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Morphometric Characteristics and Reproductive Performance of Pasundan Cattle in the North Prianganese and Southern South Coast Region

Mas Yedi Sumaryadi[1]   Euis Nia Setiawati[2*]   Agus Triyanto[2]   Vony Armelia[1]

1.Faculty of Animal Science, Jenderal Soedirman University, Grendeng, Purwokerto, Central Java, Indonesia
2.Cinagara Animal Health Training Center, Snakma Pasir Buncir Village, Caringin District, Bogor Regency, West Java, Indonesia

ARTICLE INFO	ABSTRACT

This study aims to determine the morphometric characteristics and reproductive performance of Pasundan cows which are extensively reared on smallholder farms in the coastal areas of the south (Garut, Cianjur, and Sukabumi) and North Priangan (Bogor, Purwakarta, and Sumedang). This research is descriptive research with a qualitative approach. Production characterization was carried out using a simple method, namely by measuring the body surface including shoulder height, chest circumference, body length, and bodyweight of Pasundan cattle. Meanwhile, the reproductive characteristics discuss puberty, service per conception (S / C), conception rate (CR), calving rate, postpartum estrus, postpartum mating, days open (DO), calving interval (CI), calving birth weight, calving rate, and calves weight growth. Data were collected by survey, and the location was determined by purposive sampling in the area of the seed source with the largest population and the random sampling of livestock was determined purposively as many as 30 Pasundan cows from each region. Data were analyzed using quantitative descriptive analysis. The results showed that the morphometric characteristics of Pasundan cattle included mean shoulder height of 123.0 0 ± 3.06a cm VS 121.34 ± 2.82a in males and 110.34 ± 2.78 vs 108.00 ± 2.14a in females. Body length 115.74 ± 3.30 cm VS 115.34 ± 2.97acm in males and 112.67 ± 2.97cm VS 109.67 ± 1.82 cm in females. Chest circumference 145.67 ± 2.97cm VS 142.67 ± 2.67cm bulls and 136.00 ± 2.95cm VS 131.00 ± 2.92cm in females, Bodyweight 268.0 ± 17.00 kg VS 246.00 ± 7.00a for males and 215.0 ± 15.00 kg VS 194.00 ± 54.00kg in females. As for reproductive characteristics, it shows puberty of 20-24 months., S / C 1.4 - 1.6, Conception rate 65-70%, calving rate 62.5-65%, Postpartum Estrus 50-60 days, postpartum mating 72-104 days, day -open 94-126 days and a calving interval of 12-14 months. Calves' birth weight was 18.0 - 18.5 kg and daily body weight gain ranged from 0.48 to 0.50 kg. It was concluded that the morphometric characteristics and reproductive performance of Pasundan cattle in the Pesisir Selatan area were better than North Priangan.

Corresponding Author:
Euis Nia Setiawati,
Cinagara Animal Health Training Center, Snakma Pasir Buncir Village, Caringin District, Bogor Regency, West Java, Indonesia;
E-mail: e.niasetiawati@gmail.com

1. Introduction

Pasundan cattle are one of Indonesia's germplasm and are the result of adaptation of more than ten generations between Bos sundaicus / banteng / Bali cows with Javanese cows, Madurese cattle and Sumba Ongole cows. The original distribution of Pasundan cattle is found in West Java Province including Pangandaran, Tasikmalaya, Garut, Cianjur, Sukabumi, Ciamis, Kuningan, Majalengka, Sumedang, Indramayu and Purwakarta districts, and is one of the potential new plasma to be developed.

Pasundan cattle are divided into two, namely the results of inbreeding Bali cattle to form non "gelambir" Pasundan cows, and the results of inbreeding PO cows to form sagged pasundan cows [1], while Indrijani et al. stated that Pasundan cattle have two types, namely Pasundan cow type gong/hump and not gongo / hump. Genetically, Pasundan cows come from interbreeding cows that are different from Bali cattle and PO cows [2]. Then the offspring occur inbreeding for ten offspring resulting in small body size. Pasundan cattle have small bodies, are resistant to tropical diseases, and can withstand extreme environmental changes including those with low-quality feed [3]. Pasundan cattle morphometric characteristics include body size with a shoulder height average of 115 cm in males and 109 cm in females. The average body length of the bulls is 120 cm and 110 cm for the females. The average male cow's chest circumference is 150 cm and 138 cm in females [4].

