





Utilization of Organic Feeds Formulation as an Alternative to Enhance the Growth Performance of Quezon Native PIGS

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Abstract

This study aimed to develop an Organic Feed Formulation and evaluate its effects on the Growth Performance of Quezon Native Pigs from lechon-bound pigs. It also assessed the carcass characteristics, such as back fat thickness, crude protein, water holding capacity, and meat quality, including aroma, taste, juiciness, tenderness, and overall acceptability. The findings sought to provide valuable insights to native pig raisers in Guinayangan, Quezon, to help them optimize growth rates, productivity, and profitability in native pig production. A two-group design was used in this study with two treatments replicated three times. The treatments are: T1 - Native pigs under Traditional Feeding Practices and T2 - Native Pigs under Organic Feed Formulation. There was a significant difference in the Average Daily Gain (ADG) and Feed Conversion Ratio between the two treatments. In terms of carcass characteristics (back fat thickness, crude protein, and water holding capacity) and meat quality (aroma, taste, tenderness, juiciness, and overall acceptability), better meat quality and improved water holding capacity were obtained in native pigs fed with the Organic Feed Formulation. Moreover, a higher Return on Investment (ROI) was observed in native pigs fed with the Organic Feed Formulation.

Keywords: Carcass characteristics, Growth performance, Meat quality, Organic feeds formulation, Traditional feeding practices.

1. Introduction

Livestock production plays a significant role in the Philippines' food security, as it provides essential sources of protein through meat, dairy, and eggs that contribute to the dietary diversity and nutritional security of the country. The livestock sector specifically the native pig-raising program in the municipality of Guinayangan, Quezon, serves as a reliable source of income, particularly for women from low-income households. It offers them financial stability, empowers women to engage in the community and boosts the local economy by raising native pigs.

Native pigs (*Sus scrofa* L.) are typically black in color, but there are also breeds with white, red, or black spots that are common. Generally, both sows and boars weigh between 40 and 60 kilograms. They reproduce quickly as they breed and give birth easily with an average litter of 5 to 8 piglets per farrowing (Santiago, 2018).

Moreover, one of the current genetic groups or strain of native pigs in the Philippines is the Quezon native pigs (Q-Black) which originated from the Bondoc Peninsula in Quezon Province. They have distinctive physical characteristics: straight hair type, black coats, and plain color patterns, straight head shape, smooth skin, straight and semi-loop ears, and straight backline. Both males and females have an average of 12 teats. Quezon sows farrow 7 piglets, weighing about 0.84 kg on average; meanwhile, the average weaning weight of piglets is 4.79 kg at 43 to 47 days old (Bondoc et al., 2019).

Given that Philippine native pigs can adapt well to the local conditions, they do not need costly housing care arrangements, which makes them easier and cheaper to raise compared to other commercial breeds. Besides, they are only fed with materials that can be found around the household or farm, such as vegetable scraps and plant leaves.

However, despite the advantages of raising native pigs, farmers still face challenges regarding the high cost of commercial feeds, given that 70% of the total production costs in pig farming come from feed expenses (Rooney et al., 2023). There seems to be a struggle with the slow growth of native pigs as they may not getting the proper nutrition because they are usually feeding them with the traditional feeding practices like giving them vegetables, foliage, and other food waste. Moreover, feeding them with commercial feeds is a significant challenge as it is not appropriate for their needs or requirements, simply because the feeds that are available commercially are made for commercial and hybrid pigs. Also, it is associated with high-cost formulas that can affect the profitability and

sustainability of pig farming operations. Hence, the farmers still seek for organic feeds formulation help them achieve rapid growth performance and enhance the carcass characteristics of native pigs.

Considering that traditional feeding practices of farmers for native pigs may not meet their nutritional needs adequately, the researchers aimed to develop a organic feed formulation appropriately designed for native pigs, and it was achieved by the use of the following ingredients including rice bran, corn (ground), copra meal, molasses, limestone, salt, trichantera leaves, banana trunks, and water spinach, which were affordable, sustainable, and readily available in the local area.

This study aimed to provide an organic feed formulation and understand how the formulation affected the growth performance of Quezon native pigs from weaning to lechon-bound pig, as well as the carcass characteristics according to its back fat thickness, crude protein, and water holding capacity and meat quality to determine its aroma, taste, juiciness, tenderness, and overall acceptability. Knowing these effects will potentially help the native pig raisers in Guinayangan to maximize the growth rate and productivity of native pigs as well as their profitability.

2. Materials and Methods

2.1. Research Design

The researchers used experimental research to determine the growth performance, carcass characteristics and meat quality of Quezon native pigs (Q-Black) with organic feed formulation. In order to examine the impact on the growth performance, carcass characteristic, and meat quality of Quezon native pigs, the researchers compared pigs fed with traditional feeding practices to those fed with Organic feed formulation. This research used a two-group design with two treatments which was replicated thrice. Treatment 1 was used for native pigs fed with traditional feeding practices, while Treatment 2 was used in Organic feed formulation.

Strain or groups of Native pigs

Quezon native pigs (Q-Black) were the subject used in this study. The strain of this native pigs which originated from the Bondoc Peninsula in Quezon Province, have distinctive physical characteristics: they have straight hair type, black coats, and plain color patterns, straight head shape, smooth skin, straight and semi-loop ears, and straight back line. Due to their feeding practices the Quezon native pigs grow slower and have smaller litters compared to commercial breeds. However, their meat is prized for its unique flavor and tenderness. Additionally, they are vital to local farmers’ livelihood and hold cultural significance. Conservation efforts are ongoing to preserve this valuable breed amid challenges from commercial pig farming.

