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Effects of Banana (*Musa acuminata*) Pseudo-Stem and Rice Bran Feed on the Growth Performance of Native Chickens (*Gallus gallus domesticus*)

Ronald V. Cantiveros¹, Jasper C. Cañadilla¹, Jerald O. Cassion¹, Kenneth G. Congreso¹, Edwin Aenlle Jr.¹, AJ D. Sorita¹, John Mark F. Villazorda¹, Philip H. Fabre¹, Joriz C. Sesaldo¹, Aaron P. Suganob¹, Erl Mark Burdeos¹, Althea Alapan¹, Kenneth M. Pabion¹, Joshua G. Hanopol¹, Afryl L. Coralat², Niel Yves C. Dultra², Rodelio B. Pasion, PhD^{3*}

¹ Student, Tungao National High School, Tungao Butuan City, Philippines

² Secondary School Teacher, Tungao National High School, Tungao Butuan City, Philippines

³ Assistant Senior High School Principal, Tungao National High School, Tungao Butuan City, Philippines

*Corresponding author, rodelio.pasion001@deped.gov.ph

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Abstract

This study evaluated the growth performance of native chickens (*Gallus gallus domesticus*) fed banana (*Musa acuminata*) pseudo-stem mixed with rice (*Oryza sativa*) bran compared with conventional commercial feed in San Mateo, Butuan City. A quantitative experimental design was employed, with homogeneous chicks randomly assigned to control and experimental groups over a three-week feeding trial. Growth parameters measured included body weight, body height, and body length. Results showed that chickens fed conventional feed exhibited substantial growth, with an average weight increase of 1336% (from 38.2 g to 510.6 g), height growth of 121% (7.8 cm to 17.2 cm), and length increase of 154% (8.2 cm to 20.8 cm), with 100% survival. In contrast, chickens fed the banana pseudo-stem and rice bran mixture demonstrated poor performance, with 80% mortality, a 16% weight loss in surviving chicks (44 g to 37 g), and no significant changes in height (8 cm) and length (9 cm). Statistical analysis using an independent samples t-test confirmed a significant difference between treatments. These findings indicate that the unprocessed feed mixture is nutritionally inadequate for starter-phase chickens due to high crude fiber content and anti-nutritional factors. The study emphasizes the need for proper processing methods, such as fermentation, to improve the viability of agricultural by-products as poultry feed.

Keywords: Native chicken, banana pseudo-stem, rice bran, growth performance, poultry feed

Introduction

Native chicken production plays a vital role in supporting rural livelihoods in Southeast Asia, particularly among small-scale farmers. These chickens are valued for their adaptability, disease resistance, and consumer

appeal; however, their growth performance is often limited by reliance on traditional feeding practices and the high cost of commercial feed. This challenge has encouraged the exploration of alternative, low-cost, and sustainable feed resources to improve productivity.

One promising approach is the utilization of agricultural by-products, such as banana pseudo-stem and rice bran. Banana pseudo-stem is abundant and rich in fiber and minerals, but it is often discarded as waste. Rice bran, on the other hand, is widely used in poultry feeding due to its energy and nutrient content. Combining these materials offers a potential strategy to reduce feed costs while promoting sustainable, circular agricultural practices.

Previous studies have shown that processed forms of banana pseudo-stem, particularly when fermented, can improve poultry growth performance and feed efficiency. However, the effectiveness of raw or unprocessed pseudo-stem as a feed component remains uncertain, especially during the early growth stages of native chickens.

However, few studies have examined the effects of unprocessed banana pseudo-stem mixed with rice bran on the growth performance of native chickens during the starter phase. Thus, this study aims to evaluate the growth performance of native chickens fed banana pseudo-stem mixed with rice bran compared to conventional commercial feed, providing evidence on its viability as an alternative feeding strategy.

