Body size of male Bali cow in different maintenance systems in Bima District, West Nusa Tenggara

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Abstract. Bali cattle originate from the Indonesian island of Bali and are well known in various regions throughout Indonesia. Bali cattle are known as beef cattle with high carcass proportion and good performance. There are two systems of Balinese cattle raising in Bima Regency, namely extensive and intensive. This study aims to measure the body size of male Bali cattle reared in an intensive and extensive rearing system in Bima Regency, West Nusa Tenggara. A total of 100 male Bali cows are kept using different maintenance systems, in the intensive system there are 50 heads and in the extensive system there are 50 heads, measured by body length, shoulder height, and chest circumference. Quantitative descriptive body size data were used to obtain mean values and standard deviations. The results showed that the body size of male Bali cows in intensive care in Bima Bali Cows was better in extensive maintenance (P <0.05). Thus, the intensive maintenance system for male Bali cattle can be applied to obtain better growth performance and can be used for fattening or selection of cattle of good quality to meet future national demand for beef.

1. Introduction

Bima Regency is part of the province of West Nusa Tenggara, located at the eastern tip of the NTB province. The area of Bima Regency reaches 4,374.65 km², consisting of 315.96 km² or 7.22 percent of rice fields and 4,058.69 km² or 92.78 percent of non-rice fields. The area of this paddy field has increased by 8.53 km² when compared to 2008 which was 307.43 km². The increase in the rice field area is driven by the decreasing area of forest, both state forest, and community forest area. The main livelihood of the community is agriculture. Rice is the main production of food crops.

In 2011, Bima Regency had a beef cattle population of 117,842 heads while in 2015 the beef cattle population was 413,124 heads. From this data, during the last 5 years, there has been an increase in the beef cattle population in Bima Regency from 2011-2015. Bali cattle commodity has been designated as superior livestock because it fits the agro-climatic conditions of West Nusa Tenggara and has adapted well and spreads in several districts, one of which is Bima [1].

Nearly 100 percent of beef cattle production in regency Bima is run by a farmer who lives in villages where agricultural produce such as rice plantations and various food crops are the main production to
support their livelihoods. They raise types of beef cattle such as Balinese cattle. Bali cattle have become the main source of income for breeders when they need a lot of money for both children's educational needs and religious and cultural ceremonial events. [2]

The availability of beef cattle is also prepared to meet the demand before Eid al-Adha and National Religious Holidays. This availability is also the contribution of Bima Regency as one of the centers of beef cattle production to meet the demand for meat during the religious holidays.

Deliveries of cattle out of the region as many as 6,500 beef cattle to be sent to Jabodetabek before Eid al-Adha are part of the quota for sending cattle of 78,159 heads in 2020. Realization of requests made by Bima regency in several regions as business partners in inter-island livestock trade transactions carried out between entrepreneurs from producing areas to consumer areas, both in the form of seeds and beef cattle.

The realization of the delivery of beef cattle and beef cattle originating from Bima Regency shows an increasing trend during 2010-2014, this is in line with the National policy which has established NTB as one of the centers for beef cattle production from several other regions such as Central Java, East Java, South Sulawesi, Lampung, DIY, Bali, NTT and NTB.

There are two livestock raising systems in Bima district, namely extensive and intensive. Intensive maintenance systems are often used in beef cattle in Indonesia because they are more efficient in terms of feeding, cleaning pens, handling disease, and washing livestock [3]. Extensive rearing systems are often used when raising cows through an investment pattern of mini-ranch breeding and pasture-based cow breeding business partnerships.

The small body size of Bali cattle is generally related to genetic traits and environmental contribution effects such as the quality and quantity of feed as well. [4] reported that Bali cattle have lower plasma bovine growth hormone levels (1.50 ± 0.78 µg / ml) compared to other breeds (1.7–3.3 µg / ml) [5,6]. The growth hormone is a well-known hormone that is responsible for animal growth.

Information on the maintenance system for male Bali cattle is important to obtain a suitable maintenance strategy for both breeding purposes (genetic enhancement) and fattening. So that the purpose of this study is to determine the body size (growth characteristics) of male Bali cows maintained in two different systems, namely intensive and extensive in Bima Regency, West Nusa Tenggara.

2. Materials and methods

2.1. Time and place of research
The research will be carried out at the location of people's farms in Bima Regency, West Nusa Tenggara in January 2019 - July 2020. The Bali cattle used are 100 male Bali cows (aged 4-8 years) which are kept intensively (in cages) of 50 heads and extensively there are 50 heads of grazing land for the farmer community in Bima Regency.

