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Optimization of the Cage Environment To Improve Broiler Health

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Abstract
Background. Pen environment management is a key factor in maintaining broiler health and performance, especially in closed *house systems*.
Aims. This study aims to describe the application of cage environment optimization to the health and productivity of broiler chickens in the Cucu Nurlela Farm Cage as a partner of PT ASPM Paranjê in Majalengka Regency, West Java.
Method. The method used is descriptive research with a participatory observational approach through Field Work Practice (PKL) activities, which involves direct observation and active involvement in the entire broiler chicken rearing cycle. The aspects observed included temperature and humidity regulation, ventilation management, ammonia control, litter management, biosecurity implementation, chicken health management, and production success indicators. The observation results show that the cage temperature and humidity are within the optimal range for the chickens' age, with a relative humidity of 50–70% and effective ventilation to suppress ammonia accumulation.
Results. Implementing zoning-based biosecurity, daily health observations, isolating sick chickens, and providing vitamins, medicines, and herbal remedies can help maintain the flock's overall health. Production performance indicators show a mortality rate of 2.78% and *a Feed Conversion Ratio (FCR) of 1.47, reflecting feed efficiency and successful cage management*.
Conclusion. Optimizing the cage environment in the closed-house system plays a significant role in maintaining broiler chicken *health*, reducing mortality, and increasing production efficiency.

Keywords: broiler chickens, *closed house*, cage environment, chicken health, mortality, FCR

INTRODUCTION

The broiler farming industry in Indonesia is experiencing rapid growth, in line with the increasing demand for affordable, nutritious animal protein. Chicken meat is one of the main food commodities because its price is relatively stable, it is easy to obtain, and it can be processed into various consumer products. The increase in demand is driving the growth of

broiler farming businesses, both on a small, medium, and large scale, which is largely supported by a partnership system between core companies and plasma breeders.

One form of partnership that is growing rapidly is the partnership between broiler chickens and closed-cage systems (Closed Houses). The system is designed to optimally control environmental factors, such as temperature, humidity, ventilation, and air quality, in the cage, thereby improving chicken growth performance and reducing disease risk. Good management of the enclosure environment is a key factor in the success of the Closed House system, because inappropriate microclimate conditions can cause stress, reduced feed consumption, increased mortality, and reduced broiler productivity.

PT AS Putra Perkasa Makmur, through the Paranjê brand, is one of the companies that implements a cage-based broiler chicken partnership system, *Closed House*. This company provides production facilities, technical assistance, and the application of digital technology in broiler maintenance management. With this system, partner farmers are expected to increase production efficiency and maintain optimal chicken health. One of PT ASPM Paranjê's partners who implements this system is Nurlela's Cucu Cage, located in Majalengka Regency, West Java.

The health of broilers is greatly influenced by the environmental conditions of the coop, especially in the early phases of rearing (*Brooding*) until the harvest. Factors such as unstable temperatures, excessive humidity, poor litter quality, suboptimal ventilation, and high ammonia levels can trigger health problems, including respiratory diseases, digestive disorders, and heat and cold stress. Therefore, optimizing the cage environment is a strategic step in maintaining chicken health, improving growth performance, and reducing mortality rates.

Through Field Work Practice (PKL) activities at the Cucu Nurlela Cage as a partner of PT ASPM Paranjê, students have the opportunity to observe and be directly involved in the implementation of cage environmental management in the *Closed House*. These activities include cage preparation, temperature and humidity control, ventilation management, litter management, biosecurity implementation, and overall chicken health. This experience is an important way for students to integrate the theory they gain in college with real-world practice in the field.

