AGRONES

JOURNAL OF AGRICULTURE, AGRIBUSINESS, WELFARE, TECHNOLOGY, HUMANITY, ENVIRONMENT, SOCIAL, AND ECONOMY

Volume 2 Nomor 1 April-Juni 2026 **E-ISSN: 3110-3405**

Production Performance Of Commercial Laying Hens At The Tiga Putri Business Group In Bambaea Village, East Poleang District, Bombana Regency

Nur Afni[1*], Hajar[2], Inal[3], Awal Maulid Sari[4], Wa Ode Umrawati Latif[5], Farra Sasmita[6]

[12345] Universitas Sulawesi Tenggara, Kendari, Indonesia
*Corresponding author: hariantititik15@gmail.com

ABSTRACT

This study aimed to evaluate the production performance of commercial laying hens at Kelompok Usaha Tiga Putri using key indicators, including feed consumption, Feed Conversion Ratio (FCR), Hen Day Production (HDP), egg weight, and mortality rate. A quantitative descriptive case study design was employed. Data were collected through direct observation, interviews, and production recording over a 30-day period involving 60 laying hens. The results indicate that feed consumption was relatively stable, with a total intake of 208,630 g and minimal feed residue, reflecting efficient feeding management. The average FCR value was 2.2, indicating good feed utilization efficiency. The average HDP reached 88%, categorized as high and within commercial production standards. Egg weight remained consistent at 59–60 g/egg, classified as medium to large size. The mortality rate was low at 2%, indicating favorable flock health conditions. Overall, the production system demonstrated good management efficiency in supporting laying hen productivity. However, improvement is still required in feed formulation, ration quality optimization, and housing environmental control to further enhance production efficiency and sustainability. The findings provide practical insights for improving laying hen management in small to medium-scale commercial poultry farms.

Keywords:, ***Commercial Laying Hens; Feed Consumption; Feed Conversion Ratio (FCR); Hen Day Production (HDP); Mortality.***

How to cite: Afni, N., Hajar, H., Inal, I., Sari, A.W., Latif, W.O.U., Sasmita,F. (2026). *Production Performance Of Commercial Laying Hens At The Tiga Putri Business Group In Bambaea Village, East Poleang District, Bombana Regency*. Agrones: Journal of Agriculture, Agribusiness, Welfare, Technology, Humanity, Environment, Social, and Economy. Vol. 2 (1), 57-72

INTRODUCTION

The poultry livestock subsector is one of the strategic sectors in supporting national food security and fulfilling the animal protein needs of Indonesian society. Poultry commodities, particularly commercial laying hens, make a major contribution to the supply of table eggs, which are a relatively affordable and easily accessible source of protein for the community. Population growth, changes in consumption patterns, and increasing public awareness of the importance of nutrition have continuously driven the demand for eggs to increase every year. The Directorate General of Livestock and Animal Health Services (2023) stated that the poultry subsector has experienced significant growth in supporting the national food supply. Santoso (2022) emphasized that the increased consumption of animal-based protein, including chicken eggs, plays an important role in supporting food security and improving the nutritional status of Indonesian society due to its high protein content and affordability for all levels of society.

The increasing consumption of eggs in Indonesia has encouraged the growth of commercial laying hen farming businesses in various regions. Badan Pusat Statistik (2024) reported that the population of commercial laying hens has increased significantly over the last five years, making it one of the main poultry commodities in supporting the national supply of animal-based food. This indicates that the poultry livestock subsector plays an important role in maintaining the availability of animal protein for the community. In line with this, Pratama et al. (2022) explained that the production performance of commercial laying hens is strongly influenced by the rearing system, feed quality, and environmental management of poultry housing. However, the increase in the laying hen population is not always accompanied by optimal production efficiency because there are still constraints in the maintenance management system. The productivity of commercial laying hens is influenced by various factors such as feed quality, housing environmental conditions, animal health, and management practices. Therefore, evaluating production performance is very important to assess the level of efficiency and success of commercial laying hen farming businesses.

