PSU Journal of Natural and Allied Sciences
Vol. 1 No.1, pp. 32-37, December 2017

Alternative Small Scale Native Pig Production Cum Natural Farming and Profit Viability

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Abstract — **This study was conducted to evaluate the performance of grower pigs through natural pig production by simulating the natural environment of the pigs in the pens by using locally available indigenous materials or alternative housing, the use of effective microorganism (EM) for improving growth performance instead of the commercially available growth-promotants, and assess the production profitability of using alternative materials and the use of EM for Grower pigs.This study was conducted at the Piggery Project of Pangasinan State University - Infanta Campus, from March 2016 to April 2016 with the duration of forty five (45) days. The experimental study includes the use of alternative housing with EM and without EM and concrete housing (farmer's practice) with EM and without EM.The experimental design used in this study was the Complete Randomized Designed (CRD). Based on the result of the study, the use of alternative housing provides better growing condition for the pigs thus promoting animal welfare. Also, it was found out that the use of alternative housing together with the application of effective microorganism in the feeds was better than the other treatment. In general, simulating the natural environment of pigs through Alternative Housing will result to a more sustainable pig production in the long-run.**

Keywords* — *Alternative Housing; Effective Microorganism; Grower Pigs

I. INRODUCTION

Natural pig farming is a production system in which the farmer utilizes economically their readily-available resources making pig farming more efficient and profitable. This farming system promotes health protection for both humans and animals. The animals are raised according to their simulated natural environment with less dependence on synthetically-produced growth promotant and antibiotics. At the same time, this ensures quality and safe food for human consumption.

Ironically, commercial or large-scale pig farming produces cheaper food through specialization of production activities and by economies of scale. However, it generates hidden costs to the society and to the environment. For instance, generated animal wastes from large farms contribute mostly to greenhouse gases that, if not properly managed, would pose health and environmental hazard risks, according to the World Bank report (2010) and the Food and Agriculture Organization (FAO) of United Nations (2013).

Food safety also becomes an issue due to the overuse of chemicals or animal-biologics interjected within feeds which is being practiced to increase the growth of animals abnormally or outside the normal pattern of growth. This may result to possible health side-effects both for the animals and humans.

Furthermore, establishments of commercial farms require greater capital while small scale pig farming simply needs minimum investment. Incidentally, 64% of pig inventory is produced by backyard or small farmers and only 36% from commercial farms, according to the report of the Philippine Statistics Authority (PSA). Hence, in order to achieve food sufficiency in the country, it is vital to improve the production capability of small scale pig farmers through natural farming.

With natural farming, small farmers will be able to appreciate the social and economic benefits of farming, encourage human and animal welfare resulting to food security and safety while mitigating harmful environmental effects, consequently, promoting sustainable livelihood. Effective microorganisms (EM) are used in numerous fields associated with agriculture (Higa and Parr, 1994). The beneficial effects of EM on the general health of pigs and on production parameters are also determined by the influence of these microbes on immunity (Laskowska et al. 2017).

This study was done to evaluate the performance of grower pigs through natural pig production by simulating the natural environment of the pigs in the pens by using locally available indigenous materials as compared with concrete housing, and the use of effective microorganism (EM) for improving growth performance instead of the commercially available growth-promotants.

II. Materials and Methods

A. Study Site

The study was conducted from March 2016 to April 2016 at the Piggery Project of Pangasinan State University Infanta Campus.

B. Experimental Design and Treatments

There were two housing systems used in the study – concrete and alternative housing systems. The concrete housing system is a type of housing in which the flooring of the pig pen is made of cement, and the drinker and feeder are situated along the cement floor. On the other hand, the alternative housing system is a type of housing that used indigenous materials such as rice hull and saw dust as floor bedding, with separate feeder and drinker trough, and wallowing pool. The two types of housing systems were compared in this study, together with the use of effective microorganisms (EM) and without the use of effective microorganism. The EM was applied to the feeds by means of mixing with a rate of 1 tablespoon of EM per kilogram of feeds. On the other hand, the EM was prepared by mixing 1 gallon of molasses, 1 liter of commercial powdered milk, and 1 liter of medium from fermented rice.

