# Influence of Feed Quantity Offered on Linear Body Measurements, Nutrient Digestibility, and Back Fat Composition of Finishing Pigs.

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## ABSTRACT

This study was conducted to determine the effect of feed quantity offered (1.5, 2.0, or 2.5 kg) on linear body measurements, nutrient digestibility and back fat composition of 48 Large White Grower male pigs with average initial weight of 36.48±2.25 kg. The pigs were allotted to three experimental groups of 16 pigs per group and were further quadruplicated with 4 pigs per replicate. Linear body measurements data were collected on weekly basis and back fat composition was determined when the pigs on each experimental group attained an average weight of 70 kg.

Final weight, height at wither, chest and loin girths of finishing pigs were significantly ($P<0.05$) influenced by feeding level. The final body weight ranged from 69.63 to 78.19 kg. Chest girth value (1.15 cm/week) of Pigs offered 2.0 kg feed daily was the highest when compared to the values (0.94 and 1.00 cm/week) obtained for pigs fed 1.5 and 2.5 kg feed/day, respectively. Feed quantity offered had significant ($P<0.05$) influence on dry matter intake, crude fibre digestibility and ash, nitrogen intake, nitrogen absorption and retention. Mean values for dry matter intake ranged from 1.36 kg for pigs fed1.5 kg/day to 1.62 kg for pigs fed 2.5 kg/day. Fat at first and last ribs, and subcutaneous fat depth increased with increasing feed quantity offered. It was concluded that feeding pigs 2.0 kg daily improved the linear body dimensions, nutrient digestibility and reduced back fat deposition of finishing pigs.

(Keywords: feed quantity, linear body measurements, back fat composition, pigs, animal feed, livestock)

## INTRODUCTION

The unbeatable fecundity of the pig and its ability to subsist on a very wide range of feed resources including crop residues, kitchen wastes and agro-industrial by-products, which have limited alternative uses, are factors of comparative advantages which can be tapped to increase the supply of pork (Dafwang et al., 1998). Since pork is cheaper than beef, chicken, mutton, chevon, and other animal protein sources, encouraging pork production and consumption will reduce the pressure on the demand for these meats thereby making them more available and at cheaper rates.

The increase in the number of pigs produced per year might be attributed mainly to the proliferation of a few breeds of pigs, the erosion of important genetic diversity in several indigenous breeds of pigs, and proper management system (qualitative and quantitative feeding systems). The type of feed and the method of feeding greatly influence the feed efficiency, growth rate, breeding efficiency, carcass quality, and the general health of pigs. Seasonal feed deficiency, high cost of feed ingredients, erratic feed ingredients supply and competition between humans and monogastric animals for available grains are some of the factors militating against livestock production in the developing countries (Halimani et al., 2007).

Preston and Leng (1987) suggested that livestock system in developing countries should aim at utilizing available feed resources in a way that economic optimization is obtained. Since 55 to 70 % of the total cost of intensive pig production is feed, pork producers should aim at optimal utilization of nutrients in order to optimize lean growth and better feed efficiency. An ideal

nutritional programme should provide adequate nutrients to maximise growth rate by improving nutrient utilization while minimizing feed wastages, excreted nutrients and costs.

Linear body measurements (chest girth, heart girth, height at wither, and body length) are used in evaluating the body size or weight of pig (Sulabo *et al*., 2006). They provide good information on performance, productivity and carcass characteristics of animals (Ige *et al.,* 2006). Brown *et al*. (1973) stated that linear body measurements could be used in evaluating growth rate, body weight, feed utilization and carcass characteristics in livestock production industry. Also, Oke *et al*. (2006) stated that changes in linear body dimensions are resultant effect of tissue growth which is evident in the muscle growth and fat tissue deposition. These parameters tend to increase as the animal grows overtime. This study thereby aimed at evaluating the effect of feed quantity offered on linear body measurements, nutrient digestibility and back fat composition of finishing pigs.