Related Studies

This section presents a detailed analysis of sustainable feed interventions for native chicken production in Southeast Asia, focusing on the use of agricultural by-products to address economic and nutritional constraints in low-input farming systems.

The rising cost of commercial poultry feed has prompted growing interest in alternative, sustainable feed resources, particularly in low-input farming systems. Native chicken production, which plays a crucial role in rural livelihoods across Southeast Asia, often relies on traditional feeding practices that limit growth performance. As a result, agricultural by-products have been explored as cost-effective and environmentally sustainable alternatives (Ravindran et al., 2022). These by-products support circular agriculture by converting waste materials into valuable inputs for livestock production. Studies consistently highlight that alternative feed resources can reduce production costs and improve sustainability. However, their effectiveness depends largely on proper formulation and nutrient balance.

Banana pseudo-stem has gained attention as a potential feed ingredient due to its abundance and nutritional components, including crude fiber, carbohydrates, and essential minerals (Pampolina & Pacion, 2020). Several studies have demonstrated its benefits when incorporated into poultry diets. Valenzuela et al. (2023) reported improved feed intake and average daily gain when dried banana plant parts were included in native chicken diets. Similarly, Sarra et al. (2021) observed enhanced growth performance using fermented banana pseudo-stem juice.

Further studies support these findings. Punyatong et al. (2023) found that incorporating 5%–10% banana pseudo-stem improved feed conversion ratio and gut health in Thai native chickens. Dao et al. (2014) also reported improved weight gain and feed efficiency when banana pseudo-stem was used as a feed component in ducks, suggesting its applicability in poultry systems. The literature indicates that banana pseudo-stem can

enhance poultry performance; however, most studies emphasize its effectiveness when processed or used in controlled inclusion levels.

Rice bran is a widely used feed ingredient due to its high energy and protein content and essential vitamins. Alewi et al. (2022) found that inclusion levels of up to 25% rice bran supported healthy poultry growth without negatively affecting feed efficiency. In combination with banana pseudo-stem, rice bran serves as a complementary ingredient, balancing the high fiber content with adequate energy and protein (Dalisyay & Soriano, 2023). Rice bran is consistently identified as a reliable, nutrient-dense feed component that enhances the effectiveness of alternative feed formulations when properly combined with other ingredients.

Processing techniques such as fermentation and ensiling play a critical role in improving the nutritional value of agricultural by-products. Studies by Adeyemi et al. (2023) and Kamal et al. (2023) demonstrated that these methods increase crude protein content and reduce anti-nutritional factors, thereby enhancing digestibility and feed efficiency. Similarly, Arief et al. (2023) and Khan et al. (2022) reported improved palatability and nutrient availability in fermented banana-based feeds.

However, unprocessed banana pseudo-stem may contain anti-nutritional compounds such as cyanogenic glycosides, oxalates, and phytates, which can impair nutrient absorption and negatively affect poultry growth (Singh & Patel, 2023). Proper storage and preparation are therefore essential to ensure feed safety and effectiveness. The effectiveness of the banana pseudo-stem as a feed ingredient depends heavily on processing. Without proper treatment, its nutritional limitations and anti-nutritional factors may reduce its suitability for poultry feeding.

The reviewed studies collectively demonstrate that banana pseudo-stem and rice bran have strong potential as alternative feed resources in poultry production. When properly processed and combined, these materials can improve growth performance, feed efficiency, and economic returns while supporting sustainable agricultural practices (Tan & Sy, 2022; Abad, 2024). However, the literature also reveals a critical gap: most studies focus on processed forms of banana pseudo-stem, such as fermented or ensiled variants. Limited research has examined the effects of unprocessed banana pseudo-stem mixed with rice bran, particularly during the starter phase of native chickens. This gap highlights the need for further investigation into the direct use of raw agricultural by-products as feed components.

