Performances of Bali cow kept by the palm oil farmers in Rokan Hulu, Riau

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Abstract. The development of the beef cattle population in Indonesia can be done by increasing the cows' performance keeping by oil palm farmers. The research aimed to study Bali cows' production system and performance maintained by oil palm farmers in Karya Mulya Village, Rambah Samo District, Rokan Hulu Regency, Riau. Fifteen farmers as respondent with 33 of their Bali cows were the subjects of observation. This research was conducted using the interview method, focused on the production system, body size, and reproductive performance. Data were analyzed descriptively, quantitative, and qualitative. The study results on body size showed that the Bali cows had a chest circumference of 156.68±7.07 cm, shoulder height 112.73±8.86 cm, absolute body length 113.77±5.26 cm, relative body length 105±6.89 cm, body weight 253.65±28.64 kg, and body condition score 2.91±0.50. Reproductive performance includes the calving interval is 376.96±77.65 days, weaning time is 7.74±1.16 months, postpartum estrus 72.00±36.81 days, postpartum mating 72.00±36.81 days, service per conception 1.23±0.8, calf mortality 6.25%, calf weaning weight at 205 days is 97.59±22.88 kg, cows reproductive index 0.96 ± 0.26 and productivity 68.23 ± 46.89. It concluded that Bali cows raised by oil palm farmers in Rokan Hulu, Riau had good performance and body size.

1. Introduction
Various beef cattle breeding programs are needed to meet the increasing demand for beef in Indonesia from year to year [1], including the development of smallholder cattle farms, for example, owned by oil palm farmers. According to the Directorate General of Plantation [2], the land area for oil palm plantations in Indonesia reaches 12,307,677 hectares, 45.64% had by smallholders. Cattle development in smallholder oil palm plantations can be programmed because it has multiple benefits for the oil palm plantations and farmers. Riau Province is one of the provinces that have the potential to develop beef cattle due to its extensive oil palm plantation areas, Rokan Hulu district is one of them, which has a fairly extensive oil palm plantation area in Riau Province. In 2018 reached 410,306 Ha, and in 2019 it reached 480,665 Ha.

Along with the increase in oil palm plantation areas, it is necessary to consider cattle development in an integrated and mutually beneficial way. Bali cattle have adaptations and can maintain body condition so that people throughout Indonesia have appropriately raised Bali Cows. There are still not many
studies on the production system and performance of cattle reared in oil palm smallholders. The results of the study can be used as input for the most suitable maintenance system for cows in an integrated with the oil palm plantation.

2. Methodology
The study was conducted at smallholder farmers of oil palm plantation partnership in the Banjar Sari Village, Rembah Samo District, Rokan Hulu Regency, Riau Province from October to November 2019. The respondents used in the study were 15 smallholder farmers and 33 heads of their Bali cows maintained in oil palm plantations. The equipment used was the questionnaire that has been validated, livestock ruler (FHK©), and body measuring tape (Butterfly©). The study used a survey method through interviews. Bali cows' body sizes were measured, including head length, head width, ear length, chest girth, body high, hip high, chest depth, chest width, hip width, absolute body length, relative body length. The body weight data was calculated and estimated using a Djagra formula:

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bull\ weight = \frac{absolute\ body\ length\ (cm) \times chest\ circumference\ (cm)^2}{11045} \]

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cows\ weight = \frac{absolute\ body\ length\ (cm) \times chest\ circumference\ (cm)^2}{11050} \]

The other data studied were body condition score, reproductive performances include the cow reproductive index (CRI) and cow productivity index (CPI). The data were analyzed using descriptive quantitative.

3. Results and discussion

3.1. Farmer characteristics
The results showed that the smallholder farmers in oil palm plantation partnership had an average age of 44.47±9.04 years, so it was still classified as productive age [3]. Experience raising cattle of smallholder farmers in oil palm plantation partnership can be said for a long time, generally the experience of raising obtained from their parents and inherited to generation. The level of education of smallholder farmers in oil palm plantation partnerships was varied, namely elementary school (26.67%), junior high school (60%), and senior high school (13.3%). The level of education can affect the ability to think and absorb knowledge [4]. The primary job was palm oil plantation farmers. The purpose of raising cattle was as a side job and savings. The average times of the farmers in pen were 2.47±1.71 times/day, while the duration during the pen to keep their cattle was 83±74.47 minutes/day. Farmers usually carry out activities in pen, including cleaning manure, feeding, and removing their cattle to be grazed in oil palm plantations areas. Their daily activity always overseed the condition of their cattle so that the ability to recognize the signs of estrus was good.

3.2. Maintenance management
The Bali cows maintenance system by the smallholder farmers in oil palm plantation partnership in Rokan Hulu was dominated with a semi-intensive, following the extensive, and intensive. The semi-intensive maintenance system was mainly grazed from 08.00 to 17.00, then housed at night. The calculation of grazing time was 10.33 ± 5.85 hours/day. The Bali cows maintained a semi-intensive system with dry reproduction, pregnancy, and lactating status. In grazing time, the farmers brought their cattle into the oil palm plantations areas, and the oldest cattle used as the group head with the aim of the other cattle not far away. Farmers who have finished grazing their cattle then return home to carry out work activities. The dry and pregnant cows were maintenance with an extensive system. The cows were grazed all day in oil palm plantations and rotated to other areas at 15.00. during the rotation, the farmers also checked the health and estrus sign of the cows. The cattle were housed in pens in the intensive
maintenance systems and fed by continuous forages with cut and carry. The forages bank was placed near the pen. The post-weaning calf was maintenance with an intensive system.

