JWPR
Journal of World's Poultry Research

2023, Scienceline Publication

J. World Poult. Res. 13(3): 332-341, September 25, 2023

Research Paper, PII: S2322455X2300036-13

DOI: https://dx.doi.org/10.36380/jwpr.2023.36

Effects of Partnership Patterns on Broiler Chickens' Performance in the Agribusiness System of Indonesia

Nanang Febrianto, Puji Akhiroh, Muhammad Helmi, and Budi Hartono*

Faculty of Animal Science, The University of Brawijaya, Veteran Rd, Malang, 65145, Indonesia

*Corresponding author's Email: budihartono_ub@ub.ac.id

Received: 18 June 2023
Accepted: 04 August 2023

ABSTRACT

The partnership system is standard broiler cooperation in Indonesia. This system influenced agribusiness performance. Hence, the current study aimed to analyze the broiler agribusiness system in Kediri Regency, Indonesia, addressing three main areas, including partnership patterns, production performance, and financial performance. In this study, data was gathered from participants using a cross-sectional survey approach, capturing information from individuals at a specific moment in time. The research was performed from July to September 2022, utilizing both primary and secondary data. Primary data was obtained through direct observations and interviews with relevant stakeholders, while secondary data was sourced from various databases, such as the Indonesian Statistical Bureau and the Agriculture Ministry of Indonesia. Both types of data were subjected to quantitative descriptive analysis. The results indicated that the broiler partnership pattern consisted of three subsystems, including the chicken production facility providers (day-old chicks, feed, and medicines), the farming unit responsible for production process management (housing, feeding, drinking, and biosecurity), and the marketing subsystem focusing on chicken prices). The farmers in the farming unit showed effective production performance with a feed conversion ratio of 1.69, an index performance of 307, and an average body weight of 2.03 kg/head. Moreover, the farmers demonstrated a profitable financial performance with the revenue-cost ratio exceeding 1, reaching 1.07.

Keywords: Agribusiness**,** Broiler, Income, Partnership, Profitable, Revenue

INTRODUCTION

The broiler producer industry holds significant promise as a vital animal commodity due to its efficient chicken meat production, which serves as a major source of animal protein consumption in society (Azizah et al., 2013). According to Fitrah (2013), broilers are a poultry product with better performance and productivity than other products, such as beef, goat, and pig. Additionally, the Indonesian chicken commodity demonstrates substantial growth potential, driven by an increased market demand resulting from the country's rising population. According to the Indonesian Central Bureau of Statistics (2023), there was an increase of 6% in chicken production in Indonesia between 2019 and 2021, aligning with the massive Indonesian population growth of 273.52 million.

Moreover, the broiler industry plays a crucial role in meeting the ever-growing demand for meat among consumers. The chicken population is enormous, resulting in widespread farm production across all corners of the country (Ratnasari et al., 2015). Many factors contribute to the development of chicken commodities, such as the availability of breed, feed, medicine, and industry equipment. Similarly, some factors strengthen the upstream industry, such as breeding, animal feed, veterinary medicine, and farm equipment companies, and the downstream industry in the form of chicken meat processing (Amam, 2022). Hence, the broiler is a necessary commodity with substantial business potential for growth.

The partnership pattern is a standard broiler cooperation system chosen by farmers (Ulfa et al., 2021). A partnership is a business strategy by two or more business parties within a certain period to achieve profits with the principle of mutual benefit between the partnering parties (Kalangi et al., 2021). The partnership pattern in the chicken sector is one way of cooperation between small farmers called plasma farmers and private

To cite this paper: Febrianto N, Akhiroh P, Helmi M, and Hartono B (2023). Effects of Partnership Patterns on Broiler Chickens' Performance in the Agribusiness System of Indonesia. *J. World Poult. Res.*, 13(3): 332-341. DOI: https://dx.doi.org/10.36380/jwpr.2023.36

companies as the core. The reasons for choosing this system by farmers include limited resources on all sides, the shift in the position of the main actors from the government and the private sector to the community, and other complex problems, such as lack of funding, market competition, feed access, and business risk (Ulfa et al., 2021). The core of the broiler partnership approach must provide facilities for livestock production, technical and management advice, and accommodating and marketing production outcomes. Plasma farmers provide cages and carry out cultivation activities. The proceeds from the sale of chickens are handed over to the core party at a price adjusted to the contents of the cooperation agreement contract. According to Ridwan (2022), breeders want to join the partnership system to get the intensity of assistance with production facilities and earn income. In this case, the farmer's satisfaction depends on the profits with various receipts because they work on different business scales.

The Livestock Service Office of East Java Province stated that in 2022 the broiler population in East Java would reach 252,918,032 chickens, with meat production reaching 442,478.71 tons per year (Livestock Service of East Java Province, 2022). In this case, the human population of East Java reached 39.74 million people in 2022 (Ministry of Communication and Technology, 2022). Compared to the total population of East Java people, chicken production is still low since the total chicken meat consumption increased by 8.62% per year in 2022 (Indonesian Ministry of Agriculture, 2022). Given these circumstances, East Java can be an important province for broiler development. Kediri Regency is also a critical area for this commodity development since it has a large area of 1,588.79 km^2 with a population of 1,140,809 people. Within this region, broiler farms have been established, ranging from small to medium and large-scale operations. Many factors affect the scale of the business, including investment, capital, cages, land, and equipment. The investment and capital in this scenario may influence the number of broilers and the production costs. Hence, the present study aimed to examine the broiler farming agribusiness system in Kediri Regency, Indonesia, with a particular focus on the issues mentioned above.