2.2. Method
To find out the maintenance system, interviews were conducted with breeders. The criteria for breeders who are used as respondents are to have adult male Bali cattle.

2.3. Retrieval of body size data
Parameters measured according to INS (2020) include:
1. Shoulder Height, measured from the highest point between the shoulders (withers) to the ground using a measuring stick in cm;
2. Chest circumference, measured in a circle around the chest cavity through the back of the hump and behind the shoulder joint (Os scapula) using a measuring tape in units of cm;
3. Body length, measured from the hump of the shoulder (scapula) to the tip of the pelvis (processus spinisus), expressed in cm.
2.4. Data analysis

Body size data were analyzed descriptively and quantitatively to obtain the mean and standard deviation using the T-test.

3. Results and discussion

Broadly speaking, the pattern of raising cattle consists of extensive, intensive, and a combination of both. According to [7] in the extensive rearing system, livestock is kept free and grazed the natural vegetation. In this system, livestock is released with the composition of males and several females in one population. For an intensive system, livestock is kept in specially made pens. [8] added that in intensive maintenance, cut and carry forage feeding.

The system for raising adult male Bali cattle in Bima Regency applies two systems, namely extensive and intensive. In the intensive system, male Bali cattle are kept for 24 hours (tail to the tail system) whereas in the extensive the opposite way, cattle are kept without drums/pasture.

Body size is one of the indicators in growth performance, identifying livestock genetic resources because, in addition to being used to differentiate between breeds, it can also be used for genetic distance analysis between livestock breeds. The measurement results show that adult male Bali cows in the intensive care system have better growth performance than the extensive system (P <0.05) (Table 1).

| Parameter                     | Maintenance Model |
|-------------------------------|-------------------|
|                               | Extensive (n=50)  | Intensive (n=50) |
| Shoulders height (cm)         | 144±19.51         | 148±28.66         |
| Body length (cm)              | 106±5.40          | 111±5.38          |
| Chest circumference (cm)      | 120±12.64         | 130±16.82         |

The variation in body size in different maintenance systems is relatively the same, except for chest circumference. This is due to the identified body size obtained from adult cows that have no longer experienced growth, and body size measurements tend to measure body frame. The body skeleton is related to bone growth, [9] states that at the age of about 2-3 years of fattening the bone growth rate has started to decline, and the next process is to increase the weight of meat and fat.

Growth is the change in the shape or size of an animal which can be expressed by its length, volume, or mass. Growth can be assessed by increasing the height, length, circumference, and bodyweight of an
animal. Cow growth is the increase in body weight and the development of body parts. The growth process in cows begins when fertilization occurs in the uterus, then birth, and then goes through adolescence or puberty until it becomes an adult. Rapid growth occurs in the period of birth to weaning and puberty (around the age of 8-10 months) [10]. Added [11] that growth and development is one of the important factors inbreeding (breeding). Growth is the increase in body weight or body size according to age. Development is more determined by changes in the proportions of various parts of the animal's body from embryo to adulthood.

[12] stated that livestock growth is usually indicated by changes in live weight, changes in height, or body length. The more weight you gain per day, the better the growth. Genetically, growth is limited to the adult body. For Bali cows, usually after adult body weight, this occurs because of the accumulation of fat, popularly known as fattening. Growth will decline after puberty until adulthood to the selling age.

Growth is influenced by many factors such as genetics and environment, one of which is maintenance patterns. In an extensive system, livestock has a higher chance of moving from one place to another than in an intensive system so that the energy expended is higher. According to [7], livestock raised in extensive systems can achieve slaughter weight 3 to 6 years longer than other rearing systems.

Apart from the rearing pattern, the feed factor is another factor that affects the growth of male Bali cows (weight and body size). The feed applied to Bali cattle is forage. In an intensive system, forage is given periodically as much as 30 kg per day with drinking ad libitum. Whereas in the extensive system, forage is obtained from grass that grows in grazing fields. The types of grass that grow are reeds, grinding. Drinking water in the form of ad libitum.

Competition for a feed between livestock in the extensive system may also be another factor that affects the lower growth performance compared to the intensive pattern. The intensive maintenance system for male Bali cattle can be an alternative to obtain a more optimal Balinese cattle growth performance, especially in the business of beef cattle fattening.

4. Conclusions
Based on the results that the Bali cattle intensive rearing system is better than the extensive rearing system. Therefore, the intensive system can be applied to get better growth performance and can be used for future fattening programs or national beef fulfillment selection.

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