

## **The Correlation of Body Measurements and Weights of Ongole Crossbred (PO) Cattle in Kebumen Regency**

**Satria Budi Kusuma<sup>1</sup>, Nono Ngadiyono<sup>1</sup>, and Sumadi<sup>1</sup>**

<sup>1</sup>Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia, 55281

Corresponding email: satria.bk@gmail.com

### **ABSTRACT**

The aim of this research was to determine the correlation of body measurements with body weights, slaughter weights with carcass weights and deciding the most suitable formula to estimate body weights of Ongole Crossbred (PO) cattle in Kebumen Regency. This research was conducted from September to December 2015. The materials which were used recording data from 357 male PO cattle and 762 female PO cattle were divided into three groups of age (calf, young, and mature). The correlation between body measurements and weights was analyzed by multiple regression equation analysis by using SPSS 16 with stepwise method. The estimation of body weights through body measurements used Schoorl and Lambourne formula. The correlation of slaughter weights and carcass weights was analyzed by simple regression analysis used SPSS 16. The body measurements and body weights had a great correlation that showed by  $R^2$  value were 0.86 and 0.91 for sire and dam respectively. The estimation of young and mature male cattle body weights was better using Schoorl formula while the estimation of young and mature female cattle body weights is better using Lambourne formula. The slaughter weights and carcass weights had a great correlation that showed by  $R^2$  value were 0.90 and 0.65 for sire and dam respectively. Therefore, according to the research's result can be concluded that there is a great correlation between body weights with body measurements and slaughters weights with carcass weights of PO cattle. The estimation of PO cattle body weights through its body measurements can be calculated with Schoorl and/or Lambourne but remain to be paid attention to the correction factors.

**Keywords:** Correlation, Body measurements, Body weights, PO cattle, Kebumen

### **INTRODUCTION**

Kebumen Regency is one of breeding centers of beef cattle in Central Java Province. Local breed cattle are dominated by traditional farmer culture precisely is Ongole Crossbred (PO) cattle (Subiharta et al, 2012). The PO cattle have exelences in tropical environment adaptation and tolerant with high fiber feedstuff. Not only as draught cattle, PO cattle but also have known have great potential as beef cattle. The production performance of cattle can be seen from their body weights, body measurements, and carcass percentage.

The animal body growth can be monitored by recording their body weights changes every certain time. Therefore, in the field condition, sometimes it is not possible to bring balance machine to weigh the cattle, so that needs easier and practical method to solve this problem. The body weight is one of the indicators of animal productivity that can be measured by its body measurements including the chest circumference, body length, and wither height (Kadarsih, 2003). The body weights have important role in good raising cattle management, because its body weights will facilitate us to determine feeding amount and/or medicine dosis.

Furthermore, the PO cattle which not to be used as breeding cattle will be fattened as beef cattle, and their productivity will calculate in carcass percentage. Carcass percentage is comparison between carcass weights and slaughtered weights which showed in percentage

(Forrest *et al.*, 1975). The aim of this research was to determine the correlation of body measurements with body weights, slaughter weights with carcass weights and deciding the most suitable formula to estimate body weights of Ongole Crossbred (PO) cattle in Kebumen Regency.

## MATERIALS AND METHODS

This research was conducted from September to December 2015 in six districts of Kebumen Regency, Central Java Province. The six districts are as follow Klirong, Buluspesantren, Mirit, Puring, Ambal, and Petanahan. The materials were used recording data from 357 male PO cattle and 762 female PO cattle which divided into three groups of age (calf, young, and mature). The correlation between body weights and measurements was analyzed by multiple regression equation with the equation  $Y=a+b_1X_1+b_2X_2+b_3X_3$  using SPSS 16 by stepwise method. Estimation of body weight calculated using the Schoorl and Lambourne formula. The correlation between body weight and carcass was analyzed using simple regression analysis with SPSS 16. The T-test analysis was performed to analyze differences of male and female body measurements.

The body weights estimation by body measurements was according to these formula.

a. Schoorl

$$\text{Body weights (kg)} = \frac{(\text{chest circumferences (cm)}+22)^2}{100}$$

b. Lambourne

$$\text{Body weights (kg)} = \frac{(\text{body lengths (cm)} \times \text{chest circumferences (cm)})^2}{11050}$$

Afterward, for body weights estimation correction used this formula.

$$CF = \frac{RBW-EBW}{RBW} \times 100\%$$

Notes:

- CF = Correction factors
- EBW = Estimation body weights
- RBW = Real body weights

## RESULTS AND DISCUSSION

### The correlation of body weights and measurements

Generally, there was significant differences between male and female cattle body weights and measurements, especially on mature age cattle. The average daily gain (ADG) of male PO cattle from 6.03±3.64 to 19.33±3.98 months old was 0.39 kg/head/day and 19.33±3.98 to 36.55±10.82 months old was 0.35 kg/head/day. The ADG of female PO cattle from 6.19±2.8 to 23.70±1.24 months old was 0.36 kg/head/day and 23.70±1.24 to 61.31±22.50 months old was 0.06 kg/head/day. The low ADG of PO cattle in Kebumen on this research supposedly related with poor feeding management either quantity and quality of feedstuff was poor. Even though, body weights and measurement of male PO cattle relatively higher than female PO cattle despite of the stimulation of androgen hormones. The androgen hormone of bulls was able to stimulate their growth being the larger ones. Its existence also increases the concentration of insulin and the hormonal growth. The growth of secretion hormone would increase the average daily gain, feed efficiency and protein content (Parakkasi, 1999). The average of body weights and measurements of PO cattle in Kebumen Regency 2015 was showed in Table 1.

