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To cite this article: A A Oka *et al* 2018 *IOP Conf. Ser.: Earth Environ. Sci.* **207** 012028

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Body dimensions of primiparous Bali cattle (*Bibos sondaicus*) supplemented with concentrate at their first three month of pregnancy

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Abstract. This study was undertaken to compare body dimensions between primiparous Bali cattle that were supplemented with concentrate or no concentrate at their first three month of pregnancy reared by smallholder farmers in Petang, Badung, Bali Province. Twenty primiparous Bali cattle that were fed with forage divided into two groups i.e. supplemented with concentrate (Rwc) and no concentrate (Rnc) from May to July 2018 using Completely Randomized Design. Body weight, body length, chest circumference, height at withers and rump width were measured every fortnight. Results showed that ADG of primiparous Bali cattle (Rwc) were significantly heavier ($P<0.01$) being 0.47 ± 0.02 kg compared to 0.19 ± 0.02 kg of primiparous Bali cattle (Rnc). Chest circumference, body length and rump width of those Rwc were also significantly higher ($P<0.01$) being 153.3 ± 0.5 cm, 112.1 ± 0.3 cm and 45.2 ± 0.2 cm, respectively compared to those Rnc being 151.2 ± 0.6 cm, 108.9 ± 0.3 cm and 44.0 ± 0.2 cm, respectively. High correlations ($P<0.01$) were found between chest circumference and body length of primiparous Bali cattle (Rwc), $R^2=0.911$, between chest circumference and body weight $R^2=0.648$ and between body length and body weight $R^2=0.591$. In summary, it is strongly suggested to feed concentrate particularly at the first three month of pregnancy of primiparous Bali cattle.

1. Introduction.

Bali cattle are native Indonesian germplasm that are regional and national superior assets having high genetic and economic potential to be developed as beef cattle. Although Bali cattle rearing played a very important role in the socioeconomic and social life of many Balinese smallholder farmers, they had them as side job with small flock size about 1-3 cattle per household (Suarna, I. W. 2018, pers. comm. 4 September). One characteristic of Balinese smallholder cattle farmers is that feeding cattle management is generally relied on roughage-based with cut and carry system. Roughage alone particularly field grass could not meet the livestock's requirement for energy or protein particularly in the early pregnancy of primiparous cattle. Feeding commercial concentrate to cattle is rare among smallholder cattle farmers in Bali. Smallholder cattle farmers sometimes fed their cattle with rice bran with small quantity resulted in various daily gain weights. Bali cattle reared by smallholder famers showed diverse responses to concentrate supplementation when cattle fed ration roughage based. Bali cattle gained bodyweight ranged from 0.13 to 0.24 kg/head/day when they were



fed only with field grass. However, when they were fed with roughage and concentrate with 4.578 kcal gross energy and 16% crude protein contents they gained 0.76 kg/head/day [1]. Feeding adequate and balanced nutrients to Bali cattle based on their requirement is important to achieve their standard growth rate [2]. High genetic potential of livestock could be achieved through feeding management that met their requirements resulted in high productivity i.e. favorable growth rate and reproductive parameters.

Primiparous cattle are livestock of the prospective parents of the first time mated where they have had puberty so that they required special handling for preparing them as parent stocks. Pregnant cattle required sufficient nutrients so that their pregnancy process went safely until parturition. Bali cattle showed a diverse response to the improvement of the nutritional value of feed. Improvement of feeding management of early primiparous Bali cattle is paramount as they needed quality and balanced nutrients for their physiological status. The flow and distribution of nutrients resulted from metabolism of early pregnancy cattle is complex [3].

The study was undertaken to compare body dimensions between primiparous Bali cattle that were supplemented with and no concentrate at their first three month of pregnancy reared by smallholder farmers in Petang District, Badung Regency, Bali.

2. Materials and Methods.

Twenty primiparous Bali cattle aged between 18 – 24 months with average early bodyweight 202 - 247 kg reared by smallholder farmers in Belok Sidan Village, Petang District, Badung Regency, Bali Province were used in this study. The twenty primiparous Bali cattle that were fed with forage i.e. *Caliandra calothyrsus*, *Sesbania sesban*, *Gliricidia sepium*, *Erythrina variegata*, *Pennisetum purpureum* and native grass divided into two groups. A group of 10 primiparous had concentrate supplementation (Rwc) i.e. 2 kg rice bran per head per day and another group of 10 primiparous had no concentrate supplementation (Rnc) during the 12 weeks of observation from May until July 2018 using Completely Randomized Design. Feeding of 2 kg of concentrate i.e. rice pollard and rice Weighing and measuring body dimension were done every fortnight. Body dimension measuring included body weight (kg), body length (cm), chest circumference (cm), height at withers (cm) and rump width (cm). Bodyweight (BW, kg) were measured in the morning before feeding cattle by using an Aflek[®] scale which had an accuracy to 1 kg. Body length (BL, cm) referred to the distance from the base of the ear to the base of the tail (where it joins the body). Extreme care was taken to ensure that the backbone was straight in both vertical and horizontal planes. All the measurements of body length were taken to the nearest 0.5 cm. Chest circumference (CC, cm) or hearth girth is a circumferential measurement taken around the chest just behind the front legs and withers. Chest depth (CD, cm) was measured from the backbone at the shoulder (standardized on one of the vertical processes of the thoracic vertebrae) to the brisket between the front legs. Height at withers (HW, cm) was the distance from the surface of a platform on which the animal stands to the withers. The measurement was made with a special measuring stick made with two arms one which was held vertical and the other at right angles to it sliding firmly up and down to record height. Rump height (RH, cm) is the distance from the surface of a platform on which the animal is standing to the rump using a measuring stick as described for height at withers. All measurement method was based on [4]. Data was analysed with T-test [5].

