



## Evaluation of Productivity and Financial Feasibility of Broiler Chicken Farming Business Models: Cage and Postal Systems

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**Abstract.** *The growth of the human population and increased purchasing power drive greater demand for broiler meat, posing challenges for farmers to enhance their productivity and business efficiency. The development of closed-house cages offers a solution to improve production efficiency. This study compares the productivity and financial analysis between the cage and postal models. Utilizing a quantitative descriptive method, the research was conducted over a single rearing period in cages and postal setups at PT Dinamika Megatama Citra (DMC) without any specific treatment. Research parameters encompassed body weight gain, mortality, FCR, harvest weight, and Performance Index. Financial analysis was conducted using indicators such as the R/C ratio, B/C ratio, Break-Even Point (BEP), and Return on Investment (ROI). Results indicate that in cage conditions, mortality stood at 4.07%, FCR at 1.718, average weight at 2.2 kg, and Performance Index at 287.5. Meanwhile, postal cages exhibited higher mortality at 8.79%, FCR at 1.732, average weight at 2.3 kg, and Performance Index at 285.6. In financial analysis, cage systems had a BEP price of Rp 19,726/kg with a unit BEP of 40,616 kg, an R/C ratio of 1.039, a B/C ratio of 0.039, and an ROI of 3.92%. Conversely, postal cages had a BEP price of Rp 19,507/kg with a unit BEP of 39,924 kg, an R/C ratio of 1.05, a B/C ratio of 0.05, and an ROI of 5.09%.*

**Keywords:** *Broiler productivity, Cages, Financial feasibility, Postal cage*

## INTRODUCTION

The growth of the human population and increasing purchasing power drive a growing demand for broiler chicken meat (Sasongko et al., 2017). According to the report by the Central Statistics Agency (BPS) on the distribution pattern of broiler chicken meat commodities in 2022, the average consumption of broiler chicken meat per capita per year among national households reached 6,048 kg in 2021. This figure represents household consumption alone and excludes restaurants, industries, hotels, and other activities. This consumption increased by 8.62% compared to the previous year. The increase in consumption is matched by a corresponding increase in production. Statistical data from the Central Statistics Agency shows that chicken meat production in East Java has been increasing annually. In 2020, production reached 424,942.68 units, rising to 433,757.08 units in 2021, and further increasing to 586,703.35 units in 2022. Farmers face challenges in enhancing productivity and efficiency in their operations (Anonymus, 2022).

Land constraints pose a significant challenge for farmers in constructing poultry houses, necessitating the construction of houses near residential areas (Pratama, 2018). Establishing poultry houses adjacent to residential areas can have various social and environmental impacts. The construction of these houses must meet feasibility standards, ensuring they do not disrupt the surrounding environment, comply with legal requirements, and avoid areas prone to environmental damage or disturbance.

The development of closed-house systems represents an innovation that can enhance production efficiency through controlled environmental management. In broiler farming, the selection of appropriate housing models significantly influences productivity and efficiency. The two main models frequently utilized are cage systems and deep-litter systems. Housing broilers in deep-litter systems reduces strong odors and facilitate easier and more efficient chicken management. Air circulation is smoother, and sunlight can enter during the day to promote chicken growth. While deep-litter systems offer more freedom for chickens, they require more intensive management.

Cage systems may provide better security and protection against theft and wild animal disturbances but tend to be more costly. This model has gained popularity due to its efficient use of space, which boosts production within limited cage areas, limits animal activity, and ensures feed consumption is solely for production purposes (Fitra et al., 2019). Cage systems are considered a viable solution to several challenges faced in conventional farming systems. The use of cage systems in the continuous growth of the broiler farming industry is highly

relevant, particularly given the increasingly complex demands of society, technological advancements, and environmental challenges facing this industry.

This research aims to describe the productivity and financial feasibility of operations aligned with the needs and references for the development of practices beneficial to farmers. In an era of intense competition and evolving technology, this study is highly relevant for enhancing efficiency and sustainability in the broiler farming industry.

## **THEORETICAL REVIEW**

Research by Sunanda et al. (2023) asserts that broiler chickens are among the poultry species capable of producing animal protein and can be mass-cultivated, making broiler farming highly sought after and crucial for the national livestock industry. The advantage of broiler farming lies in its ability to produce meat in a relatively short period of time and require only a small amount of land. Intensively managed operations can boost livestock populations and meat production. Broiler chickens have a short growth period, typically reaching a harvest weight of 1.8 kg within 4 to 5 weeks (Putra et al., 2023). Chicken growth is typically measured by daily, weekly, or other time-specific weight gain (Rahmawati, 2020). Factors influencing poultry weight gain include species, strain, production type, sex, season, feed quality and quantity, management practices, feed form, feeding systems, and initial weight.

