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# Growth Evaluation and Meat Assessment of Native Pig in Romblon Province, Philippines

Ken N Falculan
Faculty, Department of Animal Science, Romblon State University
College of Agriculture, Odiongan, Romblon, Philippines 5505

**Abstract:- This study was conducted to evaluate the growth and meat assessment of native pigs in the province of Romblon. Specifically, it evaluates the growth performance and the meat quality of the native pigs. This study used the experimental research design following the Complete Randomized Design to test the animals studied under different treatment. The data gathered were statistically analyzed using frequency/percentage, mean, Warner-Bratzler Method to test the meat qualities, Trained Panel, Carver Press Method to determine the water holding capacity, Pearson's correlation, and analysis of variance to test the relationship and difference of the variables. From the analysis and interpretation conducted it was found out that: control treatment had better feed conversion efficiency compared to other treatments. Significant difference was failed to observe on the effect of different treatments to the final body weight, gain in weight and feed consumption of native pigs while significant difference was observed on the feed conversion efficiency. The carcass characteristics of native pigs were comparably observed; the result of cost and return analysis shows that control treatment incurred higher profit compared to other treatments. The sensory evaluation on the meat qualities of native pigs was moderately and slightly acceptable and the tenderness of meat was not significantly affected by the water holding capacity between treatments.**

***Keywords:-*** *Growth, Carcass, Evaluation, Body Weight, Feed Consumption, Sensory.*

## I. INTRODUCTION

Philippine pig industry is traditionally a backyard dominated operation. Despite the presence of large-scale swine farms in some areas of the country, backyard hog raising still predominates in the rural areas. Stocks in backyard farms went up by 2.27 percent. Likewise, stocks in commercial farms grew by 7.15 percent compared to the 2015 level. About 64.0 percent of the total stocks were raised in backyard farms and the rest were in commercial farms, Philippine Statistics Authority, (2015). Management practices are largely influenced the success of swine enterprise. Some of these management practices are essentially under the control of the caretaker or the operator. Proper care and management living about many advantages, such as increase in litter size, survival rate of pigs, from birth to weanling growth rate and feed efficiency.

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Feeding strategy was most common for many farmers. Feeding 2-3 times daily of the usual corresponding ration starts from booster to lactating. Backyard farmers, however, provide the cheaper brood sow ration, a diet given to all breeders whether, dry, pregnant, nursing or boars. Swill or left-over feed, even if cooked, is no longer popular even among backyard raisers unless a link to eateries or restaurants has been instituted. In producing healthy and better-quality swine, raisers must first have sufficient knowledge about swine-raising. They must consider the environmental conditions of the swine and most especially, they need to invest in the food that the swine eat. They have the option to utilize commercial or other alternative local feeds. Commercial feeds assure utmost quality regarding the nutrient requirements needed by the pigs, (PCCARD, 2000).

## II. METHODOLOGY

Experimental research design following the Complete Randomized Design (CRD) was used. The experimental design was applied in this study which the test animals studied once but subsequent treatment is applied to determine the cause of change. In CRD the treatments are allotted to the experimental units entirely by chance without making any effort to confine treatments to any portion of the experimental materials. Thus, the randomization gives every experimental unit in the experimental material an equal probability of receiving the treatment, (Rangaswamy, 1995).

Hence, the Complete Randomized Design was used to identify the growth performance of native pigs as affected by different treatments namely:

- Treatment 1, Natural food (farmers practice) mixed grated coconut (sapal) + wild taro (chopped/cooked) + rice bran + water spinach (ad-libitum, if available);
- Treatment 2, wild taro (chopped/ cooked) 350 grams + rice bran 275 grams + cassava root (cooked) 325 grams + banana peel (chopped) 250 grams + fish meal (cooked/dried) 450 grams + ipil (leaves) 150 grams + sea purslane (cooked) 255 grams + copra meal (chopped) 345 grams + fish amino acid (30 ml.) and.

- Treatment 3, wild taro (chopped/ cooked) 255 grams + rice bran 200 grams + cassava root (cooked) 202 grams + banana peel (chopped) 250 grams + fish meal (cooked/dried) 626 grams + ipil (leaves) 150 grams + sea purslane (cooked) 325 grams + copra meal (chopped) 477 grams + fish amino acid (30 ml.).

