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# Review: Reproductive Efficiency of Cows in Different Parity

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**ABSTRACT**

Livestock is one of the agricultural sectors that play an important role in providing animal products. Cows are one of the largest meat and dairy producers. The low reproductive efficiency of cattle is the biggest problem of its development. Increasing reproductive efficiency through artificial insemination programs is one way to enhance livestock populations. Reproductive efficiency parameters can be measured through values of Service per Conception (S/C) and Conception Rate (CR). Service per conception and C Rare related to cows parity. Parity is the number of the calf that has been born to a cow. This study aimed to provide information on reproductive efficiency as seen from the value of S/C and CR of cows in different parities and the factors that influence them. High rates of parity are followed by high S/C scores and low CR. Each animal has different values of S/C and CR. The normal range for S/C is 1.6-2.0 and 60% in CR. Several factors that affect reproductive efficiency are environment, nutrition, body condition score (BCS), knowledge of farmers, inseminator skills, and quality of used semen. The highest S/C was at parity of 5 with age ± 7 years and the CR was at parity 3 age± 5 years.

Keywords: conception rate, different parity, reproductive efficiency, service per conception.

## INTRODUCTION

Livestock is one of the sectors in agriculture that plays a role in providing animal protein for the people of Indonesia [1]. Cattle are one type of livestock that can produce meat and milk for human consumption [2]. However, in the development of livestock populations in Indonesia, low reproductive efficiency is the biggest problem for breeders [3].

One of the ways to increase livestock population and milk production in dairy cows is by enhancing reproductive efficiency through Artificial Insemination (AI) [4]. Artificial insemination is one of the reproductive technologies that have been commonly implemented in Indonesia [5]. It is necessary to record reproductive efficiency to support the success of AI [6].

Reproductive efficiency is the main component in increasing beef cattle productivity [7]. Reproduction is related to the production aspect of livestock, there is production if the reproduction process is going well [8]. Therefore, reproductive efficiency in the livestock business is very important and becomes a benchmark for livestock success [9]. The high and low reproductive efficiency of cattle can be measured using the parameters Service Per Conception (S/C) and Conception Rate (CR)[10].

The reproductive efficiency value of cows that includes S/C and CR is related to parity [11]. Parity is the number of calves that have been born by a cow or the stages of a cow in giving birth to calves [12]. Therefore, this paper aimed to provide information on reproductive efficiency in terms of the S/C and CR values of cattle in different parities and the factors that influence them.

## REPRODUCTIVE PERFORMANCE

Reproductive efficiency is a term that indicates the ability of an animal to become pregnant and give birth to healthy offspring [13]. Reproduction of female livestock is a complex process and can be disrupted, both before and after the start of the reproductive cycle. Therefore, reproductive efficiency can be achieved through good maintenance management [14].

Reproductive efficiency can be measured through the parameters of the time interval from giving birth to next pregnancy (days Open), CR, S/C and first service [15]. Sari *et al.*[16] said that reproductive efficiency can be seen from the S/C. It is in line with Masir *et al.*[17] that reproductive efficiency can be calculated through the parameters of the S/C, CR, and calving interval (CI).

There are several factors that affect the reproductive efficiency of livestock such as nutrition. Pariswara *et al.*[18] states that nutrients are needed by livestock for the life and reproduction. Therefore, balanced nutrition is required for the synthesis of reproductive hormones. Imbalance of nutrients in the body of livestock can reduce the reproductive efficiency. Livestock that lack nutrients will produce low BCS values [19], and Pisantra *et al.*[20] reported that cows with low BCS have high S/C values. In addition to nutritional factors, Khan *et al.*[21] stated that in tropical countries the reproductive performance of livestock is influenced by several factors and one of them is parity. Parity is the stage at which a cow gives birth to a calf.

Yohana *et al.* [2] revealed that several factors that influence pregnancy failure so that cattle mate repeatedly include: (1) estrus detection, (2) the timing of artificial insemination, in which the insemination should be carried out around 8-12 hours after the start of estrus, (3) the low quality of semen which is caused by the skill of the inseminator in doing thawing in the field, (4) livestock reproductive disease, this disease can be prevented by paying attention to the condition of the cage which must always be cleaned and also adequate feed consumption.

## SERVICE PER CONCEPTION

Service per Conception is the number of mating required for a female to become pregnant [22]. Siagarini *et al.* [12] reported that the S/C value can be calculated using theformula:

$$S/C = \frac{Number\ of\ insemination}{Number\ of\ pregnant\ cows}$$

Table 1. Service per conception of cows at different parities

| Parity | Ihsan and Wahjuningsi [23] | Lari *et al.* [24] | Wahyudi *et al.* [11] | Retno *et al.* [25] | Puspitasari *et al.* [26] | Average |
|---|---|---|---|---|---|---|
| 1 | - | 2.1 | 2.51 | 1.94 | 1.1 | 1.91 |
| 2 | 1.37 | 2.6 | 2.72 | 2.15 | 1.23 | 2.01 |
| 3 | 1.33 | 2.7 | 3.01 | 2.35 | 1.24 | 2.12 |
| 4 | - | 2.7 | 2.51 | 1.95 | 1.57 | 2.18 |
| 5 | - | 3 | 2.32 | 1.86 | - | 2.39 |
| 6 | - | - | 3 | 1.14 | - | 2.07 |

Several research results related to the S/C value are presented in Table 1. The average S/C score is seen that parity 1 has the lowest S/C with 1.9, while the highest at parity 5 with 2.39. This showed that in parity from 1 to 5 there is an increase in S/C, the higher parity, the higher S/C number. Khan *et al.* [21] stated that the reproductive performance of cattle is influenced by several factors, one of which is parity. The average age of cows in parity 5 is ± 7 years. Retno *et al.*[25] reported that the value of S/C was also influenced by age, where the reproduction of old cattle experienced a decline in reproductive efficiency. The same thing was reported by Ananda *et al.* [9] that increasing age in the animal is followed by an increase in the value of S/C.

