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Original Article

Productive performance of improved creole chickens under two feeding systems

Comportamiento productivo de pollos criollos mejorados bajo dos sistemas de alimentación

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Abstract

The objective of this study was to evaluate the productive and economic performance of improved creole chickens under different feeding systems. The research was conducted at the Lodana experimental farm of the Universidad Laica Eloy Alfaro de Manabí, using a quantitative approach and a completely randomized design. A total of 96 birds were used, distributed into two treatments with four replicates each, considering the cage as the experimental unit. One system included commercial balanced feed supplemented with Roda grass (*Chloris gayana*), while the other used only commercial balanced feed. Variables such as weight at different stages, feed intake, feed conversion ratio, and carcass weight were recorded. The results showed differences in productive performance between the evaluated systems. Descriptively, the treatment with balanced feed supplemented with Roda grass showed higher average values of final weight and carcass weight, as well as better feed conversion compared to the treatment based exclusively on balanced feed. Likewise, this system showed a more favorable cost–benefit ratio. In conclusion, under the evaluated conditions, supplementation with Roda grass represented a viable alternative to improve the productive and economic performance of improved creole chickens.

Keywords: compound feed, efficiency, feeding, supplementation.

Resumen

El presente estudio tuvo como objetivo evaluar el comportamiento productivo y económico de pollos criollos mejorados bajo diferentes sistemas de alimentación. La investigación se desarrolló en la finca experimental Lodana de la Universidad Laica Eloy Alfaro de Manabí, utilizando un enfoque cuantitativo y un diseño completamente al azar. Se emplearon 96 aves distribuidas en dos tratamientos con cuatro réplicas cada uno, considerando la jaula como unidad experimental. Un sistema incluyó balanceado comercial complementado con pasto Roda (*Chloris gayana*), mientras que el otro utilizó únicamente balanceado comercial. Se registraron variables como peso en diferentes etapas, consumo de alimento, conversión alimenticia y peso a la canal. Los resultados evidenciaron diferencias en el comportamiento productivo entre los sistemas evaluados. De manera descriptiva, el tratamiento con balanceado suplementado con pasto Roda presentó mayores valores promedio de peso final y peso a la canal, además de mejor conversión alimenticia en comparación con el tratamiento basado exclusivamente en balanceado. Asimismo, este sistema mostró una relación costo-beneficio más favorable. En conclusión,

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bajo las condiciones evaluadas, la suplementación con pasto Roda representó una alternativa viable para mejorar el desempeño productivo y económico de los pollos criollos mejorados.

Palabras clave: alimentación, balanceado, eficiencia, suplementación.

1. Introduction

Poultry production constitutes one of the main activities of the global agri-food sector due to its capacity to consistently supply essential products such as chicken meat, eggs, and genetic material for reproduction, establishing itself as a key pillar of food security (Jupiter Toala, 2021). In this context, poultry farming has positioned itself as one of the fastest-growing industries, showing a sustained increase in the production of broiler chickens and laying hens in recent years, which has generated significant economic benefits for producers and has strengthened the dynamics of the sector (Lizcano Moreno, 2021).

Against this background, creole chickens have gained particular interest in rural and small-scale production systems due to their adaptation to adverse environmental conditions, resistance to diseases, and contribution to household food security (Hotúa-López et al., 2021). Likewise, these birds are part of traditional backyard production systems that integrate local knowledge and sustainable practices, establishing themselves as a viable alternative within agroecological models.

However, one of the main challenges in the production of creole chickens lies in optimizing their productive performance, especially about growth, feed conversion, and economic efficiency. In this regard, feed represents between 65% and 70% of production costs, which has driven the search for alternative nutritional strategies that improve performance without significantly increasing costs (Agila Córdova, 2023). Several studies have shown that the inclusion of local inputs or alternative diets can maintain productive parameters similar to those obtained with commercial feed, thereby improving the profitability of the production system (Carriel Morán, 2021; Mendoza Delgado & Mendoza Rivadeneira, 2019).

On the other hand, the improvement of creole chickens, together with appropriate management and feeding practices, has made it possible to increase their productivity without compromising their adaptive characteristics. Recent studies highlight that, through improvements in nutrition and health management, it is possible to enhance the growth and performance of these birds, even under traditional rearing conditions (Siddiqui et al., 2024). Consequently, the evaluation of different feeding systems becomes a key aspect for understanding their impact on the productive performance of improved creole chickens.

