Correlation Between Linear Body Measurements And Body Weight In Thin-Tailed Ewes

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ABSTRACT

Linear body measurement traits have been known to be an important trait to estimate live body weight. The aim of this research was to determine the correlation between linear body measurements and body weight in thin-tailed ewes. Data on body weight (BW), chest girth (CG), body length (BL), and wither height (WH) of the 66 thin tailed ewes were analyzed. The ewes were also grouped by age (1-1.5 years (PI 1), 1.5-2 years (PI 2), and 2.5-3 years (PI 3)). The correlation between BW and linear body measurement traits were estimated using Pearson correlation and simple linear regression. The result showed that the correlation between CG, BL, and WH with BW in thin tailed ewes for PI 1 were 0.66, 0.72, and 0.28 respectively; for PI 2 were 0.81, 0.40, and 0.46 respectively and for PI 3 were 0.82, 0.51, and 0.62 respectively. The most accurate linear regression equation to predict body weight based on vital statistics in female thin tailed sheep were BW= -16.58+0.76BL for PI, BW= -37.74+0.89CG for PI 2, BW= -37.61+0.92CG for PI 3. The correlation between chest girth and body weight in all age groups was the highest. Therefore, chest girth was the most important linear body measurement trait to estimate the body weight of thin-tailed ewes.

Keywords: body weight, linear measurements, correlation, linear regression

1. INTRODUCTION

The need for animal protein, especially meat, is increasing along with increasing income and people's concern for nutritional needs. This condition affects the livestock sector which is required to support meat needs. Sheep are one of the commodities in the meat-producing livestock sector. Sheep have great potential for development because they have the advantages of quickly reaching sexual maturity, having prolific characteristics, high adaptability, and relatively easy maintenance, supported by Sihombing [1]. Judging from the data on the sheep population in East Java released by the Central Statistics Agency, in 2022 there will be an increase of 37,192 heads from the previous year, supported by BPS 2023 [2]. This condition has an impact on opening up business opportunities in sheep livestock commodities.

Sheep are one of the small ruminant livestock commonly kept by Indonesian people, which have various types and different characteristics. One type of sheep that is commonly kept is the Thin-Tailed Sheep. Thin-tailed sheep have characteristic white fur, have circular horns in males and no horns in females, and have black spots in the nose and eye area, supported by Hartatik [3]. The characteristic of Thin-tailed sheep is that the tail is triangular and narrows at the tip and there are no fat deposits, supported by BSN 2009 [4]. Thin-tailed sheep is one of the sheep breeds that is popular with breeders because of its high Daily Body Weight Gain, high feed efficiency, and resistance to ectoparasites, one of which is ticks, supported by Maulana et al [5].

Sheep productivity in Indonesia is still relatively low so it needs to be increased. Increasing sheep productivity can be done through selection programs. According to Nurgiartiningsih [6], selection is the activity of selecting superior livestock in a population to serve as parents. Selection can be based on phenotypic characteristics which are generally divided into qualitative traits and quantitative traits. Quantitative characteristics are characteristics that influence production and can be measured directly, supported by Hardjosubroto[7]. Selection of quantitative traits in sheep can be based on minimum requirements including body weight, chest circumference, body length and shoulder height, supported by BSN 2009[4].

Body weight is a quantitative characteristic that has a dominant influence on selection activities because it reflects production performance and increases in the economic value of sheep. Parameters for the success of

Y. A. Yusran et al. (eds.), *Proceedings of the 2023 Brawijaya International Conference (BIC 2023)*, Advances in Economics, Business and Management Research 294,
https://doi.org/10.2991/978-94-6463-525-6_27

sheep rearing management can be determined through body weight. According to Gunawan and Noor [8], body weight is a reference in determining rearing patterns, feed requirements and selling value of livestock. The body weight of sheep can be determined through direct weighing or estimating body weight. Measuring body weight in ruminant livestock tends to be difficult due to their large body size and limited facilities, especially for smallholder farmers. Efforts to ease body weight weighing activities are very necessary. Estimating body weight using vital statistics is an alternative step to reduce stress on livestock during weighing, supported by Tama et al [9].

