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RE-ALIMENTATION OF GROWING PIGS IN QUANTITATIVE FEED RESTRICTION

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ABSTRACT: *This study objective is to investigate the growth performance and cost implication of pigs during a period of quantitative feed restriction. Twenty-four (24) mixed sexes (Large white x Landrace) of weaner pigs with an initial live-weight of 8.39 ± 0.01 kg were grouped into four treatments for 126 days in a completely randomized design experiment. Each treatment was further subdivided into three replicates of two pigs each. Diets were fed to the pigs at 5%, 4%, 3% of their live weight, and ad libitum feeding regimen. Daily feed intake and weekly weight gains were recorded while the feed conversion ratio and cost implications of pigs were calculated. The results of performance of pigs showed that there was a significant (P<0.05) decrease in feed consumption in pigs fed at 3% body weight when compared with those fed ad libitum with significant. However, weight gain was not influenced (P>0.05) in pigs on ad libitum and restricted feeding. Cost of feed ₦/kg and cost of feed ₦/kg weight gain were not influenced (P>0.05) while cost of feed consumed decreased significantly (P<0.05) in pigs fed 3% body weight when compared with pigs on ad libitum feeding. For minimum cost and optimal growth of pigs, pig farmers are advised to employ feeding regimens in pig production.*

KEYWORDS: Feed restriction, Alimentation, Quantitative, swine, performance.

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INTRODUCTION

Feed restriction is a common management practice to improve carcass quality and feed efficiency while decreasing production cost and carcass fat in farm animals. Strategies for feeding pigs have a great importance in the determination of chemical, physical and sensorial characteristics of meat (fatty depots included) and of processed products. The review of Lebret (2008) examined extensively the link between the feeding/rearing system and the quality of carcass and meat in pigs, with particular emphasis on the conventional breeds. The feeding strategies can be categorised according to the following points: 1) feeding restriction; 2) feeding restriction and re-alimentation (and, consequently, compensatory growth); 3) dietary level of protein (or lysine) energy ratio.

An increase in meat consumption has affected a change in consumers' demands in terms of sensory traits of food products. Owing to this, consumers search for tender and juicy pork with appropriate aroma and taste (Aaslyng *et al.,* 2007). The production performance of the pig is greatest when free access to feed and water is given. Feed, incidentally, is the most expensive factor in producing pigs. Inadequacy and inconsistency of feed supply is a major bottleneck to efficient animal production in tropical farming systems (Melaku & Peters, 2000). Nji *et al.* (2002) attributed this short-fall in feed supply to two major factors viz: 1) scarcity and high cost of conventional protein and energy feedstuff, and 2) competition for these products by man, livestock and agro-industrial sectors. The quantitative feed restriction programme has been successfully applied in managing this scarce feedstuff.

Feed restriction, limited feeding and using alternative feedstuffs are veritable tools of feeding management in achieving profitable livestock business (Ogunnusi *et al.,* 2023). In view of this, farmers now evolve feeding management programs that will optimize lean carcass yield without compromising the growth of the animal and income of the farmers. Thus, the thrust of this study was to assess the re-alimentation of growing pigs on quantitative feed restriction.

MATERIAL AND METHODS

Area of the Study

The experiment was carried out at the Piggery Unit of Aladenika Livestock Farms, located at Km 7, Awoyaya Ondo-Ore Road, Ondo State. Ondo is located between $07^0$12'W':$05^0$05'E with annual rainfall of between 1800 to 3600mm, 54 to 91% relative humidity and mean daily temperature range of 22 to 35^0 throughout the year (Map-Street view, 2023).

Experimental Animals and management

Twenty-four (24) mixed sexes (Large white x Landrace) of weaner pigs with an initial live-weight of 8.39 ± 0.01 kg were grouped in a completely randomized design (CRD) experiment into four treatments for 126 days in a completely randomized design experiment. Each treatment was further subdivided into three replicates of two pigs each. Diets were fed to the pigs at 5%, 4%, and 3% of their live weight, and *ad libitum* feeding regimen. The feed conversion ratio was calculated as the ratio of average feed intake to average weight gain (g).

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The pigs were treated against external and internal parasites by subcutaneous injection of ivermectin at the rate of 0.2 ml/pig; iron III and Vital flash were injected at the rate of 2 ml/pig. Feeding and water troughs were cleaned on a daily basis before serving the pigs with feed and clean water. Cleaning of the pens was done on a daily basis.

Experimental Diets

The feed ingredients were procured from a reputable feed mill in Ondo. The feed ingredients before formulation were analysed for their proximate composition according to the methods of AOAC (2002). The experimental diet was formulated to meet the nutrient requirements for the class of pigs (NR, 1998), as shown in Table 1.

