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RESEARCH ARTICLE

A Comprehensive Assessment of Biosecurity and Health Management in the Layer Poultry Sector of Batangas, Philippines

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Abstract

Objective: This study aimed to evaluate the health management strategies and biosecurity practices implemented in commercial layer farms in Batangas, Philippines and to identify gaps that may compromise flock health and disease prevention.

Materials and Methods: A purposive sampling approach was employed to survey 100 commercial layer farms registered with the Department of Agriculture Region IV-A, each housing 500 to >5,000 layers. Data were collected through structured questionnaires and on-site observations, covering vaccination programs, behavioral management practices, egg-handling procedures and biosecurity measures.

Results: Vaccination was universally practiced across farms, although significant variation was observed in the modes of administration and frequency of veterinarian visits. Debeaking was routinely implemented as a preventive measure against feather pecking and cannibalism and farms commonly used isolation and environmental enrichment to manage aggressive behaviors. Eggwashing practices differed widely; while most farms avoided washing due to concerns about spoilage, a smaller proportion performed pre-washing, drying and sanitizing steps consistent with national guidelines. Biosecurity measures were generally well adopted, with footbaths serving as the primary disinfection method. Nonetheless, inconsistencies were noted in disinfectant maintenance, use of personal protective equipment, waste handling and other critical procedures. Good housekeeping, restricted visitor access and disease monitoring were commonly practiced to reduce disease transmission risks.

Conclusion: The findings demonstrate considerable adherence to recommended health and biosecurity standards among commercial layer farms in Batangas. However, gaps in the consistency and quality of implementation persist. Strengthening farm-level biosecurity protocols, waste management, monitoring systems and capacitybuilding initiatives is essential to support sustainable egg production and enhance disease prevention within the province.

INTRODUCTION

The commercial layer chicken industry in Batangas Province constitutes a major component of the regional livestock sector and supplies a substantial proportion of the egg demand in Region IV-A (CALABARZON). Maintaining flock health and enforcing stringent biosecurity protocols are essential for sustaining productivity, minimizing economic losses and preventing the introduction and dissemination of infectious diseases. Effective health management practices-including vaccination, sanitation, environmental control and restricted farm access-are critical for reducing the prevalence

of major poultry diseases such as avian influenza, Newcastle disease, fowl pox and other management-related disorders[1].

Biosecurity serves as the primary line of defense against disease transmission in poultry operations. International and national regulatory frameworks, including the ASEAN Good Animal Husbandry Practices (GAHP), the PNS/BAFS 184:2016 Code of GAHP for Chickens and the PNS/BAFS 209:2017 Code of Hygienic Practice for Table Eggs, underscore the importance of regulating farm entry points and maintaining robust sanitation systems to mitigate contamination. However, studies indicate that the extent of adoption of these measures varies among farms and is often shaped by farmers' knowledge, resource availability, access to veterinary services, membership in agricultural associations and overall technical capacity[2,3].

As one of the leading layer-producing regions in the Philippines, Batangas faces elevated risks from transboundary and emerging infectious diseases. Avian influenza outbreaks in several nearby provinces, including Laguna, Rizal and Quezon, highlight the need for sustained disease surveillance and consistent adherence to biosecurity standards[4]. Previous research has also identified deficiencies in health management, sanitation and farm-level biosecurity across poultry operations, all of which contribute to pathogen transmission, reduced flock performance and environmental contamination[5-7].

Despite the recognized importance of comprehensive biosecurity and health management, empirical evaluations within Batangas-particularly among commercial-scale farms-remain limited. Given the economic significance of the local layer sector and the potential risks associated with suboptimal practices, a systematic assessment of existing farm protocols is warranted. Such evidence is crucial for identifying operational gaps, guiding policy improvement, strengthening farmer training initiatives and ensuring the long-term sustainability of the provincial egg industry. Therefore, this study aimed to evaluate current health management and biosecurity practices in commercial layer farms in Batangas, identified areas requiring improvement and proposed science-based recommendations to enhance disease prevention and overall farm productivity.

MATERIALS AND METHODS

Survey design and data collection: A purposive sampling strategy was employed to select respondents who met the following criteria:

- Registration with the Department of Agriculture (DA) Region IV-A
- Operation of a commercial layer chicken farm
- Management of flocks ranging from 500 to >5,000 layers

The survey was conducted in ten municipalities of Batangas, identified as having the highest layer chicken inventory based on DA Region IV-A records. A total of 100 commercial farms were interviewed, representing 53% of the 190 registered layer farms in the province. Data were collected using structured questionnaires that captured respondents' socio-demographic characteristics (e.g., sex, marital status, educational attainment, chicken ownership status and income), as well as detailed information on farm health management and biosecurity practices.