The female with low S/C has a high fertility rate, and if the S/C number is high then the female cow has a low fertility rate [12]. According to Susilawati [27] reported that the lower the S/C value, the higher the fertility rate. Furthermore, Budiawan *et al.* [28] reported that the general factors that affect the fertility level of an animal are genetics, feed management, and the environment.

Normal S/C values range from 1.6 to 2.0 [29,30]. This is in line with earlier report [2] that the normal range of S/C is 1.6 to 2.0 and the ideal value is 1. The S/C value in some cows varies with 1.1 and 1.3 in Bali cattle [31], 1.53 in Kruai cattle [32], 2.07 in PO cattle [33], and 1.79 in another study on Bali cattle [1].

Sulaksono *et al.* [34] reported several factors that influence the S/C value that includes the timing of AI implementation, the ability of breeders to detect estrus, inseminator skills, the environment, and the quality of the semen used. This is in line with the several factors that can

influence S/C such as the Body Condition Score (BCS) with an influence level of 1.6% and 98.4% of semen quality factors, acceptors conditions, estrus detection, and inseminator skills [35]. In addition, the age at first mating influences the high and low S/C of cows. The age of 18-24 months is the condition of the cow where the reproductive organs function properly [32].

## CONCEPTION RATE

Conception rate is defined as the percentage of pregnant cows resulting from artificial insemination services [36]. The CR value can be calculated by formula [12]:

$$\boldsymbol{CR} = \frac{Number\ of\ pregnant\ cows}{Number\ of\ AI\ acceptors}\ X100\%$$

Table 2. Conception rate of cows at different parities

| Parity | Miah *et al.*[37] | Razi *et al.*[38] | Khatun *et al.* [39] | Khan *et al.* [21] | Siagarini *et al.* [12] | Average |
|---|---|---|---|---|---|---|
| 1 | 47.00% | 50.00% | 51.47% | 57.90% | 62.00% | 53.67% |
| 2 | 52.28% | 62.00% | 72.97% | 61.90% | 64.00% | 62.63% |
| 3 | 52.57% | 68.00% | 65.79% | 73.70% | 62.00% | 64.41% |
| 4 | 50.27% | 77.00% | 31.81% | 75.00% | - | 58.52% |
| 5 | 36.32% | 75.00% | 42.66% | 52.90% | - | 51.72% |
| 6 | 25.57% | 55.00% | 33.33% | 40.00% | - | 38.48% |

Several research results related to CR at different parities are presented in Table 2. The highest average of CR is at parity 2 and 3, while the lowest is at parity 6 and the middle CR percentage is at parity 1, 4 and 5. This showed that cows at parity 2 and 3 with ages of 4-5 years have experienced maturity of reproductive organs and hormonal systems [33]. Meanwhile, in heifers 2-3 years old, the level of the hormone estrogen is still low and causes difficulties in detecting the estrus and affecting the reproductive efficiency of the cows [40]. This is in line withreported by Wahyudi *et al.* [11] that the fertility of an animal is influenced by age. Puspitasari *et al.*[26] stated that the percentage of CR is moderate or low if it is <60%. The CR of 50% was sufficient and was a normal condition in Indonesia [41].The conception rate of each cowis varied. Dairy cattle have a lower CR with 44.30% [42], while beef cattle can reach 69.42% [43] and 77% [44].

The high and low percentage of CR is closely related to the condition of acceptors, the low knowledge of farmers about the nutritional quality of the feed needed by each animal, as well as varying environmental conditions can affect pregnancy in the first insemination of cattle [2]. This is in line with reported by Bhaskara *et al.*[45] that one of the factors that influence CR is the environment, where bad environmental conditions will affect livestock stress levels. The mechanism of stress can affect the reproductive performance of cows. Adrenocorticotropic Releasing Hormone (ACTH-RH) stimulates the anterior pituitary and produces ACTH (Adrenocorticotropic Hormone) thereby releasing the cortisol hormone. The increase incortisol affects the hypothalamus to produce Gonadotropin Inhibitory Hormone (GnIH) so that the

anterior pituitary cannot produce FSH and LH, causing the process of folliculogenesis not to occur, resulting in failure of ovulation [46].

In further, [41] reported that the low CR was due to the delay in detecting estrus, reproductive diseases or abnormalities in the female reproductive organs, and facilities and skills of the inseminator. It is in line with [2] which states that the failure of pregnancy of an animal can be influenced by several factors are the detection of estrus by the breeders, the implementation and technique of AI by the inseminator, semen quality and diseases that attack the cattle.

## CONCLUSION

The highest service per conception (S/C) value was at parity 5 with aged ± 7 years and the conception rate (CR) was at parity 3 aged ± 5 years.

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