Vital statistical measures in the form of chest circumference, body length and shoulder height are performance indicators which are statistically quite vital in the quantitative characteristics of livestock. Vital statistics are used as technical parameters in estimating body weight and determining livestock breed standards. According to the statement by Gunawan et al.[8], vital statistical measures that have a high correlation with body weight are chest circumference, body length and shoulder height. Minimum quantitative trait requirements for sheep include body weight, chest circumference, body length and shoulder height, supported by BSN 2009 [4]. Chest circumference has the highest correlation with body weight because most of the body weight is located in the chest to hip area of the animal, supported by Tama et al [9]. According to the statement by Heriyadi et al[10], body length provides an idea of the meat content of a sheep. Shoulder height is a normal growth parameter for the bones that make up the legs as support for the livestock's body, supported by Septian et al [11].

Based on the description above, research on estimating body weight through vital statistics measurements on thin-tailed ewes needs to be carried out. Vital statistics measures used in this study include chest circumference, body length and shoulder height. The results of this research are expected to be useful in estimating the body weight of sheep based on their vital statistics and as a basis for consideration in determining appropriate selection.

2. MATERIALS AND METHODS

2.1. Materials

The material used in this research was 66 Thin-Tailed Sheep ewes located at PT Juara Agroniaga Sejahtera, in Simbatan Village, Kanor District, Bojonegoro Regency, East Java. The ewes were grouped based on their age. The age of the ewes was determined by observing the amount of permanent incisor teeth, namely PI 1 (1-1.5 years) with 31 animals, PI 2 (1.5-2 years) with 23 individuals, and PI 3 (2-3 years) as many as 12 individuals.

2.2 Methods

The methods used in this research was a quantitative method with direct weighing and measurements in the field. Data collected included vital statistics measurements and body weight. Vital statistics measurements were obtained from the measurements of chest circumference, body length and shoulder height. Body weight data is obtained from weighing results. The data obtained was then analyzed statistically. Sample collection was carried out randomly *purposive sampling* based on certain criteria, namely Thin-tailed ewes with age groups PI 1, PI 2, and PI.

2.3 Variables

The variables observed in this study were body weight and Thin-tailed ewes' linear body measurements. Vital statistics measured include Chest Circumference (CC), Body Length (BL), and Shoulder Height (SH). In order to obtain uniformity in the measurement of each variable, it can be done in the following way:

a. Body Weight (BW), weighing is carried out before the sheep are fed in the morning. Weighing uses a digital hanging scale in kilograms (kg).

b. Chest Circumference (CC), measured by circling the chest cavity just behind the elbows (*the scapula*). Measurement using a measuring tape in centimeters (cm).

c. Body length (BL), measured from the edge of the humerus bone to the lumbar bone (*tuber ischii*). Measurements use a measuring stick in centimeters (cm).

d. Shoulder Height (SH), measured from the highest point of the shoulders (*the vertebra thoracalis*) to the ground surface perpendicularly. Measurements use a measuring stick in centimeters (cm).

2.3 Analysis

The data analysis used is t-test of correlation values (1), correlation coefficient (2), coefficient of determination (3), regression analysis (4), and bias analysis between estimated and real body weight (5).

a. *T-test*

$$t\ count = r\sqrt{\frac{n-2}{1-R^2}} \quad (1)$$

r = Correlation coefficient

n = Number of livestock studied

R^2 = Coefficient of determination

b. *Correlation coefficient*

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

r = Correlation coefficient

X = linear body measurements (circumference chest, body length, shoulder height)

Y = Body weight

n = Number of samples

According to Maylinda's [12], interpretations regarding the close relationship between variable X and variable Y can be grouped as follows:

Table 1. Interpretation of correlation coefficient values

Correlation coefficient	Negative	Positive
Low	-0.3 to -0.1	0.1 to 0.3
Currently	-0.5 to -0.3	0.3 to 0.5
Height	-1.0 to -0.5	0.5 to 1.0

c. *Coefficient of Determination*

$$R^2 = r^2 x 100\% \quad (3)$$

Where :
R = Coefficient of Determination
r = Correlation Coefficient

d. *Regression Analysis*

$$Y = a + bX \quad (4)$$

Y = Body weight of ewes

a = Constant

b = Regression Coefficient

X = linear body measurements

e. *Bias Analysis*

$$\%Bias = \frac{Estimated\ BW - Real\ BW}{Real\ BW} x100\% \quad (5)$$

4. RESULTS AND DISCUSSIONS

4.1 Linear body Measurements and Body Weights of Thin Tail Sheep

The results of vital statistics measurements including chest circumference, body length, shoulder height and body weight in thin-tailed ewes are presented in Table 2.

