ESTIMATING LIVEWEIGHT OF PHILIPPINE NATIVE PIGS USING EXTERNAL BODY MEASUREMENTS

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ABSTRACT

The objective of this study was to develop prediction equations to estimate liveweight of Philippine native pigs with the use of external body measurements such as heart girth, midriff girth, flank girth, and body length. A total of 54 Philippine native pigs (13 males and 41 females) weighing between 20 to 50 kg were used in the study. Body length (BL), heart girth (HG), midriff girth (MG) and flank girth (FG) of each individual pig were measured using a tape measure, then the actual BW was determined using a weighing scale. Correlation analysis was performed to determine the degree of linear relationships between liveweight and external body measurements. Simple and stepwise multiple regression analyses were used to develop the optimal prediction models. Body weight was positively correlated (*P*<0.01) with HG (r=0.94), FG (r=0.91), MG (r=0.88) and BL (r=0.76). Heart girth was the best predictor of liveweight of Philippine native pigs, which explained 88% of the total variability. Including body length as a predictor increased the R^2 of the regression model to 92% (*P*<0.05). In conclusion, live weight of Philippine native pigs between 20 to 50 kg may be predicted using the following prediction equation: BW, kg = -46.32 + 0.83 × Heart girth, cm + 0.27 × Body length, cm.

Keywords: Body weight, external body measurements, Philippine native pigs, liveweight, prediction equation

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INTRODUCTION

One of the fastest growing enterprises in the local swine sector is the production of organically-raised Philippine native pigs. This growth is mainly attributed to a growing health-conscious population and the increasing demand for the popular Filipino delicacy, lechon. Philippine native pigs are usually smaller in size compared to modern, commercially-grown pigs and they are either black-colored or black with a white-colored belly. These pigs are also known for their ability to grow and reproduce even under adverse conditions and they are more resistant to parasites and common swine diseases. Most of these native pigs are raised in rural areas by small-scale farmers because they only require low-cost production inputs such as housing and feeding.

Marketing pigs in the Philippines is based primarily on liveweight, and this requires the use of weighing scales. However, majority of farmers engaged in the production of local native pigs do not have access to weighing scales due to cost, and many rely on “eyeball” estimation when marketing pigs. This may limit their total revenue especially when the actual weight of pigs are underestimated. Therefore, there is a need to develop a more accurate method of estimating liveweight of Philippine native pigs. There is significant amount of work on the use of external body measurements such as heart girth and flank measurements to estimate liveweight of pigs (Boado, 1971; Vergara, 1994; Javier, 2001; Lettiere, 2004). However, these studies involved modern genetics that do not have the same body conformation as Philippine native pigs.

Therefore, the objective of this study was to determine the relationship of external body measurements of ready-to-market Philippine native pigs with their actual liveweight and to develop prediction equations to estimate liveweight.

MATERIALS AND METHODS

The study was conducted from June to August 2013 at the Bureau of Animal Industry – National Swine and Poultry Research and Development Center (BAI-NSPRDC) located at Brgy. Lagalag, Tiaong, Quezon.

Data Collection

A total of 54 Philippine native pigs (13 males and 41 females) weighing between 20 to 50 kg with apparently normal body condition were used in the study. Liveweight of each pig was taken using a typical weighing scale and the external body measurements (body length, heart girth, midriff girth and flank girth) were obtained using an ordinary tape

measure. All the external body measurements were taken while the pig was in proper standing position and restrained from any movement to avoid irregularities while taking the measurements. Body length was measured through the curve of the back from the poll, which is the midway from between the ears up to the base of the tail. The heart girth was the circumference of the animal's chest just behind the elbow. The midriff girth was recorded as the circumference of the pelvic region at the level of the umbilicus or just in front of the prepuce in males. Then the flank girth was taken as the circumference of the pelvic region just in front of the hip of the pig.

Statistical Analyses

Correlation analysis was performed using SAS (SAS Inst. Inc., Cary, NC) to determine the degree of linear relationships between liveweight and external body measurements. The degree of correlation was categorized into 4 levels: high [correlation coefficient (r) ≥ 0.60], moderate (0.60 > r ≥ 0.30), low (r < 0.30), and non-significant (P>0.05). Simple and stepwise multiple regression analyses were used to develop the optimal prediction models. Statistical significance were set at P≤0.05 for all statistical tests.