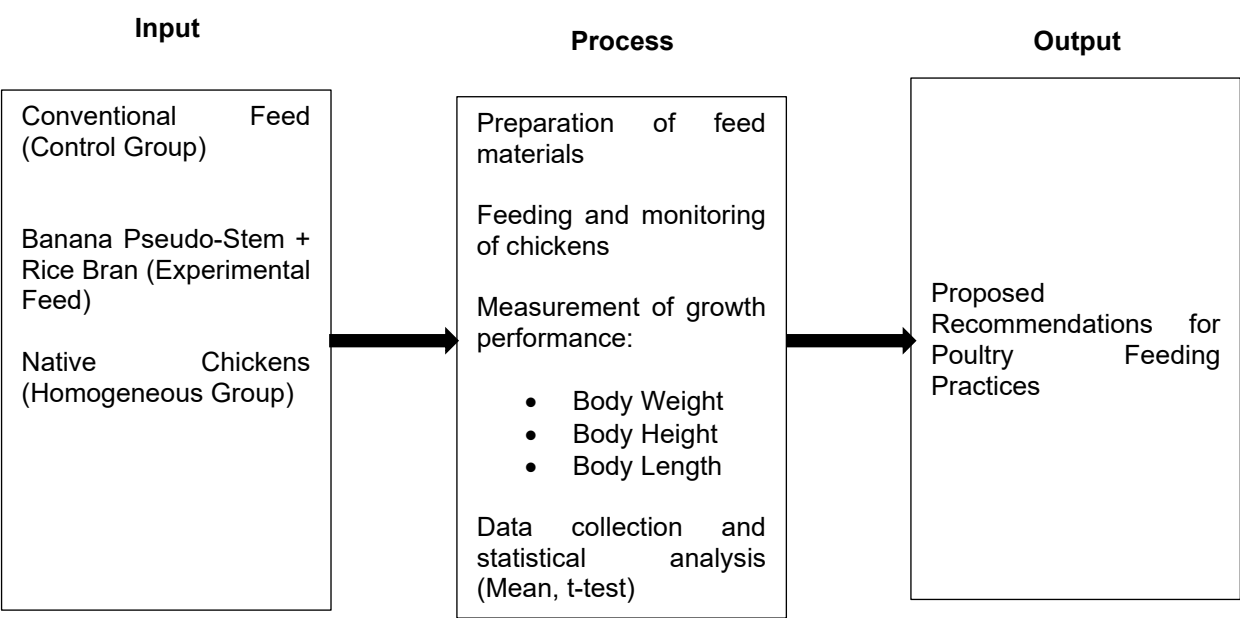
Theoretical/Conceptual Framework

This study is anchored on the nutritional theory of feed formulation, which emphasizes that balanced combinations of feed ingredients improve animal growth performance. Sokchea et al. (2018) demonstrated that combining banana pseudo-stem with rice bran enhances the overall nutrient profile compared to using banana pseudo-stem alone. Additionally, the study is supported by the concept presented by Nuriyasa et al. (2022), which explains that native chickens can utilize low-cost, high-fiber agricultural by-products owing to their physiological adaptability.

Guided by these theories, this study assumes that combining banana pseudo-stem and rice bran can influence the growth performance of native chickens. The independent variable is the feed type (banana pseudo-stem mixed with rice bran and conventional feed), while the dependent variables include body weight, body height, and body length. It is expected that the nutrient interaction between fiber (from banana pseudo-stem) and energy and protein (from rice bran) may affect growth outcomes. However, the effectiveness of this combination depends on nutrient availability and proper feed utilization, which this study aims to evaluate.

This study assumes that the type of feed (input), when subjected to proper feeding and monitoring procedures (process), will directly influence the growth performance of native chickens (output). The framework highlights that changes in feed composition may result in variations in body weight, height, and length. The study's outcome provides evidence on whether banana pseudo-stem, mixed with rice bran, can serve as a viable alternative to conventional feed.