Table 2. Mean, Standard Deviation (SD), and Coefficient of Variation (KK) in Body Weight (BB), Chest Circumference (LD), Body Length (PB), and Shoulder Height (TP) of female Thin-tailed sheep in the PI 1 age group, PI 2, and PI 3

Variable	Age group	n	Average ± ± SD	CV (%)
BW (kg)	PI 1	31	23,69 ± ± 3,59	15,17
	PI 2	23	28,72 ± ± 3,98	13,85
	PI 3	12	30,02 ± ± 3,92	13,07
CC (cm)	PI 1	31	71,13 ± ± 4,26	5,99
	PI 3	12	73,33 ± ± 3,49	4,76
	PI 2	23	74,67 ± ± 3,62	4,84
BL (cm)	PI 1	31	52,81 ± ± 3,37	6,38
	PI 2	23	57,11 ± ± 3,03	5,30
	PI 3	12	60,67 ± ± 3,77	6,22
SH (cm)	PI 1	31	50,55 ± ± 3,24	6,42
	PI 2	23	52,46 ± ± 3,17	6,05
	PI 3	12	54,17 ± ± 2,82	5,21

SD (Standard Deviation), CV (Coefficient of Variant), BW (Body Weight), CC (Chest Circumference), BL (Body Length), SH (Shoulder Height)

The average body weight of thin-tailed ewes from research in the PI 1, PI 2, and PI 3 age groups were 23.69 ± 3.59 kg, 28.72 ± 3.98 kg, and 30.02 ± 3, respectively. 92 kg. This result is lower than the body weight of 1.5 year old female Garut sheep SNI 7532:2009 of 37 kg. Differences in environment, maintenance management and feeding influence sheep body weight, supported by Ananda et al[13].The average chest circumference of thin-tailed ewes from research in the PI 1, PI 2, and PI 3 age groups were 71.13 ± 4.26 cm, 74.67 ± 3.62 cm, and 73.33 ± 3, respectively. 49 cm. These results are higher than the chest circumference of female Sapudi sheep aged 1-1.5 and 1.5-2 years SNI 7532-2:2018, respectively 60 cm and 62 cm.

The average body length of thin-tailed ewes from research in the PI 1, PI 2, and PI 3 age groups were 52.81 ± 3.37 cm, 57.11 ± 3.03 cm, and 60.67 ± 3, respectively. 77 cm. These results are higher than the body length of female Sapudi sheep aged 1-1.5 and 1.5-2 years SNI 7532-2:2018, respectively 54 cm and 56 cm. According to Malewa [14], differences in body length in sheep are influenced by growth speed in accordance with their genetic potential. The average shoulder height of thin-tailed ewes research results in the PI 1, PI 2, and PI 3 age groups was 50.55 ± 3.24 cm, 52.46 ± 3.17 cm, and 54.17 ± 2.82 respectively. cm. This result is lower than the shoulder height of female Sapudi sheep aged 1-1.5 and 1.5-2 years SNI 7532-2:2018, respectively 56 cm and 57 cm.

4.2 Correlation between Chest Circumference and Body Weight

Results of analysis of correlation coefficient (r), coefficient of determination (R^2), the regression equation, and the average deviation in chest circumference with body weight can be seen in Table 3.