In Ecuador, the poultry sector has maintained an expanding trend, reflected in an approximate 27% increase in the number of birds raised, considering that chicken meat and eggs are an essential part of the population's diet and rank among the most widely consumed animal-source foods worldwide (Mero Chávez et al., 2022). Within this context, the province of Manabí stands out as one of the most representative, contributing approximately 10% of the national production, with significant direct and indirect employment generation, favored by its geographical and climatic conditions, which are suitable for poultry production (Quiroz Pincay, 2023).

However, the growth of the sector, especially in cantons such as Santa Ana, has revealed limitations in some production systems, where small and medium-sized enterprises face difficulties associated with efficiency, sustainability, and the definition of productive competencies, which has resulted in the closure of certain production units and the need to adopt more viable production alternatives. In this regard, free-range or semi-free-range rearing systems are presented as a relevant option, since they make it possible to reduce infrastructure costs, decrease stress in the birds, and respond to the growing demand for more environmentally friendly production systems (Quishpe Lema, 2021).

Historically, improved free-range or creole chickens have been raised under semi-free-range systems, characterized by their meat quality and market acceptance, despite their longer growth period compared with conventional broiler chickens (Salazar Proaño, 2022). Likewise, this type of production has maintained a constant presence in rural areas, being oriented toward both household consumption and local commercialization, and serving as an economic alternative for small family production units (Zhiñin Guerrero, 2019).

The present study addressed the following research question: How does the type of feeding influence the productive and economic performance of improved creole chickens? In this context, the general objective was to evaluate the productive and economic performance of improved creole chickens under different feeding systems. To achieve this, the specific objectives were to compare body weight under two

feeding systems, analyze feed conversion and carcass weight as indicators of productive efficiency, and evaluate profitability through the cost–benefit ratio for live birds and carcasses. In accordance with the descriptive approach of the study, the guiding hypothesis was that the inclusion of pasture as a supplement to commercial feed improves the productive performance and profitability of improved creole chickens compared with a system based solely on commercial feed.

2. Materials and Methods

2.1. Methodological approach and study area

The research was conducted under a quantitative approach aimed at evaluating the effect of Rhodes grass (*Chloris gayana*) supplementation on the productive performance of improved creole chickens. The objective measurement of variables such as weight gain, feed intake, and feed conversion ratio throughout the production cycle was considered.

The study was carried out at the Lodana Experimental Farm of Universidad Laica Eloy Alfaro de Manabí [ULEAM], located in the Lodana parish, Santa Ana canton, during the months of September to December. The environmental conditions corresponded to a tropical climate, with estimated average temperatures ranging from 24 to 30 °C and relative humidity between 70% and 85%, which allowed for the proper development of the birds.

2.2. Experimental design and study units

A completely randomized distribution of the experimental units was established, considering the feeding system as the study factor. Two treatments were established: the first consisted of supplying commercial feed supplemented with Rhodes grass (*Chloris gayana*), while the second was based exclusively on the use of commercial feed.

A total of 96 commercially improved creole chickens ("pío pío") were used. The chickens used correspond phenotypically to the Redbro (Hubbard) line, characterized by uniform reddish-brown plumage and yellow legs, although no genetic certification from the supplier was available, which is acknowledged as a limitation of the study. This type of bird is characterized by its hardiness and adaptation to local conditions. The birds were of mixed sex, with no differentiation during their experimental allocation.

The experimental allocation was performed randomly, assigning the birds to eight experimental units. Each unit consisted of one pen housing 12 birds, with the pen defined as the experimental unit. Thus, each treatment had four replicates, totaling 48 birds per treatment. Stocking density was kept constant across all experimental units (4 birds m^{-2}) and was considered a controlled variable.

2.3. Experimental infrastructure and management conditions

The experimental units consisted of mobile cages constructed with a galvanized metal structure and a zinc upper cover, designed to provide protection against climatic conditions. Each cage had dimensions of 3 m in length by 1 m in width and a height ranging from 0.70 to 0.80 m, corresponding to an area of 3 m^2 per experimental unit. A diagram of the experimental design (Figure 1) was developed to show the arrangement of the units and the distribution of replicates. Each treatment had four replicates (independent cages), arranged alternately to reduce positional effects.

