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Relationship among Cow Weight, Calf Birth Weight and Calf Weaning Weight of Bali Cattle Raised Under Extensive Rearing System in Belu Regency of East Nusa Tenggara, Indonesia

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Abstract		Original Research Article

The aim of this study was to determine the relationship between cow weight and calf birth weight, as well as calf birth weight and calf weaning weight of Bali cattle. This study was carried out from October to November 2018 in Belu regency, East Nusa Tenggara province, Indonesia. The samples used in this study were Bali cattle which consisted of Bali cows, calves and weaned calves. Data obtained were analyzed using correlation analysis. The results showed that the correlations between cow weight and calf birth weight, as well as calf birth weight and calf weaning weight of Bali cattle raised in the highland were higher than those raised in the lowland. In conclusion, cow weight had a strong positive correlation with calf body weight with correlation values of 0.75 (highland) and 0.35 (lowland). A strong positive correlation (0.94 for highland; 0.75 for lowland) between calf birth weight and calf weaning weight was also observed.

Keywords: Bali cattle, birth weight, correlation, cow weight, weaning weight.

INTRODUCTION

Beef cattle are found in almost all countries around the world and they possess a considerable biodiversity. Bali cattle are one of the Indonesian native cattle, which are potential to be developed as a breed of beef cattle [1]. They are claimed to have superior fertility compared to other cattle breeds in the world [2]. The genetic potential of Bali cattle must be improved in combination with good feeding management practices that meet the nutritional needs of cattle. The genetic potential of cattle, therefore, can be fully exploited.

Birth weight is one of the economic traits affecting farm profitability as many livestock keepers take birth weight into consideration when they buy calves for future rearing. The animal performance is determined by genetic and environmental factors. The genetic potential of an animal can be fully exploited when it is raised in a proper environmental condition. Two factors such as maintenance system and altitude seem to have an important effect on the genetic potential performance of animal as these factors determine the availability of good quality feed for animals.

Because of their good adaptability to the tropical condition in Eastern Indonesia, Bali cattle can adapt and breed well in Belu regency, East Nusa Tenggara province. The population of Bali cattle in Belu regency is about 69,621 heads in 2017 [3]. However, there are some obstacles in the development of Bali cattle in Belu regency such as low productivity and development, as well as decreased genetic quality of Bali cattle depicted by a decrease in body measurements [4].

Some factors can affect the growth of Bali cattle including gene, environment and nutrition. Environmental factors can be passed from parents to offspring, while genetic factors cannot be passed from parents to progeny. A good quality seed come from a superior dam. The growth of Bali cattle is strongly affected by environmental factors. Hence, a good environmental condition is important to make sure that the cattle are in perfect health and can growth optimally. Nutrition is one of the factors affecting the growth of Bali cattle, especially regarding the quality and quantity of feed offered to animals. However, an adequate feed could not change the genetic characteristics of cattle [5].

MATERIALS AND METHODS

This study was conducted in 2 areas with different altitudes including West Tasifeto (highland; >500 m above sea level) and East Tasifeto (lowland; <500 m above sea level) of Belu regency, East Nusa Tenggara province, during 3 months, from October to December 2018. These locations were selected as study areas as they had the highest population of Bali cattle. The population of Bali cattle was estimated to be 69,621 heads in Belu regency made up of 13,321 heads in East Tafiseto and 9,082 heads in West Tasifeto [3]. A total of 105 Bali cattle made up of 35 heads of each dam, calf and weaned calf raised by livestock keepers in East Tasifeto and West Tasifeto districts of Belu regency, East Nusa Tenggara, Indonesia, were observed in this study. Data obtained were then analyzed by using correlation and linear regression analysis.

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

Description:
r : Correlation
X : Vital statistics (Cows' weight)
Y : Calf weight
n : Total samples

The magnitude of the effect of cow weight on calf birth weight and the effect of calf birth weight on calf weaning weight of Bali cattle can be indicated as a coefficient of determination using a formula described by Harjosubroto [7]:
$R^2 = r^2 \times 100\%$
The degree of relationship was determined according to Sugiyono [6] as follows:
Person correlation value of 0.00-0.20 = no correlation
Person correlation value of 0.21-0.40 = weak correlation
Person correlation value of 0.41-0.60 = medium correlation
Person correlation value of 0.61-0.80 = strong correlation
Person correlation value of 0.81-100 = very strong correlation

RESULTS AND DISCUSSIONS

The correlation values between cow weight and calf body weight in two different locations are presented in Table 1.

Table-1: Relationship between cow weight and calf body weight

Location	n	r	R^2 (%)	Regression equation	Significance
West Tasifeto	18	0.75	56.25	Y= 9.48+0.56x	P<0.05
East Tasifeto	17	0.35	12.25	Y= 4.65+0.12x	P<0.05
Note: n = number of samples, r = coefficient of correlation, R^2 = coefficient of determination					

The results of statistical analysis showed that cow weight had a strong positive correlation with calf body weight with correlation values of 0.75 (highland) and 0.35 (lowland). The calf birth weight was strongly affected by cow weight with magnitudes of 56.25% in West Tasifeto and 12.25% in East Tasifeto, as well as by other factors. The relationship between cow weight and calf birth weight of Bali cattle followed a regression Y = 9.48 + 0.56x for West Tasifeto and Y = 4.65 + 0.12x for East Tasifeto, of which x as the factor of cow weight had a positive relationship. This indicated that the increase in cow weight was accompanied by an increase in calf body weight and vice versa.

Table-2: Correlation betwen calf birth weight and calf weaning weight

Location	n	r	R^2 (%)	Regression equation	Significance
West Tasifeto	18	0.94	88.36	Y= 1.96-0.88x	P<0.05
East Tasifeto	17	0.75	56.25	Y= 79.13+0.56x	P<0.05
Note: n = number of samples, r = coefficient of correlation, R^2 = coefficient of determination					

In general, the results of this study indicated a strong positive relationship between birth weight and weaning weight of the calf. The correlation and coefficient of determination in the highland (r = 0.94 and R^2 = 88.36%) were higher than those in the lowland (r = 0.75 and R^2= 56.25%). These results are in agreement with the guidelines of the degree of relationship. The correlation between calf birth weight and calf weaning weight in the highland is positive and very strong, while that in the lowland was positive and strong.

The results of variance analysis showed that calf weaning weight was affected by calf birth weight (0.03% for West Tasifeto and 0.31% for East Tasifeto), as well as by other factors (nutrition, environment and gene). The relationship between calf birth weight and calf weaning weight was determined in regression equations Y = 1.96-0.88x for West Tasifeto and Y = 79.13 + 0.56x for East Tasifeto, of which x was the factor of birth weight. It can be noted that the increase in birth weight was accompanied by an increase in body weight of the calf and vice versa.

Birth weight is an important factor affecting the growth of the calf. Calves born normally with higher birth weight is better at maintaining their life than those with a lower birth weight [8]. The average

body measurements and female calf birth weight increase in line with the increase in age. Body measurement and live weight of calves at 0 to 2 months of age have a large coefficient value reflecting a phenotypic diversity of body measurement and live weight of calves in the early period of birth. Contrarily, the coefficient of variation decreases in line with an increased age of animal indicating a decrease of the influence of environmental factors such as age and milk production capacity of the dam [9].

CONCLUSION

Based on the results of the present study, it can be concluded that:
1. There is a positive correlation between cow weight and calf birth weight of Bali cattle with correlation values of 0.75 (highland) and 0.35 (lowland).
2. The correlation between birth weight and weaning weight of the calf in the highland is positive and very strong (0.94), while that in the lowland is positive and strong (0.75).

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