

ISRG Journal of Multidisciplinary Studies (ISRGJMS)



ISRG PUBLISHERS

Abbreviated Key Title: isrg j. multidiscip. Stud.

ISSN: 2584-0452 (Online)

Journal homepage: <https://isrgpublishers.com/isrgjms/>

Volume – III, Issue - VII (July) 2025

Frequency: Monthly



Succes Rate of Double Dose Artificial Insemination in Sragen Central Java Indonesia

Dwi Sanyoto¹, Engkus Ainul Yakin^{2*}

^{1,2} Program Study of Animal Husbandry, Faculty of Agriculture, Universitas Veteran Bangun Nusantara, Sukoharjo, Indonesia

| **Received:** 14.07.2025 | **Accepted:** 19.07.2025 | **Published:** 22.07.2025

***Corresponding author:** Engkus Ainul Yakin

Program Study of Animal Husbandry, Faculty of Agriculture, Universitas Veteran Bangun Nusantara, Sukoharjo, Indonesia

Abstract

This study aims to determine the success rate of double dose AI (Artificial Insemination) at 8 and 16 hours in simmental/limousin cows with different quality of heat. Parameters used in this study are Non Return Rate (NRR), Conception Rate (CR) and Pregnancy Rate (PR). The materials used in this study were 25 Simmental/ Limousin cows. Samples were selected by purpose sampling with the criteria of adult female cows that have a minimum BCS of 3, with an age of more than 1.5 years identified based on dental poel and have a healthy condition. The semen used for this study was frozen semen of Limousin males produced by the Artificial Insemination Center (BBIB) Ungaran. The method used in this study was direct observation method in the field, by selecting female cattle according to the criteria and have good quality in heat. The results of the study %NRR (52.1%) showed that not all cows showed reproductive success, and there was room for improvement, especially in reproductive management techniques and approaches. CR (65.9%) indicates a fairly good IB success rate, reflecting that most of the inseminated cows experienced conception. PR (87.1%) is an outstanding indicator of program success, indicating the number of cows that successfully conceived.

Keywords: Artificial Insemination, Double Dose, Cattle

1. Introduction

The high demand for beef must be balanced by population growth and domestic beef production. This ensures that domestic demand can be met through smallholder livestock farming, while imports can be gradually reduced, in line with the national beef self-sufficiency plan. Currently, national beef demand cannot be fully met by domestic production due to low or suboptimal growth in the domestic cattle population.

The growing public demand for livestock products, especially meat, is influenced by the growing population. In addition, rising incomes and growing public awareness of the importance of consuming nutritious food also increase the demand for meat. This high demand should be balanced by an increase in the cattle population, which produces meat. One way to increase meat and calf production is by increasing the number of beef cattle owned and the genetic quality of the livestock. (Rusdiana, 2019).

The AI program is a powerful method ever created by humans to increase livestock population and production quantitatively and qualitatively. (Hiola et al., 2023). This can be implemented by applying artificial insemination (AI) in beef cattle, because the semen used for AI comes from bulls with good genetics and a lower average service per conception (S/C) rate compared to natural mating. Artificial insemination (AI) or injection mating is an effort to insert semen into the reproductive tract of a female animal in heat with the help of an inseminator to make the animal pregnant. From this definition, the inseminator plays a very large role in the success of AI implementation. The expertise and skills of the inseminator in accurate heat recognition, equipment sanitation, handling of frozen semen, correct thawing, and the ability to perform AI will determine the success (Azhari & Zulfikar, 2023).

The use of Artificial Insemination (AI) technology in Indonesia has increased and spread to various provinces. Central Java, in particular, has seen a significant increase in the use of AI. The success rate for AI has reached 50% across all regions, including Sragen, Boyolali, Klaten, and Wonogiri. However, this success rate remains relatively low. This is in line with the opinion of (Juli et al., 2019), stated that the success rate of AI in cattle in developed countries is considered good if it reaches 60%-75%.