Prior to data collection, official communication letters were provided to the ten municipalities and presented to farm owners and workers to explain the objectives of the survey. Farms were then randomly selected from the DA Region IV-A database. Selected farms were contacted through phone calls and text messages to request permission for an on-site visit and formal interview. Upon approval, interview schedules were arranged and coordination with Municipal Agriculturist Offices, DA Livestock Inspectors, poultry associations, Barangay Captains and Barangay Health Workers facilitated access to the farms. During each scheduled visit, researchers conducted systematic interviews, clarifying questions when necessary. Each interview lasted approximately 30 min to 1 hr. Following the interview, visual observations of farm facilities and practices were recorded. After data collection, responses from the structured questionnaires were encoded, tabulated and summarized for analysis. To ensure confidentiality, the identities of farmers and the names of farms were not disclosed.

Data analysis: Collected data were analyzed using descriptive statistical methods, including means, standard deviations, frequency counts and percentages. Findings were summarized and presented in tabular form.

RESULTS AND DISCUSSION

Health management practices: Table 1 presents the health management practices implemented in the surveyed layer chicken farms in Batangas. Most farms administered vaccines through mass or drinking-water vaccination, commonly carried out by farmworkers. This aligns with the findings of Fernandez[8], who noted that mass/drinking-water vaccination is a simple and rapid method that reduces stress during vaccine administration. However, intranasal, intramuscular and wing-web vaccination methods are considered more

Table 1: Health management practices in selected chicken layer farms in Batangas, Philippines

Variables	Classification	No. of respondents (n=100)	Percentage
Bird vaccination	Yes	100	100.00
Vaccinator*	Farmworkers	59	44.00
	Veterinarian	29	22.00
	Farm owner	22	16.00
	Technician	20	15.00
Syringe is reused for vaccination	No	89	89.00
	Yes	11	11.00
Veterinarian/consultant visit	Only when there is occurrence of disease in the farm	43	43.00
	Once a week	19	19.00
	Once a month	14	14.00
	None	9	9.00
	Others	15	15.00
Debeaking	Yes	100	100.00
Practices performed when feather pecking observed*	Isolation	65	56.00
	Adjust light intensity	16	14.00
	No incidence	13	11.00
	No action	6	5.00
	Others	17	14.00
Practices performed after egg collection•			
• Wash of dirty eggs	No	62	62.00
	Yes	38	38.00
• Processes in egg washing	None	61	49.00
	Pre-washing	30	24.00
	Drying	24	19.00
	Sanitizing	10	8.00

*Multiple responses

reliable than drinking-water administration[9]. Some farmers also reported purchasing vaccinated RTL/pullets. While syringes were generally not reused during vaccination, a small proportion of farmers reused them for treatment and medication purposes only, consistent with their veterinarians' biosecurity recommendations. These practices underscore the importance of structured vaccination programs and routine monitoring of birds' immunological responses to ensure optimal flock performance.

The results further indicate that most veterinarians visited farms only in response to disease occurrence, consistent with the findings of Scott *et al.*[1]. Some farmers reported that veterinarians visited only during the purchase of pullets, as feed mill associations or corporations provided complimentary veterinary consultations as a value-added service. Veterinary and technical visits have become more restricted due to heightened biosecurity protocols intended to prevent the introduction and spread of avian influenza in the region. Nonetheless, farmers actively sought veterinary assistance when disease outbreaks occurred, supporting the observations of Scott *et al.*[1] and Justus *et al.*[10]. Routine blood collection every three months for avian influenza surveillance, with samples submitted to the Bureau of Animal Industry (BAI), was practiced to prevent disease spread and enable rapid intervention. This protocol is aligned with the provisions of the Code of GAHP for Chicken Broiler. Thus, regular serological monitoring, veterinary consultation and restricted visitor entry collectively reduce the likelihood of disease outbreaks.