Conditions in the field still have several problems in terms of genetic resources, breeding, management, production, and diversity of Pasundan cattle such as diversity of body size of Pasundan cattle. Until now, scientific data for Pasundan cattle are still scarce and have not been documented in a unified whole, especially the morphometric characteristics and reproductive performance, therefore it is necessary to evaluate the morphometric characteristics and bodyweight considering that Pasundan cattle are a rich genetic resource of Indonesian local livestock which need to be developed, conserved and used sustainably as superior livestock that meets standardization. Morphometrics is a study that deals with variations and changes in livestock body size and is useful for identifying and describing livestock potential quantitatively [5].

The fact in the field of reproductive failure is one of the main factors that can cause a delay in estrus in Pasundan cattle, thus affecting the rate of the population development of Pasundan cattle. There are several indicators used to predict the suboptimal reproductive function of Pasundan cattle, including the low success of artificial insemination (IB), the high incidence of silent heat (calm estrus)

in heifers Pasundan cattle [6]. Reproductive displays can be used to calculate cycle times for existing livestock breeding, and can also be used to estimate future livestock populations. The reproductive performances observed included age at first mating (Puberty), age at calf weaning, service per conception (S / C), age at first birth, and calving interval (CI). Postpartum estrus (PPE), postpartum mating (PPM), and days open (DO) [7].

Pasudan cattle productivity improvement can be done by increasing its efficiency, including by increasing the number of calving births, shortening the calving interval, extending the mother's productive period, and optimizing mating management to prepare a sufficient number of feeders [8]. Many factors affect reproductive efficiency which includes external factors such as calf weaning management; quality of rations and limitations in the use of superior straws, altitude and internal factors such as cattle breeds and parent conditions [9]. Therefore, it is necessary to evaluate the morphometric and reproductive performance of cows as a selection of broodstock that will be used to produce feeder cows in the future.

Based on the background and existing problems, it is necessary to research with the aim of. Getting basic information about the genetic quality of livestock can be seen from the morphometric characteristics including shoulder height, body length, chest circumference, and bodyweight of female and male Pasundan cows aged 2 - 3 years and reproductive performance. The results of this study serve as a standard of selection and basic capital in the development of science on the formation of superior Pasundan cattle that are in the environmental and socio-cultural conditions of the community.

2. Material and Methods

The research was conducted with a survey method through direct observation and monitoring which was determined based on purposive random sampling. Respondents were determined purposively, namely following the research interests to gather information. The number of samples is determined by the conditions of the research area which can provide information and explain the research problem until it is satisfied so that the sample of respondents is limited by the target of information. Respondents consisted of: Pasundan cattle breeders (30 breeders/district), and formal figures that is 3 officers each from each district (Bogor District Animal Husbandry Service, Purwakarta District Animal Husbandry Service, Sumedang District Animal Husbandry Service, Sukabumi District Animal Husbandry Service, Cianjur District Animal Husbandry Service, and Garut District Animal Husbandry Service). Informant identity in terms of age (30-45 years),

informants who fall into the productive age group. At the productive age, physical strength is still good so that the response to taking action and efforts to increase knowledge and skills in receiving new information and technology to support livestock business and productivity is quite good (Wawan, A., dan Dewi. 2010.) [10]. Education (junior high school, high school and undergraduate), education can influence a person, including one's behavior regarding life patterns. Irawati. 2017 [11] states that a good level of education has an important role in the productivity of the livestock business being carried out. Farming experience (between 10 years and 20 years). Generally the experience of farmers has a positive correlation with productivity (Irawati. 2017) [11] This is included because it is thought to describe the general situation of breeders who are members of the Livestock Group.