Sragen Regency is one of the regencies that has developed beef cattle by implementing artificial insemination (AI) technology. According to the Sragen Central Statistics Agency (2023), the beef cattle population in Sragen is 63,348. The birth rate of beef cattle in Sragen Regency has increased quite well from year to year, as seen in 2021, when the birth rate reached 44.4%, then decreased in 2022 to 40%, and increased in 2023 with a birth rate reaching 47%. Through the Agricultural Facilities Provision and Development Program in the Animal, Plant, and Microorganism Genetic Resource Management (SDG) activities, the Regency/City Authority in Sragen Regency through the Food Security, Agriculture, and Fisheries Service in 2023 provided grant assistance for Simmental/Limousin cattle to 19 livestock groups with a total budget of around 4.2 billion. The assistance was provided almost evenly throughout Sragen Regency, which is spread across 20 sub-districts. Each group receives a minimum of 10 cows, with a membership of 10 people. Since 2020, all livestock grants have been provided through the aspirations of the councils, whether at the central, provincial, or regional levels. Therefore, each group is based on the name and address of each council. Two

groups in Miri District, one in Sumberlawang District, and one in Sidoharjo District are fostered by the Department of Food Security, Agriculture, and Fisheries, and are districts with large livestock populations. The prospects for developing grant cattle in these three districts are very promising, especially for beef cattle. Breeders in these livestock groups generally use an artificial insemination system (AI) for their livestock. The types of livestock currently raised are Simmental or Limousin crossbreeds.

2. Materials and Methods

This research will be conducted from February 1, 2025, to May 30, 2025, in Sragen, Central Java. The material used in this study is 25 female cattle. The sample was selected by purposeful sampling with the criteria of adult female cattle with a BCS of at least 3, with an age of more than 1.5 years identified based on dental poles and having a healthy condition. The semen used for this study is frozen semen from Limousin bulls produced by the Ungaran Artificial Insemination Center.

2.1 Method

The method used in this study was direct observation in the field, by selecting female livestock according to criteria and having good estrus quality. The thawing method used tap water for 10-30 seconds. The AI technique was carried out using the deep insemination method (positioned on the uterine cornua). Insemination was carried out in double doses at estrus intervals of 8 hours and 16 hours. The meaning of 8 hours and 16 hours is that the AI was carried out 8 hours after the inseminator received a call from the farmer (if in the morning, then insemination in the afternoon), while 16 hours is 24 hours after the inseminator received the initial call.

2.2 Observation Variables

2.2.1 Independent Variable: Quality of Desire, parameters measured:

1. Vulva Color, observation of vulva color is done by observing the color of the labio minora which turns red during estrus (Rachmawati et al., 2018).
2. Vaginal temperature, vulvar temperature measurement is carried out using a digital thermometer which is inserted into the vulva for three minutes during estrus and an average temperature of 37-39°C is obtained (Rachmawati et al., 2018).
3. Cervical mucus, mucus observation is done by looking at the consistency and amount of mucus that comes out of the vulva before AI (Irfan et al., 2017).
4. Mucus pH, observations are made using pH test paper which is inserted into the vagina, then the pH value is observed.

2.2.2 Dependent Variable

1. Non-Return Rate (NRR)

NRR is a female that does not show signs of estrus again after being inseminated within 21-60 days after insemination. Susilawati (2011), Wiranto et al. (2020) added that the percentage of inseminated cows that do not show estrus again on days 18-21 (NRR-1) and 40-42 after insemination (NRR-2). Iswoyo and Widyaningrum (2008) explained that to determine the NRR, namely:

$$\% \text{ NRR} = \frac{A-B}{A} \times 100\%$$

A = Number of female cattle artificially inseminated

B = Number of female cattle artificially inseminated again

2. Conception Rate (CR)

Conception Rate (CR) is the number of pregnant cattle resulting from pregnancy examination (PKB) conducted by rectal palpation in the first AI divided by the number of cattle mated, multiplied by one hundred (%) (Susilawati, 2011); (Wiranto et al., 2020).

$$\% \text{ CR} = \frac{X}{Y} \times 100\%$$

X = Number of pregnant female cattle in the first artificial insemination

Y = Number of female cattle

3. Pregnancy Rate (PR)

Pregnancy Rate (PR) is the number of pregnant cows from the total number of cows in AI (Putra et al., 2018). The PR value can be calculated using the formula according to Iswoyo and Widyaningrum (2008); Putra et al. (2018).

$$\% \text{ PR} = \frac{M}{N} \times 100\%$$

M = Number of pregnancy female cattle

N = Number of female cattle artificially

2.3 Data analysis

The data obtained were then tabulated and statistically processed using Microsoft Excel, and analyzed descriptively and compared with the success rate parameters of double-dose AI with different estrus qualities in previous studies.