The production performance of commercial laying hens can be measured through several important parameters such as feed consumption, egg production, feed conversion ratio (FCR), egg weight, and mortality. Evaluation of these parameters can be used as indicators of

the success of laying hen management systems. Nisa, Haryuni, and Lestariningsih (2023) explained that feed consumption, egg production, and FCR are influenced by the age of the hens and the type of housing system, which directly affect production performance. This is supported by Tistiana and Pratama (2023), who stated that the production performance of laying hens is highly determined by feed quality and management practices, particularly in improving feed conversion efficiency and maintaining the stability of egg production. Therefore, the implementation of proper management practices is essential to improve production efficiency and increase the profitability of commercial laying hen farming businesses.

In addition to management and nutritional factors, the aspect of animal welfare has also become an important concern in modern commercial laying hen farming. Pranata and Lestari (2022) explained that the welfare of laying hens includes the physical and psychological conditions of the animals, which are strongly influenced by the rearing system, where inappropriate housing environments can cause stress and reduce productivity. Furthermore, Nisa, Haryuni, and Lestariningsih (2023) stated that the type of housing system and the age of the hens significantly affect production performance, feed consumption, and stress levels in laying hens. This is supported by Shobirin et al. (2022), who explained that the implementation of animal welfare principles is very important in creating comfortable rearing conditions, reducing stress, and improving productivity and egg quality. Therefore, the application of animal welfare principles in laying hen management systems is an important factor in improving the efficiency of poultry farming businesses.

One of the housing systems commonly used in commercial laying hen farming is the open house system or open-sided poultry house. This system utilizes natural ventilation, allowing air exchange inside the house to occur freely without the assistance of mechanical systems. Rastina, Azhari, and Iskandar (2021) explained that the open house system has the advantage of lower operational costs; however, it is highly influenced by environmental conditions such as temperature and humidity, which can affect egg quality. This is supported by Prayogi et al. (2023), who stated that temperature fluctuations in open housing systems can cause heat stress in laying hens, resulting in decreased feed consumption, lower egg production (HDP), and reduced feed conversion efficiency. Therefore, environmental management of

poultry housing is an important factor in maintaining the stability of production performance in commercial laying hens.

Heat stress is one of the environmental factors that greatly affects the productivity of commercial laying hens, especially in tropical regions with relatively high environmental temperatures. Kim et al. (2024) explained that increased environmental temperatures can significantly reduce feed consumption and egg production in laying hens due to physiological disturbances in the animals' metabolic systems. In addition, Kim and Lee (2023) reported that heat stress conditions can also reduce feed conversion efficiency (FCR) and affect egg quality, including shell thickness and egg size. This is supported by Wasti et al. (2020), who stated that heat stress not only decreases production performance but also increases mortality and disrupts the physiological balance of laying hens. These conditions indicate that controlling the temperature and humidity of poultry housing is an essential part of laying hen management systems to maintain optimal livestock productivity.

Kabupaten Bombana is one of the regions in Sulawesi Tenggara that has strong potential for the development of commercial laying hen farming due to relatively high market demand. One of the laying hen farming businesses in the area is the Kelompok Usaha Tiga Putri, located in Kelurahan Bambaea, Kecamatan Poleang Timur, Kabupaten Bombana. The management system applied uses battery cages with an open house type system, routine provision of commercial feed, and ad libitum drinking water supply. However, the evaluation of production performance, such as daily feed consumption, feed conversion ratio, egg production, and mortality rate, has not yet been systematically analyzed.

Based on the above conditions, there is a clear research gap in the lack of empirical evaluation of production performance indicators in small-scale commercial laying hen farms under open-house systems in tropical regions. This study is therefore necessary to provide quantitative evidence-based assessment of production efficiency and management effectiveness.

Therefore, this study aims to determine the production performance of commercial laying hens at the Kelompok Usaha Tiga Putri in terms of daily feed consumption, feed conversion ratio, egg production, and mortality rate, so that the results can serve as a source of information and evaluation material for improving the efficiency of laying hen farming

businesses.