Closed-house systems, known as closed houses, must effectively remove excess heat, moisture, and harmful gases such as CO, CO<sub>2</sub>, and NH<sub>3</sub> while providing adequate oxygen for the chickens. This closed system minimizes adverse environmental impacts while prioritizing chicken productivity (Prihandanu et al., 2015). Postal cages are broiler chicken enclosures with solid floors lined with litter, such as sawdust, which provides a suitable base and can be layered with other materials (Sumarno et al., 2022). These enclosures do not have outdoor runs, thus, most chicken activities occur inside the cage. In their evolution, closed-house systems now not only use litter but also include cage types where broilers are raised in multi-tiered colonies, typically three to four levels high. The use of multi-tiered racks enhances feed efficiency and consumption compared to litter systems, though it poses challenges in environmental control, especially at large population scales (Putra et al., 2023).

## **RESEARCH METHODOLOGY**

This study was conducted in cages and postal systems owned by PT Dinamika Megatama Citra (DMC) located in Kayoman, Purwosari Subdistrict, Pasuruan Regency. The cage population consisted of 33,600 Cobb strain chickens, while the postal system housed 42,000 Ross strain chickens. The research method employed was quantitative descriptive. Both

primary and secondary data were utilized. Primary data were collected through direct observation and interviews using a questionnaire. Secondary data were obtained from existing sources, literature studies, previous research, and books.

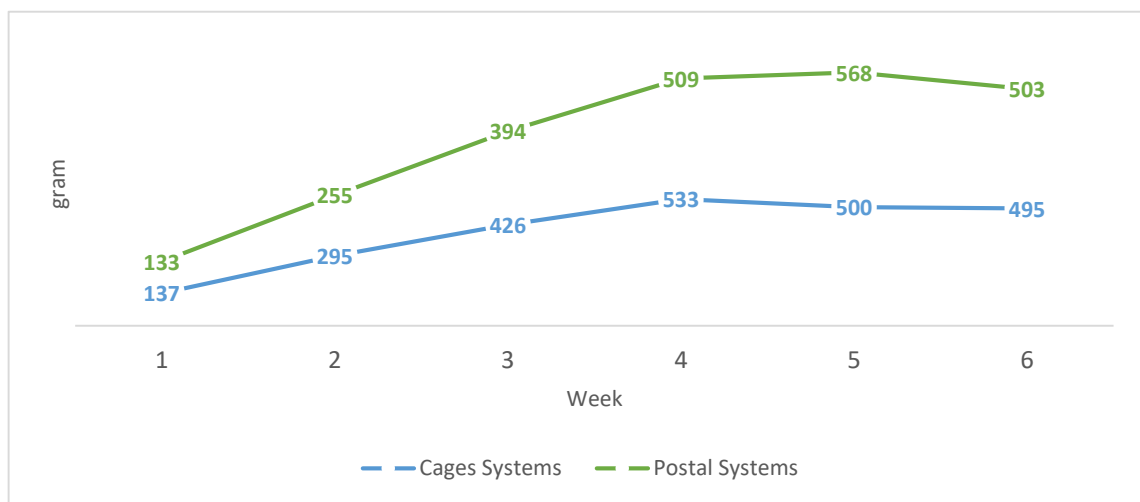
Data analysis involved descriptive analysis of observed variables, including productivity metrics such as weight gain, mortality rate, harvest weight, Feed Conversion Ratio (FCR), performance index (PI), and financial feasibility analysis comprising R/C ratio, Net B/C ratio, Break-Even Point (BEP), and Return On Investment (ROI). Financial feasibility calculations were based on per-unit financial values and then standardized to a population of 20,000 chickens per period to reduce data variability potentially caused by differences in production scale.

## RESULTS AND DISCUSSION

### Evaluation of Productivity

#### 1. Weight gain

In broiler chicken farming, weekly body weight growth needs careful monitoring to ensure production stability. Regular weighing is essential to achieve optimal production. According to Susanti et al. (2016), feed quantities can be adjusted based on standard weight deficits if the chickens have not reached the required weight standards.



Source: Primary Data (2024)

**Figure 1.** Weight gain graph

The weight gain of chickens is influenced by feed consumption; good feed intake results in good growth (Susanti et al., 2016). In terms of feeding methods, cage systems utilize feeder lines operated by conveyors to prevent feed competition. In contrast, postal systems employ pan feeders, where chickens must approach the nearest feeding station and compete with others

for access to feed. This competition leads to chickens competing for feed, resulting in uneven distribution of feed among them.

