

BIBLIOGRAPHY

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Adviser: Ben B. Luis, Ph.D.

ABSTRACT

The study was conducted at Barangay Florida, Maria Aurora, Aurora from May to August 2010 to assess the potentials of coconut meat (Matured) and banana peelings as feed supplements for growing finishing pigs.

A total of nine (9) crossbred (largewhite x duroc) pigs were randomly allotted in a completely randomized design into the following treatments:

- T₀ (control) = Commercial Feeds (CF)
- T₁ = CF + 1kg banana peelings
- T₂ = CF + 1 kg banana peelings + 500 gms coconut meat (matured)

Inclusion of banana peeling and coconut meat (Matured) in the ration of pigs resulted to faster growth rates than control diets. Higher net return and ROI were also realized from the pigs given banana peelings supplementation, followed by pigs given coconut meat (Matured) + banana peelings supplementation and the control pigs or those given no feed supplementation gave the lowest net return and ROI.

It is recommended that banana peelings and coconut meat (Matured) may be given to growing- finishing pigs as “merienda” or snack.

TABLE OF CONTENTS

	Page
Bibliography.....	i
Abstract.....	i
Table of Contents.....	ii
INTRODUCTION.....	1
REVIEW OF LITERATURE.....	3
MATERIALS AND METHODS.....	6
RESULTS AND DISCUSSION	
Body Weight.....	10
Gain in Weight.....	11
Feed Intake and Conversion Ratio.....	12
Net Return and Return on Investment.....	13
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....	14
LITERATURE CITED.....	15
APPENDICES.....	16

INTRODUCTION

Swine Industry is a well-developed subsector of the animal industry in the Philippines. It contributes about 98% of the country's total meat supply. Pork represents 50% of the total animal meat consumed by Filipinos. Over the past few decades, the swine industry contributed more than 70% of the animal meat output of the local industry (PCARRD, 2005). At present, fewer producers than ever before produce pork, and the operation are much larger than these were in the past.

Nowadays, backyard swine raising popular in every areas of the Philippines. Farmers engage in this activity because people in the area are notably meat eaters in addition of their culture of using pigs as ceremonial animals. Backyard swine is a major source of protein for the family and as a source of additional income.

Commercial feeds are popularly to supply the specific needs of animals. As a result, since the availability of local plant products as source of most nutrients in livestock production, there is a great need then to explore the possibility of using fresh coconut meat and banana peeling as food supplement for growing hogs.

Banana (*Musa sapientum L.*) is a common backyard plant in the countryside. In population centers, banana peelings are available everyday as waste from the sale of banana cue and turon as the common snack products. The portion of the banana, which is waste as peel, is 18-20%. Traditionally, the volume of farm wastes from banana industry can utilized as feed for hogs and cattle.

On other hand, Fresh coconut meat (matured) is a very popular feed for backyard swine. It has high-energy value from 60-70 percent fat. When added to fine rice bran in equal proportion, it constitutes a very good ration for fattening pigs. Early studies showed



that based on feed required for given unit of gain, 1.25 kilograms of grated fresh coconut meat has a feeding value approximately equal to 1-kilo grain of corn. Using rate of gain in weight as the measure of feed efficiency, two parts of fresh grated coconut meat used in place of one part corn as the basic constituent of the ration for growing – fattening pigs was found to be more efficient than corn.

The feeding experiment generally aimed to assess the potentials of coconut meat (matured) and banana peelings as feed supplements for growing finishing pigs. Specifically, it aimed to determine the response of growing-finishing pigs fed with the supplements in terms of weight gain, feed consumption, feed conversion ratio and net income.

The study was conducted from May to August 2010 in Barangay Florida, Maria Aurora, Aurora for a period of 90 days.



REVIEW OF LITERATURE

Banana Peelings as Hog Feed

Banana (*Musa sapientum L.*) is a fast growing crop with a 3-5 ft. high herbaceous stem and almost every part as usable. Nowadays, banana waste is a problem where they are disposed, especially banana peelings. The portion of the banana, which is wasted as peel is 18-20 %. Traditionally the peel is disposed in the field or just thrown anywhere, which cause environmental problems. As the peel has high-energy content of 4592 Kcal/kg, it has low protein content of 47.77%. It also contains 95.66 % dry matter, 14.56 % ether extract, 11.95% crude fiber, 0.36% calcium, 0.23% phosphorus, and 0.36% ash and according to them, the digestibility coefficient of dry matter, organic matter and protein, net protein utilization, biological value, digestible energy and metabolic energy in three types of banana peelings indicated no statistical difference. The nutritive value of ripe banana peel was slightly better than the almost ripe green peel (Tartrakoon and Langenhens, 1999).

