Original Research Paper

Identification of Qualitative and Quantitative Characteristics of Male Bali Cattle in Dompu District

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Abstract: Livestock identification is a form of recording that must be done to provide information about individual livestock. This study aimed to identify the qualitative and quantitative characteristics of male bali cattle in Dompu Regency. Data analysis was carried out using statistics descriptive, using the average, standard deviation, and coefficient of variation. One hundred twenty male bali cattle aged 1-36 months were used as samples. The results showed the frequency of each feature was 47.5% light brown fur color, 32.5% dark brown, and 20% black. The eel line was 40% thick line, 15% medium line, 25% thin line, and 20% did not have eel line. The metatarsal color was 87.5% white with a firm border and 12.5% white with an indistinct border. The rump color was 82.5% white with a firm boundary and 17.5% white with an indistinct boundary. The tail feather color was 37.5% black-brown, 32.5% brown, and 30% black. Furthermore, the measurement results obtained for quantitative properties were 113.8 ± 10.0 for body length, with a 8.8% coefficient of variation. Chest circumference were 147.2 ± 11.8, with a 8.0% coefficient of variation. Back height were 112.0 ± 7.9, with a 7.1% coefficient of variation. Hip height were 115.8 ± 8.4, with a 7.2% coefficient of variation. Body weight were 287.6 ± 40.1, with a 14.0% coefficient of variation. The study results show that the male bali cattle characteristics at Dompu Regency are relatively heterogenous, both qualitatively and quantitatively.

Keywords: Male bali cattle, qualitative characteristics, quantitative characteristics.

Introduction

Livestock are animals resulting from a domestication or taming process that can be used for consumption, as a means of transportation, or as pets or beloved livestock (Daud, 2021). Livestock in Indonesia based on the domestication process is generally grouped into native livestock and local livestock. Based on Regional Regulation (PERDA) Number: 10/2018 concerning Management of Local Genetic Resource, native livestock is livestock whose wild relatives originate from an area of Indonesia and the domestication process occurred in Indonesia. Meanwhile according to government regulations (Perpu) Number 48/2011 about Animal Genetic Resources and Livestock Breeding local livestock is livestock resulting from crosses or introductions from abroad that have been bred in Indonesia to the fifth generation or more and adapt to the local environment or management.

According to Saputra et al., (2019), bali cattle are native Indonesian germplasm originating from the island of Bali. Bali cattle have various advantages, so many breeders keep them. Bali cattle have the advantage on high adaptability (Zafitra et al., 2020). Bali cattle are Indonesian germplasm resulting from domesticated from wild bulls (Martojo, 2003). However, based on scientific studies through DNA analysis, bali cattle are not the result of the domestication of bulls because they have zebu and bull genes, with a gene composition of 79% bull and 21% zebu. Based on the gene composition, bali cattle are the result of a cross

between a bull and a zebu which was graded up towards the bull (Winaya et al., 2007).

Livestock identification is a form of recording that must be done to provide information about individual livestock. The recording model applied to bali cattle production performance in this research includes qualitative and quantitative characteristics. Qualitative traits are traits that cannot be measured but can be grouped, while quantitative traits are traits that can be measured (Dewi and Wahyuni, 2020). According to Putra et al., (2015), recording livestock production is needed to prepare superior livestock. Morphometrics relates to variations and changes in livestock body size and is useful for quantitatively describing livestock potential (Takandjandji and Sawitri, 2015).

Dompu Regency is a district in West Nusa Tenggara Province. The capital city is Dompu. This district is in the central part of Sumbawa Island. The area is 2.321,55 km² with a population of around 200,000 people. The population of cattle in Dompu Regency in 2016 was 88.615 tails (Badan Pusat Statistik, 2017). Based on the description above, researchers need to carry out this research activity with the hope of obtaining information and being able to provide deeper knowledge and insight regarding the identification of qualitative and quantitative characteristics of male bali cattle and being able to apply the research results to the livestock community environment. Therefore, this research aims to determine the qualitative and quantitative characteristics of identified male bali cattle in Dompu Regency. Apart from that, this research is expected to provide information regarding the characteristics of male bali cattle in Dompu Regency, both qualitatively and quantitatively.

Materials and Methods

Location and time of research

This research was implemented in November 2021 located in Dompu Regency, West Nusa Tenggara, namely in 6 sub-districts (Dompu, Hu'u, Kempo, Manggelewa, Pajo, and Pekat).

