CORRELATION BETWEEN BODY SIZE AND MANY SIZES IN RAROWATU UTARA SUB-DISTRICT, BOMBANA REGENCY

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ABSTRACT

This research was conducted in January 2019 until February 2019, located in North Rorowatu District, Bombana Regency. The purpose of this study was to determine body weight with body size (chest circumference, body length, shoulder height and hip height). Male and female goats in North Rarowatu District Bombana Regency. The material used in this study is adult male and female goats aged 12-24 years as many as 201 animals. The instrument used is a 50 kg scale with a capacity of 50 kg to measure life weight, a measuring tape to measure chest circumference, body length and a measuring stick to measure shoulder height, hip height. The results of this study indicate that the average body weight of male goats is 29.06 ± 5.85 kg and female goats are 23.75 ± 3.00 kg, chest circumference of male goats is 69.60 ± 5.83 cm and on goats females at 67.38 ± 7.92 cm, body length on male goats at 62.05 ± 6.46 cm and on female goats at 60.50 ± 8.46 cm shoulder height on male goats at 58.03 ± 4.54 and in females 54.49 ± 7.65 cm, hip height in male goats was 59.44 ± 4.85 and in female goats 57.49 ± 7.75 cm. Based on the results of the study concluded there was a relationship between body measurements with body weight of goat nuts in North Rarowatu District. Chest circumference has the most close and very strong relationship to body weight as indicated by the correlation coefficient of 0.92 in males and 0.86 in females. Sequentially the results of the analysis of the correlation coefficient and determination are body weight - chest circumference 0.92 and 84.09% male, body weight - chest circumference 0.86-74.46% female, body weight - body length 0.68 and 46, 79% male, body weight - body length 0.70-48.89% female, body weight - shoulder height 0.60 and 36.36% male, body weight - shoulder height 0.64 and 40.98% female body weight - hip height 0.66 and 43.01% male, body weight - hip height 0.59 and 35.09% female..

Keywords: Peanut Goat, Live weight, Body size.

INTRODUCTION

Goat husbandry is one of the common livestock business carried out by the community both as a side business and as a main business. The goat, especially male goat, is one of the small ruminant livestock kept as beef cattle. The male goat has advantages such as easy maintenance and high ability to adapt to various environmental conditions and become one of the goats that are cultivated by people's farms.

One of the efforts made to develop the existing bean goat breeding business is to learn about the performance of goats through body weight that is expected to facilitate farmers in determining livestock value and economic value. Determination of body weight to determine the value of livestock becomes important especially in selecting breeds. Seed selection is usually done through a selection process that uses livestock body weight and age as the criteria.

Determination of the value of livestock body weight is very important to be able to determine meat production and selling prices so that it can help farmers calculate the benefits gained. In addition, it can also determine feed requirements that can help farmers in calculating the cost of feed in meeting the needs of their animals.

Based on BPS data in Bombana District in 2017 that the population of 11,972 goats were scattered in several districts. Whereas the livestock population in Rarowatu Utara Subdistrict was 403 scattered in eight villages,

Estimation of body weight through livestock body measurements has often been done and has a fairly high accuracy shows that livestock body measurements have many uses, namely giving an idea of the body shape of cattle as a characteristic of a particular nation and can be used to estimate body weight. Besides body size data can also be used for selection of livestock (Permatasari et al., 2013).

Measurement of some livestock body parameters that are responsive to body weight can be used as an alternative to determining livestock body weight. Body measurements are responsive to body weight such as chest circumference and body length used to form a new formula that makes it easy for breeders to estimate livestock body weight without weighing. The use of formulas based on body measurements for certain animals may not necessarily be accurate if applied to other types of livestock. Therefore, it is necessary to study the relationship between body measurements and body weight, in this case bean goats. Based on the background above, it is necessary to do research on the correlation between body measurements and body weight of goat nuts in Bombana District.

MATERIALS AND METHODS

This research was conducted in January to February 2019 in the District of North Rarowatu, Bombana Regency, Southeast Sulawesi Province. The research material used in this study were adult male and female pea goats with a range of 12-24 months of age while the tools used in this study included measuring tape, 50 kg scales, shoves, measuring sticks, stationery and cameras.

