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Weight Changes in Bali Cattle During Lactation at Different Seasons in the Cattle-Oil Palm Production System

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ABSTRACT

The season impacts livestock productivity and cattle kept in grazing production systems in tropical conditions. This research aims to determine the effect of season on the weight changes of Bali cows and calves on oil palm plantations. This research used 20 Bali cattle kept semi-intensively in oil palm plantation areas without feed supplementation in 2016–2018. Cows and calves were weighed at calving and every month until weaning (150 days). Season grouping was based on calving time: dry season (DS) May–October and rainy season (RS) November–April. Data were analyzed by independent T-test statistics using the SPSS 20.0 application. The results of observations showed that cows' body weight decreased gradually until the fourth month of lactation in both seasons. Cows' weight changes were only significantly different in the second month, in which cows at DS were better than RS ($P<0.05$). The pre-weaning average daily gain (ADG) of calves each month was not significantly different between the two seasons, and they could reach a body weight of 60.60 kg (RS) and 61.47 kg (DS) at weaning. Season differences do not impact weight changes in the Bali cows and calves in the cattle-oil palm plantation production system.

Keywords: body weight, cows, calf, seasons, semi-intensive

INTRODUCTION

Indonesia's climate conditions, which have two seasons (rainy and dry), are a significant factor in the productivity of livestock that is kept extensively. Changes will follow different seasons in environmental conditions, such as rainfall, temperature, humidity, and rainy days. Rainfall in the dry season is only 0–300 mm/day, while in the rainy season it reaches 50–>700 mm/day (Aldrian, 2000). High rainfall in the rainy season significantly impacts forage productivity compared to the dry season (Prawiradiputra et al., 2012).

The alternation of rainy and dry seasons influences the quality and quantity of pasture forage. Moreover, it indirectly influences livestock production and reproduction (Muhajirin et al., 2017). The productivity of Bali cattle on natural grazing on Timor Island is lower in the dry season due to a lack of nutrients from the forage available in the grazing area (Mullik & Jelantik, 2009). Post-partum mating (PPM) of Bali cattle is significantly influenced by season and parity (Suranjaya et al., 2010).

Changes in behaviour occur when cattle are grazed in different seasons, where there is a decrease in feeding time and an increase in browsing time for Bali cattle grazed in oil palm plantations semi-intensively during the dry season (Maulana et al., 2018). The decline in forage production during the dry season underlies research on the changes in body weight of Bali cows during grazing on oil palm plantations. According to those backgrounds, this research was conducted to determine the effect of season on the weight changes of Bali cows and calves on oil palm plantations during the lactation period. This research will provide data for the Bali Cows' productivity, as shown by the calf weight change at pre-weaning. The results of this research will help develop an oil palm and cattle production system that has the potential to scale up the Indonesian beef cattle population.

MATERIALS AND METHODS

Study site

The research was conducted at the PTPN V oil palm Sei Rokan plantation, Rokan Hulu, Riau, from August 2016 to September 2018. The data on rainfall and the number of rainy days for five years (2013–2017) were obtained from the Indonesian Meteorology, Climatology, and

Geophysical Agency (BMKG) and used to define the rainy seasons (rainfall >250 mm/month) and dry seasons (rainfall >250 mm/month) for the study site (Figure 1). The rainy seasons (RS) lasted from May to October, while the dry seasons (DS) lasted from November to April.

