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Reproductive Performance of Ongole Crossbred Cattle in Deli Serdang Regency as Affected by Body Condition Score

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ABSTRACT. *Reproductive efficiency is a key determinant of productivity in beef cattle, and Reproductive performance is significantly influenced by the Body Condition Score (BCS). The purpose of this study was to assess the reproductive performance of Ongole Crossbred (PO) cattle based on the relationship between BCS, Service per Conception (S/C), and Calving Interval (*CI*) in Deli Serdang Regency, North Sumatra. The research was conducted from July to August 2022 using a descriptive method. Purposive sampling was used to pick 377 PO cows, and information was gathered through farmer interviews and direct observation. and secondary data from local livestock institutions. BCS was assessed using the Scottish/Canadian scoring system, while S/C and C/I were obtained from insemination records. According to the findings, PO cattle had an average BCS of 2.65±0.18, indicating thin to moderate body condition. The mean S/C value was 2.16±0.25, suggesting that more than two to become pregnant, insemination attempts were necessary.. The average CI was 429.8±15.4 days, exceeding the ideal 12-month interval. Regression analysis revealed a negative relationship between BCS and both S/C and* CI*, indicating that better body condition improved reproductive outcomes. In conclusion, BCS has a major impact on the reproductive success of PO cattle in Deli Serdang, and improvements in nutritional and reproductive management are required to enhance cattle productivity.*

Keywords: Deli serdang regency, performance; productivity, ongole crossbred cattle, body condition score (BCS)

INTRODUCTION

Ongole (PO) cattle are one of Indonesia's livestock genetic resources that play an important role in meat production as well as draft power. High tolerance to tropical settings is one of PO cattle's benefits, resistance to diseases, and efficient utilization of fibrous feed resources (Hardjosubroto, 2004; Sutarno & Setyawan, 2015). Nevertheless, the productivity of PO cattle, particularly in terms of reproductive performance, still faces several constraints that affect the efficiency of smallholder farming systems (Meuwissen et al., 2024; Yan et al., 2019).

Reproductive performance of female cattle can be evaluated through several key parameters, such as Body Condition Score (BCS), Service per Conception (S/C), and Calving Interval (CI). BCS reflects the animal's nutritional status and energy reserves and is widely recognized as a key factor influencing reproductive physiology (Sukma et al., 2024). Cows with excessively low or high body condition tend to experience reproductive disorders, including irregular estrous cycles, weak estrus expression, and low conception rates (Kalds et al., 2022). Meanwhile, S/C represents the number of inseminations required to achieve pregnancy, and CI indicates the interval between two successive calvings. Elevated S/C values and prolonged CI are generally associated with inadequate nutrition, reproductive disorders, and suboptimal body condition (Wanjala et al., 2022; Nkadimeng et al., 2024).

Although the association between BCS and reproductive parameters has been widely reported in various cattle breeds, limited information is available regarding this relationship specifically in PO cattle raised under smallholder conditions in Deli Serdang Regency. Moreover, recent changes in feeding practices, land use patterns, and increasing climatic variability may alter body condition dynamics and reproductive outcomes in this region. Therefore, updated and location-specific data are necessary to provide an accurate picture of current reproductive performance.

The parameters S/C and CI are also considered major indicators of reproductive efficiency. The number of inseminations needed to become pregnant is known as Service per Conception, whereas Calving Interval indicates the length of time between successive calvings. High S/C values and prolonged C/I are generally associated with suboptimal feeding management, reproductive health disorders, and non-ideal body condition (Wanjala et al., 2022).

Deli Serdang Regency, located in North Sumatra Province, is characterized by predominantly small-scale cattle farming systems where animals are managed under semi-intensive or tethering systems with variable feed resources. Limited grazing land and dependence on seasonal forage availability often result in fluctuations in body condition throughout the year (Zhu et al., 2023; Demir et al., 2022). Therefore, an assessment of the relationship between BCS and reproductive parameters such as S/C and CI is essential as a basis for improving the productivity of PO cattle in this region.