2.2. Research Locale

This study was conducted at Barangay Cabong Norte, Guinayangan, Quezon. The location was suitable for the experiment due to the availability of space, accessibility of resources and materials needed.

2.3. Treatment and Layout of the Experiment

The study were consist of two (2) treatments and each treatment was replicated thrice. Treatment 1 used Quezon native pigs fed with traditional feeding practices, while Treatment 2 used organic feed formulation. In treatment 1 they were fed with traditional feeding practices by the farmers with the used of available materials rice bran, copra meals (soaked in water for 8-24 hours), and fresh crops (trichantera leaves, kangkong leaves, and banana trunks). Originally, there was no standardized ratio for the ingredients of traditional feeding practices. However, the researchers established a ratio with the help of the Office of the Municipal Agriculturist in Guinayangan, Quezon which was based on the observed typical amount of what the farmers fed the native pigs with traditional feeding practices. Additionally, the ratio was established to ensure consistent controls on both treatments and were adjusted as well, based on the age and weight of the native pigs.

Housing Preparation

The housing was designed to give protection and create an ideal environment for the growth of native pigs, considering factors such as location, ventilation, temperature and the areas weather condition. Sanitation was done before using the house and before the arrival of the native pigs. Recycled materials, such as bamboo, wood, used roofing, nails, and cement, were used, along with other necessary building materials for the water system, like PVC pipes, hoses, nipple drinkers, faucets, and buckets.

The researchers constructed a confined housing with a total size of 12x6 ft, providing 2x ft per pig. The pen housing was divided into two sections for 2 treatments. Since each treatment had 3 replicates, each section was further divided into 3 individual pens for each pig. Ensuring that each pigs received the precise amount of feed required, and preventing pigs from overeating while others may be eating less.

2.4. Preparation of the Materials

Recommended by the (Office of the Municipal Agriculturist in Guinayangan, Quezon).

Table 1. Traditional Feeding Practices.

Traditional Feeding Practices (Treatment 1)					
Target Production			50kg		
Materials	%	Kg	In Grams	Cost / Kg	Cost / Ingredients
Rice Bran	50%	25	25,000	15	375
Copra Meal	30%	15	15,000	21	315
Fresh Crops	20%	10	10,000	0	0
Total	100%	50 Kg	50,000	11.9 Kg	690

Note: Copra meal were soaked in water for 8-24 hours.

Table 2. Organic Feeds Formulation.

Organic Feeds Formulation (Treatment 2)					
Target Production			50 KG		
Materials	%	KG	In grams	COST / kg	COST / INGREDIENTS
Rice Bran	31.0%	15.50	15,500	15	225
Corn	28.0%	14.00	14,000	15	210
Copra Meal	25.7%	12.85	12,850	21	269.85
Molasses	3.0%	1.50	1,500	50	75
Limestone	2.0%	1.00	1,000	50	50
Salt	0.3%	0.15	150	14	2.1
Fresh Crops	10.0%	5.00	5,000	0	0
Total	100%	50 kg	45,000	15.393 kg	769.65

Based on BAI-NSPRDC (2014), the organic feeds formulation were consist of 15.50 kilos of darak, 14.00 kilos of corn (meal) grits12.85 kilos of copra meal, 1.50 kilos of molasses, 1 kilos of limestone, and 0.15 kilo of salt, 2 kilos of trichantera leaves, 1.5 kilos of banana trunks, and 1.5 kilos of water spinach.

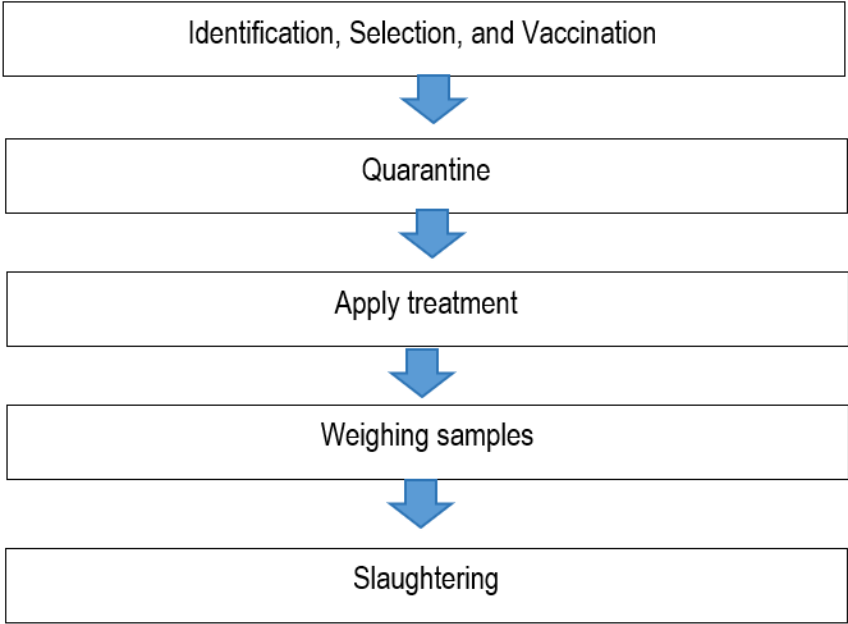


Figure 1. Procedure in Conducting the study.