Adlibitum feeding was used in treatment 1 and application of the different treatment was 2.4 kg per day per head per treatment as their feeding scheme. Likewise, the different feeding regimen was conducted to determine the growth performance and carcass characteristics of native pigs in terms of carcass weight, dressing percentage, and meat quality, and the profitability of native pigs under different feeding regimen.

**SUBJECT OF THE STUDY**

The experimental animal being used were; nine (9) male and nine (9) female native pigs, two months of age regardless of weight was selected to be fattened for two months by feeding them with different experimental rations, the growth performance of native pigs in terms of weight gain, feed conversion ratio, average daily gain and growth rate; carcass quality and the cost and return analysis was determine under different feeding regimen; and the cooked meat quality in terms of aroma, tenderness, juiciness, fat content and general acceptability.

**SAMPLING TECHNIQUE**

Scientific or probability sampling method was employed to determine the growth performance of native pigs in terms of weight gain, feed conversion ratio, average daily gain, and growth rate; the carcass quality of native pigs in terms of carcass weight, dressing percentage and the profitability analysis of native pigs under different feeding regimen. This was used in the study because each member in the population is given an equal chance of being included in the sample.

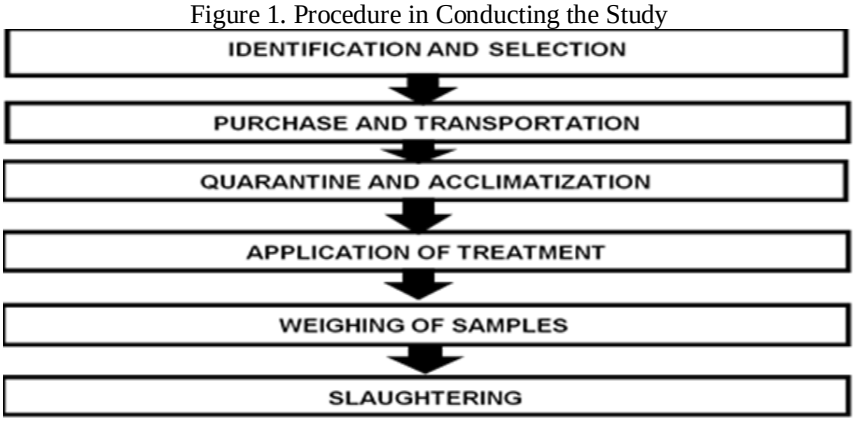
**MATERIALS**

There were eighteen native pigs (9 male and 9 female) two months of age regardless of weight was used as experimental animals to be fattened in two (2) months; natural food such as coconut meat (grated coconut), wild taro (gabi), rice bran (darak), cassava root (kamoteng kahoy) and sea purslane (dampalit) was used for feeding regimen added with fish amino acid diluted in water; communication equipment; and means of transport (field vehicle, motorcycles)

**PROCEDURE**

The following techniques and procedure were employed in the conduct of the experiment.

Figure 1. Procedure in Conducting the Study




It can be gleaned on Figure 1 the techniques and procedure in conducting the experimental study. It shows that the first step is the identification and selection of native pigs from local farmers in the province. Piglets identified and selected through their body conformation (appearance), healthy and vigorous.

Second, eighteen native pigs two months of age (9 male and 9 female) regardless of weight was selected. After selection, it was purchase from the local farmers and at the same time it was transported to the experimental site.

Quarantine and acclimatization of the samples was done to be familiarized in the new housing condition. Separation of new animal is needed from any existing pigs, and must have a separate room from others. This is because some common illness can be easily transferred from pig to pig. Treatment of new animals can be done during quarantine to avoid the spread of the disease. Housing is very necessary in the acclimatization of the native animal for them to be comfortable. Floor space requirements should be in consideration. According to Banerjee, (1991) the floor space requirement of growing- fattening pig must be 30-40 square foot per pig.