Musa sapientum peels will analyze for minerals, nutritional and anti-nutritional contents. The result of mineral content indicate the concentrations (mg/g) of potassium, calcium, sodium, iron, manganese, bromine, rubidium, strontium, zirconium and niobium to be 78.10, 19.20, 24.30, 0.61, 76.20, 0.04, 0.21, 0.03, 0.02 and 0.02, respectively. The percentage concentrations of protein, crude lipid, carbohydrate and crude fiber were 0.90, 1.70, 59.00 and 31.70, respectively. the results indicate that if the peels are properly exploited and processed, these could be a high quality and cheap source of carbohydrates and minerals for livestock (Anhwange *et al.*, 2009).



Sison (1982) reported that dried banana peeling is a good feed supplement for finishing hogs. Results showed that dried banana peeling could be incorporated in the hog finishing diet without adverse effect on gain and feed conversion ratio. He stated that swine raisers can save on feed cost by adding 8 to 16 % dried banana-peeling meal to ordinary commercial hog fattener mash.

Silverio (1981) stated that banana peelings are promising raw materials, which are just left or thrown away by banana cue and toron peddlers. He also reported that these could be energy and protein sources for animal production with a level of 8-16% as highly recommended to hog finisher rations. However, at a higher rate usage is beyond 24% with isonitrogenous and isocalorie feed additives to be applied to attain good performance.

Coconut Meat as Hog Feed

Coconut (*Cocos nutrifera L.*) is popularly known as the “tree of life” because of the variety of products and by-products made from the tree namely: coconut meat, oil, juice, husk, shell charcoal, leaves, pith, trunk, and roots (Roberts, 2006).

Coconut meat is the thicker layer of kernel is much lower in moisture and high calories. The coconut is high in oil content and it used for oil extraction. The coconut oil has a high percentage of medium chain triglycerides (M.C.T.). This is the coconut at its maximum degree of maturity with moisture percentage of 36.3; 4.5 grams of protein, 41.6 grams of fats, 444 grams of calories per 100 grams (Barreto, 2009).

The nutrient contents of coconut meat (raw) per 100 grams are the following: moisture (%) 47.0; energy (Kcal and KJ) 354 and 1480; protein (g) 3.3; and other nutrient



like fat, carbohydrate, and fiber. They stated that coconut meat (raw) is also rich in protein and it contains high dietary fiber but free in cholesterol (Anonymous, 2010).

The recommended level of copra meal in the ration for growing 10kg per 100 kg and finishing pigs is about 20 kg per 100 kg of feeds. It should not be higher than this level because coconut is high in oil that affects the health of the animal (PCARRD, 2003).



MATERIALS AND METHODS

The materials used in the study are the following: 9 crossbred (large white x duroc) pigs, which are 3 months old, commercial hog ration, feeding and drinking troughs, matured coconut, banana peelings (dippig), stick broom, pails, weighing scale, record book and pen.

A week before selecting or choosing the experimental animals, pens were prepared, disinfected and cleaned thoroughly including the area. The animals were weighed and randomly distributed into three treatments following the Completely Randomized Design (CRD) of an experiment. Each treatment was replicated three times with one animal serving as replicate. However, before the pigs were placed into their respective pens, their individual weights were taken and recorded.

The different treatments were as follows:

- T₀ (control) = Commercial Feeds (CF)
- T₁ = CF + 1kg banana peelings daily
- T₂ = CF + 1kg banana peelings + 500g coconut meat

Matured coconut meat to be used for the day was separated daily from its shell using knife or bolo. The banana peelings were washed and allowed to drain. After draining, the feedstuff was prepared, weighed (Figure 1) and given to the pigs based on specified amount.

The initial weight of the 9 pigs were determined and record before the start of the study. All the experimental animals were subjected to the same care and management except on their diets.



In treatment 1, a kilogram of banana peeling was offered to each pig. The same is true with treatment 2, however, 500 grams of raw coconut meat was also given in addition to the 1 kg banana peelings. Animals in the control group did not receive any supplement. Giving of supplements was done twice a day, 10:00 am and 2:00 pm. Concentrate feeding of the animals also done twice 7:00 am and 5:00 pm.

