Reproductive Performance of Dairy Cows at Different Parities (A Case Study in Enrekang Regency, Indonesia)

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Abstract—The objective was to know the reproductive performance of dairy cows at different parities. A total of 60 dairy Holstein-Friesian cows with parity one to three were used. Reproductive parameters were days open, calving interval, and service per conception (S/C). The results showed that the mean (±SD) days open in parity 2 was slightly longer than those in parity 3 (228.2±121.5 vs. 205.5±144.5; P=0.061). None cows conceived within 85 days postpartum in parity 3 in comparison to 13.8% cows conceived in parity 2. The mean (±SD) calving interval of the cows in parity 2 and parity 3 were 508.2±121.5 and 495.5±144.1, respectively. Cows in parity 1 had significantly (P<0.01) lower number of S/C in comparison to the cows with parity 2 and parity 3 (1.6±1.2 vs. 3.5±3.4 and 3.3±2.1). It can be concluded that reproductive performance of the cows is affected by different parities.

Index Terms—dairy cows, parity, days open, calving interval, service per conception

I. INTRODUCTION

It has been reported that reproductive performance of dairy cows has decreased worldwide [1], in particular cows with a high genetic potential for milk production. Many studies have reported the factors affecting reproductive performance in dairy cow. For example Coleman *et al.* [2], reported that reproductive performance in dairy cows was affected by season of calving, production, maturity, and reproductive disorders. Moreover, Chagas *et al.* [3] stated that management, nutrition, production, and genetics are the main reasons for the decline in fertility in dairy cow. Similarly, study of Garcia-Ispierto *et al.* [4] stated that the likelihood of pregnancy decreased in cows milked three times per day, inseminations performed during the warm period, repeat breeder cows, and inseminating bulls.

Therefore, fertility is significantly affected by the factors such as milking frequency, AI technician, bull, repeat breeding syndrome, lactation number, and AI season. In addition, shortening or eliminating the dry period leads to earlier postpartum ovulation [5], [6].

However, reasons for the decline in fertility are multifactorial [7]. Other factors such as reproductive diseases or season of calving were relatively more important than milk yield on influencing reproductive performance [7], [8].

Since multi factors contributed in declining fertility in dairy cows [9], especially due to high milk production in modern dairy cows [3], alternative management strategies may be required to improve fertility of dairy cows [6]. However, in smallholder farms, the problems might be different. One of the problems that frequently reduced the reproductive performance in dairy cows is lactation number (parity) as reported by Darwash *et al.* [10] that cows with higher parities had longer days to first service and days to conception. Therefore, in the present study we tried to know the reproductive performance of dairy cows at different parities.

II. MATERIALS AND METHODS

A. Animals and Herds Management

A total of 60 dairy Holstein-Friesian cows from five dairy smallholder farms were enrolled in the present study. All dairy cows in the farms were housed in tie-stall barns with rubber on the concrete floor. The size of small farm ranged from two to 20 cows. The parity of the cows ranged from one to three. Cows were milked twice a day using hands milking system by the farmers. Feedstuffs consisted of elephant grass or natural grass, rice bran or concentrate, and mineral supplements.

B. Reproductive Management

Detection of estrus were conducted by the farmers and based on secondary estrous signs only. The cows detected in estrus were notice by the farmers and inseminated by inseminator using frozen/thawed semen approximately six hours later (AM/PM rule). Pregnancy diagnosis was conducted by the technician to the cows that did not showing estrous signs 60 days or more after insemination. In all farms, no estrous induction or synchronization was performed.