MATERIALS AND METHODS

Ethical approval

All subjects participated voluntarily and provided written informed consent to participate in this study. The study was approved by the ethics committee of the Animal Science Faculty, the University of Brawijaya (register number KEP.29/07/2022)

Study area

The current research was performed in Kediri Regency, Indonesia, due to its status as the largest production center of broilers in the region. Furthermore, Kediri Regency stands out for having the highest number of farmers engaged in partnerships with private companies using a partnership pattern in East Java Province (Mahendra, 2023). The research was carried out in July-September 2022 using a cross-sectional survey method, collecting data from respondents at a single point in time.

Respondent criteria

The respondents were 80 plasma farmers and 6 broiler partnership core companies. Respondents were determined using purposive sampling with the plasma farmers as the samples with a chicken population between 2,000-12,000 chickens. The farmers had a three-year minimum partnership period and carried out broiler farming activities for at least three production cycles within 2022. Moreover, the partnership core companies were the plasma farmers' business partners, with more than 5 years of experience.

Data collection

The data collection method employed in this research involved field observation and interviews. Field reflection was carried out through direct observations and interviews with respondents on-site to gather primary data. Ethical considerations were given utmost importance, and consent was obtained from all participants in adherence to the standard ethical guidelines and regulations set forth by the University of Brawijaya.

The primary data were predominantly acquired through interviews and questionnaire distribution to both farmers and partnership companies. Questionnaires were administered directly to the respondents, encompassing various aspects, such as farmer identity, production costs (including the quantity and price of inputs), and revenue (entailing the quantity and price of output). Similarly, partnership companies' data included respondent identity, broiler input development, and output prices.

The secondary data included information on the broiler population and the development of broiler input and output prices from relevant agencies. These agencies encompassed the Livestock Service Office of the government, Animal Husbandry Companies, Trade Office,

and the Indonesian Central Bureau of Statistics.

Production performance analysis

Feed conversion ratio

Feed Conversion Ratio (FCR) is defined as the amount of feed required to produce one kilogram of body weight. Ideally, 1 kilogram of feed should result in 1 kilogram or even more (FCR ≤ 1) of body weight (Ulfa et al., 2021). Unfortunately, this condition is not always achieved. In broilers, the target FCR of 1 can usually be achieved before the chickens reach 2 weeks of age. After that, the FCR increases as the chickens grow older. According to Karar et al. (2023), the formula for FCR is as follows, FCR= Total Feed (g)/ Total Weight (g).

Index performance

The index performance (IP) is one of the main parameters used in measuring the success of a farm. The IP value is obtained through calculations based on the ratio of feed consumption in a given period, the total weight achievement of the livestock at the time of harvest, the average age of the livestock at the time of harvest, and the percentage of mortality rate (Ulfa et al., 2021). The formula for IP is as follows:

IP = ([100-D] × ABW X 100) / FCR × average age

Where, IP defines Performance Index, D denotes the depletion percentage of the chicken population (%), ABW is the average body weight at harvest (kg), FCR refers to feed conversion ratio, and the average age represents the average duration required for raising broiler, typically measured in days.

The IP values in broiler chicken farming are classified into five categories. The IP below 300 is classified as poor, IP in the range of 301-325 is considered fair, IP in the range of 326-350 is good, IP in the range of 351-400 is classified as very good, and IP above 400 is excellent (Santoso and Sudaryani, 2011).

Other parameters of production performance

Average body weight (ABW) is another parameter for measuring production performance in the broiler industry. According to Santoso and Sudaryani (2011), the ABW in the chicken industry refers to the average weight of a chicken at a specific stage or age. It is commonly used as a measurement to assess the growth and development of chickens. The unit of measurement for ABW is typically kilograms.

Financial performance analysis

Production costs

Production costs in the chicken industry refer to the expenses incurred in raising and producing chickens for commercial purposes, including feed costs, housing and equipment cost, utilities, and medicine expenditures (Azizah et al., 2013).

Revenue and income

In the broiler industry, revenue refers to the total amount of money generated from selling chickens and chicken-related products (Sehabudin et al., 2022). It represents the income generated from the primary business activities of selling live chickens and other chicken-related products. Income, on the other hand, refers to the profit or financial gain obtained from the chicken industry after deducting the production costs and expenses from the revenue (Azizah et al., 2013). It shows the net earnings after deducting all expenditures, such as feed, labor, housing, veterinary charges, utilities, and other operating costs.

Revenue costs ratio

The revenue cost ratio (R/C), also known as the cost-to-revenue ratio, is a financial metric used in the chicken industry to assess the relationship between revenue and costs (Afandi et al., 2020). It is calculated by dividing the total costs incurred in chicken production by the total revenue generated from the sale of chickens and chicken-related products. The R/C is measured using the formula below.

R/C ratio = Revenue (IDR) / Costs (IDR).

Where, R/C refers to the revenue cost ratio and IDR represents Indonesian Rupiah, the Indonesian currency.

Statistical analysis

The study examined the resulting data using descriptive analysis (SPSS, version 20, USA) to describe the situation within the samples and the partnership pattern system so that the study would achieve a factual and accurate description of the facts, characteristics, and relationships between the phenomena being investigated.

