



Enhancing the Utilization of Local Feed Ingredients to Support the Development of Native Chicken Farming in Gorontalo, Indonesia

SINDU AKHADIARTO^{1*}, EZI MASDIA PUTRI^{1**}, ARMINA FARIANI², MIRNAWATI MIRNAWATI³, WINDU NEGARA¹, RUSLAN ABDUL GOPAR¹, MAMAN SURACHMAN¹, I WAYAN ANGGA DARMAWAN¹, DIMAR SARI WAHYUNI¹, PUTUT SURYO NEGORO¹, RIRIS DELIMA PURBA¹

¹Research Center for Animal Husbandry, National Research and Innovation Agency (BRIN), Jl. Raya Jakarta-Bogor Cibinong, Indonesia; ²Departement of Animal Science, Faculty of Agriculture, Sriwijaya University, Jalan Palembang-Prabumulih, KM 32 Inderalaya, Sumatera Selatan, Indonesia; ³Department of Animal Feed and Nutrition, Faculty of Animal Science, Universitas Andalas, Jl. Limau Manis, Padang, Indonesia.

Abstract | The study aimed to empower community businesses by using Indonesian native chickens fed with local feed compared to commercial feed conducted in Gorontalo. We evaluated the comparison between local feed and commercial feed by examining feed intake, body weight gain, feed conversion ratio, mortality, income over feed and chick cost (IOFCC), and revenue cost ratio of native chicken. The subjects used in this study were 200 one-day-old Indonesian native chickens. The research design was a Completely Randomized Design (CRD) with four treatments and five replications. The treatments in this study were local feed with CP 16.20; ME = 2,738 (R1), CP = 17.68 %; ME 2,723 (R2), CP = 21.50; ME = 2,676 (R3), and as a control, commercial feed with CP = 20.22; ME = 2,868 (R0). Based on the results of the study, the Control Feed treatment (R0) resulted in the highest average final body weight and the lowest feed conversion ratio (FCR), but economically yielded the least profit compared to local feed. Meanwhile, the local feed with 17.68% protein; ME 2,723 Kcal/kg (Treatment R2) provided the highest profit compared to other local feeds (R1 and R3) because R2 resulted in the highest IOFCC and R/C. In conclusion, although the local feed with 17.68% protein and ME 2,723 kcal/kg (Treatment R2) in the region is not as high as commercial feed in resulting final body weight, but Treatment R2 is highly prospective for economic development and for empowering community agricultural products such as corn, bran, coconut meal, fish meal, and others. A recent study proved that local feed can be compared to commercial feed by resulting in the highest profit. Variation in nutrient composition of local feed, focusing on different protein and energy, content is potential for future research.

Keywords | Body performance, Cost, Feasibility study, Indonesian native chicken, Local raw materials formulation, Profit

Received | July 26, 2024; **Accepted** | September 16, 2024; **Published** | March 18, 2025

***Correspondence** | Sindu Akhadiarto, Ezi Masdia Putri, Research Center for Animal Husbandry, National Research and Innovation Agency (BRIN), Jl. Raya Jakarta-Bogor Cibinong, Indonesia; **Email:** sind001@brin.go.id, ezim002@brin.go.id

Citation | Akhadiarto S, Putri EM, Fariani A, Mirnawati M, Negara W, Gopar RA, Surachman M, Darmawan IWA, Wahyuni DS, Negoro PS, Purba RD (2025). Enhancing the utilization of local feed ingredients to support the development of native chicken farming in Gorontalo, Indonesia. *Adv. Anim. Vet. Sci.* 13(4): 809-816.

DOI | <https://dx.doi.org/10.17582/journal.aavs/2025/13.4.809.816>

ISSN (Online) | 2307-8316; **ISSN (Print)** | 2309-3331



Copyright: 2025 by the authors. Licensee ResearchersLinks Ltd, England, UK.

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

An adequate reasonably priced animal-based food that meets halal criteria is required due to population expansion and rising community affluence. Additionally, this food must be available in significant quantities. The Indonesian populace now primarily chooses poultry-based foods (poultry meat and eggs) as their source of animal protein from animals (Saud *et al.*, 2023; Kamel and Hamed, 2021). Compared to native poultry, broiler chicken meat is far more readily available, which accounts for its high contribution level. On the other hand, customers find native chicken flesh to be significantly more affordable than broiler chicken. This fact demonstrates how inadequately the community's meat supply is met by the native chicken producers. Thus, it is appropriate to make efforts to expand the number of local chickens through various government-sponsored community projects.

The market share for native chickens is different from that of broiler chickens. Due to their specific consumer base and preferences, native chickens will not intrude on the market share of broiler chickens despite their increased population (Thuannadee and Noosuwan, 2023). The government's initiative to hasten the growth of nearby chickens at different phases must be well-received. The government's strategic development of native chickens in conjunction with stakeholders, will improve the reputation of native chickens in the long run (Kanyama *et al.*, 2022). Since native chicken is guaranteed to be a consistent supply and high-quality raw material, this initiative will lessen reliance on outside sources, increase employment prospects in rural regions, slow down urbanization, and foster the expansion of culinary businesses that use native chicken as their primary ingredient. Native chickens can contribute to the self-sufficiency of the country's animal protein food supply because they are an indigenous genetic resource of Indonesia (Sugiharto *et al.*, 2019). However, the primary problem with native chicken growth is their low productivity. The conventional maintenance method, which provides inadequate feed and deviates from nutritional science standards, particularly concerning chicken nutritional requirements, is one contributing reason.