Table 3. Correlation coefficient (r), coefficient of determination (R^2), regression equation, and average deviation in chest circumference with body weight

Age group	n (Tail)	r	R^2	Regression Equations	Average of Bias
PI 1	31	0,66**	43,56%	BW= -15,85+0,56CC**	2,60%
PI 2	23	0,81**	65,51%	BW= -37,74+0,89CC**	0,67%
PI 3	12	0,82**	67,37%	BW= -37.61+0.92CC**	-0,005%
PI 1, PI 2, in PI 3	66	0,75**	55,84%	BW= -33,99+0,83CC**	0,72%

Note: (**) = very significant (P<0.01)

Based on the results of the correlation coefficient analysis (r) on chest circumference and body weight of thin-tailed ewes in all age groups, it shows a high positive relationship because the r value is > 0.5. This r value illustrates that as chest circumference increases, body weight will increase. The size of the chest circumference increases in line with the growth of muscle tissue in the chest area or rib cage, supported by Setiawati et al [15]. Table 3 shows that the r value between chest circumference and body weight increases with increasing age. The r value between chest circumference and body weight of Thin-tailed ewes PI 1, PI 2, PI 3, and all age groups (PI 1, PI 2, and PI 3) respectively was 0.66; 0.81; 0.82; and 0.75. The results of Saputro's [16] research on Thin-tailed ewes PI 1, PI 2, and PI 3 at the Kliwon Market Slaughterhouse, Surakarta had r values respectively of 0.89; 0.77; and 0.56. The r PI 2 and PI 3 values in this study are higher compared to the results of Saputro's [16] research, while the r PI 1 values in this study are lower than the results of Saputro's [16] research. The difference in the r value between chest circumference and body weight was influenced by differences in the number of livestock and environmental conditions in the study by Tama et al. [9].

The value of the coefficient of determination (R^2) between chest circumference and body weight of Thin-tailed ewes PI 1, PI 2, PI 3, and all age groups (PI 1, PI 2, and PI 3) respectively was 43.56%; 65.51%; 67.37%; and 55.84%. This can be interpreted that chest circumference has an influence on body weight by 43.56%; 65.51%; 67.37%; and 55.84%, while the remaining 56.44%; 34.49%; 32.63%; and 44.16% is influenced by other factors. The results of Saputro's [16] research on PI 1 Thin-tailed ewes had an R value^2 higher than this study, namely 79.57%, while PI 2 and PI 3 have an R value^2 lower than this study, namely 58.59% and 31.39. Saputro [16] used fewer Thin-tailed ewes PI 1 females, namely 22 compared to this study, namely 31. Saputro's [16] research location is in the slaughterhouse area where livestock mobility is high and there are differences in feed consumed.

The regression equation between chest circumference and body weight of PI 1 Thin-tailed ewes is BW= -15.85+0.56CC. The regression coefficient value of 0.56 indicates that for every 1 cm increase in chest circumference of PI 1 females there will be an increase in body weight of 0.56 kg. PI 2 Thin-tailed ewes have a regression equation, namely BW= -37.74+0.89CC. This shows that for every 1 cm increase in the chest circumference of PI 2 ewes there will be an increase in body weight of 0.89 kg. PI 3 Thin-tailed ewes have a regression equation, namely BW= -37.61+0.92CC. This shows that for every 1 cm increase in the chest circumference of Thin-tailed ewes PI 3 there will be an increase in body weight of 0.92 kg. Thin-tailed ewes in all age groups (PI 1, PI 2, and PI 3) have a regression equation, namely BW = -33.99+0.83CC. This shows that for every 1 cm increase in the chest circumference of Thin-tailed ewes in all age groups (PI 1, PI 2, and PI 3) there will be an increase in body weight of 0.83 kg. The results of the regression analysis can be concluded that the regression equation of the relationship between chest circumference and body weight is very significant (P<0.01) in PI 1, PI 2, PI 3, and all age groups (PI 1, PI 2, and PI 3).

The results of estimating body weight using the breast circumference regression equation for Thin-tailed ewes PI 1, PI 2, PI 3, and all age groups (PI 1, PI 2, and PI 3) have a relatively low average bias of 2.60 respectively. %; 0.67%; -0.005%; and 0.72%. The regression equation on PI 3 is the most accurate in predicting body weight because it has a high positive r value, R value^2 relatively high, and the average deviation is low. Prameta [17] stated that low deviation values and high coefficients of determination indicate the validity of the data.

4.3 Correlation between Body Length and Body Weight

Results of analysis of correlation coefficient (r), coefficient of determination (R^2), the regression equation, and the average deviation in body length and body weight can be seen in Table 4.