Research material

The tools used in this research were stationary, mobile phone to capture images, measuring tape, and measuring sticks. The material used in this research was male bali cattle consisting of 40 calves, 40 heifers, and 40 adults, with age criteria divided into 1-6 months, 6-18 months, and 18-36 months.

Research steps

Livestock body measurements (quantitative characteristics) are carried out when the cow stands upright on a flat plane. Measurement of livestock body size is carried out as follows:
1. Body length (cm) is measured by drawing a horizontal line from the front edge of the shoulder to the back edge of the hump of the sitting bone using a measuring stick.
2. Chest circumference (cm) is measured in cm which is taken by following the chest or body circumference just behind the shoulder through the gumba or in humped cattle just behind the hump using a measuring tape.
3. Back height (cm) is measured from the highest part of the back, namely at the 12 ribs to the bottom, following a perpendicular line using a measuring stick.
4. Hip height (cm) is measured by placing the measuring stick perpendicularly and ensuring that the horizontal part of the stick is exactly above the hips.
5. Animal body weight is determined based on chest circumference measurements found on a measuring tape.

Observed variables

The variables observed in this study were qualitative characteristics (fur color, horn color, eel line, metatarsal color, white color on the rump, and tail color) and quantitative characteristics (body length, chest circumference, back height, and hip height).

Data analysis

Data analysis was carried out using statistics descriptive, using the average $(\bar{x})$ standard deviation (S), and coefficient of variation (KK), with the following equation.

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

$$S = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

$$KK = \frac{S}{\bar{x}} \times 100\%$$

With x_1, x_2, ..., x_n being the observation values and n being the amount of observation data (Harini and Kusumawati, 2007).

Results and Discussion

Qualitative characteristics
Fur color

The basic types of hairdressing can be distinguished between color and heterogeneous color. Color is that which covers the entire surface of the body to form a uniform color, while heterogeneous color is a color that has two different types. The percentage of coat color is explained in Table 1.

Table 1. Percentage of fur color

Cattle aged	Fur color	Amount (tail)	Percentage of each type
Calf (1-6 months)	Brick red	40	100%
Heifer (6-18 months)	Light brown	35	87,5%
	Dark brown	5	12,5%
Adult (18-36 months)	Light brown	19	47,5%
	Dark brown	13	32,5%
	Black	8	20%
Total		**120**	

The results of research identification of the qualitative characteristics of fur color in male bali cattle aged calf, heifer, and adults in Dompu Regency showed that the highest fur color in calf was brick red and the lowest in heifer was dark brown. The results of research conducted by Andoyo et al., (2014), namely that the fur color is dominated by brick red. The fur color of bali cattle changes according to age and gender, so cattle are included in the group of animals with sexual dimorphism. Changes in fur color that occur in male bali cattle are caused by the influence of the testosterone hormone (Bandini, 2004).

Horn color

Horns are parts of the body of some animals that grow from the head which is a projection made of tough skin. The horns on bulls grow well and are black. Table 2 below explains the percentage of horn color based on the age of male bali cattle. The color of the horns on male bali cattle aged calf, heifer, and adult is dominated by the calf, namely a faded brown color. The results of the horn color of male bali cattle showed that there were 8 animals whose horns were not identified. Andoyo et al., (2014) stated that all male bali cattle have horns. Factors that influence the differences in horns are gender, age, livestock lacking calcium, and the hormone testosterone (Ris et al., 2012).

Table 2. Percentage of horn color

Cattle aged	Horn color	Amount (tail)	Percentage of each type
Calf (1-6 months)	Faded brown	26	65%
	Not identified	7	17,5%
	Faded black	4	10%
	Black	3	7,5%
Heifer (6-18 months)	Faded brown	22	55%
	Black	10	25%
	Faded black	7	17,5%
	Not identified	1	2,5%
Adult (18-36 months)	Faded brown	21	52,5%
	Faded black	12	30%
	Black	7	17,5%
Total		**120**	

Eel line

Table 3. Percentage eel line

Cattle aged	Eel line color	Amount (tail)	Percentage of each type
Calf (1-6 months)	Thick	21	52,5%
	Medium	12	30%
	Thin	7	17,5%
Heifer (6-18 months)	Thick	16	40%
	Medium	15	37,5%
	Thin	5	12,5%
	Not have	4	10%
Adult (18-36 months)	Thick	16	40%
	Thin	10	25%
	Not have	8	20%
	Medium	6	15%
Total		**120**	