Research on the environmental management of broiler chicken coops has focused on closed-cage systems (closed houses), which are known to control temperature, humidity, ventilation, and air quality more stably than open cages. Various studies show that regulating temperature and humidity appropriate to the age of chickens plays an important role in reducing

heat stress, increasing feed intake, and maintaining broiler growth performance. The optimal temperature during the brooding phase ranges from 32–34°C and is gradually lowered to the thermoneutral zone in the finisher phase to maintain production efficiency. In addition to temperature and humidity, cage air quality, particularly ammonia gas concentrations, is a major concern in modern poultry research. Previous research has reported that ammonia accumulation from wet litter and suboptimal ventilation can cause respiratory distress, reduce feed efficiency, and increase the incidence of *footpad dermatitis*. Therefore, various ammonia control strategies, such as litter management, minimum ventilation, and the use of ammonia-absorbing materials, have been studied extensively separately.

On the other hand, the application of biosecurity in broiler farms has also been shown to reduce disease incidence and antibiotic use. Previous studies have emphasized the importance of human traffic control, equipment sanitation, and cage zoning systems in maintaining floc health. However, most biosecurity research still focuses on technical or comparative aspects between cage systems, without comprehensively linking them to cage environmental parameters and production performance indicators.

Research on indicators of production success, such as mortality and Feed Conversion Ratio (FCR), has also been widely reported. Cage *Closed House* generally reduces mortality to below 3–5% and achieves a more efficient FCR than open or semi-open cages. However, most studies are experimental or based on secondary data, while descriptive studies grounded in integrated field practices remain relatively limited.

LITERATURE REVIEW

Temperature and Humidity.

The optimal temperature for chicken farming. Based on the latest research, the optimal temperature for broilers depends on age and the body's ability to regulate heat. reports that in the Ferreira et al. (2024) *Brooding* (0–14 days), the ideal temperature is in the range of 32–34°C, then gradually lowered by 2–3°C per week until it reaches 22–24°C at 4–5 weeks of age so that growth is not stunted and mortality rates remain low. The forecasted need for a balance between temperature and humidity underscores the importance of balancing ventilation and humidity. When the outside air is humid, ventilation that is too open can increase the humidity in the cage, while a controlled setting can maintain ideal conditions for chickens: 22–28°C with 50–70% humidity (Goel, 2021)

Ammonia.

Excessive ammonia concentrations have been shown to negatively impact the health and performance of broiler chickens. Research in the Journal of Tropical Livestock shows that high levels of ammonia can cause respiratory tract irritation, decrease feed efficiency, and trigger foot pad dermatitis. Nugraha & Yulianti (2023), Amran et al. (2025). This impact can reduce feed conversion efficiency (FCR). In addition, the Journal of Animal Science (Uniga) reported that poor litter management led to a significant increase in ammonia levels and stress in chickens, resulting in reduced growth performance and carcass quality. Therefore, it is important to ensure good ventilation, regularly replace litter, and use ammonia-absorbing materials such as zeolite to maintain air quality and chicken welfare.

Biosecurity

Comparative research shows that broiler farms with strict biosecurity, including access control, routine disinfection, management of people and vehicle traffic, and sanitation of cages and equipment, have lower disease incidence and a smaller need for antibiotic use than farms with loose biosecurity. Therefore, the implementation of footbaths, disinfection at each entrance, and zone systems (red-yellow-green) is not just an administrative procedure, but an essential part of a modern and effective forage health strategy (bioexclusion & biomanagement). (Miles et al., 2004)

Handling Sick Chickens

According to the isolation of sick chickens in broiler chicken coop management is an important part of internal biosecurity because separating infected individuals from healthy populations can reduce the spread of pathogens through direct or indirect contact, thereby preventing the transmission of infectious diseases within the flock and lowering the risk of outbreaks that can lead to increased morbidity and mortality; Isolation measures also allow for more focused and effective infection control and minimize negative economic impacts on broiler production while improving the overall health of the population as part of the biosecurity protocols recommended in modern poultry production. Vougat Ngom et al. (2025)

