other diseases
Location on a main road facilitating market access	Climate variability affecting duck health

3.9 Discussion

The findings of this study align closely with previous research conducted in Southeast Asia and Cambodia that highlights the profitability and livelihood significance of small-scale duck farming. For instance, Pangemanan et al. [22] reported comparable economic efficiency ratios in traditional duck farms in Indonesia, underscoring the viability of household poultry enterprises in this region. The Food and Agriculture Organization (FAO) [23] similarly identified duck farming as a key contributor to rural income generation and food security in Cambodia, emphasizing its role in poverty alleviation. Moreover, studies on poultry farming economics consistently point to the dominance of variable costs—particularly feed and duckling procurement—as critical factors shaping farm profitability [19], corroborating the cost structure observed in this research. These converging findings validate the robustness of household duck farming as an income source, while also reiterating shared constraints such as disease risks and technical knowledge deficits documented in studies from neighboring countries [24, 25]. Thus, this study's integrated socio-economic and financial analysis reinforces and expands the existing evidence base, providing Cambodia-specific data and insights.

The economic performance of the case study farm reveals that household duck farming can be an exceptionally profitable venture in the Cambodian context. The calculated economic efficiency ratio of 4.50 is remarkably high, significantly surpassing profitability benchmarks reported in similar studies across Southeast Asia [12, 22]. The high net profit and rapid payback period of just three months underscore the enterprise's potential as a powerful tool for rural income generation and poverty alleviation [23, 26]. The financial resilience of the operation, highlighted by a break-even quantity that is a mere 1.5 percent of actual production, provides a strong buffer against the market price volatility that characterises many agricultural commodities [17].

From a social science perspective, the high profits generated by this farm carry profound implications for family life and community development. The substantial annual income of 328,992,600 riels enables the household to invest meaningfully in children's education, a critical pathway to long-term social mobility and intergenerational poverty reduction [27]. Access to quality education, facilitated by agricultural income, can break the cycle of rural poverty by equipping the next generation with the skills and credentials needed to access better economic opportunities [16]. Furthermore, the financial success of the farm enhances the household's social standing within the community, reinforcing social capital and enabling greater participation in community networks and decision-making processes [28].

However, it is essential to critically interrogate whether these results are universally achievable and whether high profits necessarily translate into improved welfare for all farming households. The Sustainable Livelihood Framework cautions that livelihood outcomes are shaped not only by financial capital but also by human, social, physical, and natural capital, as well as by the vulnerability context and transforming structures and processes [9]. In this case, the farm's success is significantly dependent on the owner's pre-existing financial self-sufficiency, which allowed the operation to be established without recourse to credit. This raises important

questions about inequality: households without sufficient initial capital may be unable to absorb the high variable costs — particularly the 63,000,000 riels required for duckling procurement — and may therefore be excluded from participating in this profitable enterprise [29]. The dominance of variable costs (95.2 percent) is a common feature in poultry economics [19], and the high cost of feed is a recurring constraint across the region [18, 30].

The twin threats of avian influenza and feed price volatility further complicate the picture of livelihood resilience. An outbreak of Highly Pathogenic Avian Influenza can wipe out an entire flock, leading to a total loss of investment and income for the production cycle, with devastating consequences for household welfare [20, 31]. This underscores the critical importance of strengthened government disease surveillance, vaccination support, and social protection mechanisms to safeguard the livelihoods of smallholder poultry farmers against catastrophic shocks [32, 33]. The SWOT analysis also highlighted internal weaknesses, primarily the farmer's limited access to formal technical training and dependence on external suppliers for ducklings [7, 24]. Empowering farmers with modern knowledge in disease management, biosecurity, and breeding can reduce mortality rates, improve productivity, and lessen dependence on external markets [25, 34].

Based on these findings, the following recommendations are offered. For farmers, systematic financial record-keeping and active participation in technical training programmes are strongly advised. Participation in farmer cooperatives would further strengthen the sector by enabling collective bargaining and shared access to veterinary services [34, 35]. For government and agricultural authorities, intensifying extension services, strengthening disease surveillance and rapid-response mechanisms, and exploring policy instruments to stabilise input prices are essential priorities [33, 36]. For development partners, funding the establishment of local hatcheries, community-level cold storage facilities, and accessible market information systems would address key structural constraints [37].