On the backs of bali cattle, black hair is usually found that forms a straight line that extends from the gumba to the base of the bali cattle's tail. Table 3 below explains the percentage of eel lines based on the age of male bali cattle. The characteristics of the eel line in male bali cattle aged calf, heifer and adult obtained the highest percentage, namely the thick eel line. The characteristics of eel lines that extend along the back are dominated by thick, medium and thin lines

Metatarsal color

Both male and female bali cattle have white-like socks (white stockings) found on the bottom four legs and above the hooves. Table 4 explains the percentage of metatarsal color based on the age of male bali cattle. Other characteristics show that the highest percentage of metatarsal color in male bali cattle aged calf, heifer, and adult is obtained, namely white metatarsal color with firm boundaries. The results of the metatarsal color in male bali cattle are visible and dominated by white metatarsals with firm boundaries with the fur color and are found in all ages of male bali cattle.

Table 4. Percentage metatatrsal color

Cattle aged	Metatarsal color	Amount (tail)	Percentage of each type
Calf (1-6 months)	white with firm borders	31	77,5%
	white with an indistinct border	9	22,5%
Heifer (6-18 months)	white with firm borders	34	85%
	white with an indistinct border	6	15%
Adult (18-36 months)	white with firm borders	35	87,5%
	white with an indistinct border	5	12,5%
Total		**120**	

White color on the rump

The white color on the cattle rump or what is usually called a white mirror on the cattle rump is common in Bos sondaicus cattle, such as bali cattle and Madurese cattle. The percentage of white color on the rump based on the age of the male bali cattle is explained in Table 5. Furthermore, the results of the research showed that the white rump or mirror white color of male bali cattle aged calf, heifer, and adult was obtained in the highest percentage, which was dominated by white rump color with firm boundaries. This happens to all ages of bali cattle. The results of other research were also carried out on female bali cattle and obtained a white rump color with firm boundaries that were more dominant (Gobel *et al.*, 2021).

Table 5. Percentage of white color on the rump

Cattle aged	White color on the rump	Amount (tail)	Percentage of each type
Calf (1-6 months)	white with firm borders	28	70%
	white with an indistinct border	12	30%
Heifer (6-18 months)	white with firm borders	28	70%
	white with an indistinct border	12	30%
Adult (18-36 months)	white with firm borders	33	82,5%
	white with an indistinct border	7	17,5%
Total		**120**	

Tail color

The tip of the bali cattle tail is black. However, from the results of observations made in the field, there are various colors on the tip of the tail of bali cattle. Table 6 below explains the percentage of color at the tip of the tail based on the age of male bali cattle. The final characteristic is the color of the tail tip of male bali cattle aged calf, heifer, and adult. The highest percentage was found in heifers with black tips. Then, calf cattle with brown tips and adult cattle with black-brown tips. The color results on the tip of the tail of male bali cattle show that black tails are more dominant in male bali heifer. Meanwhile, according to the results of research conducted by Andoyo *et al.* (2014), the color of the tip of the tail of male bali cattle is highest, namely black at all ages of male bali cattle.

Table 6. Percentage tail color

Cattle aged	Tail color	Amount (tail)	percentage of each type
Calf (1-6 months)	The tip is brown	20	50%
	The tip is black-brown	11	27,5%
	The tip is black	9	22,5%
Heifer (6-18 months)	The tip is black	26	65%
	The tip is brown	9	22,5%
	The tip is black-brown	5	12,5%
Adult (18-36 months)	The tip is black-brown	15	37,5%
	The tip is brown	13	32,5%
	The tip is black	12	30%
Total		**120**	

Quantitative characteristics
Body length

Livestock body length is the longest part of the livestock's body which can be measured using a measuring stick. Body length is measured by drawing a horizontal line from the front edge of the shoulder joint to the back edge of the hump of the sitting bone, expressed in cm.

Table 7. Statistics descriptive of body length

Cattle aged	Statistics	
	Average ± SD	Coefficient of variation
Calf (1-6 months)	81,5 ± 13,4	16,4
Heifer (6-18 months)	98,8 ± 8,6	8,7
Adult (18-36 months)	113,8 ± 10,0	8,8

The standard deviation and coefficient of variation values for body length of male bali cattle were highest, namely for male bali cattle with calf and the lowest were for male bali cattle, heifer. Based on the Indonesian National Standard (SNI) 7651.4: 2020 regarding the requirements for male bali cattle, male bali cattle aged 18-24 months have a minimum body length of 119-125 cm. The research results show that the largest body length for each calf of male bali cattle is 105 cm, for heifer bali cattle is 125 cm, and for adult male Bali cattle 145 cm (Badan Standarisasi Nasional, 2020). Differences in genetic factors and rearing management between bali cattle and Simmental-bali cross (Simbal) cattle show that the body length of bali cattle has decreased while Simbal cattle have experienced improvements in genetic quality (Syaiful et al., 2020).