Therefore, this study aimed to analyze the association between Body Condition Score and reproductive performance, as measured by Service per Conception and Calving Interval, in Ongole crossbred cattle in Deli Serdang Regency. The results are expected to provide an evidence-based reference for improving nutritional and reproductive management strategies at the smallholder farmer level.

MATERIALS AND METHODS

Study Location and Time

The study was carried out in Deli Serdang Regency in July and August of 2022., North Sumatra Province.

Materials and Equipment

The research materials consisted of productive female Peranakan Ongole (PO) cattle that had calved at least once. The equipment used included a measuring stick, measuring tape, ropes, stationery, a calculator, and other supporting tools.

Research Method

This study employed a descriptive research method. Purposive sampling approaches were used to gather primary data through farmer interviews and direct observation, namely the selection of samples based on specific characteristics determined by the researcher. These criteria included female Peranakan Ongole (PO) cattle that had calved, were overseen by intense or semi-intensive systems, and had participated in an artificial insemination program. Secondary data were obtained from the Agricultural Extension Center (Balai Penyuluhan Pertanian, BPP) and other relevant institutions in Deli Serdang Regency.

Body Condition Score (BCS) assessment was performed using the Scottish/Canadian scoring system with a scale ranging from 1 to 5, representing body conditions from very thin to very fat (Wildman et al., 1982). BCS determination was carried out through visual observation and palpation of several body parts, including the spinous processes (processus spinosus), tuber coxae, tuber ischiadicus, tail head, and hip area (Irawansyah, 2023).

Sampling Procedure

The research samples consisted of female PO cattle aged ≥1.5 years that had calved at least once. The Slovin formula with a 5% margin of error was used to get the sample size.

$$n = \frac{N}{1 + N(e)^2}$$

With a cattle population of 6,634 heads, a sample size of 377 heads was obtained.

Research Parameters

Body Condition Score (BCS)

Using the technique outlined by Cooke et al. (2021) the Body Condition Score (BCS) was determined by palpating and visually observing fat deposits along the back and hindquarters.

Service per Conception (S/C)

Service per Conception (S/C) is defined as the number of artificial inseminations required to achieve pregnancy (Thanh et al., 2025). The formula used is:

$$S/C = \frac{\text{Number of artificial inseminations until conception}}{\text{Number of pregnant acceptors}}$$

Calving Interval (CI)

The calving interval (CI) was determined based on the time difference between the previous calving and the subsequent calving, as recorded by inseminators (Meuwissen et al., 2024).

$$CI = Calving_i - Calving_{(i-1)}$$

Data Analysis

To ascertain the association between Body Condition Score (BCS), Service per Conception (S/C), and Calving Interval (CI), the data were subjected to simple linear regression and correlation analysis (Lavrijsen-Kromwijk et al., 2024). The Minitab program was used for all statistical analyses. The regression model used was:

$$Y = a + bX$$

Where:

Y = response variable (S/C or CI); X = predictor variable (BCS); a = constant; b = regression coefficient.

RESULT AND DISCUSSION

Data Population Size and Observation Sample

The total population of beef cattle subjected to artificial insemination, the population of PO cattle subjected to artificial insemination, and the number of observation samples are presented in Table 1.

Based on the calculation using the Slovin formula, from a total of 6,634 PO cattle subjected to artificial insemination, 377 heads were selected as the observation sample. Bangun Purba, Pancur Batu, and STM Hilir Subdistricts recorded the highest levels of artificial insemination, whereas Sibolangit and Labuhan Deli showed relatively low numbers. Gunung Meriah Subdistrict was the only area where no artificial insemination activities were reported.

The marked variation among subdistricts may reflect differences in access to insemination services, farmer awareness, and management systems. Areas with higher insemination coverage, such as Bangun Purba, are likely to have better accessibility to field inseminators and more established extension support. In contrast, the absence of artificial insemination in Gunung Meriah may be related to geographical constraints, limited service availability, or a stronger reliance on natural mating practices. Variations in feed availability and overall herd management may also influence farmers' willingness to adopt artificial insemination programs.