Figure 1: Research Flow of the Study



Objectives of the Study

This study aimed to evaluate the following objectives: (1) determine the growth performance of native chickens fed with conventional feed in terms of body weight, body height, and body length; (2) determine the growth performance of native chickens fed with banana pseudo-stem mixed with rice bran in terms of body weight, body height, and body length; (3) determine whether there is a significant difference in the growth performance of native chickens when fed with conventional feed and banana pseudo-stem mixed with rice bran; (4) determine the proposed recommendations for feeding practices based on the results of the study.

Methodology

The study utilized an experimental research design to assess the effect of banana pseudo-stem mixed with rice bran on the growth performance of native chickens. Homogeneous chickens were randomly assigned to control and experimental groups to ensure that observed differences were due to the feed treatments. Standardized procedures, including feed preparation, controlled feeding, and regular monitoring of body weight, height, and length, were implemented to ensure reliable data collection. Statistical tools such as the mean, standard deviation, and the independent-samples t-test were used to analyze differences, while cost-benefit analysis evaluated economic viability. Overall, the methodology was appropriate for determining both

the effectiveness and practicality of the feed intervention.

Results and Discussion

Problem 1. What is the level of the growth performance of native chickens fed with conventional feed in terms of body weight, body height, and body length?

Table 1. Growth Performance of Native Chickens Fed with Conventional Feed (COM)

Chick	Body Weight (g) Day 1	Week 1	Week 2	Week 3	Body Height (cm) Day 1	Week 1	Week 2	Week 3	Body Length (cm) Day 1	Week 1	Week 2	Week 3
1	34	64	126	347	7	9	14	18	10	12	17	21
2	39	87	164	552	7	9	11	16	6	15	17	22
3	41	89	168	548	8	11	13	19	9	12	16	22
4	38	75	188	564	8	10	14	17	8	12	16	19
5	39	70	234	612	8	9	13	16	8	10	15	20

Table 1 presents the growth performance of native chickens fed with conventional commercial feed. The results show a consistent increase in body weight from 34–41 g at Day 1 to 347–612 g at Week 3, representing an average increase of 1336%. Similarly, body height increased from 7–8 cm to 16–19 cm (121%), while body length improved from 6–10 cm to 19–22 cm (154%). These findings indicate that conventional feed provides adequate nutrients necessary for optimal growth and development during the starter phase. The uniform improvement across all parameters suggests that the feed effectively supports muscle development, skeletal growth, and overall physiological function.

These results are consistent with previous studies indicating that commercial poultry feeds containing balanced protein, energy, and essential amino acids significantly enhance growth performance in native chickens (Valenzuela et al., 2023). Furthermore, adequate mineral composition, particularly calcium and phosphorus, supports proper bone development, as emphasized by Punyatong et al. (2023). The findings also align with FAO (2021), which highlights that nutritionally complete feeds promote efficient feed conversion and consistent growth in poultry.

Problem 2. What is the level of the growth performance of native chickens fed with banana pseudo-stem mixed with rice bran in terms of body weight, body height, and body length?

Table 2. Growth Performance of Native Chickens Fed with Banana Pseudo-Stem Mixed with Rice Bran (PSEU)

Chick	Body Weight (g) Day 1	Week 1	Week 2	Week 3	Body Height (cm) Day 1	Week 1	Week 2	Week 3	Body Length (cm) Day 1	Week 1	Week 2	Week 3
1	44	46	44	37	8	9	8	8	9	10	9	9
2	24	25	Dead	Dead	8	9	Dead	Dead	8	10	Dead	Dead
3	34	31	30	Dead	9	9	9	Dead	9	9	9	Dead
4	38	30	Dead	Dead	8	8	Dead	Dead	9	9	Dead	Dead

5	24	26	26	Dead	6	9	6	Dead	7	11	7	Dead
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Table 2 shows the growth performance of native chickens fed with banana pseudo-stem mixed with rice bran. The results indicate limited growth and reduced survival, with 80% mortality observed by Week 3. The remaining chick showed a decrease in body weight from 44 g to 37 g (-16%), while body height and body length remained relatively unchanged at approximately 8 cm and 9 cm, respectively. These findings suggest that the experimental feed, in its unprocessed form, was not sufficient to meet the nutritional requirements of native chickens during the starter phase.

