

THE PREDICTION OF LIVWEIGHT OF CROSSBRED PIGS FROM THREE BODY MEASUREMENTS

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ABSTRACT

The prediction of pig liveweight from three body measurements was studied using crossbred (Landrace x Large White and Hampshire x Large White) barrows and gilts. There were 286 measurements for the different parameters studied (Chest girth, Body length and Loin girth). There were no significant differences due to sex for all the parameters investigated. Pig liveweight was best predicted singly using chest girth measurement. However, with the use of a combination of chest girth and body length, the prediction efficiency was enhanced.

Key words: Pig, liveweight, prediction, chest girth, loin girth, body length.

INTRODUCTION

Several studies have reported the relationship between body measurements and liveweight of cattle in the tropics (Young 1972), Buvanendran *et al.*, 1980, Umoh and Buvanendran, 1982). Although very little has been reported in literature on such studies with pigs, the relationship between live measurements and performance of pigs has been studied (Fink *et al.*, 1976 and Corley and Hines, 1976). The importance of liveweight in assessing the economic value of farm animals cannot be over-emphasized. Weighing scales are common features on most government and commercial farms, but it is a different picture in the villages, where majority of the pig trade goes on. Pigs are often appraised visually and the conformation assessed before the economic values of the animals are determined.

The present study was carried out to examine the predictability of liveweights from the measurements of chest girth, body length and loin girth of crossbred pigs (gilts and barrows) in the tropics. Studies reporting the relationship between body measurements and pig liveweight in Nigeria are very scanty and are probably non-existent. Crossbred pigs now constitute a high proportion of the pigs in most Nigerian villages and towns owing to their adaptability to the environment coupled with economic considerations. A study of the relationship between liveweight and body measurements of crossbred pigs will enable one come up with prediction equations, which will be a handy tool for researchers and prospective pig buyers in most of our villages. Besides, data obtained from such studies will serve as reference point or base data for further in-

vestigations into the relationships between body measurements and pig liveweight and some performance characteristics.

MATERIALS AND METHODS

Animals used for this study comprised of grower and finisher pigs selected from the pig herd, kept on the Swine Research Station of the National Animal Production Research Institute (NAPRI), Otukpo, Benue State, Nigeria. The pigs were crossbred (Landrace x Large White and Hampshire x Large White) barrows and gilts weighing between 15 kg and 92.7 kg liveweight. Pigs were fed the normal farm diets (18% crude protein grower diet and 15% crude protein finisher diet) twice daily at 8.00 16.00 hour (h) and water intake was not restricted. Animals were weighed prior to feeding and the different body measurements were taken, using ordinary tailor's linen tape rule. In all, there were 286 sets of measurements taken for the different parameters studied. Two sets of measurements were obtained from 53 animals at monthly interval and one set of observation each from 180 animals. The study was carried out between June and November 1983. Body measurements were obtained as follows:

- (i) Chest girth (CG): It is the body circumference measured perpendicular to the median immediately posterior to the shoulder.

- (ii) Body length (BL): This represents the distance from the point of the last cervical vertebra to the last lumbar vertebra/the first cervical vertebra.

- (iii) Loin girth (LG): This is the body circumference taken about the point of the 4th Lumbar vertebra.

Data collected were later classified on basis of sex and later classified into lean or fat group. Classification into lean or fat group was based on the chest ratio of chest girth to body length i.e. Chest Girth/Body length.

Body length is a measure of skeletal development of the animals while chest girth is an indicator of tissue growth i.e. muscle development and fatness. Animals with ratio greater or equal to one were grouped together as fat animals, while those with ratio less than one were classified as lean animals.

The inter-relationships of body measurements were estimated by simple correlation analysis. This was followed by the use of multiple regression analysis to obtain the body characteristics that could best be used to estimate liveweight of growing-finishing pigs. Logarithmic transformation of the data obtained was also done and regression analysis performed.

Table 1
Population parameters of cross-bred pigs

Parameter	No. of observation	Mean	S.D.	C.V. %
Chest girth (CG) cm	286	80.724	9.836	12.2
Body length (BL), cm	286	81.949	11.605	14.2
Loin girth (LG), cm	286	80.678	10.968	13.6
Live weight, kg	286	43.476	13.144	30.23

Table 2
Population parameters classified on basis of body conformation

	<i>Fat Animals^a</i>			
Live weight (kg)	131	41.369	14.057	34.00
Chest girth (cm)	131	76.495	10.488	13.70
Loin girth (cm)	131	80.303	11.320	14.10
	<i>Lean Animal^b</i>			
Live weight (kg)	155	45.257	12.081	27.00
Chest girth (cm)	155	80.924	8.927	11.03
Body length (cm)	155	86.559	10.474	12.10
Loin girth (cm)	155	80.997	10.688	13.20

a. $\frac{\text{Chest Girth}}{\text{Body length}} \geq 1$ b. $\frac{\text{Chest Girth}}{\text{Body length}} < 1$

