

Analysis of Local Poultry Productivity in Extensive and Semi-Intensive Maintenance Systems

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Abstract : *The productivity of local poultry livestock plays an important role in providing animal protein sources for the community, especially in the people's livestock system. Local poultry such as free-range chickens have good adaptability to the environment, are resistant to disease, and are able to utilize local feed. However, their productivity is still relatively low compared to purebred poultry, mainly due to the traditional maintenance system. Extensive rearing systems generally rely on natural feed in the surrounding environment so that egg growth and production are less than optimal, while semi-intensive systems provide additional feed and more controlled maintenance management. This study aims to analyze the productivity of local poultry in extensive and semi-intensive maintenance systems. The method used is a survey through direct observation and interviews with farmers. The observed parameters included body weight gain, egg production, mortality rate, and feed use efficiency. The data were analyzed descriptively to compare the productivity of the two maintenance systems. The results showed that the semi-intensive rearing system provided better productivity than the extensive system, as indicated by higher body weight gain, more stable egg production, and lower mortality rate. This is due to better feed management and animal health monitoring. Thus, a semi-intensive rearing system can be an effective alternative to increase the productivity of local poultry on people's farms.*

Keywords: *local poultry, productivity, maintenance system, extensive, semi-intensive.*

INTRODUCTION

Local poultry is one of the genetic resources of livestock that has an important role in people's livestock systems, especially in developing countries including Indonesia. In the context of smallholder farming, local poultry functions not only as a source of food, but also as a household economic asset, a life saver, an additional source of income, as well as part of the socio-cultural system of rural communities. The existence of local poultry such as free-range chickens is important because it is able to provide animal protein in the form of meat and eggs with a relatively simple maintenance scale. This is in line with the view of Alders and Pym (2009) who affirm that village poultry or local poultry still have a major contribution to food security, poverty reduction, and the sustainability of the livelihoods of small communities.

In the food system of rural communities, local poultry has the advantage of being able to be raised with limited capital, does not always require high technology, and is able to utilize feed resources available in the surrounding environment. Kampung chickens, as one of the most widely known local poultry breeds in Indonesia, have good adaptability to tropical environments, simple maintenance conditions, and variations in feed availability. This adaptive advantage is one of the reasons why local poultry is still maintained by small breeders despite the rapid development of commercial breed poultry. Padhi (2016) explained that local chickens or native chickens have strategic value because they are able to adapt to local environmental conditions,

are resistant to certain environmental pressures, and play an important role in the rural household economy.

In addition to the adaptation aspect, local poultry also has a fairly high economic value because the products produced, especially meat and eggs, have different characteristics from commercial purebred poultry. Native chicken meat is generally considered to have a distinctive taste, denser texture, and relatively high consumer preference value. This condition causes free-range chickens to still have their own market, both for household consumption, traditional culinary businesses, and local food needs. In the Indonesian context, the development of local chickens is also related to efforts to preserve germplasma, diversify animal protein sources, and increase the income of smallholder farmers. Kartika *et al.* (2025) show that local chickens from crossbreeds, such as IPB D1, were developed to overcome the weaknesses of local chicken growth that is relatively slow, while maintaining the advantages of local chicken characteristics.

Despite having great potential, the productivity of local poultry is still relatively low compared to commercial poultry. The low productivity can be seen from slow weight growth, unstable egg production, longer harvest life, and still quite high mortality rates in some maintenance systems. This condition is generally caused by a combination of several factors, including genetic quality, feed quality and quantity, cage management, livestock health, environmental sanitation, and farmers' knowledge in implementing a more efficient production system. Magothe *et al.* (2012a) explained that the productivity of local chickens is greatly influenced by the production system, feed availability, health, and the limitations of maintenance technology used by small farmers.

One of the main factors affecting the productivity of local poultry is the maintenance system. In people's farms, the free-range chicken rearing system is generally still carried out extensively or traditionally. Extensive systems are characterized by minimally controlled maintenance, livestock are released freely around yards or residential environments, and feed needs are largely obtained from the results of self-searching in the surrounding environment. In this system, free-range chickens utilize various natural feed sources such as insects, worms, seeds, young grasses, household food scraps, and agricultural waste. Melesse (2014) stated that the scavenging maintenance system has an important role in providing food to rural communities, but its productivity is highly dependent on the availability of natural feed and environmental conditions.