C. Reproductive Performance

The following reproductive parameters were used to characterize reproductive performance:

- Days **open**: number of days from calving to conception
- **Calving** interval: number of days between two consecutive calving
- **Service** per conception: number of services (AI) per conception
- First Artificial Insemination Conception Rate (FAICR): percentage of cows conceived at first AI

D. Data Collection

Two types of data were collected in the present study (primary and secondary data). For collecting primary data, all herds were visited twice for reproductive examination. The cows were clinically examined for reproductive check by palpation per rectum and vaginoscopy. Palpation per rectum was conducted to assess cervical and uterine conditions as well as ovarian structures. Cows that did not become pregnant at the time of clinical check were subjected for vaginoscopy examination. For secondary data, all reproductive data for each cow were obtained from individual recording data sheet and with the help of a questionnaire including age, date and number of calving, date and number of AI for each calving (S/C), interval from calving to first AI, and interval from calving to conception.

E. Data Analyses

All data were tabulated and presented as mean ± SD (standard deviation). Descriptive statistic was used to calculate the mean interval from calving to conception, calving interval, and S/C. Different the mean interval from calving to conception, calving interval, and S/C at different parities was analyzed using ANOVA. All calculation was carried out using the statistical package SPSS 16.0 for Windows (SPSS Inc., Chicago, IL, USA).

III. RESULTS AND DISCUSSION

A. Interval from Calving to Conception (Days Open)

Table I shows interval from calving to conception (days open) in dairy cows at different parities. Mean days open of dairy cows did not differ between parity 1 and parity 2 (P=0.61). However, cows in parity 1 tended to be longer 23 days; approximately one estrous cycle than those cows in parity 2. This finding was in line with the studies conducted by LeBlanc et al. [11] and Gautam et al. [12]. Moreover, their studies suggested that cows in the third or greater lactations were at greater risk of clinical endometritis than those cows in their second or first lactation, and subsequently reduced the likelihood to become pregnant as well as prolonged interval from calving to conception. Similarly, Yusuf et al. [13] reported that cows in the fourth or higher lactations had more likely to have sub-fertility/culled compared to those cows in the first to third lactations. Their study confirmed that cows in higher parities more easily suffered from the

incidence of clinical reproductive disorders such as endometritis.

TABLE I.   INTERVAL FROM CALVING TO CONCEPTION (DAYS OPEN) OF DAIRY COWS AT DIFFERENT PARITIES

Parity	Days open (mean ±SD)	P-value
1	228.2±121.5	0.61
2	205.5±144.3	

In parity 1 cows, there was 13.8% cows conceived within 85 days after calving and none in parity 2 (P<0.01) (Fig. 1). This might due to that in early lactation, cows in parity 2 produced more milk than cows in parity 1, DeVries et al. [14] suggested greater Negative Energy Balance (NEB) occurred in parity 2 cows; consequently affected reproductive activities. Tanaka et al. [15] concluded in their study that influence of parity on the resumption of ovarian cycle is modulated by the factors different from the nutrition-related changes during the postpartum period in dairy cows. Conversely, up to 150 days postpartum, no significant difference (P>0.05) in conception rate was found between the two different parities (30.1% and 36.4%). Furthermore, up to 210 days postpartum, cows in parity 2 had significantly higher (P<0.01) conception rate than those cows in parity 1 (72.8% vs. 44.8%).
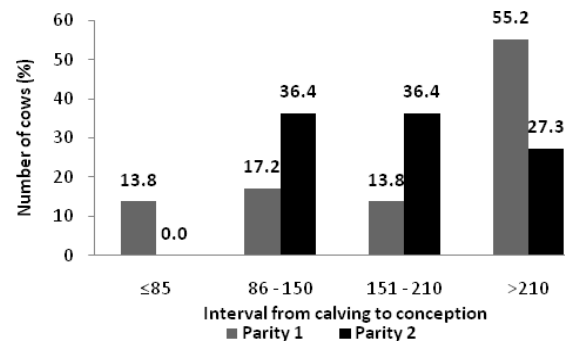

Figure 1.   Comparison interval from calving to conception between cows in parity 1 and cows in parity 2.