This research is a descriptive research with a qualitative approach. The Cattle selected as samples were adult Pasundan (male and female) Cattle from the South Pesisr region (Garut, Cianjur and Sukabumi) and the North Priangan region (Bogor, Purwakarta, and Sumedang). The number of samples of Cattle from each place was 30 Cattle (male 15 head and female 15 head), 2-5 years old and not pregnant to avoid bias in measurement, based on simple random sampling of 30 heads (male 15 head and female 15 head), which is a method in which all sample members are considered to have the same characteristics, so that the Cattle taken can represent their population [12]. The equipment used to measure variables in Cattle is tape measure, measuring stick 200 cm high with an accuracy level of 0.1 cm; measuring tape in units (cm) with an accuracy level of 0.1 cm, laptop, stationery, and camera. Measurements of body surface parts are taken while the cattle are in a normal standing condition. Meanwhile, the evaluation of reproductive characteristics was carried out using a questionnaire equipped with a structured list of questions aimed at breeders and to obtain further information. An in-depth interview was carried out with several key informants. The variables observed were morphometric characteristics which included shoulder height, body length, chest circumference, and body weight of female Pasundan cows aged 2.0–5.0 years who were not pregnant. The reproductive characteristics observed included puberty age, service per conception, S / C), conception rate (CR), postpartum estrus calving rate, postpartum mating, days open (DO) and calving interval.

2.1 Morphometric Characteristics Analysis

a). The height of the shoulders is measured based on the distance from the flat surface to the top of the shoulder which passes perpendicular to the Scapulla, using a measuring stick.

b). Body length is measured based on the distance from the shoulder blade (tuberosity humeri) to the end of the sitting bone (Tuber ischii), using a measuring stick.

c). Chest circumference is measured by wrapping a measuring tape on the chest behind the shoulders.

d). Body weight is the actual body weight of Pasundan cattle which is measured by scales in kilograms or using a Rondo measuring tape. Measurement body is performed while the cow is standing straight on a flat plane ("parallelogram" livestock position). Bust is measured in cm taken by following the circle chest or body just behind the forelegs cattle using a Rondo measuring tape.

Data were analyzed on average (Mean) and explained descriptively, which aims to describe the facts and explain the object of research as well as to dig up the information needed by the reality as it is.

Average / Mean (X)

$$\bar{x} = \frac{\sum x_i}{n}$$

Information:

X = Average

$\sum x$ = Number of data values

n = Number of samples

Then the data sizes were analyzed using correlation analysis system (SAS) 9.1.3

2.2 Reproductive Characteristics Analysis

a). Puberty age is the age at which a female Pasundan cow occurs for the first time in heat which is determined in months.

b). Service per conception is the number of matings that are carried out until pregnancy or the average number of inseminations required by a female cow until pregnancy occurs in units of times [13].

c). Conception rate is the number of Pasundan Cattle that are pregnant as a result of the 1st IB (first) divided by the number of cows that were bred times 100 in units of percent, which were diagnosed perrectal [14] or the number of Cattle that were pregnant at the first IB divided by the total number of broodstock that has been bred is then multiplied by one hundred.

d). The calving rate is the number of children born at the first IB divided by the number of Cattle in IB multiplied by one hundred percent within a certain period.

e). Post partum estrus is the length of time the Pasundan Cattle emerge after giving birth in days.

f). Post partum mating is the length of time Pasundan Cattle are bred again after giving birth in days.

g). Days open is the length of time from delivery to pregnancy again in days.

h). Calving interval (range of birth, CI) is the length of time from birth to next child in months.

3. Results and Discussions

3.1 Morphometric Description of Pasundan Cattle

Descriptive information on the morphometric characteristics of pasundan cattle can be used as a database for selection. Selection to improve the performance of cattle can be done through the selection of prospective elders or selection of prospective bulls or selection of prospective broodstock [15], based on morphometrics of body size and body weight. The morphometric performance (body size) of Pasundan cattle provides information on quantitative characteristics. The average live weight and body size are presented in Table 1.