Once the native pigs had been quarantined and adapted to his new environment, the experimental animals in control treatment were fed in ad-libitum feeding regimen if food material are available, experimental animal in treatment 1 and 2 were fed twice a day and was given 1.2 kilograms of food per meal per head in every feeding routine with the different levels of treatment such as Control: Natural food (adlibitum, if available) mixed grated coconut (sapal) + wild taro (chopped/cooked) + rice bran + water spinach (chopped); Treatment 1, wild taro (chopped/ cooked) 350 grams + rice bran 275 grams + cassava root (cooked) 325 grams + banana

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peel (chopped) 250 grams + fish meal (cooked/dried) 450 grams + ipil (leaves) 150 grams + sea purslane (cooked) 255 grams + copra meal (chopped) 345 grams + fish amino acid ( 30 ml. diluted in 1 liter of water); Treatment 2, wild taro (chopped/ cooked) 250 grams + rice bran 200 grams + cassava root (cooked) 200 grams + banana peel (chopped) 220 grams + fish meal (cooked/dried) 620 grams + ipil (leaves) 150 grams + sea purslane (cooked) 320 grams + copra meal (chopped) 440 grams + fish amino acid ( 30 ml. diluted in 1 liter of water). All feedstuffs will be collected, mixed and cooked per treatment as their feeding regimen.

The selected fattened native pigs were weighted before slaughtering to determine the growth performance and the cost and return analysis. After weighing of the sample, it was slaughtered to identify the carcass characteristics of native pigs according to its carcass weight, dressing percentage and cooked meat quality to determine its aroma, tenderness, juiciness, fat content and general acceptability.

**DATA GATHERING PROCEDURE**

The data gathered were the production performance of native pigs in terms of weight gain, feed conversion ratio, average daily gain, and growth rate; carcass quality according to its carcass weight, dressing percentage, back fat thickness, carcass length, and meat quality under the different feeding regimen.

**DATA PROCESSING**

The growth evaluation of native pigs was determined in terms of weight gain, feed conversion ratio, average daily gain and growth rate. Warner-Bratzler Method was used to determine the meat quality of native pigs with regards to tenderness. Sensory Evaluation through Trained Panel was used to evaluate the meat quality in terms of flavor, off flavor, tenderness, juiciness and general acceptability. The Carver Press Method was used to determine the water holding capacity of the carcass of the native pigs. Analysis of Variance was used to determine the differences on the growth performance and carcass characteristics of native pigs under different feeding regimen.

**SCORING INSTRUMENT**

The following (4) point rating scale was used to identify the marketing practices employed by hog raisers.

| **Scale** | **Numerical Rating** | **Descriptive Interpretation** |
|---|---|---|
| 4 | 3.25-4.00 | Always |
| 3 | 2.50-3.24 | Often |
| 2 | 1.75-2.49 | Sometimes |
| 1 | 1.00-1.74 | Never |

Trained Panel Members from University of the Philippines, Animal Products Science and Technology Division determine the quality of meat in terms of; flavor, off flavor, tenderness, juiciness and general acceptability.

The 9-Point Hedonic Rating Scales was used to interpret the descriptive quality of carcass.

| Scale | Numerical Rating | Descriptive Interpretation |
|---|---|---|
| **Flavor:** | | |
| 9 | 8.51-9.00 | Very Rich Full Flavor |
| 8 | 7.51-8.50 | Full Flavor |
| 7 | 6.51-7.50 | Moderately Full Flavor |
| 6 | 5.51-6.50 | Slightly Full Flavor |
| 5 | 4.51-5.50 | Neither Full Nor Weak Flavor |
| 4 | 3.51-4.50 | Slightly Weak Flavor |
| 3 | 2.51-3.50 | Moderately Weak Flavor |
| 2 | 1.51-2.50 | Weak Flavor |
| 1 | 1.00-1.50 | Very Weak Flavor |
| **Off Flavor:** | | |
| 9 | 8.51-9.00 | Very Strong |
| 8 | 7.51-8.50 | Strong |
| 7 | 6.51-7.50 | Moderately Strong |
| 6 | 5.51-6.50 | Slightly Strong |
| 5 | 4.51-5.50 | Perceptible |
| 4 | 3.51-4.50 | Moderately Perceptible |
| 3 | 2.51-3.50 | Slightly Perceptible |
| 2 | 1.51-2.50 | Very Low |
| 1 | 1.00-1.50 | None |
| **Tenderness:** | | |
| 9 | 8.51-9.00 | Very Tender |
| 8 | 7.51-8.50 | Tender |
| 7 | 6.51-7.50 | Moderately Tender |
| 6 | 5.51-6.50 | Slightly Tender |
| 5 | 4.51-5.50 | Neither Tender nor Tough |
| 4 | 3.51-4.50 | Slightly tough |
| 3 | 2.51-3.50 | Moderately Tough |
| 2 | 1.51-2.50 | Tough |
| 1 | 1.00-1.50 | Very Tough |
| **Juiciness:** | | |
| 9 | 8.51-9.00 | Very Juicy |
| 8 | 7.51-8.50 | Juicy |
| 7 | 6.51-7.50 | Moderately Juicy |
| 6 | 5.51-6.50 | Slightly Juicy |
| 5 | 4.51-5.50 | Neither Juicy nor Dry |
| 4 | 3.51-4.50 | Slightly Dry |
| 3 | 2.51-3.50 | Moderately Dry |
| 2 | 1.51-2.50 | Dry |
| 1 | 1.00-1.50 | Very dry |
| **General Acceptability:** | | |
| 9 | 8.51-9.00 | Very Acceptable |
| 8 | 7.51-8.50 | Acceptable |
| 7 | 6.51-7.50 | Moderately Acceptable |
| 6 | 5.51-6.50 | Slightly Acceptable |
| 5 | 4.51-5.50 | Neither Acceptable nor Unacceptable |
| 4 | 3.26-4.00 | Slightly Unacceptable |
| 3 | 2.50-3.25 | Moderately Unacceptable |
| 2 | 1.75-2.49 | Unacceptable |
| 1 | 1.00-1.74 | Very Unacceptable |