The animals were housed individually in pens with concrete cement floor. Cleanliness of their pens was observed and their manure and urine were washed out to the drainage three times. The animals were also dewormed two times, at the start of the study and two weeks before the end of the study. The pigs were also weighed at the end of the study in order to get the final weight (Figure 2).



Figure 1. Weighing of coconut meat (matured) and banana peelings



Figure 2. Weighing of pigs at the end of the study

The Data Gathered

1. Initial weight (kg). This refers to the individual weight of the animals taken at the start of the study.
2. Final weight (kg). This refers to the individual weight of animals taken at the completion of the study.
3. Feed offered (kg). This refers to the quantity of feed given to each experimental animal each day.
4. Feed left over (kg). This refers to the quantity of feed not eaten by the experimental animal each day.
5. Production cost. This refers to the cost incurred in providing all materials needed during the conduct of the study. It should include the cost of equipment/facility use and supervision/management.

6. Total gain in weight (kg). This was obtained by subtracting the initial weight of the animal from its final weight.

7. Average daily gain in weight (ADG). This is determined using the formula:

$$\text{ADG} = \frac{\text{Final Weight} - \text{Initial Weight}}{\text{Number of Experimental Days}}$$

8. Total feed consumption (kg). This refers to the amount of feed consumed by an animal from the start to the end of the feeding trial.

- a. commercial feeds
- b. raw coconut meat
- c. banana peelings

9. Feed conversion ratio. This was obtained using the formula:

$$\text{FCR} = \frac{\text{Total Amount of Feed Consumed}}{\text{Total Gain in Weight}}$$

10. Return on investment (ROI). This was obtained by dividing the net profit by the total cost of production multiplied by 100%.

$$\text{ROI (\%)} = \frac{\text{Net Return}}{\text{Total Expenses}} \times 100$$

11. Net profit (Php). This was determined by subtracting the cost of producing the pigs (input) from the sales of the produced pigs (output).

All the data gathered were tabulated and were subjected to the analysis of variance for the completely randomized design (CRD). Comparison between means was made using the Duncan's Multiple Ranged Test (DMRT).



RESULTS AND DISCUSSION

Body Weight

Table 1 shows the initial and final weight of the experimental animals. In terms of initial weight, statistical analysis revealed that there were no significant differences between treatment means. This is consistent with the requirement of the experimental design that animals must be homogenous at the start of the study.

In terms of the final weight, significant differences were observed between the control and treated group. Pigs without supplement had a lower final weight with the means of 87 kg, however weights were observed from the pigs given supplements. The pigs given banana peelings a mean final weight of 97.33 kg and those given banana peelings plus coconut meat had a mean final weight of 98.67 kg.

Table 1. Initial weight of pigs at 90 days of age and final weight at 180 days of age (kg)

TREATMENT	MEAN	
	INITIAL WEIGHT	FINAL WEIGHT
Commercial Feeds (control group)	39.67 ^a	87.00 ^b
CF + 1kgbanana peelings	39.33 ^a	97.33 ^a
CF + 1kg banana peelings + 500g coconut meat(matured)	39.33 ^a	98.67 ^a

Means with common letters are not significantly different at 5% level (DMRT)



Gain in Weight

Table 2 presents the total and average daily gain (ADG) in weight of the experimental pigs. True to both parameters, it is shown in the table that the pigs given banana peelings and those given banana peelings and coconut supplementation had higher gains compared to the control pigs or those given no supplementation as revealed by the statistical analysis. The result revealed that giving banana peelings alone or in combination with coconut meat to pigs as “merienda” or snack result to higher gains in weight.

Table 2. Total and average daily gain in weight

TREATMENT	MEAN	
	AVERAGE DAILY GAIN IN WEIGHT	TOTAL GAIN IN WEIGHT
Commercial Feeds (control group)	0.526 ^b	47.33 ^b
CF + 1kg banana peelings	0.644 ^a	58.00 ^a
CF + 1kg banana peeling + 500g coconut meat(matured)	0.659 ^a	59.33 ^a

Means with common letters are not significantly different at 5% level (DMRT)



Feed consumption and Feed Conversion Ratio (FCR)

Table 3 presents the feed consumption and the feed conversion ratio of the pigs in the three treatment. Statistical analysis revealed that there were significant differences in the feed consumption of the pigs. The pigs given banana peelings and coconut meat supplementation registered the highest feed consumption with a mean of 306.55 kg this was followed by the pigs given banana peelings supplementation with a mean of 268.46 kg. As expected, the control pigs or those no supplementation consumed the least with a mean of 202.5 kg.