Table 3
Correlation co-efficients between body measurements

Liveweight (LWt)	1.0000			
Chest Girth (CG)	0.9395	1.0000		
Body length (BL)	0.8464	0.8294	1.0000	
Loin Girth (LG)	0.8603	0.8999	0.7297	1.0000
	LWt	CG	BL	LG

Table 4
Prediction equations for estimating liveweight of pigs from three body measurements

	<i>Variable</i>	<i>(a)</i>	<i>b' Value (±SE)</i>	<i>R²</i>	<i>SEE</i>	
All data	Chest Girth	-57.868	1.255(0.222)	0.88	4.511	
Lean		-56.97	1.263(0.224)	0.87	4.35	
Fat		-58.63	1.242(0.196)	0.96	4.03	
	<i>All Variables</i>	<i>b₁ (CG)</i>	<i>b₂ (BL)</i>	<i>b₃ (LG)</i>	<i>R²SEE</i>	
All data		-58.57	0.892	0.250	0.118	4.200
SE		(0.0711)	(0.03711)	(0.0521)	.095	

RESULTS AND DISCUSSIONS

The summary of measurements obtained for all parameters studied is given in Table 1. There were 286 sets of observations for each of the parameters, while table 2 presents the different population parameters based on classification of the data into lean or fat group. Attempt was made to see if sex had a major role to play in any of the parameters studied. There were no significant difference observed due to sex for any of the parameters studied. Sex only accounted for 0.08% of the variation observed for pig weight, 0.07% of the body length and 0.11% of the variation in loin girth. The correlation coefficients obtained for the characteristics studied are presented in Table 3. The coefficients were found to be generally high and highly significant ($P < 0.01$). However, chest girth (CG) had the highest correlation with liveweight ($R = 0.94$), thus suggesting that this particular variable alone would provide a good estimate for predicting the liveweight of pigs (15 to 92 kg liveweight). Using chest girth alone, the prediction equation obtained is:

$$\frac{Y}{R^2} = \frac{1.26 - 57.87}{0.88}$$

Other workers have similarly observed the closest relationship between chest girth or heart girth and liveweight in cattle (Young 1972) and Umoh and Buvanendran (1982).

With the grouping of the data and the classification of pigs on basis of body conformation into lean i.e. ratio of chest girth: body length < 1 and fat i.e. ratio of chest girth: body length ≥ 1), the prediction equation for liveweight is given in Table 4.

The use of chest girth alone appeared to be the best predictor of live weight for fat animals as indicated by the higher R^2 value of 0.96 compared to R^2 value of 0.87 for lean animals. However, using all the variables in predicting the body weight of pigs,

new equation obtained for the combined group is:

$$\begin{aligned} \text{Body weight} &= 0.89(\text{CG}) + 0.25(\text{BL}) - 58.57 \\ \text{SE} &= (0.711) \quad (0.0385) \\ &\quad (4.200) \\ R^2 &= 0.090 \end{aligned}$$

The use of all variables did not appreciably improve the prediction efficiency for fat animals, R^2 0.95.

From table 4 it can be said that using CG as a means of predicting live weight will serve just as good as when all the variables are used considering the R^2 values for both groups (Table 4).

With the logarithmic transformation of the data the equation obtained for both lean and fat groups and using chest girth alone in predicting body weight, the prediction efficiency is not appreciably enhanced, $R^2 = 89\%$. Burt (1957) estimating the liveweight of dairy cows observed that the regression of liveweight upon log of chest girth is the most satisfactory. The logarithmic transformation of the data obtained in this study using chest girth alone did not improve the prediction efficiency. Young (1972) also obtained linear regression equations relating heart girth to weight of cattle in Kenya. He also indicated that the use of heart girth alone was easy and more convenient. Umoh and Buvanendran (1982) also reported closest relationship between chest girth and liveweight of crossbred cattle in Nigeria. The result of the present study showed that the prediction efficiency is best using chest girth alone. Besides the fact that chest girth is easy to measure and more convenient. As Burt (1957) reported, the efficiency of estimating liveweight of cattle was increased when log of pauch girth or log of body length was included as a second variate. He however, observed that the reduction in the residual variance was not

vary great and that chest girth alone is the best predictor. For a quick tool on the field and with minimum difficulty, liveweights of crossbred pigs can be readily estimated using chest girth alone.

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