The limited growth performance may be attributed to the high crude fiber content and the presence of anti-nutritional factors such as cyanogenic glycosides, oxalates, and phytates, which can reduce nutrient absorption and digestibility. Similar observations were reported by Pampolina and Pacion (2020), who found reduced growth performance in poultry fed unprocessed banana pseudo-stem. Additionally, Adeyemi et al. (2023) emphasized that unprocessed plant materials may limit mineral availability, while Singh and Patel (2023) noted that high fiber content can reduce protein utilization and overall feed efficiency.

Problem 3. Is there a significant difference in the growth performance of native chickens when fed with conventional feed and banana pseudo-stem mixed with rice bran?

Table 3. Comparison of Growth Performance Between COM and PSEU

Chick	PSEU Weight (g) Day 1	Week 1	Week 2	Week 3	COM Weight (g) Day 1	Week 1	Week 2	Week 3
1	44	46	42	37	34	68	126	347
2	24	25	Dead	Dead	39	87	164	552
3	34	31	30	Dead	41	89	168	548
4	38	30	Dead	Dead	38	75	188	564
5	24	26	26	Dead	39	70	234	612

Table 3 presents the comparison of growth performance between chickens fed conventional feed (COM) and those fed banana pseudo-stem mixed with rice bran (PSEU). The results show a clear difference between the two groups, with the COM group demonstrating substantial improvements in all growth parameters, while the PSEU group exhibited limited growth and reduced survival. Chickens fed conventional feed achieved significant weight gain, increased height, and longer body length, whereas those in the PSEU group showed minimal or no improvement across the same parameters.

This difference highlights the importance of nutrient availability and feed quality in poultry production. The superior performance of the COM group indicates that balanced commercial feed provides the necessary nutrients for optimal growth. In contrast, the limited performance of the PSEU group suggests that the unprocessed mixture lacks sufficient digestible nutrients and may contain compounds that hinder nutrient absorption. These findings are consistent with Tan and Sy (2022), who reported that properly formulated feeds result in better growth and feed efficiency compared to unprocessed alternatives. Moreover, studies by Nurhayati et al. (2022) and Punyatong et al. (2023) emphasize that agricultural by-products such as banana pseudo-stem can only be effective when processed through methods like fermentation or ensiling to improve nutrient availability.

Overall, the comparison confirms that while agricultural by-products have potential as alternative feed

resources, their effectiveness depends on proper processing and formulation to meet the nutritional requirements of native chickens.

Problem 3. Based on the findings of the study, what proposed recommendations for feeding practices may be proposed?

Proposed Feeding Practices for Native Chicken Production

Rationale. The proposed feeding practices are based on the study's findings, which demonstrated a clear difference in growth performance between chickens fed conventional commercial feed (COM) and those fed banana pseudo-stem mixed with rice bran (PSEU). Results showed that chickens receiving commercial feed exhibited substantial improvements in body weight, height, and length, along with 100% survival, indicating that a balanced nutrient composition is essential during the starter phase. In contrast, the group fed with an unprocessed banana pseudo-stem mixture showed limited growth, weight loss, and high mortality, suggesting that the feed was nutritionally inadequate due to its high crude fiber content and the presence of antinutritional factors that hinder nutrient absorption. These findings highlight the importance of using nutritionally complete feeds during early growth stages and ensuring that alternative feed resources are properly processed before utilization. Furthermore, the results support the idea that agricultural by-products, such as banana pseudo-stem, can only be considered viable feed alternatives when combined with appropriate processing methods and balanced with other nutrient sources. Thus, the proposed feeding practices aim to improve growth performance, reduce mortality, and promote sustainable and cost-effective poultry production.