Table 1: Gross Composition of Experimental Diet

Ingredients	Quantity (kg)
Maize	57
Groundnut Cake	7
Palm Kernel Cake	18
Soya Bean Meal	8
Wheat Offal	6.7
Limestone	1.5
Di- Calcium Phosphate	0.5
Lysine	0.15
Methionine	0.15
Premix	0.5
Salt	0.5
Total	**100**
Nutrient composition	
Crude protein (%)	15.96
Crude fibre (%)	5.48
Ether extract (%)	5.09
Metabolizable Energy (kcal)	2682.45
Calcium (%)	0.72
Phosphate (%)	0.36

Premix (broiler) composition (2.5 kg), vitamin A 180,000–200,000 iu, vitamin D3 60,000-70,000 iu, vitamin E ≥ 500 iu, vitamin K3 50 mg, vitamin B1 ≥ 40 mg, vitamin B6 ≥ 80 mg, vitamin B12 ≥ 0.4 mg, Kolic acid ≥ 24mg, Biotin ≥ 2.4mg, nicotinic acid ≥ 1300mg, pantothenic acid ≥ 230 mg, Choline chloride ≥ 10 g, Copper 12–14 g, Iron 1.2–1.4 g, manganese 1.8–3.0 g, zinc 1.5–1.7 g, Selenium 4–10 mg, iodine 20–200 mg, moisture ≥ 10%, Calcium 10–20%, Phosphorus ≥ 3%, salt 18% carriers qs.

Data Collection and Analysis

Data were collected on daily feed intake and weekly weight gain, and analysed using Statistical Package for Social Science (SPSS) version 20.

The feed intake was calculated as the difference between the feed given and the leftover after removing every foreign material in the leftover.

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It is mathematically represented as:

Fed intake (g) – Feed given (g) – Leftover (g)

The weekly weight gain was calculated as the difference between the present live weight from the initial weight.

It is mathematically represented as:

Average weight gain = final live weight (g) – initial live weight (g)

Feed conversion ratio (FCR) was calculated as the ratio of average feed intake (g) to average weight gain (g).

It is mathematically represented as:

$$FCR = \frac{\text{Average feed intake (g)}}{\text{Average weight gain (g)}}$$

ECONOMIC EVALUATION

The cost evaluation of pigs fed on different feeding regimens were determined using the under-listed economic tools while the cost of feed was calculated based on the prevailing market price of the feed ingredients of the time of study.

1. Total Revenue (TR) (₦) = Total weight gain X price/kg live body weight
2. Net Revenue (NR) (net profit per pig) (₦) = total revenue (TR) – total cost (TC)
3. Economic Efficiency (EE) = NR/TC
4. Relative Economic Efficiency (REE) = $\frac{\text{EE of treatment of test group}}{\text{EE of the control group}}$
5. Profit per pig over control (₦) = Net profit per pig on test diet – Net profit per pig on control
6. Cost of feed (kg) weight gain = $\frac{\text{cost of feed kg X average feed consume}}{\text{Average weight gain}}$
7. Total Weight Gain (₦) = $\frac{\text{average weight gain (kg) X cost of feed(₦)/kg}}{\text{Weight gain}}$
8. Relative Cost Benefit (%) = Cost of feed ₦/kg weight gain of control diet – Cost of feed ₦/kg weight gain test diet – Cost of feed ₦/kg weight gain of control diet X 100
9. Cost Differential = Cost of feed ₦/kg weight gain of test diet – cost of feed ₦/kg weight gain of the control diet.

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The cost of feed and ingredients were determined based on the prevailing market cost in Ondo.

RESULT AND DISCUSSION

Results

Performance of Pigs (1–126 Days) on Quantitative Feeding

The proximate analysis of the ingredient can be seen in table 2. Result on Table 3 shows that the final live weight (61.07–74.07 kg/pig), total weight gain (52.80–65.73 kg/pig) and average gain (0.42–0.52 kg/pig) of pigs fed *ad libitum* up to 4% body weight were not significantly different (P>0.05). Also, the total feed consumed (168.56–231.08 kg/pig) of pigs fed *ad libitum* up to 4% body weight was not significantly different. However, pigs fed at 3% body weight had a total weight gain (42.67–65.73 kg/pig), final live weight (51.00–74.07), and total feed consumed (133.14–231.08) were significantly lower compared to pigs fed *ad libitum*.

Table 2 Proximate Composition (g/100g) of Feed Ingredients used for the Experiment

Feed ingredients	Crude Protein	Crude fibre	Esther extract	Ash
Maize	8.55	3.51	4.14	1.5
Groundnut cake	44.69	3.67	8.89	6.05
Soyabean meal	44.34	6.03	3.84	7.14
Palm kernel cake	18.78	11.12	7.71	4.80
Wheat offal	15.35	1100	6.20	6.35

Table 3: Performance of Pigs (1–126 Days) on Quantitative Feeding % Body

Parameters	Ad-lib	5%	4%	3%	SEM	SIG
Initial weight, kg/pig	8.33	8.63	8.27	8.33	2.01	0.99
Final live weight, kg/pig	74.07^{a}	64.83^{ab}	61.07^{ab}	51.00^{b}	5.79	0.02
Total weight gain, kg/pig	65.73^{a}	56.20^{ab}	52.80^{ab}	42.67^{b}	3.94	0.02
Average weight gain, kg/pig	0.52^{a}	0.45^{ab}	0.42^{ab}	0.34^{b}	0.03	0.02
Total feed consumption, kg/pig	231.08^{a}	198.70^{ab}	168.56^{ab}	133.14^{b}	23.41	0.03
Average feed consumption, kg/pig/day	1.83^{a}	1.58^{ab}	1.34^{ab}	1.06^{b}	0.91	0.03
Feed conversion ratio	3.51	3.50	3.18	3.08	0.22	0.43