Extensive maintenance systems have advantages, especially in terms of low production costs because farmers do not need to provide large quantities of commercial feed. This system is also in line with the maintenance patterns of rural communities that utilize local yards and resources. However, extensive systems have various limitations that can reduce production performance. Chickens that are released freely are difficult to control their feed consumption, are vulnerable to predator attacks, are more susceptible to disease, and are difficult to monitor the growth and production of their eggs. Halima *et al.* (2007) show that in the village-based local chicken system, limited feed, disease, and weak management are important factors that affect production and reproductive performance. Thus, although extensive systems are cheap and easy to implement, they are often not able to support the productivity of local poultry optimally.

The problem of feed is one of the important obstacles in the extensive maintenance of local poultry. In a system that relies on natural feed, the amount and quality of nutrients consumed by chickens are highly dependent on the season, environmental conditions, the area of the roaming area, and the availability of feed sources around the cage. Nutritional imbalances, especially proteins, energy, minerals, and vitamins, can lead to slow chicken growth, low egg production, and decreased feed use efficiency. Wong *et al.* (2017) emphasized that in small-scale poultry

systems in resource-constrained areas, feed availability and livestock health are the main factors that determine production success. In the national context, Sudibya *et al.* (2022) also showed that certain regulation of ration composition and supplementation can affect the consumption, digestibility, and conversion of free-range chicken rations.

In addition to feed, environmental factors and livestock health also greatly determine the success of local poultry rearing. Free-range chickens are known to be more adaptive than commercial purebred chickens, but they still require good environmental management so that their production potential can be achieved. Less than suitable cage conditions, poor sanitation, exposure to high temperatures, and the absence of disease prevention programs can increase stress and livestock mortality. Aryani *et al.* (2021) showed that KUB chickens and Walik chickens have a certain physiological response when exposed to acute heat stress, so tropical environmental conditions still need to be considered in maintenance management. Ofte *et al.* (2021) also emphasized that biosecurity in rural and free-range poultry systems is an important challenge because poultry have more open contact with the environment, humans, other animals, and sources of disease.

As an alternative to extensive systems, semi-intensive rearing systems are starting to be widely introduced to increase the productivity of local poultry. Semi-intensive systems are a combination of extensive and intensive systems. In this system, chickens are still given the opportunity to move and look for natural feed in certain areas, but farmers still provide cages, additional feed, drinking water, and health management more regularly. Through a semi-intensive system, farmers can control most of their nutritional needs, reduce the risk of predator attacks, reduce the possibility of disease transmission, and facilitate observation of livestock growth and production. Dalimunthe *et al.* (2020) showed that the implementation of a semi-intensive system is effective in free-range chicken farming because it involves improving aspects of nutrition, cage, health, vaccination, and cage sanitation.

The implementation of a semi-intensive system can also increase the efficiency of livestock businesses because farmers have a greater opportunity to regulate feed quality, feeding schedules, cage density, environmental cleanliness, and livestock protection at night. This system does not completely eliminate the advantages of free-range chickens in utilizing natural feed, but provides additional control so that nutritional and health needs are more guaranteed. Harnanik and Wiraswati (2021) show that giving different rations to KUB chickens can affect the performance of chickens, so feed management is an important component in increasing local poultry productivity. Meanwhile, Magothe *et al.* (2012b) emphasized that the development of local chickens requires a management approach that is appropriate to the conditions of small farmers, including improvements in the rearing system, feed, health, and livestock selection.

From a sustainability point of view, a semi-intensive system can be a more realistic option for smallholder farmers than a full-intensive system. Intensive systems require more capital, more commercial feed, more complete cage equipment, and stricter technical supervision. In contrast, semi-intensive systems still allow for the use of local resources, but with a better level of control than extensive systems. Bettridge *et al.* (2018) emphasized that the sustainability of village chicken production is closely related to the ability of livestock to adapt locally, so productivity improvement interventions need to take into account the environmental, social, and resource conditions of local farmers. Thus, semi-intensive systems can be seen as an intermediate approach that combines efficiency, local adaptation, and increased productivity.