## MATERIALS AND METHODS

### Experimental Site

The experiment was carried out at the Piggery Unit of the Teaching and Research Farms Directorate (TREFAD), Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. The farm lies within latitude $7^{o}$ 10′ N, longitude $3^{o}$ 2′ E and altitude 76 mm. It is located in the derived savannah zone of South-Western Nigeria. It has a humid climate with mean annual rainfall of about 1037 mm and temperature of about 34.7$^{o}$ C. The relative humidity ranges from 63 to 96% in the rainy season (late March to October) and from 55 to 82% in the dry season (November to early March) with an annual average of 82%. The seasonal distribution of annual rainfall is approximately 44.96 mm in the late dry season (January-March); 212.4 mm in the early wet season (April-June); 259.3 mm in the late wet season (July-September) and 48.1 mm in the early dry season (October-December) as recorded in Google Earth (2012).

### Experimental Animals and their Management

Forty eight (48) grower Large White male pigs with mean body weight of 36.48 ± 2.25 kg were allotted to three experimental groups in a completely randomized design. The pigs were grouped (group 1 consisting of pigs fed 2.5 kg feed daily, while pigs in groups 2 and 3 were offered 2.0 and 1.5 kg feed/day, respectively) of sixteen (16) pigs each. Each group was quadruplicated with 4 pigs per replicate; housed together in naturally ventilated pen with floor size dimension of 3m x 2 m. Fresh clean water was supplied *ad libitum* throughout the duration of the experiment.

### Experimental Design

The pigs were randomly assigned to 3 experimental groups in a Completely Randomized Design of 16 pigs per group. The experimental groups consisted of the daily amount of dietary portion fed to each of the pigs. Pigs were offered 2.5, 2.0 or 1.5 kg feed daily until the pigs on replicate attained mean liveweight of 70 kg. Each pig received ½ of their daily ration at 08:00hr and the remaining portion at 14:00 hr. Diets were formulated to meet the body requirements of growing pigs. The ration contained 16.48% crude protein and digestible energy of 2986.70 kcal/kg as shown in Table 1.

### Data Collection

Initial body weights and body dimensions of grower pigs were taken using measuring tape and recorded. Weekly records of changes in body dimensions were subsequently taken as defined below:

- Body length (BL): This was measured as the distance between the last cervical vertebrae to the last lumber vertebra or the anterior point of the shoulder to the posterior extreme of the pin bone of the body with aid of measuring tape (cm).
- Chest or Heart girth (HG): Measuring tape was used in determining the body circumference perpendicular to the median vertebra which is immediately after the shoulder.
- Loin girth (LG): was determined by measuring the body circumference taken at about the point of the 4$^{th}$ lumber vertebra.
- Height at wither (HTW): It was measured as the distance between the most dorsal point of wither and the ground level.

**Table 1:** Composition of Experimental Diet (%).

| Ingredients | Fattener ration |
|---|---|
| Maize | 47.00 |
| Groundnut cake | 14.00 |
| Wheat offal | 24.00 |
| Palm kernel cake | 12.50 |
| Bone meal | 2.00 |
| Premix* | 0.20 |
| Salt (NaCl) | 0.20 |
| Lysine | 0.05 |
| Methionine | 0.05 |
| **TOTAL** | **100.00** |
| **Calculated Analysis** | |
| Crude protein (%) | 16.48 |
| Crude fibre (%) | 6.48 |
| Calcium (%) | 0.54 |
| Phosphorus (%) | 0.25 |
| DE (Kcal/kg) | 2986.70 |

* Supplied the following per kg diet: Vit. A, 12600 IU; Vit. $D_3$, 2800 IU; Vit. E, 49 IU; Vit.$K_3$, 2.8 mg; Vit. $B_1$, 1.4 mg; Vit. $B_2$, 5.6 mg; Vit. $B_6$ ,1.4 mg; Vit. $B_{12}$, 0.014 mg; Niacin ,21 mg; Pantothenic acid, 14 mg; Folic acid, 1.4 mg; Biotin, 0.028 mg; Choline, Chloride, 70 mg; Manganese, 70 mg; Zinc, 140 mg; Iron, 140 mg; Copper, 140 mg; Iodine, 1.4 mg; Selenium, 0.28 mg; Cobalt, 0.7 mg; Antioxidant, 168 mg.