The results showed that almost all the smallholder farmers in the oil palm plantation partnership in Rokan Hulu used the manure of theirs cattle. The manure was utilized by stacked to become organic fertilizer without treatment. The farmers have been aware that the presence of cattle to produce organic fertilizer can reduce the chemical fertilizer cost for their agricultural and oil palm plantations. Atmoko [5] reported that young and adult cows manure production was 14.02 and 19.24 kg/day, and very potential was processed into organic fertilizers for agriculture.

3.3. Body sizes of Bali cows

The results showed that the body sizes of Bali cows (Table. 1) were higher compared to SNI [6], which stated that the body high of Bali cows (aged > 24 months) in 1st, 2nd, and 3rd-grade were 110, 106, and 104 cm, respectively. The chest girth of 1st, 2nd, and 3rd-grade were 147, 135, and 130 cm, respectively. The 1st, 2nd, and 3rd-grade body length were 114, 110, and 105 cm, respectively. The results showed that the body length was almost close to 1st-class on SNI. In addition to the genetic factors, the body size differences were influenced by environmental factors, including maintenance management [7].

Table 1. Body sizes of Bali cows at smallholder farmers of oil palm plantation partnership in Rokan Hulu

| Variable                        | Minimum | Mean±standard deviation | Maximum |
|---------------------------------|---------|-------------------------|---------|
| Body condition score (1-5)      | 2       | 2.91±0.50               | 3.8     |
| Body sizes (cm)                 |         |                         |         |
| Head length                     | 31      | 34.86±2.42              | 39      |
| Head width                      | 15      | 17.32±1.10              | 19      |
| Ear length                      | 12      | 21.14±2.32              | 24      |
| Chest girth                     | 141     | 156.68±7.07             | 169     |
| Body high                       | 106     | 112.73±8.86             | 149     |
| Hip high                        | 94      | 105.55±5.21             | 116     |
| Chest depth                     | 53      | 59.23±3.16              | 64      |
| Chest width                     | 33      | 39.23±4.46              | 54      |
| Hip width                       | 26      | 33.73±3.16              | 41      |
| Absolute body length            | 102     | 113.77±5.26             | 122     |
| Relative body length            | 86      | 105±6.89                | 116     |
| Body weight (kg)*               | 183     | 253.65±28.64            | 298     |

* The body weight was calculated and estimated using a Djagra formula

The body weight of Bali cows showed a higher value than the Decision of the Minister of Agriculture of The Republic of Indonesia [8] that decided the body weight of Bali cows (aged 24 months) ranged from 170 kg to 225 kg. The previous study reported that the body weight of Bali cows in Bali, South Sulawesi, and West Nusa Tenggara were 207.89±7.02, 221.3±4.27, and 170±1.34 kg, respectively [9]. The body weight was closely related to the body sizes. The body conditioning score of Bali cows in the study has an ideal score of 2.91±0.50 (Table 2).

3.4. Reproductive performances of Bali cows

Cow reproduction index (CRI) and cow productivity index (CPI) of Bali Cow (Table 2) were higher than the Bali cows with semi-intensive at an oil palm plantation in PTPN V Riau of 0.69-0.76 and 51-59 [10] and Bali cows with semi-intensive maintenance in South Konawe Regency of 0.77 and 71.70 [11]. The CRI and CPI were good due to the calving interval of the cow, pre-weaning mortality, and the weaning weight of the calf. The calving interval in this study was similar to the previous study in Bali cow at the oil palm plantation-cattle integration system in PTPN V Riau of 370-421 days [12] and lower than Bali cow with semi-intensive maintenance in South Konawe Regency was 15.11 months [11]. The pre-weaning calf in this study has good natality. It can be seen based on a lower mortality rate than the
previous study in Bali cattle in the oil palm plantation-cattle integration system in PTPN V Riau, which reached 21% [12]. The mating system was carried out by artificial insemination (84%) and influenced the high weaning weight of the calf. Artificial insemination was one way to improve the genetic quality of Bali cattle that was maintained at the smallholder farmer level.

The level of farmer knowledge of estrus detection was good. It can be seen from the lower of service per conception. The service per conception in this study was lower than the Bali cow that was inseminated in the South Konawe Regency of 1.44–1.70 [11].

### Table 2. Reproductive performances of Bali cows at smallholder farmers of oil palm plantation partnership in Rokan Hulu

| Variable                              | Minimum | Mean±standard deviation | Maximum |
|---------------------------------------|---------|-------------------------|---------|
| Calving interval (days)               | 304     | 376.96±77.65            | 669     |
| Birth process                         | -       | easy                    | -       |
| Weaning age (months)                  | 6       | 7.74±1.16               | 10      |
| Postpartum estrus (days)              | 18      | 72±36.81                | 180     |
| Postpartum mating (days)              | 18      | 72±36.81                | 180     |
| Service per conception (days)         | 1       | 1.23±0.8                | 5       |
| Mating systems (%)                    |         |                         |         |
| Natural mating                        | -       | 15.38                   | -       |
| Artificial insemination               | -       | 84.62                   | -       |
| Mortality (%)                         | -       | 6.25                    | -       |
| Weaning weight at 205 days (kg)       | 66.79   | 97.59±22.88             | 136.53  |
| Cow reproduction index                | 0.55    | 1±0.16                  | 1.2     |
| Cow productivity index                | 53.24   | 97.89±15.84             | 117.17  |

4. Conclusion
It can be concluded that the reproductive performances of Bali cows include the calving interval, weaning age, PPE, PPM, S/C, mortality, weaning weight, CRI, and CPI at smallholder farmers of oil palm plantation partnership in Rokan Hulu was good. The body sizes of the Bali cows based on the body height and chest girth have entered the 1st grade of Bali cows seeds (SNI).

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