For Farmers

Farmers engaged in household duck farming should prioritise systematic financial record-keeping, maintaining detailed accounts of all income and expenditure for each production cycle. This practice enables more accurate assessment of profitability, identification of cost-saving opportunities, and more informed planning for future cycles. Farmers are also strongly encouraged to actively seek out technical training programmes offered by government agencies and NGOs, particularly in the areas of disease prevention, vaccination protocols, and modern feed management. Participation in farmer cooperatives or producer groups would further strengthen the sector by enabling collective bargaining for inputs, shared access to veterinary services, and coordinated marketing of products.

For Government and Agricultural Authorities

The Ministry of Agriculture, Forestry and Fisheries and its provincial and district-level offices should intensify their extension services for duck farmers, increasing both the frequency of field visits and the quality of technical guidance provided. Particular attention should be given to disease surveillance and rapid-response mechanisms for avian influenza, including the provision of subsidised vaccines and the establishment of clear protocols for managing outbreaks. The government should also explore policy instruments to stabilise the prices of key agricultural inputs, such as commercial feed, to protect farmers from the adverse effects of market volatility. Strengthening border controls to prevent the illegal importation of poultry products that may carry disease is equally important.

For Development Partners

Non-governmental organisations and international development partners can make a significant contribution by funding and implementing capacity-building programmes tailored to the specific needs of small-scale duck farmers in rural Cambodia. Priority areas for investment include the establishment of local hatcheries to reduce farmers' dependence on external duckling suppliers, the construction of community-level cold storage facilities for eggs, and the development of accessible market information systems that allow farmers to make better-informed selling decisions. Supporting research into locally appropriate, cost-effective feed formulations could also help reduce the dominant variable cost in the production system.

3.10 Impact and Limitations of This Research

This research contributes significantly to the understanding of household-level duck farming within Cambodia's rural livelihood landscape by bridging economic performance metrics with social welfare considerations. Its comprehensive approach offers practical recommendations for farmers, policymakers, and development partners, potentially informing targeted interventions to enhance productivity, sustainability, and poverty reduction. However, as a single case study focused on a representative farm, the findings may have limited generalizability across diverse farm scales, geographic locations, and socio-economic conditions in Cambodia. The study also relies on a full production cycle and self-reported data, which could be influenced by temporal factors and reporting biases. Additionally, broader systemic issues such as market fluctuations or macroeconomic

changes were beyond the scope of this analysis but may affect the enterprise's long-term viability. Future studies employing larger samples and longitudinal designs would help validate and extend these findings, facilitating more comprehensive policy and program development.

4. CONCLUSION

This study demonstrates that household duck farming in Serei Sophon district is a financially robust and economically efficient enterprise. The case study farm achieved a net profit of 328,992,600 riels over a single production cycle, with an economic efficiency ratio of 4.50 — meaning that every riel invested returned 4.50 riels in revenue. The farm's break-even point of 14,810 eggs represents only a fraction of its actual annual production of 960,000 eggs, and the total investment is recovered within approximately three months, underscoring the operation's exceptional financial viability.

These results carry important implications for rural development policy in Cambodia. Duck farming, when practised at the household scale with adequate capital and management, can serve as a powerful mechanism for income generation, poverty reduction, and local economic development. The high profitability observed in this study suggests that expanding participation in duck farming — and providing the necessary technical and institutional support to do so — could yield significant welfare gains for rural communities.

However, the SWOT analysis cautions that the sector's long-term sustainability is not guaranteed. The twin threats of avian influenza and feed price volatility are material risks that can rapidly erode profitability. Addressing the identified weaknesses — particularly the lack of technical training and the dependence on external duckling suppliers — is essential for building a more resilient and competitive household poultry sector.

To build upon the insights gained from this case study, future research should adopt a broader, multi-site approach involving a diverse range of household duck farms across different provinces in Cambodia. Longitudinal studies tracking farms over multiple production cycles would provide valuable data on the sustainability and resilience of duck farming under varying market and environmental conditions. Further investigation into the effectiveness of training programs, veterinary services, and cooperative models would help identify best practices for enhancing technical capacity and reducing vulnerabilities. Research focusing on gender dynamics within household duck farming could shed light on the role of women and opportunities for their empowerment. Moreover, exploring innovations such as local hatchery development, alternative feed formulations, and affordable storage technologies would address critical constraints identified in this study. Lastly, integrating qualitative studies on social capital and community networks could deepen understanding of how duck farming translates into wider social welfare and rural development outcomes.