In this study, the growth performance of pigs was evaluated using four (4) experimental treatments: (T1, concrete housing with effective microorganisms; T2, concrete housing without effective microorganisms; T3, alternative housing with effective microorganisms; and T4, alternative housing without effective microorganisms). Each treatment contained five (5) heads of grower pigs as replication, totaling of twenty (20) heads of pigs used in the study.

C. Data Gathering and Analysis

Data on growth performance of the pigs was gathered by obtaining the mean initial weight and the mean final weight, in which, these were used to compute the mean gain in weight. Also, the data for mean feed consumption and the mean feed conversion rate were collected. The statistical t-test was used in assessing the growth performance of pigs in concrete housing without EM and alternative housing without EM as well as on growth of pigs in concrete housing with EM and alternative housing with EM.

III. Results and Discussion

A. Performance of Native Grower Pigs in the Alternative Housing

The result of growth performance of pigs in concrete housing without EM and in alternative housing without EM shows that there is no significant difference between the two housing systems based on the mean gain in weight and mean feed conversion ratio (Figures 1 and 2). This implies that the alternative housing does not affect growth performance of grower pigs. However, it improves conditions of the animals as observed by their free movement along the alternative housing, they wallow in the pond during high temperature or noon, and their manure has less odor as compared to the concrete housing or standard farmer's practice.

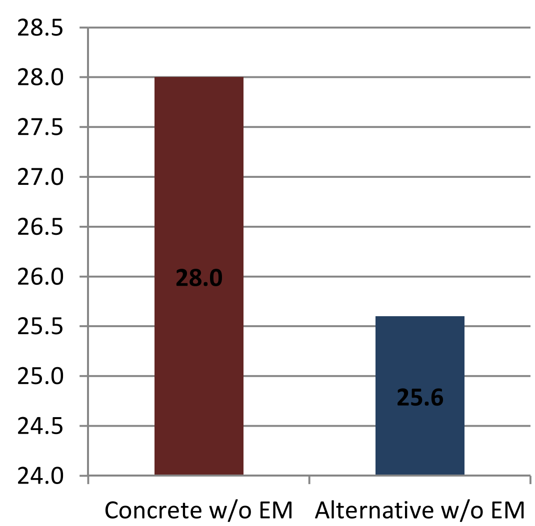

Figure 1**.** *Mean Gain in Weight grower pigs at the concrete and alternative housing without EM*
Note: *Not significant at 5% using T-test computation*

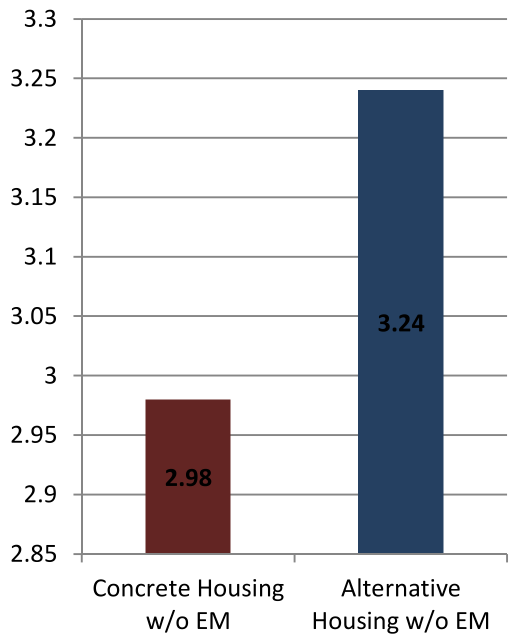

Figure 2. *Mean Feed Conversion Ratio of concrete and alternative housing without EM*
Note: *Not significant at 5% using the t-test computation*