Currently, the NRC and Scott *et al.*'s recommendations serve as the foundation for the nutritional requirements for regional chicken feed utilized in Indonesia. According to Scott *et al.* (1982), the metabolizable energy demand for lightweight hens aged 2-8 weeks is 2,600-3,100 kcal/kg, while the feed protein requirement is 18.0% - 21.4%. The NRC (1994) states that the need for protein is 18.0% and the demand for metabolizable energy is 2,900 kcal/kg. These guidelines are applied to the calorie and protein requirements of commercial chickens. This is similar to the findings of Faradila *et al.* (2020), which showed that an en-

ergy balance of 2,800 kcal/kg and protein of 18% provided the best level for improving the performance of native chickens. Similarly, Sidadolog and Yuwanta (2009) reported that balancing protein and energy in the Indonesian native chicken diet potentially improves body performance. So, that, we assume the level of protein and energy level in local feed has the potential to improve native chicken performance and also economic profit.

Feed is the greatest expense factor in the production of animals. About 56.95% of the total expenses spent on small-scale broiler chicken raising are related to feed. Meanwhile, up to 70.97% of the overall expenses in layer chicken production are related to feed. A challenge in Indonesian poultry feed production is the large percentage (about 35%) of imported feed materials, including premixes, soybean meal, maize gluten meal, and beef bone meal (Ditjen Peternakan dan Kesehatan Hewan, 2021). Gorontalo is a province in Indonesia, with abundant potential for corn, rice, and marine fishery products (Australian Consulate-General, 2024). However, the high cost of factory-made feed and the lack of experience with feed production technologies have hindered the growth of the livestock industry, especially for broilers and local chickens. Factory-made feed is still imported at a high cost from other locations, particularly Surabaya, East Java, Indonesia. The cost of feed can make up around 70% of all chicken farming costs. Gorontalo has considerable potential for the growth of chicken feed production because of the region's wide and growing production of food crops (corn, rice, soybeans, etc.) and its richness of marine fisheries goods (fish meal) and plantation products (copra). Thus, the need arises for an "integrated feed production" method that makes use of regional raw materials.

Therefore, the Gorontalo province government has put in place an excellent native chicken farming program under the heading of community empowerment. The Provincial Livestock Service owns the hatcheries where the Day-Old Chicks (DOC) are raised, and Gorontalo-sourced raw materials are used to make the feed. According to Statistics Data of Gorontalo Province, In 2022, there were 2,458,439 native chickens in Gorontalo, or around 6,700 birds every day. Encouraged by the comparatively high price at which native chickens may be sold (around Rp. 48,000 per kg, weighing between 0.8 and 1 kg each), the native chicken industry looks set to grow in Gorontalo Province (BPS-Statistics of Gorontalo Province, 2023).

From the explanations above, the issue of this study is how community empowerment initiatives, such as growing native chicken in the area and feeding them locally derived feed ingredients, compare against commercial feed (which is produced in factories). Furthermore, there is still a lack of study about the potential of local feed in Gorontalo to

improve the performance of native chickens and economic aspects. It is anticipated that the study's findings will help native chicken producers, particularly those that grow feed ingredients like corn, bran, fish, coconut meal, and other crops. We hypothesize that local feed has more potential to improve the performance of native chickens and the economic profit of poultry farmers.

MATERIALS AND METHODS

ETHICAL CONSIDERATIONS

This experiment adhered to research ethics involving livestock as per Indonesian government law number 18 of 2009 (Section 66), which governs the keeping, raising, slaughtering, and proper treatment and care of animals. Additionally, this study adhered to Indonesian National Standard 8405-1:2017 about raising native chickens with registration No. KURI/SNI8405-1:2017.

THE STUDIED PREPARATIONS

This study was conducted at the Food Security Agency of Gorontalo Province, Gorontalo Province, from October to December 2023, spanning 10 weeks. The chickens used were native chickens of Indonesia (AKI), one day old (DOC), totaling 200 DOC purchased from a poultry shop in the city of Gorontalo. The geographical location of this study is 00° 18' 25" - 00° 48' 21" N dan 123° 03' 41" - 123° 33' 06" E.

The cage used is a battery cage system consisting of 20 compartments, with walls and floors made of bamboo. Bamboo is used for the walls and flooring of the battery cage system, which has 20 sections. Each compartment is equipped with feeders and drinkers. The dimensions of each compartment are 40 cm in height, 80 cm in width, and 120 cm in length. Plastic is positioned at the bottom of the cage to catch spilled food. When the chicks are three weeks old, heat lamp (artificial brooder) are installed to provide warmth. Additionally, there are lights for evening illumination in addition.