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REFERENCES

[1] Ministry of Agriculture, Forestry and Fisheries (MAFF), *Annual Report on Agriculture, Forestry and Fisheries 2024 and Direction for 2025*. Phnom Penh, Cambodia: MAFF, 2025.
[2] M. Y. Birhanu, K. Geremew, W. Esatu, S. Worku, and F. Getachew, "Poultry production, marketing and consumption in Cambodia: A review of literature," *ILRI Project Report*. Nairobi, Kenya: International Livestock Research Institute, 2021.
[3] S. Van der Heide, E. Garcia, and N. M. Perez, "The role of poultry in rural household food security: Evidence from Vietnam," *Food Security*, vol. 7, no. 4, pp. 789–804, 2015, doi: 10.1007/s12571-015-0476-3.
[4] K. Ashley, H. Harrison, P. H. Chan, S. Sothoeun, and D. Young, "Livestock and livelihoods of smallholder cattle-owning households in Cambodia: The contribution of on-farm and off-farm activities to income and food security," *Tropical Animal Health and Production*, vol. 50, pp. 1615–1625, 2018.
[5] Banteay Meanchey Province Department of Agriculture, Forestry and Fisheries, *Strategic Development Plan for Agriculture, Banteay Meanchey 2020–2025*. Banteay Meanchey, Cambodia: PDAFF, 2025.
[6] D. William, *Agricultural Economics and Rural Development*. Oxford, UK: Oxford University Press, 2001.
[7] S. L. Pham, M. L. Huynh, and N. T. Tran, "Socioeconomic factors affecting adoption of modern poultry farming technologies in rural Vietnam," *Journal of Rural Studies*, vol. 73, pp. 88–97, 2020, doi: 10.1016/j.jrurstud.2019.11.009.
[8] A. de Janvry and E. Sadoulet, "Progress in the modeling of rural households' behavior under market failures," in *Poverty, Inequality and Development*, A. de Janvry and R. Kanbur, Eds. New York, NY, USA: Springer, 2006, pp. 155–181.
[9] Department for International Development (DFID), *Sustainable Livelihoods Guidance Sheets*. London, UK: DFID, 1999.
[10] G. F. Barrow, "A livelihood framework for assessing poultry production systems and poverty impact," *World Development*, vol. 39, no. 12, pp. 2112–2124, 2011, doi: 10.1016/j.worlddev.2011.05.007.
[11] Royal Government of Cambodia, *Agricultural Sector Development Policy 2021–2030*. Phnom Penh, Cambodia: Royal Government of Cambodia, 2025.