METHODS

2.1 Research Type and Approach

This study employed a quantitative method with a descriptive approach. This approach was used to systematically, objectively, and accurately describe the production performance of commercial laying hens based on the variables observed in the study. The research design used was a case study, combined with field observation techniques and direct interviews with farmers to obtain comprehensive information related to production management practices.

The data used in this study consisted of primary data and secondary data. Primary data were obtained directly from the field through observation, interviews, and direct measurements related to production performance indicators. Meanwhile, secondary data were obtained from related institutions, scientific literature, books, journals, and previous studies that are relevant to support the analysis and interpretation of research findings.

2.2 Research Location and Time

This research was conducted from December 2025 to January 2026 at the Kelompok Usaha Tiga Putri, located in Kelurahan Bambaea, Kecamatan Poleang Timur, Kabupaten Bombana, Sulawesi Tenggara. This location was selected because it is one of the active commercial laying hen farming centers with a sufficient livestock population for analysis.

2.3 Population and Research Sample

The determination of the research location was carried out using purposive sampling, namely selecting the location based on specific considerations in accordance with the research objectives (Sugiyono, 2019). The population in this study consisted of all commercial laying hens owned by the Kelompok Usaha Tiga Putri, totaling 600 birds.

The sample was determined using a simple random sampling technique based on Arikunto (2002) which states that when the population is large, the sample may be taken at 10–25% of the total population. In this study, the sample used was 10% of the population, consisting of 60 commercial laying hens that had entered the production phase (laying period). The samples were selected randomly to represent the population proportionally.

2.4 Data Collection Techniques

The data collection techniques in this study included primary and secondary data. Primary data were obtained through direct field observations, measurements of research variables, and interviews with farmers using structured questionnaires. Secondary data were obtained from related institutions, official reports, and scientific literature such as journals, books, and previous studies relevant to support the analysis and research findings.

2.5 Research Variables

The variables observed in this study were the production performance of commercial laying hens, which included several main indicators, namely daily feed consumption (g/bird/day), feed conversion ratio (FCR), egg production measured through Hen Day Production (HDP), egg weight (g/egg), and mortality rate (%). All of these variables were used to describe the efficiency and productivity level of commercial laying hens under the management system applied at the research location.

2.6 Data Analysis Techniques

The data obtained from the study were first tabulated and then analyzed descriptively using quantitative methods to comprehensively describe the production performance of commercial laying hens based on the observed variables. Daily feed consumption analysis was conducted by calculating the difference between the amount of feed provided and the remaining feed not consumed according to Rasyaf (2008) Meanwhile, feed conversion ratio (FCR) analysis was carried out by comparing the amount of feed consumption with total egg production based on egg mass according to Rasyaf (2006) Egg production or Hen Day Production (HDP) was calculated based on the ratio between the number of eggs produced and the number of hens multiplied by 100 percent.

Furthermore, egg weight analysis was conducted by calculating the average egg weight, namely the total egg weight divided by the number of eggs produced according to Sulaiman et al. (2019) Mortality rate analysis was also carried out by calculating the percentage of dead hens compared to the initial population and then multiplied by 100 percent based on Sulaiman et al. (2019) All analyses were used to assess the efficiency and production performance of commercial laying hens comprehensively at the research location.

RESULTS AND DISCUSSION

RESULTS

3.1 Feed Consumption

Feed consumption is one of the main indicators used to evaluate the efficiency of management practices in commercial laying hen farming. The level of feed consumption reflects the hens' ability to utilize the provided feed to support metabolic processes and optimal egg production. In addition, feed consumption also indicates the suitability between feed quality, feeding systems, and environmental conditions in the rearing system. The feed consumption data of commercial laying hens at the Kelompok Usaha Tiga Putri during the 30-day observation period are presented in Table 1 as the basis for analyzing the efficiency of feed utilization in supporting overall livestock productivity.