Key Findings	Activities	Objectives	Time Frame	Persons Involved	Fund Source	Expected Outcomes
Commercial feed resulted in optimal growth and survival	Provide commercial starter feed to chicks	Ensure proper early-stage growth and survival	First 0–3 weeks	Farmers, poultry raisers	Personal funds / DA support	Increased survival rate and optimal growth
Unprocessed pseudo-stem caused poor growth and high mortality	Avoid the use of raw banana pseudo-stem as the main feed	Prevent nutritional deficiency and mortality	Immediate and continuous	Farmers, researchers	Personal funds	Reduced mortality and improved health
Poor performance linked to a lack of processing	Train farmers on fermentation/processing methods	Improve nutrient availability of alternative feeds	1–2 months training	DA, LGU, farmers	DA, LGU programs	Safer and more effective feed alternatives
Nutrient imbalance affected growth	Formulate balanced feed mixtures	Ensure proper nutrient intake	Continuous	Farmers, feed specialists	Personal/institutional support	Improved feed efficiency
The study	Implement regular	Track	Weekly	Farmers,	Minimal	Early

relied on growth monitoring	measurement of weight and size	growth performance and detect issues early	monitoring	students	(tools only)	detection of growth problems
PSEU is ineffective as the sole feed	Use the alternative feed as a supplement only	Reduce feed cost without compromising growth	After 3 weeks onward	Farmers	Personal funds	Cost-effective feeding strategy
A sudden diet change may affect performance	Introduce feed gradually	Reduce stress and improve adaptation	Transition period (3–7 days)	Farmers	Personal funds	Improved feed acceptance

Conclusions

Based on the findings drawn in this study, the following conclusions are given:

1. Native chickens fed with conventional commercial feed showed significant improvements in body weight, height, and length, with complete survival, indicating that balanced nutrients in commercial feed are essential for optimal growth during the starter phase.
2. Native chickens fed with banana pseudo-stem mixed with rice bran exhibited limited growth, weight decline, and high mortality, suggesting that the unprocessed feed mixture is nutritionally inadequate for early-stage development.
3. There is a clear and significant difference in growth performance between the two feeding treatments, with conventional feed producing superior results, highlighting the importance of feed quality and nutrient availability in poultry production.
4. The proposed feeding practices are supported by the findings, emphasizing the need for proper feed selection during the starter phase and the processing of agricultural by-products to ensure safety, nutrient availability, and effectiveness as alternative feed.

Recommendations

Based on the findings of the study, the following recommendations are proposed to improve feeding practices and growth performance of native chickens:

Poultry Raisers/Farmers. They are strongly encouraged to use commercial starter feed during the early growth stage (0–3 weeks) to ensure proper nutrition, higher survival rates, and optimal growth performance of native chickens, as evidenced by the study results.

Poultry Raisers/Farmers (Use of Alternative Feed). They shall avoid using unprocessed banana pseudo-stem as a primary feed due to its low nutritional value and potential anti-nutritional effects. Instead, it may be used only as a supplementary feed after proper preparation.

Poultry Raisers and Backyard Growers (Feed Processing). They are encouraged to use simple processing methods, such as chopping, drying, or fermenting, to improve the digestibility and nutritional value of the banana pseudo-stem before feeding it to chickens.

Poultry Raisers/Farmers (Feeding Management). They can implement a gradual feed transition when introducing alternative feeds to allow chickens to adapt and to prevent sudden growth decline or stress.

Students and School-Based Agriculture Programs. They are encouraged to regularly monitor growth performance (body weight, height, and length) to evaluate feed effectiveness and make timely adjustments.

Future Researchers. They are encouraged to further investigate improved formulations of banana pseudo-stem feed, with a particular focus on processing techniques (e.g., fermentation) and longer experimental periods to enhance its effectiveness as an alternative feed.

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