2.5. Procedure

In Figure 1 presented the techniques and procedure in conducting the experimental study. It presented the first step which involved the identification and selection of native pigs, sourced from the Provincial Veterinarian Office of Quezon Province. The piglets were selected based on their body conformation (appearance), health, and vigor. Six 45-day-old native pigs, already vaccinated and with almost similar weights, were chosen, ensuring an equal number of males and females in each treatment group (e.g., T1: 2 females and 1 male; T2: 2 females and 1 male). Due to uncontrollable issues related to ASF (African Swine Fever), the pigs arrived at 63 days old and immediately underwent a 15-day quarantine to prevent disease transmission and allow them to acclimate to their new environment. By the end of the quarantine period, at 78 days old, pigs were gradually introduced to a mixture of commercial and organic feed formulation for three days. The initial weight of pigs was recorded at 81 days old, marking the official start of the treatments, with one group receiving traditional feeding practices (T1) and other group receiving the organic feed formulation (T2).

The experiment began after the native pigs completed the quarantine period, became accustomed to organic feed formulation, and adopted the new environment at 81 days old. Native pigs were divided into two groups: those fed with traditional feeding practices (Treatment 1) and those fed with organic feed formulation (Treatment 2). For treatment 1, it was consisted of 25 kilos of rice bran, 15 kilos of copra meal (soaked in water for 8-24 hours), and 10 kilos of fresh crops, which included 3.4 kilos of Trichantera leaves, 3.3 kilos of banana pseudo stems, and 3.3 kilos of water spinach. In treatment 2, the feed consisted of 15.50 kilos of rice bran, 14 kilos of corn (meal) grits, 12.85 kilos of copra meal, 1.50 kilos of molasses, 1 kilo of lime, and 0.15 kilos of salt, 5 kilos of fresh crops, including 2 kilos of trichantera leaves, 1.5 kilos of banana trunks, and 1.5 kilos of water spinach, measured according to the required percentage. Both treatments received a restricted feeding twice a day in the morning and in the afternoon.

In processing the feed formulation for treatment 2, all ingredients were mixed thoroughly until even. Next, the mixture was placed to the feed pelletizer machine, shaping the mixture into pellets of uniform size. Once the feeds were already formed, they were collected and stored in containers or sacks, and finally ready to be used as organic feed formulation for native pigs. This process ensured that the ingredients were properly combined to provide a balanced diet for the native pigs, incorporating essential nutrients from various sources to support their growth and health effectively.

The selected native Lechon-bound pig was tested for an approximate period of three months, assessed for weight before slaughter, and their growth performance and the cost return analysis were determined. After weighing the sample, it was slaughtered, and the carcass and meat quality were identified. In case of health condition issues, assistance was sought from a veterinarian or pig technician. For vaccination, the Hog Cholera vaccine was administered during the first two months, particularly when the pigs are 45 days old (Santiago et al., 2016). Regarding pig nutrition, VITON-500 was administered via injection to enhance growth and health.

To prevent any obstacles in the study this was put into effect: To ensure the health and safety of the pigs, bio-security was implemented. To prevent diseases or viruses, waste disposal was implemented as well.

Restricted Feeding for both treatment (twice a day)

Recommended daily feed intake of native pigs by the (Office of the Municipal Agriculturist in Guinayangan, Quezon).

Table 3. Daily Feed Intake of Pigs in Both Treatment.

AGE / Days old		Grams	Days	Feeds (kg)
81-110	Week 1	500	7	0.5
	Week 2	550	7	0.55
	Week 3	600	7	0.6
	Week 4	625	7	0.625
111-139	Week 5	675	7	0.675
	Week 6	700	7	0.7
	Week 7	750	7	0.75
	Week 8	800	7	0.8
140-164	Week 9	850	7	0.85
	Week 10	900	7	0.9
	Week 11	950	7	0.95
	Week 12	1000	7	1

Recommended water for pigs (Philippine National Standard, 2019)

1. Water must be clean, potable, and free from harmful substances.
 - a. The farm should have a continuous clean water supply.
 - b. Water quality should be tested from the start of production and whenever concerns occurs, with results recorded.
2. There should be enough water for all pigs to drink.
 - a. Drinking equipment must be well-designed, easily accessible, and positioned to prevent contamination from feces and urine.
 - b. For nipple drinkers, ensure that the water pressure is appropriate and no sediment that can cause blockages; water pipes should be cleaned regularly to prevent buildup.

The Subject / Sampling / Sampling Technique

Incidental sampling was used in the sensory evaluation to analyze the meat quality in terms of its aroma, color, tenderness, juiciness, and general acceptability. The 30 respondents served as the panel of evaluators in the Barangay Calimpak, located in the town proper of Guinayangan, Quezon.

2.6. Research Instrument

The researchers used the rating and free tasting techniques to identify the acceptability of meat quality of native pigs. The rating form provided blank spaces for respondents, profile such as their name, age, and gender. The next part focused on the respondents' perception on the meat quality of native pigs, including aroma, taste, tenderness, juiciness, and overall acceptability. After answering, the perception of the respondents were tallied and the results were identified.

2.7. Survey Procedure

Comparison of meat quality of native pigs fed with traditional practices and native pigs fed with organic formulated feeds.

2.8. Objective

To assess and compare the meat quality of native pigs using the 9-points Hedonic scale by Peryam and pilgrim (1957), using the free taste technique.