These disparities may indirectly influence reproductive performance indicators. Limited access to artificial insemination services can delay breeding, increase days open, and contribute to prolonged calving intervals. Furthermore, variations in feed availability and herd management practices across subdistricts may affect Body Condition Score, which

subsequently influences conception success. Therefore, the uneven distribution of artificial insemination services may not only reflect management differences but also contribute to variability in S/C and CI values observed in the study area.

Table 1. Population of Beef Cattle in Deli Serdang Regency and the Number of PO Cattle Subjected to Artificial Insemination in 2021.

No	Subdistrict	Number of cows inseminated	Number of PO cattle inseminated	Number of Observation Samples
1	Gunung Meriah	3	0	0
2	S.T.M. Hulu	244	98	5
3	Sibolangit	25	10	0
4	Kutalimbaru	1509	604	35
5	Pancur Batu	1651	660	35
6	Namo Rambe	196	78	5
7	Biru-Biru	217	87	5
8	S.T.M. Hilir	1552	621	35
9	Bangun Purba	2220	888	50
10	Galang	1114	446	25
11	Tanjung Morawa	938	375	20
12	Patumbak	397	159	10
13	Deli Tua	413	165	10
14	Sunggal	823	329	18
15	Hamparan Perak	1068	427	25
16	Labuhan Deli	132	53	5
17	Percut Sei Tuan	1089	436	25
18	Batang Kuis	208	83	5
19	Pantai Labu	702	281	16
20	Beringin	1304	522	30
21	Lubuk Pakam	181	72	5
22	Pagar Merbau	601	240	13
	Total	16587	6634	377

Source: Data processed from district Deli Serdang (2022).

Body Condition Score (BCS) of PO Cattle

The Body Condition Score (BCS) values of PO cattle subjected to artificial insemination in Deli Serdang Regency are presented in Table 2.

PO cattle had an average Body Condition Score (BCS) of 2.65 ± 0.18, indicating that the animals were generally in thin to moderate body condition. BCS is influenced by herd management practices such as feeding regime, housing quality, and overall health status. Inadequate nutrient intake prevents cows from achieving optimal body reserves at the time of breeding, which may reduce reproductive efficiency (Hickson & Morris, 2017; Yasin et al., 2018). Housing conditions may also affect animal comfort and feed intake. Appropriate flooring and housing design can reduce stress and locomotion problems, thereby indirectly supporting better feed utilization and body condition (Cooke et al., 2021; Nurkholis et al., 2025).

In addition, BCS is closely related to milk production in dairy cattle. In order to support milk supply, lactating cows with low BCS typically mobilize significant amounts of body fat stores (Ervandi et al., 2020; Syaiful et al., 2024). When feed intake after calving is insufficient, excessive fat mobilization occurs, leading to a decline in BCS (Pratama et al., 2024; Pinheiro et al., 2021).

In beef-type cattle, inadequate body reserves before and after calving may lead to a prolonged Negative Energy Balance (NEB). During early postpartum, cows often experience increased energy demands while feed intake has not yet fully recovered. If this condition persists,

ovarian activity may be suppressed, resulting in delayed resumption of estrous cycles or prolonged postpartum anestrus. Consequently, cows with low BCS are more likely to experience extended calving intervals and higher service per conception values.

Table 2. Average Body Condition Score (BCS) of PO Cattle in Deli Serdang Regency

No	District	Number of inseminated PO cattle	Number of observed samples (head)	Value body condition score (BCS)
1	Gunung Meriah	0	0	0
2	S.T.M. Hulu	98	5	2.80
3	Sibolangit	10	0	0
4	Kutalimbaru	604	35	2.60
5	Pancur Batu	660	35	3.00
6	Namo Rambe	78	5	2.60
7	Biru-Biru	87	5	2.57
8	S.T.M. Hilir	621	35	2.60
9	Bangun Purba	888	50	2.50
10	Galang	446	25	2.50
11	Tanjung Morawa	375	20	3.00
12	Patumbak	159	10	2.56
13	Deli Tua	165	10	2.50
14	Sunggal	329	18	2.88
15	Hamparan Perak	427	25	2.80
16	Labuhan Deli	53	5	2.50
17	Percut Sei Tuan	436	25	2.60
18	Batang Kuis	83	5	2.40
19	Pantai Labu	281	16	2.70
20	Beringin	522	30	2.89
21	Lubuk Pakam	72	5	2.50
22	Pagar Merbau	240	13	2.60
	Average			2.65 ± 0.18

Service per Conception (S/C) Value

The average Service per Conception (S/C) value of PO cattle in Deli Serdang Regency was 2.16 ± 0.25 (Table 3), indicating that more than two inseminations were required on average to achieve pregnancy. This value is relatively high compared with the ideal standard of 1–2 inseminations and suggests reduced reproductive efficiency.