RESULTS AND DISCUSSIONS

The partnership patterns

The subsystem of the production facility provider

The production facility provider is crucial in day-old chick (DOC), feed, vaccines, medicines, and equipment. Its primary obligation is to provide livestock production facilities for the plasma farm. Some criteria considered in this subsystem are accuracy of time, place, price, type, quantity, and quality. Farm agribusiness operations can run more efficiently when this production provider is available and adequate (Salman, 2020). In Kediri Regency, Indonesia, the farming subsystem of the

production facility provider includes providing DOC, feed, and Medicines.

Day old chick

The core company provides DOC to plasma farmers using it for chicken rearing. The DOC strains maintained by the majority of farmers are Cobb, Lohman, and Ross, depending on who the core company supplier is and what the manufacturer is. The price of DOC varies in each period but is the same for each plasma stratum because the DOC supply comes from the same core company. The price of DOC is also dependent on the contract list between plasma farmers and core companies. In several cases, the difference in the price happens due to the additional costs, such as the additional costs of the vaccine in the hatchery. Figure 1 shows the average DOC cost to raise chickens for six periods with 34,029,007 Indonesian Rupiah (IDR).

Based on Figure 1, the DOC price fluctuated in each period. Supply and demand influence the DOC price; in this case, the core companies also have a significant role in determining the price. According to Rahmadani (2009), certain seasons also affect the DOC price. For example, a notable increase in activity can be observed during period 4 (P4), which corresponds to the months of July and August. This period coincides with the start of the new academic year, and it also includes holidays when many individuals plan and take vacations. Consequently, this combination of factors contributes to the highest surge in activity during this time.

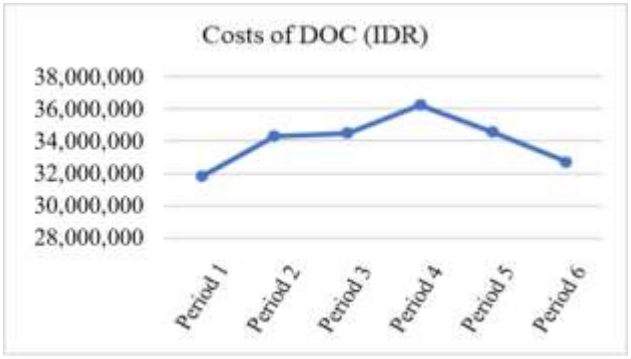

Figure 1. The cost of day-old chicks during six periods of rearing broiler chickens

Table 1. Cost of feed during six periods of rearing broiler chicken in Indonesia in 2022

Period	Feed consumption (kg)	Feed costs (IDR)	Feed costs per bird (IDR/bird)	Increase percentage (%)
Period 1	12,998.48	110,544,612	23,978.78	0
Period 2	14,115.53	121,533,879	26,362.52	10
Period 3	14,125.63	124,359,330	26,975.40	2
Period 4	14,793.94	129,577,390	28,107.28	4
Period 5	14,104.67	120,505,348	26,139.42	-7
Period 6	13,519.57	115,569,573	25,068.77	-4
Average	13,942.97	120,348,355	26,105.36	

IDR: Indonesian Rupiah.The six periods of broiler chicken rearing refers to the latest six durations during which broiler chickens are raised from day-old chicks to the point of reaching market weight from 2021 to 2022

Feed

The core companies also provide feed to plasma farmers. These companies include Charoen Pokphand Indonesia Ltd. (Limited liability company), Malindo Feed Mill Ltd., Japfa Comfeed Indonesia Ltd., Cheil Jedang Indonesia Ltd., and New Hope Indonesia Ltd. There are two phases for feeding depending on the chicken's development period. Those phases are the starter phase in the form of granules (crumble) and the finisher phase in the form of pellets. Feed is a crucial element in the financial system as it substantially contributes to business costs with 60-80% of total production costs (Syamsudin, 2000). Table 1 illustrates the different feed consumption of broilers due to harvest time and mortality in each period. The highest consumption occurred in period 4 because of the low mortality rate; thus, more chickens were produced during this period.

Feed costs can affect farmers' income. When feed prices rise, production costs also increase, affecting the selling price of broilers later. Feed costs reach 80% of production costs for plasma-core farmers with supplies from feed manufacturers. This is because the core company supplies the majority of feed without farmers being independent and skilled to make their feed ratio. Similarly, feed and breed costs are the main costs in broiler farming (Suwarta et al., 2012). According to Amri et al. (2017), the core company has set the feed price stated in the partnership contract.

Medicines

The core company plays a vital role in supplying medicines to plasma farmers. The administration of these medicines is crucial for preventing diseases that may arise during the rearing of chickens, as well as for preventive measures against certain diseases. Each core company collaborates with livestock medicine companies to support the production process of their plasma farmers. Table 2 shows the average cost of medicines needed to raise chickens for six periods with 1,815,082 IDR.

According to the data presented in Table 2, period 5 stands out with the highest medical costs compared to the other periods. This indicates that during this specific period, more funds were allocated to purchasing medicines for the chickens. The primary reason behind this higher expenditure is that period 5 occurs in September-October, which marks the transition from the dry season to the rainy season. Such shifts in weather conditions can significantly impact the health of livestock, including chickens.