Debeaking was practiced across all surveyed farms to minimize feather pecking and cannibalism, which are often more severe in non-debeaked flocks, particularly as birds mature[11,12]. This practice was associated with the absence of feather pecking in 11% of farms. However, this contrasts with the findings of Lambton *et al.*[12], Kaukonen and Valros[13], Lambton *et al.*[14] and Pettersson *et al.*[15], who reported that debeaking does not eliminate feather pecking but merely reduces its occurrence, as multiple environmental and behavioral factors influence these behaviors. These results suggest that beak trimming remains the most effective method for reducing feather pecking incidence, although it should be complemented with additional management strategies.

Isolation was also commonly employed to control feather pecking, cannibalism and disease spread, although 5% of farmers did not implement this practice despite its importance. Additional interventions reported by farmers included supplementation of minerals, salts and sugar; adjustment of dietary protein levels; and provision of banana trunks to divert the birds' attention. These findings align with reports by Dixon *et al.*[4], Jones *et al.*[16] and the Philippines Recommends for Egg Production[9], which emphasize that

various forms of enrichment can effectively reduce feather pecking. Isolation remains the primary strategy for managing severe pecking and separate cages should ideally be located at least 300 meters away from healthy birds to minimize further spread. These findings indicate that farmers in the region are receptive to adopting low-cost, alternative management practices.

Egg-washing practices varied among farms, with most avoiding washing due to concerns about rapid egg spoilage and the lower market value of dirty eggs. However, some farmers practiced pre-washing, wiping with vinegar, sanitizing and drying, which are permissible under PNS/BAFS 209:2017, provided that proper cleaning procedures are followed. In contrast, the Food Safety and Standards Authority of India[17] discourages washing dirty eggs because washing increases shell porosity; such eggs should instead be discarded. Conversely, USDA regulations require that graded eggs be washed and sanitized in compliance with FDA food processing standards. Australian layer farmers also employ appropriate detergents, sanitizers and water temperatures to minimize microbial contamination[18], demonstrating that proper egg-washing procedures can reduce Salmonella risk. However, James et al.[19] reported that egg-washing technology remains debated due to the potential for Salmonella penetration into eggs. Furthermore, the European Food Safety Authority[20] found Salmonella in manure and dust samples from commercial layer farms, suggesting that early collection of eggs is critical in reducing contamination. The pre-washing practice reported by some farmers is consistent with PNS/BAFS 209:2017 guidelines for table egg hygiene. Overall, effective vaccination programs and strict biosecurity measures-particularly in relation to egg-washing practices-are essential to minimizing disease risk and maintaining bird health.

Biosecurity protocol in the farm: Table 2 summarizes the biosecurity practices implemented in the surveyed layer chicken farms in Batangas. Most farms reported the adoption of biosecurity protocols and these procedures were generally understood by farm laborers. Workers who recognized the importance of biosecurity were more likely to comply with protocols even without direct supervision from farm owners. Footbaths were the most commonly used disinfection system, consistent with the recommendations of the ASEAN Biosecurity Management Manual for Commercial Poultry Farming[21]. In addition to footbaths, farmers employed several other disinfection methods, including knapsack spraying, the use of burned rice straw and disinfection services facilitated by the local government. In most farms, disinfectant solutions were replaced daily, whereas others changed solutions only when disease or pest problems were observed.

Neglected footbaths-characterized by dirt accumulation and mold growth-were noted in several farms. This condition may contribute to disease occurrence by reducing disinfectant efficacy, especially when solutions are not replaced frequently. Furthermore, most farm laborers were observed not wearing boots inside the poultry houses, a practice that increases the risk of pathogen introduction and spread. Strict adherence to biosecurity protocols is fundamental to preventing disease

Table 2: Biosecurity practices of selected chicken layer farms in Batangas, Philippines

Variables	Classification	No. of respondents (n = 100)	Percentage
Biosecurity implementation	Yes	98	98.00
	None	2	2.00
Disinfection system*	Footbath	94	46.00
	Area for vehicle disinfection	70	35.00
	Shower disinfection	28	14.00
	None	4	2.00
	Others	7	3.00
Frequency of changing disinfectant*	Once a day	44	42.31
	When dirty	23	22.12
	Every other day	16	15.38
	When dried	11	10.58
	Others	10	9.62
Good housekeeping	Yes	100	100.00
FIFO	Yes	100	100.00
HACCP	No	80	80.00
	Yes	19	19.00
	Ongoing	1	1.00
HALAL certified	No	94	94.00
	Yes	4	4.00
	Ongoing	2	2.00

*Multiple responses, FIFO: First-in-first-out and HACCP: Hazard analysis critical control point

outbreaks in layer operations; however, the FAO[22] reported that biosecurity remains poorly implemented and inadequately understood in some Asian poultry sectors, including among Indonesian layer farmers. Thus, the effectiveness of the egg industry is closely linked to the consistent and proper implementation of farm-level biosecurity measures, which must be clearly understood by both farm owners and workers.

