

Increasing the productivity of laying ducks through optimizing healthy farming techniques based on appropriate feed management

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Abstract

Improving the productivity of laying ducks largely depends on proper feed management, as feed costs account for approximately 60–70% of total production expenses. This study aimed to evaluate the effectiveness of a targeted educational program in improving farmers' knowledge of laying duck feed management in Palembang Village, Bojonegoro Regency, Indonesia. The program was conducted on January 26–27, 2026, involving 40 participants using a one-group pre-test and post-test design without a control group. The evaluation instrument assessed understanding of feed types and formulation, nutritional requirements according to growth phase, feeding frequency, drinking water management, and the utilization of local feed ingredients. The results showed a significant increase in knowledge, with the total score rising from 108 (54%) in the pre-test to 156 (78%) in the post-test, reflecting a 24% improvement. The mean individual score increased from 2.7 to 3.9 on a 0–5 scale. Considering that most participants had a basic educational background and were engaged in small-scale agriculture, the educational intervention proved effective in strengthening practical nutritional literacy tailored to the physiological needs of laying ducks. By enhancing productivity and improving feed efficiency among small-scale farmers, this program directly contributes to Sustainable Development Goal (SDG) 2: Zero Hunger, particularly Target 2.3, which aims to increase agricultural productivity and incomes of small-scale food producers. Strengthening feed management capacity at the village level therefore supports sustainable livestock production and rural economic resilience.

Keywords: Ethnoveterinary Medicine; Herbal Phytotherapy; Duck Health Management; Smallholder Livestock Systems; Sustainable Animal Production; Zero Hunger

1 Introduction

Livestock plays a significant role in national food security by supplying animal protein and generating employment opportunities in both rural and urban areas [1]. The poultry sector, particularly laying ducks, has a strategic function in supporting food security and strengthening rural economies. Ducks represent a relatively affordable source of animal protein and have the potential to produce eggs consistently throughout the year. However, at the small-scale farmer level, productivity often remains suboptimal due to limited knowledge of feed management, animal health, and efficient farming systems.

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Feed management is a dominant factor in the success of duck farming enterprises because feed costs may account for 60–70% of total production expenses. The nutritional content of protein and energy in feed functions as structural components and metabolic regulators in the body, directly influencing growth and egg production performance [2]. Feeding practices must therefore be adjusted according to age and physiological growth stages. During the starter phase, feed should be placed in accessible containers to minimize spillage. From 7 days to 1 month of age, a mixed ration can be provided, such as starter feed combined with bran at a 1:1 ratio or ground corn mixed with bran at a 2:1 ratio, supplemented with animal protein sources. Ducks aged 3–5 months and older benefit from home-formulated rations adjusted to their production phase. Feeding is generally administered 2–3 times daily, with half of the ration provided in the morning and the remainder in the afternoon and evening [3].

Inaccurate feed formulation, the use of ingredients without clear nutritional standards, and insufficient understanding of nutrient requirements across growth phases reduce production efficiency and increase operational costs. This condition directly affects farmer income and household welfare. These local challenges are closely aligned with the global agenda outlined in the United Nations Sustainable Development Goals (SDGs).

Specifically, this issue is relevant to SDG 2: Zero Hunger, particularly Target 2.3, which aims to increase agricultural productivity and incomes of small-scale food producers, and Target 2.4, which promotes sustainable food production systems. Improving feed management literacy enhances egg productivity and strengthens local food availability through efficient smallholder livestock production. Furthermore, the intervention supports SDG 3: Good Health and Well-being (Target 3.9) by improving livestock health and ensuring better-quality animal-based food products, thereby contributing to safer and more nutritious food consumption. From an economic perspective, it contributes to SDG 8: Decent Work and Economic Growth (Target 8.3) by strengthening micro-scale livestock enterprises and enhancing farmer income potential. In addition, optimizing locally available feed resources aligns with SDG 12: Responsible Consumption and Production (Target 12.2) through more efficient use of natural resources and sustainable production practices.

In Palembang Village, Bojonegoro Regency, most farmers work as agricultural laborers and have primary to secondary educational backgrounds. Their feed management practices remain largely empirical and are not yet based on principles of balanced nutrition. Therefore, educational intervention through feed management counseling represents a strategic approach not only to enhance individual farmer capacity but also to operationalize SDG implementation at the village level. Duck feed management education thus serves not merely as a knowledge-improvement initiative but as a tangible contribution of higher education institutions in strengthening the resilience, productivity, and sustainability of the smallholder livestock sector.

2 Material and methods

2.1 Study area and activity design

This community service activity was conducted on January 26–27, 2026, in Palembang Village, Kanor District, Bojonegoro Regency, East Java Province, Indonesia. The location was selected due to its high potential for laying duck farming, characterized by household-scale production systems, fertile agricultural land, and access to local markets. Palembang Village is included in the local livestock empowerment and community economic development program, making it a strategic target for educational intervention.

The activity consisted of socialization and technical training sessions focusing on intensive duck farming systems. The intensive system was introduced as a more productive alternative to traditional farming practices, particularly in terms of egg production efficiency and feed management.

2.2 Study design and participants

This study applied a descriptive quantitative approach using a one-group pre-test and post-test design without a control group. A total of 40 participants were involved, consisting of small-scale duck farmers and agricultural workers from Palembang Village.