The cages were located in the lower area of the experimental farm, in a previously conditioned area through manual cleaning, using tools such as mache-

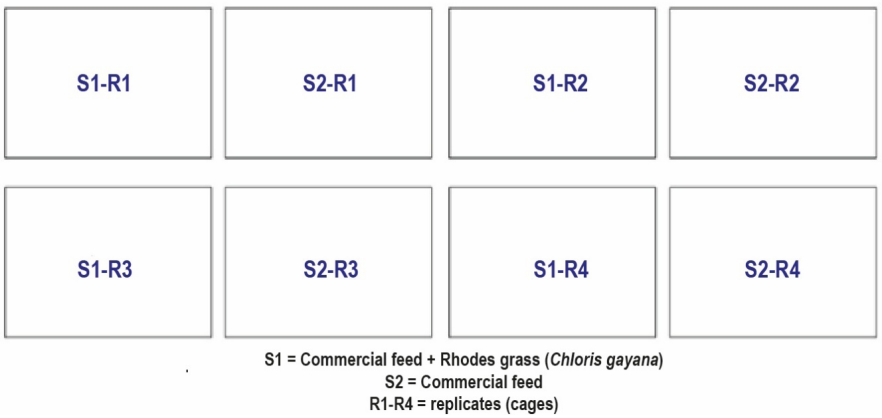

Figure 1. Distribution of experimental units and replicates.

tes, shovels, and rakes, to remove unwanted vegetation and potential pest sources. Subsequently, the area was disinfected through the application of creolin and diluted iodine (3 mL 4 L^{-1} of water), using a spray pump. Likewise, the feeders and drinkers were disinfected before the beginning of the experiment, ensuring adequate hygienic conditions.

Conventional feeders and drinkers were used, distributed in a way that allowed uniform access of the birds to feed and water, avoiding excessive competition. The available space per bird was in accordance with the established density, ensuring adequate welfare conditions.

2.4. Bird management and health

The chicks were transferred under controlled conditions to the experimental area, recording an initial average temperature of 30 °C. From the beginning, continuous access to water and feed was guaranteed, supplementing hydration with vitamins to promote adaptation during the first days.

Health management included the application of a vaccination program against diseases such as Newcastle, Avian Pox, and Infectious Coryza, following a previously established schedule. Additionally, antibiotics such as enrofloxacin (Solubactone) and Cerzona were administered, as well as vitamins (Electravite, A-V 25, Probiovet) and dewormer (Piperazine 53%), as part of the comprehensive management of the birds.

2.5. Feeding and supplementation

Feeding constituted the experimental factor of the study. In both treatments, commercial feed was supplied continuously throughout the entire production cycle, corresponding to a standard diet for broiler chickens, with approximate crude protein levels between 18 and 21% and metabolizable energy between 2,800 and 3,100 kcal kg^{-1}.

In the treatment with supplementation, Roda grass (*Chloris gayana*) was supplied chopped and placed directly on the floor of the experimental units. Its provision was carried out according to the growth stage, reaching approximately 2.55 kg between 45 and 60 days and 3.40 kg between 60 and 90 days.

2.6. Evaluated variables

During the development of the experiment, productive variables were recorded to evaluate the performance of the feeding systems, including body weight at 60 and 75 days, feed conversion, carcass weight, and the cost-benefit ratio. The weight of the birds was recorded individually at different growth stages; however, for the purposes of the analysis, the data corresponding to 60 and 75 days were considered, due to the consistency in the recording of information during the research process. The data were grouped by treatment, obtaining representative average values for each system.

Feed conversion was estimated as the relationship between feed intake and weight gain, being expressed as an indicator of productive efficiency. Carcass weight was determined at the end of the production cycle as an indicator of the commercial performance of the birds. Additionally, variables such as feed intake and grass intake were recorded; however, due to limitations in the recording by experimental unit, these data were used only as general reference and were not included in the comparative analysis.

2.7. Sampling procedure and statistical analysis

The data were recorded in Excel spreadsheets and organized for descriptive analysis. Inferential statistical tests were not applied due to limitations in the experimental unit, prioritizing the comparison of trends between treatments.

3. Results

Weights were recorded in representative samples of birds by feeding system on days 60 and 75. The data were processed descriptively to compare productive performance between treatments. As shown in Table 1, chickens from treatment S1 (feed + grass) presented higher weight values compared to treatment S2 (feed) at 60 and 75 days of age. This difference suggests a possible positive influence of grass inclusion during the intermediate growth stages.

