



Effect of Rainfall on Cow and Calf Performance Raised Under Oil Palm and Cattle Integrated Farming System

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Abstract | The current study aimed to explore the effect of rainfall on cow and calf performance raised under oil palm and cattle integrated farming system. Indonesian local cows (n=200) and Brahman crossbred bulls (n=10) were raised under oil palm and cattle integrated farming system. Data were collected for cow and calf performance from two consequent calvings that were distributed into two groups according to the rainy days and rainfall for a year backward from the calving date. The rainy days were categorized as low (< 150 d) and high (\geq 150 d) whereas rainfall was categorized as low (< 2400 mm) and high (\geq 2400 mm). The results exhibited that rainy days and rainfall did not significantly affect ($p > 0.05$) cow body weight and body condition score. However, the calf born in the high rainy days and rainfall had a heavier ($p < 0.05$) birth weight and weaning weight comparing with those born in the low rainfall and rainy days. These results indicated that the different rainfall and rainy days have no considerable effect on cow performance raised under oil palm and cattle integrated farming system, however, these climatic conditions are important for calf performance.

Keywords | Palm oil, Grazing cattle, Breeding cattle, Tropics, Rainfall

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INTRODUCTION

The beef demand in Indonesia is increasing from year to year. In 2019, the beef consumption reached 2.56 kg/capita/year (Center for Agriculture Data and Information Systems, 2019). It is estimated the national beef demand is expected to be doubled in the next two decades. However, recent situation indicated that the domestic beef production only supplied about nearly half of the national demand, while another half come from imported sources (Indonesia Australia Red Meat & Cattle Partnership, 2020). This condition requires a strategy to fulfill the national beef demand.

Recently, Indonesia become a country with the largest palm oil production in the world. It is estimated that In-

donesian palm oil accounted for about 58% of world production (United States Department of Agriculture, 2021). The abundance of palm oil by-products is potential to be used as animal feed resources (Agus and Widi, 2018). Besides that, according to Directorate General of Estate Crops (2019), the area of oil palm plantations in Indonesia reached 14.33 hectares. These large areas had potency to be used as potential pasture for grazing cattle. Therefore, the oil palm and cattle integrated farming system is currently used as a national strategy to support the fulfillment of meat demand.

Climatic conditions are essential affecting overall livestock productivity (Isnaini et al., 2021). Among of the climatic conditions, rainfall is the most sensitive factors related with the forage production in the pasture. High rainfall

rate was associated with the high forage production, while low rainfall rate was associated with the low forage production (Fynn and O'Connor, 2001; Hein, 2006). The forage availability is a key factor affecting productive performance of cattle (O'Reagain et al., 2009). To date, the evaluation of rainfall on the performances of cattle reared under oil palm and cattle integrated farming system is currently still very limited. For that reason, the current study was planned to investigate the effect of rainfall on cow and calf performance reared under oil palm and cattle integrated farming system.

MATERIALS AND METHODS

EXPERIMENTAL SITE

The experimental site was located on South Abung District, Lampung, Indonesia. The location is extended from -4.80 to -5.00 latitude and from 104.85 to 104.99 longitude. The altitude of this area is around 38 m above sea level.

ANIMALS AND EXPERIMENTAL DESIGN

Indonesian local cows (n=200) and Brahmann crossbred bulls (n=10) were raised under oil palm and cattle integrated farming system. Data were collected for cow and calf performances from two following calvings (total n = 400) and then divided into two groups according to the rainy days and rainfall received for a year backward from the calving date. The rainfall was classified into low (< 2400 mm) and high (\geq 2400 mm), while rainy days were categorized into low (< 150 d) and high (\geq 150 d). Cow performance traits were body weight (BW) and body condition score (BCS), while calf performance traits were birth weight (BiW) and weaning weight (WW).

STATISTICAL ANALYSIS

Data of cow and calf performances were not normally distributed according to the Shapiro-Wilk test. For that reason, data were compared by using Mann-Whitney U test. A significant difference was declared when $p < 0.05$. All statistical analysis was performed by using IBM SPSS Statistics 22.