The population in this study was the peanut goat found in North Rarowatu District, Bombana Regency as many as 403 individuals. The sample of this study was male and female goat herds with a range of 12-24 months that were kept semi-intensive by breeders and the number of samples was determined using the Slovin formula (2012) as follows:

\[ n = \frac{N}{1 + N(e)^2} \]

Information:
- \( n \) = number of samples
- \( N \) = total population
- \( e \) = error (5%)

So that the number of samples of 201 goat nuts.

The research location was determined by Purposive Sampling, namely North Rarowatu Subdistrict, Bombana Regency with the consideration that the research location was one of the Districts that had the largest population of goat nuts. Whereas the selection of sample villages was determined in all villages (Wumbubangka, Watumentade, Hukaea, Tembe, Lantowua and Tunas Baru).

RESULTS AND DISCUSSION

Body Weight and Body Size

Body weight and dimensions of body dimensions (chest circumference, body length, shoulder height and hip height) of goat nuts in Rarowatu Utara District Bombana District obtained in this study, are presented in Table 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Male (n=36)</th>
<th>Female (n=165)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Weight (kg)</td>
<td>29,06±5,85</td>
<td>23,75±3,00</td>
</tr>
<tr>
<td>Chest Circumference (cm)</td>
<td>69,60±5,83</td>
<td>67,38±7,92</td>
</tr>
<tr>
<td>Body Length (cm)</td>
<td>62,05±6,46</td>
<td>60,50±8,46</td>
</tr>
<tr>
<td>Shoulder Height (cm)</td>
<td>58,03±4,54</td>
<td>54,49±7,65</td>
</tr>
<tr>
<td>Hip Height (cm)</td>
<td>59,44±4,85</td>
<td>57,49±7,75</td>
</tr>
</tbody>
</table>

Data Source: Correlation Analysis Results, 2018.
**Body Weight**

Based on the results of the study in Table 1 shows that the average body weight of male goat nuts is 29.06 ± 5.85 kg, while female bean goats are 23.75 ± 3.00 kg. The results of weighing the body weight of these goats are higher than in Suyasa (2016), that the body weights of male and female adult goats are 23.6 kg and 18.5 kg. Sitepoe (2008), body weight of adult bean goats can reach 15-35 kg. According to Decree of the Minister of Agriculture No. 2840 / Kpts / LB.430 / 8/2012, the body weight of adult male goats is 24.7 ± 6.1 kg and in adult females is 21.6 ± 6.5 kg.

Body weight is a very important trait in goats and this trait is influenced by genetic and non genetic factors (Jainudeen and Hafez, 2000). According to Sutama (2006), the differences in body weight both male and female are influenced by several factors including genetic, type of feed given and also maintenance management at each maintenance location.

"Inbreeding" mating systems can make genetics low, indirectly it can also make livestock lose weight. Peanut goat mating system in North Rarowatu Subdistrict is carried out with an outer cross that is using superior males obtained from other breeders, so that the genetic body weight of cattle can be increased. This is consistent with the opinion of Hartono (2009) that the use of superior males can improve the genetic quality of goat seedlings. Increasing local goat productivity can be done through a cross-breeding program (cross) with superior goats and selection to obtain individuals who have superior production characteristics. It was further explained that efforts to establish superior goats really need the support of various factors including cross management, breeding management, nutrition, animal health and reproduction (Elieser, 2016).

The environment which can influence the body weight of livestock is feed. In general, feed given to goat nuts in Rarowatu Utara District is obtained from cashew plantations and paddy fields. So that livestock have enough food for their daily needs. This is according to Nozawa's opinion (1980), which states that feed management is included in environmental factors. The quality and quantity of feed is one of the factors that greatly influences the success of a livestock business. Because the intake of nutrients in feed plays an important role to meet basic needs, body development and for the reproductive needs of livestock. Further stated by According to Hartanto (2008), that feed is the main energy source for growth and power generation for livestock. Because the better the quality and amount of feed given, the greater the energy generated and the greater the energy stored in the form of meat.