The elevated S/C value observed in this study may be closely associated with the moderate to low Body Condition Score (2.65 ± 0.18) recorded in the cattle population. Cows with inadequate body reserves often experience metabolic stress, particularly during the postpartum period. A low BCS reflects insufficient energy availability, which may impair follicular development, reduce oocyte quality, and delay the resumption of normal ovarian activity. Furthermore, suboptimal energy status may affect the uterine environment, reducing the likelihood of successful embryo implantation. Consequently, insemination attempts are more likely to fail at the first service, leading to repeated inseminations and a higher S/C value.

In addition to body condition, other management-related factors such as inaccurate estrus detection, inseminator skill level, and improper timing of artificial insemination may also contribute to increased S/C values (Bezdíček et al., 2020; Al-Jubori et al., 2023). An S/C value above 2 is generally associated with prolonged days open and extended calving intervals, which may result in increased production costs and economic losses for smallholder farmers.

Table 3. Average Service per Conception (S/C) values

No	District	Number of inseminated PO cattle	Number of observed samples (head)	Value service per conception (S/C)
1	Gunung Meriah	0	0	0
2	S.T.M. Hulu	98	5	2.13
3	Sibolangit	10	0	0
4	Kutalimbaru	604	35	1.94
5	Pancur Batu	660	35	2.00
6	Namo Rambe	78	5	2.10
7	Biru-Biru	87	5	2.20
8	S.T.M. Hilir	621	35	1.94
9	Bangun Purba	888	50	2.39
10	Galang	446	25	2.11
11	Tanjung Morawa	375	20	2.08
12	Patumbak	159	10	2.94
13	Deli Tua	165	10	2.25
14	Sunggal	329	18	1.72
15	Hamparan Perak	427	25	2.25
16	Labuhan Deli	53	5	1.90
17	Percut Sei Tuan	436	25	2.15
18	Batang Kuis	83	5	2.22
19	Pantai Labu	281	16	2.00
20	Beringin	522	30	2.29
21	Lubuk Pakam	72	5	2.33
22	Pagar Merbau	240	13	2.19
	Average			2.16 ± 0.25

Table 4. Average Calving Interval (CI)

No	District	Number of inseminated PO cattle	Number of observed samples (head)	Average calving interval (days)
1	Gunung Meriah	0	0	0
2	S.T.M. Hulu	98	5	438.21
3	Sibolangit	10	0	0
4	Kutalimbaru	604	35	440.44
5	Pancur Batu	660	35	423.50
6	Namo Rambe	78	5	434.77
7	Biru-Biru	87	5	431.69
8	S.T.M. Hilir	621	35	434
9	Bangun Purba	888	50	408.31
10	Galang	446	25	429.03
11	Tanjung Morawa	375	20	389.28
12	Patumbak	159	10	437.92
13	Deli Tua	165	10	440.23
14	Sunggal	329	18	405.51
15	Hamparan Perak	427	25	421.54
16	Labuhan Deli	53	5	406
17	Percut Sei Tuan	436	25	438.24
18	Batang Kuis	83	5	458.92
19	Pantai Labu	281	16	443.83
20	Beringin	522	30	436.94
21	Lubuk Pakam	72	5	406
22	Pagar Merbau	240	13	445.69
	Average			429.8 ± 15.4

Calving Interval (CI) Value

The calving interval of PO cattle in Deli Serdang Regency was 429.8 ± 15.4 days (approximately 14.3 months). This value is longer than the ideal standard of 12 months. Among the various factors influencing calving interval, Body Condition Score plays a central role because it reflects the cow's energy reserves during late gestation and early postpartum. Cows with low BCS at calving are more likely to experience prolonged Negative Energy Balance, which delays uterine involution and suppresses the resumption of ovarian cyclicity. As a result, the onset of postpartum estrus is postponed, extending the interval from calving to conception. This delay ultimately lengthens the calving interval. Therefore, maintaining cows at an adequate BCS prior to calving is essential to ensure timely return to estrus and to achieve a calving interval closer to the biological optimum of approximately 365 days.