Based on this description, it is important to analyze the productivity of local poultry in extensive and semi-intensive maintenance systems. A comparison of these two systems is necessary because each has advantages and disadvantages that affect the performance of

livestock. Extensive systems have advantages in low production costs and utilization of environmental resources, but have drawbacks in feed control, health, and livestock safety. In contrast, semi-intensive systems require additional costs and labor, but have the potential to increase growth, egg production, feed efficiency, and lower mortality. Alders et al. (2018) emphasized that family poultry has a dual role in food security and household economy, so the improvement of the maintenance system needs to be directed at increasing productivity without ignoring the affordability of technology for small farmers.

Thus, research on the analysis of local poultry productivity in extensive and semi-intensive rearing systems has scientific and practical relevance. Scientifically, this study can provide information about the difference in local poultry performance based on the maintenance system applied. Practically, the results of the research can be the basis for recommendations for farmers in choosing a more efficient, productive, and suitable maintenance system in accordance with the condition of their resources. This study aims to determine the difference in the productivity level of local poultry in extensive and semi-intensive maintenance systems, so that it can provide scientific information for farmers, extension workers, and related parties in improving the efficiency and sustainability of local poultry farming businesses.

RESEARCH METHODS

This research was carried out on local poultry farms owned by smallholder farmers who applied two different maintenance systems, namely the extensive maintenance system and the semi-intensive maintenance system. The selection of the research location was based on the existence of local poultry farmers who are still carrying out traditional or extensive rearing patterns, as well as breeders who have implemented a semi-intensive rearing system. Thus, the research location was deliberately chosen based on the suitability of the research object with the research objective, namely analyzing the difference in the productivity of local poultry in the two maintenance systems.

This study uses a survey method with a quantitative descriptive approach. The survey method is used because this study aims to obtain factual data on maintenance conditions, feed management, cage conditions, livestock health, and productivity of local poultry raised by smallholder farmers. A quantitative descriptive approach is used to describe the productivity conditions of local poultry based on numerical data obtained in the field. The data is then compiled, calculated, and compared between extensive and semi-intensive maintenance systems.

The object of this study is local poultry raised by smallholder farmers, especially local poultry used to produce meat and eggs. The subjects of the study were breeders who applied an extensive maintenance system and breeders who applied a semi-intensive maintenance system. The farmers who are respondents are farmers who have experience in raising local poultry and have information about the maintenance conditions and productivity of their livestock. The selection of respondents was carried out by considering the suitability of the characteristics of the breeders with the needs of the research data.

The data used in this study consisted of primary data and secondary data. Primary data was obtained directly from the field through observation of livestock maintenance conditions and interviews with farmers using structured questionnaires. Observations were carried out to find out directly the condition of the cage, feeding system, feeding patterns, maintenance environmental conditions, number of livestock, and livestock health conditions. Interviews were conducted to obtain information from farmers about the maintenance system implemented, the type of feed given, the frequency of feeding, egg production, weight gain, the number of dead livestock, and the obstacles faced during the maintenance process.

Secondary data is obtained from livestock production records owned by farmers, such as records of the number of eggs, number of livestock, weight of livestock, feed consumption, and livestock death. In addition, secondary data is also obtained from relevant literature, such as books, scientific journals, research reports, and other written sources related to local poultry productivity, extensive rearing systems, semi-intensive rearing systems, feed management, and local poultry livestock. Secondary data are used to strengthen the discussion and provide a theoretical basis for the research results obtained in the field.

The data collection technique in this study was carried out through observation, interviews, questionnaires, and documentation. Observation was carried out by directly observing the conditions of local poultry rearing on each farm. The aspects observed included the condition of the cage, environmental cleanliness, feeding system, availability of feed and drinking water, and the physical condition of livestock. Interviews are conducted with farmers to obtain information that cannot be obtained through direct observation alone. Structured questionnaires are used so that the data obtained from each respondent has the same format and is easy to compare. Documentation is carried out by recording data on livestock production, the number of livestock, the number of eggs, the number of deaths, and other supporting information.

