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## Pre-weaning performances and mortality rate of calf Bali cattle maintained in the community with smallholder and intensive systems

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# Pre-weaning performances and mortality rate of calf Bali cattle maintained in the community with smallholder and intensive systems

Sudirman Baco<sup>1\*</sup>, Ratmawati Malaka<sup>1</sup>, Muhammad Hatta<sup>1</sup>, and Zulkharnaim<sup>1</sup>

<sup>1</sup>Department of Animal Production, Faculty of Animal Science, Hasanuddin University, Makassar 90245 South Sulawesi, Indonesia

\*E-mail address: sudirmanbaco@unhas.ac.id

**Abstract.** Bali cattle are native cattle of Indonesia, which is widely maintained by farmers and is a source of income for livestock farmers in South Sulawesi and even as a source of national meat food from beef cattle. Therefore, this livestock is the main commodities of South Sulawesi in the field of animal husbandry. Based on this, the Hasanuddin University Research Master Plan (RIP), Bali cattle is the main priority in the development of superior commodities in the field of animal husbandry. The problem is that the calf mortality rate is still very high (30-50%), the performance of Bali cattle breeds is still low. It can be seen that it is very difficult to get female cows with shoulder height exceeding 104 cm. The high rate of calf mortality and the low level of productivity of livestock may be due to farmers not paying attention to the management factors and cows breeding used. Therefore, it is necessary to conduct comprehensive and sustainable development research, how to reduce calf mortality rates and improve the performance of Bali cattle breeding sustainability through improved management in the calf phase. The aim of the study was to determine the level of performance and mortality rates of calves of Bali cattle that were maintained traditionally in the community and intensive systems. To achieve this goal, the research method was designed to improve feed and management in the calf phase continuously. Research parameters were calf mortality rate, calf growth (calf body weight) and body dimensions before weaning. Analysis of the data used was descriptive analysis and t-independent test. The results of the study show the following: 1) the calf mortality rate before weaning was high (maintained in the community 49.5% and intensive 9%), 2) the calf growth before weaning differs significantly between the calf that was maintained with a system of maintenance the community without the additional feed (existing management) and intensive feeding, 3) the changes in rates of growth and parts of the body dimensions of livestock that were given a quality feed and improved management in the calf phase vary between one part and another.

## 1. Introduction

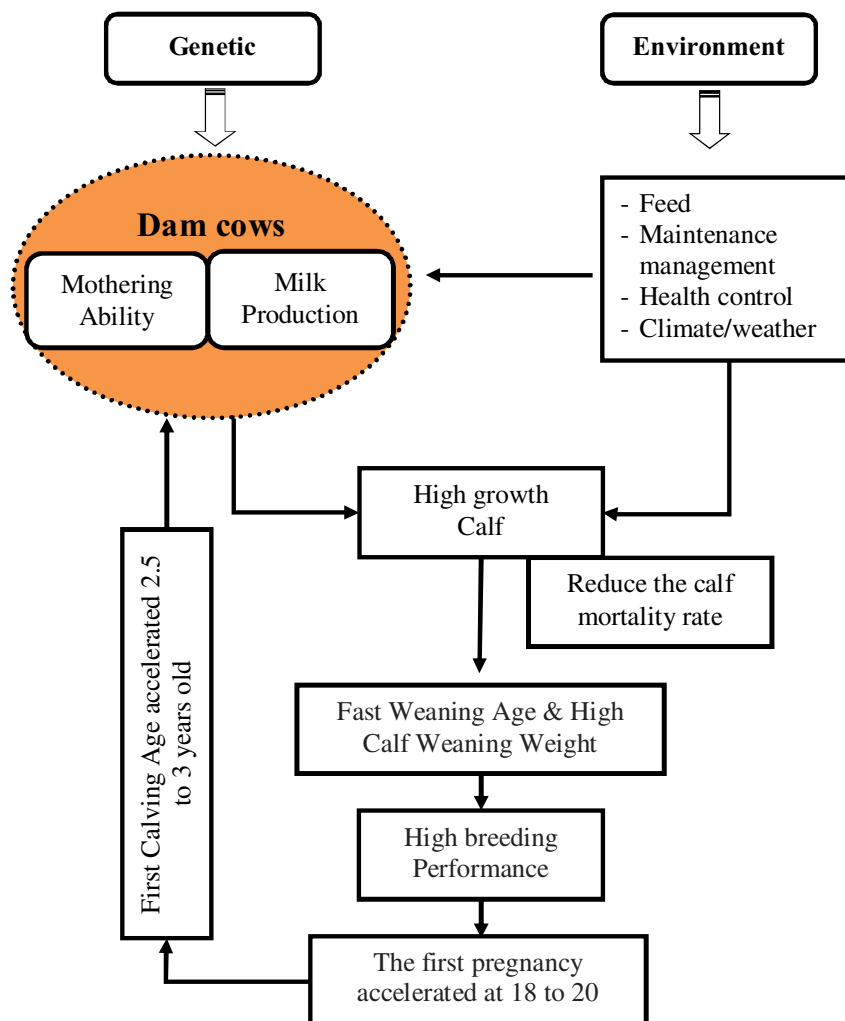
Bali cattle are native to Indonesia, which is widely maintained by farmers in South Sulawesi. This is because the Bali cattle has several advantages, among others, not selective and able to utilize low-quality feed, has a level of adaptation to the environment that can even live and produce well on critical land, while other cattle are not like that [1,2,3], and have a high percentage of carcass, less meat fat and tenderness of meat is not inferior to imported beef [4]. Thus Bali cattle provide an important contribution in improving the welfare of the community so that Bali cattle are the leading



