

# The Correlations between Body Size and Weight of Bali Cows in the Maiwa Breeding Center Partnership Barru Regency of South Sulawesi Province

Aulia Uswa Noor Khasanah<sup>1</sup>, Suyadi<sup>2</sup>, Kuswati<sup>3</sup>

<sup>1</sup>Magister in Faculty of Animal Science, University of Brawijaya

<sup>2,3</sup>Lecturer of Animal Production, Faculty of Animal Science, University of Brawijaya

Email address: auliauswanoor @ gmail.com

**Abstract**— This study aims to analyze the correlation between body size and body weight, and also to estimate body weight (BB) based on body size. The study was conducted in September 2019 - December 2019 in Barru District. The research material are Bali cows grouped by age (permanent Incisive), namely PI4, PI6, and PI8. PI4 total 41 heads, PI6 total 88 heads, and PI8 total 172 heads, total 301 Bali cows. The data obtained were analyzed using the method of correlation coefficient and simple linear regression with SPSS 24. The results obtained are the highest correlation coefficient value in PI4 is chest girth value of 0.768 R2 value 59%. The highest correlation coefficient is PI6's body length with value 0.525, R2 value 27.6%. The highest correlation coefficient in PI8 is body length with value is 0.483, R2 value is 23.4%. Based on the results of the study concluded that the correlation of body length with body weight has the strongest correlation with age. the results of the highest analysis proximity correlation between body size and body weight is shown in PI4 between chest girth and body weight.

**Keywords**— Bali Cattle, Body Size, coefficient correlation.

## I. INTRODUCTION

Bali cattle by people in Barru Regency are one of the livestock commodities used to increase family income. Bali beef can be consumed, the manure can be used as fertilizer for food plants cultivated by the local community. Bali cattle are Indonesian germplasm and a wealth of genetic resources of Indonesian local livestock that need to be protected and preserved. The spread of Bali cattle has almost all parts of Indonesia, this breed is more in demand by farmers because of its superiority. Bali cattle have a high fertility rate, good and efficient working cows, good adaptability to low nutrient feed, can adapt to heat stress, and good adaptability to bad environments and the percentage of breeders that can reach 80% (SNI, 2017).

The growth process experienced by cattle starts from the beginning until fertilization occurs the calf is born and continues until it reaches adult. The simple definition of growth is the change in size including changes in life weight, shape, linear dimensions and body composition, including changes in chemical components, especially water, fat, protein and ash in the carcass (Kuswati, 2016). Changes in organs and tissues take place gradually until the size and shape characteristics of each organ and tissue are reached (Soeparno, 2009).

Growth and development is a livestock body event that changes morphologically, the magnitude of body changes,

both in shape and size. Growth and development is largely determined by the nation, age, sex and feed provided.

Indicators of productivity assessment can be seen based on body parameters that are often used in assessing productivity including chest girth, height and body length (Jaelani, et al., 2013). Animal body measurements may differ from one another, each component of the body has different growth or development rates, due to genetic and environmental influences, but can correlate with each other (Destanto, 2011). The closeness of body size variables with body weight variables can be determined by correlation analysis. According to Nurgartintingsih (2017) Correlation is a calculation to measure the degree of correlation between two properties or variables (variables).

In this study, dimensions of body size and body weight were analyzed to determine the value of the coefficient correlation and the regression line equation model. Correlation analysis aims to determine the degree of correlation between body size and body weight. Regression analysis will produce a regression line equation model that can be used to analyze the effect of body size on the bodyweight of Bali cows.

## II. MATERIALS AND METHODS

This research was conducted in September 2019 to December 2019 in Barru Regency, South Sulawesi. The location selection was done purposively, namely the area that partnered with Maiwa Breeding Center. The research material is Bali cows grouped by age (permanent Incisivi) as PI4, PI6, and PI8. PI4 are 41 heads, PI6 are 88 heads, and PI8 are 172 heads with a total amount 301 Bali cows. The main variables are body size parameters namely Shoulder Height, Body Length and Chest girth (x) and body weight (y).

