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GROWTH PERFORMANCE, PIGLETS SIZE AND PROFITABILITY OF NATIVE PIGS FED WITH KITCHEN LEFTOVER, MADRE DE AQUA *(Trichantera* gigantea) AND TARO (*Colocasia esculenta*) IN CONTRAST WITH COMMERCIAL FEEDS

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ABSTRACT

Hog raisers of today consider feeds to be the most expensive component in hog enterprise. Thus, the study of the Comparative Effects of low-cost indigenous Feeds and Commercial Feeds on the Growth and Profitability of Native Pigs. Effects of indigenous feeds and commercial feeds on the growth and profitability of native pigs. This study was carried out to determine the effect of indigenous feeds and commercial feeds on the growth and profitability of native pigs. A total of 12 heads of piglets were distributed into 4 treatments with 3 replications. Results revealed that feeding native pigs with different mixtures of indigenous and commercial feeds has a significant effect on the initial weight; however, based on the results, it was T_4 (100% commercial feeds) that showed a numerically heavier initial weight among all treatments fed with a different mixture of indigenous feeds, while in terms of weight gain, results showed that T_1 was given 50% taro and 50% leftovers compared quantitatively to T_4 fed 100% commercial feeds. Comparable differences were observed from T_1-T_3, where an average of 2,253.08 kg of feed per head was consumed. In other words, pigs consumed the maximum amount of feed given with a minimal feed leftover up to an average of 1.43 kg. Results revealed that feeds consumed by native pigs were numerically higher in T_1- taro (50%) kitchen leftover (50%) followed by T_3, T_2 (80% Taro & 20% Kitchen leftover), while T_4 with commercial feeds consumed 1,258.80 kg. In T_3, 80% taro and 20% kitchen leftover, gave an average number of 8 piglets, followed by T_2 with 7 piglets, T_1 with 6 piglets, and T_4 with 5 piglets, while in average weight, T_4 has 0.8400 kg, T_2 with 0.8267 kg, T_3 with 0.6700 kg and T_1 with 0.5667 kg, respectively. T_3 have the highest profit of 11,707.60 pesos with Return on Investment (ROI) of 95.24%, followed by T_2 with profit of 7,351.60 pesos and 53.86% ROI, T_1 with 5,710.60 pesos and 46.47% ROI, and T_4 with -43,180.40 pesos and ROI of -25.78%.

Key words: commercial feeds, indigenous feeds, kitchen Leftover, native pigs, piglet size, profitability, taro

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INTRODUCTION

The demand for concentrated feed resources is rising globally, particularly in the tropics where many nations are net food importers. Although using forage plants as feed for pigs is an option, doing so raises some problems due to their greater fiber and plant secondary metabolite contents as well as their poorer nutritional value [1]. Native pigs from the Philippines have a distinctive phenotype. However, Studies on their genetic diversity and structure have not yet been carried out. Three commercial pig breeds and native Philippine pigs were used in the genetic analyses, which used 10 porcine microsatellite markers [2].

Farming native pigs was one of the climate-smart agriculture (CSA) practices used in the Philippines; the study revealed that the majority of the farmers have a positive net income from raising native pigs [3]. Farmers should start producing native pigs as a source of supplementary income in a subsistence economy with very little capital investment because there are at least three possible markets for this sector [4].

Mucilage, oxalic acid, tannins, cyanide, lectins, alpha-amylase inhibitors, protease (trypsin and chymotrypsin), and inhibitors are the principal anti-nutrients found in taro [5]. Crossbred pigs' growth performance and carcass attributes were not significantly different from native pigs, when up to 50% of the soybean protein in the diet was substituted with protein from ensiled taro leaves [6].

Kitchen and farm leftover can be used in animal feeding through transformation and enrichment, favoring environmental conservation and leading to "organic production". Some alternatives in the use of dish residues with alternatives that reduce the microbial load and its use in feeding pigs with values that have been favorable for production [7].

Since the beginning of time, pigs have been fed with fodder species, and smallholder pig production systems still use it to make up a significant portion of the diets of the pigs [8]. Numerous vegetable wastes and byproducts are nutrient- and protein-rich due to their chemical makeup and utilization [9]. Taro produces 135 kcals per 100 g and has more than double the number of carbohydrates as potatoes [10]. The highest level of taro leaf inclusion was 46 % of the diet of native pigs in upland areas, which was the highest inclusion level recorded of any green plant material [11].

The multi-purpose tree *Madre de agua* contains high crude protein content of the foliage, particularly the leaves and the thin stems, which are also consumed by the animals, and apparently, most of that is true protein and has a good amino acid balance [12].