Although much research has been conducted on the environmental management of broiler chicken coops, there remain research gaps. First, most previous studies have addressed the environmental factors of the cage in a systematic manner Separate, such as temperature,

humidity, or ammonia, without examining the relationship between these factors in a single integrated management system. Second, research that integrates cage environment, biosecurity, and chicken health management in a single comprehensive study remains limited, especially in the broiler farm partnership system at the partner farmer level. In fact, partnership systems have different management characteristics and operational challenges than full-scale industrial farms. Third, studies based on Field Experience (PKL) that document cage management practices in Closed House in detail and are linked to production performance indicators are still rarely reported in the scientific literature. As a result, there are few references describing the actual implementation of cage environmental management standards among partner breeders in Indonesia. Based on these gaps, this study is here to fill the gap by presenting an integrated study on the optimization of the cage environment, *Closed House,* based on field practices and their impact on the health and performance of broiler chickens, so that it can be an applicable reference for the development of sustainable broiler chicken farm management.

Cage Density

The appropriate cage density greatly affects the growth performance, health, and welfare of broiler chickens. Aviagen states that cage density must be adjusted to the chicken's age and body weight, as too high a density can cause stress, reduce feed consumption, and increase the risk of health problems. Aviagen (2018)

METHODS

Descriptive research by being actively involved in the entire series of activities that are part of the broiler chicken maintenance cycle at the Cucu Nurlela Farm Cage. These activities include adjusting feeding to the age and growth stage of chickens, setting feeding schedules, and controlling feed quality so it remains in good condition and suitable for consumption. Drinking water management, including cleaning drinking areas and checking the function of water channels to ensure the availability of clean and hygienic water for chickens at all times, sanitation and biosecurity activities for chickens, such as cleaning of cage areas, spraying disinfectants, regulating air circulation, replacing and leveling litter (husks), as well as pest and disease vector control. This activity is carried out regularly to maintain optimal conditions in the cage and minimize the risk of disease spread. Students also learn to apply standard entry procedures, such as wearing special footwear, washing hands, and implementing restrictions on the movement of people and equipment.

DISCUSSION

Temperature and Humidity

Measurements of temperature and relative humidity in Cucu Nurlela's cage are carried out at least three times a day, namely in the morning, afternoon, and night as part of environmental management aimed at maintaining the stability of the cage microclimate conditions. This temperature regulation is important to help the chickens stay comfortable and avoid stress, especially during the brooding phase, when chicks' thermoregulatory ability is still low.

Table 1. Average Temperature

Age (Days)	Temperature (^{o}C)
1	33
2	32
3-4	31
5-7	30
8-11	29
12-14	28
15-17	28
18-21	27
22-25	25
26-29	24
30-31	23

Source: Nurlela's Grandchild Cage

After the initial growth phase, adult broiler chickens are in the thermodynamic zone of 18–24°C, where feed efficiency and growth performance are optimal. When the temperature exceeds 30°C, there is a decrease in body weight by up to 20–30%, accompanied by increased heat stress and electrolyte balance disorders (Goel, 2021)

The average humidity in Cucu Nurlela's cage is 50–70%, which is still within the ideal range for broilers to maintain body heat balance. At this humidity level, it supports heat evaporation through breathing and skin, helping chickens maintain their body temperature optimally. ,(Hadyanto & Amrullah, 2022).

However, during the rainy season, humidity can increase by up to 75%. This condition can cause hidden heat stress because humid air inhibits the evaporation of the chicken's body heat. To overcome this, one effective step is to narrow the intake or outside air intake hole. According to , regulating air circulation by reducing wind openings when humidity is high can

help maintain the stability of the cage's microclimate, so it is not too humid but still has sufficient air circulation. (Ferreira et al., 2024)

Ammonia

The measurement of ammonia levels in Cucu Nurlela's cage was conducted manually using the five human senses, including observing strong odors and litter conditions. Strong odors indicate ammonia accumulation from wet litter and suboptimal ventilation. According to the Lampung State Polytechnic, increased ammonia levels are often caused by high temperatures and humidity in the cage, which accelerates the decomposition of chicken manure. Fattah et al. (2023)