### Data Analysis

The data obtained were analyzed using simple correlation coefficient analysis (r) and simple linear regression analysis (Sugiyono, 2000).

$$r = \frac{n \sum XY - \sum X \sum Y}{\sqrt{(n \sum X^2 - (\sum X)^2)(n \sum Y^2 - (\sum Y)^2)}}$$

Description:

r: Pearson Coefficient Correlation

X: Vital Statistics (Shoulder Height, Body Length, and Chest girth)

Y: Body weight

N: Number of samples

Regression analysis was used to determine the correlation of vital statistics (chest girth, body length, height) with the body weight of Bali Cows using the equation:

$$Y_i = \alpha + \beta X_i + e_i$$

Description:

Y : Bali Cattle’s Body Weight

X : Vital Statistics (Chest Girth, Body Length, Height)

$\alpha$  : intersep

$\beta$  : Coefficient Regression

$e_i$  : error

### III. RESULTS AND DISCUSSION

#### Relations of Body Size and Body Weight

Correlation values between vital statistics (X) and body weight (Y) of Bali cows can be seen in Table 1.

TABLE 1. Coefficient Correlation between Body Size and Body Weight

Age	Variables	Coefficient Correlation (r)	Coefficient Determination (R <sup>2</sup> )
PI4 (n=41)	Shoulder Height - Body Weight	0,579	33,6%
	Body Length - Body Weight	0,621	38,6%
	Chest girth - Body Weight	0,768	59,0%
PI6 (n=88)	Shoulder Height - Body Weight	0,13	0,00%
	Body Length - Body Weight	0,525	27,6%
	Chest girth - Body Weight	0,228	52%
PI8 (n=172)	Shoulder Height - Body Weight	0,223	50%
	Body Length - Body Weight	0,483	23,4%
	Chest girth - Body Weight	0,435	19,0%

Caption: significant at level 5%.

The results of statistical correlation analysis on body size with body weight of Bali cattle obtained that the correlation coefficient (r) and the coefficient of determination (R<sup>2</sup>) have different levels of proximity. The correlation coefficient shows the value of the close relation between the observations of body size and body weight.

The results of this study indicate that overall the correlations between shoulder height and body weight of Bali cows is high and positive. The correlation coefficient values from highest to lowest are PI4 of 0.579, PI6 of 0.13, and PI8 of 0.223.

Based on the observations above it can be observed that PI4 Shoulder Height has a strong correlation while PI6 does not correlate with body weight. This shows that there are differences in shoulder height at each age, due to cows experiencing growth until their growth slows down and stops. Based on this explanation, the age of cattle in this study includes the adult’s age which has stopped or has maximized

growth. If the correlation is negative then only one develops. This causes the growth of body length in cattle has reached a maximum but body weight gain is still occurring.

The growth process is also influenced by maintenance factors, the better the maintenance, the better the growth in body size, including shoulder height. This is accordance with the statement of Pikan (2018) which states that growth usually starts slowly, then takes place more quickly, then gradually decreases or slows down and stops after reaching the adult body.

The correlation between body length and body weight of Bali cattle is strong and positive. The correlation coefficient values of PI4 is 0.621, PI6 is 0.525, and PI8 is 0.483. Based on observations, correlation of body length with body weight is different and decreases with increasing age of cattle because the rate of bone growth in cattle has stopped. Djagra et al. (2002), states that bone growth can affect body length and body weight while meat growth affects chest girth. Bone growth will increase at the initial growth rate, then it will be followed by development and finally with the energy content of the feed given, the fat will experience a rapid increase.

The correlation between breast girth and body weight of Bali cattle is moderate and positive. The correlation coefficient between the width of chest with body weight of Bali cattle in PI4 is 0.768, PI6 is 0.228, and PI8 is 0.435. Correlation between body weight and chest girth can produce a positive correlation between two variables. This shows that the girth of the chest at every age has closer better relations with body weight compared to shoulder height. Measurement of chest girth is easy to understand because chest girth shows volume. Practically measuring chest girth is easier, compared to other measurements that require measuring sticks and perpendicular measurements. Chest girth measurements only use a measuring tape and wrap it around the chest. Mansyur (2010) added that body measurements have a significant and positive correlation to body weight. The girth of the chest enlarges as cattle age because in the girth there are organs such as the lungs and heart which also experience growth as they age. Chest girth in an adult body can be used as a body weight predictor with a determination value of 22.2% (Kadarsih, 2003).