RESULTS AND DISCUSSION

The mean actual weight and external body measurements of Philippine native pigs are presented in Table 1. On average, pigs

Table 1. Mean actual weight and external body measurements of Philippine native pigs used in the study.

Item	Male (n=13)	Female (n=41)	All (n=54)
Actual BW, kg	28.00	32.60	31.49
Body length, cm	71.38	74.83	74.00
Heart girth, cm	67.31	71.20	70.26
Midriff girth, cm	72.62	78.44	77.04
Flank girth, cm	67.38	71.88	70.80

The correlation between live weight and external body measurements of Philippine native pigs weighing 20 to 50 kg is presented in Table 2. All the external body measurements were highly correlated (r ≥ 0.75; P<0.01) with liveweight regardless of gender. There was a positive correlation between external body measurements and liveweight.

Table 2. Pearson correlation coefficients between liveweight and external body measurements of Philippine native pigs weighing 20 to 50 kg.

Item	Correlation coefficient (r)		
	Liveweight		
	Male	Female	All
Body measurements, cm			
Body length	0.80**	0.91**	0.76**
Heart girth	0.93**	0.94**	0.94**
Midriff girth	0.89**	0.87**	0.88**
Flank girth	0.87**	0.75**	0.91**

**Correlation is significant (P<0.01).

Heart girth had the highest degree of correlation (r=0.94) with liveweight, followed by flank girth, midriff girth, and body length. This is in agreement with Eusebio *et al.* (1957) which reported that heart girth and body length of local pigs composed of Berkjala, Berkshire, and Berkjala-Berkshire crosses were highly correlated with body weight. This also conformed with other studies that evaluated different pure breeds and cross bred pigs (Vergara, 1994; Groesbeck, 2003; Murillo, 2004; Lettiere, 2004). These studies consistently showed that heart girth had the strongest degree of linear relationship with body weight.

Prediction equations were then developed to estimate liveweight of Philippine native pigs weighing between 20 to 50 kg (Table 3). Results indicate that heart girth was the best predictor of liveweight regardless of gender among all the body measurements. Heart girth explained 88% of the total variability in liveweight of Philippine native pigs.

Stepwise multiple regression analyses indicate that adding either body length or flank girth as an independent variable in the model increased the goodness of fit. For males, the proportion of total variability in liveweight explained by the model increased from 87% to 94% when flank girth was included. For both females and overall, the proportion of total variability in liveweight explained by the model increased from 88% to 92% when body length was included. This conforms with Mutua *et al*. (2011), which showed that heart girth and body length best explained the total variation in body weight of 628 native pigs in Western Kenya.

CONCLUSION

Based on the conditions under which this study was conducted, it is concluded that external body measurements may be used to estimate liveweight of Philippine native pigs weighing between 20 to 50 kg. The best prediction equation that can be used to estimate liveweight of Philippine native pigs weighing between 20 to 50 kg is BW, kg = -46.32 + 0.83 × Heart girth, cm + 0.27 × Body length, cm.

Table 3. Prediction equations to estimate liveweight of Philippine native pigs between 20 to 50 kg.

Prediction equation	R^2
Males (n=13)	
BW, kg = -18.72 + 0.66 × Body length, cm	0.64*
BW, kg = -35.59 + 0.95 × Heart girth, cm	0.87*
BW, kg = -23.18 + 0.71 × Midriff girth, cm	0.78*
BW, kg = -21.32 + 0.73 × Flank girth, cm	0.76*
BW, kg = -37.60 + 0.64 × Heart girth, cm + 0.33 × Flank girth, cm	0.94*
Females (n=41)	
BW, kg = -23.33 + 0.75 × Body length, cm	0.56*
BW, kg = -40.18 + 1.02 × Heart girth, cm	0.88*
BW, kg = -26.96 + 0.76 × Midriff girth, cm	0.76*
BW, kg = -26.26 + 0.82 × Flank girth, cm	0.83*
BW, kg = -47.57 + 0.84 × Heart girth, cm + 0.27 × Body length, cm	0.92*
All (n=54)	
BW, kg = -23.77 + 0.75 × Body length, cm	0.58*
BW, kg = -39.98 + 1.02 × Heart girth, cm	0.88*
BW, kg = -26.43 + 0.75 × Midriff girth, cm	0.78*
BW, kg = -26.11 + 0.82 × Flank girth, cm	0.83*
BW, kg = -46.32 + 0.83 × Heart girth, cm + 0.27 × Body length, cm	0.92*

*Significant (P<0.05)

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