Commercial feed is bought from a poultry shop in Gorontalo, while the local feed is made with primary ingredients obtained from Gorontalo, including maize, rice bran, fish meal, and coconut meal. The feed formulation technique used in the *FeedstaR* feed program, which was created by the Research Center for Livestock, National Research and Innovation Agency (BRIN), in Indonesian and customized to local ingredients for ease of use. The nutrient composition of selected local feed was analyzed, especially proximate and fiber fractions. Then, the value of the nutrient composition of each selected local feed was collected in the *FeedstaR* program. Ad libitum access to food and drinking water is offered. The feeders are just halfway full to prevent feed from spilling out. Feeding was done twice a day, in the

morning and afternoon. The ingredient and nutrient composition of the diet experiment is given in Table 1.

Table 1: Ingredient and Nutrient Composition of Diet Experiment.

Ingredient composition (%)	Diet Experiment			
	R0	R1	R2	R3
Maize	-	40	39	36
Rice bran	-	30	26	24
Coconut meal	-	15	15	15
Fish meal	-	13	18	23
Feed Supplement	-	2	2	2
Commercial feed	100	-	-	-
Total	100	100	100	100
Nutrient Composition				
Dry matter - DM (%)	90,00	87,76	87,66	81,65
Crude protein (%DM)	20,22	16,20	17,68	21,50
Crude fiber (%DM)	3,70	7,64	7,76	7,62
Extract ether (%DM)	4,34	5,15	3,83	2,95
Calcium (%DM)	1,91	0,85	0,72	1,10
Phosphor (%DM)	0,43	0,50	0,30	1,77
Metabolizable energy (Kcal/Kg)	2.868	2.738	2.723	2.676

Analysis of Laboratorium of Science and Feed Technology of Animal Husbandry Faculty, IPB.

DESIGN OF STUDY

This study evaluated the difference in protein and energy content of local feed and commercial feed as control. We used a Completely Randomized Design with four treatments and five replications. Each plot consisted of 10 DOC, totaling 200 DOC (unsexed). The treatments were given as follows:

R0: Crude protein 20.22%DM, ME 2.868 Kcal/Kg
 R1: Crude protein 16.20%DM, ME 2.738 Kcal/Kg
 R2: Crude protein 17.68%DM, ME 2.723 Kcal/Kg
 R3: Crude protein 21.50%DM, ME 2.676 Kcal/Kg

VARIABLES OF STUDY

The observed variables are performance indicators, which include: initial body weight, final body weight, feed intake, feed conversion ratio (FCR), and economic analysis (IOFCC-Income Over Feed and Chick Cost and business feasibility).

- Feed intake = given feed in the previous day - remaining feed
- Body weight gain = final weight at the end of the study period - initial weight
- $$\text{Feed conversion ratio} = \frac{\text{feed intake}}{\text{body weight gain}}$$
- $$\text{Mortality} = \frac{\text{the number of chickens that died during study period}}{\text{initial number of chickens raised at the beginning of study}} \times 100\%$$

- *Income Over Feed and Chick Cost (IOFCC)*
- $\text{IOFCC} = (\text{average of final weight gain} \times \text{chicken price/kg life weight}) - (\text{average of feed intake} \times \text{feed cost/kg}) + \text{DOC cost}$
- $\text{Revenue Cost Ratio (R/C)} = \frac{\text{expenses}}{\text{earnings}}$

STATISTICAL ANALYSIS

The data obtained were then analyzed using Analysis of Variance, and data groups that showed a statistical significance ($P < 0.05$) were further analyzed using Duncan's new multiple range test (DMRT) Figure 1.

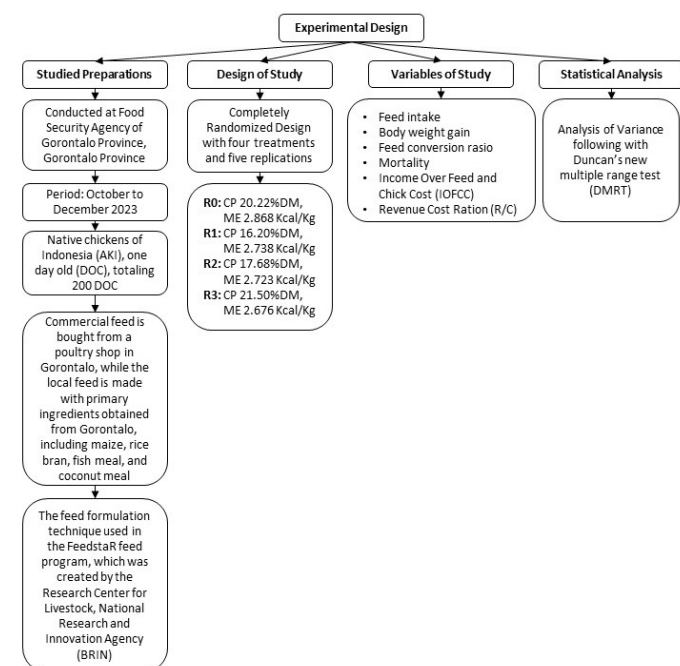


Figure 1: Experimental design chart of this study.