1. Preparation
 - Selecting the two treatments of native pigs:(T1) fed with traditional practices and (2) fed with organic feed formulation.
 - Ensuring both treatments will be roasted (lechon) without any additives (herbs and spices), to preserve their original flavors.
 2. Sampling
 - Selecting a sample respondent who are readily available and willing to participate at the time of taste test.
 3. Testing Process
- Step 1: Presenting treatment 1 (Fed with traditional practices):
- Securing a portion of lechon from native fed with traditional practices to each respondent.
 - Instructing the respondents to taste the lechon and give their ratings on a scale 1-9, with 9 being the highest.
 - Interlude: Providing a snack or neutralizing agent like sky flakes and water to cleanse and eliminate the residual flavour.
- Step 2: Presenting treatment 2 (Fed with organic feed formulation):
- Serving a portion of lechon from native pigs fed with organic feed formulation to each respondent.
 - Instructing the respondents to taste the lechon and give their ratings on a scale 1-9 with 9 being the highest.

The perception of the respondents on the meat quality of native pigs such as aroma, taste, tenderness, juiciness, and acceptability will be identified using the rating scale below.

Table 4. Scale Verbal Interpretation.

Scale	Verbal Interpretation				
	Aroma	Taste	Tenderness	Juiciness	Acceptability
9	Extremely strong aroma	Extremely Flavorful	Very tender	Very Juicy	Extremely acceptable
8	Intense aroma	Very flavorful	Tender	Juicy	Very acceptable
7	Very strong aroma	Moderate flavorful	Moderately Tender	Moderately Juicy	Moderate acceptable
6	Strong aroma	Slightly flavorful	Slightly Tender	Slightly Juicy	Slightly acceptable
5	Moderate aroma	Neither flavorful nor tasteless	Neither Tender nor Tough	Neither Juicy nor Dry	Neither acceptable nor unacceptable
4	Weak aroma	Slightly tasteless	Slightly tough	Slightly Dry	Slightly unacceptable
3	Faint aroma	Moderate tasteless	Moderately Tough	Moderately Dry	Moderate unacceptable
2	Very Faint aroma	Very tasteless	Tough	Dry	Very unacceptable
1	Very weak or no aroma	Extremely tasteless	Very Tough	Very dry	Extremely unacceptable

2.9. Data to be Gathered

Growth performance

- Initial body weight = weight of Quezon native pigs before feeding period
- Final weight = weight of Quezon native pigs at the end of the feeding period
- Average monthly gain = final weight-initial weight
- Total average weight gain = average of final weight – initial weight
- Average daily feed intake (ADFI) = feed intake / (number of pigs x number of feeding days)
- Average daily gain = final weight-initial weight / number of feeding day
- Feed conversion ratio (FCR) = feed intake / Total average weight gain (kg)

The data was gathered and analyzed by keeping monthly records of the performance of native pig (Q-Black) fed with traditional feeding practices and organic formulated feeds.

Carcass characteristics

- Back fat thickness was measured using Mechanical Fat Thickness Measuring Devices (Calipers).
- Crude protein of Q-Black were analyzed in Lipa Quality Control Center Inc. (LQCCI) Lipa, Batangas.
- Water holding capacity of the carcass of native pigs was analyzed using drip loss method.
- (Drip loss (%) = initial weight - final weight / initial weight x 100)

Meat quality

- Aroma
- Taste
- Tenderness
- Juiciness
- Acceptability

In terms of the meat quality of native pigs, it was determined by using 9-points Hedonic scale by Peryam and Pilgrim (1957) by using the free taste techniques.

Statistical Analysis

The data collected was analyzed and interpreted using T-test to determine the significant difference in the growth performance, carcass characteristics and meat quality of Quezon native pigs (Q-Black) fed with organic feed formulation compared to those fed with traditional feeding practices. And for the sensory analysis of the meat quality of Quezon native pigs (Q-Black), gathered data was interpreted using mean formula.

Mean Formula: $\sum FX/N$

Where:

F= Frequency

X= Rank

N= Number of the Respondents

3. Results and Discussions

3.1. The Effects of Traditional Feeding Practices and Organic Feeds Formulation on the Growth Performance of Quezon Native Pigs

The growth performance of Quezon native pigs was influenced by the type of feeding practices and the provided feed type. In a sustainable approach, small-scale farmers gained the attention of utilizing traditional feeding practices and organic feed formulation, and to achieve sufficient growth rates, balancing its cost-effectiveness and optimal supply of nutrients were vital.

As shown in Table 5, no significant difference was observed on the growth performance of Quezon Native pigs fed with Traditional feeding practices and Organic feed formulation during the first 60 days of rearing. However,

significant difference was observed by the 90th day of rearing, where T2 (Organic feed formulation) demonstrates a higher average daily gain (ADG) of 0.22.

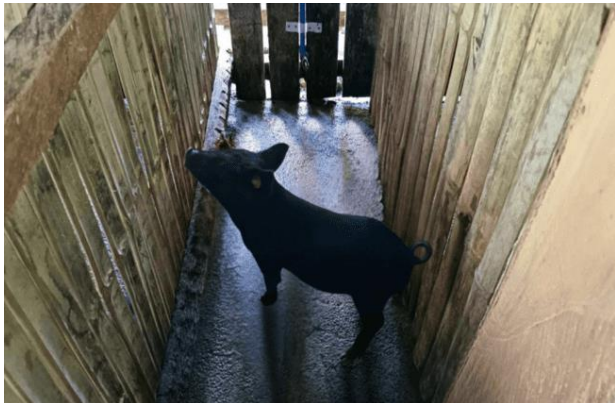
Table 5. Growth Performance of Quezon Native Pigs Fed with Traditional Feeding Practices and Organic Feeds Formulation.