## Digestibility Study

Two pigs weighing 60 kg from each replicate were selected and arranged in clean, disinfected metal metabolic cages toward the end of the experiment. A 7-day adaptation period followed a 5-day of quantification of feed intake, excreted feces and urine. Feces and urine were collected quantitatively and stored in a freezer until analyzed. To avoid ammonia losses and keep the pH below 3, urine was collected into bottles containing $H_2SO_4$ (20%, v/v).

After the collection periods, feces and urine were thawed and homogenized separately. Feces were dried in a forced air cabinet. Sub-samples of 200 g (feces) and 50 ml (urine) were taken and stored frozen until analyzed. The oven-dried feces and feed materials were milled to 2 mm particle size and analyzed for their proximate constituents. Following AOAC (2005) protocols, the dry matter of the samples was determined by drying at 105$^o$C for 4 hours. The crude protein (CP) content of samples was determined by the Kjeldahl method and the ether extract by a Soxhlet apparatus. The crude fibre (CF) content was determined using trichloroacetic acid digestion reagent, and concentration of ash was determined by incinerating samples at 550$^o$C for 5.5 hours.

## Back Fat Measurements

The back fat measurement was carried out when the pigs on each replicate attained an average live-weight of 70 kg. Two pigs per replicate were selected and slaughtered in order to determine the back fat composition. The pigs were fasted for 16 hours, and the fasted weight of each pig meant for slaughtering was taken before they were stunned by percussion method and bled by incision using a sharp knife cutting through the jugular vein between the skull and the atlas. Complete bleeding and dehairing were done. The stomach of the pigs was opened along the greater curvature and emptied. The carcass was divided longitudinally. The left half of the carcass was dissected as described by Barca *et al*. (2006). The mid-line back-fat measurements were taken at the first rib and the last rib using Vernier calliper. The fat-free index was estimated using the formulae postulated by National Pork Producers Council (1994).

Fat-free index = 50.767 + (0.035 x hot carcass weight, kg) – (8.979 x last rib midline back-fat on hot carcass, cm).

## Statistical Analysis

Data were processed by one-way analysis of variance using Statistical Analyst Software® (SAS, 2000) package. Significantly (P<0.05) different means among variables were separated using New Duncan's Multiple Range Test as contained in the same package.

## RESULTS

### Effect of Feed Quantity Offered on Linear Body Measurements of Finishing Pigs

The effect of quantity of feed offered on linear body dimensions of finishing pigs is shown in Table 2. Significant differences were noted in final body weight, height at wither, chest girth and loin girth. Final body weight values increased significantly (P<0.05) with increase in feed quantity offered, with the highest value of 78.19 kg recorded by pigs on 2.5 kg daily feeding regime while the least value of 69.63 kg was recorded for those on 1.5 kg feed/day. Height at wither value of 1.06 cm/week (pigs on 1.5 kg feed/day) was similar to 1.04 cm/week (pigs on daily ration of 2.0 kg), but differed significantly from 0.90 cm/week gotten for pigs on 2.5 kg feed/day. Chest girth value (1.15 cm/week) of pigs offered 2.0 kg feed daily was the highest when compared to the values (0.94 and 1.00 cm/week) obtained for the pigs fed 1.5 and 2.5 kg feed daily respectively. Comparable mean values (1.16 and 1.10 cm/week) were obtained in loin girth of pigs fed 2.0 and 2.5 kg feed daily which were significantly (P<0.05) lower than 0.84 cm/week recorded for pigs on 1.5 kg feeding regime.