RESULTS AND DISCUSSIONS

Using the current production standards—body weight, feed consumption, and feed conversion ratio—it can be accomplished to observe how various feed formulas affect the productivity of chickens. At the same time, an economic study is conducted on the financial elements related to costs and revenues during the maintenance period.

BODY WEIGHT GAIN

Day-old chicks (DOC) had body weights ranging from 35.0 to 37.5 g across all treatments (Table 2). The study did not compare the body weights of male and female DOC. At 10 weeks of age, the average body weight increased, showing a significant difference between treatments. The recent study reported the average final body weights as follows: 981.47 g (R0), 802.83 g (R1), 913.75 g (R2), and 863.75 g (R3).

Compared to the other four treatments, R0 had the highest body weight, as it utilized commercial feed as the con-

trol ($P < 0.05$). This result is attributed to the control feed's greater consumption and superior feed efficiency compared to the local feeds (R1, R2, and R3). Furthermore, the inclusion of additional ingredients, such as feed additives, in the R0 feed formulation probably helped to improve the efficiency of protein digestion. Conversely, the local feeds (R1, R2, R3) had no growth hormones, colorings, flavorings, or similar chemicals; instead, they were supplemented simply with amino acids (lysine and methionine).

Table 2: Body weight, feed intake, and feed conversion ratio of native chickens at 10 weeks of age.

Parameters	Experimental Diet			
	R0	R1	R2	R3
Initial body weight (gr)	35,00	35,00	37,50	37,50
Final body weight (gr)	981,47 ^c	802,83 ^a	913,75 ^b	863,75 ^b
Feed intake (gr)	2.376	2.129	2.462	2.388
FCR	2,51 ^b	2,77 ^a	2,81 ^a	2,89 ^a
Mortality (%)	2.34	3.29	2.69	2.02

Superscript ^{a,b,c} in the same rows means significantly different ($P < 0.05$); R0: Crude protein 20.22%DM, ME 2.868 Kcal/Kg; R1: Crude protein 16.20%DM, ME 2.738 Kcal/Kg; R2: Crude protein 17.68%DM, ME 2.723 Kcal/Kg; R3: Crude protein 21.50%DM, ME 2.676 Kcal/Kg.

Among the three local diets (R1, R2, R3), the R2 produced a body weight that was a bit greater than the R3 (913.75 g), but it differed significantly ($P < 0.05$) from the R1. This is consistent with the findings of Faradila *et al.* (2020), which stated that different energy-protein ratios in the diet of native chickens significantly ($P > 0.05$) affect their performance, and an energy-protein ratio of 2800 kcal/kg : 18% provides the best level for improving the performance of free-range chickens. The same results were suggested by Chang *et al.* (2023), showing that protein content of 14–15% and metabolizable energy of 2749.11 kcal/kg resulted in the best production performance of native chickens. Similarly, the study by Sidadolog and Yuwanta (2009), found that using medium protein and energy (protein 18% and ME 2,690 kcal/kg) for Merawang chickens (native chickens) was better compared to 15% protein (ME 2,270 kcal/kg) or higher protein, such as 21% (ME 3,140 kcal/kg).

The recent study reported that the average body weight of the local chickens was 913.75 g (R2), 802.83 g (R1), 981.47 g (R0), and 863.75 g (R3). A previous study found that native chickens at 10–16 weeks of age fed with 2701.34–2796.8 kcal/kg of metabolizable energy and 14–16% of crude protein significantly increased body weight 512.19–627.93 g (Chang *et al.*, 2023). In line with Hadrawi *et al.*, (2023) who reported that native chicken from Indonesia (KUB chicken) fed with 100% local mixed feed tended

to increase average body weight gain compared to 100% crumble for the broiler starter phase. It reflects that an increase in body weight is influenced by the increasing age of livestock and feed consumption.

At 10 weeks of age, statistical analysis revealed significant differences ($P<0.05$) in the body weights among R0, R1, R2, and R3. Among the local feed treatments, R2 had the highest body weight. However, it was still 67.72 grams less per chicken than the control diet (R0), with the difference being statistically significant ($P<0.05$). This variance in body weight suggests that important aspects that must be taken into consideration include improved management practices, improved feed nutrition, and hereditary characteristics. Factors affecting growth rate include sex, environment, management techniques, genetics (strain), and the type and amount of feed ingested (Baracho *et al.*, 2019; Hafid, 2023).

FEED INTAKE

The chickens' feed and living conditions were kept consistent across all treatments in this study. Ad libitum feeding was provided according to the minimum standards for feed efficiency, using crumble as the physical form of feed for all treatments (R0, R1, R2, and R3). The resulted indicated that the local feed formulations (R1, R2, and R3) were less palatable compared to the factory-made feed used in the control group (R0).

In the study, the local feed was found to be nearly as prevalent as the control feed (R0), which was consumed by the chickens (2.376 g). Treatments R1, R2, and R3 consumed 2.129 g, 2.462 g, and 2.388 g of feed each chicken, respectively (Table 2). The earlier-mentioned weight gain is intimately linked to the chickens' behavioral responses to the various protein concentrations in the meal treatments. According to Sidadolog and Yuwanta (2009) in order to meet the protein energy requirements for growth, feed intake will increase with a reduced protein concentration.