The data in Table 1 show that Pasundan cattle in the Pesisir Selatan area have a higher body size than North Priangan with the following mean shoulder height 123.0 0 ± 3.06cm VS 121.34 ± 2.82a for males and 110.34 ± 2.78 vs 108.00 ± 2.14a in females. Body length 115.74 ± 3.30 cm VS 115.34 ± 2.97acm in males and 112.67 ± 2.97cm VS 109.67 ± 1.82cm in females. Chest circumference 145.67 ± 2.97cm VS 142.67 ± 2.67cm bulls and 136.00 ± 2.95cm VS 131.00 ± 2.92cm in females, Bodyweight 268.0 ± 17.00 kg VS 246.00 ± 7.00 kg for males and 215.0 ± 15.00 kg VS 194.00 ± 54.00kg. The results

of correlation analysis showed that Pasudan cattle in the Pesisir Selatan area were significantly different (< 0.05) better than Pasundan cattle in North Priangan. The difference in the body morphometric size of the Pasundan cattle is thought to be very much influenced by the place of life associated with the maintenance management which has two agroecosystems with different topographies. On the other hand, it is suspected that in some areas of the population base in North Priangan, there have been changes in land use and changes in forest cropping patterns which have caused Pasundan cattle to lose their carrying capacity for grazing, so that the availability of forage is decreasing. This condition is thought to be a factor triggering the decline in the appearance of Pasundan cattle on an ongoing basis. The conversion of agricultural land to residential, industrial, and shopping centers causes the availability of forage to decrease, especially for farms located around cities (urban areas) [16].

Poor nutrition will not only reduce performance below its genetic potential but also increase the negative impact on the environment. On the other hand, differences in body size are also caused by environment and genetics. There is a high level of diversity in livestock, so it is necessary to apply genetic quality improvement through precise and accurate selection [17]. Animal body size can be used as a selection standard to obtain livestock that has a larger size [18]. It is estimated that 70% of livestock

Table 1. Average Body Size of Pasundan Cows in North Priangan and Pesisir Selatan

Variable	Gender	Southern South Coast Region	North Priangan region	Regulation of the Minister of Agriculture Number 1051 / Kpts / SR.120 / 10/2014)
Body length (Cm)	♀	112.67 ± 2.97[a]	109.67 ± 1.82[b]	109.74 ± 6.30[c]
	♂	115.74 ± 3.30[a]	115.34 ± 2.97[b]	115.74 ± 8.40[c]
Shoulder height (Cm)	♀	110.34 ± 2.78[a]	108.00 ± 2.14[b]	110.09 ± 9.68[c]
	♂	123 .0 0 ± 3.06[a]	121.34 ± 2.82[b]	120.09 ± 9.80[c]
Chest size(Cm)	♀	136.00 ± 2.95[a]	131.00 ± 2.92[a]	138,22 ± 11.85[c]
	♂	145.67 ± 2.97[a]	142.67 ± 2.67[b]	150,22 ± 11.76[c]
Body weight (kg)	♀	215.0 ± 15.00[a]	194.00 ± 54.00[b]	220.30±22.00[c]
	♂	268.0 ± 17.00[a]	246.00 ± 7.00[b]	240.40 ±34.00[c]

[a, b,c] *superskrip yang berbeda pada baris yang sama menunjukkan perbedaan yang nyata (P<0.05).*

productivity is influenced by environmental factors, while 30% is influenced by genetic factors [19].

In general, the body size of Pasundan cattle in the North Priangan and South Coastal regions has the same relative body size as the criteria for Pasundan cattle in the excerpt of the Decree of the Minister of Agriculture of the Republic of Indonesia Number 1051 / Kpts / SR.120 /10/2014. Likewise, when compared with the data available in the West Java Provincial Animal Husbandry Office[4], it includes the average height of the male Pasundan cattle 115 cm and 109 cm in females, the body length of the bulls is 120 cm and the females are 110 cm, this shows that that the same result.

The variation in body size of Pasundan cows, presumably due to the spread of Pasundan cattle in one land that is not separated and the traditional system of grazing is thought to be an opportunity for livestock migration to allow the opportunity for undirected mating. Production is a manifestation of the interaction between internal/genetic and external/environmental factors [20]. The environment can be nutritional, climatological, and managerial. Factors

of differences in location, maintenance management, and direction of selection can affect body size [17]. The difference in the body size of Pasundan cattle is influenced by their place of life-related to maintenance management and distribution of the population of Pasundan cattle in 11 districts which have two agroecosystems with different topographies, namely forest and coastal buffer zones [2]. phenotypic of a livestock breed are caused by selection, migration, marriage, and genetics [21].

3.2 Pasundan Cattle Reproduction Performance

Research data regarding the reproductive performance of Pasundan cattle kept semi-intensively and extensively in the Pesisir Selatan and North Priangan areas were analyzed using quantitative descriptive statistical analysis. The reproduction performance description is presented in Table 2.