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This study was conducted and hypothesized the use of indigenous and commercial feeds to determine the effects of indigenous feeds and commercial feeds and to evaluate and compare the Return of Investment (ROI) of native pig feed with *Madre de Aqua*, kitchen leftover, and taro against commercial feeds on the growth and profitability of native pigs.

MATERIALS AND METHODS

Experimental Layout and Design

This study was laid out in a Randomized Complete Block Design (RCBD) with four (4) treatments and three (3) replicates. A total of twelve heads of native piglets were purchased.

The following were the experimental treatments used in the study:

T_1- Control (traditional feeds) taro (50%) and kitchen leftover (50%)
T_2- 80% taro & 20% *Madre de aqua*
T_3- 80% taro & 20% kitchen leftover
T_4- 100% commercial feeds

Construction of Pigpens and Experimental Animals

Construction of pigpens was established at the experimental area located inside the premises of Northwest Samar State University-San Jorge Campus. Pigs were housed in an individual pig pen with a total dimension of 1.5mx2m/ pig pen. Walls and flooring were made concretely.

Preparation of Experimental Diets

Taro was collected and prepared thoroughly before utilizing it in the study. Taro leaves and tubers were chopped into small pieces and mixed with kitchen leftovers, then cooked for 30 minutes. Fresh-harvested *Madre de aqua* leaves were directly fed to pigs.

The experimental pigs were managed in six (6) month's growing period. Traditional feeds were given to experimental pigs in Treatment 1: 500g taro and 500g kitchen leftover; Treatment 2: 800g taro and 200g *Madre de aqua* given; Treatment 3: 800g taro and 200g kitchen left over, while treatment 4: 1000g commercial feeds such hog pre-starter, starter and hog grower throughout the study.

Experimental Animals

Twelve (12) heads of native pigs, all female with an average initial weight of 4.48 kg were randomly distributed in 4 treatments in 3 replications. The piglets were bought from three native sows who were consigned to have mated the same day using the estrus synchronization. In this approach, the source of piglets came from the 3 sows farrowed on the same day. The same weaning day was also observed, and at the same time, the same time pick up of the experimental piglets.

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Feeding Management

Pigs were given feeds in the morning and in the afternoon as restricted feeding. Water was given *ad libitum*. The animals were fed within 367 days, for taro, *madre de aqua* and kitchen leftover, pigs were fed with 1.34 kg per head/day in 180 days, and 2.5 kg per head/day in 187 days, while commercial feeds 0.25 kg in 1-2 months, 0.75 kg in 3-6 months, 1.5 kg for 7-9 months and 2 kg for 10-12 months.

Analysis of Data

All observations in each parameter were subjected to Analysis of Variance (ANOVA) for a single factorial experiment in a Randomized Completely Block Design (RCBD), Statistical Tool for Agricultural Research (STAR), Plant Breeding Genetics and Biotechnology Biometrics and Breeding Informatics, Version 2.0.1 (2014) of International Rice Research Institute (IRRI) was used in the study. Treatment was compared using Least Significance Difference (LSD) at a 5% level of significance.

RESULTS AND DISCUSSION

Weight of experimental native pigs

The initial and final weight and weight gain of a native pig as fed with a different mixture of indigenous and commercial feeds from 1st to 12th months of the study are showed in Table 1. Results revealed that feeding native pigs with a different mixture of indigenous and commercial has a significant effect observed on the initial weight. however, based on the results, it was T_4 (100% commercial feeds) that showed a numerically heavier initial weight among all treatments fed with a different mixture of indigenous feeds. The replacement of concentrate mixture with kitchen waste as well as kitchen and rice fermented waste increased the growth performance of pigs and thereby reduced the cost of feeding [13]. While T_1 - taro (50%) and kitchen leftover (50%) showed a heavier weight gain among pigs fed with local feeds. This result is in contrast with the study that there was an increase in weight gain as the level of treatment increased mainly because of its palatability and nutrient contents [14].

Feed Consumption

The feed consumption of native pigs was not significantly influenced by the different mixtures of indigenous feeds in comparison with the different treatments showed in Table 2. Comparable differences were observed from T_1-T_3, wherein an average of 2,253.08 kg of feed per head was consumed. In other words, pigs consumed the maximum amount of feed given with a minimal feed leftover up to an average of 1.43 kg. Results revealed that feeds consumed by native pigs were numerically higher in T_1- taro (50%) kitchen leftover (50%) followed by T_3 (80% Taro & 20% Madre de aqua), T_2 (80% Taro & 20% Kitchen leftover), while T_4 with

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commercial feeds consumed 1,258.80 kg. Native pigs' feed consumption and feed intake of pigs was improved provided they were cooked or ensiled [15].