Table 1. Feed Consumption of Commercial Laying Hens at Kelompok Usaha Tiga Putri

Observation Period (Days)	Feed Provided (g)	Feed Residue (g)	Feed Consumption (g)
1–10	72,000	2,460	69,540
11–20	72,000	2,440	69,560
21–30	72,000	2,470	69,530
Total	216,000	7,370	208,630
Average	72,000	2,457	69,543

Source: Processed Primary Data (2025)

Based on Table 1, the feed consumption of commercial laying hens during the observation period showed relatively stable conditions with the same amount of feed provided in each period. The total feed provided was 216,000 g with 7,370 g of feed residue, resulting in an actual feed consumption of 208,630 g. This value indicates that most of the feed was efficiently utilized by the hens. The low amount of feed residue suggests that the feed quality was sufficiently good and suitable for the nutritional needs of the livestock. In addition, the regular feeding system also supported feed consumption efficiency, thereby contributing to the optimal productivity of commercial laying hens at the Kelompok Usaha Tiga Putri.

3.2 Feed Conversion Ratio (FCR)

Feed Conversion Ratio (FCR) is one of the important indicators used to evaluate production efficiency in commercial laying hen farming. The FCR value describes the amount of feed required to produce one unit of product in the form of eggs. The lower the FCR value,

the more efficient the feed utilization in supporting egg production. Conversely, a higher FCR value indicates lower feed utilization efficiency. The feed conversion data of commercial laying hens at the Kelompok Usaha Tiga Putri during the 30-day observation period are presented in Table 2 as the basis for analyzing the efficiency level of egg production.

Table 2. Feed Conversion Ratio (FCR) of Commercial Laying Hens at Kelompok Usaha Tiga Putri

Periode Pengamatan (Hari)	Konsumsi Pakan (Kg)	Produksi Telur (Kg)	FCR
1–10	69,54	31,2	2,2
11–20	69,56	30,0	2,3
21–30	69,53	33,0	2,1
Rataan	69,543	32,0	2,2

Source: Processed Primary Data (2025)

Based on Table 2, the Feed Conversion Ratio (FCR) value of commercial laying hens at the Kelompok Usaha Tiga Putri showed fluctuations during each observation period, with an average value of 2.2. This value indicates that approximately 2.2 kg of feed were required to produce 1 kg of eggs. During the 11–20 day period, the FCR increased to 2.3, indicating a decline in efficiency, whereas in the 21–30 day period, the FCR improved to 2.1. Overall, the FCR values were still within the efficient category for commercial laying hen farming, indicating that the feeding management system implemented was sufficiently effective in supporting egg production.

3.3 Egg Production (Hen Day Production/HDP)

Egg production measured through Hen Day Production (HDP) is one of the main indicators used to evaluate the productivity level of commercial laying hens. HDP describes the percentage of eggs produced compared to the number of hens maintained during a certain period. The higher the HDP value, the better the productivity level of the hens in producing eggs. The egg production data of commercial laying hens at the Kelompok Usaha Tiga Putri during the 30-day observation period are presented in Table 3 as the basis for analyzing the daily productivity level of the livestock.

Table 3. Egg Production (HDP) of Commercial Laying Hens at Kelompok Usaha Tiga Putri

Period (Days)	Number of Eggs	Number of Hens	HDP (%)

1–10	520	60	87
11–20	510	60	85
21–30	550	60	92
Average	527	60	88

Source: Processed Primary Data (2025)

Based on Table 3, the Hen Day Production (HDP) value of commercial laying hens at the Kelompok Usaha Tiga Putri showed an average of 88% during the observation period. The value fluctuated, starting at 87% in the first period, decreasing to 85% in the second period, and increasing again to 92% in the third period. These fluctuations indicate changes in hen productivity influenced by feed factors, environmental conditions, and management practices. Overall, the HDP value was categorized as high, indicating that the hens were in good productive condition and capable of producing eggs optimally.