Overcoming ammonia litter can be achieved by stirring the Cucu Nurlela cage, which is routinely done every 2 days and plays an important role in maintaining the environmental conditions of the broiler chicken coop. With periodic stirring of the litter, we are also required to use boots and step on the husk until the material is advanced, like pushing the husk. Moisture from drinking water, excrement, or environmental sources can be broken down, keeping the litter loose and preventing clumping. However, if it is too humid, it is still sown again with new husks because it cannot be turned over; this helps prevent the accumulation of ammonia and the growth of pathogenic microbes, which, if not controlled, can interfere with air quality and the health of the chicken's respiratory tract (e.g., irritation, infection). Studies show that the right combination of litter density and active litter management (aeration/stirring) can significantly lower ammonia emissions (Cohuo-Colli et al., 2018).

Biosecurity Management in Broiler Farms

Cucu Nurlela's cage The implementation of a three-zone system of red zones, yellow zones, and green zones can increase the effectiveness of biosecurity by controlling the flow of people, vehicles, and equipment into the cage. The red zone is defined as the outdoor area or the area at high risk of carrying the pathogen (e.g. parking areas, goods reception), the yellow zone as a transition area for sterilization (e.g. foot/shoe washing, disinfection, changing of clothes), and the green zone as a production area where only people/staff who have been sterilized are allowed to enter. Thus, the zoning system helps ensure that only personnel and equipment that have undergone sanitation procedures are allowed to enter the enclosure, thereby significantly reducing the risk of disease agents entering.

Animal Health

Observation of Sick Chickens

Routine observation of broiler chickens aims to detect early signs of health problems that can affect welfare and production. Observation is conducted at least twice a day so that abnormal symptoms can be detected immediately and treatment can begin as early as possible. Some of the common symptoms that exist in Cucu Nurlela's cage and their indications include:

Gasping for breath (*Gasping*): The chicken appears with its beak open constantly, breathing rapidly or panting. These symptoms often result from poor air quality, especially high levels of ammonia or other harmful gases, or from respiratory infections. Exposure to high temperatures or heat stress can also trigger "panting" in broilers as a way to regulate body temperature (Miles et al., 2004).

Watery/irritated eyes: The chicken's eyes appear watery, red, or swollen. It can be triggered by dust, litter particles, ammonia vapors, or irritants from the enclosure environment. Ammonia and poor air quality can damage the mucosa of the eyes and upper respiratory tract.

Lame walking/unstable walking: Chickens show paralysis, limping, wobbly or irregular walking. This can be caused by wet/dirty litter conditions that cause the foot to become infected or injured (e.g. foot dermatitis), or musculoskeletal problems related to litter moisture and cage management (Miles et al., 2004).

Dull / non-fluffy fur: Feathers that appear to be concave, dull, and untidy are often an indicator that the chicken is in a stressful state, is uncomfortable, or that its body is weakening. This condition can be caused by infection, environmental stress, insufficient feed or water intake, or cage discomfort (Aditya Eka Wijaya, 2025).

Observation does not rely on a single symptom; it must consider a combination of symptoms and changes in the cage environment (air quality, litter humidity, ventilation, and sanitation). For example, shortness of breath and watery eyes can indicate poor air quality, so the cage's ventilation or sanitation needs to be adjusted.

Handling Sick Chickens: Isolation and Therapy

The handling of sick chickens in Cucu Nurlela's cage should be done immediately through the main step, namely isolation and the administration of vitamins/drugs, so that the disease does not spread to healthy chickens and the condition of sick livestock can be improved. When a chicken with sick symptoms is found in Cucu Nurlela's cage, the first recommended step is to move the sick chicken to a separate cage or quarantine (isolation) room from healthy

chickens. This practice is a core part of the biosecurity program, separating sick chickens from healthy ones that can prevent the spread of pathogens through air, direct contact, equipment, or husks/litter. Officers who handle sick chickens should not directly handle healthy chickens without a sanitation process first, including washing hands, changing footwear or clothing, and disinfecting equipment, to minimize cross-contamination.