B. Effectiveness of Effective Microorganism for Growth Enhancement of the Grower Pigs

Results of the study demonstrated that Effective Microorganism had no effect on the growth performance of pigs grown in concrete housing, but there is significant effect on the gain in weight when EM is given to pigs produced in alternative housing as shown in Figure 3. EM is more effective when used simultaneously with alternative housing because it provides favorable environment for the animals to feed and drink since the feeder and drinker were separated accordingly, thus efficiently consuming the feeds with EM. This is in contrast to the concrete housing wherein the feeding trough also serves as the drinking trough. In effect, the pigs usually bath or lie down on the trough and defecate contaminating their feed and/or water. Hence, the feeds mixed with EM are not properly consumed by the pigs resulting to poor feed conversion ratios (Figure 4).

The result also indicates that the pigs in the concrete housing with EM have the highest feed conversion (3.78) than the alternative housing (2.82).This means that pigs produced in the concrete housing with EM need to consume 3.78 kilograms of feeds in order to produce 1 kilogram of additional weight as compared to the alternative housing with EM with only 2.82 kilograms. Normally, the standard feed conversion ranges from 2.72 with Average Daily Gain (ADG) of ≥650g to 3.07 with ADG of 500-550g, according to the International Training Center for Pig Husbandry (ITCPH). Hence, the pigs grown in the alternative housing with EM applied in their feeds are more efficient in converting feeds to additional weight. The use of living microorganisms as probiotics is recommended as an alternative to antibiotics as prophylactic, therapeutic, and growth-promoting agents in livestock production by many authors. For instance, Cavazzoni et al. (1998) showed that a newly isolated *Bacillus coagulans* strain as probiotic had a growth-promoting, prophylactic effect comparable to that of virginiamycin, an antibiotic. Similar results were observed by Jin et al. (1998) and Mohan et al. (1996) when they showed that the growth performance, intestinal microbial populations, and serum cholesterol of broilers improved when fed diets containing dietary probiotic supplementations.

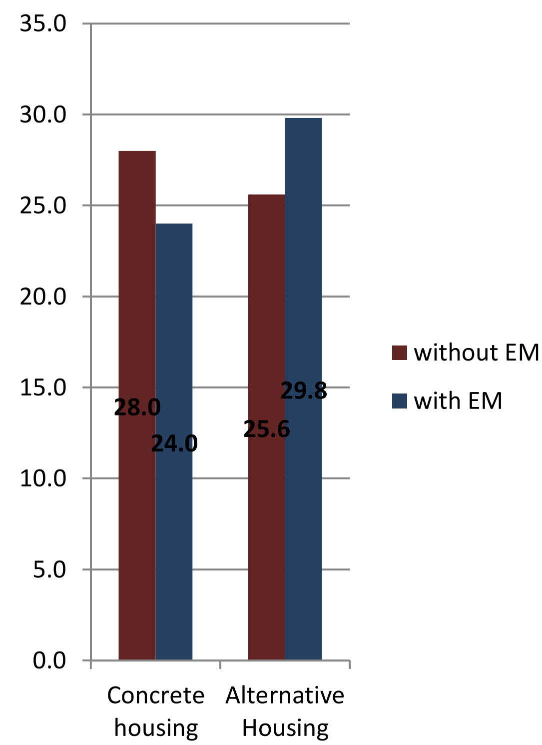

Figure 3. *Mean Gain In Weight of pigs in Concrete and Alternative Housing*
Note: *Concrete housing - not significant at 5% using T-test*
Alternative housing - significant at 5% using T-test
Concrete Housing w/ EM vs. Alternative Housing w/ EM – significant at 5% using T-test