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## III. RESULT AND DISCUSSION

### Growth performance

Presented in Table 1 is the growth performance of native pigs in terms of feed conversion efficiency ratio and total gain in weight. The data showed that higher total gain in weight was obtained by control treatment with better feed conversion efficiency compared to pigs raised in Treatment 1 and Treatment 2. In which 38.94% feed conversion efficiency or 389.94g feed consumption is needed to produce 10 kilo of meat. However, the analysis of covariance failed to show the significant difference on the effect of the different treatment to the final body weight, gain in weight and feed consumption of native pigs while significant difference was observed on the feed conversion efficiency. Thus, Pearson (2018) conformed that, a low feed conversion ratio indicates that the pigs are efficiently turning feed into body weight while a high feed conversion ration means the pigs might not be using the full potential of the feed program.

Table 1. Performance of native pigs in terms of feed conversion efficiency ratio and total gain weight under different feeding regimen

| Treatment | Growth Performance | | | Feed Consumption | F C E (FC/TGW) |
|---|---|---|---|---|---|
| | Initial Body Weight (kg) | Final Body Weight (kg) | Total Gain Weight(kg) | | |
| Control | 8.67 | 18.67 | 10 | 389.39 | 38.94 |
| Treatment 1 | 9.67 | 18.17 | 8.50 | 385.71 | 45.38 |
| Treatment 2 | 8.50 | 12.75 | 4.25 | 291.92 | 137.05 |
| *F-value* | *.691* | *.623* | *1.837* | *5.814* | *7.711* |
| *P-value* | *.543$^{ns}$* | *.474$^{ns}$* | *.247$^{ns}$* | *.073$^{ns}$* | *.050* |
| *CV (%)* | *13.28* | *28.25* | *63.99* | *59.81* | *97.55* |
| | | | | | |

### Carcass characteristics

As shown on Table 2 the carcass characteristics of native pigs presented found that control and Treatment 1 had a slight increase of 0.50kg on live weight compared to Treatment 2. There was an increase of 0.44kg between carcass weight of control and Treatment 1. Treatment 2 with a carcass weight of 6.04 is comparable to Control and Treatment 1. Therefore, the analysis of variance on the carcass characteristics of native pigs under the 3 treatments was comparably observed.

Table 2. Liveweight, carcass weight and dressing percentage of the experimental pigs

| Treatment | Live weight (kg) | Carcass characteristics | | Dressing Percentage |
|---|---|---|---|---|
| | | Carcass weight (kg) | Dressed Weight (kg) | |
| | | | | |
| Control | 18.67 | 5.10 | 8.50 | 48.15% |
| Treatment 1 | 18.17 | 4.66 | 7.77 | 45.65% |
| Treatment 2 | 11.00 | 6.04 | 10.07 | 88.12% |
| | | | | |
| *F value* | *2.522* | *.507* | *.507* | *4.743* |
| *P value* | *.160$^{ns}$* | *.626$^{ns}$* | *.626$^{ns}$* | *.058$^{ns}$* |
| *CV (%)* | *34.48* | *30.49* | *30.49* | *43.48* |
| | | | | |

### Net income of Production

As shown in Table 3, raising pigs in control treatment incurred higher profit amounting to Php7, 734.76 due to lesser purchases of variable cost or feeding ingredients such as grated coconut, taro, rice bran and water spinach. However, the mean difference on the test of significance was observed on the cost and return analysis of native pigs. Therefore, the result of profit is significantly different due to different feeding consumption and ingredients applied to Treatment 1 and Treatment 2 such as grated coconut, taro, rice bran, cassava root, banana peel, fish meal, ipil-ipil leaves, sea purslane, copra meal and fish amino acid which incurred higher variable cost.