Treatment	Initial Weight	Weight gain (kg) after 30 days	Weight gain (kg) after 60 days	Weight gain (kg) after 90 days	Average daily gain
T1 – Traditional Feeding Practices	4.83	4.0	12.30	16.32*	0.18*
T2 – Organic Feeds Formulation	4.37	3.68	13.0	19.50*	0.22*
P-Value	.13	.55	.45	.000468*	.000388*
T-Value	1.87	0.65	-0.82	-10.48*	-11*

Note: *Significant difference at p<.05 value using T-test

The growth performance of Quezon native pigs fed T2 (Organic feed formulation) showed a positive result, more likely because of the improved palatability of the feeds. The T2 feed formulation’s aroma, texture, and overall appeal contributes to the increased consumption which may have helped in achieving better growth rates compared to T1 (Traditional feeding practices). The findings of the study revealed that the nutrients in the Organic feed formulation were sufficient to meet the nutritional requirements of Quezon native pigs, contributing to their improved growth rate over time. In-line with this study is the findings of Vidad et al., (2022), which highlighted those Organic feeds formulation such as those incorporating wheat bran, corn, powder, sweet potatoes, and other nutrient dense ingredients, significantly affect the growth, due to better absorption of nutrients and increased of consumption. In contrast, the study of Falculan (2021) demonstrates that there’s no significant difference on the final body weight, weight gain, or feed consumption among different treatments in Romblon province when evaluating their effects on the growth and meat quality of native pigs. While, the controlled treatment demonstrates a better feed conversion efficiency and profitability. These different treatments underscore the effectiveness of Organic feeds formulation in meeting the nutrients needed while highlighting the potential impacts of feed type, palatability and its nutritional content on the growth performance.

Treatment 1 Traditional Feeding Practices



Treatment 2 Organic Feeds Formulation



Figure 2. Quezon Native Pigs Before and After rearing.

3.2. Feeds Conversion Ratio

Feed Conversion Ratio measures the efficiency in converting feed into body weight. To measure the Feed Conversion Ratio (FCR), the weight of feed consumed is computed and divided it by the total average weight gained by the animal ratio (FCR), this is a common indicator of livestock production efficiency. As shown in Table 6 the total feed consumed by the Quezon Native Pigs for each treatment was 68.776 kg. The initial weight of pigs in treatment 1, which involved traditional feeding practices, was 4.83 kg, while treatment 2, which used a organic feed formulation, started at 4.37 kg. Respectively, the final average weights for treatments 1 and 2 were 21.15 kg and 24.00 kg. The Quezon Native Pigs in treatment 1 had an average total weight gain of 16.32 kg, while those in treatment 2 had an average weight gain of 19.63 kg. Pigs fed with traditional feeding practices had an FCR of 4.21, whereas those fed with the organic feed formulation had an FCR of 3.50. This indicates that the organic feed formulation was more efficient in promoting weight gain in Quezon Native Pigs compared to traditional feeding practices.

Table 6. Feeds Conversion Ratio (FCR).

	T1 (Traditional Feeding Practices)	T2 (Organic Feeds Formulation)
Total feed consumed	68.776	68.776
Product type	Meat	Meat
Initial Average Weight	4.83	4.37
Final Average Weight	21.15	24
Total Average Weight Gain	16.32	19.63
Feed Conversion Ratio	4.21	3.50

The results revealed that native pigs fed with the Organic feeds formulation had better feed efficiency compared to those fed with traditional feeding practices. In the study of Fry et al., (2018) it was stated that lower FCR values indicate higher efficiency, with FCR values typically ranging from 2.7 to 5.0 for pigs. This can be attributed to a more diverse and balanced nutrient composition of the Organic feed’s formulation, which likely provides better energy and protein sources for growth.

The inclusion of corn, molasses, and limestone in the organic feeds formulation likely enhanced the energy levels, palatability, and mineral balance, leading to improved weight gain. Whereas, the simpler composition of traditional feeding practices may have lacked the same nutritional value, leading to less efficient feed utilization. According to McDonald et al., (2010) ingredients like corn and molasses are excellent sources of energy which can help enhance the growth performance when they are included in the diets of the animal. Additionally, adding mineral like limestone can improve the development bond and overall efficiency of feed.

3.3. Carcass Characteristics of Quezon Native Pigs Fed with Traditional Feeding Practices and Organic Feeds Formulation

3.3.1. Back Fat

The back fat of native pigs refers to the thick layer of subcutaneous fat found along their back. Its meat were prized for its quality, being rich in flavor and often softer compared to commercial pig breeds. Native pigs, typically raised in traditional, free-range systems, produce back-fat with distinct characteristics influenced by their diet and environment, making it ideal in traditional and specialty cuisines.



Figure 3. Back fat thickness of Quezon Native Pigs Compared to Commercial pigs and Sow Quezon Native Pigs

The study revealed that no data were gathered in native pig’s back-fat thickness, due to the use of an inappropriate caliper. However, based on related study, the backfat of native pigs were significant higher compared to commercial pigs, making it ideal for traditional dishes like lechon, due to their rich fat layer and enhanced flavor and texture. This aligns with the study of Wang, Y., et. Al., (2021) found that Large Black pigs, a native British breed, exhibited higher back-fat thickness than cross-bred commercial pigs. Wherein, the average daily gain (ADG) and hot carcass weight (HCW) of commercial pigs were higher than black pigs, but the back-fat thickness of BP was higher than CP.