Municipal agriculturists also imposed restrictions on the entry of manure collectors and pullets originating from areas with reported avian influenza cases, in an effort to safeguard Batangas poultry farms from disease incursions. Strict farm-level measures-such as limiting visitor access, regulating entry of buyers and farm personnel and enforcing multiple disinfection systems-were reported by most respondents. Notably, some protocols in San Jose, Batangas, were implemented only after an avian influenza outbreak, reflecting a reactive rather than preventive approach[23]. If avian influenza enters a farm and spreads rapidly, the resulting losses can be catastrophic for farmers and the broader egg industry. The Department of Agriculture has documented avian influenza cases in multiple provinces, including Benguet, Kalinga, Pangasinan, Tarlac, Pampanga, Nueva Ecija, Bulacan, Laguna, Rizal, Quezon and Sultan Kudarat. As a result, farmers are required to submit Monthly Negative Monitoring Data as part of surveillance and early detection efforts[23]. These findings highlight that strict biosecurity-particularly sanitation and vaccination-plays a critical role in minimizing disease occurrence[24].

Good housekeeping and the First-in-First-Out (FIFO) system were consistently practiced across surveyed farms, in accordance with Philippine National Standards[25,26]. Despite this, enhanced housekeeping measures remain necessary to address the presence of predators reported by some farms. Only a few farms implemented Hazard Analysis and Critical Control Point (HACCP) systems or obtained HALAL certification. This aligns with the observations of Nam[27], who noted limited global research on the effects of on-farm HACCP implementation, likely due to its adoption in only a small number of countries. Furthermore, Tshewang *et al.*[28] emphasized that adopting good management practices in layer farms can enhance both industry performance and farmers' livelihoods. Thus, educating farmers about the benefits of implementing sound management and biosecurity practices is crucial-not only for improving farm operations and addressing operational challenges but also for building consumer trust and strengthening market competitiveness.

CONCLUSION

This study demonstrated that commercial layer farms in Batangas generally maintain a high level of compliance with essential health management and biosecurity measures, including routine vaccination, debeaking, bird isolation and the implementation of various disinfection systems. Widespread adherence to biosecurity protocols-such as good housekeeping, proper sanitation and First-In-First-Out (FIFO) stock management-indicates a strong awareness among farmers of the importance of preventing disease incursions. Despite this overall compliance, several operational gaps were identified. These include inconsistent maintenance of disinfection systems, limited use of personal protective equipment, variable frequency of veterinary consultation and non-standardized egg-washing practices. Such deficiencies increase the risk of disease introduction and transmission, particularly amid recurrent avian influenza outbreaks and the growing volume of farm-generated waste. External pressures, including pandemic-related movement restrictions and heightened biosecurity alerts, have further complicated waste handling and routine farm operations. Nevertheless, farmers remain committed to sustaining layer production, supported by local agricultural offices and poultry associations. The results highlight the need for continued reinforcement of biosecurity measures, especially in light of emerging poultry diseases and increasing waste management challenges. Strengthening current practices through targeted capacity-building programs, improved waste management systems and more consistent enforcement of national biosecurity standards is essential to enhance disease resilience and ensure the long-term sustainability of the layer industry in Batangas. Effective vaccination programs and strict implementation of biosecurity protocols-including appropriate procedures for handling and washing dirty eggs-are indispensable for minimizing health risks and preventing disease outbreaks. Although, many farms demonstrate strong compliance, biosecurity remains insufficiently practiced by some producers, underscoring the need for ongoing education, monitoring and policy support. The management practices identified in this study-particularly those related to health, biosecurity and disinfection systems-should be incorporated into the provisions of PNS/BAFS 184:2016 (Code of Good Animal Husbandry Practices for Chicken Broilers and Layers), PNS/BAFS 209:2017 (Code of Hygienic Practice for Table Eggs) and the ASEAN GAHP for Layers and Broilers. Furthermore, additional research is warranted to evaluate and enhance the biosecurity practices implemented by farmers in Batangas following the Avian Influenza outbreak.

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