The main variable in this study is the maintenance and productivity system of local poultry. Maintenance systems are differentiated into two, namely extensive systems and semi-intensive systems. An extensive system is a maintenance system characterized by livestock being released freely in the surrounding environment, feed is mostly obtained naturally, and livestock supervision of feed, cages, and livestock health is still limited. Meanwhile, the semi-intensive system is a maintenance system that combines the use of natural feed with additional feed from farmers, as well as the presence of livestock at certain times to facilitate livestock supervision and protection.

The productivity of local poultry in this study was observed through several parameters, namely body weight gain, egg production, mortality rate, and feed use efficiency. Body weight gain is used to determine the ability of livestock to increase body weight during the maintenance period. This parameter can be calculated based on the difference between the final body weight and the initial body weight of the cattle in a given observation period. The higher the body weight gain, the better the performance of livestock growth in the maintenance system.

Egg production is used to determine the ability of local poultry to produce eggs during the observation period. Egg production data is obtained from farmers' records or interview results regarding the number of eggs produced by livestock in a certain period of time. Egg production is one of the important indicators of productivity because it describes the reproductive ability and production performance of local poultry. More stable egg production indicates that livestock obtain better rearing conditions, especially in terms of nutritional adequacy, health, and environmental comfort.

Mortality rates are used to determine the percentage of livestock mortality during the rearing period. This parameter is important because the death of livestock directly affects the success of the livestock business. The mortality rate can be calculated by comparing the number of dead cattle with the number of initial cattle, then multiplied by one hundred percent. The lower the mortality rate, the better the maintenance management implemented by the breeder. Low mortality rates indicate that livestock are in better health and have adequate protection from disease, predators, and unfavorable environmental conditions.

The efficiency of feed use is observed to determine the extent to which the feed consumed by livestock can be used for growth or production. In an extensive system, feed efficiency is observed based on the pattern of natural feed utilization available in the surrounding

environment. Meanwhile, in semi-intensive systems, feed efficiency is observed from the feeding of additional feeds such as bran, corn, simple concentrates, or other local feed ingredients. The efficiency of feed use is an important indicator because it is directly related to production costs and the results obtained by farmers. Feed that is given in a more measured manner is expected to increase livestock growth and egg production more optimally.

The research instruments used in this study were in the form of observation sheets and structured questionnaires. Observation sheets are used to record real conditions in the field, such as cage conditions, environmental cleanliness, maintenance systems, and physical conditions of livestock. Structured questionnaires are used to systematically obtain data from farmers. The questions in the questionnaire were prepared based on research needs, including the identity of the farmer, the number of livestock reared, the maintenance system implemented, the type of feed given, the frequency of feeding, the amount of egg production, the number of livestock deaths, and obstacles in local poultry rearing.

The research procedure is carried out through several stages. The first stage is research preparation, namely determining the research location, compiling research instruments, and determining breeders that are in accordance with the research criteria. The second stage is the collection of field data through observation, interviews, filling out questionnaires, and documentation of livestock production records. The third stage is data processing, which is checking the completeness of the data, grouping the data based on the maintenance system, and calculating livestock productivity parameters. The fourth stage is data analysis, which is to compare the productivity of local poultry in an extensive and semi-intensive rearing system based on predetermined parameters.

The data obtained in this study was analyzed in a quantitative descriptive manner. Descriptive analysis is carried out by presenting data in the form of numbers, averages, percentages, and narrative descriptions. Livestock productivity data in extensive and semi-intensive maintenance systems were compared based on the value of body weight gain, egg production, mortality rate, and feed use efficiency. The results of the analysis were then interpreted to determine the tendency of differences in productivity between the two maintenance systems.

Through quantitative descriptive analysis, this study not only describes the productivity conditions of local poultry, but also provides an explanation of the factors that affect productivity differences in extensive and semi-intensive maintenance systems. These factors include feed availability, nutritional quality, cage management, health surveillance, protection against predators, and the involvement of farmers in the maintenance process. Thus, the results of the study are expected to provide a clear picture of a more effective maintenance system in increasing the productivity of local poultry in smallholder farms.

RESULTS AND DISCUSSION

The results of the study show that the maintenance system is one of the important factors that determine the productivity level of local poultry livestock on people's farms. The difference between extensive and semi-intensive maintenance systems can be seen in the aspects of feed availability, cage management, health supervision, livestock protection, and feed use efficiency. A more controlled maintenance system tends to have a positive influence on the growth, egg production, and survival rate of livestock. On the other hand, traditional and less regular maintenance systems tend to limit the productivity potential of local poultry because the nutritional, health, and environmental needs of livestock have not been fully met.