commodity of South Sulawesi in the field of animal husbandry with a population growth target in 2013 of 1 million through the Action Program of Achievement of a Million beef cattle to support the Meat Self-Sufficiency Program (PSDS) in 2014 [5] and the National Meat Adequacy Program that has been proclaimed by the government. Even the discourse is carried out by the movement to reach a population of 2 million in 2018. Although Bali cattle have the advantages as mentioned above, they need to be improved in performances or level of productivity. By looking at the condition and performances of Bali cattle in South Sulawesi at present by several researchers, it has been indicated that Bali cattle have a genetic degradation and productivity. It can be seen that it is very difficult to get female cows with shoulder height exceeding 104 cm at the age of 18-20 months [6, 7]. The decline in the performance of Bali cattle may be due to the seed stock factor used by farmers in the maintaining of the community farm is not in accordance with the appropriate criteria. The occurrence of inbreeding and the absence of superior males in the community livestock groups that are used as a bull so that random mating occur without controls in groups [8]. In addition, the management of the handling of the parent during the breeding or mating season and the handling/management of calf maintenance before weaning (pre-weaning) get less attention. However, the results of [9] research on the analysis of genetic diversity of Bali cattle in South Sulawesi shows that genetic diversity is still high. This gives an indication that it is very possible to improve the performance and productivity of Bali cattle through genetic and environmental improvements or management. Theoretically, determining the level of productivity and performance of livestock are genetic factors (livestock) and the environment (feed, maintenance management, health, climate and so on).

In general, the maintenance management of Bali cattle in the community is still traditional and consequently, livestock productivity is low [10]. With such a maintenance system, it is unable to exploit the potential of livestock even though genetically these animals have high productivity potential. Field surveys indicate that the calf mortality rate of Bali cattle in the community with a small scale maintenance system was very high (30-50%) and calf growth before weaning was low [11]. This is based on the experience of the author's conducting preliminary studies at the Laboratory of Beef Livestock, Faculty of Animal Husbandry, Hasanuddin University. It can be seen that Bali cattle were reared semi-intensively at the Cattle Farming laboratory; temporary results showed high levels of pregnancy and birth, but calf mortality rates still high 20-30% and calf growth before weaning 0.1-0.2 kg per head per day [12]. As a temporary conclusion the results of management experience at the Beef Livestock Laboratory are semi-intensive as follows; 1) improved management through the Semi-Intensive maintenance pattern with additional feeding only limited rice bran can increase pregnancy rates and calf births but have not been able to reduce the calf mortality rate 0 - 3%, 2) calf growth before weaning was still low so the calf weight at the time of weaning weight was also low, thus the time of puberty, pregnant and birth is delayed, as a result the production costs become high and inefficient.