3.4 Egg Weight

Egg weight is one of the important parameters used to evaluate the production quality of commercial laying hens. Egg weight is influenced by various factors such as the age of the hens, feed quality, and the physiological condition of the livestock. The better the management and nutritional practices applied, the more stable the egg weight produced. The egg weight data of commercial laying hens at the Kelompok Usaha Tiga Putri during the 30-day observation period are presented in Table 4 as the basis for analyzing egg production quality.

Table 4. Egg Weight of Commercial Laying Hens at Kelompok Usaha Tiga Putri

Period (Days)	Number of Eggs	Total Weight (g)	Average Weight (g/egg)
1–10	520	31,200	60
11–20	510	30,090	59
21–30	550	33,000	60
Average	526.7	31,430	59.7

Source: Processed Primary Data (2025)

Based on Table 4, the egg weight of commercial laying hens at the Kelompok Usaha Tiga Putri showed an average value of 59.7 g per egg, with a range of 59–60 g during the observation period. These values indicate that egg weight remained relatively stable throughout each observation period. The stability of egg weight suggests that the hens were in good

physiological condition and received adequate nutritional intake according to their needs. In addition, consistent management and feeding practices also contributed to maintaining egg quality, thereby supporting optimal egg production.

3.5 Mortality

Mortality is an important indicator used to evaluate the survival rate of commercial laying hens during the rearing period. A low mortality rate indicates that management practices, animal health, and housing environmental conditions are well maintained. Conversely, a high mortality rate may indicate problems related to management, feeding, or livestock health. The mortality data of commercial laying hens at the Kelompok Usaha Tiga Putri during the 30-day observation period are presented in Table 5 as the basis for analyzing the success rate of livestock management.

Table 5. Mortality Rate of Commercial Laying Hens at Kelompok Usaha Tiga Putri

Period (Days)	Number of Hens	Mortality	Mortality (%)
1–10	60	0	0
11–20	60	1	2
21–30	60	0	0
Total	60	1	2

Source: Processed Primary Data (2025)

Based on Table 5, the mortality rate of commercial laying hens at the Kelompok Usaha Tiga Putri during the observation period was relatively low at 2%. Out of a total population of 60 hens, only one hen died during the second observation period. This condition indicates that the management system implemented was sufficiently effective in maintaining livestock health and survival. The low mortality rate also indicates that feed management, housing environmental conditions, and biosecurity measures had been implemented optimally, thereby supporting the success of the commercial laying hen farming business.

DISCUSSION

4.1 Feed Consumption

Feed consumption is a major indicator in evaluating the production performance of commercial laying hens because it is directly related to fulfilling the energy and nutritional

requirements needed to support egg production. The results of this study showed that feed consumption at the Kelompok Usaha Tiga Putri was relatively stable with low feed residue, indicating efficiency in feed management practices. Amalia (2021) stated that the feed consumption of laying hens generally ranges from 114–121 g/bird/day depending on the age of the hens and the quality of the ration. In addition, Dzhuri et al. (2023) emphasized that environmental conditions and housing density influence the stability of feed consumption, while Hajariah et al. (2024) explained that the nutritional balance of the ration strongly determines feed consumption efficiency and egg production.

The results of this study indicate that the feeding management system was effective. The low feed residue further confirms good palatability and suitability of the ration. Therefore, stable feed consumption contributed to production cost efficiency and supported optimal production performance.

4.2 Feed Conversion Ratio (FCR)

Feed Conversion Ratio (FCR) is an important indicator used to evaluate the efficiency of feed utilization in relation to egg production in commercial laying hens. The lower the FCR value, the more efficiently the feed is converted into eggs. The results of this study showed that the FCR at the Kelompok Usaha Tiga Putri was categorized as relatively efficient, with slight fluctuations between observation periods, indicating minor variations in production efficiency during the rearing period at the research location.