Table 3. Net income of native pigs under different feeding regimen

| Treatment | PROFIT (in peso) | | | | | | Mean |
|---|---|---|---|---|---|---|---|
| | Replication | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| | | | | | | | |
| Control | 299.96 | 1,604.96 | 2,404.96 | 414.96 | 714.96 | 2,294.96 | 1,309.00 |
| | | | | | | | |
| Treatment 1 | 37.49 | 512.51 | 452.51 | 2,087.51 | 1,037.51 | 192.51 | 720.00 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatment 2 | 758.03 | 1,873.03 | 1,643.03 | 373.03 | 568.03 | 656.97 | 979.00 |
| | | | | | | | |
| *F-value* | | | | | | | *0.87* |
| *P-value* | | | | | | | *0.441* |

**Sensory characteristics of native pig carcass**

The data in Table 4 indicates that the sensory evaluation on flavor of replication 1, 2 and 3 under control feeding regimen was observed as moderately full flavor; no off flavor for replication 1 and 2 while the off flavor was very low on replication 3; in terms of tenderness, replications 1 and 3 were slightly tender while replication 2 was slightly tough; the 3 replications was slightly juicy, and therefore, moderately acceptable. In Treatment 1, replications 1 and 2 were moderately full flavor while replication 3 was slightly full flavor; the off flavor of the 3 replications were very low; in terms of tenderness the 3 replications were slightly tender; moderately juicy was observed on replication 1 while slightly juicy on replication 2 and 3; hence replication 1 was moderately acceptable while replications 2 and 3 were slightly acceptable respectively. In Treatment 2, replications 1 and 2 were slightly full flavor; the off flavor were very low; the tenderness was found as not tender nor tough; replication 1 was moderately juicy while replication 2 was slightly juicy; therefore, the 2 replications were slightly acceptable; while the meat qualities of replication 3 cannot be computed because the sample for treatment 3 sessions was too small.

To summarize, the overall mean of control feeding procedure was 7.11 which was observed as moderately full flavor, there was no off flavor found on the 3 replications as rated 1.33 by the Trained panel, the mean of 5.44 shows its tenderness as neither tender nor tough, a mean of 6.17 shows slightly juicy, hence, it was moderately acceptable with an overall mean of 7.00. In Treatment 1, the 3 replications show slightly full flavor with an overall mean of 6.50, the sample have very low off flavor shown by the weighted mean of 1.89, slightly tender with an overall mean of 5.67, slightly juicy (6.33), and therefore, slightly acceptable (6.28). In Treatment 2, the 3 replications with an overall mean of 6.33 was slightly full flavor, with very low off flavor (1.92), the tenderness were neither tender nor tough (5.33), and slightly juicy (6.33), that is why the 2 replications were slightly acceptable. However, the analysis of variance failed to show the significant difference on the meat qualities of native pigs under different feeding regimen. This means that, no variations were observed statistically on the meat qualities of native pigs regardless of treatment per replication.

The evaluation of the sensory characteristics of the carcasses of the experimental native pigs under the different feeding regimen using sensory evaluation (Trained Panel) in terms of flavor, off flavor, tenderness, juiciness, and general acceptability was presented on Table 4.

Table 4. Sensory characteristics of the Carcasses of the Experimental pigs

| **Treatment** | **Flavor** | | **Off Flavor** | | **Tenderness** | | **Juiciness** | | **Acceptability** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **WM** | **DI** | **WM** | **DI** | **WM** | **DI** | **WM** | **DI** | **WM** | **DI** |
| Control | 7.11 | MFF | 1.33 | None | 5.44 | NTNT | 6.17 | SJ | 7.00 | MA |
| Treatment1 | 6.50 | SFF | 1.89 | VL | 5.67 | ST | 6.33 | SJ | 6.28 | SA |
| Treatment2 | 6.33 | SFF | 1.92 | VL | 5.33 | NTNT | 6.33 | SJ | 6.17 | SA |
| *F –value* | .698 | | .747 | | .086 | | .030 | | .524 | |
| *P-value* | .513$^{ns}$ | | .491$^{ns}$ | | .918$^{ns}$ | | 971$^{ns}$ | | .602$^{ns}$ | |