By looking at the problems mentioned above it can be expected that one of the causes is the quality of animal feed and management patterns. Therefore, further research has been carried out to examine the effect of improved management (intensive) through an improved feed on the level of productivity and performance of Bali cattle that were maintained intensively. The direction and conceptual framework of the research are shown in figure 1. With the improvement of feed in the pre-weaning period, it is expected that the calf growth rate will increase and weaning acceleration with high weaning weight so that the first breeding age and first calving age are faster or younger. Thus there is efficiency in production costs so that farmers get optimal benefits.



**Figure 1.** Direction Scheme Improving the quality of Bali Cattle Breeding performance and emphasizing calf mortality through Improving management and feed on the pre-weaning Phase

## 2. Research methods

### 2.1. Location of research

The study was conducted at the Laboratory of Cattle Livestock, Hasanuddin University, Makassar and at the Community/People's Farm in Cenrana District, Maros Regency, South Sulawesi.

### 2.2. Materials of research

The research materials used in this study were 25 calves aged 1 month old after (10 calves maintained intensively and 15 calves samples from the community (existing management in livestock farmers). The research material and parameters measured based on research time as shown in table 1. Animal feed ingredients (concentrated ingredients) used were local materials from agricultural and industrial waste. Forage feed ingredients used were elephant grass and natural grass. The tools used to weigh the weight of cattle was electronic digital scales. Special scales for cattle that

have a capacity of 2000 kg was used. The meter tape and measuring stick were used to measure the dimensions of the body of the cattle.

### 2.3. Feeding and maintenance management

Feed improvement was done by providing concentrated feed in the calf phase with the composition as shown in table 2. Concentrated feed ingredients based on local materials, cheap and easy to obtain, and availability at all times (LEISA). The maintenance system was carried out in an intensively. The concentrated feed was given in the morning and evening. After the concentrate has been eaten, then forage was given 2-3 times per day and given *ad-libitum*. In addition to feeding, animal health was always controlled through good cage sanitation and administration of medicines. The cattle maintenance was also exercised in the morning for 3 hours with their dam and at the same time to breastfeed the dam. After that, the calf was put back in the maintenance cage. Maintenance of both dam and calf cattle generally still apply the Good Management Practice (GMP) and Good Breeding Practice (GBP). To see the effect of the treatment in this study, a comparison was made with the conditions of the farm carried out by farmers/communities traditionally in the field (existing management) with extensive management without any treatment.

### 2.4. Research procedure

The treatment was carried out in the calf phase pre-weaning to see the mortality rate and calf growth. Maintained calves kept with their dam. Treatment was only given to calves with a creep feeding model. Feed calf concentrate was given as much as 3% of calf weight while forage was given *ad-libitum*. Additional feed/concentrate was given in the form of comboran/liquid until the age of 3 months and after that additional feeding was given the same as weaner. The treatment of concentrate / supplementary feeding and measured parameters, and the composition of concentrate feed in this study can be seen in table 1 and table 2, respectively.