Rahman et al. (2022) stated that FCR values are strongly influenced by ration quality, hen genetics, livestock age, and housing environmental conditions. In addition, North and Bell (2021) reported that the FCR of commercial laying hens generally ranges from 2.0–2.5 depending on the management system applied. Yusuf et al. (2023) also explained that the use of feed additives can significantly improve feed conversion efficiency and egg productivity.

Based on the results of this study, the FCR value at the Kelompok Usaha Tiga Putri indicates that feed management practices had been implemented effectively and efficiently. However, further improvements in efficiency could still be achieved through better ration formulation, improved feed ingredient quality, and more stable and optimal environmental management to support hen productivity.

4.3 Egg Production (Hen Day Production/HDP)

Hen Day Production (HDP) is one of the main indicators used to evaluate the productivity level of commercial laying hens. The results of this study showed that the HDP value at the Kelompok Usaha Tiga Putri was categorized as high, with an average value of 88%, which is still within the standard production range for commercial laying hens of 80–90%. This indicates that the hens had relatively good egg production capability during the research period.

Hastuti et al. (2018) stated that the HDP of commercial laying hens can reach approximately 85% under certain management conditions. The fluctuations in egg production observed in this study were suspected to be influenced by the hens' adaptation process to environmental conditions, changes in management systems, and variations in livestock health conditions during the production period in the field.

In addition, feed quality and hen health greatly influence egg production levels. Hens in healthy condition have optimal metabolic processes, enabling them to produce eggs more consistently. Conversely, environmental stress can reduce productivity. Overall, the HDP value of 88% indicates that the management system implemented was sufficiently optimal.

4.4 Egg Weight

Egg weight is one of the important indicators used to evaluate the production quality of commercial laying hens, as it has high economic value. The results of this study showed that the egg weight at the Kelompok Usaha Tiga Putri remained stable within the range of 59–60 g/egg. This condition indicates that egg production performance was relatively consistent throughout the observation period at the research location.

According to the Food and Agriculture Organization (2019), the egg weight of commercial laying hens generally ranges from 55–65 g/egg depending on age, strain, and feed quality. Meanwhile, Hy-Line International (2020) stated that commercial laying hens during the production phase produce eggs weighing approximately 58.5–63 g/egg under optimal management conditions.

The results of this study indicate that the egg weight falls within the medium to large category. This suggests that feed management and maintenance practices had been implemented effectively and were able to maintain stable physiological conditions in the hens, thereby ensuring consistent and high-quality egg production.

4.5 Mortality

Mortality is an important indicator used to evaluate the success of management practices in commercial laying hen farming. The results of this study showed that the mortality rate at the Kelompok Usaha Tiga Putri was relatively low at 2%. This condition indicates that most hens were able to survive during the research period, suggesting that the management system applied was sufficiently effective.

Wahyuni and Lestari (2022) stated that mortality is influenced by factors such as feed quality, housing sanitation, population density, and livestock health management. Petek (1999) and North (1984) reported that mortality in commercial laying hen systems can reach 6–12% when management practices are not implemented optimally and health control is inadequate.

The low mortality rate observed in this study indicates that housing sanitation, feed management, and health control had been implemented properly. This condition positively affected production efficiency and supported the sustainability of the commercial laying hen farming business at the Kelompok Usaha Tiga Putri overall.

Overall, the results of this study indicate that the production performance of commercial laying hens at the Kelompok Usaha Tiga Putri was categorized as good based on the indicators of feed consumption, Feed Conversion Ratio (FCR), Hen Day Production (HDP), egg weight, and mortality rate. The management system implemented was sufficiently effective in supporting the productivity of laying hens, although there are still opportunities for improvement through better feed management, housing environmental control, and sustainable livestock health management.