*RCBD design for the sensory evaluation **session is the replication ns=not significant
wm=weighted mean di=descriptive interpretation MFF=moderately full flavor
SFF=slightly full flavor VL = very low off flavor NTNT=neither tender nor tough
SJ = slightly juicy MA=moderately acceptable SA=slightly acceptable

**Tenderness and Water Holding Capacity of the Carcass**

Water holding capacity is the ability of meat and meat products to bind water during slicing, mincing, pressing, transport, storage, processing, and cooking (Hamm, 1986). Water holding capacity refers to the bound water contained within the meat and water added during operations connected with meat processing pointing the potential ability to bind water in raw meat (Pospiech and Montowska, 2011).

Free water flows from the tissues are unimpeded in which weak surface forces hold this fraction of water in meat which cannot be seen in pre-rigor meat. It can only be developed as conditions change that allows the entrapped water to move from the structures where it is found (NPPC, 2000).

Bound water is the water that exists in the vicinity of non-aqueous constituents like proteins and has reduced mobility or it does easily move to other compartments. Truly bound water is a very small fraction of the total water approximately 0.5% found in the muscle cells of pigs (Fennema, 1985).

According to Offer and Knight (1988) as cited by Warner (2017) the content of water in muscle by chemical composition is about 75%; protein (w20%), lipids (w5%),

carbohydrates (w1%) and vitamins and minerals (w1%, often left as ash). There is a direct relationship between water and fat content such that as fat percentage increases, the water percentage decreases. About 1% of the water in meat is classed as bound water and is tightly bound by proteins (Huff-Lonergan and Lonergan, 2005). The water released from a processed meat product is a cook yield which is directly related to water holding capacity, but the traits do not always have a strong correlation (Warner, 2017).

The data on tenderness and water holding capacity of native pigs under different feeding regimen using Warner-Bratzler Method and Carver Press Method respectively was presented on Table 5. It was revealed that the tenderness of meat of native pigs was not significantly affected by the water holding capacity between treatment means.

Table 5. Tenderness and water holding capacity of native pigs under different feeding regimen

| **Treatment** | **Tenderness: (Warner-Bratzler Method)** | | **Water Holding Capacity: (Carver Press Method)** | |
|---|---|---|---|---|
| | **g/sq. cm.** | **Descriptive Interpretation** | **Percentage Free Water** | **Percentage Bound Water** |
| | **Mean** | | **Mean** | **Mean** |
| Control | 322.88 | Neither tender nor tough | 30.44 | 69.56 |
| Treatment 1 | 276.31 | Slightly tough | 24.56 | 75.44 |
| Treatment 2 | 390.14 | Slightly tender | 21.22 | 78.78 |
| *F-value* | *2.966* | | *4.428* | *4.428* |
| *P-value* | *.127*$^{ns}$ | | *.066*$^{ns}$ | *.066*$^{ns}$ |

## IV. FINDINGS

From the analysis and interpretation conducted derived from the statement of the problems the following were the findings:

1. The growth performance of native pigs found out that control treatment had better feed conversion efficiency compared to other treatments. Significant difference was failed to observe on the effect of different treatments to the final body weight, gain in weight and feed consumption of native pigs while significant difference was observed on the feed conversion efficiency.
2. The carcass characteristics of native pigs were comparably observed under the 3 treatments.
3. The result of cost and return analysis found out that control treatment incurred higher profit compared to other treatments in which significant difference was observed.
4. The sensory evaluation on the meat qualities of native pigs found out that control treatment was moderately full flavor, no off flavor, neither tender nor tough, slightly juicy, and acceptable; Treatment 1 and 2 were slightly full flavor, with very low off flavor, slightly tender on Treatment 1 while neither tender nor tough on Treatment 2 and both treatments were slightly acceptable.
5. The tenderness and water holding capacity of native pigs found out that the tenderness of meat was not significantly affected by the water holding capacity between treatments.

## V. CONCLUSIONS

The control treatment procedure may be adopted to increase the growth performance and meat qualities of native pigs, give better feed conversion efficiency, carcass characteristics, and profit. Hence, there is significant difference to the final body weights, gain in weight, feed consumption and the cost and return analysis of native pigs.

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