

# Comparison of Estimated Genetic Improvement of Bali Cattle Based on The Selection of Body Dimensions

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**Abstract.** Selection is one action in improving the genetic potential in animal population. Selection will be effective if the traits are varied and depends on heritability of the traits and selection intensity applied. This study was carried out using 270 breeding cows from Bali Cattle Breeding Centre in Sobangan Badung district Bali. The variables measured in this study was body length, withers height and chest girth. The results showed that the estimated selection response of body length, withers height and chest girth based on the heritability of traits and selection intensity was 0.37 cm; 0.64 cm and 1.27 cm respectively. It can be concluded that the estimated selection response of chest girth was the highest compared to body length and height of withers.

**Keywords:** Bali cattle, body dimensions, selection response

## I. INTRODUCTION

Bali cattle (*Bos sondaicus*) are the best Indonesian local cattle breed originated from Bali island of Indonesia. As meat production animal, Bali cattle has several good traits, i.e able to with stand in new environment, especially in low quality feed [11]; high fertility rate (80-82%) and when crossed has a high heterotic effect [4]; high meat quality as well as low fat percentage [1][6]; and resistant to ticks (*Boophilus sp*) and worms infections [10].

However, it seemed that the performance of this breed of cattle is decreasing as compared to several years ago particularly on their body weight. Oka [8] stated that performance of Bali cattle was not like in the pass since it was difficult to find Bali cattle heavier than 500 kg live weight at present. If this condition is left unconcern, Bali cattle may not be classified as the best local cattle in Indonesia in the future, because their superiority have been lost. Therefore, efforts to improve their performance is necessary. It has been known that animal performance including their production and product quality is depended on the genetic potential of the animals and their environment. Consequently, improvement of the genetic potential of Bali cattle is needed besides the

availability of feed as the highest part of the environment.

Selection is one of the powerful tools in improving the genetic potential in animal population. Selection will be effective if the traits are varied and depends on heritability of the traits and selection intensity applied. This research was carried out at the Bali Cattle Breeding Centre in Sobangan Badung regency, Bali Province to determine the phenotypic coefficient of variation and selection response of the body length, withers height and chest girth of Bali cattle.

## II. RESEARCH METHODS

The study was carried out at the Bali Cattle Breeding Centre in Sobangan Badung district. The body length, withers height and chest girth of 270 cows were measured in this study. The phenotypic coefficient of variation of body length, withers height and chest girth were calculated. The selection response (Rg) was estimated.

The coefficient of variation (CV) was calculated by using formula  $CV =$

$$\frac{sb}{\bar{X}} \times 100\%$$

where *sb* is the phenotypic standard

deviation and  $\bar{X}$  is the average of body length, withers height and chest girth [3][5].

Estimation of the selection response is calculated by the formula  $R_g = h^2 \times i \times S_b$ ;  $h^2$  = heritability;  $i$  = selection intensity;  $S_b$  = standard deviation. Heritability in this study refers to Supriyantono and Iriyanti [7] which is 0.34; 0.50 and 0.60 for body length, withers height and chest girth, respectively. The value of selection intensity used was 0.275, assuming 15% culling rate [3].

### III. RESULTS AND ANALYSIS

#### *The Phenotypic Coefficient of Variation*

The phenotypic coefficient of variation (CV) of the body length, withers height and chest girth obtained in this study were 4.45%; 4.62% and 7.52% respectively (Table 1). This meant that the population were homogenic, since their coefficient of variation was below 15%. Hanafiah [2] stated that the population is to be homogenic if CV under below 15%.

TABLE 1.  
THE AVERAGE AND PHENOTYPIC  
COEFFICIENT OF VARIATION OF BODY  
LENGTH, WITHERS HEIGHT AND CHEST  
GIRTH OF BALI CATTLE AT BALI  
CATTLE BREEDING CENTRE IN  
SOBANGAN

Parameters	Population	Average (cm)	CV (%)
Body Length	270	123.37±5.49	4.45
Withers Height	270	114.62±5.30	4.62
Chest Girth	270	168.80±12.69	7.52

Notes:

CV : Phenotypic Coefficient of Variation

Based on the above result, it indicated that the selection of breeding stock has been well implemented at the Cattle Breeding Centre in Sobangan. Similar results are also obtained by Warmadewi [9] who studied the livestock groups in Jembrana Regency.

Table 1 also showed that the chest girth coefficient of variation was higher than body length and withers height. Therefore, selection based on the chest girth was more effective if compared to the body length and withers height.

#### *Selection Response*

Based on the calculation, the selection response of body length, withers height and chest girth was 0.37 cm; 0.64 cm and 1.27 cm,

respectively (Table 2). The selection response of the body length which was calculated using the formula  $R_g = h^2 \times i \times S_b$  resulted  $R_g = 0.34 \times 0.20 \times 5.49 \text{ cm} = 0.37 \text{ cm}$  (Table 2). Since the average of the body length was 123.37 cm (Table 1) therefore, response per generation of the body length would be 123.74 cm. Response per generation of withers height and chest girth would be 115.26 cm and 170.07 cm, respectively.

TABLE 2.  
SELECTION RESPONSE OF BODY  
LENGTH, WITHERS HEIGHT AND CHEST  
GIRTH OF BALI CATTLE AT THE BALI  
CATTLE BREEDING CENTRE IN  
SOBANGAN

Parameter	$h^2$	$i$	$S_b$	$R_g$
Body Length	0.34	0.20	5.49	0.37
Withers Height	0.60	0.20	5.30	0.64
Chest Girth	0.50	0.20	12.69	1.27

Noted:

$h^2$  : heritability

$i$  : selection intensity

$S_b$  : standard deviation

$R_g$  : selection response

The estimated selection response chest girth was the highest compared to body length and withers height. Based on the above estimation the chest girth was found effective if used as the selection criteria to improve the genetic potential at this location. This is accordance to the statement of Supriyantono and Irianti [7] and Warmadewi [9] which stated that the chest girth as selection response is more effective compared to the the body length and withers height.

### IV. CONCLUSIONS

Based on the above results, it can be concluded that estimation of chest girth of Bali cows is best to be used as selection criteria compared to the body length and withers height.

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