However, the caliper used in the study was inappropriate for accurate measurement of the native pig’s backfat, As the table shown the comparison of back-fat measurements among native pigs (lechon), native sow, and commercial pigs, its measurement inaccuracy highlights the need for specialized tools to effectively assess the unique physical characteristics of native pigs. Similarly, the study of Dabas et. al., (2024) states that producers can accurately assess and monitor the Backfat Thickness (BFT) by utilizing proper advanced tools such as ultrasound imaging, digital calipers, and computerized systems, that facilitates targeted interventions in optimizing feed efficiency, reproductive outcomes, and meat quality. The BFT measurement was commonly performed at anatomical landmarks like at the last rib, last thoracic vertebra, and lumbar vertebrae, with the use of techniques like ultrasound and calipers.

3.2. Crude Protein Content of Quezon Native Pigs

In the diet of Quezon native pigs, crude protein is an essential component, as it plays an important role in their overall health, growth and development. When it comes to muscle development and reproductive performance, the quality and quantity of protein in their diet is crucial. Moreover, research into crude protein levels that is suitable for native pigs, should focused essentially on enhancing feed formulation, and ensures proper nutrition, while still considering its cost effectiveness and availability. These were essential and will guarantee a much-improved productivity and a more sustainable farming practice.

As shown in table 7, there’s no significant difference on the result of Crude protein analysis of Quezon native pigs. Wherein, the T1 (Traditional Feeding Practices) has 19.86% crude protein content, while the T2 (Organic feeds formulation) has 20.01%. This result indicates that T2 has slightly higher crude protein content of 20.01% compared to T1 that has 19.86% crude protein content.

Table 7. Crude Protein of Quezon Native Pigs Fed with Traditional Feeding Practices and Organic Feeds Formulation.

Treatment	Results for Crude Protein Analysis
T1 – Traditional Feeding Practices	19.86%
T2- Organic Feeds Formulation	20.01%
P-Value	.65682
T-Value	-0.4792

Note: No significant difference at p<.05 using T-test.

The result shown that the crude protein of T2 (Organic feed formulation) were slightly higher than the T1 (Traditional feeding practices), likely due to the ingredients of T2 as it includes rich protein ingredient such as corn, molasses, and copra meal. Besides, T2 also contains other nutrients like fats, carbohydrates, vitamins, and minerals that are essential for native pigs’ growth. Similarly, the study of Feeds, W. (2022) states that there are six appropriate serving of nutrients that pig requires including water, protein, fats, carbohydrates, vitamins, and minerals to support their well-being and development.

Additionally, the ingredients in the formulated feeds were usually more digestible as it is already pelleted and this ensures that the pigs will absorb more protein compared to traditional feeding, which may have higher fiber or indigestible components. As stated in the study of Hancock (2000) pelleting supports nutrient digestibility as the heat of pelleting process breaks down carbohydrate bonds that making them more digestible for pigs. Similarly to the study of Rojas (2017) higher fiber can reduce the nutrient and digestibility that can have a negative effect on the growth and carcass quality of pigs. However, the methods of feed processing like pelleting can help break down fiber, which can increase the availability of nutrients that can improve energy digestibility.

3.3. *Water Holding Capacity of Quezon Native Pigs*

The water-holding capacity (WHC) of meat refers to the ability to retain some water during processing, storage and cooking, which significantly affects the quality, texture, and juiciness. When it comes to native pigs, WHC were influenced by such factors like genetics, diet, and pre-slaughter handling. The unique characteristics of native pigs that exhibits such higher intramuscular fat and distinct muscle composition can contribute to the variations of their WHC. It is essential to understand the water-holding capacity of native pigs for improving meat quality, optimizing processing methods, and cater the customer’s preferences in niche markets.

The result of the study have shown that water holding capacity of Quezon native pigs under T1 (Traditional Feeding Practices) and T2 (Organic feeds formulation) have significant difference where T2 had a higher water holding capacity of 83.00 compared to T1 that has 73.00.

Table 8. Water Holding Capacity of Quezon Native Pigs Fed with Traditional Feeding Practices and Organic Feeds Formulation 24 hours duration

Treatment	Average Final dresses weight (grams)	Average Final dressed weight (grams) after 24 hours
T1 – Traditional Feeding Practices	90	73.00*
T2- Organic Feeds Formulation	90	83.00*
P-Value	1	.001496*
T-Value	0	-7.74597*

Note: *Significant difference at p<.05 value using T-test.

The result have shown that pigs fed with T2 had the higher water holding capacity (WHC) in their meat compared to T1, this is due to their differences in the composition of feed. Additionally, the organic feed formulation includes ingredients with high fiber, protein-rich products and minerals that can improve the muscle protein content and water-binding properties. These ingredients include rice bran, copra meal, corn, limestone, molasses, salt and fresh crops. Based on the observation the addition of salt on organic feed potentially affects the water-holding capacity of the meat, but its effect is only indirect as it primarily related to overall muscle physiology and hydration of the animal. In order to have a more pronounced impact on WHC, salt must be directly added to the meat after slaughter. According to Bertram et al., (2004) pH and salt levels has an effect on water-holding and water binding capacity of MP gels. Myofibrillar proteins (MP) are commonly known for influencing the functional properties of water-holding ability, emulsifying ability and gelling properties (Westphalen et al., 2006). In order to have a more pronounced impact on WHC, salt must be directly added to the meat after slaughter. Similarly, the study of Ruusunen and Puolanne (2005) states that when sodium chloride is added to meat products, the negative charges of protein increased due to its strong bonding of protein with chloride ion. These negative charges on the protein can cause the repulsion among myofilaments, resulting in swelling of myofibrils that increases the binding ability.