### Mortality Rate

Mortality, indicating the number of chickens that die during farming, is a crucial factor that farmers must consider. According to Susanti et al. (2016), mortality rates are influenced by body weight, climate, environmental conditions, sanitation, and disease.

**Table 1.** Mortality Rate

Cages Systems	Postal Systems
1.369 heads 4,07%	3.694 heads 8,79%

Source: Primary Data (2024).

Although both use tunnel ventilation, the placement of cooling pads differs between postal and cage systems. In cage systems, cooling pads are positioned at the front, right, and left sides, whereas in postal systems, they are only placed on the right and left sides, leading to uneven air distribution for the chickens. In postal systems, chickens experience higher humidity due to the use of litter mixed with ammonia and water from the cooling pads. This increased humidity can contribute to higher mortality rates. Additionally, stress levels among chickens are exacerbated by population density, which limits movement and increases competition for food. Farm workers' activities, such as adding litter, expanding partitions, selecting and removing chicken carcasses, and thinning flocks, also contribute to chicken stress.

### 2. FCR

Feed Conversion Ratio (FCR) is a measure comparing the amount of feed consumed to the meat production within the same unit of time (Susanti et al., 2016). It is utilized by farmers to assess the livestock's ability to convert feed into meat efficiently.

**Table 1.** FCR

Cages Systems	Postal Systems
1,718/heads	1,732/heads

Source: Primary Data (2024)

The FCR value measures how efficiently chickens optimize feed for their growth; the lower the FCR value, the more efficient the feed consumption (Trison et al., 2022). Lower FCR values are found in cage systems, indicating that feed conversion in cages is superior to that in postal systems. This suggests that feed usage in cages is highly efficient. Feeding is administered via a conveyor running over feeder lines, delivering equal portions tailored to the chickens' needs, thereby preventing feeding competition. In contrast, FCR values in postal

systems are relatively higher compared to cage systems. This excess FCR occurs when the amount of feed consumed does not correspond proportionally to the body weight produced. This observation aligns with Susanti et al. (2016), who state that factors influencing feed conversion include livestock digestibility, the quality of consumed feed, and the compatibility of nutritional values contained in the feed.

### 3. Harvest weight

Harvest weight is the final weight of broiler chickens obtained during the rearing period until harvest. It is a critical factor determining the success of broiler farming operations (Umam et al., 2014).

**Table 2.** Harvest weight

	Cages Systems	Postal Systems
Total (kg)	72.115,2	90.050,5
Average (kg)	2,2	2,3

Source: Primary Data (2024)

The average harvest weight in cage systems is 2.2 kg, whereas in postal systems, it averages 2.3 kg. The harvest weight of broiler chickens ranges from 2 to 2.5 kg in cage systems because the chickens are supplied to DMC's internal processing plant. In postal systems, chickens weighing approximately 1.4 to 1.8 kg are supplied to the processing plant (RPA), while those weighing 2 to 2.7 kg are demanded by local sellers for sale in the market using pickups. The difference in harvest weights between the two systems is due to the number of chickens harvested during thinning or small chicken harvests. According to Sofyan et al. (2023), harvesting more chickens during thinning results in a decrease in average harvest weight.

### 4. Performance Index

Calculating the Performance Index at the end of broiler farming is crucial for determining the extent or score of productivity achieved from cultivation efforts (Pakage et al., 2018).

**Table 3.** Performance Index

	Cages Systems	Postal Systems
	287,5	285,9

Source: Primary Data (2024)

The Performance Index (PI) for cage systems is 287.5, while for postal systems it is 285.9. The higher PI in cage systems compared to postal systems indicates better performance. Both PI values are also higher compared to the study by Nuryati (2019), who reported a performance index of 213. The high PI in cage systems is attributed to lower mortality rates and FCR values. This aligns with the findings of Mahardika et al. (2020), who stated that a

high PI can be achieved with higher body weight, lower mortality, and lower FCR values. PI values are also influenced by the percentage of live chickens, final body weight, FCR values, and average age at broiler harvest.

### **Financial Feasibility Evaluation**

Financial analysis of a business should be conducted before its establishment to determine profitability levels, thereby facilitating achievable targets. Financial analysis aids in future financial planning, including budgeting, capital requirements, and strategies to achieve long-term financial goals, while providing transparency regarding the financial condition of a company. The results of the comparative financial analysis between the two cage models with a production scale of 20,000 heads are presented in Table 5.