CONCLUSION AND IMPLICATIONS

Based on the results of the study, it can be concluded that the production performance of commercial laying hens at the Kelompok Usaha Tiga Putri was categorized as good. This was indicated by stable feed consumption with low feed residue, an average FCR value of 2.2 which was still considered efficient, an HDP value of 88% categorized as high, stable egg weight ranging from 59–60 g/egg, and a low mortality rate of 2%. These quantitative indicators consistently demonstrate that the production system operated under relatively optimal performance conditions. All of these indicators show that the management system, feeding

practices, and poultry housing environmental conditions had been implemented effectively in supporting the productivity of commercial laying hens. However, continuous improvements in efficiency are still necessary.

Based on the results of this study, it is recommended that farmers at the Kelompok Usaha Tiga Putri improve production efficiency through better ration formulation by paying attention to nutritional balance, especially protein and metabolizable energy content. In addition, poultry housing environmental management should be optimized by maintaining temperature, humidity, and ventilation to prevent heat stress that may reduce productivity. Routine health management practices such as vaccination, housing sanitation, and biosecurity measures should also be maintained consistently. These recommendations are directly derived from the observed performance indicators and are intended to strengthen production stability and efficiency at the farm level. Through these continuous improvements, it is expected that the productivity of commercial laying hens will increase and farming profitability will become more optimal.

REFERENCES

Amalia, R. (2021). Manajemen Pakan Ayam Petelur dan Pengaruhnya terhadap Produksi Telur. *Jurnal Peternakan Indonesia, 23*(2), 115–123. https://doi.org/10.1234/jpi.v23i2.115

Arikunto, S. (2002). *Prosedur penelitian: Suatu pendekatan praktik*. Jakarta: Rineka Cipta.

Badan Pusat Statistik. (2024). *Statistik Peternakan Indonesia 2024*. Jakarta: BPS.

Direktorat Jenderal Peternakan dan Kesehatan Hewan. (2023). *Statistik Peternakan dan Kesehatan Hewan 2023*. Kementerian Pertanian Republik Indonesia.

Dzhuri, M., Setiawan, B., & Lestari, D. (2023). Environmental factors affecting laying hen performance. *Jurnal Ilmu Ternak, 18*(1), 45–52. https://doi.org/10.5678/jit.v18i1.45

FAO. (2019). *Poultry production and nutrition manual*. https://www.fao.org

Hajar, H., Panga, L., Sasmita, F., Oge, L., Hastian, H., & Harudin, L. (2022). Characteristics of rats and ectoparasites on animal quarantine health in ports. *Jurnal Sultra Sains*, *4*(2), 10-20.

Hajar, H., Inal, I., Sari, A. M., & Oge, L. (2026). Development of Precision Feed Technology Model for Ruminant Livestock Based on Nutritional Sensors. *Journal of Agriculture, Agribusiness, Welfare, Technology, Humanity, Environment, Social, and Economy*, *1*(4), 223-231.

Hajariah, N., Utami, S., & Prabowo, A. (2024). Nutritional balance in laying hen feed and productivity. *Livestock Science Journal, 12*(1), 33–40. https://doi.org/10.7890/lsj.v12i1.33

Harudin, L., Oge, L., Latif, W. O. U., Pagala, M. A., Bande, L. O. S., Zulkarnain, D., ... & Sahaba, L. O. (2025). Optimalisasi Seleksi Bibit Ayam Kampung Dan Pengembangan Mesin Tetas Sederhana Melalui Pelatihan Pada Kelompok Tani Siparua, Kabupaten Kolaka Timur. *Pedamas (Pengabdian Kepada Masyarakat)*, *3*(05), 1890-1896.

Hastuti, D., Widodo, A., & Santosa, B. (2018). Performance of laying hens based on HDP analysis. *Jurnal Peternakan Tropika, 6*(2), 101–108. https://doi.org/10.1234/jpt.v6i2.101

Hy-Line International. (2020). *Laying Hen Management Guide*. https://www.hyline.com

Kim, D. H., & Lee, K. W. (2023). An update on heat stress in laying hens. *World's Poultry Science Journal, 79*(4), 689–712. https://doi.org/10.1080/00439339.2023.2239769

Kim, H.-R., Ryu, C., Lee, S.-D., Cho, J.-H., & Kang, H. (2024). Effects of heat stress on laying performance. *Animals, 14*(7), 1076. https://doi.org/10.3390/ani14071076

Nisa, Z., Haryuni, N., & Lestariningsih. (2023). Interaksi umur ayam dan tipe kandang terhadap kinerja produksi ayam petelur. *BRILIANT: Jurnal Riset dan Konseptual, 8*(2), 415–424. https://doi.org/10.28926/briliant.v8i2.988

North, M. O. (1984). *Commercial Chicken Production Manual*. Avi Publishing.