Table 3: Income Over Feed and Chick Cost (IOFCC) of native chickens at 10 weeks of age.

Diet experiment	Economy Analysis			
	Income (Rp.)	Outcome (Rp.)	IOFCC (Rp.)	R/C
R0	47.111	33.235	13.876	1,42
R1	38.536	21.135	17.401	1,82
R2	43.860	23.526	20.334	1,86
R3	41.460	23.567	17.893	1,76

R0: Crude protein 20.22%DM, ME 2.868 Kcal/Kg; R1: Crude protein 16.20%DM, ME 2.738 Kcal/Kg; R2: Crude protein 17.68%DM, ME 2.723 Kcal/Kg; R3: Crude protein 21.50%DM, ME 2.676 Kcal/K.

According to the results, the R0 treatment—consumed the most feed overall, averaging 2.376 grams per native chicken, when compared to the other treatments. The R1 treatment resulted in the lowest feed intake (2.129 g) among the chickens. Statistical analysis revealed that there were no noteworthy variations ($P>0.05$) in feed consumption across the four treatments. This is in line with the results of Magala *et al.* (2012), who found that feeding Ugandan local chickens with varying quantities of metabolizable energy and crude protein did not significantly affect their feed intake ($P>0.05$). In line with Hadrawi *et al.*, (2023) who reported that there were no significant differences in feed intake of KUB chicken fed with local mixed feed compared to commercial feed.

Conversely, a previous study reported that feeding graded levels of metabolizable energy and crude protein significantly increased the feed intake of the DZ-white chicken strain (Fekadu *et al.*, 2022). These differences are due to feed palatability (taste, smell, and form), feeding technique, and chicken health and strain affecting feed intake of chicken (Khalil *et al.*, 2021; Yaung *et al.*, 2024).

FEED CONVERSION RATIO (FCR)

The feed conversion ration (FCR) with local feed showed no significant difference ($p>0.05$) among treatments R1, R2, and R3 (Table 3). However, there was a significant difference ($p<0.05$) when comparing these local feed treatments to R0, which used commercial feed as the control. The similar feed intake and weight gain across the local feed treatments explain the lack of significant differences in their FCR, while the commercial feed (R0) showed a notable increase in weight gain. These findings align with the study conducted by Fekadu *et al.* (2022), which found that feed conversion in Ugandan local chickens was significantly ($P<0.05$) affected by the feed's varied metabolizable energy and crude protein levels. Conversely, the study from Erwan (2020), reported that the substitution of local feed (corn) in commercial feed did not significantly affect the FCR.

Feed conversion is an indicator of the efficiency of feed utilization in promoting chicken growth (Al-Dawood and Al-Atiyat, 2021). A higher feed conversion ratio means more feed is needed to achieve a given weight gain, suggesting less efficient feed utilization and lower feed quality (Chrystal *et al.*, 2020). A high feed conversion value indicates excessive feed consumption but results in low weight gain. Conversely, a low feed conversion value that results in high weight gain indicates efficient feed consumption.

The feed conversion rates published by Fekadu *et al.* (2022) were between 3.27-4.09, whereas the feed conversion values from our study ranged between 2.51-2.89. A lower feed conversion value suggests more effective feed use, where-

as a larger feed conversion value implies waste in animal feed availability. Three factors have a negligible impact on the feed conversion value: genetics, type of feed, and feed additives used, nutritional content, metabolizable energy, protein content, also livestock management methods, and environment (Liermann *et al.*, 2019; Lisnahan and Nahak, 2020). There is a strong correlation between the feed conversion value and economic value in chicken farming because higher feed consumption results in lower earnings.

MORTALITY RATE

Mortality is an important factor in poultry farming because it is closely related to economic profitability. Factors that can influence mortality such as lack of management, diseases prevalent, and stress of new feeding (Itafa *et al.*, 2021). The quick growth, low mortality rate (approximately 5%), and ease of environmental adaptation are just a few benefits of raising native chickens. A previous study identified several factors contributing to chicken mortality, including disease outbreaks due to inadequate land and housing, the sale of sick chickens, lack of vaccination, high operational costs, low business motivation, insufficient knowledge of farming management and animal welfare, and the absence of government extension programs related to traditional farming practices. Strategies to reduce mortality involve preventing disease by providing appropriate land and housing, banning the sale of sick chickens, introducing vaccination, enhancing management practices through extension programs and campaigns, and offering support from medical personnel to native chicken farmers (Ismoyowati *et al.*, 2022).

The research results demonstrated a relatively low mortality rate due to excellent management strategies. Treatments R1 (3.29%), R2 (2.69%), R3 (2.02%), and R0 (control) (2.34%) had the highest mortality rates. Previous studies reported that different levels of ME and energy affected mortality significantly, probably the level of ME was not enough to build up the chicken's resistance (Chang *et al.*, 2023). The mortality rate is a crucial metric for evaluating how well management techniques are working. Native chicken belongs to animals that have less risk of disease and mortality due to its genetics. Additionally, it is noted that a mortality rate of below 7% during the growth period is still considered normal (Yerpes *et al.*, 2020).