3. Results and Discussion.

Results showed that primiparous Bali cattle supplemented with concentrate 2 kg per head per day had during 12 weeks significantly larger chest circumference, body length, rump width and daily gain weight ($P < 0.01$) compared to those of primiparous with no concentrate supplementation (Table 1). Height at withers and bodyweights of those primiparous that supplemented with concentrate also tended to be higher ($P > 0.05$) than of the primiparous with no concentrate supplementation. Daily gain weight of primiparous supplemented concentrate gained 0.47 ± 0.2 kg was significantly heavier than 0.19 ± 0.02 kg of primiparous with no supplementation. This indicated that all the 20 primiparous Bali

cattle still grew and they required energy and protein of nutrient to support their growth rate as well as the growth of foetus and also produce milk to their calves. [6] reported that an early pregnancy of beef cattle required dry matter intake (DMI) 5 kg, crude protein (CP) 10.2% or 0.55 kg, TDN 62% or 3.05 kg and Ca. 0.36% and P 0.2% to be able to gain about 500 g/head/day in early pregnancy beef cattle. This result was confirmed by [1] who reported that Bali cattle gained about 0.13 - 0.24 kg/head/day by feeding field grass. However, research conducted on Bali steer by [1], the steer gained 0.76 kg/head/day that was triple up to 5 times heavier that of steers with no concentrate supplementation. Furthermore, [7] reported that by increasing energy ration until 2300 kcal ME/kg significantly ($P < 0.05$) increase energy intake and resulted in the peak of milk yield of 2179.83 ml/day with milk fat and lactose 8.56% and 4.76 %, respectively.

Table 1. Comparison between body dimensions between primiparous Bali cattle supplemented with and no concentrate (control)

Parameter	Control	Concentrate	Paired Samples Test		Correlation	
	Mean \pm SEM	Mean \pm SEM	Mean \pm SEM	P	R ²	P
Chest circumference, cm	151.2 \pm 0.6	153.3 \pm 0.5	2.08 \pm 0.59	0.001**	0.356	0.005
Body length, cm	108.9 \pm 0.3	112.1 \pm 0.3	3.18 \pm 0.44	0.000**	-0.199	0.127
Rump width, cm	44.0 \pm 0.2	45.2 \pm 0.2	1.20 \pm 0.27	0.000**	-0.148	0.260
Daily gain weight, kg	0.19 \pm 0.02	0.47 \pm 0.2	0.27 \pm 0.03	0.000**	0.109	0.451
Height at withers, cm	112.5 \pm 0.3	112.6 \pm 0.3	0.18 \pm 0.48	0.702	-0.362	0.004
Rump height, cm	113.9 \pm 0.3	113.8 \pm 0.2	-0.12 \pm 0.31	0.701	0.148	0.263
Bodyweight, kg	239.0 \pm 2.1	240.4 \pm 2.3	1.450 \pm 0.92	0.621	0.104	0.428

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 2. Correlation relationship coefficient (R²) of body dimension of primiparous Bali cattle supplemented with concentrate

		Correlation	
Parameter 1	Parameter 2	R ²	P
Chest circumference, cm	Body length, cm	0.911**	0.000
Chest circumference, cm	Bodyweight, kg	0.648**	0.000
Chest circumference, cm	Rump height, cm	0.384**	0.002
Body length, cm	Height at withers, cm	0.363**	0.004
Chest circumference, cm	Rump width, cm	0.318*	0.013
Chest circumference, cm	Height at withers, cm	0.179	0.172

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

There are closed relationship between chest circumference and body length ($R^2 = 0.911$ and $P < 0.01$) (Table 2). This indicated that primiparous Bali cattle supplemented with concentrate the growth of chest circumference was parallel with the growth of body length. When the chest circumference grew then the body length grew as well. The correlation between body dimensions was positive but they were not as strong as the correlation between chest circumferences with body length. The growth of Bali cattle particularly the circular body dimension started from chest circumference then it followed by abdomen circumference, anterior neck circumference and posterior neck circumference was the latest growth among the circumference dimension [8].

Measuring of body dimension i.e. body length, chest circumference, rump width were significantly higher ($P < 0.01$) of those primiparous Bali cattle with concentrate supplementation than those of primiparous with no concentrate supplementation. This result was confirmed by [9] who reported that the condition of early pregnancy of primiparous, their body dimensions particularly chest circumference, and rump width were growing due to the growing of foetus as well as secretory cells to produce milk [7]. This indicated that the

present study improved the growth rate of the primiparous Bali cattle. This result was supported by [6] that the present study provided sufficient energy and protein to primiparous cattle.

4. Conclusion

In summary, average daily gain weight of primiparous Bali cattle supplemented with 2 kg concentrate per head per day were significantly heavier ($P < 0.01$) i.e. 0.47 kg/head/day than of those primiparous with no concentrate supplementation. It is strongly suggested to feed concentrate particularly at the first three month of pregnancy of primiparous Bali cattle.

Acknowledgements.

The authors gratefully acknowledge support by The Institute for Research and Community Service (LPPM) and Faculty of Animal and Husbandry, The University of Udayana, Bali-Indonesia for the research fund and the generosity of all Bali cattle farmers in Petang District, Badung Regency, Bali Province.

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