### Effect of Quantity of Feed Offered on Nutrient Digestibility of Finishing Pigs

The effect of quantity of feed offered on nutrient digestibility of finishing pigs in Table 3 revealed significant (P<0.05) differences in the feed intake, dry matter intake, faecal dry matter output, dry matter digestibility and ash. Feed intake values increased significantly (P<0.05) with increase in feed quantity offered. The pigs offered 2.5 kg feed/day had the highest daily feed intake value of 1.71 kg when compared to 1.57 kg (pigs fed2.0 kg feed/day) and 1.47 kg (pigs offered 1.50 kg feed daily). Mean values for dry matter intake ranged from 1.36 kg (pigs on1.5 kg daily feed offered) to 1.62 kg (pigs on 2.5 kg daily feed offered). Pigs fed 2.0 kg feed daily had fecal dry matter output of 0.41 kg which was significantly (P<0.05) higher than 0.35 kg obtained for pigs fed 1.5 kg feed daily. Crude fiber digestibility and ash did not follow any particular trend. The highest values of 39.66% and 49.75% were obtained for the pigs offered 1.5 kg feed daily while their least values (10.90% and 40.30%), respectively were noted for the pigs on 2.0 kg feed daily. Dry matter digestibility value of 69.68% (pigs offered 1.5 kg feed daily) was similar to 70.45% (pigs offered 2.0 kg feed daily), but were significantly different from 74.05% (pigs on 2.5 kg daily feed offered).

**Table 2:** Effect of Feed Quantity Offered on Linear Body Measurements of Finishing Pigs.

| Parameters | Quantity of feed offered | | | SEM |
|---|---|---|---|---|
| | 1.5 | 2.0 | 2.5 | |
| Initial weight (kg) | 36.25 | 37.00 | 36.19 | 2.25 |
| Final weight (kg) | 69.63$^{b}$ | 74.93$^{ab}$ | 78.19$^{a}$ | 2.31 |
| Body length (cm/week) | 1.38 | 1.13 | 1.32 | 0.08 |
| Height at wither (cm/week) | 1.06$^{a}$ | 1.04$^{a}$ | 0.90$^{b}$ | 0.04 |
| Chest girth (cm/week) | 0.94$^{b}$ | 1.15$^{a}$ | 1.00$^{b}$ | 0.04 |
| Loin girth (cm/week) | 0.84$^{b}$ | 1.16$^{a}$ | 1.10$^{a}$ | 0.06 |

$^{ab}$-means within rows followed by different superscripts are significantly different

**Table 3:** Effect of Quantity of Feed Offered on Nutrient Digestibility of Finishing Pigs.

| Measurements | QUANTITY OF FEED OFFERED | | | |
|---|---|---|---|---|
| | 1.5 kg | 2.0 kg | 2.5 kg | SEM |
| Feed intake (kg) | 1.47[b] | 1.57[b] | 1.71[a] | 0.03 |
| Dry matter intake (kg) | 1.36[c] | 1.47[b] | 1.62[a] | 0.04 |
| Excreted faece (kg) | 0.87 | 0.88 | 0.89 | 0.02 |
| Faecal dry matter output (kg) | 0.35[b] | 0.41[a] | 0.40[ab] | 0.01 |
| Excreted faece/dry matter intake | 0.64 | 0.60 | 0.55 | 0.02 |
| Dry matter digestibility (%) | 69.68[b] | 70.43[b] | 74.05[a] | 1.33 |
| Crude protein digestibility (%) | 78.11 | 74.88 | 76.72 | 0.87 |
| Ether extract (%) | 39.18[b] | 74.41[a] | 77.19[a] | 1.91 |
| Crude fibre digestibility (%) | 39.66[a] | 10.90[b] | 31.20[a] | 3.86 |
| Ash (%) | 49.75[a] | 40.30[b] | 42.88[b] | 1.47 |

[ab-] means within rows followed by different superscripts are significantly (P<0.05) different