Vitamin and Drug Administration

Providing drugs and vitamins in Cucu Nurlela's cage is one of the main pillars of chicken health management (internal biosecurity). All standard operating procedures (SOPs) are carried out following strict guidelines provided by PT Paranje. This is done to ensure that each individual chicken gets additional nutritional intake and targeted medical protection according to its growth phase.

Technically, the process of administering vitamins and medicines is carried out simultaneously at 08.00 am. This time is considered optimal because the temperature of the drinking water is still stable, and the chicken's metabolism is active, allowing it to absorb these substances. Cage officers are obliged to ensure the cleanliness of drinking water containers before mixing is carried out, to prevent cross-contamination or degradation of the drug's active substances by dirt residue.

In addition to timeliness, treatment effectiveness also depends on the accuracy of the dosage, adjusted to the volume of water or the weight of feed. Monitoring is conducted daily to assess the chicken's response to vitamin administration, especially during critical phases such as DOC or when extreme weather changes occur. This medical program is generally divided into two main categories: managing stress/infection, and maintaining long-term productivity through digestive health.

Details about the type of product, specific function, and dosage applied can be seen in the following description:

Table 2. Vitamins and Medicines

Medication	Indications	Dosage
Fresh Chick	Increase DOC immunity, reduce post-DOC stress, and help the chicken's initial adaptation in the cage.	45 grams/L of drinking water, administered for 3–5 days of initial maintenance.

Medication	Indications	Dosage
Doxy Forte	Addresses respiratory and digestive bacterial infections caused by *Mycoplasma, E. coli,* and other sensitive bacteria.	24 grams/L of drinking water for 3–5 consecutive days.
Biopros	Probiotics to maintain the balance of intestinal microflora, improve feed digestibility, and support chicken growth.	25 grams/L of drinking water or 500 grams/ton of feed, given regularly.
Proxy	Overcoming indigestion such as diarrhea and helping to improve gastrointestinal health.	20 grams/L of drinking water or 500 grams/ton of feed, given regularly.
Mix Master	Multivitamin and mineral supplements to increase stamina, growth, and endurance of chickens.	25 grams/L of drinking water or 500 grams/ton of feed, given regularly.

Source: ASPM Paranje

Herbal Medicine Dispensing

In Cucu Nurlela's cage, herbal medicine is administered from 12-day-old chickens through harvest, every two days. Herbal medicine made from turmeric is given to maintain the health of chickens, increase immunity, and support growth performance during the maintenance period. Administering herbal medicine at that age is considered appropriate because the chickens' digestive systems have begun to develop well and can accommodate additional herbal ingredients.

Several local studies show that administering herbal medicine to broiler chickens can have a positive impact. reported that the administration of herbal medicine made from ginger, turmeric, and temulawak was able to improve performance and maintain the health of the internal organs of broiler chickens. In addition, it states that traditional herbal medicine added to drinking water can help boost immunity and reduce stress in chickens. Mustika et al. (2022) (Firdaus et al., 2017)

Other research also shows that regular administration of herbal ingredients does not reduce feed intake and helps maintain chicken health during the growth phase. Thus, the practice of giving herbal medicine in Cucu Nurlela's cage is in accordance with the results of the research and can be an alternative Gea et al. (2022) *A natural feed additive* to support the health and productivity of broiler chickens.

End of Maintenance (Pre-Harvest)

Enclosure Hygiene

Cage cleanliness is the main foundation for maintaining the quality of the broiler chicken maintenance environment. A clean, controlled environment not only supports chickens' comfort but also directly helps suppress diseases linked to litter quality and cage air. In Cucu Nurlela's cage, one of the routine activities that is the focus is cleaning wet litter, especially in critical areas such as around drinking places. Wet litter is easy to ferment and increases ammonia levels, creating ideal conditions for bacterial growth and causing health problems such as footpad dermatitis and respiratory tract irritation. Research shows that poorly managed litter is associated with reduced broiler performance and increased incidence of foot disease (Meluzzi et al., 2008).