The results in this study (Table 2) indicate that the reproductive performance of Pasundan cattle in semi-intensive and extensive rearing systems is the puberty of 20-24 months, S / C 1.4 - 1.6, conception rate 65-70%, calving

Table 2. Reproductive Performance of Pasundan Cows

Reproductive Parameters	Southern South Coast Region	North Priangan region
Servic perconseption (SC) (Time)	1.4	1.6
Conception rate,	70.0	65.0
CR (%)	65.0	62.5
Calving interval (Month)	Dec-13	13-14
Post Partus Estrus (Days)	50.0	60.0
Post Partus Mating (Days)	72-94	82-104
Day-open (Days)	94-104	104-126
Puberty(Month)	20-24	22-24
Birth Weight (Kg)	18.5	18.0
Age Body Weight 120 days (kg)	78.5	75.6.
Calf Daily Weight Gain (kg)	0.50	0.48

rate 62.5-65%. Postpartum Estrus 50-60 days, postpartum mating 72-104 days, day-open 94-126 days, and a calving interval of 12-14 months. The results of this study, when compared with the reproductive performance of other local Indonesian cattle, are relatively similar. Aceh cow puberty is reached at the age of 12-24 months [22]; Female PO cows range from 12 - 18 months, Bali cattle range from 18-26 months [23]. The occurrence of delayed puberty or delayed puberty is a weakness in Pasundan heifers allegedly caused by environmental factors including ambient temperature and humidity. Environmental temperature can directly affect the body of the cow, high temperature (heat) can cause strong heat stress in the cow, and eventually, the cow becomes stress, which can affect the formation of the hormone estradiol so that the estrous cycle fluctuates [24]. High temperatures (27 ℃ - 34 ℃) can slow down the puberty process in cows [13]. Lack of energy can inhibit sexual development and puberty in livestock [25]. For livestock to live comfortably and physiological processes to function normally, an appropriate environmental temperature is needed, generally, cows need a comfortable temperature of 13 ℃ - 18 ℃ [26].

Environmental temperature can affect livestock body temperature and grazing (eating) activities, besides livestock that are kept at high environmental temperatures will drink more to regulate their body temperature, so that consumption and ration efficiency decrease and interfere with metabolic activity in the body [27]. On the other hand, in this research location, cows are kept extensively where the cows only receive forage according to what is available in the pasture, and when the dry season occurs, the availability of forages decreases in quality and quantity, so it is suspected that there is a negative nutritional balance that will affect ovarian activity and response. Lack of nutritional intake will affect metabolic compounds and hormones such as insulin and insulin-like growth factor-I which affect the hypothalamus and pituitary to respond to the ovaries and the sensitivity of gonadotropin hormones in the pituitary so that the body's energy will suppress the release of gonadotropin releasing hormone (GnRH) and affect pulsatile frequency. Luteinizing hormone (LH) which is needed for follicle growth. This condition will cause delayed puberty due to the follicles not developing into atresia-dominant or ovulation-dominant follicles, in addition to causing a decrease in ovarian function or reversible ovarian hypofunction. Ovarian hypofunction that is not treated immediately will lead to irreversible ovarian atrophy. Low feed intake will delay puberty accompanied by a decrease in the development of ovarian follicles so that low feed intake in female cattle can make the dominant follicles smaller [28]. Lack of feed, especially for hot

tropical areas, including Indonesia, is one of the causes of decreased reproductive efficiency because it is always followed by reproductive disorders that cause infertility in female livestock [29].

The average service preconception (S / C) for PO cattle is 1.28 times [30], lowlands 1.5 and uplands 1.3 (Iskandar 2011), lowlands 1.64 ± 0, 77 times and the plateau 1.94 ± 0.87 times [20]; PO cattle 1.28 ± 0.32 times and Limousin Cross-breed cattle 1.52 ± 0.39 times. Service per conception is influenced by several factors, namely the accuracy of detecting lust, the condition of livestock, and the skills and accuracy of the inseminator in implementing insemination [31].