The analysis of feed conversion shows that treatment S1 presented better results than S2 in all evaluated periods (Table 2). At 60 days, S1 recorded a mean of 2.32, while S2 reached 2.47. This trend was maintained at 75 days, with 6.02 for S1 compared to 7.11 for S2, and at 90 days, with 10.11 in S1 and 14.04 in S2. In general, S1 showed greater efficiency in feed conversion over time, as it required a lower amount of feed (kg) per unit of gain compared to S2.

Table 3 shows that the S1 system presented a higher carcass weight compared to S2, which suggests better productive performance under conditions of grass supplementation.

The cost-benefit ratio indicates that the S1 system

presents greater profitability compared to S2 (Table 4). However, these values should be interpreted with caution due to the cost structure considered.

When comparing both systems, system 1 presents greater profitability in terms of carcass production (Table 5). However, the values obtained are lower than those recorded in the live weight analysis, which suggests a reduction in profitability when considering product processing. System 1 presented a total production cost of $368.25 and an income of $508.50, generating a net benefit of $140.25. The cost-benefit ratio was 1.38, indicating that for every dollar invested, a return of $1.38 is obtained, equivalent to a net profit of $0.38. System 2 recorded a total cost of $360.25 and an income of $462.00, generating a net benefit of $101.75. The cost-benefit ratio was 1.28, representing a profit of $0.28 for every dollar invested.

Table 1. Average weight (kg) of chickens at different growth stages.

Treatment	Day 60 (kg)	Day 75 (kg)
S1	1.61	2.01
S2	1.55	1.91

Table 2. Feed conversion.

Treatment	60 days	75 days
S1	2.32	6.02
S2	2.47	7.11

Table 3. Average carcass weight (kg) by feeding system.

Treatment	Carcass weight (kg)
S1	1.94
S2	1.59

Table 4. Cost-benefit relationship of production systems.

System	Total cost ($)	Total income ($)	Net benefit ($)	Cost/Benefit ratio
S1	328.25	690.00	361.75	2.10
S2	320.25	617.00	296.75	1.93

Table 5. Cost–benefit ratio per carcass.

System	Total cost ($)	Total income ($)	Net benefit ($)	Cost/Benefit ratio
S1	368.25	508.50	140.25	1.38
S2	360.25	462.00	101.75	1.28

4. Discussion

The results of the present study show that the feeding system influences the productive performance of improved Creole chickens under semi-grazing conditions. In this sense, the inclusion of grass as a supplement in System 1 [S1] showed a favorable trend in productive variables such as weight and feed conversion, particularly during the intermediate growth stages. These findings highlight the importance of nutritional management within alternative poultry production systems. In this regard, González-Cerón et al. (2019) indicate that the rearing system directly influences the growth rates of birds, with grazing being a determining factor in the productive trajectory, with growth models that differ significantly between birds raised under confinement and those raised under grazing systems.

Regarding productive performance, the weight values recorded at 60 and 75 days show that S1 reached higher

averages compared to System 2 [S2]. This difference suggests that forage supplementation may contribute positively to bird growth during specific development stages. However, since the data were analyzed under a descriptive approach, conclusive statistical inferences could not be established. In this context, the observed results coincide with those reported by Andrade Mendoza (2022) and Muñoz Marcillo (2022), who indicate that the use of forages as a feed supplement can improve nutrient utilization and promote growth in semi-intensive systems. On the other hand, Freitas-Pinheiro et al. (2019) demonstrated that adjusting the nutritional composition in Redbro Creole chickens directly influences productive performance. The optimization of crude protein, without altering essential amino acids, can improve weight gain and feed conversion, highlighting the importance of adequately formulating balanced feed.

On the other hand, feed conversion showed lower values in S1 compared to S2 throughout the evaluated stages, indicating greater efficiency in feed utilization in the system with grass supplementation. This behavior suggests that the inclusion of forage resources can optimize the use of balanced feed, potentially reducing production costs. These results are consistent with those reported by Arjona Smith and Guevara (2020), who highlight the importance of the relationship between nutritional quality and productive efficiency in poultry systems.