Generally the composition of feed for goats is similar to cattle feed, but goats require relatively more food than cattle. A cow weighing approximately 400 kg requires approximately 35 kg of forage food a day, while 10 goats with an average body weight of 40 kg with an amount of 400 kg require food more than 35 kg of forage every day. Benchmark for goats on forage has more leaves than grass (Djanah, 1963).

**Chest size**

Based on the results of the study in Table 1, the average chest circumference of male goat breasts is 69.60 ± 5.83 cm, while female bean goats are 67.38 ± 7.92 cm. The average chest circumference of goat nuts in this study is higher than the research of Pertiwir (2018), namely the chest circumference of adult male and female goats are 67.6 cm and 62.1 cm. Meanwhile according to Suyasa (2016), that the chest circumference of adult male and female goats in Bali is 65.4 cm and 62.4 cm.

The relationship between chest circumference with body weight in goats aged 12-24 months has the highest correlation value than other body sizes at the same age According to Victori et al., (2017). While Malewa (2009) states that chest circumference is the size of the body that has the most close relationship with body weight. Sutiyono et al., (2003), suggested that several body measurements were known to be correlated and were indicators of body weight such as shoulder height, chest circumference and body length.
The productivity of a livestock is influenced by two main factors namely genetic and environmental (Noor, 2000). Genetic factors determine the ability of production, while the environment is a supporter so that livestock are able to produce in accordance with their abilities. Environmental factors include food, housing, maintenance. Goat breeders in North Rarowatu District generally raise goats with an integrated system of goats with cashew plantations. Sources of food in the cashew plantation area in the form of weeds and leaves, in addition to goat livestock are also released in the rice fields when the harvest is finished. Parimartha (2016), that weeds and lamtoro available in the plantation area can be used as animal feed, besides that the plantation waste (coffee, cocoa, cashew), abundant during the harvest season, can be processed and used for feed, and goat manure waste made into compost to increase soil fertility and in turn can increase the productivity of plantation production.

**Body length**

Based on the results of the study in Table 1, the average body length of male goat nuts is 62.05 ± 6.46 cm, while female bean goats are 60.50 ± 8.46 cm. This result is higher than the Pertiwi research (2018), that the body length of the goat bean is 55cm in male and 47cm in female. Suyasa (2016), body length of adult male goat is 54.2 cm and adult female is 45.4 cm. This difference is caused by genetic factors. This is consistent with the opinion of Warwick et al., (1995), which states that the appearance of a trait depends on the genes owned by livestock, but a favorable environmental condition is needed to provide an opportunity for the appearance of a trait in full, clarified by Dwiyanto (1994), states that each component of the body has a different speed of growth or development due to genetic and environmental influences.

Body length has a correlation with body weight if the weight of the goat is high then the body length also tends to be greater. During pregnancy and during lactation, livestock requires feed of sufficient quality and quantity so that the growth of the fetus and cempe during presukih remains normal (Hardiono, 2016).

**Shoulder Height**

Based on the results of the study in Table 1, the average shoulder height of male goat is 58.03 ± 4.54 cm, while the female bean goat is 54.49 ± 7.65 cm. This result is higher than the study of Suyasa (2016), shoulder height of goat nuts is 55.7 cm in adult males and 55.3 cm in adult females. According to the Decree of the Minister of Agriculture No. 2840 / Kpts / LB.430 / 8/2012 (2012), male and female goat nuts that have shoulder height measures range between 56.3 ± 4.4 and 55.6 ± 4.2 cm.

Individual appearance and production differences are influenced by genetics and the environment (Subekti and Arlina, 2011), in addition to efforts to increase livestock productivity can also be influenced by feed and maintenance management. Muscle and bone growth mainly accumulates in the leg bones so that it affects shoulder height. Growth of shoulder height indicates that the bones that make up the foot grow according to their function to support the animal's body (Septian et al., 2015). The forelegs are more active when the calf is feeding the mother (Pradana et al., 2014).