The research findings by Widianingrum et al. (2023) support this observation, as they reported that environmental temperature changes, like those experienced during seasonal transitions, can have notable effects on the prevalence and severity of poultry diseases.

Table 2. The cost of medicines used during the six periods of raising broiler chicken in Indonesia in 2022

Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
Medicines costs (IDR)	1,727,983	1,761,146	1,844,954	1,843,068	2,004,290	1,709,050	1,815,082

IDR: Indonesian Rupiah.The six periods of broiler chicken rearing refers to the latest six durations during which broiler chickens are raised from day-old chicks to the point of reaching market weight from 2021 to 2022

Table 3. The average selling price of broiler chicken per kilogram for six periods in Indonesia in 2022

Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
Broiler price (IDR/kg)	19,588	20,040	20,236	20,261	19,763	19,787	19,946

IDR: Indonesian Rupiah.The six periods of broiler chicken rearing refers to the latest six durations during which broiler chickens are raised from day-old chicks to the point of reaching market weight from 2021 to 2022

Farming business subsystem

The farming subsystem includes the production process, such as housing, feeding and drinking management, and sanitation.

Housing

The majority housing system is stilt cages with a common area of 50 m × 8 m × 1.5 m (from the ground to the base of the cage) × 2 m (from the base of the cage to the roof) for a capacity of 2,500 chickens (Figure 2). The main advantage of stilt cages is that it is easier for air circulation to enter, considering that the Kediri Regency, Indonesia, is a hot area. Less air circulation can cause respiratory problems and disease in chickens (Brouček and Čermák, 2015). The coop direction is from west to east or vice versa, so there is no direct exposure from sunlight to the chicken. The cage roof is made of asbestos and tiles with a monitor roof. Asbestos and tile materials do not absorb heat like zinc roofs resulting in lower temperatures for the chicken. The use of a monitor roof is to provide air circulation in housing. Fadilah et al. (2007) state that the recommended leg height is 1.5-1.8 m with a width not exceeding 8 m and a length of 30-50 m. Stage cage system has better air circulation than postal cages because the air can enter through the bottom and side directions. In addition, farmers also utilize bamboo for housing systems (Wantasen et al., 2014).

Figure 2. Open house system of rearing broiler chicken for plasma farmers (tilt cage) in Kediri Regency, Indonesia, 2022

This bamboo housing system can allow air to enter between the floor gaps and provide air circulation. Similarly, the direction of the chicken coop is arranged from east to west (Rasyaf, 2008). This arrangement is based on the assumption that positioning the coop in this direction helps prevent the chickens from being directly exposed to sunlight. By avoiding direct sunshine, it helps to prevent the accumulation of excessive sunlight inside the coop.

The average chicken density for DOC, 1-week-old, 2-week-old, 3-week-old, 4-week-old, and 5-week-old was 350, 85, 44, 15.5, 10, and 7 head/m^2, respectively. Figure 3 shows the density of the cages on one of the plasma breeders in Kediri Regency, Indonesia. Fadilah et al. (2007) had a different opinion regarding broiler density in stage pens. They suggested a density of 6-7 individuals per square meter. The density of chickens in the coop varies between the rainy season and summer. During the rainy season, when the temperature is lower, a higher density is needed to provide sufficient warmth and prevent the chickens from experiencing cold stress. In contrast, during the summer, when the temperature is higher, a lower density is recommended to avoid overheating and ensure the comfort of the chickens.

Figure 3. Feed and drinking management of broiler chicken in plasma farmers in Kediri Regency, Indonesia, 2022

Feed and drinking management

The feeding system is *ad libitum* feeding from the DOC to the finisher phase in Kediri Regency, Indonesia. The amount of feed and time varies from day to day. This difference is due to the distinct daily feed requirements. Feeding at 1-14 days is in the crumbled form, and the feed from 15 days until harvest is in the form of pellets. According to Fadilah et al. (2007), a balanced diet with the proper proportions of protein, carbohydrates, fats, vitamins, and minerals is necessary for broiler chickens. The feed should be thoughtfully prepared and modified to meet the unique nutritional requirements of the broilers at various growth stages. This comprises starter feed for the initial growth stage, followed by grower feed, and finisher feed. According to Rasyaf (2008), the consumption of broiler rations is a reflection of various nutritious components entering the chicken's body. This amount of feed is what chicken needs for production and body maintenance.

The drinking system is also *ad libitum*, in Kediri Regency, Indonesia. Drinking water must always be available because the water content in the chicken's body is more than 70% (Figure 4). Chicken needs to consume a significant amount of water to prevent stress and dehydration, to keep body temperature, and to maintain body water content steady. Fadilah et al. (2007) stated that the temperature inside the cage impacts the water consumption of chickens. Specifically, as the temperature increases, chickens tend to drink more water.