In this same sense, Paredes and Díaz (2023) found that the partial substitution of finishing feed with yellow corn up to 40% did not affect body weight gain or feed conversion in improved Creole chickens, demonstrating that the incorporation of alternative feed resources can be viable without compromising productive performance. Likewise, Mendoza Ribadeneira et al. (2020) reported that the partial substitution of corn with whole meal flour of *Cucurbita moschata* generated significant differences in feed intake and weight gain during early stages, confirming that the energy source used as a feed supplement has a relevant influence on the productive efficiency of birds.

Regarding carcass weight, S1 presented higher values compared to S2, which reinforces the idea of better productive performance under conditions of grass supplementation. This result is relevant considering that carcass weight represents a more direct indicator of the commercial performance of birds. However, as with other variables, these results should be interpreted from a descriptive approach, due to the methodological limitations associated with the experimental unit.

From a management perspective, the use of mobile cages allowed an adequate distribution of the birds in the space, facilitating land use and reducing waste accumulation. This type of system contributes to improving sanitary conditions and animal welfare, which are fundamental aspects in semi-grazing production systems. In accordance, Chiriapa Brito (2023) indicates that the implementation of mobile infrastructures favors the reduction of pathogens and improves the productive environment. Along the same line, Acosta Lozano et al. (2018) highlight that the design of infrastructures adapted to local conditions is essential to guarantee an adequate productive environment in small-scale poultry systems, which is relevant in the context of the present study. Additionally, the supplementation with local inputs as a management strategy has been explored by Quiroz Pincay (2023), who evaluated the use of azolla meal in improved Creole chickens and found that this input, rich in protein and minerals, can be integrated as a feed supplement within semi-intensive systems, contributing to the diversification of available nutritional sources.

In the economic analysis, both systems presented cost-benefit ratios greater than 1 in live production, indicating that they are economically viable. S1 showed greater profitability, with a C/B ratio of 2.10, compared to 1.93 in S2, suggesting an economic advantage associated with the use of grass as a feed supplement. These results coincide with those reported by Alcívar Mero and Mero Mejía (2020), who highlight that the incorporation of alternative feed resources can reduce costs and improve profitability in poultry systems.

On the other hand, in the carcass analysis, both systems continued to show profitability, although with lower values compared to live production. S1 reached a C/B ratio of 1.38, while S2 presented 1.28, maintaining the advantage of the system with grass supplementation. This decrease in profitability could be associated with the additional processing costs, which highlights the importance of considering different economic scenarios within the production system. In this sense, Angarita Leiton and Castrillón Zapata (2020) emphasize the need to evaluate the economic sustainability of production systems beyond immediate results. Additionally, Duarte Reyes (2020) indicates that management variables such as the use of brooders and artificial light hours can influence the final weight of birds and, therefore, the economic indicators of the system, making it important to consider these factors in a comprehensive evaluation of productive profitability.

Overall, the results suggest that the inclusion of grass in semi-grazing systems can improve the productive and economic performance of improved Creole chickens. However, the methodological limitations of the study imply that these findings should be considered as a descriptive approximation, and fu-

ture research with more robust experimental designs is recommended to statistically validate the observed effects.

5. Conclusions

The feeding system based on balanced feed plus grass supplementation showed better productive performance compared to the system with exclusive balanced feed, as evidenced by higher weights at 60 and 75 days, as well as greater carcass weight. These results suggest a favorable effect of forage inclusion on the growth of improved Creole chickens under semi-grazing conditions.

Feed conversion was lower in the system with grass supplementation, indicating greater efficiency in feed utilization compared to the conventional system. In this sense, the performance reflects the potential of using forage resources as a strategy to optimize the utilization of balanced feed in alternative production systems.

Both evaluated systems presented economic profitability; however, the system with grass inclusion recorded a higher cost-benefit ratio in both live production and carcass production. Nevertheless, the limitations of the descriptive approach of the study are recognized; therefore, it is recommended to develop research with greater experimental rigor that allows the validation of the observed effects.

Contributor roles

- María Gabriela Farías Delgado: conceptualization (lead), methodology (lead), investigation (lead), formal analysis, project administration, resources, supervision.
- Valter Francisco Mero Rosado: software (lead), data curation (supporting), visualization (lead), writing – review & editing (supporting).
- Daniela Estefanía Vélez Vera: investigation (equal), validation (lead), formal analysis (supporting), writing – original draft (equal), writing – review & editing (lead).
- Gabriela Mishell Tejena Juncay: investigation (supporting), data curation (equal), validation (equal), writing – original draft (supporting), writing – review & editing (equal).