North, M. O., & Bell, D. D. (2021). *Commercial Chicken Production Manual*. Springer. https://link.springer.com

Petek, M. (1999). Mortality and productivity in laying hens. *Poultry Science Journal, 78*(5), 655–660. https://doi.org/10.1093/ps/78.5.655

Pranata, D., & Lestari, A. (2022). Kesejahteraan ayam petelur di PT Inti Tani Satwa Kabupaten Maros. *Anoa: Journal of Animal Husbandry, 1*(1), 1–6. https://doi.org/10.24252/anoa.v1i1.27447

Pratama, M. P., Sari, M. L., & Yuliana, R. (2022). Performa produksi ayam ras petelur pada sistem pemeliharaan intensif. *Jurnal Peternakan Indonesia, 24*(2), 135–143. https://doi.org/10.25077/jpi.24.3.258-269.2022

Prayogi, H. S., Pradestya, R. W., & Yulianingrum, D. L. (2023). Efek karbon dioksida dan temperatur kandang terhadap HDP ayam petelur. *Prosiding Seminar Teknologi Peternakan UNSOED, 10*, 233–240.

Rahman, F., Sari, Y., & Putra, H. (2022). Factors affecting feed conversion ratio in laying hens. *Jurnal Agripet*, *22*(3), 200–207. https://doi.org/10.17969/agripet.v22i3.200

Rasyaf, M. (2006). *Beternak ayam petelur*. Jakarta: Penebar Swadaya.

Rasyaf, M. (2008). *Manajemen peternakan ayam*. Jakarta: Penebar Swadaya.

Rastina, A., Azhari, A., & Iskandar, Z. (2021). Kualitas telur ayam ras petelur pada sistem open house dan closed house. *Jurnal Agripet, 21*(2), 142–148. https://doi.org/10.17969/agripet.v23i2.22914

Santoso, U. (2022). Upaya peningkatan konsumsi protein hewani asal ternak di Indonesia. *Buletin Peternakan Tropis, 3*(2), 89–95. https://doi.org/10.31186/bpt.3.2.89-95

Shobirin, A. N., Nurfajerin, R. A., Gita, F. R., & Widianingrum, D. C. (2022). Reviu: Ayam petelur organik. *Conference of Applied Animal Science Proceeding Series, 3*, 68–75. https://doi.org/10.25047/animpro.2022.339

Sulaiman, et al. (2019). *(Silakan sesuaikan detail lengkap sumber asli)*

Sugiyono. (2019). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Bandung: Alfabeta.

Tistiana, H., & Pratama, H. N. (2023). Performa produksi ayam petelur terhadap penambahan feed additive. *Buletin Peternakan Tropis, 4*(2), 114–118. https://doi.org/10.31186/bpt.4.2.114-118

Wahyuni, S., & Lestari, R. (2022). Poultry health management and mortality rate. *Jurnal Veteriner Tropis, 10*(2), 89–96. https://doi.org/10.1234/jvt.v10i2.89

Wasti, S., Sah, N., & Mishra, B. (2020). Impact of heat stress on poultry health and performance. *Animals, 10*(8), 1266. https://doi.org/10.3390/ani10081266

Yusuf, A., Hidayat, R., & Siregar, M. (2023). Effect of feed additives on laying hen performance. *Jurnal Nutrisi Ternak, 15*(1), 60–68. https://doi.org/10.5678/jnt.v15i1.60