**Table 1.** Research material and parameters measured based on maintenance systems

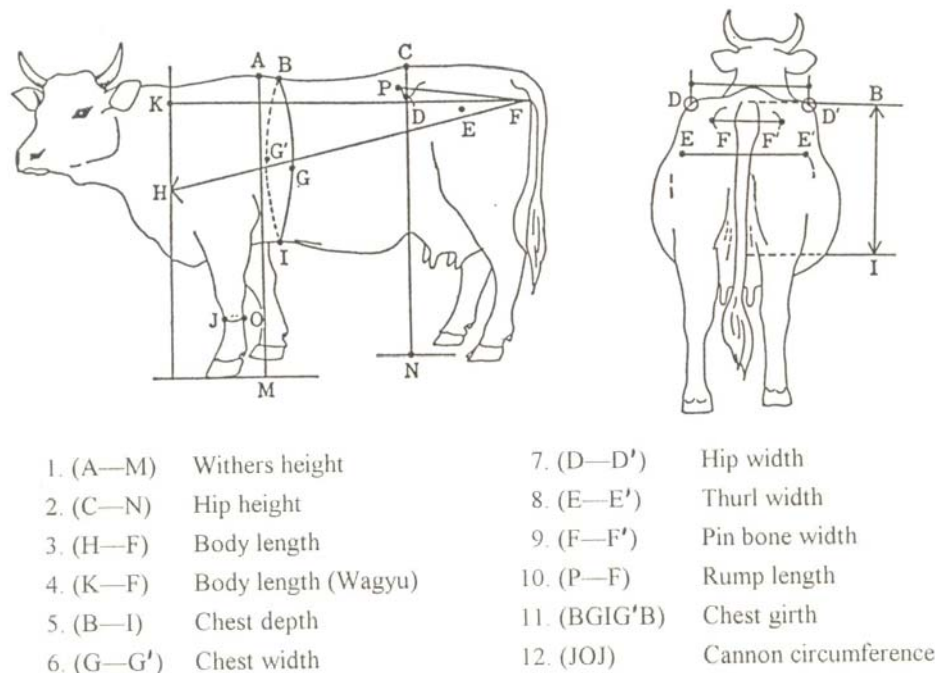
Research Materials		
Treatment (concentrate and intensive system)	Existing Management in Farmer Community (as the comparison)	Research Parameters
Treatment :	Control:	- Calf mortality rate
- Concentrate feed with high protein during 6 months (until weaning age)	- Existing management in Farmer community	- Calf growth (body weight, average daily weight gain)
- Concentrate 3% of calf body weight	- No concentrate	- Body dimensions (body length, chest girth, withers height) of calf
- Forage <i>ad-libitum</i>	- Materials: 15 calves (sampling)	
- Materials: 10 calves		

**Table 2.** Compositions of feed concentrate in research

Materials	Composition (%)
Rice bran	30.0
Tofu waste	50.0
Coconut pulp	7.0
Molasses	10.0
Minerals	1.0
Urea	0.5
Salt	1.0
Probiotic	0.5

### 2.5. Research parameters

The parameters measured were the calf mortality rate, calf growth, and calf body dimensions, and more clearly can be seen in table 1. The location of anatomical body dimension measurements was carried out based on the method used by [13], as shown in figure 2. Weighing body weight and measuring the dimensions of the body of the cattle were carried out simultaneously in the morning before the cattle were given concentrate feed.



**Figure 2.** Anatomy location of animal body dimension measurement based on methods used by [13]

### 2.6. Data analysis

The data obtained were analyzed by parametric and non-parametric analysis methods. Parameters with quantitative or ratio types were analyzed using a t-test, while parameters with nominal quantitative or qualitative data were analyzed by descriptive analysis. The data obtained from the results of this study were also compared with the data obtained from smallholder farms with a traditional maintenance system that aims to determine the differences in productivity and performance of Bali cattle raised in the community with smallholder systems and intensive systems. Processing data using a computer package SPSS Version 12 for Windows [14].

## 3. Results and discussion

### 3.1. Calf mortality rate

The average age, mortality rate, body weight and calf body dimensions of Bali cattle of the study, which received different management backgrounds (intensive/treatment and field conditions in the community), can be seen in table 3. Table 3 shows that the calf mortality rate Bali which was maintained with intensive management was a lowly significantly (9.0%) compared to the field conditions in the community (49.5%). These results indicate that improved livestock maintenance management was highly significant to reduce calf mortality, and thus population growth can be

increased. A high calf mortality rate is the beginning of the failure of a farm business because to produce a calf requires a lot of time, cost and energy. It takes at least 9 months to maintain pregnancy. Therefore the cause of calf mortality must be explored more deeply. So far, it was suspected that the cause of calves mortality was one that was poor management/management at the time of calf. Poor or improper management can cause the cows and calf conditions to be inferior so that the livestock are susceptible to certain diseases that can cause death.