This result is in line with a number of earlier research findings indicating the calving interval (CI) of Ongole Crossbred (PO) cattle generally ranges around 430 days (Moreno-Sierra et al., 2021; Heryani et al., 2024). A prolonged calving interval may be caused by: (1) inaccurate estrus detection; (2) low body condition score (BCS); (3) inadequate feeding and mating management; (4) delayed postpartum estrus; and (5) the effects of dam age and environmental stress. A prolonged CI reduces reproductive efficiency and decreases the number of calves produced per year (Afif et al., 2023; Mulianda et al., 2018).

The Connection Between Service per Conception (S/C) and Body Condition Score (BCS)

The coefficient of correlation (r = –0.292) indicates a negative relationship, meaning that an increase in BCS is associated with a decrease in S/C. This suggests that cattle with better body condition require fewer inseminations to achieve pregnancy. The relationship between BCS and S/C is presented in Table 5.

Table 5. Regression and Correlation Relationship Between BCS and S/C

BCS	R	R-sq	R-eq	Average
S/C	-0.292	35%	3.228 – 0.404	2.16 ± 0.25

Source: Processed primary data (2022).

The coefficient of determination (R^2) of 0.35 indicates that Body Condition Score (BCS) explains 35% of the variation in Service per Conception (S/C), while the remaining 65% is influenced by other factors such as inseminator skill, accuracy of estrus detection, timing of insemination, semen quality, as well as general health and environmental conditions (Mangun et al., 2024; Jakaria et al., 2020). Although the contribution of BCS may appear moderate, it represents a substantial proportion in field-based reproductive studies.

Importantly, BCS is an internal biological factor that can be directly managed by farmers through improvements in feeding strategies and overall herd nutrition. In contrast, many of the remaining factors influencing S/C are external and may be beyond the immediate control of farmers, such as technical skill of inseminators or semen handling quality. Therefore, maintaining optimal body condition serves as a fundamental basis for improving conception success before other technical interventions can be fully effective.

The regression analysis showed a regression coefficient of –0.404, indicating a negative relationship between BCS and S/C (Septian et al., 2015; Chekirov et al., 2023). This means that for every one-unit increase in BCS, the S/C value decreases by 0.404. In practical terms, improving the body condition of PO cows through better nutritional management is likely

to enhance reproductive efficiency, as reflected by reduced S/C values in Deli Serdang Regency.

CONCLUSION

The reproductive performance of Ongole Crossbred (PO) cattle in Deli Serdang Regency was significantly influenced by Body Condition Score (BCS). The average BCS of 2.65 indicates that most cows were in thin to moderate condition at the time of artificial insemination, which is below the commonly recommended threshold of approximately 3.0 (on a 1–5 scale) for optimal reproductive efficiency. This suboptimal body condition was associated with a relatively high average Service per Conception (2.16) and a prolonged Calving Interval (429.8 days).

The negative correlation between BCS and both S/C and CI confirms that BCS is not merely a numerical score, but a biological indicator of the cow's readiness for successful conception and timely return to estrus postpartum. Cows with better body reserves required fewer inseminations and exhibited shorter calving intervals, highlighting the central role of adequate energy status in reproductive success.

From a practical perspective, improving body condition should become a primary management focus in smallholder systems. Efforts may include providing supplemental feed during critical periods, particularly in late gestation and early postpartum, improving forage quality, and ensuring consistent nutrient availability throughout the production cycle. Strengthening nutritional management during these phases is expected to enhance reproductive efficiency and reduce economic losses associated with repeated inseminations and extended calving intervals.

CONFLICT OF INTEREST

There is no conflict of interest, according to all of the authors.

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