The Effect of Maintenance Systems on Local Poultry Productivity

The maintenance system has a significant influence on the productivity of local poultry. This is because the maintenance system determines how livestock get feed, get protection, and get supervision from farmers. In this study, extensive and semi-intensive rearing systems showed clear differences in supporting poultry growth and production. These differences are mainly seen from the rate of body weight gain, stability of egg production, mortality rate, and efficiency of feed utilization.

In extensive rearing systems, the productivity of local poultry tends to be lower because livestock do not obtain a structured feed and cage arrangement. Livestock depend more on the surrounding environment to meet their living needs. This condition causes livestock productivity to be greatly influenced by the availability of natural feed, weather conditions, the area of exploration, and environmental safety. If the environment provides enough feed, livestock can still survive and thrive. However, if the availability of feed is limited, livestock growth slows and egg production becomes suboptimal.

In contrast, in semi-intensive maintenance systems, livestock productivity shows a better tendency as farmers begin to make adjustments to some aspects of maintenance. Livestock are still given the opportunity to look for natural feed, but also get additional feed from farmers. In addition, livestock are also caged at certain times so that it is easier to supervise. This system provides a balance between the utilization of local resources and the implementation of more targeted maintenance management. Thus, the semi-intensive system is able to support the increase in local poultry productivity better than the extensive system.

Feed Availability and Quality in Extensive and Semi-Intensive Systems

Feed is the main factor that affects the growth and production of local poultry livestock. In extensive rearing systems, cattle are generally released freely in the surrounding environment in search of their own feed. The type of feed obtained is usually in the form of insects, grains, grass, worms, and household food scraps. This system has advantages because farmers do not need to spend large feed costs. Therefore, extensive systems are often considered more economical by smallholder farmers who have limited capital.

However, the main drawback of the extensive system lies in the lack of guaranteed amount and quality of feed consumed by livestock. Natural feed available in the environment does not always meet the nutritional needs of poultry, especially the needs of energy, protein, vitamins, and minerals. Feed availability can also change according to the season, environmental conditions, and livestock density around the rearing area. As a result, the nutritional intake of livestock becomes unstable. Insufficient nutrition can cause livestock growth to be slow, body weight is difficult to increase, and egg production becomes low and irregular.

In a semi-intensive system, farmers provide additional feed such as bran, corn, simple concentrates, or other local feed ingredients. The provision of additional feed plays an important role in improving the nutritional adequacy of livestock. With additional feed, the energy and protein needs of livestock can be better met so that growth becomes more optimal. In addition, egg production can also take place more stable because livestock obtain a more regular nutritional intake. This shows that better feed management in semi-intensive systems is one of the main factors that cause local poultry productivity to be higher than in extensive systems.

Environmental Management and Livestock Husbandry

In addition to feed, environmental management and the herding system also affect the productivity of local poultry. In an extensive maintenance system, livestock are generally allowed

to roam around yards, gardens, or residential environments without any clear space limitations. This system provides freedom for livestock to seek natural feed, but it also poses a variety of risks. Cattle that are released freely are more difficult to supervise, more susceptible to extreme weather conditions, and more susceptible to disturbances from other animals or the surrounding environment.

Uncontrolled environmental conditions can increase stress levels in livestock. Changes in temperature, rainfall, high humidity, or lack of shelter can affect the physiological condition of the birds. Environmental stress can decrease appetite, slow growth, and reduce egg production. Additionally, poultry that are not caged regularly have a higher risk of being lost, injured, or attacked by predators. This risk can reduce the number of productive livestock and have an impact on low livestock business yields.

In a semi-intensive maintenance system, farmers have the opportunity to manage the timing of livestock carrying. Cattle can be released at a certain time in search of natural feed, then re-caged in the afternoon or evening. This pattern provides better protection for livestock, especially from predators, bad weather, and environmental disturbances. Pregnancy also makes it easier for farmers to monitor the physical condition of livestock, feeding, providing drinking water, and collecting eggs. With better environmental management, livestock are in a safer and more comfortable condition so that their productivity can increase.