Figure 4. The layout of the feed and drink system in the broiler open house cage in Kediri Regency, Indonesia, 2022

Beosecurity management

Sanitation plays a crucial role in biosecurity efforts for livestock farming by maintaining cleanliness and preventing the spread of diseases. Dewulf and van Immerseel (2019) emphasize that sanitation aims to prevent diseases by ensuring the cleanliness of the cages, environment, and equipment. Fadilah et al. (2007) highlight that biosecurity and sanitation measures are essential in stopping the transmission of infectious and zoonotic diseases. Cleaning cages and conducting fumigation after harvesting is an example of a sanitation practice in the farm, Kediri Regency, Indonesia. This helps eliminate potential disease-causing agents, reduce the cycle of diseases, control flies and odors, and safeguard

the environment. The farmers also protect the chickens by vaccination, which is vital for maintaining the chicken's immune system against various diseases. According to Ravikumar et al. (2022), administering vaccines requires careful consideration of several factors. For instance, the vaccinated chickens should be in good health, the correct dose of the vaccine should be used, the appropriate vaccine type should be selected based on the chicken's age, and sterile equipment and proper packaging should be utilized. Vaccines can be administered at different ages and through various methods. For instance, the avian influenza vaccine can be given via subcutaneous injection at 3 days of age (Alkie et al., 2018), the Gumboro vaccine can be administered through drinking water at 12 to 14 days of age (Khan et al., 2017), and the New Castle Disease Clone vaccine can be administered via spray at 20-22 days of age (Dimitrov et al., 2017). It is important to note that vaccine administration may vary among farmers due to their experience and the specific history of diseases on their farms (Müller et al., 2012).

The marketing subsystem

Prices

Partnership patterns have different prices in each period, but the price set is not far from the market price. The average price of harvested broilers fluctuated in each period. Market prices fluctuate (not fixed) and tend to rise because the number of broiler market demands is increasing daily, and the supply of broilers is decreasing. For instance, during holy shrine holidays, there is a lot of market demand, but chicken availability does not increase, causing broiler prices to rise. In the partnership system, there is a contractual agreement about the price between the core companies and plasma. Hence, price similarities exist even though the plasma farms differ in stratum and scale. The main reason is that the core companies determine the final price for the plasma farm. Table 3 shows the average selling price earned by farmers for six consecutive periods. The highest price is in period 4, with a value of 20,261 IDR per kg of chicken.

Table 4. The average selling price of broiler chicken per kilogram for six periods in Indonesia in 2022

Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
Broiler price (IDR/kg)	19,588	20,040	20,236	20,261	19,763	19,787	19,946

IDR: Indonesian Rupiah.The six periods of broiler chicken rearing refers to the latest six durations during which broiler chickens are raised from day-old chicks to the point of reaching market weight from 2021 to 2022

Table 5. Average Body Weight values generated for six periods of raising broiler chicken in Indonesia in 2022

Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
Average body weight (kg)	1.91	2.09	2.02	2.15	2.07	1.96	2.03

IDR: Indonesian Rupiah.The six periods of broiler chicken rearing refers to the latest six durations during which broiler chickens are raised from day-old chicks to the point of reaching market weight from 2021 to 2022

The production performance

Average body weight

Average Body Weight (ABW) results from production in the form of average harvest weight obtained from broiler rearing activities. The ABW unit is kg/head. Table 4 shows the ABW values generated in each period. In this case, each period has a different value. The results showed that the average value was 2.03 kg/head, which all farmers have the probability of producing in each period.

Feed conversion ratio

Production performance is an essential factor in determining a farm's effectiveness. Farmers can see how effective their farms are by using variables such as the FCR value and IP. According to Rodde et al. (2020), the FCR value helps calculate how much feed is consumed to produce the desired livestock products such as eggs, meat, and milk. The lower the FCR means, the lower the feed costs required. In addition, farmers apply the IP value to assess the efficiency of broiler farming based on the percentage of live chickens, body weight, harvesting age, and FCR (Maharatih et al., 2017). Table 5 shows the amount of feed given and the total weight of the chickens produced each period. The second period has the best feed effectiveness compared to the other periods, as evidenced by a low FCR value. Overall, the effectiveness of feeding in broilers can be seen from the FCR value with an average of 1.69, and it is categorized as a good performance. The FCR value is used to calculate the efficiency of the feed consumed by broilers. The effectiveness of animal feed is inversely proportional to the FCR value; in other words, as the FCR value increases, the effectiveness of the feed decreases, and vice versa.

Index performance

Furthermore, Table 5 shows the average IP value of 307.14; this means that the farmer's performance is excellent and stable. According to Fadilah et al. (2007), a

higher IP value indicates better production performance in chickens. They categorized IP values ranging from 300-350 as indicative of stable and effective production performance. In other words, achieving an IP value within this range is considered desirable for optimal performance in chicken production.

Table 6. Feed conversion ratio obtained during six periods of rearing broiler chicken in Indonesia in 2022

Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
Total feed (kg)	12,998.48	14,115.53	14,125.63	14,793.94	14,104.67	13,519.57	13,942.97
Total body weight (kg)	7,722.85	8,453.20	8,178.79	8,720.60	8,393.49	7,949.85	8,236.46
FCR	1.68	1.66	1.72	1.69	1.68	1.69	1.69
IP	310.60	313.39	299.84	304.67	307.85	306.52	307.14

FCR: Feed Conversion Ratio, IP: Index Performance.The six periods of broiler chicken rearing refers to the latest six durations during which broiler chickens are raised from day-old chicks to the point of reaching market weight from 2021 to 2022

Table 7. Total cost for six periods of broiler chicken rearing in Indonesia in 2022

Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
Total costs (IDR)	144,135,629	157,614,025	160,718,110	167,661,744	157,057,871	150,033,261	156,203,440
Total costs per bird (IDR)	31,950	33,858	34,887	36,825	34,316	32,985	34,137
Total costs per kg (IDR)	18,578	18,520	19,416	19,250	18,670	18,777	18,869