2.3 Instrument and data collection

Knowledge assessment was conducted using a structured questionnaire administered before (pre-test) and after (post-test) the educational intervention. The evaluation instrument measured participants' understanding of five key aspects of feed management:

- Feed types and formulation
- Nutritional requirements according to growth phase
- Feeding frequency and feeding system
- Drinking water management
- Efficient utilization of local feed resources
- Each topic had a maximum score of 5, resulting in a total maximum score of 200 for all respondents combined.

2.4 Data analysis

Data were analyzed descriptively by comparing total scores, percentage achievement, and mean individual scores between pre-test and post-test results. The effectiveness of the educational program was determined based on the magnitude of score improvement after the intervention.

3 Results and discussion

A total of 40 respondents participated in both the pre-test and post-test sessions. The socio-demographic characteristics of participants are presented in Table 1. The majority of respondents were adults to elderly individuals, with a mean age of 49.2 years (range 20–67 years). Most participants (75%) worked in the agricultural sector as farm laborers or independent farmers, while 25% were employed in non-agricultural occupations such as self-employed workers, homemakers, and private employees.

In terms of educational background, 52.5% of respondents had low educational attainment (no formal education or primary school graduates), while 47.5% had secondary education (junior or senior high school/vocational school). These findings indicate that although participants possessed practical agricultural experience, their formal exposure to scientific feed management principles was relatively limited.

Table 1 Socio-demographic characteristics of respondents (n = 40)

No	Characteristics	Category	Frequency (n)	Percentage (%)
1	Age	Adults–Seniors (Mean: 49.2 years; Range: 20–67 years)	–	–
2	Occupation	Agricultural sector	30	75.0
		Non-agricultural sector	10	25.0
3	Education level	Low (No formal education/Primary school)	21	52.5
		Secondary (Junior/Senior high school/Vocational)	19	47.5

The comparison between pre-test and post-test results is shown in Table 2. The total knowledge score increased from 108 (54%) before the intervention to 156 (78%) after the intervention, reflecting a 24% improvement. The mean individual score increased from 2.7 to 3.9 on a scale of 0–5, representing a 1.2-point gain. This improvement demonstrates enhanced understanding of feed types and formulation, nutritional requirements according to growth phase, feeding frequency and systems, drinking water management, and efficient utilization of local feed ingredients.

Table 2 Comparison of pre-test and post-test results

Indicator	Pre-test	Post-test	Increase
Total score	108	156	+48
Percentage	54%	78%	+24%
Mean score	2.7	3.9	+1.2

Duck farming in Indonesia has shown steady development, with the national duck population exceeding 60 million heads in recent years [4]. However, productivity at the smallholder level often remains suboptimal due to empirical feeding practices and limited access to standardized nutritional information. Feed accounts for approximately 60–70% of total production costs, making proper feed management essential for improving efficiency and profitability. Various

feed forms such as mash, pellets, crumbles, and mixed formulations require adequate technical understanding to ensure balanced nutrient intake [6].

The 24% increase in knowledge observed in this study confirms that locally adapted educational interventions can effectively bridge technical knowledge gaps in rural communities. Considering the relatively low educational background of participants, the consistent improvement across respondents suggests that extension-based approaches remain a strategic mechanism for strengthening smallholder livestock capacity. Although this study employed a one-group pre-test and post-test design without a control group, the magnitude of improvement indicates a direct positive impact of the intervention.

Improved feed management literacy is expected to influence behavioral changes in feeding practices, potentially leading to improved feed efficiency, higher egg production, and increased farmer income. When combined with continuous mentoring and monitoring of production performance, such interventions can serve as a sustainable model for village-based livestock empowerment and rural economic resilience.

3. Conclusion

The duck feed management educational program conducted in Palembang Village, Bojonegoro Regency, was effective in improving participant knowledge, as demonstrated by an increase in total scores from 54% to 78% (a 24% improvement) and an increase in mean scores from 2.7 to 3.9. Most participants, who had primary educational backgrounds and were engaged in the agricultural sector, demonstrated improved understanding of feed formulation, growth-phase nutritional requirements, feeding systems, and efficient utilization of local feed resources. These findings indicate that targeted educational interventions can strengthen feed management literacy among small-scale farmers and support productivity improvement, cost efficiency, and sustainable rural livestock development.

Compliance with ethical standards

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Disclosure of Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript. No financial, personal, or institutional relationships influenced the study design, data collection, analysis, interpretation, or writing of this article.

Statement of Ethical Approval

This study involved a community-based educational intervention focusing on knowledge assessment and capacity building in laying duck husbandry. The research did not involve biomedical experimentation, invasive procedures, or the use of experimental animals. Activities were limited to training sessions, interviews, and knowledge evaluations using pre-test and post-test instruments. Therefore, the study falls within the scope of community education and capacity-building activities and did not require formal institutional ethical clearance under prevailing research regulations.

Statement of Informed Consent

Informed consent was obtained from all participants prior to data collection. Participants were informed about the objectives of the study, the voluntary nature of participation, and the use of anonymized data for academic and publication purposes. Confidentiality and privacy were strictly maintained throughout the research process.

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