Table 4. Correlation coefficient (r), coefficient of determination (R^2), regression equation, and average deviation in body length with body weight

Age group	n (Tail)	r	R^2	Regression Equations	Average of Bias
PI 1	31	0,72**	51,84%	BW= -16,58+0,76BL**	0,47%
PI 2	23	0,40	16,09%	BW= -1,38+0,53BL	2,30%
PI 3	12	0,51	26,47%	BW= -2,44+0,54BL	2,16%
PI 1, PI 2, in PI 3	66	0,73**	52,72%	BW= -15,57+0,76BL**	2,21%

Note: (**) = very significant (P<0.01)

The results of the correlation coefficient analysis on body length and body weight of Thin-tailed ewes PI 1 and all age groups (PI 1, PI 2, and PI 3) showed that there was a very significant relationship (P<0.01), while PI 2 and PI 3 showed there was no significant relationship (P>0.05). The correlation coefficient (r) of body length with body weight of Thin-tailed ewes PI 1, PI 3, and all age groups is classified as high positive because the r value is > 0.5, while PI 2 shows a moderate positive relationship because the r value = 0.3-0 .5. A high positive r value illustrates that as body length increases, body weight will increase. Body length is a vital statistical component in estimating body weight because it describes body capacity which affects the carcass, supported by Maulana et al [5]. The r value between body length and body weight of Thin-tailed ewes PI 1, PI 2, PI 3, and all age groups (PI 1, PI 2, and PI 3) respectively is 0.72; 0.40; 0.51; and 0.73. The results of Saputro's research (2011) on Thin-tailed ewes PI 1, PI 2, and PI 3 at the Kliwon Market Slaughterhouse, Surakarta had an r value of 0.77; 0.79; and 0.50. The correlation values for PI 1 and PI 2 in this study are lower and for PI 3 they are higher compared to the research results of Saputro [16]. Differences in the correlation value of body length with body weight are influenced by differences in the number of livestock and environmental conditions in the, supported by Tama et al [9].

The value of the coefficient of determination (R^2) between body length and body weight of Thin-tailed ewes PI 1, PI 2, PI 3, and all age groups (PI 1, PI 2, and PI 3) respectively was 51.84%; 16.09%; 24.47%; and 52.72%. This can be interpreted that body length has an influence on body weight by 51.84%; 16.09%; 24.47%; and 52.72%, while the remaining 48.16%; 83.91%; 75.53%; and 47.28% is influenced by other factors. The results of Saputro's [16] research on Thin-tailed ewes PI 1, PI 2, and PI 3 have an R value^2 higher than this study respectively, namely 59.45%; 61.69%; and 25.37%. Difference in R values between body length and body weight is influenced by differences in the number of livestock and environmental conditions in the study (Tama et al [9]. Saputro's research [16] has several differences with this research. The number of livestock used was 77 heads, which is higher than in this study. Saputro [16] measured body length using a measuring tape, while this study used a measuring stick. The maintenance management carried out by Saputro [16] is in a slaughterhouse environment so that maintenance is less intensive and the adaptation period is shorter.

The regression equation between body length and body weight of PI 1 Thin-tailed ewes is BW= -16.58+0.76BL. This shows that for every 1 cm increase in body length of PI 1 Thin-tailed ewes there will be an increase in body weight of 0.76 kg. PI 2 Thin-tailed ewes have a regression equation, namely BW= -1.38+0.53BL. This shows that for every 1 cm increase in body length of PI 2 Thin-tailed ewes there will be an increase in body weight of 0.53 kg. PI 3 Thin-tailed ewes have a regression equation, namely BW= -2.44+0.54BL. This shows that for every 1 cm increase in body length of PI 3 Thin-tailed ewes there will be an increase in body weight of 0.54 kg. Thin-tailed ewes in all age groups (PI 1, PI 2, and PI 3) have a regression equation, namely BW = -15.57+0.76BL. This shows that for every 1 cm increase in body length of Thin-tailed ewes in all age groups (PI 1, PI 2, and PI 3) there will be an increase in body weight of 0.76 kg. The results of the regression analysis can be concluded that the regression equation of the relationship between body length and body weight PI 1 and all age groups (PI 1, PI 2, and PI 3) is very significant ($P<0.01$), while PI 2 and PI 3 there was no significant relationship ($P>0.05$).