**Effect of Quantity of Feed Offered on Nitrogen Balance of Finishing Pigs**

Table 4 shows the effect of quantity of feed offered on nitrogen balance of finishing pigs. All parameters considered except percentage nitrogen absorption were significantly (P<0.05) different. Nitrogen intake, faecal nitrogen, nitrogen absorption and nitrogen retention increased with increase in quantity of feed offered. Pigs offered 2.5 kg feed daily had highest daily nitrogen intake of 41.09 g while 37.27 g and 34.60 g were noted for the pigs on 2.0 and 1.5 kg daily feed quantities offered in that order. Pigs fed 2.5 kg feed daily had highest faecal nitrogen (9.57 g), nitrogen absorption (31.52 g) and nitrogen retention (26.01 g). While those placed on 1.5 kg feed daily had the least values (7.58 g, 27.03 g and 22.78 g), respectively. Urine output and urinary nitrogen followed no trend, the highest values were obtained for pigs on 2.5 kg feed quantity offered while the least value were noted for those fed 2.0 kg feed daily. 1525.00 g urine output was noted for pigs offered 2.5 kg daily feed while 890.00 g was recorded for the pigs fed 2.0 kg daily feed and 1025.00 was documented for those on 1.5 kg daily feed.

**Effect of Quantity of Feed Offered on Back Fat Composition of Finishing Pigs**

The effect of quantity of feed offered on back fat composition of finishing pigs is depicted in Table 5. There were no significant (P>0.05) differences noted for live weight, hot carcass, Longissimus dorsi muscle “A”, Longissimus dorsi muscle “B”, subcutaneous fat depth “C” and fat free index. However, significant (P<0.05) differences were noted for fat at first rib, fat at last rib and subcutaneous fat at “K”. The values increased significantly with increase in feed quantity offered.

The pigs on 2.5 kg feed daily had the highest recorded values while those on 1.5 kg feed per day had the least values. Fat at first rib had the mean values ranged from 3.49 cm (pigs offered 1.5 kg feed/day) to 4.12 cm (pigs offered 2.5 kg feed/day). Pigs fed 2.5 kg feed daily had the highest fat at last rib (2.53 cm) while the least value 1.68cm was obtained from the pigs fed 1.5 kg feed per day. The values for subcutaneous fat depth “K” ranged from 1.60 cm (pigs fed 1.5 kg feed daily) to 2.47 cm (pigs fed 2.50 kg feed daily). The highest numerical values for live weight (75.00 kg), hot carcass (58.58 kg) and subcutaneous fat depth “C” (1.35 cm) were obtained in 2.5 kg feed /day fed pigs while their least means value 71.25%, 56.88% and 1.03 cm, respectively were obtained for the pigs on 1.5 kg feed/day

**DISCUSSION**

There were no significant differences in the initial body weights of pigs offered feed at different levels. This implied that the experimental pigs were equalized before the commencement of the experiment. The initial weight ranged from 36.19 to 37.00 kg.

**Table 4:** Effect of Quantity of Feed Offered on Nitrogen Balance of Growing Pigs.

| Measurements | QUANTITY OF FEED OFFERED | | | |
|---|---|---|---|---|
| | 1.5 kg | 2.0 kg | 2.5 kg | SEM |
| Urine output (g) | 1025.00$^{ab}$ | 890.00$^{b}$ | 1525.00$^{a}$ | 207.94 |
| Nitrogen intake (g/day) | 34.60$^{c}$ | 37.27$^{b}$ | 41.09$^{a}$ | 0.80 |
| Faecal nitrogen (g/day) | 7.58$^{b}$ | 9.34$^{a}$ | 9.57$^{a}$ | 0.16 |
| Urinary nitrogen (g/day) | 4.25$^{ab}$ | 2.90$^{b}$ | 5.52$^{a}$ | 0.58 |
| Nitrogen absorption (g/day) | 27.03$^{b}$ | 27.93$^{b}$ | 31.52$^{a}$ | 0.69 |
| Nitrogen absorption (%) | 78.05 | 74.89 | 76.72 | 0.87 |
| Nitrogen retention (g/day) | 22.78$^{b}$ | 25.03$^{a}$ | 26.01$^{a}$ | 0.41 |