Shoulder height is measured from the floor perpendicular to the highest point of the gumba, namely on the third and fourth vertebrae with a cm scale using a measuring stick. Shoulder height is also one of the body measurements that can be used as supporting data in determining livestock performance.

**Hip Height**

Based on observations in Table 1, the average hip height of male goats is 59.55 ± 4.85 cm, while female bean goats are 57.49 ± 7.75 cm. This result is lower than the study of Suyasa (2016), where the height of the bean goat hips is 57.8 cm in adult males and 53.5 cm in adult females.

Hip height describes the bones making up the foot as it is on shoulder height and the difference is the height of the hip as the
The height of the hip height increases with age. According to Setiadi et al., (1997), that the size of the hip height with shoulder height is relatively the same, the effect of diversity that occurs on the shoulder height applies equally to the height of the hip.

**Relationship of Body Weight and Body Size**

**Correlation**

The correlation coefficient between body weight and measurements of goat nuts in Rarowatu Utara District, Bombana Regency is shown in Table 2.

<table>
<thead>
<tr>
<th>Body Size</th>
<th>Male Information</th>
<th>Female Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB-LD</td>
<td>0.92* Strong</td>
<td>0.86* Strong</td>
</tr>
<tr>
<td>BB-PB</td>
<td>0.68* Strong</td>
<td>0.70* Strong</td>
</tr>
<tr>
<td>BB-TPu</td>
<td>0.60* Strong</td>
<td>0.64* Strong</td>
</tr>
<tr>
<td>BB-TPi</td>
<td>0.66* Strong</td>
<td>0.59* Strong</td>
</tr>
</tbody>
</table>

Information: * Significant level 5% (P<0,05)

The results of Table 2 show that body measurements in general, both male and female sex have a positive and strong relationship to body weight of goat nuts. The highest correlation coefficient values in males and females were obtained in the chest circumference of 0.77 and 0.86.

The results of this study indicate that chest circumference can be used to estimate body weight in goat nuts. Yunus (2016), has proven that the body weight of male and female goats in the Transmigration area show a very strong correlation with chest circumference \((r = 0.87\) and \(r = 0.67\)). Hazza et al., (2017) and Victori et al., (2017), stated that body weight and chest circumference had a positive and very strong relationship in male ettawa crossbreed goats, 0.91 and 0.98, while local male and female moa goats, 0.94 and 0.97 (Nurfaizin and Matitaputty, 2017).

According to Lake (2016), that body component that has the most close relationship with body weight is chest circumference. Gunawan et al., (2009), the correlation coefficient which strongly influences the estimation of body weight is chest circumference, shoulder height and chest. Basbeth et al. (2015) stated that differences in body size dimensions are influenced by circumference, thickness and body weight. This can be understood because the circumference of the chest is a place attached to body components such as meat, fat, internal organs which give a large proportion of weight in goat weight (Nurfaizin and Matitaputty, 2017). According to Zurahman (2011), chest circumference is directly related to the chest and abdominal space where most of the body weight of cattle comes from the chest to the hips, so that the greater the size of the chest circumference and body length, the heavier the body weight. This statement is in accordance with. Based on these results it can be explained that the close correlation of significant numbers in body measurements of the goat bean can be used as a parameter for estimating body weight.

Shoulder height in males and hip height in females have the lowest correlation value.
compared to other body sizes. This is due to the size of the shoulder and hip height is affected by the growth of leg bones. In addition, muscle tissue attached to the leg area is less when compared to the amount of muscle tissue attached to the chest area and along the bones making up body length, so it has the lowest correlation value. This is consistent with the results of research by Sutiyono et al., (2006), that shoulder height is influenced by the bones of the forefoot and is not directly related to the abdominal space where the bones of the forefoot

Coefficient of Determination ($R^2$)

The value of the coefficient of determination aims to predict how much the contribution of the influence of the independent variable ($X$) to the dependent variable ($Y$) or between the weight of the variable $Y$ with body size is the variable $X$ (chest circumference, body length, shoulder height and hip height) male goat and females in North Rarowatu Subdistrict, Bombana Regency, are presented in Table 3.