**Table 1.** Body Weights and Measurements Average of PO Cattle in Kebumen Regency, Central Java Province, 2015

No.	Variable	Sex	
		Male	Female
1	Calf PO cattle (0 to 10 months)	119	179
	Average age (months)	6.03±3.64	6.19±2.8 <sup>a</sup>
	Body weight (kg)	120.50±40.93 <sup>a</sup>	119.53±34.36 <sup>a</sup>
	Wither height (cm)	101.40±9.58 <sup>a</sup>	99.98±10.38 <sup>a</sup>
	Body length (cm)	89.54±12.71 <sup>a</sup>	88.50±11.45 <sup>a</sup>
	Chest circumference (cm)	110.62±15.15 <sup>a</sup>	110.01±12.15 <sup>a</sup>
2	Young PO cattle (11 to 24 months)	129	33
	Average age (months)	19.33±3.98	23.70±1.24
	Body weight (kg)	274.94±88.84 <sup>a</sup>	308.67±60.69 <sup>b</sup>
	Wither height (cm)	124.27±10.81 <sup>a</sup>	125.67±5.99 <sup>a</sup>
	Body length (cm)	119.91±18.96 <sup>a</sup>	137.06±14.79 <sup>b</sup>
	Chest circumference (cm)	146.19±18.89 <sup>a</sup>	155.64±11.18 <sup>b</sup>
3	Mature PO cattle (more than 24 months)	109	547
	Average age (months)	36.55±10.82	61.31±22.50
	Body weight (kg)	457.39±121.29 <sup>a</sup>	371.98±69.84 <sup>b</sup>
	Wither height (cm)	137.45 ± 8.65 <sup>a</sup>	130.97±4.55 <sup>b</sup>
	Body length (cm)	138.04±14.65 <sup>a</sup>	143.07±9.77 <sup>b</sup>
	Chest circumference (cm)	175.19±16.84 <sup>a</sup>	165.53±9.77 <sup>b</sup>

Note: <sup>a, b</sup> different superscripts in different columns indicate significant differences (P < 0.05).

The performance of body weights and measurements of calf PO cattle in low external input condition has low variances. The ADG of heifer and steer 6 months old were 0.35 kg and 0.33 kg respectively (Hartati *et al.*, 2007). This matter due to of the same raising management that was traditional and maintenance oriented. However, if this result is compared with Indonesia National Standard (SNI) about PO cattle (Anonymous, 2015c), the body measurements of PO cattle in Kebumen either male or female had the first rank or highest class. Subiharta *et al.* (2012) reported that heifer PO cattle's ( $\leq 24$  months old) body weights was 251.5±7.78 kg, wither height was 130.5±0.71 cm, body length was 129.5±7.78 cm, and chest circumference was 145.5±3.54 cm. It showed that the PO cattle body weights and measurements excluded wither heights was increase on this research. Thus it indicated that there was improvement on PO cattle breed replacement stock.

The PO cows are relatively older than PO bull due to of their rule as breeding cows which is producing calves. However, PO bull had significant higher body weights than PO cows because of the aim of their raising was to be PO cattle contestant on annual PO event contest and/or to be beef cattle. Therefore, the differences is in their feeding management, PO bulls were raised to increase their body weights while PO cows were raised to maintenance their weights in order to made sure their body weights still ideal for breeding purpose. One of efforts to increase ADG is to improve feeding management. Dinata *et al.* (2009) stated that giving concentrate feed as many as 2% of cattle live weights and *ad libitum* straw fermented by urine on PO cattle can increase their ADG and chest circumference (P<0.05), but cannot increase wither height and body length.

The correlation between body weights and measurements of PO cattle showed that variable which is not significant will be disappeared from the function. The estimation of body weight reflected from body measurement because there were higher correlation between body

measurements and weights ( $Y=-202,41+1,06X1+0,17X2+1,81X3$ ) with the  $R^2$  is 0.86 for male calf PO cattle, ( $Y=-169,66+0,90X1+1,81X3$ ) with the  $R^2$  is 0.76 for female calf PO cattle, ( $Y=518,24+1,06X1+1,57X2+3,23X3$ ) with the  $R^2$  is 0.84 for steer PO cattle, ( $Y=-501,25+5,20X3$ ) with the  $R^2$  is 0.92 for heifer PO cattle, ( $Y=-1117,67+4,34X1+1,31X2+4,56X3$ ) with the  $R^2$  is 0.85 for sire PO cattle and ( $Y=-828,46+0,90X1+6,54X3$ ) for dam PO cattle with the  $R^2$  is 0.91. Where Y is body weight, X1 is wither height, X2 is body length, and X3 is chest circumference.