$^{ab-}$ means within rows followed by different superscripts are significantly (P<0.05) different

**Table 5:** Effect of Quantity of Feed Offered on Back Fat Composition of Finishing Pigs.

| Measurements | QUANTITY FEED OFFERED | | | |
|---|---|---|---|---|
| | 1.5 kg | 2.0 kg | 2.5 kg | SEM |
| Live weight (kg) | 71.25 | 72.00 | 75.00 | 2.54 |
| Hot carcass weight (kg) | 56.88 | 55.75 | 58.58 | 2.65 |
| Longissimus dorsi muscle 'A' (cm) | 7.92 | 7.64 | 6.63 | 0.27 |
| Longissimus dorsi muscle 'B' (cm) | 4.21 | 3.96 | 3.89 | 0.24 |
| Fat at first rib (cm) | 3.49$^{b}$ | 3.94$^{ab}$ | 4.12$^{a}$ | 0.17 |
| Fat at last rib (cm) | 1.68$^{b}$ | 2.35$^{ab}$ | 2.53$^{a}$ | 0.17 |
| Subcutaneous fat depth 'C' (cm) | 1.03 | 1.12 | 1.35 | 0.09 |
| Subcutaneous fat depth 'K' (cm) | 1.60$^{b}$ | 1.93$^{ab}$ | 2.47$^{a}$ | 0.12 |
| Fat free index | 49.90 | 48.52 | 47.78 | 0.60 |

ab- means within rows followed by different superscripts are significantly (P<0.05) different
"A" (cm) Maximum width of the Longissimus dorsi muscle at the widest point
"B" (cm) Maximum width of the Longissimus dorsi muscle at the greatest depth and perpendicular to the point A measurement
"C" (cm) Subcutaneous fat depth immediately above the B measurement
"K" (cm) Subcutaneous fat depth at the dorso-lateral edge of the Longissimus dorsi muscle

Increase in the final weight with increasing feeding level was a function of plane of nutrition (Snetsinger, 1994), thereby resulting in adequate intake of nutrients required to sustain rapid growth and development (Esonu *et al*., 2002). Sufficient offering of feed to pigs is vital in optimizing overall growth performance. Garcia-Valverde *et al*. (2008) reported that pigs on high level of nutrition deposited both lean and fat at a faster rate than those fed moderate level of nutrition on both age- and weight- constant bases. This is in line with the observations noted in this present study where final body weight was significantly influenced by feed quantity offered. Height at wither, chest girth and loin girth were significantly affected by feed quantity offered. Pigs fed 2.0 kg feed per day had higher values than those on 1.5 and 2.5 kg. Linear body measurements have been used to relate body dimensions to overall body size or weight. The significant difference noted in the linear body measurements conforms to the reports of many researchers (Tegbe and Olurunju, 1988; Oke *et al*., 2006; Sulabo *et al*., 2006; Onyimonyi *et al*., 2010). They all asserted that changes in linear body measurements are indication of tissue growth and tends to increase as the animal grows.

The significant difference noted in the dry matter fecal output might be associated with the level of dry matter intake. As feed intake increases, digestive efficiency tends to decrease because feed passes through the digestive system at a faster rate. Water is needed to move digesta, a small decrease in digestibility results in a much larger increase in fecal output. Haydon *et al.* (1984) reported that increasing feed intake resulted in increased losses of dry matter and

gross energy in the large intestine. This significant difference can be attributed to the rate of passage of digesta in the gastrointestinal tract of the pigs which increases with increased in feeding level, hence, limiting the amount of time available for nutrient breakdown. Haydon *et al.* (1984) stated that the rate of collection of feces after feeding a meal marked with ferric oxide ranged from 12 to 24, 24 to 48 and 48 to 72 hours for the pigs on *ad libitum* and limited feeding (4.5 and 3.0 % of body weight), respectively. Likewise, Murphy *et al.* (1994a) asserted that increasing intake above maintenance led to decrease in digestibility of varying degrees depending on the type and quality of the feedstuff.

