

The Relationship between Vital Statistics with Pregnant Body Weight of Etawah Cross Bred Goat in Malang District, Indonesia

Rifa'i¹, Puguh Surjowardojo², dan Tri Eko Susilorini²

¹Student in Animal Science Master Study Program Animal Science Faculty, Brawijaya University

²Lecture of Animal Production Animal Science Faculty, Brawijaya University

Veteran Street (65145) Malang City, East Java

Email address: rifai01askaf@gmail.com

Abstract— The research uses a case study in the Technical Implementation Unit of Breeding and Forage Livestock Feed (UPT PT and HMT) Singosari, Malang Regency as a place for the maintenance of old pregnant Etawah Cross Bred goats. The purpose of this research was to determine the relationship between chest circumference, height, and length of the body of the old pregnant Etawah Cross Bred Goat. The material used in the research was 85 old pregnant Etawah Cross Bred goats. The closeness value of the correlation between body weight and height, body length is 0.46 and 0.42. The highest correlation value is between chest circumference and body weight 0.73 ($P < 0.01$). The vital statistical determination coefficient with body weight is 53% chest circumference, 21% height, and 17% body length. Correlation and regression analysis is used to estimate the relationship between these traits. This research concluded that body weight had a strong correlation with chest circumference (0.73), and the correlation was strong enough at height and body length, respectively 0.46 and 0.42.

Keywords— Etawah Cross Bred Goat, Old Pregnant, Body Weight, Chest Size, High and Long Body.

I. INTRODUCTION

Etawah Cross Bred goat in Indonesia is one type of goat that is widely maintained because it is profitable for farmers, including rapid breeding, capital needed is relatively small, cages and maintenance are relatively easy, and can be used as savings for livestock farming communities. Sumartono, Hartutik, Nuryadi, and Suyadi (2016) Indonesian local goat *Etawah Cross Bred* types that have good development and prospects to support the economy of local livestock farmers.

Vital statistics of *Etawah Cross Bred* include chest circumference, body length, and height. These vital statistics can be used as indicators of livestock growth, such as estimating animal body weight. The physical characteristics of *Etawah Cross Bred* goats are almost the same as *Ettawah* goats, which are long-eared and hanging, convex face profile, short horned and have white and black feathers. *Etawah Cross Bred* goats are classified as dual-purpose livestock (Zuriati, Maheswari, and Susanty, 2011). Susilorini, Sawitri, and Muharlieni (2008) characteristics of *Etawah Cross Bred* goats are long hanging ears with black or red and white feathers and having a male body weight of around 40-45 kg and female body weight of around 32 kg. Superior livestock *Etawah Cross Bred* goats that can adapt to climate conditions in Indonesia.

The productivity of *Etawah Cross Bred* goats is influenced by two main factors, namely genetic and environmental. Genetic factors determine production capabilities, while environmental factors to support livestock to be able to produce according to their abilities. Environmental factors include feed, maintenance, and climate. Genetics and the environment have an important role because superior genetics without the support of good maintenance, feed and feeding is not maximal. Conversely, livestock has given good feed but livestock do not have superior genetics, the production will not be optimal.

Body weight has an important role in the pattern of good maintenance because knowing the body weight of goats can facilitate the administration of drug doses, determining the amount of feeding. Goat weight can be known in two ways, namely by weighing and estimating. Both of these techniques each have their advantages and limitations. The weighing method is the most accurate but has obstacles, including the limitations of tools and labor and can cause stress on goats. The second goat weight measurement method is estimating through linear regression analysis between vital livestock statistics such as chest circumference, body length, height, and body weight. The ideal body weight for pregnant goats has an important role, so it is necessary to do research on vital statistic relationships with the weight of old pregnant *Etawah Cross Bred* goats.

II. MATERIALS AND METHODS

A. Research Material and Method

The research uses a case study in the Technical Implementation Unit of Breeding and Forage Livestock Feed (UPT PT and HMT) Singosari, Malang Regency as a place for the maintenance of old pregnant *Etawah Cross Bred* goats. The material used in the research was 85 pregnant *Etawah Cross Bred* old goats, consisting of 2 pregnant *Etawah Cross Bred* old goats *Permanent Incisors* (I_1), 15 pregnant *Etawah Cross Bred* old goats *Permanent Incisors* (I_2), 42 pregnant *Etawah Cross Bred* old goats *Permanent Incisors* (I_3), 26 pregnant *Etawah Cross Bred* old goats *Permanent Incisors* (I_4). Equipment used by measuring ruler with an accuracy of 1 mm, measuring tape with an accuracy of 1 mm, and digital weighing capacity of 2000 Kg with an accuracy of 0.5 kg.