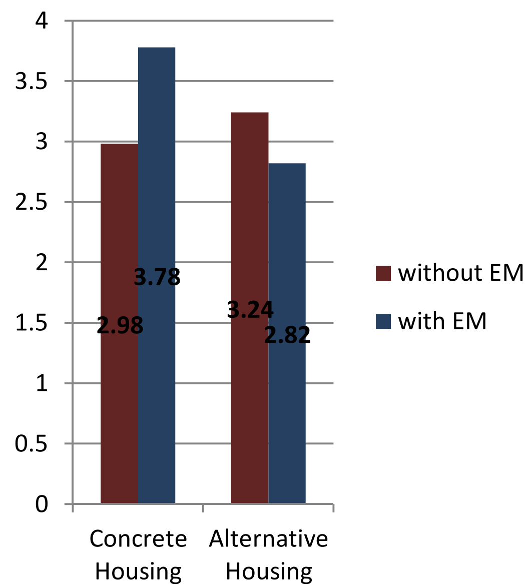

Figure 4. Mean Feed Conversion Ratio of Concrete and Alternative Housing

Note: *Concrete housing - not significant at 5% using T-test)*
Alternative housing - significant at 5% using T-test
Concrete Housing w/ EM and Alternative Housing w/ EM - *significant at 5% using T-test*

C. Production Profitability of Alternative Housing and the Use of EM for Grower Pigs

The profitability of using concrete and alternative housing with and without EM is presented in Table 1. It explains that the use of alternative housing will result to additional cost in the purchase of rice hull which is utilizable for one year before it decomposes and need to be replaced. Nevertheless, the decomposed rice hull can be sold after one year which can serve as additional source of income for the farmer and/or it can be used as organic fertilizer in their farm.

The effective microorganism (EM) is also considered as additional cost for pigs produced at concrete and alternative housing with EM but at minimum amount only.

Average production cost shows the minimum cost of producing 1 kilogram of weight. It ranges from PhP 75.70 to PhP 83.92, which is acceptable as compared to the farm market price at PhP 95.00 per kg. As a result, the remaining PhP 19.30 and PhP 11.08, respectively, serve as income per kilogram for the farmer.

Breakeven volume (BEV) demonstrated the target kilogram live weight of the pigs to be produced in order to payback all the expenses. BEV ranges from 272.43 KgLW to 288.46 KgLW which are acceptable as compared to the final weight of the treatments.

Cost and return analysis based on the treatments illustrated acceptable profitability based on the rate of return in operating expenses and total expenses as compared with the opportunity cost of capital of 12 percent annually.

TABLE 1. COST AND RETURN ANALYSIS FOR 5 HEADS GROWER PIGS ACCORDING TO CONCRETE HOUSING WITHOUT EM, CONCRETE HOUSING WITH EM, ALTERNATIVE HOUSING WITHOUT EM, AND ALTERNATIVE HOUSING WITH EM

PARTICULARS	**TREATMENT**			
	H1 T1	**H1 T2**	**H2 T1**	**H2 (T2)**
	CH w/o EM	**CH w/ EM**	**AH w/o EM**	**AH w/ EM**
I. GROSS INCOME				
A. Revenue on Grower Pig	32,015.00	30,210.00	34,390.00	30,115.00
Total live weight (5 heads/ treatment)	337.00	318.00	362.00	317.00
Live weight price @ P95/KgLW				
B. Empty sacks PhP 10/pc	82.50	82.50	82.50	82.50
TOTAL GROSS INCOME	**32,097.50**	**30,292.50**	**34,472.50**	**30,197.50**
Gross Income (per head)	6,419.50	6,058.50	6,894.50	6,039.50
II. EXPENSES				
A. Operating Expenses				
1) Starter pigs[a/]	13,675.00	13,700.00	14,600.00	12,950.00

ISSN 2599-4654 (Print) *www.psurj.org/jonas* ISSN 2599-4646 (Online)