IDR: Indonesian Rupiah. The six periods of broiler chicken rearing refers to the latest six durations during which broiler chickens are raised from day-old chicks to the point of reaching market weight from 2021 to 2022

Table 8. Farmers' revenue and income during six periods of raising broiler chicken in Indonesia in 2022

Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
Total revenue (IDR)	155,609,988	172,538,160	168,911,332	179,367,644	168,447,617	162,365,641	167,873,397
Total costs (IDR)	144,135,629	157,614,025	160,718,110	167,661,744	157,057,871	150,033,261	156,203,440
Income (IDR)	11,474,358	14,924,135	8,193,222	11,705,900	11,389,746	12,332,380	11,669,957
Income/c (IDR)	2,887	3,754	2,061	2,945	2,865	3,102	2,936

IDR: Indonesian Rupiah.The six periods of broiler chicken rearing refers to the latest six durations during which broiler chickens are raised from day-old chicks to the point of reaching market weight from 2021 to 2022

Table 9. Revenue/Cost **(**R/C) ratio for six periods of rearing broiler chickens in Indonesia in 2022

Items	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Average
Total Revenue/bird (IDR)	39,147	43,406	42,493	45,124	42,377	40,847	42,232
Total Costs/bird (IDR)	36,261	39,651	40,432	42,179	39,511	37,744	39,296
R/C Ratio	1.08	1.09	1.05	1.07	1.07	1.08	1.07
Percentage of increase (%)	-	1	-4	2	0	1	

IDR: Indonesian Rupiah.The six periods of broiler chicken rearing refers to the latest six durations during which broiler chickens are raised from day-old chicks to the point of reaching market weight from 2021 to 2022

The financial performance

Production costs

Production costs are costs incurred by farmers in the process of broiler production. This cost includes various forms such as depreciation, DOC, feed, medicines, vitamins, employee wages, electricity, and so on. Table 6 shows the costs required to maintain broiler chickens for six periods. The table reveals the cost difference in each period, with the highest costs in the fourth period, with 167,661,744 IDR or 36,825 IDR per head.

Revenue and income

Revenue and income are essential factors in measuring financial performance in the livestock business. Farmers receive income from their production activities through sales of livestock products, bonuses from core companies, and sales of manure waste (Azizah et al., 2013). In addition, farmers calculate their income or profit by total revenue minus total production costs (Edwards and Duffy, 2014). Table 7 represents the revenue and income received by farmers from period 1 to period 6.

Farmers obtained the highest revenue and income in period 2, with 172,538,160 IDR and 14,924,135 IDR, respectively. The results indicated in the figures are higher than the average per period, with a revenue of 167,873,397 IDR and an income of 11,669,957 IDR. Table 7 shows that the average farmer's income per head is IDR 2,936.

Revenue cost ratio

Calculating the revenue cost ratio (R/C) is one of the production variables to measure the efficiency of a business farm. According to Gumus (2008), this ratio analysis aims to evaluate the efficiency of input and output activities by comparing total revenue and production costs. Table 8 indicates the analysis of the R/C ratio. The analysis shows that broiler farming is profitable because the R/C ratio is more than 1 per rearing period with an average of 1.07 (Table 9).

CONCLUSION

In conclusion, the livestock partnership pattern in Kediri Regency, Indonesia consists of three subsystems, namely production facility provider, farming business, and marketing. Through this partnership, various calculations related to production performance, such as the feed conversion ratio and performance index, were carried out. The results indicated that the broiler farms demonstrated profitable performance in this study based on the return on cost (R/C) ratio, the broiler farmers exhibited positive financial performance, which proved to be beneficial for their businesses in the current study.

DECLARATIONS

Funding

This research received a research grant from the University of Brawijya under the program of research funding for professor.

Availability of data and materials

The data that support the findings of this study are available on request from the corresponding author, Hartono (budihartono_ub@ub.ac.id). The data are not publicly available due to containing information that could compromise the privacy of research participants.

Acknowledgments

The authors would like to thank the University of Brawijya for providing the research funding and the reviewers for their constructive feedback that helped improve this paper's quality.

Authors' contribution

Budi Hartono was involved in planning and supervising the work. Nanang Febrianto and Muhammad Helmi processed the experimental data, performed the analysis, drafted the manuscript, designed the figures, and performed the calculations in this study. Puji Akhiroh aided in interpreting the results and worked on the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that there is no existence of competing interests.

Ethical consideration

The authors have examined ethical issues, including plagiarism checks, publication permission, misconduct, and duplicate publishing.

REFERENCES

Afandi R, Hartono B, and Djunaidi I (2020). The analysis of production costs of laying hen farms using semi self-mixing and total self-mixing feeds in Blitar Regency, East Java. Tropical Animal Science Journal, 43(1): 70-76. DOI: https://www.doi.org/10.5398/tasj.2020.43.1.70

Alkie TN, Yitbarek A, Taha-Abdelaziz K, Astill J, and Sharif S (2018). Characterization of immunogenicity of avian influenza antigens encapsulated in PLGA nanoparticles following mucosal and subcutaneous delivery in chickens. PLoS ONE, 13(11): e0206324. DOI: https://www.doi.org/10.1371/journal.pone.0206324