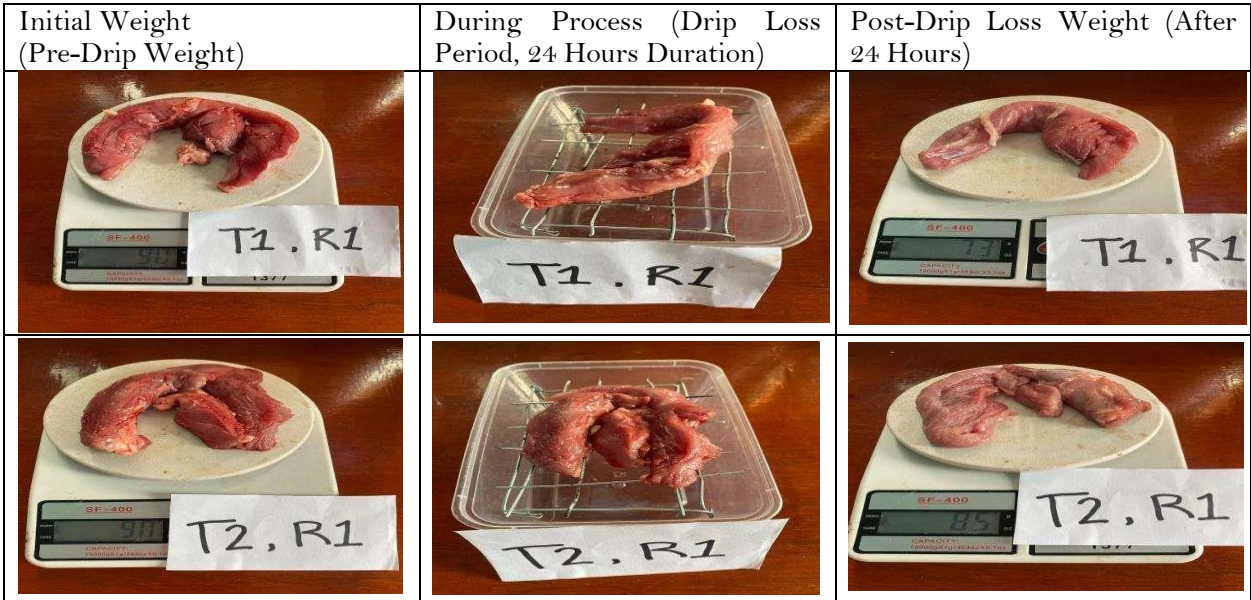


Figure 4. Determination of Water Holding Capacity of the Quezon Native Pigs.

3.4. Sensory Attributes of Quezon Native Pig Lechon

The sensory evaluation meat characteristics of Quezon native pigs focused on its aroma, taste, tenderness, juiciness, and overall acceptability. The mentioned attributes are vital in determining the quality and consumer appeal of this delicacy highlighting its unique flavor and texture. The result will potentially help identify consumer preferences, that will provide insights into how the taste, texture, and overall characteristics of the meat influence consumer satisfaction. Additionally, the quality of the meat, in terms of the aforementioned qualities, may be influenced by the organic feed formulation and traditional feeding practices, which could affect the flavor, tenderness, and juiciness of the lechon. Understanding these factors will further shed light on how feeding practices contribute to the overall eating experience. This shows the sensory attributes of Quezon native pig lechon perceived by the respondents. Two treatments were evaluated T1(Traditional feeding practices) and T2(Organic feeds formulation). The results shows that in sensory evaluation of native pig lechon T2 scored the highest in all categories, it produced the very strong aroma, moderately flavorful, tender, juicy, and very acceptable.

The sensory attributes of native pig lechon, highlight its distinct appeal as revealed in the survey. The very strong aroma describes the rich and robust scent unique to native pigs, which improve the meal experience. Moderately flavorful profile strikes a balance that offers a satisfying taste without being too overpowering. Wherein meat’s tenderness and juiciness illustrate high-quality of meat which contributes to an enjoyable texture and mouthfeel, as native pigs diet were nutrient-dense which helps with the development of intramuscular fat that enhances juiciness and tenderness of the meat. Overall, those aforementioned qualities of native pig lechon makes it very acceptable to consumers.

Table 9. Sensory Attributes of Quezon Native Pig Lechon Perceived by the Respondents.

	T1 - Traditional Feeding Practices	T2 - Organic Feeds Formulation
Aroma	6.53	7.97
Descriptive Interpretation	Strong Aroma	Very Strong Aroma
Taste	6.4	7.93
Descriptive Interpretation	Slightly Flavorful	Moderately Flavorful
Tenderness	8.03	8.67
Descriptive Interpretation	Tender	Tender
Juiciness	7.7	8.57
Descriptive Interpretation	Moderately Juicy	Juicy
Overall Acceptability	7.93	8.9
Descriptive Interpretation	Moderately Acceptable	Very Acceptable

The improvements are likely due to the more varied and enhanced nutritional composition of the T2 (Organic feeds formulation), which promoted to improved fat distribution, flavor enhancement, and muscle quality in the meat. In terms of aroma and flavor the inclusion of ingredient in T2 like molasses which is energy-rich may have enhance the flavor in meat, which results in a more appealing and stronger aroma and taste after roasting. In T1, lack of such ingredients that enhance the flavor leads to a less pronounced sensory quality. According to the study of Huff-Lonergan and Lonergan (2005) the animals diet greatly affects development of flavor and aroma indicator. Rich energy feeds that include molasses and corn can help enhance the marbling and fat quality that can influence the meat flavor and aroma directly.