The value of determination is the amount or proportion that indicates how the value of the independent variable is able to explain the variation of the dependent variable in the form of a percentage. The PI4 determination value, chest girth is higher than Shoulder height and body length. Variable chest girth gives a big influence on body weight that is equal to 59%. Likewise in the PI6, the value of determination of chest girth is higher than Shoulder height and body length that is equal to 52%. In the PI8, Shoulder height gives the greatest effect compared to body length and chest girth, which is 50%. Puspitaningrum (2009), states that body weight of cattle has a positive correlation with body measurements of livestock, including body length, hip height, and chest girth.

#### Regression Line Equation

The equation of the regression line is done to estimate the weight gain of Bali cows based on body dimensions.

Regression equation between body size and body weight in PI4, respectively for Shoulder Height, Body Length, and Chest girth are:  $BB = -326,544 + 4,942TP$ ,  $BB = -256,849 + 3,092PB$ , and  $BB = -360,067 + 4,920LD$ . Based on the results of the regression equation it can be seen that each addition of 1 cm Shoulder height will be followed by an increase in body weight of 4.942 kg, each addition of 1 cm Body length will be followed by 3.092 kg additional weight, and each increase of 1 cm chest girth will be followed by 4.92 kg addition body weight Bali cows.

Regression equation between body size and body weight in PI6, respectively for Shoulder Height, Body Length, and Chest girth are:  $BB = 191,477 + 0,05TP$ ,  $BB = 17,429 + 0,211PB$ , and  $BB = 91,136 + 0,895LD$ . Based on the results of the regression equation, it can be seen that each addition of 1 cm in shoulder height will be followed by 0.05 kg an increase in body weight, each addition of 1 cm in body length will be followed by 0.211 kg an increase in body weight, and each increase in 1 cm in girth will be followed by 0.895 kg addition of body weight Bali cows.

TABLE 2. Equation of Regression between Body Size and Bali Cows

Age	Variables	Regression Equation
PI4	Shoulder Height - Body Weight	$BB = -326,544 + 4,942TP$
	Body Length - Body Weight	$BB = -256,849 + 3,092PB$
	Chest girth - Body Weight	$BB = -360,067 + 4,920LD$
PI6	Shoulder Height - Body Weight	$BB = 191,477 + 0,05TP$
	Body Length - Body Weight	$BB = 17,429 + 0,211PB$
	Chest girth - Body Weight	$BB = 91,136 + 0,895LD$
PI8	Shoulder Height - Body Weight	$BB = 120,742 + 0,842TP$
	Body Length - Body Weight	$BB = -32,187 + 1,674PB$
	Chest girth - Body Weight	$BB = 52,650 + 1,368LD$

Regression equation between body size and body weight in PI8, respectively for Shoulder Height, Body Length, and Chest girth are:  $BB = 120,742 + 0,842TP$ ,  $BB = -32,187 + 1,674PB$ , and  $BB = 52,650 + 1,368LD$ . Based on the results of the regression equation, it can be seen that each addition of 1 cm in shoulder height will be followed by 0.842 kg an increase in body weight, each addition of 1 cm in body length will be followed by 1,674 kg an increase in body weight, and each increase in 1 cm in girth will be followed by 1,368 kg addition of body weight Bali cows.

The results of the regression equation illustrate that increasing age as expressed tooth in Bali cows will be

followed by variable weight gain. This is in accordance with the opinion of Tillman et al., (1998), that growth usually starts slowly and then takes place quickly, which gradually decreases or slows down and stops after reaching adulthood.

#### IV. CONCLUSION

Based on the results of the study concluded that the correlation of body length with body weight has the strongest correlation with age. The proximity of the correlation between the results of the highest correlation analysis between body size and body weight is shown in PI4 between chest girth and body weight.

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