Amam A (2022). Sebuah evaluasi keberhasilan usaha ternak ayam broiler sistem kemitraan inti plasma [An evaluation of the success of broiler farming in the plasma core partnership system]. Jurnal Pangan, 31(3): 253-272. DOI: https://www.doi.org/10.33964/jp.v31i3.608

Amri KS, Wahyuningsih S, and Subekti E (2017). Analisis kelayakan usaha ayam broiler pola kemitraan inti-plasma (studi kasus peternak plasma PT. Mustika di Kecamatan Boja Kabupaten Kendal) [Analysis of the feasibility of broiler chicken business in the nucleus-plasma partnership pattern]. A case study plasma breeders of PT. Mustika in Boja District, Kendal Regency. Mediagro, 13(2): 78-86. Avalaible at: https://publikasiilmiah.unwahas.ac.id/index.php/Mediagro/article/view/2162

Azizah N, Utami HD, and Nugroho BA (2013). Analysis of the partnership pattern of closed house broiler farming business in Pandaan, Jombang Regency. Jurnal Ilmu-Ilmu Peternakan, 23(2): 1-5. Avalaible at: https://jiip.ub.ac.id/index.php/jiip/article/view/135/154

Brouček J and Čermák B (2015). Emission of harmful gases from poultry farms and possibilites of their reduction. Ekológia (Bratislava), 34(1): 89-100. DOI: https://www.doi.org/10.1515/eko-2015-0010

Dewulf J and van Immerseel F (2019). Biosecurity in animal production and veterinary medicine: From principles to practice. pp. 523. Avalaible at: https://www.cabidigitallibrary.org/doi/book/10.1079/9781789245684.0000

Dimitrov KM, Afonso CL, Yu Q, and Miller PJ (2017). Newcastle disease vaccines-A solved problem or a continuous challenge?. Veterinary Microbiology, 206: 126-136. DOI: http://www.doi.org/10.1016/j.vetmic.2016.12.019

Edwards W and Duffy P (2014). Farm management. Encyclopedia of agriculture and food systems. pp. 100-112. DOI: https://www.doi.org/10.1016/B978-0-444-52512-3.00111-X

Fadilah R, Polana A, Alam S, and Parwanto E (2007). Sukses beternak ayam broiler [Success in farming broiler chickens]. Agromedia Pustaka., Malang. pp. 110-120. Avalaible at: https://agromedia.net/katalog/sukses-beternak-ayam-broiler/

Fitrah H (2013). Analisis break even point usaha peternakan ayam pedaging di Desa Ujung Baru, Kecamatan Bati-Bati, Kabupaten Tanah Laut, Provinsi Kalimantan Selatan [Break even point analysis of broiller business in Ujung Baru Village, Bati-Bati District, Tanah Laut Regency, South Kalimantan Province]. EnviroScienteae, 9(2): 72-80. DOI: http://www.doi.org/10.20527/es.v9i2.1987

Gumus SG (2008). Economic analysis of oriental tobacco in Turkey. Bulgarian Journal of Agricultural Science, 14(5): 470-475. Avalaible at: https://www.agrojournal.org/14/05-05-08.pdf

Indonesian central bureau of statistics (2023). Broiler meat production by province (tonnes), 2019-2021, Available at: https://www.bps.go.id/indicator/24/488/1/produksi-daging-ayam-ras-pedaging-menurut-provinsi.html

Indonesian Ministry of Agriculture (2022). Livestock and animal healts statistics 2022. Government report, 1(1): 1-276. Avalaible at: https://satudata.pertanian.go.id/assets/docs/publikasi/Statistik_Peternakan_dan_Kesehatan_Hewan_2022_compressed.pdf

Kalangi LS, Lombogia SOB, and Regar MN (2021). Analysis of income on the partnership program-based broiler business in Regency of North Minahasa, North Sulawesi, Indonesia. International Journal of Applied Business and International Management, 6(1): 14-24. DOI: https://www.doi.org/10.32535/ijabim.v6i1.937

Karar EMH, Atta AMM, Gharib HBA, and El-Menawey MAA (2023). Impact of prebiotic supplementation on productive performance, carcass traits, and physiological parameters of broiler chickens under high stocking density condition. Journal of World's Poultry Research, 13(1): 48-60. DOI: https://www.doi.org/10.36380/jwpr.2023.5

Khan RSA, Sajid S, Habib M, Ali W, Salah-Ud-Din Shah M, and Sarfraz M (2017). History of Gumboro (infectious bursal disease) in Pakistan. Saudi Pharmaceutical Journal, 25(4): 453-459. DOI: https://www.doi.org/10.1016/j.jsps.2017.04.005

Livestock service of East Java province (2022). The statistic of livestock production in East Java Province. Available at: https://disnak.jatimprov.go.id/web/data/statistikproduksi

Maharatih NMD, Sukanata IW, and Astawa IPA (2017). Studi kasus di Desa Baluk Kecamatan Negara [Analisis performance usaha ternak ayam broiler pada model kemitraan dengan sistem open house]. Peternakan Tropika, 5(2): 407-416. Avalaible at: http://erepo.unud.ac.id/id/eprint/17871/1/0b6cdd94ffb403c3762ce41e135eb418.pdf

Mahendra R (2023). 10 highest broiler producing areas in East Java. Available at: https://surabaya.bisnis.com/read/20230110/532/1616931/10-daerah-penghasil-ayam-broiler-tertinggi-di-jawa-timur