This research uses primary data obtained through direct observation. Primary data retrieval is done by direct observation (observation) regarding the identification of vital livestock statistics and weighing body weight, while sampling is done by purposive sampling.

B. Data Analysis

The data obtained were analyzed using correlation analysis and simple linear regression analysis.

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

Note:

r : Correlation

X : Vital statistics (chest circumference, body length, height)

Y : Body weight

n : Number of samples

The magnitude of the influence of vital statistical measures on the body weight of old pregnant *Etawah Cross Bred* goats can be seen from the coefficient of determination with the following formula:

$$R^2 = r^2 \times 100\%$$

TABLE I. The correlation value between vital statistics with body weight old pregnant *Etawah Cross Bred* goats

Variable	N	r	R ²	t count	t table	
					0,05	0,01
Chest circumference	85	0,73	53%	7,144	1,9882	2,6349
Body height	85	0,46	21%	1,301	1,9882	2,6349
Body length	85	0,42	17%	0,277	1,9882	2,6349

Note: N= number of samples; r = correlation coefficient; R² = coefficient of determination

The The results of this research indicate that overall the relationship between vital statistics (chest circumference, height and body length) with the body weight of old pregnant *Etawah Cross Bred* goats had a positive relationship. Correlation coefficient values of chest circumference, height and body length respectively are 0.73; 0.46; 0.42. Criteria for correlation coefficient values are used to help conclude about the closeness between variables one with other variables. Correlation coefficient value criteria based on Victori, Purbowati, and Lestari (2016) can be seen in Table II.

TABLE II. Criteria for correlation coefficient values(r)

Correlation coefficient interval	Relationship level
0,00-0,199	Very low
0,20-0,399	Low
0,40-0,599	Strong Enough
0,60-0,799	Strong
0,80-1,00	Very Strong

The correlation coefficient between chest circumference and body weight has the strongest relationship compared to height and body length, which is equal to 0.73. The results of the correlation coefficient of 0.73 are still smaller than those of Afolayan, Adeyinka, and Lakpini (2006) in Yakansa sheep; Basbeth, Dilaga, and Purnomoadi (2015) in young male Jawarandu goats; Melawa (2009) in Donggala sheep who reported that the chest circumference had the highest and very strong correlation coefficient of 0.94; 0.93 and 0.91. This is presumably because the chest circumference is directly related to the chest and abdominal space where most body weight

Regression analysis was used to determine the relationship of vital statistics (chest circumference, body length, height) to the body weight of old *Etawah Cross Bred* pregnant goats using the following equation:

$$Y = a + bX$$

Y = Body weight

X = vital statistics (chest circumference, body length, height)

a = constants

b = regression coefficient

Percentage of deviation estimates of animal body weight through the regression equation can be known by using the following calculations:

$$\% \text{ deviation} = \frac{\text{Estimate BW} - \text{Real BW}}{\text{Real BW}} \times 100\%$$

III. RESULTS AND DISCUSSION

A. The Relationship between Vital Statistics with the Body Weight of Old Pregnant *Etawah Cross Bred* goats

The correlation value between vital statistics (X) with body weight (Y) old pregnant *Etawah Cross Bred* goats can be seen in Table I.

comes from the chest to the hips when *Etawah Cross Bred* goats in the old pregnant phase increase fetal growth, placental development and udder glands, overall affecting the parent body weight. So that the older the *Etawah Cross Bred* goat the greater the size of the chest circumference, the body weight gets heavier because it is followed by the greater the size of the mother's abdominal circumference. Dalton (1984) in Tama (2016) adds that in ruminants, the gastrointestinal tract in the abdomen accounts for 10-25% of the body weight.