In addition to wet litter management, another aspect that is no less important is dust control, especially in the growth phase when chickens are more active, and body weight increases. Cage dust is a mixture of feed particles, dry litter, and fluff that, if left unchecked, can disrupt air quality and increase the risk of respiratory distress. High exposure to dust has been shown to cause eye irritation, respiratory stress, and, in the long run, reduce chicken productivity (Nääs et al., 2010). Therefore, keeping the litter dry and loose, ensuring optimal ventilation, and reducing dust sources are important strategies to maintain chicken health and production efficiency.

Chicken Density Control

Cage density is an important aspect of broiler chicken management, especially during the starter phase or Brooding (ages 0–14 days). The appropriate cage density plays a role in maintaining chickens' comfort, supporting the stability of DOC's body temperature, and affecting the quality of the cage environment. In the early phase of maintenance, the cage density is generally set relatively high to help chickens retain body heat, but it must still remain within safe limits to avoid stress or health problems.

Based on observations at Cucu Nurlela Farm, broiler chicken rearing is carried out in a two-story cage with a total population of 6,000 chickens, with each floor accommodating around 3,000 chickens. At the beginning of maintenance, the area of the *Brooding* Per floor is about 100 m², so the density of the cage at the age of 0–2 days reaches approximately 30

heads/m². As chickens age, the *Brooding Area was gradually expanded to about 180 m² per floor at the age of 13–14 days, which reduced cage density* to about 17 heads/m².

Table 3. Cage Density

Age (Day)	Broding Area Per Floor (m²)	Density per Floor (tail/m²)
1. 0-2	2. 100	3. 0,3
4. 3-4	5. 110	6. 0,36
7. 5-6	8. 120	9. 0,40
10. 7-8	11. 135	12. 0,45
13. 9-10	14. 150	15. 0,50
16. 11-12	17. 165	18. 0,55
19. 13-14	20. 180	21. 0,60

Source: ASPM Paranje

A gradual decrease in cage density during the starter phase is implemented to accommodate the increased space requirements as body weight and activity increase. Lower densities support better air circulation, reduce the buildup of harmful gases such as ammonia, and minimize the risk of stress and competition between chickens. With the implementation of controlled cage-density management, broiler growth is expected to proceed optimally until the next maintenance phase. Gradual adjustment of cage density during the brooding phase is an important part of broiler chicken management. The density of the enclosure at the time Brooding presented is shown in the following table.

Broiler Chicken Harvesting Procedure

Broiler chicken harvesting procedures are carried out in a planned, systematic manner to minimize stress on chickens and maintain carcass quality. Improper handling during harvest can lead to discoloration of the carcass skin, increased bruising, and the appearance of blue back syndrome or bluish bruises, which generally result from overly harsh treatment during catching and moving chickens.

Harvesting at the maintenance site is carried out in the afternoon and continues into the night, around 18.00–22.00. This time was chosen because the ambient temperature is relatively lower, which is below 25°C, so that the chicken becomes calmer and the risk of heat stress can be minimized. In addition, chicken activity at night tends to decrease, making the catching process easier and safer.

During the harvest process, the cage lighting is dimmed to keep the chickens calm and reduce excessive movement. This lighting setting aims to reduce chickens' panic, which can lead to injury or death during harvest. By implementing proper harvest procedures, the harvest mortality rate can be reduced, and the physical quality of broiler chickens can be maintained until the marketing stage.