3. RESULTS AND DISCUSSION

3.1 pH

Artificial insemination (AI) is a reproductive technique commonly used in the livestock industry to improve reproductive efficiency in cattle. One of the key factors in successful AI is the reproductive environment, including the pH of the female cattle vagina. Vaginal pH plays a role in influencing sperm quality, fertilization success, and the animal's reproductive health (Faniaet al., 2020).

Table 1. pH Frequency Distribution

	Frequency	Percent
8	33	38.8
Total	85	100.0

In this observation, researchers recorded the pH measurements in the cows' vaginas with the following results: pH 7 (number of female cattle : 52) pH 8 (number of female cattle: 33). Vaginal pH naturally ranges from 6.0 to 7.5, with optimal conditions helping maintain sperm viability and successful fertilization. The pH 7 observed in 52 female cattle indicates that a large number of female cattle are within the ideal range. This condition supports a more friendly environment for sperm to survive and fertilize eggs. This is in line with research (Maghfiroh et al., 2024)that the pH of cows during artificial insemination (AI) is a factor that influences the success of AI in cows. The frequency distribution of the pH of cows in this study can also be seen in the diagram below:

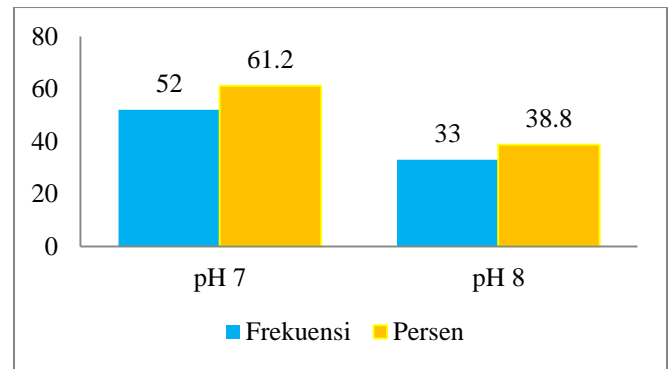


Figure 1. pH Frequency Distribution

3.2 Vaginal Temperature

Vaginal temperature is an important parameter that can affect animal fertility, including cows. When performing artificial insemination (AI), it is crucial to ensure the cow is in optimal reproductive condition. Vaginal temperature can play a role in influencing the environment around the egg and sperm, which in turn can affect the success rate of AI.

The ideal vaginal temperature for female cattle should be between 37.5°C and 39.5°C. A temperature lower than 38°C usually indicates hypothermia or reduced metabolic activity. In bulls, it can be an indication of stress or a detrimental infection.

Table 2. Frequency Distribution of Vaginal Temperature

	Frequency	Percent
<38	33	26
≥	38	59
Total	85	100.0

There were 26 female cattle with temperatures below 38°C, indicating that some cows may not be in optimal conditions for fertilization. Low temperatures can affect sperm motility and viability, which are crucial for successful AI.

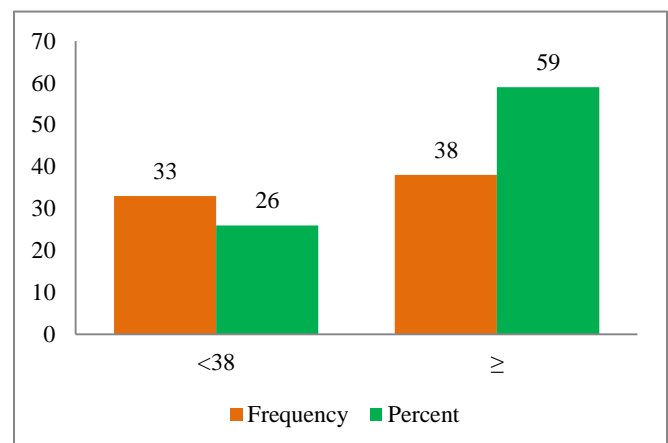


Figure 2. Vaginal Temperature Frequency Diagram

3.3 Vulva Color

Vulva color in female cattle is an important indicator in assessing the reproductive status and fertility of the animal. Before performing artificial insemination (AI), physical observations, including vulva color, can provide insight into the phase of the female cattle estrous cycle. The observations obtained were as follows: Evenly Red : 59 female cattle, Red : 26 female cattle

Table 3. Vulva Color

	Frequency	Percent
Red	26	30.6
Even Red	59	69.4
Total	85	100.0

Analysis and Meaning of Vulva Colors

3.3.1 Even Red Color (59 female cattle)

A uniformly red vulva generally indicates that the female cattle is in or very close to estrus. In cows, this uniform red color is usually indicated by expanded blood vessels and adequate blood flow to the vulva, giving it a more "red" and swollen appearance.