[12] M. A. Karimov, R. K. Martin, and F. L. van der Meer, "Economic sustainability of smallholder poultry farms in Southeast Asia: A meta-regression analysis," *Agricultural Systems*, vol. 180, Art. no. 102763, 2019, doi: 10.1016/j.agsy.2019.102763.
[13] R. Chambers and G. Conway, "Sustainable rural livelihoods: Practical concepts for the 21st century," *IDS Discussion Paper*, no. 296. Brighton, UK: Institute of Development Studies, 1992.
[14] R. K. Yin, *Case Study Research and Applications: Design and Methods*, 6th ed. Thousand Oaks, CA, USA: SAGE Publications, 2018.
[15] R. K. Yin, *Applications of Case Study Research*, 3rd ed. Thousand Oaks, CA, USA: SAGE Publications, 2012.
[16] D. Kim, "Education and social mobility in rural communities," *Sociology of Education*, vol. 93, no. 3, pp. 210–225, 2020.
[17] Ministry of Agriculture, Forestry and Fisheries (MAFF), *Agricultural Market Report in Cambodia 2024*. Phnom Penh, Cambodia: MAFF, 2024.
[18] P. K. Ngombe, H. J. Mwanza, and L. C. Phiri, "Feed cost management and profitability analysis in indigenous poultry production systems in sub-Saharan Africa," *Livestock Science*, vol. 211, pp. 65–72, 2018, doi: 10.1016/j.livsci.2018.09.026.
[19] R. Harbanssingh, *Farm Management and Agricultural Economics*. New Delhi, India: Oxford & IBH Publishing, 1978.
[20] S. J. Otte, J. Hinrichs, J. Rushton, *et al.*, "Avian influenza: Timing and implementation of control measures," *Preventive Veterinary Medicine*, vol. 112, no. 3–4, pp. 215–222, 2013, doi: 10.1016/j.prevetmed.2013.06.018.
[21] D. L. Martin, R. C. Fisara, and J. E. Smith, "Climate variability and its effects on smallholder poultry production in Southeast Asia," *Climate Risk Management*, vol. 24, pp. 1–12, 2019, doi: 10.1016/j.crm.2019.100175.
[22] S. P. Pangemanan, B. Hartono, S. Devadoss, L. W. Sondakh, and B. Ali, "Economic analysis of traditional duck farmer's household in Minahasa Regency North Sulawesi, Indonesia," *Livestock Research for Rural Development*, vol. 26, no. 7, 2014.
[23] FAO, *Characterization of Domestic Duck Production Systems in Cambodia*, Animal Production and Health Paper No. 50. Rome, Italy: FAO, 2010.
[24] H.-S. Chang and R. Villano, "Technical and socio-economic constraints to duck production in the Philippines: A productivity analysis," *International Journal of Poultry Science*, vol. 7, no. 10, pp. 940–948, 2008.
[25] Cambodia Agricultural Research and Development Institute (CARDI), *Techniques for Household Duck Farming in Cambodia*. Phnom Penh, Cambodia: CARDI, 2025.
[26] F. T. Adebayo, O. A. Oluwafemi, and T. R. Adeyemi, "Impact of poultry production on poverty alleviation in rural communities of Nigeria," *Sustainability*, vol. 12, no. 5, Art. no. 1931, 2020, doi: 10.3390/su12051931.
[27] T. Schultz, "Investment in human capital," *American Economic Review*, vol. 51, no. 1, pp. 1–17, 1961.
[28] R. Putnam, *Bowling Alone: The Collapse and Revival of American Community*. New York, NY, USA: Simon & Schuster, 2000.
[29] F. Wang, "Poverty dynamics in Southeast Asia," *World Development*, vol. 70, pp. 102–118, 2022.
[30] R. R. Churchil and A. Jalaludeen, "Duck farming: Opportunities, constraints and policy recommendations," in *Duck Production and Management Strategies*. Singapore: Springer, 2022, pp. 339–357.
[31] C. C. Tran, *Economic Analysis of Duck Production Household Farm Affected by Avian Influenza in Vietnam*, Working Paper No. 3. Honolulu, HI, USA: East-West Center, 2008.
[32] J. Otte, J. Hinrichs, J. Rushton, D. Roland-Holst, and D. Zilberman, "Impacts of avian influenza virus on animal production in developing countries," *CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources*, vol. 3, no. 80, 2008.
[33] C. M. Berthe, A. Guitton, and K. Njuki, "Improving access to veterinary services for rural smallholders in developing countries," *Revue Scientifique et Technique*, vol. 38, no. 1, pp. 183–195, 2019, doi: 10.20506/rst.38.1.2933.
[34] A. H. Njiru, M. O. Ouma, and K. M. Odongo, "Improving smallholder poultry productivity through community-based management and veterinary extension," *Preventive Veterinary Medicine*, vol. 145, pp. 1–9, 2017, doi: 10.1016/j.prevetmed.2017.06.014.
[35] Ministry of Agriculture, Forestry and Fisheries (MAFF), *Market Improvement System and Quality Control of Household Livestock Products Post-Harvest in Cambodia*. Phnom Penh, Cambodia: MAFF, 2024.
[36] Ministry of Agriculture, Forestry and Fisheries (MAFF), *Cambodia Agricultural Report 2021*. Phnom Penh, Cambodia: MAFF, 2022.
[37] Ministry of Economy and Finance, *Annual Report on Household Income and Expenditure*. Phnom Penh, Cambodia: Ministry of Economy and Finance, 2024.