INCOME OVER FEED AND CHICK COST (IOFCC) AND REVENUE COST RATIO (R/C)

In poultry farming, Income Over Feed and Chick Cost, (IOFCC) is an economic indicator. Over the course of ten weeks, a financial analysis of costs and revenues provided the basis for the economic study. Feed cost and Day-Old Chicks (DOC) at Rp 9,000 each are included in the costs. The average final body weight (kg) multiplied by the chicken's selling price of Rp 48,000/kg is the revenue com-

ponent. During the starter and grower periods, the same feed was administered (no feed modification). For each treatment, the cost of local feed is as follows: Rp 5,700 for Treatment R1, Rp 5,900 for Treatment R2, and Rp 6,100 for Treatment R3. The cost of the commercial control feed for Treatment R0 is Rp 10,200.

The best IOFCC of Rp 20,334 was obtained by the local feed treatment R2, which had 17.7% crude protein and 2,723 Kcal/Kg of energy, according to the calculations. The fact that feed consumption was comparatively consistent amongst treatments emphasizes how important "feed cost" is to make a profit. The high cost of the feed was one factor impacting the increased end body weight produced in R0 (commercial feed). The source of protein accounts for the most of feed expenses. While the control feed (R0) costs Rp. 10,200/kg, the local feed (R2) costs Rp. 5,900/kg. Better, as it indicates larger revenue from chicken sales, is an IOFCC value. Similarly, a previous study (Simpursiah *et al.*, 2018) also reported that native chicken fed with local feed resulted in high IOFCC (Rp. 15,673/kg).

This is caused by variations in the chickens' final body weight, feed cost, and feed consumption volume. Furthermore, final body weight, feed consumption, feed costs, and the selling price per kg of live chicken determine IOFCC (Tirajoh *et al.*, 2021; Zulfan *et al.*, 2021). In comparison to other treatments, reduced feed intake and high final body weight will increase profitability. A previous study identified that the factors affecting the profitability of native chicken agribusiness, including egg prices, meat prices, seed prices, feed prices, investment in egg-laying hens, and investment in broiler chickens. Each factor has the following coefficient values: -1.2344 for egg prices, 0.3413 for meat prices, -0.0470 for seed prices, -0.0529 for feed prices, 1.6563 for investment in egg-laying hens, and 0.9735 for investment in broiler chickens (Rohaeni *et al.*, 2021).

The Revenue Cost Ratio (R/C) analysis, which is the ratio of revenue divided by expenditure costs, can be used to determine whether a business venture is profitable for the poultry farmer. The calculation performed above indicates that treatment R2 has the highest R/C ratio, coming in at 1.86. The criterion ($R/C > 1$) indicates that this farming activity is known to be possible to pursue since $1.86 > 1$. This indicates that there will be a revenue of Rp. 1.86,- for every additional Rp. 1,-expenditure. Both the income received and the expenditure costs have a major impact on the R/C ratio. It may be concluded that treatment R2, which is a local feed with 17.7% protein and 2,723 kcal/kg of metabolic energy, offers a profit margin that is adequate for commercial farming. A previous study reported revenue cost ratio analysis of broiler chicken in South Konawe District, South Sulawesi, Indonesia ranges from 1.08-2.39. It showed that the business of broiler chicken farming in the

South Konawe district was very feasible (Geo *et al.*, 2020).

The authors have declared no conflict of interest.

CONCLUSIONS AND RECOMMENDATIONS

- In terms of average final body weight and feed conversion ratio (FCR), the treatment using commercial feed produced the highest results, but it also produced the lowest profit when compared to local feed.
- The local feed with 17.68% protein; ME 2,723 kcal/kg (Treatment R2) turned out to yield the highest profit compared to Treatment R1 (CP = 16.20%, ME = 2,738 kcal/kg) and Treatment R3 (CP = 21.50%, ME = 2,676 kcal/kg).
- For poultry farmers, using local raw resources to produce feed has a lot of potential for development because it can support community agricultural products including rice bran, fish meal, coconut meal, maize, and more.

ACKNOWLEDGMENTS

This study was funded by the Food Agency of Gorontalo Province, Indonesia. The authors would like to say thank Mr. Ruslie Habibie as Governor of Gorontalo Province for the 2012-2017 and 2017-2022 period.

NOVELTY STATEMENT

We compared the performance and economic feasibility of local feed formulations against commercial feed. This comparison highlights the potential benefits and drawbacks of using locally sourced feed, which are not commonly addressed in similar studies. The significance of this study lies in its community-focused approach, detailed nutritional comparisons, economic feasibility analysis, and promotion of local agricultural products, all of which contribute to the empowerment and sustainability of local poultry farming businesses. This research represents a novel contribution, as no previous studies have investigated this aspect.