Conception rate (CR) is determined by male fertility, female fertility, and insemination techniques [32]. A good CR is 60-70%, while what is understandable for conditions in Indonesia is based on considerations of natural conditions, management, and distribution. Livestock that spread is considered good if the CR reaches 45-50% [14]. day - open (DO) PO cattle 156.9 ± 29.33 days and Limousin Peranakan cattle 172.9 ± 19.21 days [33]. Bali 351-440, Post partus estrus (PPE) of Bali cattle between 106-165 days [33]; Postpartum mating (PPM) of PO cattle is 154.05 ± 13.56 days [34].

The reproductive performance (service preconception, calving rate, and calving interval) of Pasundan cattle in the Pesisir Selatan area is relatively better than cattle in the North Priangan region. This difference is thought to be influenced by different maintenance, feeding, and environmental management. The feed given in the North Priangan region is likely to be in a negative energy balance, as a result of relatively warmer temperatures (21.8 - 30.4 degrees).

Centigrade affects the body's metabolism of livestock. Dietary nutrition given before and after childbirth will affect the CR value because nutritional deficiency before childbirth will cause a delay in the estrous cycle [30]. The timing of ovulation of the dominant follicle and energy balance in a negative condition results in decreased postpartum LH secretion, consequently slowing Resumption of ovary activity [35], Studies on the importance of adequate feed (forages and concentrates) on the success of a marriage (artificial insemination and intensification of natural mating) have been widely reported. Inadequate feeding will inhibit the development of reproductive organs and interfere with hormone secretion. On the other hand, the excess feed will cause excess body weight or obesity which will interfere with the development of the heifer's body and ovulation disorders in adults cows, but there was a miscarriage or the pregnancy was safe until the child was born but the child was weak because the moth-

er lacked nutrition [36, 37, 7, 38]. Lack of crude protein in the feed of female cows will cause the potential for silent heat to be higher, so that heat is difficult to detect and delay in mating [39]. Factors that affect reproductive efficiency include the nutritional feed contained in the ration which affects the reproductive organs and the function of the glands that produce hormones, management or management, temperature and season greatly affect reproductive traits, Reproductive performance including days open, calving interval, and service per conception highland dairy cows are significantly better than lowland cattle, this condition is related to a decrease in feed consumption and digestibility in cattle experiencing stress due to hot environmental temperatures [40].

Pasundan cattle genetically have good reproductive potential even in extreme environmental conditions, can utilize low-quality feed, and have good reproductive power, which is able to produce children between 12-14 months and can give birth between 10-20 times throughout their life.

Many factors affect the individual reproductive performance of Pasundan cattle which are often difficult to identify. Even in optimum conditions, the reproduction process of Pasundan cows can be imperfect due to the contribution of various influencing factors during the pregnancy process until the calf is born safely. Understanding the relationship of various factors in influencing livestock fertility is of course essential to optimize the reproductive performance of each Pasundan female cow and livestock business. To increase the reproductive efficiency of Pasundan cattle, it is necessary to pay attention to complex processes related to reproductive traits that involve aspects of genetics, physiology, nutrition, management, and the environment. Therefore, livestock productivity depends on these factors which are limiting factors. The low productivity of local livestock is probably due to the very large role of genetic factors as limiting, although the influence of environmental factors also exists. Based on these conditions, changes in genetic composition can make an important contribution to efforts to increase livestock productivity, while environmental improvement plays a role in providing an atmosphere that supports the appearance of its genetic potential. Livestock with good genetic traits will not express their genetic potential without being supported by a supportive environment. It is even known that in shaping appearance, the environment has a greater effect than genetic traits.

Almost all of the Pasundan cattle business are semi-intensive community farming business, which is an activity to take advantage of free time, available land and labor, and agricultural by-products to produce more valuable products for income improvement. This condition influences the characteristics of the management of livestock raising carried out by livestock farmers, which is indicated by relatively inadequate feeding procedures and disease control efforts.

4. Conclusions

The morphometrics of Pasundan cattle in the Southern South Coast Region (Garut, Cianjur, and Sukabumi) are better than those in North Priangan Region (Bogor, Purwakarta, and Sumedang), although they start with almost the same birth weight and calf weight gain. The reproductive performance of Pasundan cattle in the Pesisir Selatan area is better than in the North Priangan area, but in general, it is almost the same as other local Indonesian cattle.

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