Ministry of Communication and Technology (2022). The human population in East Java, from https://kominfo.jatimprov.go.id/index.php/berita/jumlah-penduduk-jatim-2022-meningkat-0-68-per-tahun

Müller H, Mundt E, Eterradossi N, and Islam MR (2012). Current status of vaccines against infectious bursal disease. Avian Pathology, 41(2): 133-139. DOI: https://www.doi.org/10.1080/03079457.2012.661403

Rahmadani SY (2009). Day old chick (DOC) price risk analysis broiler dan layer in PT. Sierad produce Tbk Parung, Bogor. IPB. Bogor Agricultural University, Indonesia. Avalaible at: https://repository.ipb.ac.id/handle/123456789/15544

Rasyaf M (2008). Panduan beternak ayam broiler [Guide to farming broiler chickens]. Penebar Swadaya., Jakarta. Avalaible at: http://katalogdinarpusbanyumas.perpusnas.go.id/detail-opac?id=9280

Ratnasari R, Srengat w, and Setiadi A (2015). Analysis of the income of broiler breeders in the partnership system in Gunung Pati District, Semarang city. Animal Agriculture Journal, 4(1): 47-53. Avalaible at: https://ejournal3.undip.ac.id/index.php/aaj/article/view/8474

Ravikumar R, Chan J, and Prabakaran M (2022). Vaccines against major poultry viral diseases: Strategies to improve the breadth and protective efficacy. Viruses, 14(6): 1195. DOI: https://www.doi.org/10.3390/v14061195

Ridwan M (2022). Kemitraan agribisnis broiler, konsep, dinamika, kinerja, dan strategi [Broiler agribusiness partnership concept, dynamics, performance and strategy]. Media Sains Indonesia., Banten. pp. 33-38. Avalaible at: http://repository.unhas.ac.id/id/eprint/23739/1/Muh.Ridwan_KEMITRAAN%20AGRIBISNIS%20BROILER%20Konsep%2C%20Dinamika%2C%20Kinerja%20dan%20Stratetegi.pdf

Rodde C, Chatain B, Vandeputte M, Trinh TQ, Benzie JAH, and de Verdal H (2020). Can individual feed conversion ratio at commercial size be predicted from juvenile performance in individually reared Nile tilapia Oreochromis niloticus?. Aquaculture Reports, 17: 100349. DOI: https://www.doi.org/10.1016/j.aqrep.2020.100349

Salman (2020). Sistem agribisnis ayam ras pedaging di Kota Pekanbaru [Broiler agribusiness system in the Pekanbaru city]. Prosiding Seminar Nasional, FKPTPI 2015. pp. 57-62. Avalaible at: https://repo-dosen.ulm.ac.id/handle/123456789/11983?show=full

Santoso H and Sudaryani T (2011). Pembesaran ayam pedaging hari per hari di kandang panggung terbuka [The growth of broiler chickens in an open-house rearing system]. Penebar Swadaya., Jakarta, pp. 55-59. Avalaible at: https://onesearch.id/Record/IOS3358.OBATM-02130000000107

Sehabudin U, Daryanto A, Sinaga BM, and Priyanti A (2022). The Structure of costs and income of broiler chicken farming in different partnership patterns in Sukabumi Regency, West Java, Indonesia. Jurnal Ilmu-Ilmu Peternakan, 32(3): 380-387. DOI: https://www.doi.org/10.21776/ub.jiip.2022.032.03.09

Suwarta, Irham, and Hartono S (2012). Struktur biaya dan pendapatan usaha ternak ayam broiler di Kabupaten Sleman [Cost structure and revenue livestock broiler chickens in Sleman Regency]. AGRIKA: Jurnal Ilmu-ilmu Pertanian, 6(1): 66-88. Avalaible at: http://publishing-widyagama.ac.id/ejournal-v2/index.php/agrika/article/view/133

Syamsudin L (2000). Perusahaan manajemen keuangan [Financial management of a company]. Liberty., Yogyakarta. Avalaible at: https://library.itltrisakti.ac.id/opac/index.php?p=show_detail&id=1817

Ulfa D, Suyatno A, and Dewi YSK (2021). Pola dan kinerja kemitraan pada usaha peternakan ayam broiler di Kabupaten Kubu Raya Kalimantan Barat [Patterns and performance of partnership in broiler farming business in Kubu Raya Regency, Kalimantan Barat]. Analisis Kebijakan Pertanian, 19(1): 19-32. DOI: http://www.doi.org/10.21082/akp.v19n1.2021

Wantasen E, Umboh SJ, Leke JR, and Sompie FN (2014). Investment feasibility and risk management of a small-scale layer business in the Province of North Sulawesi, Indonesia GSC Advanced Research and Reviews, 11(2): 67-77. DOI: https://www.doi.org/10.30574/gscarr.2022.11.2.0132

Widianingrum DC, Prakoso SA, Rohma MR, Hunafah MF, Iqbal M, and Yusantoro D (2023). Penyakit chronic respiratory disease (CRD): Etiologi, epidemiologi, patogenesis, gejala klinis, diagnosis, pengobatan dan pencegahan [Chronic respiratory disease (CRD): Etiology, pathogenesis, clinical symptoms, pathology, epidemiology, diagnosis, treatment and prevention control]. Jurnal Sain Veteriner, 40(2): 221-224. DOI: https://www.doi.org/10.22146/jsv.56683