AUTHOR'S CONTRIBUTIONS

Conceptualization: Sindu Akhadiarto. Data curation: Armiani Fariani and Mirnawati Mirnawati. Formal Analysis: Windu Negara and Ruslan Abdul Gopar. Funding Acquisition: Sindu Akhadiarto. Methodology: Maman Surachman and I Wayan Angga Darmawan. Project Administration: Dimar Sari Wahyuni, Putut Suryo Negoro, and Riris Delima Purba. Supervision: Sindu Akhadiarto. Writing-Original Draft: Sindu Akhadiarto and Ezi Masdia Putri. Writing-Review & Editing: Windu Negara. All authors read and approved the final manuscript.

CONFLICT OF INTEREST

REFERENCES

- Al-Dawood A, Al-Atiyat, R (2021). A Comparative Study on Growth Parameters of Three Broiler Chicken Strains from Jordan. *Braz. J. Poult. Sci.*, 24(2): 1-8. <http://dx.doi.org/10.1590/1806-9061-2021-1534>
- Australian Consulate-General (2024). Gorontalo - a Green and Pleasant Province. https://makassar.consulate.gov.au/mksr/Blog_42.html (accessed on June, 19th 2024, 10.48 a.m)
- Baracho MS, Nääs IdeA, Lima NDS, Cordeiro AFS, Moura DJ (2019). Factors affecting broiler production: A meta-analysis. *Braz. J. Poult. Sci.*, 21(3): 1-10. <https://doi.org/10.1590/1806-9061-2019-105>
- BPS-Statistics of Gorontalo Province (2023). Gorontalo Province in Figures. BPS of Gorontalo Province.
- Chang C, Zhang QQ, Wang HH, Chu Q, Zhang J, Yan ZX., Liu HG, Geng AL (2023). Dietary metabolizable energy and crude protein levels affect pectoral muscle composition and gut microbiota in native growing chickens. *Poult. Sci.*, 102(2): 1-16. <https://doi.org/10.1016/j.psj.2022.102353>
- Chrystal PV, Moss AF, Khoddami A, Naranjo VD, Selle PH, Liu SY (2020). Effects of reduced crude protein levels, dietary electrolyte balance, and energy density on the performance of broiler chickens offered maize-based diets with evaluations of starch, protein, and amino acid metabolism. *Poult. Sci.*, 99(3): 1421-1431. <https://doi.org/10.1016/j.psj.2019.10.060>
- Ditjen Peternakan dan Kesehatan Hewan (2021). Perkembangan Pemasukan Bahan Pakan Asal Tumbuhan (BPAT) Tahun 2020. In Direktorat Jenderal Peternakan dan Kesehatan Hewan Kementerian Pertanian RI.
- Erwan E (2020). Effects of Substitution of Corn for Commercial Ration on Performance and Plasma Cholesterol in Kub Chickens. *Online J. Anim. Feed Res.*, 10(4): 185-190. <https://doi.org/10.51227/ojafr.2020.26>
- Faradila S, Agustina L, Mide MZ (2020). Pemberian Level Energi Dan Protein Yang Berbeda Terhadap Performa Ayam Kampung Umur 2-8 Minggu. *J. Agr.*, 16(2): 55-60. <https://ejournal.polbangtan-gowa.ac.id/index.php/J-Agr/article/view/161>
- Fekadu T, Berhane G, Mengesha M, Alewi M (2022). Effect of Dietary Metabolizable Energy and Crude Protein on the Laying Effect of Dietary Metabolizable Energy and Crude Protein on the Laying Performance, Egg Quality, Hatchability, and Fertility of DZ-White Chickens. *Int. J. Livest. Res.*, 12(7): 38-45.
- Geo L, Saediman H, Ariani WOR (2020). Profit and Financial Feasibility Analysis of Broiler Chicken Livestock in South Konawe District, Indonesia. *IOP Conf. Ser. Earth Environ. Sci.*, 465(1): 1-8. <https://doi.org/10.1088/1755-1315/465/1/012059>
- Hadrawi J, Masir U, Aswin A (2023). Performance of KUB (Ayam Kampung Balitbangtan) Chicken Fed Local and Commercial Feed. *J. Ris. Vet. Ind.*, 7(36): 42-46.
- Hafid H (2023). Growth and Development of Chicken Carcass in Different Sex and Age. *Ind. J. Agr. Res.*, 5(2): 121-131. <https://doi.org/10.32734/injar.v5i2.7425>
- Ismoyowati I, Tugiyanti E, Indrasanti D, Setianto NA, Armelia V (2022). Developing Strategy to Reduce the Mortality of Native Chicken using Qualitative Modeling. *Buletin Peternakan*, 46(1): 54. <https://doi.org/10.21059/buletinpeternak.v46i1.70195>