However, in terms of feed conversion ratio (FCR) no significant differences were observed as revealed by the statistical analysis. This means that the FCRs of the pigs in the three treatments were more or less the same. This was because even if the pigs given supplementation had higher feed consumption than those given no supplementation, they also had higher gains in weight compared to the later hence, the non significance.

Table 3. Feed intake and feed conversion ratio

TREATMENT	MEAN	
	FEED CONSUMPTION (kg)	FEED CONVERSION RATIO
Commercial Feeds (control group)	202.50 ^c	4.30 ^a
CF + 1kg banana peelings	268.46 ^b	4.64 ^a
CF + 1kg banana peelings + 500g coconut meat(matured)	306.55 ^a	5.18 ^a

Means with common letters are not significantly different at 5% level (DMRT)



Net Returns and Returns on Investment (ROI)

Table 4 presents the net returns and returns on investment obtained from the different treatments. Even though this parameter was not subjected to statistical analysis, it is revealed in the Table that the returns realized from the pigs given banana peeling supplementation was the highest with an ROI of 18.68%. This was followed by the pigs given both banana peelings and coconut meat supplementation with an ROI 13.61%. The pigs in the control or those given no feed supplementation registered the lowest ROI of 10.92%. Higher production cost were observed from the pigs given feed supplementation compared to those given no feed supplementation or the control pigs, however, their final weights were significantly heavier than the final weights of the control pigs. Because their weights were significantly heavier, higher net returns were also realized.

Table 4. Net Returns and Returns on Investment (ROI)

TREATMENT	GROSS SALE (Php)	TPC (Php)	NET RETURN (php)	ROI (%)
Commercial feeds (control group)	31,200.00	28,129.00	3,100.00	10.92
CF + 1kg banana peeling	35,040.00	29,524.00	5,815.00	18.68
CF + 1kg banana peeling + 500g coconut meat(matured)	35,520.00	31,264.00	4,555.00	13.61



SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study was conducted to assess the potentials of raw coconut meat and banana peelings as feed supplements for growing-finishing pigs. It was conducted at Barangay Florida, Maria Aurora, Aurora from May to August, 2010 or for a period of 90 days.

Results of the study revealed significant differences between treatments means in terms of final weight, total gain in weight, average daily gain in weight and feed consumption. The statistical showed no significant differences in the initial weight and feed conversion ratio.

Conclusion

Based on the results of the study, it is therefore concluded that giving banana peelings or banana peelings plus coconut meat as “merienda” or snacks to growing-finishing pigs results to higher gains in weight of the pigs and higher net returns.

Recommendation

Based on the results of the study, it can be recommended that 1kg banana peelings or 1 kg banana peelings plus 500g coconut meat can be given to growing- finishing pigs as feed supplements. However, it is also recommended that a related study should be conducted but it should include the carcass characteristic and nutrient composition of the meat derived from the pigs given the above feed supplements.



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APPENDICES

Appendix Table 1. Initial body weight of pigs (kg)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
T ₀	41	40	38	119	39.67
T ₁	39	38	41	118	39.33
T ₂	38	41	39	118	39.33
GRAND TOTAL				355	
GRAND MEAN					39.44

ANALYSIS OF VARIANCE

SOURCE OF TABLE VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	CF	TABULAR F	
					0.05	0.01
TREATMENT	2	1.00	0.50	0.23 ^{ns}	5.14	10.92
ERROR	6	13.22	2.20			
TOTAL	8	14.22				

^{ns} = Not Significant

Coefficient of Variance = 3.88%



Appendix Table 2. Final weight of the pigs (kg)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
T ₀	92	88	81	261	87.00
T ₁	101	94	97	292	97.33
T ₂	93	103	100	296	98.67
GRAND TOTAL				848	
GRAND MEAN					94.33

ANALYSIS OF VARIANCE

SOURCE OF TABLE VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	CF	TABULAR F	
					0.05	0.01
TREATMENT	2	244.67	122.335	5.27*	5.14	10.92
ERROR	6	139.33	23.222			
TOTAL	8	384.00				

