

The role of inseminators in the success of pregnancy outcome in Bali Cattle

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Abstract. The inseminators contribute an important role in the success of insemination therefore the research was conducted to evaluate the expertise and background of inseminators on the success of pregnancy outcomes. Seven inseminators from two districts were interviewed and related to their ability to do artificial insemination in Bali cattle in 2018. Reproductive data from January to December 2018 were analysed to determine their inseminator's performance from 2 districts (Kota Bengkulu and Bengkulu Tengah). One-way analysis of variance was tested to analyze the differences among inseminators on the result of AI pregnancy outcome, and a t-test was performed to determine whether the means pregnancy outcomes from two areas are different. Duncan's multiple range test was used to determine the significance of the difference between groups. The step-wise regression was applied to determine the strongest correlated variable. The result showed that conception rate (CR) and calving rate (CvR) differed significantly ($P < 0.05$) among the inseminators, CR (81.30% vs 65.02) and CvR (76.68% vs 62.36%) also different between two districts. While the step-wise regression results showed that educational background, experience, age, and centre or unit for AI training become excluded variables while training (Assisted Reproductive Technology and pregnancy diagnosis) showed the strongest correlation with the pregnancy outcome. In conclusion pregnancy outcome differs between the two regencies and advanced training (Assisted Reproductive Technology and pregnancy diagnosis) showed the strongest correlation with the pregnancy outcome and the quality of the centre or unit for AI training is similar.

1 Introduction

Inseminators are one of the elements influencing the success of artificial insemination. The inseminator plays a crucial role in the effectiveness of insemination, hence the lack of this professional's expertise in inseminators poses a barrier to achieving satisfactory pregnancy outcomes [1][2]. The proper deposition of healthy spermatozoa on the reproductive track at the proper period of estrus is one of the elements that determine how effective insemination is. It has been determined that the rate of conception is strongly influenced by the inseminator's skill in carrying out the AI process in Brazil [3] and Bangladesh [4]. According to Sahin et al [5], inseminators had a 41.36% impact on conception rates in Turkey. While

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[6] reported that an inseminator, did not affect the conception rate. Additionally, according to [7] there was no correlation between inseminators and the probability of the conception rate on the first insemination [8].

Peter JL and O'Connor [9] state that inseminators should work with a variety of reproductive tracts and have a lot of practice inseminating different live cows to learn the manual skills necessary for insemination. There should be more than one goal when learning how to insert the insemination rod into the cervix. Programs for artificial insemination (AI) training should also highlight the value of sanitary and the development of abilities to reliably determine the ideal location for the deposition of semen and to deposit semen. Additionally, inseminators should get a good knowledge of the reproductive tract and recognize the fundamental components of an effective reproductive management program.

There is room for human mistakes, and the reproductive success of a stud farm as a whole may depend on the inseminators' abilities. It takes a lot of effort and practice to do artificial insemination efficiently and correctly each time. This necessitates the employment of an experienced veterinarian or animal technician, which can be expensive [10].

2 Materials and methods

Seven inseminators from two districts were interviewed and related to their ability to do artificial insemination in Bali cattle in 2018. The research's data set included records of artificial insemination from January to December 2018 were analyzed to determine their inseminators' performance from 2 districts Kota Bengkulu and Bengkulu Tengah. A questionnaire survey was developed to reveal data on the age of inseminators, the status of marriage, gender, education, AI training, number and level of AI training, as well as the number of inseminated cattle. The performance of the inseminator was identified by the result of the AI pregnancy outcome.

$$\text{Non - Return Rate} = \frac{\text{Total no. of cows inseminated} - \text{No. of cows returned to estrus}}{\text{Total no. of cows inseminated}} \times 100\%$$

$$\text{Service per conception} = \frac{\text{Number of AI dose}}{\text{Number of pregnancies}}$$

$$\text{Conception Rate} = \frac{\text{Number of pregnancies on first AI}}{\text{Total Females on AI}}$$

$$\text{Calving rate} = \frac{\text{Total no. of cows inseminated} - \text{female not calving} - \text{female aborted}}{\text{Total no. of cows inseminated}}$$

All data were tabulated and the t-test was used to evaluate whether the means of pregnancy outcomes in the two areas differed. To assess the importance of the difference between groups, the Duncan multiple range test was performed. To identify the most strongly associated variable, step-wise regression was used.