Data availability

The supplementary data tables are cited in the manuscript.

Use of Artificial Intelligence

The authors declare that no artificial intelligence has been used in the preparation of the manuscript.

Ethical implications

The experiment was conducted exclusively with production birds, under criteria of responsible management and respect for animal welfare. The research was carried out at the "Lodana" experimental farm of the Universidad Laica Eloy Alfaro de Manabí under technical and professional supervision. Likewise, the research is framed within the provisions of Article 8, literal f of the Organic Law of Higher Education [LOES], which establishes as a purpose "to promote and carry out scientific, technological, and pedagogical research programs that contribute to the improvement and protection of the environment and promote sustainable national development in harmony with the constitutionally recognized rights of nature, prioritizing animal welfare".

Conflict of interest

The authors declare that they have no affiliation with any organization with a direct or indirect financial interest that could have appeared to influence the work reported.

References

Acosta Lozano, N., González Asencio, M., Duque Marín, R., & Andrade Yucailla, V. (2018). Producción de pollos criollos con una incubadora artesanal de huevos en la comuna San Vicente cantón Santa Elena. *Revista Científica y Tecnológica UPSE, 5*(1), 90–95. https://doi.org/10.26423/rctu.v5i1.336

Agila Córdova, R. E. (2023). *Efecto de las diferentes fuentes de fibra sobre los parámetros productivos de los pollos de carne criados en altura.* Universidad Nacional de Loja. https://dspace.unl.edu.ec/handle/123456789/28143

Alcívar Mero, J. A., & Mero Mejía, L. L. (2020). *Utilización de malezas ensiladas en la alimentación de aves domésticas (pollos) en el sitio Monos del cantón Flavio Alfaro en el año 2019*. Universidad Laica Eloy Alfaro de Manabí. https://repositorio.uleam.edu.ec/handle/123456789/3368

Andrade Mendoza, D. Y. (2022). *Comportamiento biológico de pollos camperos en diferentes densidades bajo pastoreo confinado en el trópico húmedo.* Universidad Laica Eloy Alfaro de Manabí. https://repositorio.uleam.edu.ec/handle/123456789/5118

Angarita Leiton, A., & Castrillón Zapata, F. (2020). *Producción agroecológica de gallinas criollas*. Corporación Universitaria Minuto de Dios. https://www.digitaliapublishing.com/a/131810/produccion-agroecologicos-de-gallinas-criollas

Arjona Smith, M. I., & Guevara, V. (2020). Efecto de diferentes niveles de densidad de nutrientes sobre el comportamiento productivo y metabolismo energético de pollos de engorde. *Revista Investigaciones Agropecuarias, 2*(1), 1–17. https://revistas.up.ac.pa/index.php/investigaciones_agropecuarias/article/view/1062/1902

Carriel Morán, F. O. (2021). *Balanceado artesanal: Una alternativa para la alimentación de los pollos broiler Cobb-500.* Universidad Técnica Estatal de Quevedo. https://re-

positorio.uteq.edu.ec/handle/43000/6165

Chiriapa Brito, G. V. C. (2023). *Evaluación de las características reproductivas de gallinas criollas en la etapa de postura bajo tres sistemas de manejo intensivo, semintensivo y extensivo en el cantón Logroño.* Escuela Superior Politécnica de Chimborazo. https://dspace.espoch.edu.ec/handle/123456789/19591

Duarte Reyes, K. L. (2020). *Evaluación de días de temperatura y horas luz sobre la ganancia de peso en pollos broiler en el Cantón Mira – Parroquia La Concepción.* Universidad Politécnica Estatal del Carchi. http://repositorio.upec.edu.ec/handle/123456789/953

Freitas-Pinheiro, S. R., Borges Ferreira, C., Josiane Vieira, D., Almeida Silva, J., Madureira De Souza Carvalho, R., & Gomes De Oliveira, R. (2019). Reducción de la proteína bruta en la dieta de pollos criollos de engorde en un sistema semi-intensivo. *Revista MVZ Córdoba, 24*(3), 7322–7327. https://doi.org/10.21897/rmvz.1824