^{abc}Means with different superscripts along the same row are significant at P<0.05

Cost Implications of Pigs

Result on cost implications (Table 4) reveals that while cost of feed ₦/kg was not significant (P>0.05), the cost of feed consumed is lower in 5% levels of feeding regimen (₦164.11) and 4% levels of feeding regimen (₦139.20) and 3% levels of feeding regimen (₦109.85) compared to the pigs fed with *ad libitum* (₦190.82) levels of feeding regimen, thus saving

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cost of ₦26.71, ₦51.62 and ₦80.97 respectively, although cost of ₦/kg weight gain was numerically lower compared to feeding with *ad libitum* (365.18 ₦/kg) in pigs fed on 5% (364.56 ₦/kg), 4% (331.21 ₦/kg) and 3% (321.01 ₦/kg) regime) and 3.16% (protein content) in relation to the varying feeding regimens. The result on feed cost of pig production shows that it was economically viable to feed pigs on 5, 4 or 3% of body live weight than feeding *ad libitum*.

Table 4: Cost Implications of Pigs (1–126 Days) on Quantitative Feed Restriction

	Feeding regimens					
Cost items	**Ad libitum**	**5%**	**4%**	**3%**	**SEM**	**Sig**
Average feed consumption kg/pig/day	1.83[a]	1.58[ab]	1.34[ab]	1.06[b]	0.19	0.04
Average weight gain kg/pig/day	0.52[a]	0.45[a]	0.42[ab]	0.34[b]	0.03	0.02
Cost of feed ₦/kg	104.10	104.10	104.10	104.10	0.00	---
Cost of feed consumed ₦	190.82[a]	164.11[ab]	139.20[ab]	109.85[b]	19.32	0.04
Cost of feed ₦/kg weight gain	365.18	364.56	331.21	321.21	22.35	0.43
Saving cost	____	0.62	33.97	44.17	____	_____

[abc]Means with different superscript are significantly different at P>0.054

DISCUSSION

The reduced feed intake observed in this was in line with the previous works on monogastric animals (Oyedeji & Atteh, 2005; Zhan *et al*., 2007). Significant reduction in feed consumption in pigs in restricted feeding could be ascribed to limited feed available to the animals while higher feed consumption of pigs on *ad libitum* feeding could be related to the resultant availability of excess feed which could have resulted to the hypertrophy of the gastrointestinal tract to take in or handle more feeds as earlier reported in monogastric animal (Saber *et al.*, 2011). The result of similar weight gain of pigs on *ad libitum* and restricted feed was in line with the previous works by Camacho *et al.* (2004) but in contrast to the reports by Boostani *et al.* (2010) and Oyedeji and Atteh (2005) on pigs. The similar weight gain observed in this study could be attributed to possible similar secretion of enzymes such as amylase, sucrose and lipase that are very crucial in nutrient digestion and preparation of the gut for nutrient absorption. Improvement in the feed conversion ratio of pigs on restricted feeding over those on *ad libitum* feeding was in agreement with the reports in broiler chickens (Pan *et al., 2005;* Boostani *et al.,* 2010) and pigs (Campbell *et al.,* 1983). The better feed utilization of pigs on restricted feeding could be attributed to the efficient utilization of the limited feeds (Ogunsipe *et al.,* 2017) or the possible transient decrease passage of nutrients in the gut or decrease in basal metabolic rate (Urdaneta, Rincon & Leeson, 2002).

Successive reduction in the cost of feed required to raise a kilogram weight of pig could be attributed to lesser feed consumed without negatively affecting the growth rate of the pigs. The better saving or differential cost of pigs on restricted feeding over those on *ad libitum*

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feeding could also be traced to reduced feed intake, improved feed conversion efficiency with resultant similar weight gain of the pigs, as previously reported by Cuddington (2004).

CONCLUSION AND RECOMMENDATION

Conclusion

Conclusively, the results of performance of pigs showed that there was a significant decrease in feed consumption in pigs fed at 3% body weight when compared with those fed *ad libitum* with significant. However, weight gain was not influenced in pigs *ad libitum* and restricted feeding. Cost of feed ₦/kg and cost of feed ₦/kg weight gain were not influenced while cost of feed consumed reduced in pigs fed 3% body weight when compared with pigs on *ad libitum* feeding. For minimum cost and optimal growth of pigs, pig farmers are advised to employ feeding regimens in pig production.

Recommendation

Based on the result from this study, pig farmers are advised to employ restricted feeding of either 5, 4 or 3% live body weight as against feeding *ad libitum.*

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