3 Results and discussion

Table 1 showed that all of the inseminators were male, had more than 15 years of AI implementation experience, and more than 50% were over 50. Basic artificial insemination training for inseminators in the Bengkulu regencies was provided by National Artificial Insemination Center (the Lembang Artificial Insemination Center in Bandung, the Padang Mangatas Artificial Insemination Center in West Sumatera, the Singosari National Artificial

Insemination Center (SNAIC) in East Java, the Center for Training Ranch (BBPP) in Batu, East Java.

It was also found that 85.71% of inseminators also had advanced training on Pregnancy Diagnose for Cattle (14 days) from reputable training centres namely the Lembang Artificial Insemination Center in Bandung, the Padang Mangatas Artificial Insemination Center in West Sumatera, the Singosari National Artificial Insemination Center (SNAIC) in East Java.

Table 1. Profile of inseminators.

No	Parameters		Per cent
1	Gender	Male	100
		Female	0
2	Age (years)	< 40	28.57
		40-50	14.28
		>50	57.14
3	Education	High School	57.14
		College	14.29
		University	28.57
4	Experience as inseminator (years)	<15	42.86
		15-30	57.14
5	Training Attended	Basic AI	100
		Pregnancy Diagnose and ART	85.71

While training for Assisted Reproductive Technology (ART) was obtained from BPTU Sembawa, the Padang Mangatas Artificial Insemination Center in West Sumatera and Lembang Artificial Insemination Center in Bandung.

Table 2. Pregnancy outcome in two regencies in Bengkulu

	Bengkulu Tengah			Kota Bengkulu			P value
	Mean	SE		Mean	SE		
S/C	1.4	±	0.04 ^a	1.73	±	0.07 ^b	0.00
NRR	85.27	±	1.80	86.31	±	2.12	0.71
Conception rate	81.3	±	1.99 ^a	65.02	±	2.95 ^b	0.00
Calving rate	76.68	±	2.16 ^a	62.36	±	2.99 ^b	0.01

The pregnancy outcomes of the two regencies were found to differ significantly. Service per conception (S/C), Conception Rate, and Calving Rate are all better in the Bengkulu Tengah regency than in Kota Bengkulu (Table 2). The differences could be due to the inseminator's performance or management (Table 3). Bansal et al. [11] reported major disparities in animal conception rates may be related to farmer management and agro-climatic variables of the individual district.

Table 3. The effect of inseminator on pregnancy outcome.

No	Inseminator	S/C		NRR		Conception rate		Calving rate	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
1	Inse-1	1.31	± 0.05 ^{ab}	88.19	± 2.70	85.42	± 2.95 ^{ab}	83.33	± 3.12 ^a
2	Inse-2	1.32	± 0.06 ^{ab}	81.37	± 3.08	80.63	± 3.13 ^{ab}	73.91	± 3.47 ^{abc}
3	Inse-3	1.90	± 0.12	86.67	± 4.43	70.00	± 5.97 ^{bc}	68.33	± 6.06 ^{abc}
4	Inse-4	1.22	± 0.09 ^a	91.30	± 6.01	90.91	± 6.27 ^a	77.27	± 9.14 ^{ab}
5	Inse-5	1.70	± 0.12 ^c	81.01	± 4.44	68.35	± 5.27 ^{cd}	64.56	± 5.42 ^{bc}
6	Inse-6	1.60	± 0.11 ^{bc}	83.64	± 5.03	61.82	± 6.61 ^d	58.18	± 6.71 ^d
7	Inse-7	1.80	± 0.10 ^c	90.63	± 2.59	64.06	± 4.26 ^d	62.50	± 4.30 ^{bc}
Average		1.53	± 0.04	85.69	± 1.37	74.69	± 1.71	70.87	± 1.78
P value		0.001		0.021		0.001		0.001	

Woldu et al [12] reported that management systems could influence the success of AI outcomes. The S/C was 1.22-1.80 with the average 1.53 + 0.04 services required to conceive our findings also revealed that 14% of cattle needed more than three inseminations to become pregnant. There were no significant differences between Inseminator on Non-Return Rate (NRR). It means that the quality of bull semen was proven because according to Johnson [13], the Non-Return Rate (NRR) to Artificial Insemination (AI) provides a measure of bull fertility early in the mating season. Rabidas et al. [14] said that factors affecting NRR were age and parity of the inseminated cows, season and environment especially temperature. Highly significant variations between inseminators on conception rate (61.82-90.91%) were found in Table 3, which indicates that the disparities are almost 30%. According to Mouffok [15], the inseminators' level of practice proficiency affects the conception rate and the difference was about 20%.