Average Feed Waste

The application of a different mixture of indigenous feeds to native pigs did not significantly influence the average feed waste from 1st to the 12th month of the study shown in Table 3. A numerically lower average feed waste was observed on both T_4 (100% commercial feeds) followed by T_1 (50% taro kitchen leftover 50%), T_3 (80% Taro & 20% kitchen leftover), and T_2 (80% Taro & 20% *madre de aqua*). Since feeding was limited according to the recommended in the study, pigs ate most of the given feeds resulting in small feed wastes.

Feed Conversion Ratio of Native Pigs

The feed conversion ratio of native pigs as fed with a varying mixture of indigenous and commercial feeds is shown in Table 4. The application of a different mixture of indigenous feeds has a significant influence on the feed conversion ratio of native pigs. Based on the results, T_4 (100% Commercial Feeds) obtained the lowest and better feed conversion ratio of 3.95 kg. This indicates that it only needs 3.95 kg of feed to produce a 1 kilogram of meat. Meanwhile, among the treatments with the application of a different mixture of indigenous feeds, it was T_1 - 50% taro and 50% kitchen leftover obtained a relatively lowest feed conversion, denoting that it needs 7.86 kg of feeds to produce a 1 kilogram of meat. The feed intake, rate of live weight gain and feed conversion were best when the combined Taro leaves and stems were ensiled [15].

Piglets per Sow

The number of piglets per sow in the first farrowing was not significantly affected by the different local feeds given, as shown in Table 5. Numerically, T_3 with 80% taro and 20% kitchen leftover marked more piglets of 8, followed by T_2 with 80% Taro and 20% *Madre de aqua*, T_1 with 50% Taro and 50% Kitchen leftover, and T_4 with 100% Commercial feeds, respectively. Since T_3 has the higher final weight and obtained the higher number of piglets. The pig farmers were able to produce litter sizes at birth that ranged from 7.40 to 10.44 kg by feeding their animals a variety of traditionally cooked feeds like pumpkin, bamboo shoots, banana leaves, and green banana fingers, taro leaves, and stems, sweet potato, and tapioca [16].

Weight of Piglets

The weight of piglets was significantly affected by the different feeds given to the native pigs, as shown in Table 6. T_3, with 80% taro and 20% kitchen leftover gave an average number of 8 piglets with an average weight of 0.6700 kg, followed by T_2, with 7 piglets with 0.826 average weight, T_1 with 6 piglets with 0.5667 average weight, and T_4 with 5 with 0.8400kg average weight, respectively.

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Production, Profitability, and Return on Investment

Based on the economic analysis of the study on the sales of liveweight piglets using the cost of different feeds, taro bought at P4.00 per kilo, kitchen leftover P4.00 per kilo and *madre de aqua* (fresh) P10.00 per kilo, respectively. Per treatment, consumed 1,128 kg of traditional feeds and 1,120 kg of commercial feeds (Table 7). The native pigs in T_3 fed with 80% taro and 20% kitchen leftover feeds achieved the highest profit with 11,707.60 pesos and a return of investment (ROI) of 95.24%, followed by T_2 with 53.86%, and T_1 with 46.47% of locally available feeds; this was due to the lower price of feeds which was most available in the campus/locality, while T_4 has a negative profit with 25.78% ROI due probably to expensive commercial feeds and higher freight and handling expenses, while another factor was the low average number of piglets whose sows fed on commercial feeds.

The study showed that commercial feeds have expensive feed prices resulting in negative profit and ROI, and pigs produced limited piglets, although it has a higher final weight and weight gain. Farmers have an increased income of up to 40% of the participating farmers after a year from the sales of their piglets, which were fed with *madre de aqua*, and kitchen leftovers have a significant response to growth and piglet production [17].

CONCLUSION, AND RECOMMENDATIONS FOR DEVELOPMENT

In this study, commercial feeds gave higher results in terms of body weight, weight gain, and feed Conversion Ratio (FCR). At the level of traditional feeding using 80% Taro plus 20% kitchen leftovers resulted in the higher final weight, while feeding with kitchen leftovers plus taro showed a higher weight gain. Looking at the economic aspects of the study, T_3, with 80% taro and 20% kitchen leftover, has the highest profit and Return on Investment since T_3 has a high average number of piglets sold, while feeds are cheaper compared to commercial feeds.