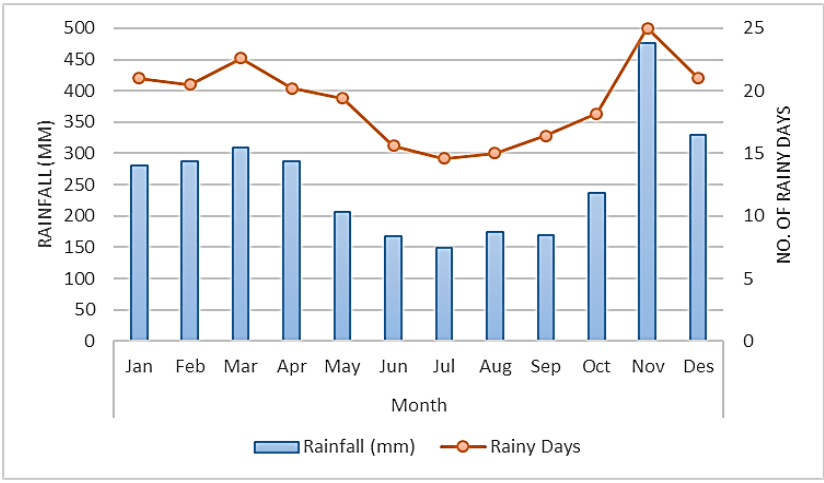

Figure 1. Rainfall and number of rainy days (in the year 2013-2017) in Riau Province

Data collection

The research used the recording data of 20 Bali cows (body weight 258±25) who were kept semi-intensive and grazed at an oil palm plantation from 08.00 am until 05.00 pm and were caged during the night without supplementary feeding. Cattle were kept at the exact location and management during the data collection (both seasons). The recording data of cows and calves was grouped based on calving time. The sample numbers of cows in rainy and dry seasons were 24 and 15 heads, respectively, and calves were 16 and 11 heads. Cows and calves were weighed by digital scales (the accuracy was 0,01 kg) immediately after calving and routinely every month until calves were weaned (150 days). The data on weight changes represented by average daily gain (ADG) was obtained by using the equation:

$$Average\ daily\ gain\ (\frac{kg}{day}) = \frac{gain\ (kg)}{number\ of\ days\ (day)}$$

Data were analysed using an Independent T-test operated by the SPSS 20.0 program.

RESULTS AND DISCUSSION

Calf birth weight

The cow's nutritional adequacy during lactation determines the calf's birth weight (Lenon Klein et al., 2022). The results of this study show that there is no difference in calf weight between both seasons (P > 0.05) (Table 1). The availability and quality of forage in the grazing area during the cow's pregnancy period is a determining factor in the quality of the calf (Maulana et al., 2019). Cows with good nutritional adequacy throughout pre-calving, which BCS shows, will positively impact the lives of those with better quality and health (calf immunity, morbidity, and mortality) (Mee, 2023). Birth weights were not significantly different in different seasons in this study, indicating no difference in nutrient adequacy from forage in oil palm plantations during the dry and rainy seasons.

Calf pre-weaning body weight

Changes in body weight of Bali calves raised semi-intensively in oil palm plantations did not show significant differences (P > 0.05) between RS and DS. These results show that Bali calves have the potential to produce throughout the year. In this study, Bali calves had good body weight in both seasons from the first to the fifth month. This result showed equally good body weight with the pre-weaning calf of Bali Cattle at Badung, Bali, kept intensively by the smallholder farmers (Ni Made Ayu Gemuh Rasa Astiti, 2020). However, the body weight of Bali's calf could be improved by giving feed supplementation to the cows during the night when they are caged. The Bali calves that were produced from the cows that were given the supplementary feed will reach body weight at 1st, 2nd, and 3rd months old, respectively, at 26.12 kg, 44.95 kg, and 56.95 kg (Hardiono et al., 2016).

The data showed that Bali calves could reach a body weight of 60.60 kg (RS) and 61.47 kg (DS) at the age of 150 days (Table 1). The weaning weight of Bali cattle is almost the same as the weaning weight of Bali cattle at the age of 205 days, which are also raised semi-intensively in Makassar, namely 62.6–66.7 kg (Hafsah et al., 2013). Bali cattle calves developed at BPTU Bali cattle can produce a weight at the age of 205 of 87–93 kg (Tavares et al., 2013). Other results showed that Bali calves could reach more than 100 kg when they were five months old. The cows' and calves' nutrient adequacy become the main factor in the calves' pre-weaning growth (Mashur, 2014).