* = significant

Coefficient of Variance = 5.09%



Appendix Table 3. Total gain in weight (kg)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
T ₀	51	48	43	142	47.33
T ₁	62	56	56	174	58.00
T ₂	55	62	61	178	59.33
GRAND TOTAL				494	
GRAND MEAN					54.87

ANALYSIS OF VARIANCE

SOURCE OF TABLE VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	CF	TABULAR F	
					0.05	0.01
TREATMENT	2	259.5557	129.7779	9.13*	5.14	10.92
ERROR	6	85.3332	14.2222			
TOTAL	8	344.8889				

* = significant

Coefficient of Variance = 8.44 %



Appendix Table 4. Average daily gain in weight of the pigs (kg)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
T ₀	0.57	0.53	0.48	1.58	0.5267
T ₁	0.69	0.62	0.62	1.93	0.6433
T ₂	0.61	0.69	0.68	1.98	0.6600
GRAND TOTAL				5.59	
GRAND MEAN					0.6100

ANALYSIS OF VARIANCE

SOURCE OF TABLE VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	CF	TABULAR F	
					0.05	0.01
TREATMENT	2	0.0317	0.0158	8.53*	5.14	10.92
ERROR	6	0.0111	0.0019			
TOTAL	8	0.0428				

* = significant

Coefficient of Variance = 7.15 %



Appendix Table 5. Total feed consumption of the pigs (kg)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
T ₀	202.50	202.50	202.50	607.50	202.50
T ₁	259.69	253.18	292.50	805.37	268.46
T ₂	309.48	300.04	310.12	919.64	306.55
GRAND TOTAL				2,332.51	
GRAND MEAN					259.17

SOURCE OF TABLE VARIANCE	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	CF	TABULAR F	
					0.05	0.01
					TREATMENT	2
ERROR	6	952.023	158.6715			
TOTAL	8	17578.862				

**=high significant

Coefficient of Variance = 4.86%



Appendix Table 6. Feed conversion ratio

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
T ₀	3.971	4.219	4.709	12.899	4.2997
T ₁	4.189	4.521	5.223	13.933	4.6443
T ₂	5.677	4.839	5.084	15.55	5.1833
GRAND TOTAL				42.382	
GRAND M EAN					4.7091

ANALYSIS OF VARIANCE

SOURCE OF TABLE VARIANCE	DEGEES OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	CF	TABULAR F	
					0.05	0.01
TREATMENT	2	1.19023	0.595	3.07 ^{ns}	5.14	10.92
ERROR	6	1.16475	0.194			
TOTAL	8	2.35498				

^{ns} = not significant

Coefficient of Variance = 9.76 %



Appendix Table 7. Cost and return analysis

	CONTROL GROUP	SUPPLEMENTED WITH BANANA PEELINGS	SUPPLEMENTED WITH BANANA PEELINGS AND FRESH COCONUT MEAT
A. Sales from 3 pigs @php 120/kg	31,200.00	35,040.00	35,520.00
B. Less Input			
1. Stock (3 pigs about 39kg average at 3 months.old) @ php 4200 each	12,600.00	12,600.00	12,600.00
2. Feeds (pellets)	6,075.00	6,075.00	6,075.00
a. Grower @ php 22.50/kg (270 kg)			
b. Finisher @ php 22.00/kg (337.50 kg)	7,425.00	7,425.00	7,425.00
3. Banana peeling @php 1.00/kg (270 kg)	-	270.00	270.00
4. Coconut @ php 6.00/pc (290 pcs)	-	-	1,740.00
5. Labor @ php 25/hr			
a) cleaning and feeding (60 hrs)	1,500.00	1,500.00	1,500.00
b) giving supplement (45 hrs)	-	1,125.00	1,125.00



	CONTROL GROUP	SUPPLEMENTED WITH BANANA PEELINGS	SUPPLEMENTED WITH BANANA PEELINGS AND FRESH COCONUT MEAT
6. Dewormer @php 29.00/ sacket (3 pcs)	29.00	29.00	29.00
7. Housing rent @ php 500 a month (3 months)	500.00	500.00	500.00
Subtotal	28,129.00	29,524.00	31,264.00
Net Return	3,071.00	5,516.00	4,256.00
Return on Investment (%)	10.92	18.68	13.61