RESULTS AND DISCUSSION

The results showed that rainfall did not significantly ($p > 0.05$) affect cow BW and BCS (Table 1). However, a significant effect of rainfall was recorded on calf BiW and WW (Table 2). The calf born from cow in the high rainfall group had a heavier BiW and WW as compared to the low rainfall group. As shown in Table 3, rainy days had no significant effect ($p > 0.05$) on cow BW and BCS. Whereas, rainy days significantly affect ($p < 0.05$) calf BiW and WW (Table 4). The cow in the high rainy days group had

heavier calf BiW and WW comparing to those in the low rainy days group.

Table 1: Effect of rainfall during a year period on dam performances reared under oil palm and cattle integrated farming system

Items	n	Dam BW (kg)	Dam BCS
Low (< 2400 mm)	216	325.84 \pm 2.73	2.84 \pm 0.03
High (\geq 2400 mm)	184	326.41 \pm 3.68	2.88 \pm 0.02
p value		0.987	0.277

BW: body weight, BCS: body condition score

Table 2: Effect of rainfall during a year period on calf performances born from dam reared under oil palm and cattle integrated farming system

Items	n	Calf BiW (kg)	Calf WW (kg)
Low (< 2400 mm)	216	26.15 \pm 0.29 ^a	101.38 \pm 0.65 ^a
High (\geq 2400 mm)	184	27.20 \pm 0.35 ^b	104.96 \pm 0.79 ^b
p value		0.006	0.001

BiW: birth weight, WW: weaning weight

^{ab}uncommon superscripts within a column indicates a significant different (P<0.05)

Table 3: Effect of rainy days during a year period on dam performances reared under oil palm and cattle integrated farming system

Items	n	Dam BW (kg)	Dam BCS
Low (< 150 d)	186	325.10 \pm 3.03	2.84 \pm 0.03
High (\geq 150 d)	214	326.97 \pm 3.27	2.88 \pm 0.02
p value		0.806	0.284

BW: body weight, BCS: body condition score

Table 4: Effect of rainy days during a year period on calf performances born from dam reared under oil palm and cattle integrated farming system

Items	n	Calf BiW (kg)	Calf WW (kg)
Low (< 150 d)	186	26.23 \pm 0.31 ^a	101.35 \pm 0.68 ^a
High (\geq 150 d)	214	26.98 \pm 0.32 ^b	104.48 \pm 0.73 ^b
p value		0.040	0.003

BiW: birth weight, WW: weaning weight

^{ab}uncommon superscripts within a column indicates a significant different (P<0.05)

According to the previous study, biomass production in the pasture is directly proportional with the rainfall (Schaffer and Rodriguez-Iturbe, 2018). In a study by Liang et al. (2018), it was also reported that the rainfall had substantial effect on the vegetation growth. The high rainfall may support the growth of vegetation in the pasture so that it could beneficially increase the feed availability for cattle. The increase in feed availability subsequently resulted the improvement in the performance of cattle (Maciel et al.,

2018). Souza et al. (2020) mentioned that the high rainfall condition could improve vegetation growth, which was then followed by the maximum cattle weight.

In the current study, the effect of rainfall and rainy days were more pronounce to the performance of calf rather than to the cow. High rainfall and rainy days did not significantly affect cow BW and BCS, but significantly improve calf BiW and WW. This current finding probably indicates the accelerated nutrient utilization in calf as coampped to cow. In the previous studies, it was also mentioned that nutrient utilization during gestation is mainly used for the growth and development of fetal rather than the dam (Reshalaitihan et al., 2020; Vaz et al., 2022).

CONCLUSIONS

It could be concluded that the rainy days and rainfall have no important effect on cow performance reared under oil palm and cattle integrated farming system. However, the high rainy days and rainfall are necessary for optimal calf performance. It is suggested to provide additional feed during low rainfall and rainy days to optimize calf performance throughout the year.

CONFLICT OF INTERESTS

The authors declare that they have no competing interests.

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AUTHORS CONTRIBUTION

All authors equally contributed and approved the manuscript.

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