Comparison calving interval between cows in parity 2 and parity 3 are shown in Fig. 2. The mean (±SD) calving interval of the cows in parity 2 and parity 3 were 508.2±121.5 and 495.5±144.1, respectively. No significant different (P=0.39) was found within the two groups. In parity 2, only 3.8% cows had calving interval within 365 days and none in Parity 3. However, cumulatively, calving interval within 400 days for the cows in parity 3 had significantly higher (P<0.01) number of cows than those cows in parity 2 (30.8% vs. 7.7%). Likewise, within 500 days calving interval, parity 3 cows had significantly higher (P<0.01) number of cows than those cows in parity 2 (69.2% vs. 46.2%) (Fig. 2). The reasons for differences in calving interval for these two parities were not clear. However, similar results was reported by Evans et al. [16] that calving interval increased for the first 5 parities. It has been reported that parity affected blood concentration such as total protein and globulin [17, 18]. Moreover, days relative to calving

is affected by the concentrations such as total protein and globulin [18], and probably increased the incidence of embryonic loss [19], subsequently prolonged calving interval. Therefore, this may explain the longer calving interval in higher parities of the cows.
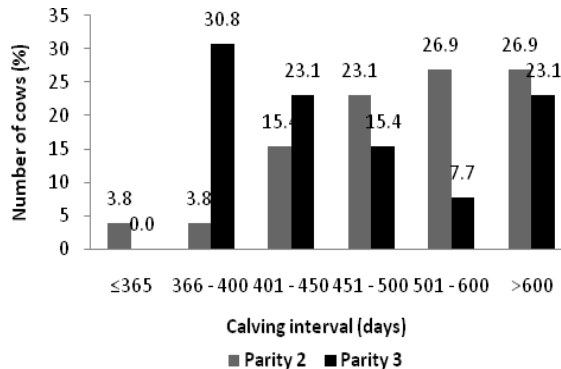

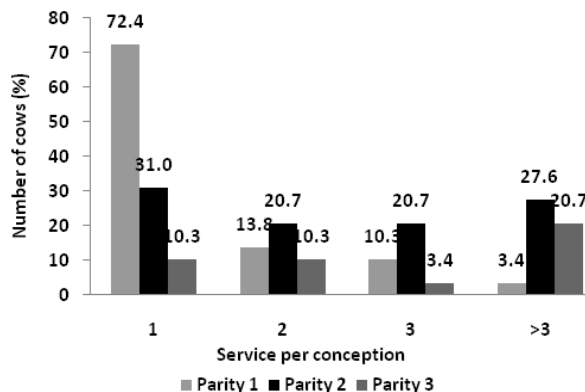Figure 2. Comparison calving interval between cows in parity 2 and parity 3.

Figure 3. Service per conception of dairy cows at different parities.

The mean (±SD) number of services per conception (S/C) in parities 1, 2, and 3 in dairy cows were 1.6±1.2, 3.5±3.4 and 3.3±2.1, respectively. Number of S/C in the present study was affected by different parities (P=0.01). Cows in parity 1 had significantly lower (P<0.01) than those cows in parity 2 and parity 3. However, number of S/C for the cows in parity 2 did not differ than those cows in parity 3 (P=0.87). In Fig. 3 shows that FAICR in parity 1cows was 72.4%; higher than those cows in parities 2 and 3. Cows in parities 2 and 3 were mostly become pregnant after two or greater services. Higher number of services in parities 2 and 3 may be caused by embryonic loss after successfully fertilization. This due to that cows in higher parities had a higher risk of embryonic loss, (El-Tabarany *et al.* [19] indicated by higher PAG (pregnancy-associated glycoproteins) in parity 1 compared with greater parities [20], resulting in an increased number of services per conception [21], [22], [23], consequently, increased the incidence of repeat breeding [23].

IV. CONCLUSIONS

In conclusion, reproductive performance of the dairy cows is affected by different parities. Interval from calving to conception (days open) of the cows in parity 2 was slightly longer than those in parity 3. Number of cows with calving interval of 400 and 450 days in parity 3 was higher than those cows in parity 2. Increased parities were followed by increase number of services per conception.

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