During catching and harvesting, broiler chickens should be handled carefully and kept in favorable environmental conditions to reduce stress and damage to the carcass. Aviagen emphasizes that harvesting at lower ambient temperatures and with minimal lighting can help keep chickens calm, reduce bruises, and maintain optimal carcass quality. This shows that selecting appropriate harvest times and techniques is an important part of broiler chicken production management. Aviagen (2018)

Harvest Preparation

Preparation for harvesting broiler chickens at Nurlela's Cucu Cage is carried out from one day before harvest (D-1) to ensure that the chickens are in a physiological condition that is ready to be harvested and minimize stress and decrease in carcass quality. The preparation stage includes fasting for approximately 5 hours before harvest, but drinking water is still provided. Feed fasting aims to reduce the contents of the digestive tract of chickens, thereby reducing the risk of fecal contamination during catching and transportation. According to , setting the right feed fasting time while still providing drinking water is an important step in maintaining the cleanliness and quality of broiler chicken carcasses. (Aviagen, 2018)

In addition to feed arrangements, harvest preparation includes checking the cage's condition to ensure a clean environment, ensuring litter or husks are dry, and ensuring the cage area is safe for the harvesting process. When catching chickens, the coop lighting is dimmed to keep them calm and reduce excessive activity. stated that low lighting during the harvest process can reduce the level of stress and risk of injury to chickens, so that the catching process can take place more effectively and safely, and the quality of broiler chickens is maintained. (Aviagen, 2018)

Catching Chicken

The capture of broiler chickens in Nurlela's Cucu Cage is carried out by applying the principle of animal welfare (*animal welfare*) to minimize stress and risk of injury to chickens. The fishing method consists of two techniques: manual catching by holding one

chicken with both hands, and the inverted catcher method, which involves holding two to three chickens per grasp and carefully holding both legs. The catching process starts at the end of the cage and is done slowly to avoid the chickens' panic, which can trigger stress and injury.

During the arrest process, several prohibitions must be followed by officers. Officers are not allowed to catch chickens by pulling on their wings, as this can cause dislocation or fractures. Additionally, chickens should not be chased for too long distances, as excessive chases can increase stress and fatigue. The number of chickens raised is also limited by the officer's ability to handle them, to prevent injuries to both the chickens and the catching officer.

After the chickens are successfully caught, their legs are tied using a rope approximately 20–30 cm long, with one tie containing a maximum of five chickens. Loose ties aim to avoid injuries to leg tissues and to prevent respiratory distress from excessive pressure. Proper techniques for catching and handling chickens before slaughter greatly affect their welfare, carcass quality, and mortality during the pre-slaughter process. Therefore, using the correct fishing method is an important part of maintaining the quality of broiler chicken production. Aviagen (2018)

Indicators of Success in Optimizing the Cage Environment Mortality

One of the main indicators of the success of environmental management in broiler chicken coops is the mortality rate during the rearing period. Mortality describes the extent to which the environment, management, and maintenance systems support the survival of chickens.

Mortality Formula:

$$\text{Mortalities (\%)} = \text{x } 100\frac{Jumlah\ Mati}{Total\ Populasi\ Awal}$$

$$\text{Mortality} = \text{x } 100 = 2.78\%\frac{167}{6000}$$

The mortality rate of 2.78% indicates that the cage environment has been well optimized, including ventilation, temperature, humidity, population density, and feeding and watering systems. A mortality rate below 3% indicates the effectiveness of maintenance management and the implementation of biosecurity.

Several previous studies have shown that the ideal mortality rate for broiler chickens ranges from 2–5%, depending on the cage system and environmental conditions. According to

the Nusantara Animal Husbandry Journal, closed houses can reduce mortality to below 3% because they have automatic ventilation and temperature regulation. Nuryati (2019)

"The success of broiler chicken production can be measured through mortality, feed consumption, and final body weight. Closed cages provide a stable environment so as to reduce mortality rates" (Nuryati, 2019).

Research in the Indonesian Journal of Animal Husbandry confirms that implementing animal welfare measures, including lighting, temperature, and density regulation, can maintain mortality at 2–4%. Low mortality is also directly related to feed efficiency and more uniform harvest weight. Hariono et al. (2024)

Thus, the mortality rate of 2.78% observed during the implementation of street vendors indicates that the cage environmental system has been managed efficiently, with stable temperature and ventilation, population density within standards, and good biosecurity.

