Effect of parity on the reproductive performance of Bali cattle at different maintenance systems in Field Station of Sekolah Peternakan Rakyat

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Abstract. Parity is one of the important factors affecting reproductive efficiency in raising beef cattle. The aim of this study was to determine the effect of parity on the reproductive performance of Bali cattle at different maintenance systems as a basis for building breeding cattle businesses in Field Station of Sekolah Peternakan Rakyat (SLSPR). Four hundred and seven records of reproductive performance of Bali cattle were obtained from twelve villages in Sungai Lilin District. Survey and observation were done on September, 2019. Data were analyzed using statistical and descriptive methods. The data were obtained from determined parameters including: calving interval (CI), days open (DO), and service per conception (S/C) of Bali cattle that are kept in intensive, semi intensive and extensive systems. The results showed that parity significantly affected the calving interval (CI), days open (DO) and service per conception (S/C) of Bali cattle that were kept in a semi intensive system. The calving interval (CI) was significantly higher in the second parity (15.46±3.42 months) compared with that of the first and third parity (15.23±3.46 and 13.69±2.15 month, respectively). Days open (DO) also showed significantly higher in the second parity (178.0±102.7 days) than the first and third parity (170.9±104.0 and 124.9±64.70 days, respectively). Furthermore, service per conception (S/C) was significantly higher in the second parity (8.52±5.59) compared to the first and third parity (8.30±5.19 and 5.56±3.88, respectively). Results obtained can be used as a basis for improving maintenance management to start establishing a collective breeding cattle industry in Field Station of Sekolah Peternakan Rakyat (SLSPR), Sungai Lilin District.

1. Introduction
More than 90% population of beef cattle in Indonesia owned by smallholder farmer with traditional and less efficient maintenance system. The characteristics of traditional farmers are the small scale of ownership, an average 1–3 cattle per farmer, low management system such as feeding, control of mating and health of cattle [1,2]. Some studies have reported that the population of cattle in smallholder farmers has not increased and their performance especially in the reproductive aspect tends to decline because generally cattle are kept only as savings [3]. Reproductive efficiency is an important factor in effort to increase population of cattle in small farmers [4]. Reproductive efficiency is influenced by reproductive parameters, as age first calving, calving interval, days open and service per conception [5]. Several
factors are affecting reproductive parameters including parity [6]. Parity is the stage when the dam produces calves [7]. Faiziah et al (2015) reported that on smallholder farmers there was decline in reproduction performance, especially at parity to the next parity [8]. Parity and nutrition have been identified to influence pregnancy failure in cattle [9,10].

The Field Station of Sekolah Peternakan Rakyat (SLSPR), a research unit for universities located in Sekolah Peternakan Rakyat, has passed from the participatory learning of IPB University. SLSPR Maju Bersama is an SPR that was formed through a collaboration between the Research and Community Service Program (LPPM) of IPB University and Musi Banyuasin Regency Government since 2013 and passed in 2017. SPR is an idea formed the aim of changing the mindset of farmers to build a collective business so that science and technology for improving livestock productivity can be easily entered and applied.

Bali cattle are a breed of beef cattle that are mostly raised by small farmers at SLSPR Maju Bersama. Bali cattle are kept because they have high fertility rates, low mortality, adaptive to the environment and produce high of carcass percentage [11]. Bali cattle in SLSPR are managed in 3 system as intensive, semi-intensive and extensive. The aim of this study was to determine the effect of parity on the reproductive performance of Bali cattle in different maintenance systems as a basis for building breeding cattle businesses in Field Station of Sekolah Peternakan Rakyat (SLSPR) Maju Bersama.

2. Materials and methods

2.1. Materials

The present study was conducted on September 2019 in SLSPR Maju Bersama that located in Sungai Lilin District, Musi Banyuasin Regency, South Sumatera. Material used in this study were reproduction records of 407 head dams owned by 147 farmers who lived in twelve from fifteen villages in Sungai Lilin District. The reproduction parameters of Bali cattle depending on parity were obtained by observing and interviewing the farmers using questionnaire. The data were obtained from determined parameters of reproductive performance including: calving interval (CI), days open (DO), and service per conception (S/C) of Bali cattle that are kept in intensive, semi intensive and extensive systems.

2.2. Data analysis

The data were analyzed using software Minitab 17. Non parametric statistic (Kruskal Wallis) were used to analyze the parity factor on CI, DO and S/C between group with different management systems [12]. Results of data were shown as the percentage, mean ± SD (standard deviation Mean) and expressed by descriptive.