This result showed that X2 variable or body length had significant effect to body weights value in all of age groups of male PO cattle, while in all of groups female PO cattle body length had no significant effect to body weights value. The difference result indicated that sex of the animal is able to affect the correlation between body weight and measurement. Analysis of determination value ( $R^2$ ) indicated the correlation among measurable variables of body weights. The value  $R^2$  of sire and dam PO cattle was 0.85 and 0.91 respectively. It indicated that the increasing of wither height, body length, and chest circumference having given influence around 85% and 91% toward the body weight, whereas the remain influences derived from environment. The close correlation between body measurement and weight comprised three measuring components namely wither height, body length, and chest circumference will be the measurement basis to body weight estimation.

#### Estimating PO cattle body weight based on body measurement

Real weighing PO cattle body weight often face difficulties but accurate result can be obtained. In the other hand, estimating body weight result was not accurate, it could be under or over estimates than real weighing value. Body Weights estimation of PO Cattle in Kebumen Regency, Central Java Province, 2015 was showed on Table 2.

**Table 21.** Body Weights Estimation of PO Cattle in Kebumen Regency, Central Java Province, 2015

No.	Variable	Male	CF (%)	Female	CF (%)
1	Calf PO cattle(heads)	119		179	
	a. Average age (months)	6.03±3.64		6.19±2.80	
	b. Real body weights (kg)	120.50±40.93		119.53±34.36	
	c. Schoorl formula(kg)	178.16±41.02	-55.37	175.74±32.11	-53.81
	d. Lambourne formula (kg)	106.00±42.51	6.00	102.15±33.80	13.94
2	Young PO cattle (heads)	129		33	
	a. Average age (months)	19.33±3.98		23.70±1.24	
	b. Real body weights (kg)	274.94±88.84		308.67±60.69	
	c. Schoorl formula(kg)	286.41±64.05	-9.33	316.76±39.30	-4.13
	d. Lambourne formula (kg)	243.17±86.03	10.98	310.29±66.63	-0.56
3	Mature PO cattle (heads)	109		547	
	a. Average age (months)	36.55±10.82		61.31±22.50	
	b. Real body weights (kg)	457.39±121.29		371.98±69.84	
	c. Schoorl formula(kg)	391.66±65.57	11.15	352.64±36.92	3.64
	d. Lambourne formula (kg)	398.19±105.03	11.70	364.41±60.06	1.33

Note: CF = Correction factors

According to Table 2, the body weight estimation for either PO steer or male PO cattle is more suitable using Schoorl formula. Whereas, Lambourne formula is more suitable for body weight estimation for either PO heifer or female PO cattle. Badriyah (2014) stated that schoorl formula was more suitable for estimation of over 300 kg mature PO cattle weight.

### **Slaughter and carcass weights**

The result of the research showed there was significant differences ( $P < 0.05$ ) on carcass percentage among sex (steer vs heifer;  $50.19 \pm 2.18$  vs  $47.26 \pm 3.72$ ) and (sire vs dam;  $51.36 \pm 3.47$  vs  $48.06 \pm 5.28$ ). But there was no significant differences ( $P > 0.05$ ) among age groups (steer vs sire;  $50.19 \pm 2.18$  vs  $51.36 \pm 3.47$ ) and (heifer vs dam;  $47.26 \pm 3.72$  vs  $48.06 \pm 5.28$ ). Steroid hormone involved in growth rule, particularly on body composition among sex between male and female. Secondary genitals on male animals namely somatotropic hormone, gonadotropin hormone, and androgen can also stimulate protein synthesis particularly at muscle and decrease fat contain on the body (Soeparno, 2009). The age factor on this result showed there was no significant differences ( $P > 0.05$ ), it explains that older animal is not affected by carcass percentage. Body weight gain of cattle always followed by their carcass weight so that carcass percentage differences among age group cannot be identified. However, there was preferences of increasing carcass percentage on older age groups among each sex.

The estimation of carcass weight reflected from slaughtered weights because there were higher correlation between slaughtered weights and carcass weights ( $Y = -278.67 + 1.03X$ ) with the  $R^2$  is 0.90 for sire PO cattle and ( $Y = -37.09 + 0.57X$ ) for dam PO cattle with the  $R^2$  is 0.65.

### **CONCLUSIONS**

There is a great correlation between body measurement with body weight and slaughters weights with carcass weights of PO cattle. Body weight estimation for steer and sire of PO cattle better using Schoorl formula, while body weight estimation for heifer and dam of PO cattle better using Lambourne formula. Nevertheless, the estimation of PO cattle body weights through its body measurements can be calculated with Schoorl and/or Lambourne but should still pay attention to correction factors.

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