The results of estimating body weight using the body length regression equation for PI 1, PI 2, PI3, and all age groups (PI 1, PI 2, and PI 3) have an average deviation of 0.47%; 2.30%; 2.16%; and 2.21%. Estimating body weight using body length at PI 1 can be used because of the high determination value, the regression equation is very significant ($P<0.01$), and the low average bias.

4.4 Correlation between Shoulder Height and Body Weight

Results of analysis of correlation coefficient (r), coefficient of determination (R^2), the regression equation, and the average deviation in shoulder height with body weight can be seen in Table 5.

Table 5. Correlation coefficient (r), coefficient of determination (R^2), regression equation, and average deviation in shoulder height with body weight

Age group	n	r	R^2	Regression Equations	Average Bias
PI 1	31	0,28**	7,88%	BW= 7,97+0,31SH	1,84%
PI 2	23	0,46*	20,75%	BW= -1,23+0,57SH*	1,47%
PI 3	12	0,62*	38,86%	BW= -16,92+0,87SH*	1,57%
PI 1, PI 2, in PI 3	66	0,53**	27,81%	BW= -10,93+0,72SH**	1,67%

Note: (*) = significant ($P<0.05$), (**) = very significant ($P<0.01$)

The results of the t-test analysis on shoulder height and body weight of PI 1 Thin-tailed ewes and all age groups (PI 1, PI 2, and PI 3) showed that there was a very significant relationship ($P<0.01$), while PI 2 and PI 3 showed that there was a significant relationship ($P<0.05$). Based on the results of the correlation coefficient analysis (r) on shoulder height and body weight of PI 3 Thin-tailed ewes and all age groups (PI 1, PI 2, and PI 3) shows a high positive relationship because the r value is > 0.5. PI 2 shows a moderate positive relationship because the r value = 0.3-0.5. PI 1 shows a low positive relationship because the r value = 0.1-0.3. A high positive r value illustrates that as shoulder height increases, body weight will increase. Maulana et al. [5] stated that shoulder height describes growth in livestock as an indicator of the development of pipe bones. The r value between shoulder height and body weight of PI 1, PI 2, PI 3, and all age groups (PI 1, PI 2, and PI 3) respectively are 0.28; 0.46; 0.62; and 0.53. The results of Subardjo's research [18] on female Priangan sheep PI 0 (0.5-1 year), PI 2 (1-1.5 years), and PI 4 (1.5-2 years) in CV. Farming Partners *Farm*, Bogor has an r value of 0.57; 0.06; and 0.53. Subandriyo [19] stated that Priangan sheep or Garut sheep are included in the category of thin-tailed sheep which are widely distributed in West Java. The r PI 1 and PI 2 values in this study are lower than the results of Subardjo's research [18]. The r PI 3 value in this study is higher than the research results of Subardjo [18]. The r value for all age groups (PI 1, PI 2, and PI 3) in this study is the same as the research results of Subardjo [18]. The difference in the r value between shoulder height and body weight is influenced by differences in the number of livestock, age of the livestock, and environmental conditions in the research of Tama et al. [9].

The value of the coefficient of determination (R^2) between shoulder height and body weight of Thin-tailed ewes PI 1, PI 2, PI 3, and all age groups (PI 1, PI 2, and PI 3) respectively was 7.88%; 20.75%; 38.86%; and 27.81%. This can be interpreted that shoulder height has an influence on body weight by 7.88%; 20.75%; 38.86%; and 27.81%, while the remaining 92.12%; 79.25%; 61.14%; and 72.19% influenced by other factors. The results of Subardjo's research [18] on Priangan sheep PI 0, PI 2, and PI 4 in CV. Farming Partners *Farm*, Bogor has an R value^2 consecutively at 31.96%; 0.33%; and 28.11%. R value^2 in this study was lower than the results of Subardjo's research [18]. Subardjo's research [18] has several differences from this research. The number of livestock used was 79 heads, which is a higher number than in this study. The determination of age groups in Subardjo's [18] research does not comply with the standards set by (National Standardization Agency [4]. Subardjo [18] uses the *total sampling method*, while this research uses *purposive sampling method*.