Height with body weight has a correlation value of 0.46 which is lower when compared to the correlation value between chest circumference and body weight which is 0.73. The size of the animal's body is influenced by the growth of the leg bones. This low correlation value for height is due to muscle tissue that is attached to the foot area less than the amount of muscle tissue in the chest area and along with the constituent bones of the body length. Sutiyo, Nurul and Endang (2006) height is influenced by the constituent bones of the forefoot and is not directly related to the abdominal space, where the forefoot bone functions only to support the The correlation coefficient between chest circumference and body weight has the strongest relationship compared to height and body length, which is equal to 0.73. The results of the correlation coefficient of 0.73 are still smaller than those of Afolayan, Adeyinka, and Lakpini (2006) in Yakansa sheep; Basbeth, Dilaga, and Purnomoadi (2015) in young male Jawarandu goats; Melawa (2009) in Donggala sheep who reported that the chest circumference had the highest and very strong correlation coefficient of 0.94; 0.93 and 0.91. This is

presumably because the chest circumference is directly related to the chest and abdominal space where most body weight comes from the chest to the hips when *Etaawah Cross Bred* goats in the old pregnant phase increase fetal growth, placental development and udder glands, overall affecting the parent body weight. So that the older the *Etaawah Cross Bred* goat the greater the size of the chest circumference, the body weight gets heavier because it is followed by the greater the size of the mother's abdominal circumference. Dalton (1984) in Tama (2016) adds that in ruminants, the gastrointestinal tract in the abdomen accounts for 10-25% of the body weight.

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The results of this pregnant *Etaawah Cross Bred* goat have the lowest correlation coefficient value of 0.42, when compared to the correlation coefficient values of chest circumference and height of 0.73 and 0.46, respectively. The correlation coefficient of 0.42 can prove that the relationship between body length and body weight in old pregnant *Etaawah Cross Bred* goats is quite strong. Victori et al. (2016) based on the correlation coefficient value criteria that the value of $r = 0.40-0.599$ was stated to have a fairly strong level of relationship.

B. Estimation of the Body Weight of Old Pregnant *Etaawah Cross Bred* Goats

The results of this research obtained a regression equation of the size of the chest circumference, height and length of the body with body weight, and Levels of deviation estimating the body weight of old pregnant *Etaawah Cross Bred* goats can be seen in Table III.

TABLE III. Estimating body weight through regression equations and estimation deviations

No	Estimating variable	Equations / formulas	Deviation
1	Chest Circular regression equation	$Y = -35,29+1,02 X$	48%
2	Height regression equation	$Y = -8,57+0,77 X$	48%
3	Body length regression equation	$Y = -13,94+0,51 X$	20%

Based on Table 3, it can be seen that the results of statistical analysis show that the relationship between vital chest circumference statistics (X) with body weight (Y) has a regression line equation $Y = -35.29 + 1.02X$, meaning that each 1 cm increase in *Etaawah Cross Bred* chest circumference than there is an increase in the body weight of 1.02 kg. Furthermore, the relationship between vital height (X) statistics and body weight (Y) has a regression line equation $Y = -8.57 + 0.77X$, meaning that every 1 cm increase in *Etaawah Cross Bred* goat height then an increase in the parent body

weight of 0, 77 kg. The regression line equation is vital statistics for body length (X) with body weight (Y) $Y = -13.94 + 0.51 X$, meaning that every 1 cm increase in body length of *Etaawah Cross Bred* goat increases the body weight of 0.51 kg.

Estimation of body weight of old pregnant *Etaawah Cross Bred* goats using regression of chest circumference, height and body length has a deviation value of 48%, 48%, and 20% respectively. The value of this large deviation is thought to be the factor of the weight of the old pregnant mother body is influenced by the development of the fetus, placenta and udder glands. Santosa, Amrozi, Purwantara, and Herdis (2016) the growing age of fetuses will increase in diameter and will affect maternal weight, fetal goat nuts at the age of 20 days of pregnancy have a diameter of 1.2 ± 0.1 cm, age 22 days fetus $0, 4 \pm 0.1$ cm, the average growth

of the fetus until the age of 30 days of pregnancy is 0.19 ± 0.1 cm per day.

Sufficiently high deviations in the chest circumference regression equation indicate that the chest circumference regression equation is not strong enough to predict the body weight of the old pregnant *Etaawah Cross Bred* goat. This is because the old pregnant *Etaawah Cross Bred* goat has increased diameter in the abdomen because of the development of the fetus, placenta and udder glands. So to find out the body weight of *Etaawah Cross Bred* pregnant goats is better and more accurate by doing the direct weighing

IV. CONCLUSION

The results of this study indicate that the vital statistical measure of old pregnant *Etaawah Cross Bred* which includes chest circumference, height and body length has a strong closeness, especially between chest circumference and body weight, whereas between body height and length with body weight has a fairly close relationship which is shown from the correlation coefficients sequentially, are 0.73, 0.46 and 0.42.

V. SUGGESTION

Further research is needed with the uniform age of *Etaawah Cross Bred* goats.

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