Table 3. Results of Determination Coefficient Analysis (%) Between Body Weight with Chest Circumference, Body Length, Shoulder Height and Hip Height.

<table>
<thead>
<tr>
<th>Body Size</th>
<th>Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB-LD</td>
<td>84.09</td>
</tr>
<tr>
<td>BB-PB</td>
<td>46.79</td>
</tr>
<tr>
<td>BB-TPU</td>
<td>36.36</td>
</tr>
<tr>
<td>BB-TPI</td>
<td>43.01</td>
</tr>
<tr>
<td>BB</td>
<td>Female (n=165)</td>
</tr>
<tr>
<td>BB-LD</td>
<td>74.46</td>
</tr>
<tr>
<td>BB-PB</td>
<td>48.89</td>
</tr>
<tr>
<td>BB-TPU</td>
<td>40.98</td>
</tr>
<tr>
<td>BB-TPI</td>
<td>35.09</td>
</tr>
</tbody>
</table>

Source: 2018 Determination Analysis Results.

In Table 3 shows that the coefficient of determination can be seen that the body weight of male and female goats using four free variables were observed, then the circumference of the chest is the best predictor compared to body length, shoulder height and hip height. This is because the circumference of the chest has a higher determination value ($R^2$) that is in males (84.09%) compared to body length (46.79%) hip height (43.01%) shoulder height (36.36%), and in females (74.46%) compared to body length (48.49%) shoulder height (40.98%) hip height (35.09%).

According to Ghozali (2009), the coefficient of determination basically measures how far the ability of a model (body size) in explaining the variation of the dependent variable (body weight). The coefficient of determination is between 0% and 100%. A small value means that the variation of the dependent variable is very limited. While a value close to 100% means that the independent variable can provide all the information needed to predict the dependent variable. Based on the coefficient of determination shows that the body size that is best used as a predictor in a row is chest circumference, body length, shoulder height and hip height.

The coefficient of determination in each body measurements is different. This is influenced by differences in the rate of growth of each animal body measurements. Of the four body sizes used as variables, body size that has a very close relationship with body weight is chest circumference. Setiawati et al., (2013), stated that the circumference of the chest shows the growth of the ribs and muscles that are in the ribs. This is due to the size of the circumference of the chest increases following the growth and development of muscle tissue in the chest area. Semakula et al. (2010) stated that differences in body size dimensions are influenced by fat and muscle deposition in the area of body dimensions, such as circumference, thickness and body weight.

The high percentage of body weight determination with chest circumference is in line with the results of the correlation coefficient analysis which has a positive and very strong relationship, so that the chest circumference is
very suitable to be used for estimating body weight or in estimating the body weight of a cow. It is emphasized by Olatunji and Adeyemo (2009), stating that chest circumference has a high degree of accuracy so that it can be used to estimate livestock body weight.

**CONCLUSION**

Based on the results of the study concluded there was a relationship between body measurements with body weight of goat nuts in North Rarowatu District. Chest circumference has the most close and very strong relationship to body weight as indicated by the correlation coefficient of 0.92 in males and 0.86 in females. Sequentially the results of the analysis of the correlation coefficient and determination are body weight - chest circumference 0.92 and 84.09% male, body weight - chest circumference 0.86-74.46% female, body weight - body length 0.68 and 46, 79% male, body weight - body length 0.70.48.89% female, body weight - shoulder height 0.60 and 36.36% male, body weight - shoulder height 0.64 and 40.98% female body weight - hip height 0.66 and 43.01% male, body weight - hip height 0.59 and 35.09% female.

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According to the Decree of the Minister of Agriculture No. 2840 / Kpts / LB.430 / 8/2012 (2012), the body weight of adult male goats is 24.7 ± 6.1 kg and in adult females is 21.6 ± 6.5 kg.


Suyasa (2016), body weight of adult male and female goats are 23.6kg and 18.5kg, body length 54.2kg and 45.4kg, chest circumference 65.4cm and 62.4cm, shoulder height 56.2cm and 54, 8cm, and hip height 57.8 and 53.5cm


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