Commercial feeds tend to be, resulting in negative profit and ROI, and pigs produce limited piglets with a higher final weight and weight gain. Thus, the researchers recommend the use of 80% taro and 20% kitchen leftover feeds for native pig raising. Further study may double the number of experimental animals to get more comparison. Farmers need to plant taro and collect kitchen leftovers to profitably venture into native pig production. Moreover, other researchers need to add crude nutrients to the composition of local ingredients, especially for pregnant pigs for energy and nutrient requirements.

CONFLICT OF INTEREST

The author declared no conflict of interest.

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Table 1: Initial, final, and weight gain of native pig fed with different levels of indigenous and commercial feeds

Treatments	Initial (kg)	Final (kg)	Weight Gain (kg)
T_1- 50% Taro and 50% Kitchen leftover	2.67	20.90 b	18.28 b
T_2-80% Taro & 20% *Madre de aqua*	5.03	21.00b	15.97 b
T_3-80% Taro & 20% Kitchen leftover	4.67	21.96 b	17.29 b
T_4-100% Commercial feeds	5.53	46.73 a	41.20 a
Mean	**4.48**	**27.65**	**23.19**
SD	**1.25**	**12.73**	**12.05**
CV (%)	**32.17**	**19.12**	**23.24**

This means within a column having the same letter does not differ significantly at a 5% level of significance using the star program

Table 2: Feed consumption of native pigs fed with a different mixture of indigenous and commercial feeds

Treatments	Feed Consumption (kg)
T_1- 50% Taro and 50% Kitchen leftover	2,253.29
T_2- 80% Taro & 20% *Madre de aqua*	2,252.87
T_3- 80% Taro & 20% Kitchen leftover	2,253.07
T_4-100% Commercial feeds	1,258.80
Mean	**2,004.51**
SD	**497.14**
CV (%)	**0.0179**

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Table 3: Average feed waste of native pigs as fed with a different mixture of indigenous and commercial feeds

Treatments	Feed Waste
T_1- 50% Taro and 50% Kitchen leftover	1.21
T_2- 80% Taro & 20% *Madre de aqua*	1.63
T_3- 80% Taro & 20% Kitchen leftover	1.43
T_4-100% Commercial feeds	1.20
Mean	**1.37**
SD	**0.20**
CV (%)	**2.26**

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Table 4: The feed conversion ratio of a native pig is fed with a different mixture of indigenous and commercial feeds

Treatments	Feed Conversion Ratio
T_1- 50% Taro and 50% Kitchen leftover	7.86 a
T_2- 80% Taro & 20% *Madre de aqua*	9.77 a
T_3- 80% Taro & 20% Kitchen leftover	11.00 a
T_4-100% Commercial feeds	3.95 b
Mean	**8.15**
SD	**3.08**
CV (%)	**23.03**

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Table 5: The average number of piglets per sow

Treatments	Number of Piglets
T_1- 50% Taro and 50% Kitchen leftover	6
T_2- 80% Taro & 20% *Madre de aqua*	7
T_3- 80% Taro & 20% Kitchen leftover	8
T_4-100% Commercial feeds	5
Mean	**6.50**
SD	**1.29**
CV (%)	**34.31**

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Table 6: The average weight of piglets upon farrowing

Treatments	Weight of Piglets (kg)
T_1- 50% Taro and 50% Kitchen leftover	0.5667b
T_2- 80% Taro & 20% *Madre de aqua*	0.8267a
T_3- 80% Taro & 20% Kitchen leftover	0.6700ab
T_4-100% Commercial feeds	0.8400a
Mean	**0.7259**
SD	**0.1312**
CV (%)	**12.68**

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Table 7: Production, profitability, and the Return of Investment of native pigs

Cost item ***Variable Cost***	**T_1**- 50% Taro and 50% Kitchen leftover	**T_2**- 80% Taro & 20% *Madre de aqua*	**T_3**- 80% Taro & 20% Kitchen leftover	**T_4**- 100% Commercial feeds
Feed cost	4,509.00	5,868.00	4,512.00	50,400.00
Piglets	2,000.00	2,000.00	2,000.00	2,000.00
Labor cost	3,750.00	3,750.00	3,750.00	3,750.00
Water cost	1,029.60	1,029.60	1,029.60	1,029.60
Electric bill	1,000.80	1,000.80	1,000.80	1,000.80
TOTAL COST	12,289.40	13,648.40	12,292.40	58,180.40
Selling price is P235.00/kg (liveweight)				
Revenue (piglets) [quantity x price]	18,000.00	21,000.00	24,000.00	15,000.00
Profit [revenue-expenses]	5,710.60	7,351.60	11,707.60	-43,180.40
ROI (%) $\frac{\text{[net investment gain}}{\text{cost investment]}}$ X 100	46.47%	53.86%	95.24%	-25.78%

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