González-Cerón, F., Olaiz-González, P. R., Mata-Estrada, A., Pro-Martínez, A., Sosa Montes, E., Fernández-de La O, M., Calzada-Marín, J. M., & Rivas-Jacobo, M. A. (2019). Modelación del crecimiento de pollos de engorda criados en pastoreo o confinamiento. *Agro Productividad, 12*(8). https://doi.org/10.32854/agrop.v0i0.1449

Hotúa-López, L. C., Cerón-Muñoz, M. F., Zaragoza-Martínez, M. D. L., & Angulo-Arizala, J. (2021). Avicultura de traspatio: Aportes y oportunidades para la familia campesina. *Agronomía Mesoamericana, 32*(3), 1019-1033. https://doi.org/10.15517/am.v32i3.42903

Jupiter Toala, R. A. J. (2021). *Producción y comercialización de pollos en el cantón La Libertad, provincia de Santa Elena.* Universidad Estatal Península de Santa Elena. https://repositorio.upse.edu.ec/handle/46000/5960

Lizcano Moreno, A. (2021). *Apoyo profesional en la implementación del protocolo en buenas prácticas avícolas en el municipio de Durania, Norte de Santander.* Universidad Francisco de Paula Santander. https://repositorio.ufps.edu.co/handle/ufps/7515

Mendoza Delgado, M. A., & Mendoza Rivadeneira, F. A. (2019). Comportamiento productivo y análisis sensorial de la carne de pollo alimentados con harina integral de zapallo (*Cucurbita moschata*) variedad macre. *Revista Arbitrada Interdisciplinaria Koinonía, 4*(8), 828. https://doi.org/10.35381/r.k.v4i8.495

Mendoza Ribadeneira, F. A., Vargas Zambrano, P. A., Vivas Arturo, W. F., Valencia Llanos, N. F., Verduga López, C. D., & Dueñas Rivadeneira, A. A. (2020). Sustitución parcial de maíz por harina integral de *Cucurbita moschata* y su efecto sobre las variables productivas de pollos Cobb 500. *Ciencia & Tecnología Agropecuaria, 21*(2). https://doi.org/10.21930/rcta.vol21_num2_art:1298

Mero Chávez, U. F., Baduy Molina, A. L., & Cárdenas Reyes, E. E. (2022). Producción avícola y su incidencia en el desarrollo económico del cantón olmedo, provincia de Manabí. *JOURNAL BUSINESS SCIENCE*, *3*(2), 43–61. https://doi.org/10.56124/jbs.v3i2.0005

Muñoz Marcillo, J. J. (2022). *Bienestar productivo en el comportamiento de pollos camperos con tres tipos de densidades.* Universidad Laica Eloy Alfaro de Manabí. https://repositorio.uleam.edu.ec/handle/123456789/5194

Paredes, M., & Díaz, M. (2023). Sustitución del pienso de finalización por maíz amarillo en pollos criollos. *Revista de Investigaciones Veterinarias del Perú, 34*(1), e24612. https://doi.org/10.15381/rivep.v34i1.24612

Quiroz Pincay, A. J. (2023). *Parámetros zootécnicos en pollos finqueros utilizando dietas con inclusión de azolla (Azolla anabaena).* Universidad Estatal del Sur de Manabí. http://repositorio.unesum.edu.ec/handle/53000/5294

Quishpe Lema, M. E. (2021). *Estudio del potencial productivo de pollos broilers Cobb 500 en las diferentes regiones agroecológicas del Ecuador.* Escuela Superior Politécnica de Chimborazo. https://dspace.espoch.edu.ec/handle/123456789/15619

Salazar Proaño, J. D. S. (2022). *Evaluación del efecto de tres dosis de levadura de cerveza inactiva (Saccharomyces cerevisiae) en la dieta de pollo campero.* Pontificia Universidad Católica del Ecuador. https://repositorio.puce.edu.ec/handle/123456789/42718

Siddiqui, S. A., Toppi, V., & Syiffah, L. (2024). A comparative review on Ayam Cemani chicken-A comparison with the most common chicken species in terms of nutritional values, LCA, price and consumer acceptance. *Tropical Animal Health and Production, 56*(4), 161. https://doi.org/10.1007/s11250-024-03980-6

Zhiñin Guerrero, M. B. (2019). *Crianza de pollos camperos para el mejoramiento de la economía familiar en zona urbano marginal.* Universidad Técnica de Babahoyo. http://dspace.utb.edu.ec/handle/49000/6073