FCR (*Feed Conversion Ratio*)

In the Cucu Nurlela cage, pt aspm harvested 5,833 from 6,000 chicken populations that were kept for 31 days with an average weight of 2.03 kg/head. During the maintenance period, the feed spent was 17,450 kg. to calculate FCR with the formula:

$$\text{FCR} = \frac{Total\ Pakan}{Total\ Bobot\ Pakan}$$

Known Results :

Total feed consumed: 17,450 kg

Number of chickens: 5,833

Average weight per chicken: 2.03 kg

Asked: What is the value of FCR?

Answer :

Calculate the total weight of the chicken

Total Weight = 5,833 x 2.03 = 11,840 kg

FCR = = $1.47\frac{17,450}{11,840}$

Feed Conversion Ratio (FCR): 1.47

The FCR (Feed Conversion Ratio) of 1.47 in Cucu Nurlela's cage indicates excellent feed efficiency. This means that each 1-kg increase in chicken body weight requires only 1.47 kg of feed. These results are efficient, especially when compared with the FCR values from recent studies in Indonesia.

Risna et al. (2024) A study on the performance of broiler chickens in Bireuen-Aceh Regency reported an average FCR of 1.55. Other data also shows that the Closed House system in Jember is able to reduce FCR to 1.48, which is significantly better than the semi-automatic system (1.57). Gojali et al. (2024)

The 1.47 score achieved by Cucu Nurlela's home is below the national average and reflects a very efficient performance. This high efficiency is the result of implementing precision feed management, optimal ventilation and temperature regulation, and strict supervision of chicken health.

The novelty of this research lies in a descriptive-integrated approach grounded in field practice that holistically examines the optimization of the broiler chicken coop environment, not only in part. This research not only discusses one aspect of the cage environment but also integrates temperature, humidity, ventilation, ammonia control, litter management, zoning, biosecurity implementation, and chicken health management into a closed-house *maintenance system*.

In addition, this study presents real empirical data from Field Work Practice (PKL) activities that are rarely used as the main source in scientific publications, especially in the context of broiler farming partnerships in Indonesia. The integration of chicken health observations, handling of sick chickens, the use of vitamins and herbal remedies, and the evaluation of production indicators (mortality and FCR) provides a comprehensive picture of the effectiveness of cage environmental management under actual operational conditions.

Another novelty is the direct association between optimizing the cage environment and measurable indicators of production success, namely a mortality rate of 2.78% and an FCR of 1.47, so that this study is not only narrative-descriptive but also shows practical implications for the production efficiency of modern broiler chickens.

CONCLUSION

Fieldwork practices (PKL) carried out at broiler-farming partners in PT Paranje, Majalengka Regency, provide a comprehensive understanding of broiler cage maintenance and management. Based on observation activities and field practice, it can be concluded that:

1. Pen environment management, such as ventilation, temperature, humidity, and litter quality, plays an important role in maintaining chicken comfort and preventing ammonia-related respiratory diseases.

2. Chicken health can be maintained through daily observation, isolation of sick chickens, administration of vitamins, vaccinations (ND and Gumboro), and the use of herbal medicine as immunity support. This effort has been shown to reduce stress levels and mortality in chickens.
3. Controlling chicken density is a key factor in production performance. The method of opening partitions, widening the area, adding feeders-drinkers, and moving part of the population can maintain an ideal density of 10–12 heads/m², ensuring weight homogeneity (CV < 10%) and FCR in the range of 1.6–1.8.
4. The harvesting procedure carried out with soft-handling techniques, harvest time at low temperatures, good internal transportation, and final inspection is able to maintain the quality of the carcass, reduce the number of bruises, maintain pH of 5.8–6.2, and achieve a live yield of 98–99% according to SNI 7478:2008 standards.

Overall, the series of street vendor activities provides a clear picture that structured, consistent, and animal-welfare-based management greatly determines the success of modern broiler chicken production.

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