Chest circumference

The body measurements used in estimating the body weight of cattle are usually chest circumference and body length. Chest circumference is expressed in cm and is measured by following the chest circumference using a measuring tape. The standard deviation value for the chest circumference of male bali cattle is highest in male bali cattle with calf and the lowest is in bali male heifer. Furthermore, the value of the coefficient of variation in the chest circumference of male bali cattle is highest in male bali cattle calves and the lowest in adult male bali cattle.

Table 8. Statistics descriptive of chest circumference

Cattle aged	Statistics	
	Average ± SD	Coefficient of variation
Calf (1-6 months)	96,0 ± 15,7	16,4
Heifer (6-18 months)	121,8 ± 10,7	8,8
Adults (18-36 months)	147,2 ± 11,8	8,0

Based on the Indonesian National Standard (SNI) 7651.4: 2020 regarding the requirements for male bali cattle, male bali cattle aged 18-24 months have a minimum chest circumference of 142-155 cm. The results of the research show that the largest chest circumference for each calf of male bali cattle is 117 cm, for heifer bali cattle is 140 cm, and for adult male bali cattle 173 cm (Badan Standarisasi Nasional, 2020).

Back height

Livestock of different age groups will have different body sizes. Back height is the highest point of the back to the ground. Back

height is measured from the highest part of the back through the scapula to the base following a perpendicular line using a measuring stick, expressed in cm. The standard deviation and coefficient of variation values for the back height of male bali cattle were highest, namely for male bali cattle with calf, and the lowest for male bali cattle, namely for male bali cattle. Based on the Indonesian National Standard (SNI) 7651.4: 2020 regarding the requirements for male bali cattle, male bali cattle aged 18-24 months have a minimum back height of 105-115 cm. The results of research that has been carried out show that the largest back height for each calf of male bali cattle is 104 cm, for male bali heifer is 117 cm, and for adult male bali cattle 134 cm (Badan Standarisasi Nasional, 2020).

Table 9. Statistics descriptive of back height

Cattle aged	Statistics	
	Average ± SD	Coefficient of variation
Calf (1-6 months)	85,4 ± 13,0	15,2
Heifer (6-18 months)	100,4 ± 6,9	6,9
Adult (18-36 months)	112,0 ± 7,9	7,1

Hip height

Hip height is the highest distance between the hips perpendicular to the ground. Hip height is measured by placing the measuring stick perpendicularly and making sure the horizontal part of the stick is exactly above the hips. Hip height is expressed in cm.

Table 10. Statistics descriptive of hip height

Cattle aged	Statistics	
	Average ± SD	Coefficient of variation
Calf (1-6 months)	89,1 ± 12,4	14,0
Heifer (6-18 months)	103,6 ± 6,7	6,4
Adult (18-36 months)	115,8 ± 8,4	7,2

The standard deviation and coefficient of variation values for hip height of male bali cattle were highest in male bali cattle with calf and the lowest was in male bali cattle with the heifer.

The results of the research showed that the largest hip height for male bali cattle for each calf was 107 cm, bali heifer was 120 cm, and adult male bali cattle were 141 cm. Hip height is used as one of the parameters determining the selection of breeding stock.

Body weight

The calf's weight at birth is influenced by fixed effects, namely gender, parity, and season. The birth weight of males is higher than that of females. This is due to the hormonal system (Susanti *et al*., 2015). The presence of steroid hormones is the hormone testosterone which is produced by the testes in livestock (Setiyono *et al*., 2017). Knowing body weight is important, because it is used to estimate meat production, carcass percentage, and animal feed requirements (Tonbesi *et al*., 2009). Body weight in cattle can be calculated using the formula. The body measurements used in estimating the body weight of cattle are usually chest circumference and body length (Hikmawaty *et al*., 2018). Body weight is expressed in kilograms (kg).

Table 11. Statistics descriptive of body weight

Cattle aged	Statistics	
	Average ± SD	Coefficient of variation
Calf (1-6 months)	141,6 ± 35,4	25,0
Heifer (6-18 months)	207,8 ± 30,0	14,4
Adult (18-36 months)	287,6 ± 40,1	14,0

The standard deviation value for the body weight of male bali cattle is highest for adult male bali cattle and the lowest is heifer male bali cattle. Furthermore, the value of the coefficient of variation in the body weight of male bali cattle was highest, for male bali cattle with calf and the lowest for adult male bali cattle. The results of the research showed that the largest body weight for each bali male calf was 193.2 kg, for bali male heifer was 262.4 kg, and for adult male bali cattle was 380.3 kg. The greater the increase in body weight per day in livestock, the better the growth.