In terms of tenderness and juiciness, the T2 have a more balanced nutrients as it includes calcium from limestone and energy from corn and molasses which supports the development of the muscle and fat distribution. This contributes as well in improving the tenderness and higher water-holding capacity that makes the meat juicier. This result aligns with the study titled Tenderness and Fat composition studies by Channon et al., (2004) stated that incorporating balanced nutrients and minerals like calcium from limestone improves muscle integrity and fat deposition which results into more tender and flavorful meat.

3.5. Expenses and Return on Investment of Quezon Native Pig Production

Native pig production were essential for many farmers, as it gives a sustainable source of income and preserves local breeds. One important factor for this industry to succeed is creating or formulating an organic feed that can

potentially reduce the expenses of production. Formulating a more affordable yet nutritious alternative feeds can help the farmers enhance the pigs’ health and growth rate while keeping the cost manageable.

The Table 10 shows that the treatment 2 (Organic Feeds Formulation) had the higher amount of expenses with the total of 4,112.553 compared to the treatment 1 (Traditional Feeding Practices) with a total of 3,878.97. Furthermore, in terms of return on investment Organic Feeds Formulation had 56.36% or 2,181.649 net income while Traditional Feeding Practices has 43.36% or 1,644.507net income.

Table 10. Expenses and Return on Investment of Quezon Native Pig Production.

Materials Used	(g/kg)/pcs	Price	(g/kg)/pcs	Price
Treatment 1 Traditional Feeding Practices			Treatment 2 Organic Feeds Formulation	
Piglets	1	2,500	1	2,500
Rice Bran	34.388	859.7	21.321	533.025
Copra Meal	20.633	433.293	17.675	371.175
Corn (meal) grits	0	0	19.257	288.855
Molasses	0	0	2.064	103.2
Limestone	0	0	1.376	68.8
Salt	0	0	0.207	5.796
Fresh Crops	13.755	0	6.876	0
Total Expenses		3,792.993		3,870.851
Live weight Native Pigs Price (kg)	250		250	
Total Harvest (kg)	21.75		24.21	
Gross Income		5,437.5		6,052.5
Net Income		1,644.507		2,181.649
ROI (%)		43.36%		56.36%

Native pigs fed with Organic Feeds Formulation achieved higher weight, resulted in greater profit due to their improved growth, compared to native pigs fed with traditional feeding practices. These findings underscore the economic advantage of Organic feed formulation as a feed, given its balance and growth efficiency. Feed acceptability plays a critical role in determining production outcomes, based on the result native pigs fed with organic feed formulation grow faster and heavier, leading to higher profits, compared to those fed with traditional feeding practices. This in turn, contributes to better returns and higher profitability.

This study can potentially help evaluate the viability of organic feed formulation for native pigs and comparing its (ROI) with traditional feeding practices. In contrast with the study of Bollido (2024) titled Growth Performance, Piglets Size and Profitability of Native Pigs Fed with Indigenous Feeds, it states that native pigs fed with a diet of 80% taro and 20% kitchen leftovers achieved the highest profit and ROI. The mentioned feeding regimen led to faster growth and greater weight gain compared to others.

4. Conclusions and Recommendations

4.1. Conclusions

Organic feed formulations significantly improved the growth performance of Quezon Native Pigs by the 90th day of rearing, and resulted in a higher Average Daily Gain (ADG) of Feed Conversion Ratio (FCR) as compared to traditional feeding practices. However, significant differences in growth performance were observed by the 90th day, where organic feed formulation demonstrates improved growth. Pigs fed with organic feed formulations had better meat quality, and showed higher water-holding capacity but no data were gathered in back fat thickness due to the use of inappropriate caliper. The sensory evaluation showed that the lechon from these pigs was more flavorful, tender, and juicy compared to those fed with traditional feeding practices. The organic feed formulation led to higher weight gain, resulting in greater profit compared to pigs fed with traditional feeding practices. This highlights the economic advantage of using organic feed formulations.

4.2. Recommendations

- Since there’s an improvement in growth performance and meat quality, it is recommended for the farmers to adopt Organic feed formulation, as it can provide a better feed efficiency, enhance growth, and produce higher quality of meat, especially for traditional dishes like lechon.
- Conduct a comprehensive feed management training for local farmers, focusing on cost- effective feed formulation to enhance growth performance and profitability.
- To ensure continuous production of Organic feed formulation, it is recommended to plant the needed fresh crops in advance to support sustainability and maintain a steady supply of ingredients.
- For future researchers, it is recommended to use the appropriate caliper that can accurately measure the back fat thickness of native pigs. This will ensure more precise data collection and reliable results.
- For future researchers, it is recommended to explore better alternatives for preserving the feeds to extend its lifespan, as Organic formulated feeds, which used molasses, only lasted for 3 months. Investigating other preservatives or additives could help enhance feed quality and prevent spoilage overtime.
- For future researchers, it is recommended to use red copra-meal instead of white copra meal, as it provides better aroma that encourages the pig to eat more. This could potentially improve the feed intake and overall performance.

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