The regression equation between shoulder height and body weight of PI 1 Thin-tailed ewes is BW= 7.97+0.31SH. This shows that for every 1 cm increase in shoulder height of PI 1 Thin-tailed ewes there will be an increase in body weight of 0.31 kg. PI 2 ewes has a regression equation, namely BW= -1.23+0.57SH. This shows that for every 1 cm increase in shoulder height of PI 2 Thin-tailed ewes there will be an increase in body weight of 0.57 kg. PI 3. Thin-tailed ewes have a regression equation, namely BW= -16.92+0.87SH. This shows that for every 1 cm increase in shoulder height of PI 3 Thin-tailed ewes there will be an increase in body weight of 0.87 kg. Thin-tailed ewes in all age groups (PI 1, PI 2, and PI 3) have a regression equation, namely BW = -10.93+0.72SH. This shows that for every 1 cm increase in the shoulder height of Thin-tailed ewes in all age groups (PI 1, PI 2, and PI 3) there will be an increase in body weight of 0.72 kg. The results of the regression analysis can be concluded that the regression equation of the relationship between shoulder height and body weight for all age groups (PI 1, PI 2, and PI 3) is very significant ($P<0.01$), PI 2 and PI 3 have a significant relationship. ($P<0.05$), and PI 1 there is no significant relationship ($P>0.05$).

The results of estimating body weight using the regression equation for shoulder height of PI 1, PI 2, PI3, and all age groups (PI 1, PI 2, and PI 3) had an average bias of 1.84%; 1.47%; 1.57%; and 1.67%. Estimating body weight by measuring shoulder height at PI 3 can be used because the r value is relatively high positive, the R value^2 high, significant regression equation ($P<0.05$), and low average deviation.

The results of the analysis of the relationship between vital statistics measurements and body weight in Thin-tailed ewes showed that chest circumference at PI 3 was the most accurate measure of vital statistics for estimating body weight. The chest circumference size on PI 3 has the highest positive r value of 0.82 with a very significant relationship ($P<0.01$), has an R value^2 the highest was 67.37%, and had the lowest average deviation of -0.005% with a very significant regression equation ($P<0.01$) which was BW= -37.61+0.92CC.

CONCLUSION

1. The relationship between vital statistics measurements and body weight in Thin-tailed ewes varies from high positive, medium positive, and low positive. The highest relationship value is chest circumference and body weight.
2. The most appropriate regression equation to estimate the body weight of Thin-tailed ewes at PI 1 is based on body length, namely BW= -16.58+0.76BL with an average deviation of 0.47%; in PI 2 it is based on chest circumference, namely BW = -37.74+0.89CC with an average deviation of 0.67%; and in PI 3 it is based on chest circumference, namely BW = -37.61+0.92CC with an average deviation of -0.005%.

RECOMMENDATION

The recommendation based on this research is to utilize chest circumference measurements for estimating body weight in female Thin Tail sheep.

REFERENCES

[1] Sihombing, J. M., K. M. Berutu, D. N. Lubis, dan C. Sihombing. 2022. Kualitas Organoleptik Mutu Bakso Daging Domba Ekor Tipis dengan Pemberian Kerak Tahu dalam Konsentrat. *Jurnal Peternakan Unggul*. 5(2): 25-33..

[2] Badan Pusat Statistik. 2023. Populasi Ternak Kambing, Domba, Babi Menurut Kabupaten/Kota dan Jenis Ternak di Provinsi Jawa Timur (Ekor), 2021 dan 2022. Diakses 10 Juni 2023.

https://jatim.bps.go.id/statictable/2023/03/28/2602/-populasiternak-kambing-domba-babi-menurut-kabupaten-kota-dan-jenis-ternak-di-provinsijawa-timur-ekor-2021-dan-2022.html.

[3] Hartatik, T. 2014. *Analisis Genetik Ternak Lokal*. Yogyakarta: Gadjah Mada University Press.