Conclusion

The results of research on male bali cattle which was carried out in Dompu Regency, samples showed that the highest fur color in calves was brick red, heifer and adult cattle were light brown. The horn color of the highest samples in calf, heifer and adult is faded brown. The characteristic of the eel line from the highest samples in calf, heifer and adult is thick. The metatarsal color of the highest samples in calf, heifer and adult is white with firm boundaries. The rump color of the highest samples in calf, heifer and adults is white with firm borders. The tail color of the highest samples in calf is brown, heifer are black, and adult are black - brown. In quantitative data analysis, it was found that the lowest body length variation coefficient value of the sample was for heifer male bali cattle, the lowest chest circumference was for adult male bali cattle, the lowest back height was for male bali heifer, the lowest hip height was for male bali heifer, and the weight lowest body is an adult male bali cattle.

Acknowledgment

Reference

Andoyo, S., Yoku, O., Widayati, T. W., & Sumpe, I. (2014). Sifat Kualitatif dan Kuantitatif Sapi Bali di Kampung Inam dan Jandurau, Distrik Kebar, Kabupaten Tambrauw, Provinsi Papua Barat [translate: Qualitative and Quantitative Characteristics of Bali Cattle in Inam and Jandurau Villages, Kebar District, Tambrauw Regency, West Papua Province]. *Skrispi*. Fakultas Peternakan, Universitas Negeri Papua. Manokwari. DOI: https://doi.org/10.14334/Pros.Semnas.TPV-2014-p.42-46.

Badan Pusat Statistik Kabupaten Dompu. (2017). Kabupaten Dompu Dalam Angka [translate: Dompu District in Numbers]. BPS Kabupaten Dompu.

Bandini, Y. (2004). Sapi Bali [translate: Bali Cattle]. Penebar Swadaya. Jakarta.

Daud, M. (2021). Ternak Domestikasi [translate: Domesticated Livestock]. Syiah Kuala University Press. Banda Aceh.

Dewi, R. K., & Wahyuni. (2020). Dasar Pemuliaan Ternak [translate: Basics of Livestock Breeding]. Litbang Pemas Unisla. Lamongan.

Gobel, Z., Laya, N. K., & Dako, S. (2021). Sifat Kualitatif dan Kuantitatif Sapi Bali Betina [translate: Qualitative and Quantitative Characteristics of Female Bali Cattle]. *Jambura Journal of Animal Science*, 4(1): 166-72. DOI: https://ejurnal.ung.ac.id/index.php/jjas/issue/archive.

Harini, S., & Kusumawati, R. (2007). Metode Statistika [translate: Statistical Methods]. PT. Prestasi Pustakaraya. Jakarta.

Hikmawaty., Bellavista., Mahmud, A. T. B. A., & Salam, A. (2018). Korelasi Bobot Badan dan Variabel-variabel Ukuran Tubuh sebagai Dasar Seleksi Calon Induk Sapi Bali [translate: Correlation of Body Weight and Body Size Variables as a Basis for Selection of Prospective Bali Cattle Mothers]. *Jurnal Ilmu Pertanian*, 3(1): 11-13. DOI: http://dx.doi.org/10.35329/agrovital.v3i1.214.

Martojo, H. (2003). Indigenous Bali Cattle: The Best Suited Cattle Breed for Sustainable Small Farms in Indonesia. Laboratory of Animal Breeding and Genetics, Faculty of Animal Science. Institut Pertanian Bogor. Bogor.

Provinsi Kalimantan Selatan. (2018). Peraturan Daerah Nomor 10 Tahun 2018 tentang Pengelolaan Sumber Daya Genetik Lokal [translate: Regional Regulation Number 10 of 2018 concerning Management of Local Genetic Resources]. Pemerintah Provinsi Kalimantan Selatan. Banjarbaru.