- Itafa BT, Mohamed AS, Abate WH, Derseh MA, Woldegiorgiss WE (2021). Effect of reciprocal crossing Koekoek and Sasso chickens on growth performance, feed efficiency, carcass yield, mortality rate, and genetic components. *J. Appl. Poult. Res.*, 30(4): 1-12. <https://doi.org/10.1016/j.japr.2021.100214>
- Kamel ER, Hamed E (2021). Effect of Dried Azolla on Growth Performance, Hematological, Biochemical, Antioxidant Parameters, and Economic Efficiency of Broiler Chickens. *Adv. Anim. Vet. Sci.* 9(11): 1886-1894. <http://dx.doi.org/10.17582/journal.aavs/2021/9.11.1886.1894>
- Kanyama C, Moss A, Crowley T (2022). Strategies of promoting sustainable use and conservation of indigenous chicken breeds in Zambia: lessons from low-income countries. *F1000Res.*, 11(251): 1-13. <https://doi.org/10.12688/f1000research.75478.2>
- Khalil MM, Abdollahi MR, Zaefarian F, Ravindran V (2021). Influence of feed form on the apparent metabolisable energy of feed ingredients for broiler chickens. *Anim. Feed Sci. Tech.*, 271(1): 1-9. <https://doi.org/10.1016/j.anifeedsci.2020.114754>
- Liermann W, Bochnia M, Berk A, Bösch V, Hüther L, Zeyner A, Dänicke S (2019). Effects of feed particle size and hydro-thermal processing methods on starch modification, nutrient digestibility and the performance and the gastrointestinal tract of broilers. *Animals.*, 9(6): 1-20. <https://doi.org/10.3390/ani9060294>
- Lisnahan CV, Nahak OR (2020). Growth performance and small intestinal morphology of native chickens after feed supplementation with tryptophan and threonine during the starter phase. *Vet. World.*, 13(12): 2765-2771. <https://doi.org/10.14202/vetworld.2020.2765-2771>
- Magala H, Kugonza DR, Kwizera H, Kyarisiima CC (2012). Influence of Varying Dietary Energy and Protein on Growth and Carcass Characteristics of Ugandan Local Chickens. *J. Anim. Prod. Adv.*, 2(27): 316-324.
- National Research Council (NRC), 1994. *Nutrients Requirements for Poultry*. Washington, DC. USA.
- Rohaeni ES, Bakrie B, Subhan A, Ahmad SN (2021). The level of rice bran usage in the growth of local chickens reared in rural areas. *IOP Conf. Ser. Earth Environ. Sci.*, 788(1): 1-7. <https://doi.org/10.1088/1755-1315/788/1/012181>
- Saud YM, Ali SM, Makmun M (2023). Independent breeder farm actors in ensuring the sustainability of food security in Blitar, East Java, Indonesia. *Int. J. Develop. Sustain.*, 12(3): 68-79.
- Scott ML, Nesheim MC, Young RJ (1982). *Nutrition of the Chickens*. Second Ed. M.L. Scott and Associates Ithaca, New York.
- Sidadolog J, Yuwanta T (2009). Effect of Protein-Energi Concentration in Feed on Body Weight Gain, Energy and Protein Efficiency in the Growth Period of Merawang Chicken. *Anim. Prod.*, 11(1): 15-22.
- Simpursiah AT, Sundu B, Syukur SH (2018). Performance Index (PI) and Income Over Feed and Chick Cost (IOFCC) of Using Thorn Acacia Seeds (*Acacia nilotica* (L.) Willd. ex Del.) With or Without Fermentation in Super Free-Range Chicken Feed. *J. Mitra Sains*, 6(1): 73-81.
- Sugiharto S, Yudiarti T, Isroli I, Widiastuti E, Wahyuni HI, Sartono TA (2019). Effect of formic acid, *Saccharomyces cerevisiae* or their combination on the growth performance and serum indices of the Indonesian indigenous crossbred chickens. *Ann. Agr. Sci.*, 64(2): 206-210. <https://doi.org/10.1016/j.aos.2019.12.004>
- Thuannadee A, Noosuwan C (2023). Consumer meat preference and willingness to pay for local organic meat in Thailand: a case study of Taphao Thong-Kasetsart chicken. *J. Agr. Dev. Emerg. Eco.*, 12: 1-15. <https://doi.org/10.1108/JADEE-12-2022-0279>
- Tirajoh S, Dominanto GP, Usman U, Soplanit A, Bakrie B (2021). Production performance of KUB chicken with the inclusion of Lamtoro (*Leucaena leucocephala*) leaf flour in the feed. *IOP Conf. Ser. Earth Environ. Sci.*, 788(1): 1-8. <https://doi.org/10.1088/1755-1315/788/1/012035>
- Yaung S, Praptiwi II, Wahida W, Lesik MMNN (2024). The influence of the form of feed on the productivity of Broiler chickens. *IOP Conf. Ser. Earth Environ. Sci.*, 1341(1): 1-6. <https://doi.org/10.1088/1755-1315/1341/1/012057>
- Yerpes M, Llonch P, Manteca X (2020). Factors associated with cumulative first-week mortality in broiler chicks. *Animals.*, 10(2): 1-13. <https://doi.org/10.3390/ani10020310>
- Zulfan Z, Zulfikar Z, Daud M, Fitri CA, Munthe WU, Rasyiqah SZ (2021). Evaluation of the Performances and IOFCC of Broilers Fed the Whole, the Skinless, and the Skin of Leubim Fish Waste Meals Based Partial Replacement Feed of Commercial Diets. *Bul. Pet.*, 45(4): 205-213. <https://doi.org/10.21059/buletinpetermak.v45i4.68906>