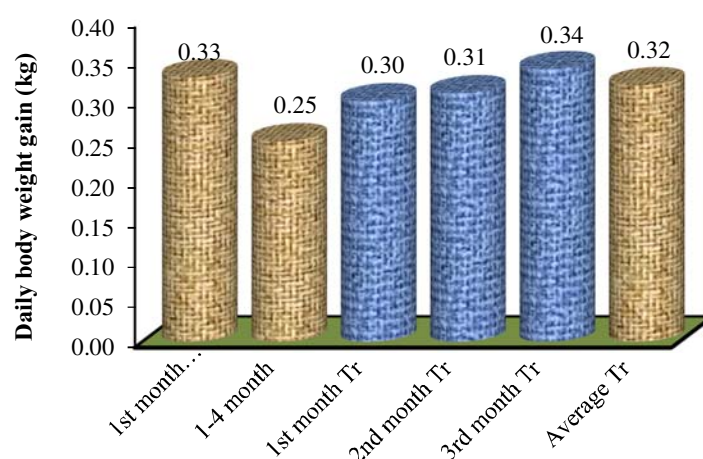
**Table 3.** Age, the mortality rate, body weight and body dimensions of calves before weaning

Characters	Intensive	Existing
Age (mo.)	5,4±1,4	6,6±3,1
Mortality rate (%)	9,0 <sup>a</sup>	49,5 <sup>b</sup>
Body weight (Kg)	57,9±13,7 <sup>a</sup>	37,5±14,7 <sup>b</sup>
Chest girth (cm)	92,9±7,5 <sup>a</sup>	81,5±10,8 <sup>b</sup>
Withers height (cm)	83,8±5,6 <sup>a</sup>	69,5±8,0 <sup>b</sup>
Body length (cm)	72,5±7,7 <sup>a</sup>	59,8±8,8 <sup>b</sup>

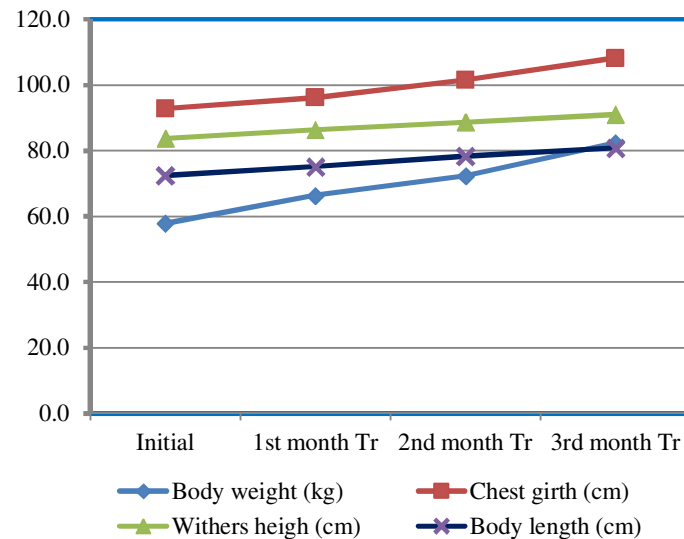
Different superscripts in different columns showed highly significant differences ( $P < 0.01$ )