Female cattle in this condition are more receptive to sperm, increasing the success rate of AI. This is an ideal time for artificial insemination.

3.3.2 Red Color (26 cows)

A red vulva, even if uneven, can indicate that the female cattle is in or nearing estrus. This redness can be a sign of swelling, but it's not as obvious as a uniform redness.

While female cattle with red vulvas may also be in good condition for insemination, a more in-depth assessment of their behavior and other signs of estrus may be necessary to determine the best time to perform AI. Female cattle in this condition may require more attention to ensure they are truly ready for insemination.

Determining vulva color is one method for identifying when a cow is in its optimal reproductive phase. Understanding vulva color can improve the chances of successful artificial insemination by ensuring accurate estrus diagnosis.

The data showed that most cows (59 out of 85) exhibited an even red vulva color, indicating they were in good estrus and ready for artificial insemination. Meanwhile, the 26 cows with red color may indicate a similar condition but may require more attention to ensure they are in the right condition for AI. Observing and recording vulva color before AI provides important information to improve the success rate and efficiency of reproductive programs in female cattle.

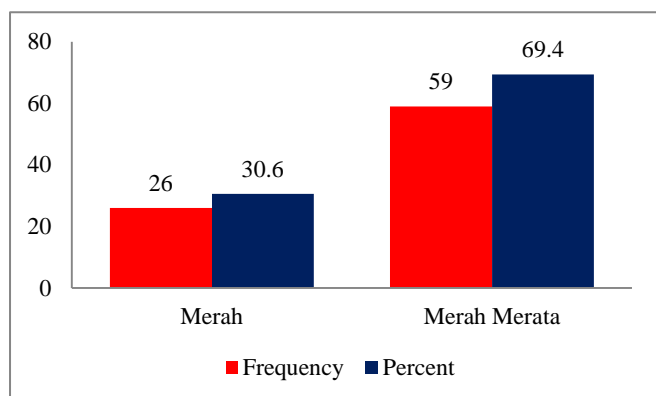


Figure 3. Vulva Color

3.4 Non-Return Rate(NRR)

Non-Return Rate(NRR) is the percentage of cows that do not return to estrus after artificial insemination within a specified period. This indicates that the cow is likely pregnant. An NRR of 52.1% indicates that more than half of the inseminated cows did not show

signs of returning to estrus. This value is considered good in the context of an existing reproductive program, although there is likely still room for improvement.

Table 4. NRR

	Frequency	Percent
Female cattle in IB	57	67
Female cattle in Re-Insemination	28	33
Total	85	100.0

A higher NRR is generally expected as it indicates good AI success. However, other factors such as insemination technique, semen quality, and the cow's general health also influence NRR.

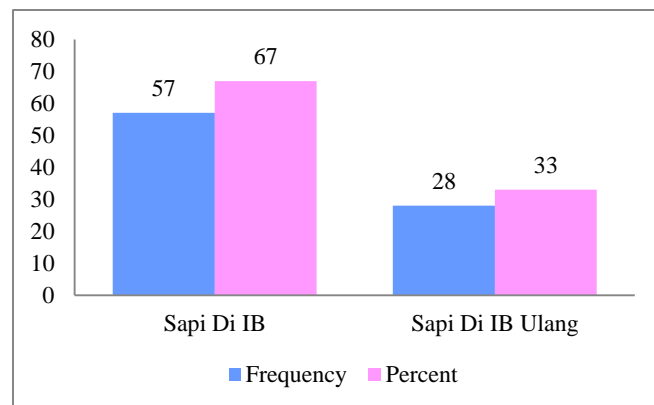


Figure 4. Vulva Color

3.5 Conception Rate(CR)

Conception Rate (CR) is the percentage of cows that successfully conceive after artificial insemination. CR is calculated by dividing the number of cows that successfully conceive by the total number of inseminations performed. CR of 67.1% indicates that the majority of inseminated cows conceived. This is a positive indicator that the insemination procedure and semen quality used were adequate.

Table 5. % CR

	Percent
% CR	67.1
% Non CR	32.9
Total	100.0

A high CR rate is usually associated with good reproductive health, proper insemination techniques, and accurate timing of AI.