[4] Badan Standardisasi Nasional. 2009. *Bibit Domba Garut (SNI 7532:2009)*. Jakarta.

[5] Maulana, A., I. Hadist, dan B. Ayuningsih. 2020. Pengaruh Imbangan Rumput dan Konsentrat Terhadap Ukuran Tubuh Domba Garut Jantan Umur Lima Sampai Delapan Bulan. *Journal of Animal Husbandry Science*. 5(1): 106-16.

[6] Nurgiartiningsih, V. M. A. 2017. *Pengantar Parameter Genetik pada Ternak*. Malang: UB Press.

[7] Hardjosubroto. 1994. *Aplikasi Pemuliabiakkan Ternak di Lapangan*. Yogyakarta: Grasindo.

[8] Gunawan, A., K. Jamal, dan C. Sumantri. 2008. Pendugaan Bobot Badan Melalui Analisis Morfometrik Dengan Pendekatan Regresi Terbaik Best - Subset Pada Domba Garut Tipe Pedaging, Tangkas dan Persilangannya. *Majalah Ilmiah Peternakan*. 11(1): 1-6.

[9] Tama, W. A., M. Nasich, dan S. Wahyuningsih. 2016. Hubungan antara lingkar dada, panjang dan tinggi badan dengan bobot badan kambing Senduro jantan di Kecamatan Senduro, Kabupaten Lumajang. *Jurnal Ilmu-Ilmu Peternakan*. 26(1): 37-42.

[10] Heriyadi, D., A. Sarwesti, dan S. Nurachma. 2012. Sifat-Sifat Kuantitatif Sumber Daya Genetik Domba Garut Jantan Tipe Tangkas di Jawa Barat. *Bionatura-Jurnal Ilmu-ilmu Hayati dan Fisik*. 14(2): 101-6.

[11] Septian, A. D., M. Arifin, dan E. Rianto. 2015. Pola Pertumbuhan Kambing Kacang Jantan di Kabupaten Grobogan. *Animal Agriculture Journal*. 4(1): 1-6.

[12] Maylinda, S. 2010. *Pengantar Pemuliaan Ternak*. Malang: UB Press.

[13] Ananda, P., Y. Usman, dan M. A. Yaman. 2021. Perbandingan Bobot Badan Domba Lokal Jantan dan Betina Akibat Perbedaan Komposisi Pakan Basal, Konsentrat Fermentasi, dan Silase Eceng Gondok. *Jurnal Ilmiah Mahasiswa Peternakan*. 6(1): 88-97.

[14] Malewa, A. Dg. 2007. Karakteristik Fenotipe dan Jarak Genetik Domba Donggala di Tiga Lokasi di Sulawesi Tengah. Tesis. Fakultas Peternakan. Institut Pertanian Bogor.

[15] Setiawati, T., P. Sambodho, dan A. Sustiyah. 2013. Tampilan Bobot Badan dan Ukuran Tubuh Kambing Dara Peranakan Ettawa Akibat Pemberian Ransum dengan Suplementasi Urea yang Berbeda. *Animal Agricultural Journal*. 2(2): 8-14.

[16] Saputro, A. D. 2011. Hubungan Antara Panjang Badan, Lingkar Dada dengan Bobot Badan, Bobot Karkas Domba Ekor Tipis Betina di Rumah Potong Hewan (RPH) Pasar Kliwon Surakarta. *Skripsi*. Fakultas Peternakan. Universitas Sebelas Maret.

[17] Prameta, M. I. 2014. Pengaruh Kualitas Layanan dan Harga Terhadap Keputusan Pembelian Ayam Goreng Nelongso Cabang Ketintang. *Jurnal Pendidikan Tata Niaga*. 9(1): 1062- 1068.

[18] Subardjo, A. W. 2021. Hubungan Statistik Vital dan Jenis Kelamin Terhadap Bobot Badan Domba Priangan di CV. Mitra Tani Farm Bogor. *Skripsi*. Fakultas Peternakan. Universitas Brawijaya.

[19] Subandriyo. 1996. Pengelolaan Sumberdaya Genetika Ternak Domba di Indonesia. *Buletin Plasma Nutfah*. 1(1):44-50.