Putra, W. P. B., Sumadi., Hartatik, T., & Saumar, H. (2015). Seleksi Awal Calon Pejantan sapi aceh Berdasarkan Berat Badan [translate: Early Selection for Aceh Candidate Bull Based on Body Weight]. *Jurnal Sain Peternakan Indonesia*, 10(1): 7-12. DOI: https://doi.org/10.31186/jspi.id.10.1.7-12,

Republik Indonesia. 2011. Peraturan Pemerintah Republik Indonesia Nomor 48 Tahun 2011 tentang Sumber Daya Genetik Hewan dan Perbibitan Ternak [translate: Republic of Indonesia Govermant Regulation Number 48 of 2011 concering Animal Genetic Resources and Livestock Breeding]. Jakarta.

Ris, A., Suatha, I. K., & Batan, I. W. (2012). Keragaman Silak Tanduk Sapi Bali Jantan dan Betina [translate: Diversity of Male and Female Bali Cattle Horn Silak]. *Buletin Veteriner Udayana*, 4(2): 87-93.

Saputra, D. A., Maskur., & Rozi, T. (2019). Karakteristik Morfometrik (Ukuran Linier dan Lingkar Tubuh) Sapi Bali yang Dipelihara Secara Semi Intensif di Kabupaten Sumbawa [translate: Morphometric Characteristics (Linear size and Body Circle) of Bali Cattle That Are Raised Semi-intensively in Sumbawa Regency]. *Jurnal Ilmu dan Teknologi Peternakan Indonesia*, 5(2): 67-75. DOI: https://doi.org/10.29303/jitpi.v5i1.53.

Setiyono., Kusuma, A. H. A., & Rusman. (2017). Pengaruh Bangsa, Umur, Jenis Kelamin terhadap Kualitas Daging Sapi Potong di Daerah Istimewa Yogyakarta. *Buletin Peternakan*, 41(2): 176-186. DOI: https://doi.org/10.21059/buletinpeternak.v41i2.9935.

Susanti, I., Ihsan, M. N., & Wahjuningsih, S. (2015). Pengaruh Bangsa Pejantan Terhadap Pertumbuhan Pedet Hasil IB di Wilayah Kecamatan Bantur Kabupaten Malang [translate: The Influence of Male Breeds on The Growth of AI Produced Calves in Bantur sub-district, Malang Regency]. *J Ternak Tropika*, 16(1): 41-47. DOI: https://doi.org/10.21776/ub.jtapro.2015.016.01.7.

Syaiful, F. L., khasrad., & Maulida, S. (2020). Identifikasi Ukuran Tubuh Sapi Bali dan Simbal (Simmental-Bali) di Kecamatan Luhak Nan Duo Kabupaten Pasaman Barat [translate: Identification of Bali and Simbal Body Size in Luhak Nan Duo District, West Pasaman District]. *Jurnal Sain Peternakan Indonesia*, 15(2): 216-226. DOI: https://doi.org/10.31186/jspi.id.15.2.219-226.

Takandjandji, M., & Sawitri, R. (2015). Ukuran Morfometrik Banteng (*Bos javanicus* d'Alton, 1823) untuk Menduga Bobot Badan [translate: Morphometric Measurement of Banteng (*Bos javanicus* d'alton, 1823) for Body Weight Estimation]. *Jurnal Penelitian Hutan dan Konservasi Alam*, 12(1): 59-73. DOI: https://doi.org/10.20886/jphka.2015.12.1.59-73.

Tonbesi, T. T., Ngadiyono, N., & Sumadi. (2009). Estimasi Potensi dan Kinerja Sapi Bali di Kabupaten Timor Tengah Utara, Propinsi Nusa Tenggara Timur [translate: The Potency Estimation and Performance of Bali Cattle in Timor Tengah Utara Regency, East Nusa Tenggara]. *Buletin Peternakan*, 33(1): 30-39. DOI: https://doi.org/10.21059/buletinpeternak.v33i1.132.

Winaya, A., Muladno., & Tappa, B. (2007). Panel 16 Lokus Mikrosatelit untuk Deteksi polimorfisme dan Hubungan filogenetik Pada Genom Sapi [translate: Panel of 16 Microsatellite Loci for Detection of Polymorphisms and Phylogenetic Relationships in the Cattle Genome]. *Med Pet*, 24(2): 81-88.

Zafitra, A., Gushairiyanto, H., Ediyanto., & Depison. (2020). Karakterisasi Morfometrik dan Bobot Badan Pada Sapi Bali dan Simbal di Kecamatan Bangko Kabupaten Merangin [translate: Characterization of Morphometric and Body Weight Bali Cattle and Simbal in Bangko Merangin District]. *Majalah Ilmiah Peternakan*, 23(2): 66-71. DOI: https://dx.doi.org/10.24843/MIP.2020.v23.i02.p04