Calf production of Bali cows in cattle-oil palm plantation integration system in Riau Province Indonesia

Endang Baliarti¹, I Gede Suparta Budisatria, Panjono, Bayu Andri Atmoko, Hamdani Maulana

¹Department of Animal Production, Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia.

E-mail: bali_arti@ugm.ac.id

Abstract. The development of cattle in the area of oil palm plantations has the potential to become an agribusiness, but it still needs to be studied in-depth because the cattle business requires a long period with a significant investment. One study that needs to do is the calf production per year because it is directly related to input-output calculations. This study aims to find out the calf production of Bali cows which maintained integrated with oil palm plantations in Riau province, as one of the provinces that has the largest oil palm plantation area in Indonesia. Twenty-three Bali cows grazed with males in a colony were used as research samples. Livestock is kept semi-intensive by grazing in the plantation area from 7 a.m. to 5 p.m. then housed without additional feeding. The study conducted from 2016 to 2018; the data recorded for calculating the calf crop is the calving interval, birth rate, and calf mortality. During three years of observation, the calving interval, calving percentage, and calf mortality were 370-421 days, 86-100%, and 10-34% respectively. The calculation obtained that the calf production was 64-72%/year. It concluded that the development of Bali cattle with an integrated system with oil palm plantations has the potential to be an agribusiness opportunity in terms of the calf crop to be obtained.

1. Introduction
Indonesia is still unable to meet national beef demand and is predicted to continue to decline and only reach 55% in 2023 [1]. More efficient cattle breeding innovations needed to be done to increase the national cattle population. Industrial breeding business is still constrained by the lack of land and the high cost of feed. The integration of cattle and oil palm plantations is one of the innovations that is expected to be able to answer the problem. Utilization of byproducts of plantations as animal feed and plantation areas as grazing land is an advantage of the integration system of cattle and oil palm plantations. Oil palm plantations in 2017 have an area of 12.3 million hectares [2] and can accommodate 0.8 animal units (AU) in each hectare [3]. The presence of cattle in the area of oil palm plantations is also able to be a provider of organic fertilizer for oil palm plants. The integrated system of cattle and palm oil will benefit both commodities so that they can become sustainable agricultural business innovations. However, information on the ability to produce Bali cattle in oil palm plantations has not been found, especially in the calf harvest parameters. This study aims to determine the potential of oil palm plantations as a cow development area based on the ability to produce Bali calf. Information from the results of this study is expected to be the basis for floating integration between cattle and oil palm plantations.
2. Materials and Methods
The study was conducted using a reproductive record of 23 Bali cows (Bodyweight 258 ± 25.17) that were kept in an oil palm plantation owned by PTPN V, Rokan Hulu, Riau. Livestock was conducted semi-intensively (cattle grazing in the oil palm plantation area from 8 am to 5 pm and then housing without additional feeding). Calving interval is calculated from the length of time it takes for the cows to return to calving. Mortality of a calf is based on the number of calves died before the weaning period (150 days). Data were analyzed descriptively quantitatively. Determination of calf production based on the equation:

\[
\text{Calf Production} = \frac{\sum \text{calves birth} - \sum \text{calves mortality}}{\sum \text{cows}} \times \frac{365 \text{ days}}{\text{calving interval (days)}} \times 100\%
\]

3. Results and Discussion

3.1. Calving intervals
The results showed that calving intervals of Bali cattle kept in oil palm plantations did not differ from 2016 to 2018 (P>0,05) (Table 1). The calving interval value affects the cow's reproductive performance in a year. The calving intervals in this study are not different from the Bali cows in Indonesia, 330-550 days [4]. Even so, the calving intervals value is still higher when compared to the Bali cattle at Bali cattle breeding centers (BPTU), 365 days [5]. One of the factors that influence calving interval for Bali cows that are kept by grazing is the availability of forage in the grazing area. Lack of forage caused by a long dry period in a year can have an impact on nutrient deficiencies for the parent [6].

| Parameter                  | Year    | Mean   |
|---------------------------|---------|--------|
| Calving intervals (days)  | 421,71  | 370,74 |
| Calving rate (%)          | 91,30   | 100,00 |
| Mortality (%)             | 4,00    | 34,78  |
| Calf crop (%)             | 63,97   | 64,21  |

3.2. Calving rate
The best calving rate occurs in 2017 and the lowest in 2018 (Table 1). Calving rate of Bali cows which in this study is quite good when compared to Bali cows that are kept in the smallholders of Yapen Islands Regency, Papua, which only reaches 72.27% [7]. The colony maintenance system is a factor in the high calving rate in this study. A natural mating system with the maintenance of bulls along with cows throughout the year can increase conception success. Bulls can minimize the silent heat or abnormal behavior of animal estrus caused by a lack of nutrients in the cows [8].

3.3. Mortality
Mortality of pre-weaning Bali calf in oil palm plantations varies each year and is in the range of 4-34% the highest in 2017 (Table 1). Livestock kept grazing is very dependent on changing environmental conditions. The mortality of Bali calves increase following rainfall intensity. Humid and wetter natural conditions are causing calves more susceptible to cases of disease and parasitic attacks [6]. The research location used has high rainfall during 2017 reaching 3983.5 mm/year [9]. So the pre-weaning calf mortality rate in 2017 is higher than in 2016 and 2018. The mortality of this study is not much different from the Bali cattle that are kept in the pasture fields of Bombana district, which is 14.83-20.93% [10].
3.4. Calf production
Bali cows kept in oil palm plantations have a calf production of 63.97 to 72.09% annually. Calf production is influenced by calving intervals, calving rate, and calf mortality. Short calving intervals and low mortality rate affect the high calf productivity rate in 2018. The results of this study are better when compared to the calf production of Bali cattle kept in oil palm plantations in Central Borneo, which is only 55.76% [11].

4. Conclusion
The development of Bali cattle with an integrated system with oil palm plantations has the potential to be an agribusiness opportunity in terms of the calf crop to be obtained.

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