Continuation of Table 1…

PARTICULARS	TREATMENT			
	H1 T1	H1 T2	H2 T1	H2 (T2)
	CH w/o EM	CH w/ EM	AH w/o EM	AH w/ EM
2) Grower Feeds[b/]	10,998.90	10,998.90	10,998.90	10,998.90
3) Rice hull & transportation[c/]	-	-	112.50	112.50
4) Water	250.00	250.00	250.00	250.00
5) Labor[d/]	675.00	675.00	675.00	675.00
6) Effective Microorganism[e/]	-	150.00	-	150.00
7) Disinfectant	25.00	25.00	25.00	25.00
8) Anti Stress (multivitamins & electrolytes)	-	30.00	60.00	60.00
Total Operating Expenses	**25,623.90**	**25,828.90**	**26,721.40**	**25,221.40**
B. Overhead Expenses				
1) Interest of Capital[f/]	384.36	387.43	400.82	378.32
2) Depreciation – Building[g/]	468.75	468.75	281.25	281.25
Total Overhead Expenses	**853.11**	**856.18**	**682.07**	**659.57**
III. TOTAL EXPENSES	**26,477.01**	**26,685.08**	**27,403.47**	**25,880.97**
Total Expenses (per head)	5,295.40	5,337.02	5,480.69	5,176.19
IV. NET INCOME	**5,620.49**	**3,607.42**	**7,069.03**	**4,316.53**
Net Income (per head)	1,124.10	721.48	1,413.81	863.31
V. Average Production Cost (Price /Kg)	78.57	83.92	75.70	81.64
Average Production Cost (per head)	5,295.40	5,337.02	5,480.69	5,176.19
VI. Break Even Volume (Kg LW per treatment)	278.71	280.90	288.46	272.43
Break Even Volume (Kg LW per head)	55.74	56.18	57.69	54.49
VII. RAOExp (%)	21.93	13.97	26.45	17.11
VIII. ROExp (%)	21.23	13.52	25.80	16.68

Note:

a/ Cost of Starter Pigs (PhP 2000 for initial 10KgLW + PhP 25/KgLW for additional KgLW based on initial weight of pigs

b/ Grower feeds - 8.25 sacks consumed per treatment at PhP 1333.20/sack

c/ Ricehull - 72.5 sacks at PhP 10/sack + PhP 175 delivery per treatment for 1 year

d/ Family Labor P60/day for 45 days for 20 heads of grower pigs

e/ EM –PhP150/liter, consumed EM per treatment for 45 days at 1 liter

f/ Interest charge of Capital at 12% per annum based on operating expenses

g/ Depreciation of building

- *Cost of Building (CH) at PhP 150,000 w/ 20 years lifespan*
- Cost of Building (AH) at PhP 90,000 w/ 20 years lifespan

IV. Conclusion

The study concludes that the use of alternative housing without EM does not significantly improve the growth performance of grower pigs. However it provides better growing conditions for the pigs, therefore promoting animal welfare in pig production through larger area for movement, wallowing pool for avoiding heat stress, feeder and drinking trough that eliminates aggressive behavior of the animals, and less odor from pig waste. In a study on composting with and without effective microorganisms, the overall results suggested the positive effect provided by EM notably in odor control and humification (Fan et al. 2017). The present study also indicates that significant growth performance of pigs can be achieved if the alternative housing is used concurrently with application of Effective Microorganism to the feeds of the pigs. The formulation used in the present study contains beneficial organisms and enzymes as well as vitamins and minerals which are added to animal feeds, and virtually suppress the growth of harmful bacteria, which then improves the immune system of the animals that enable them to combat stress and resist diseases. In a latest study by Laskowska et al. (2017), they noted that supplementation with EM increased average daily gain in pigs. The EM activate both the cellular and humoral immune response, activate pro- and anti-inflammatory cytokines in the serum, and that high IFN-γ concentrations promote the Th1 phenotype in pigs receiving EM. The result of the study of Laskowska et al. (2017) indicate that supplementation of pig feed with EM Bokashi activates the cell-mediated and humoral immune response, ensuring that Th1/Th2 balance is maintained and enhancing immune processes protecting the body against infection.

Profitability analysis also shows that the use of alternative housing will result to additional cost in purchasing rice hull and EM but will result to acceptable profitability based on rate of return for operating expenses and total expenses.

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