The overall calving rate in this study was 70.87%, according to the Directorate General of Livestock and Animal Health (Ditjen PKH) the implementation of UPSUS SIWAB already managed to increase the percentage of conception rate from 38,54% in 2017 to 50,49% in 2018 and reach 63,27% on 2019. According to Bilkis et al. [16] the animal's state of health, collection of semen, evaluation and processing, transportation method, and semen processing, while loading an artificial Insemination gun, as well as appropriate detection of oestrus, insemination at the appropriate time, and site of deposition semen, all had a big impact on how successful AI was. Mouffok et al. [15] said that the animal itself, season, and inseminators either technicality or availability all affect reproductive performance.

Table 4. Spearman correlation coefficients between pregnancy outcome with the profile of inseminators.

		Education	Advance Training	Experience	Regency	AI training location	Age
S/C	Pearson Correlation	-.089*	-.136**	-.117**	.178**	.141**	0.025
	Sig. (2-tailed)	0.023	0.001	0.003	0.000	0.000	0.528

Table 4. Cont.

NRR	Pearson Correlation	-.083*	0.006	0.029	0.015	-0.009	.096*
	Sig. (2-tailed)	0.035	0.873	0.457	0.711	0.825	0.014
CR	Pearson Correlation	0.054	0.047	.089*	-.184**	-.099*	-0.018
	Sig. (2-tailed)	0.170	0.235	0.024	0.000	0.012	0.641
Calving rate	Pearson Correlation	0.008	0.018	.083*	-.155**	-.104**	0.005
	Sig. (2-tailed)	0.843	0.649	0.034	0.000	0.008	0.902
**. Correlation is significant at the 0.01 level 2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Table 4 showed significant positive/negative Spearman correlations were found in all pregnancy outcomes on the inseminators profile. Service per conception correlated significantly to education, advanced training, experience, and AI training for inseminators. According to Russi et al. [1], the personal and professional circumstances of the inseminator may have an impact on how well they execute or their performance associated with the pregnancy rate. The inseminators' education level had a significant impact on the rate of conception, which were consistent with those of [17] in Pakistan, who discovered that the level of education had an impact on the rate of conception in field animals. Müller-Sepúlveda et al. [18] reported that inseminator experience correlated with pregnancy success.

Chebel et al [19] said that service per conception and the rate of conception are inversely correlated. Sahin et al [5] also stated that the inseminator's experience affects whether the pregnancy outcome is successful or not. It was also found that there were no correlations between education, this result was not in line with findings by [20] educational level of inseminators significantly affected the conception rate. According to Hoeni [21], the inseminator elements including expertise, knowledge, technical abilities, and straw management account for 9.13% of the success of AI. The inseminator factor's coefficient of its line was positive, which suggests that the more successful AI is, the better the experience, knowledge, technical abilities, and management of the inseminator. The contrary condition in Norway is likely caused by a confluence of environmental factors, such as weather, lightning, nutrition (grazing versus indoor feeding), and cow housing, which is distinct in the normally chilly temperate environment [22].

The step-wise regression showed that S/C was significantly associated with inseminator (X1) and advance training (X2) on AI ($R: 0.254$) $Y= 1.660+0.086X1-0.243X2$. Adha et al. [23] reported that inseminators discovered disparities in kind of character and performance. As a result of these differences in academic and advanced training for inseminators, their experience and upbringing, have a favourable and significant impact on artificial insemination outcome. According to O'Connor and Peters [1], all inseminators should occasionally take a refresher course, to assess their approach, learn about the latest developments, and receive suggestions for the new AI method. Astuti [24] also found that inseminator gains more expertise and understanding through insemination training is needed.

4 Conclusion

Pregnancy outcomes vary across the two regions (Kota Bengkulu and Bengkulu Tengah), NRR, conception rate and calving rate are better in Bengkulu Tengah. Advanced training

including pregnancy diagnosis and Assisted Reproductive Technology showed the strongest link with those outcomes which means that the standard of the centre or unit providing AI training is comparable.

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