The most fed pigs digested more dry matter and ether extract per day due to the level of feed offered to them. Since, dry matter digestibility is a function of level of feed intake. The significant differences noted in crude fiber and ash digestibilities can be associated with the rate of passage of digesta in the gastrointestinal tract. The slow rate of passage of ingested nutrient by the least fed pigs might have contributed to the fiber degradation by microbial fermentation in the lower part of the gastrointestinal tract of pigs. Thacker (2009) and den Hartog *et al*. (1988) asserted that improvements in nutrients digestibility have generally been attributed to delay in gastric emptying which was postulated to be the result of slow passage through the small intestine allowing more time for nutrients breakdown.

Quantity of feed offered had great effect on nitrogen balance of pigs. The values obtained increased as feeding levels increased from 1.5 to 2.5 kg per day. Improvement in nitrogen digestibility with increasing body weight during the growing phase of pigs has been reported (Hansen and Lewis, 1993). The nitrogen intake and fecal nitrogen increased with the levels of dry matter intake. The increase in fecal nitrogen excretion can be linked partially to the increase metabolic fecal nitrogen (Murphy *et al*., 1994a). Metabolic fecal nitrogen is positively related to dry matter intake (Murphy *et al*., 1994b; Hutchinson and Morris, 1936) but may be closely related to fecal dry matter output (Stallcup *et al*., 1975). The urinary nitrogen is dependent on the quantity of urine output by the individual pigs and also on the quantity of protein and energy intakes (Hansen and Lewis, 1993). Nitrogen retention is a composite function of nitrogen intake, digestibility and apparent biological values of the feedstuff (Hansen and Lewis, 1993). The nitrogen retention from this experiment increased with increase in feed quantity offered. Kyriazakis and Emmans (1992) reported that the relationship between nitrogen intake and nitrogen deposition was of the linear plateau nature, with nitrogen retention being dependent on level of feeding and thus on energy intake.

Many research findings have shown that the level of feed offered greatly influenced the fat deposition in pigs. Feed restriction affects fat tissue more than lean tissue deposition when applied during the finishing phase. Therefore, restricted feeding leads to leaner carcasses compared with *ad libitum* feeding (Ellis *et al*., 1996; Wood *et al*., 1996; Lebret *et al*., 2001). Decrease in subcutaneous fat, adipocyte volume and lipogenic capacity in pigs is some of the effects of restricted feeding (Mersmann *et al*., 1981; Leymaster and Mersmann, 1991; Gondret and Lebret, 2002). The least subcutaneous fat at first and last ribs was recorded for the pigs restricted to feeding regime of 1.5 kg feed per day. Hence, the importance of feed restriction on production indices over the growth period and meat quality cannot be over-emphasized and this depends very much on feeding pattern, degree and duration (Campbell *et al*., 1983; Prince *et al*., 1983; Donker *et al*., 1986; Critser *et al*., 1995).

The amount of feed offered per day played vital role in the growth which therefore had direct bearing on the quality of carcass produced. Limited-feeding led to depletion of apparent rate of glycogen as measured by muscle acidity (Mcphee and Trout, 1995) resulting to reduction in subcutaneous fat and increased in rate of lean growth (Mcphee *et al*., 1988). Pigs raised on restricted feeding were reported by Nguyen and Cam (2001) to have high growth rate, low back fat and high lean percentage in the carcass of their descendants, hence, the advantage of limited feeding transcends a generation.

## CONCLUSION

The results of this study show that the linear body dimensions (Height at wither, chest and loin girths) and nutrient digestibilities (dry matter intake, crude protein and crude fiber digestibilities, nitrogen intake, absorption and retention) of finishing pigs were influenced by feed quantity offered. The back fat composition (fat at first and last ribs, and subcutaneous fat) of

the finishing pigs were also affected by feed quantity offered. Therefore, a degree of feed restriction may result in a discernible improvement in linear body dimensions, nutrients digestibilities and back fat composition of finishing pigs.

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