Table 1. Pre-weaning Bali calf body weight in different seasons at the cattle-oil palm plantation production system

Parameter	Season		Sig.
	Rainy	Dry	
Calf birth weight (kg)	13.58±2.20	13.12±1.29	NS
Calf pre-weaning weight (kg):			
1st month	25.85±3.83	25.27±3.90	NS
2nd month	35.31±5.16	35.17±7.18	NS
3rd month	44.74±6.12	44.03±10.19	NS
4th month	52.24±6.60	52.90±13.18	NS
5th month	60.60±7.77	61.47±16.39	NS

NS= non-significant (P> 0.05)

ADG of cows and calves

Changes in body weight during the lactation period indicate the adequacy of nutrients consumed by the cows for maintenance and milk production. Cows with high body weight loss during lactation will have a reduced ability to restore the reproductive tract so that the reproductive cycle will be longer. The weight changes of Bali cows in the RS and DS (Table 2) showed a non-significant difference in the first month of lactation (P > 0.05). The difference in ADG of RS, which was lower than DS, occurred in the second month of lactation (P < 0.05). The cows' lactation from the 3rd to the fifth month showed no significant difference between the DS and RS (P > 0.05). Giving energetic protein feed supplements during late gestation (60 days before calving) will help maintain changes in the cow's body weight during lactation. Moreover, this treatment can improve the reproductive performance of the cows (da Silva et al., 2017).

Table 2. Bali cows and calf weight changes during the lactation period in different seasons at the cattle-oil palm plantation production system

Parameter	Season		Sig.
	Rainy	Dry	
Cows (kg/d)			
1st month	-0.28±0.28	-0.11±0.30	NS
2nd month	-0.23±0.27	-0.01±0.31	*
3rd month	-0.06±0.44	-0.09±0.36	NS
4th month	-0.03±0.31	-0.01±0.19	NS
5th month	0.08±0.18	0.15±0.22	NS
Calf (kg/d)			
1st month	0.41±0.09	0.41±0.14	NS
2nd month	0.32±0.06	0.33±0.11	NS
3rd month	0.30±0.05	0.30±0.11	NS
4th month	0.25±0.06	0.30±0.11	NS
5th month	0.28±0.56	0.29±0.11	NS

Different in the same row means * = significantly different (P < 0.05) or NS = non-significant (P > 0.05)

The non-significant difference in cows is also followed by the change in the calf's weight throughout the pre-weaning phase at RS and DS ($P > 0.05$) (Table 2). Average daily gain at DS and RS is highest in the first month of age (0.41 kg/day) and continues declining until weaning in the fifth month (0.28–0.29 kg/day). Fulfilment of cow's level energy during pre- and post-calving can help maintain calf performance during pre-weaning. Feed supplementation is needed for cows whose calves have low pre-weaning growth (Houghton et al., 1990).

The cow's body weight in both seasons decreased gradually until the fourth month of lactation and only increased in the last month before weaning (Figure 2). Lack of nutrient intake during lactation impacts the dismantling of nutrients reserved in the cow's body to produce milk, as seen in the cow's body weight during lactation. Furthermore, insufficient feed nutrients will impact the length of the reproductive system recovery process so that the reproductive cycle will be longer. The cow's body weight begins to increase in the third to fifth month (weaning period) due to the cow's milk production decrease starting in the third month of lactation. Suppose you look at the research results on the calving interval of cows in the dry and rainy seasons, 381 and 428 days, respectively (Maulana et al., 2019). So. In that case, the cows are estimated to become pregnant again at 3 and 4 months of lactation. It causes the cow's body weight to increase while the calf's growth declines (Figure 2). Studies on the milk production of Bali cows need to be carried out to determine the impact of pregnancy on the milk produced for calves.