Local Poultry Health and Mortality Rate Surveillance

Livestock health is an important aspect in determining the success of local poultry rearing. In an extensive system, livestock health monitoring tends to be less than optimal because poultry is released freely and is difficult to monitor regularly. Farmers often only find out about health problems after livestock shows quite severe symptoms. This condition can cause late disease treatment. In addition, free-release poultry have a greater chance of contact with sources of disease from the environment, other poultry, wild animals, or unhygienic food waste.

Health risks in extensive systems are also related to the lack of environmental sanitation. Because livestock are not always in cages, poultry manure is scattered in various places and is difficult to manage properly. This condition can be a source of disease transmission. In addition to diseases, the threat of predators is also a factor that can increase livestock loss. Attacks by wild animals, dogs, cats, or other predators can lead to the death of livestock directly. Therefore, mortality rates in extensive systems are generally higher compared to more controlled systems.

In a semi-intensive system, livestock health monitoring can be done better because livestock are in more regular management. Farmers can more easily notice changes in livestock behavior, such as decreased appetite, weakness, dull fur, or other symptoms of disease. Early detection of health problems allows farmers to take preventive measures or treatment more quickly. In addition, sowing at certain times can reduce the risk of predator attacks and exposure to unfavorable environments. The results showed that the mortality rate in the semi-intensive system was lower than in the extensive system. This condition proves that more controlled maintenance management plays an important role in maintaining health and improving the survival rate of local poultry.

Feed Use Efficiency and Sustainability of People's Livestock Business

The efficiency of feed use is one of the important indicators in assessing the productivity of local poultry. In extensive systems, the feed consumed by livestock cannot be measured with certainty because most of it comes from the environment. Farmers do not know clearly the amount and nutritional content of feed eaten by livestock every day. This condition makes the

efficiency of feed use difficult to control. If the available natural feed is insufficient, livestock will experience nutritional deficiencies so that egg growth and production are not optimal.

In semi-intensive systems, more regular supplementary feeding allows farmers to better control the nutritional intake of livestock. Additional feeds such as bran, corn, and simple concentrates can help meet the energy and protein needs needed for egg growth and production. With more measured feeding, livestock can utilize nutrients more optimally. This has an impact on increasing body weight gain, stable egg production, and reducing the risk of health problems due to nutritional deficiencies.

Increasing the efficiency of feed use in semi-intensive systems also has a positive impact on the sustainability of people's livestock businesses. Although this system requires additional costs for feed and cage, the results are likely to be better than extensive systems. Higher productivity, lower mortality rates, and more stable egg production can increase farmers' incomes. In addition, semi-intensive systems still allow farmers to utilize local resources so that they are not completely dependent on commercial feed. The results of this study are in line with the opinion of Suryana and Hasbianto (2020) who stated that a semi-intensive maintenance system is able to increase the productivity of local poultry livestock through improved feed management and more controlled control of the maintenance environment.

CONCLUSIONS AND SUGGESTIONS

Based on the results of the discussion, it can be concluded that the maintenance system has an effect on the productivity of local poultry. The extensive maintenance system has the advantage of low production costs because it utilizes natural feed from the surrounding environment. However, this system has weaknesses in terms of nutritional limitations, low health surveillance, high risk of predator attacks, and lack of optimal environmental management. These conditions cause livestock growth to be slower, egg production is less stable, and mortality rates tend to be higher. In contrast, semi-intensive rearing systems show better results due to additional feeding, timed feeding, more intensive health monitoring, and more adequate livestock protection. Thus, a semi-intensive system can be an effective strategy to increase the productivity of local poultry on people's farms.

The suggestion that can be given is that local poultry farmers need to start implementing a semi-intensive maintenance system gradually according to the capabilities of available capital, labor, and resources. Farmers do not have to leave the traditional system immediately, but can improve it through additional feeding, simple cage provision, timing of feeding, improvement of environmental cleanliness, and regular monitoring of livestock health. In addition, support from extension workers, the government, and related parties is needed in the form of training, mentoring, and the provision of technical information regarding feed management, housing, disease prevention, and business efficiency. With continuous assistance, a semi-intensive maintenance system can be applied more widely so that local poultry farming businesses can develop more productively, efficiently, and sustainably.

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