**Table 4.** Financial Analysis

No	Financial Analysis	Cages Systems	Postal Systems
1.	Fix Costs	Rp 36.000.000	Rp 36.000.000
	Land Rent	Rp 36.000.000	Rp 36.000.000
2.	Variable Costs	Rp 796.633.883	Rp 782.456.669
	DOC	Rp 144.000.000	Rp 144.000.000
	Feed	Rp 554.725.000	Rp 555.665.000
	Medicine	Rp 12.662.760	Rp 12.586.980
	Gas	Rp 18.000.000	Rp 19.800.000
	Diesel	Rp 809.200	Rp 5.905.500
	Labor (supervisor)	Rp 9.300.000	Rp 714.000
	Labor (operator)	Rp 18.600.000	Rp 646.000
	Harvesting Team	Rp 3.798.828	Rp 8.850.000
	Water Fees	Rp 625.000	Rp 26.550.000
	Environmental Compensation	Rp 1.000.000	Rp 3.776.094
	Environmental Tax	Rp 375.000	Rp 625.000
			Rp 1.000.000
			Rp 375.000
3.	Total Production Costs	Rp 832.633.883	Rp 818.456.669
4.	Revenue	Rp 865.288.600	Rp 860.110.300
5.	Profit	Rp 32.654.717	Rp 41.653.631
6.	R/C ratio	1,039	1,05
7.	Net B/C ratio	0,039	0,05
8.	BEP unit	40.616 kg	39.924 kg
9.	BEP price	Rp 19.726/kg	Rp 19.507/kg
10.	ROI	3,92%	5,09%

Source: Primary Data (2024)

### 1. R/C ratio

The R/C ratio in cage systems indicates revenue of Rp 865,288,600 divided by total costs of Rp 832,633,883, resulting in an R/C ratio of 1.039. In postal systems, revenue amounts to Rp 860,110,300 divided by total costs of Rp 818,456,669, resulting in an R/C ratio of 1.05. This indicates that both broiler farming operations in cage and postal systems meet business feasibility standards.

### 2. B/C ratio

The results obtained from the B/C ratio calculations for cage systems show a value of 0.039, derived from a profit of Rp 32,654,717 divided by expenses of Rp 832,633,883. Similarly, in postal systems, the B/C ratio is 0.05, calculated from a profit of Rp 41,653,631 divided by expenses of Rp 818,456,669. This indicates that a business is deemed viable and beneficial if the B/C ratio exceeds zero (Normansyah et al., 2014). Based on these B/C ratio

calculations, both cage and postal systems for broiler farming demonstrate profitability and feasibility for continuation.

### **3. BEP**

The BEP per unit in cage systems, where each harvest requires an average weight of 2 kg per chicken, results in a BEP unit of 40,616 kg, while for postal systems, the BEP unit is 39,924 kg. This indicates that the BEP unit for both systems is lower than the number of chickens raised. The BEP price for cage systems is 19,726 IDR/kg, whereas for postal systems, it is 19,507 IDR /kg. Sales of chickens must at least meet the determined BEP price, indicating that both systems have a BEP price lower than the chicken price, thereby avoiding losses. A lower BEP value indicates better efficiency, as a smaller difference between sales and BEP price signifies greater efficiency (Sugito et al., 2021).

### **4. ROI**

In one rearing period conducted by PT DMC, cage systems yielded an investment return of 3.92% of the initial investment, while postal systems yielded an investment return of 5.09%.

## **CONCLUSION AND RECOMMENDATIONS**

### **CONCLUSIONS**

The conclusions drawn from this study are as follows:

1. Broiler productivity in cage systems is higher compared to postal systems, with a mortality rate of 4.07%, FCR of 1.718, Performance Index of 287.5, harvest weight of 72,115.2 kg, and average weight of 2.2 kg.
2. Financial analysis of broiler farming in postal systems shows higher profitability compared to cage systems. With total expenses of 818,456,669,- IDR and revenue of 860,110,300,- IDR, the profit amounts to 41,653,631,- IDR. Additionally, it has an R/C ratio of 1.05, B/C ratio of 0.05, and ROI of 5.09%, indicating the feasibility of the enterprise.

### **RECOMMENDATIONS**

Based on the conclusions above, several recommendations can be made. Firstly, further evaluation is needed to reduce the mortality rate in postal systems. Secondly, additional assessment is required to optimize profit factors in cage systems. Lastly, environmental sustainability aspects and the availability of resources such as litter should also be considered for postal systems

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