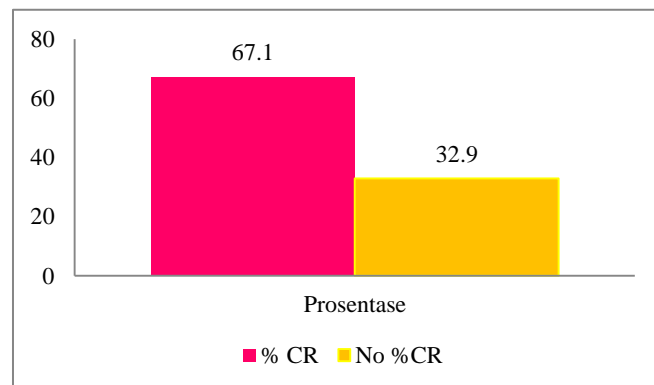


Figure 5. % CR diagram

3.6 Pregnancy Rate (PR)

Pregnancy Rate (PR) is the percentage of pregnant female cattle at a certain time, calculated from the number of pregnant cows compared to the total number of female cattle given AI in a certain period.

Table 6. % PR

	Percent
% PR	87.1
% Non PR	13
Total	100.0

Pregnancy Rate PR of 87.1% is excellent, indicating that most heifers successfully conceived after insemination. This indicates that the reproductive program is effective, and many cows are achieving successful pregnancies.

Pregnancy Rate high (PR) can also indicate good management in terms of animal welfare, nutrition and health.

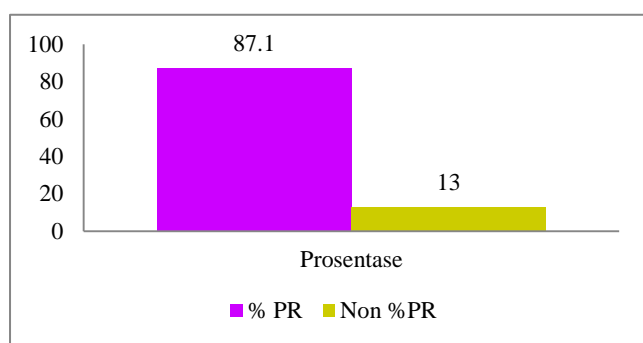


Figure 6. PR% Diagram

4. Conclusion

The conclusion of this study:

1. NRR (52.1%) shows that not all cows have shown reproductive success, and there is room for improvement, especially in reproductive management techniques and approaches.
2. CR (65.9%) indicates a fairly good AI success rate, reflecting that most of the inseminated cows conceived.
3. PR (87.1%) is an excellent indicator of program success, showing the large number of cows that successfully became pregnant.

References

1. Azhari, A., & Zulfikar, Z. 2023. Level of knowledge and implementation of the Artificial Insemination (AI) program towards increasing the cattle population in Baktiya District, North Aceh Regency. *Journal of Agricultural Sciences (JSP)*, 5(1).
<https://doi.org/10.51179/jsp.v5i1.1698>
2. Fania, B., Trilaksana, IGNB, and Puja, IK. 2020. Success of Artificial Insemination (AI) in Balinese Cattle in Mengwi District, Badung, Bali. *Indonesia Medicus Veterinus*, 9(3).
<https://doi.org/10.19087/imv.2020.9.2.177>
3. Hiola, MM, Malewa, AD, and Mangun, M. 2023. Evaluation of the Artificial Insemination Program in Donggala Cattle in Sindue Tombusabora District, Donggala Regency. *AgriSains Scientific Journal*, 24 (1).

4. Juli, K., Bireuen, K., and Aceh, P. 2019. Evaluation of Artificial Insemination Program on Local Female Cattle. *Agripet*, 19 (1).
5. Maghfiroh, FL, Mubarakati, NJ, Zayadi, H., and Musaffak, TR. 2024. Analysis of Fresh Sperm Quality in Simmental and Limousin Cattle Against Various Ejaculate Fractions. *Jurnal Sains Alami* 6 (2).
<https://doi.org/10.33474/j.sa.v6i2.1880>
6. Rusdiana, S. 2019. The phenomenom of meat-original food needs can be fulfilled through increasing beef cattle business in farmers Soca. *Journal of Social and Agricultural Economics*.
<https://doi.org/10.24843/soca.2019.v13.i01.p06>