The successful adaptation of Bali cows to the cattle-oil palm integration system means that the season does not influence changes in the cow's body weight during the lactation period. Cows' consumption greatly influences weight changes. The results of another study showed the success of Bali cows in modifying their eating behaviour while grazing on oil palm plantations. Bali cows, which are grazed semi-intensively in the oil palm plantation, showed a decrease in the time of eating in the dry season (3.48 hours/day) compared to the rainy season (7.28 hours/day). Bali cows, during grazing in the dry season (69% of feeding time), consume more oil palm leaves, which are a by-product of the plantation, compared to the rainy season (22%). Palm oil leaves are an alternative feed when grazing livestock in the dry season so that livestock can have the same productivity as in the rainy season (Maulana et al., 2018). No studies have been found regarding the consumption and quality of oil palm leaves as feed for Bali cattle, so it is necessary to carry out future studies.

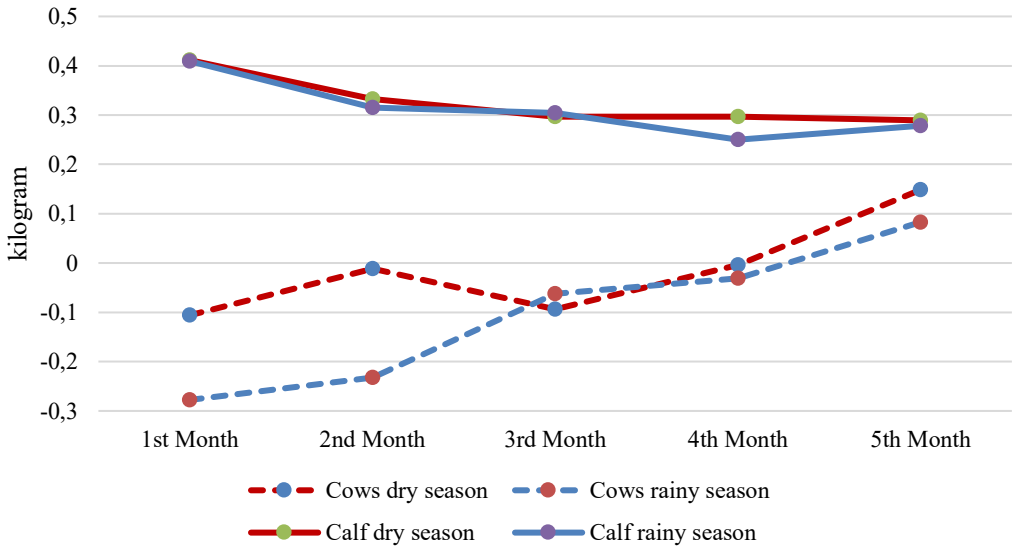

Figure 2. Graphic of Bali cows and calf weight changes during lactating periods in different seasons at the cattle-oil palm production system

The results of this research further demonstrate the ability of Bali cattle to adapt to various production system models. Different seasons do not impact the comfort of Bali cattle because this type of cattle is a native Indonesian breed, so it already has good adaptability. Bali cattle can adapt to various environmental conditions in Indonesia, as seen from the

distribution of Bali cattle in almost all regions of Indonesia, such as Sulawesi, Nusa Tenggara, Maluku, Sumatera, and Kalimantan. The obstacles to the spread of Bali cattle are diseases that arise in several areas (Talib, 2002). Moreover, the successful adaptation of Bali cattle to the integrated cattle-oil palm production system is also due to the temperature and humidity of the oil palm plantations, which is what Bali cattle require. So that environmental conditions in the dry season do not impact physiological changes in livestock (Baliarti et al., 2017).

CONCLUSION

The season does not impact the weight changes of Bali cows and calves during pre-weaning. Bali cows on oil palm plantations show a decrease in body weight throughout lactation in both rainy and dry seasons, and they can regain it at the last lactation period. However, the cow has good productivity, as shown by the calf's pre-weaning growth.

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