3. Results and discussion

The results showed that parity significantly affected the CI, DO and S/C of Bali cattle that were kept in a semi intensive system (table 2) and has no significant effect on intensive system (table 1) and extensive system (table 3). In semi intensive system, CI was significantly higher in the second parity (15.46 ± 3.42 months) compared with that of the first and third parity (15.23 ± 3.46 and 13.69 ± 2.15 month, respectively). DO also showed significantly higher in the second parity (178.0 ± 102.7 days) than the first and third parity (170.9 ± 104.0 and 124.9 ± 64.70 days, respectively). Furthermore, S/C was significantly higher in the second parity (8.52 ± 5.59) compared to the first and third parity (8.30 ± 5.19 and 5.56 ± 3.88, respectively). Ihsan and Wahjuningsih (2011) stated that the effect of parity in the Limousin, Simental and Ongole cattle does not show significant difference, because the distance for each parity is very short, which is about one year so the conditions of the reproductive organ were not much different [7]. This condition is in accordance with the results of the study, namely the intensive and extensive maintenance system have smaller differences in CI, DO and S/C for each parity, compared semi intensive system.

CI, DO and S/C have an effect on each other. The long period of calving interval is due to the days open period and high conception rate (S/C) [13,14]. CI at first parity was generally longer because in general, the first calves to calve have a higher stress level than older cattle and this affects their reproductive organs [15-17]. Hinojosa et al (1980) stated that CI tended to decrease until the cattle were
6–7 years old, whereas in the second and third of calving were relatively constant [18]. DO were strongly influenced by postpartum estrus, weaning period and mating control of smallholder farmers [19,20]. Postpartum estrus was influenced by the nutritional adequacy of the feed, which is determined by maintenance system. The dam that reared in grazing land with adequate feed nutrition have a faster postpartum estrus, but have longer weaning period because there was no weaning control from the smallholder farmers. The number of S/C tend to decrease as parity increases because the incidence rate of estrus accompanied by estrus symptoms in cattle that partus more than once will be seen more clearly than cattle that has never been partus [21,22].

### Table 1. Impact of different parities of Bali cattle in reproductive performance of intensive system

| Parity | No of records | CI (months) | DO (days) | S/C         |
|--------|---------------|-------------|-----------|-------------|
| 1      | 130           | 14.84±3.60  | 159.2±108.06 | 7.89±5.39  |
| 2      | 66            | 14.12±2.62  | 137.70±78.88 | 6.83±3.98  |
| ≥3     | 58            | 13.92±2.19  | 131.86±65.96 | 6.54±3.36  |

NS= Non-significant *= significant difference at level (P<0.05)

### Table 2. Impact of different parities of Bali cattle in reproductive performance of semi intensive system

| Parity | No of records | CI (months) | DO (days) | S/C         |
|--------|---------------|-------------|-----------|-------------|
| 1      | 51            | 15.23±3.46  | 170.9±104.0 | 8.30±5.19   |
| 2      | 33            | 15.46±3.42  | 178.0±102.7 | 8.52±5.59   |
| ≥3     | 41            | 13.69±2.15  | 124.9±64.70 | 5.56±3.88   |

NS = Non-significant. *= significant difference at level (P<0.05)

### Table 3. Impact of different parities of Bali cattle in reproductive performance of extensive system

| Parity | No of records | CI (months) | DO (days) | S/C         |
|--------|---------------|-------------|-----------|-------------|
| 1      | 12            | 14.98±3.05  | 163.7±91.6  | 8.18±4.58   |
| 2      | 9             | 15.66±3.22  | 183.9±96.7  | 9.19±4.83   |
| ≥3     | 7             | 15.18±2.18  | 169.6±65.5  | 8.48±3.27   |

NS= Non-significant. *= significant difference at level (P<0.05)

The result shows a decrease of CI, DO and S/C at more than third parity in intensive, semi intensive and extensive system (figure 1). CI, DO and S/C tend to decrease in intensive system from first to above third parity. This condition indicates that there was an improvement in mating control of smallholder farmers every time the parity increases in intensive system. In a semi intensive system, the number of CI, DO and S/C increased from first to second parity, but fell sharply at more than third parity. The extensive system shows an increase in CI, DO and S/C from first parity to second parity, the decreases with a value approaching the first parity. Bali cattle reared in extensive system tend to have lower reproductive performance than semi intensive and intensive system (high CI/DO and S/C). This condition indicates that maintenance management at extensive system in SLSPR Maju Bersama needs to be improved so that reproductive efficiency can be created.
Figure 1. Effect of parity on CI, DO and S/C of Bali cattle in different management systems

4. Conclusions
Parity significantly affected the CI, DO and S/C of Bali cattle that were kept in a semi intensive system. Results obtained can be used as a basis for improving maintenance management to start establishing a collective breeding cattle industry in Field Station of Sekolah Peternakan Rakyat (SLSPR), Sungai Lilin District.

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