### 3.2. Growth and body dimensions of calves

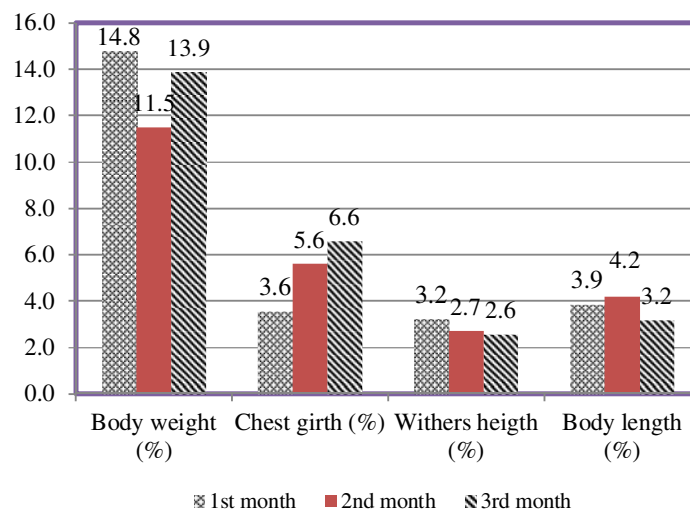
Table 3 shows that the average body weight, chest girth/circumference, shoulder height and calf body length with intensive management that received good feed treatment was higher significantly ( $P < 0.01$ ) compared to the management of makeshift in the community (existing management). At the same age of calves (5.4 - 6.6 months), calf body weight in treatment was 57.9 kg higher (54.4%) than without treatment (37.5 kg), chest circumference 92.9 cm higher (14.0%) than without treatment (81.5 cm), shoulder height 14.3 cm (20.5%) from without treatment (69.5 cm) and body length 12.7 cm (21.2%) higher than without treatment (59.8 cm). However, the diversity of each research parameter in calf without treatment or existing management in the community was greater than the treatment (can be seen in the amount of standard deviation in table 3). Thus, the results of the study indicate that the management factor has a highly significant influence on the calf growth before weaning.



**Figure 3.** Average daily weight gain of Bali cattle calf before treatment and at the research treatment



**Figure 4.** Changes in body weight and calf body dimensions of Bali cattle before weaning



**Figure 5.** The ratio of changes in body weight of calf body dimensions of Bali cattle before weaning

This study also conducted a comparison of calf performance between no treatment and treatment with the addition of high protein feed in the intensive management system as shown in figure 3. In figure 3, shows that calves that were treated with high protein feed interventions at the beginning /first-month research have a daily body weight gain (ADG) tends to increase then decreases in the second month. Calf ADG was increased in the first month of treatment of 0.30 kg it was relatively the same as the first-month calf ADG of postpartum which only given breast milk cows. But when compared with age calves after 1-4 months, the first-month ADG was higher in treatment. These results indicated that calf growth in the first month of postpartum was relatively higher after it fluctuates according to its environment. Therefore, improved management through quality feed interventions can maintain calf growth before weaning. Although it was known that breast milk cows



were a very important role in this phase. On the other hand, the production of dam's milk, especially Bali cows, is very limited in the phase after 2 months postpartum. Therefore, to meet the need for calf nutrition, additional food is needed from other ingredients according to calf needs. This can be seen in figure 3, that the average daily weight gain was increased again after being given additional feed in the phase after 1-4 months of age at 8.0% of ADG before.

The decrease of calf ADG in the second month of treatment was caused by the ratio of changes in other body parts to a higher percentage increase compared to ADG as shown in figure 5. This shows that the calf growth indicator was not only body weight gain but changes in body dimensions (morphometric) must be considered in evaluating growth. This was different from adult cattle which have a more focused growth indicator on body weight gain. In the 3<sup>rd</sup> month treatment. Calf ADG has increased again by 0.34 kg, exceeding ADG in the first 1 month postpartum.

In figure 4, shows changes in body weight and calf body dimensions of Bali cattle before weaning. These results provide an indication that management improvements can increase calf growth with growth rates in different parts of the body. The difference in the growth rate of these body parts may be due to differences in each part of the body's dimensions responding to feed intake that is in accordance with the growth pattern of each part of the body dimension. Changes in growth of the chest circumference followed by linear changes with body weight, while shoulder height and body length, changes were relatively consistent and gradual. Therefore, the approach to determine the volume or weight of cattle without weighing a more appropriate approach is to measure chest circumference and body length.

#### 4. Conclusion

Based on the results and discussion it can be concluded that improved management in the calf phase pre-weaning can:

1. The calf mortality rate before weaning was high (maintained in the community 49.5% and intensive 9%)
2. Calf growth before weaning differs significantly between the calf that was maintained with a system of maintenance of the community without the additional feed (existing management) and intensive feeding.
3. The rates of growth changes and parts of the body dimensions of livestock that was given a quality feed in the calf phase vary between one part and another.

#### 5. Acknowledgment

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