
AWARENESS OF LIVESTOCK INSPECTORS IN KERALA ON DECLINING SUCCESS RATE OF ARTIFICIAL INSEMINATION IN CATTLE AND ITS LONG-TERM CONSEQUENCES

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ABSTRACT

Success rate of artificial insemination (AI) in cattle is known to decrease over the years of its continuous adoption. Objective of this study was to assess the awareness and relevant practices of livestock inspectors providing AI service, on the declining success rate, emerging fertility issues and possible remedies. The study involved a pre-structured questionnaire survey preceding refresher training for LIs. Among 170 participated, success rate of AI assessed was 36.29 %. Reported incidence of prolonged oestrus in the herd was $38.61 \pm 2.01\%$ and double insemination was carried out in 27.27 % of oestrus. Preferred time for first AI was 12.94 ± 7.26 hours from the onset of oestrus, site of semen deposition was anterior cervix or uterine body in 40.47 % and 32.74 % respectively and the actual process of AI took an average of 41.30 ± 3.50 seconds per animal. Regarding the emerging fertility

issues in AI bred animals, majority of inseminators were aware of and youngsters were more concerned for adoption of remedial measures. To conclude, present success rate of AI in cattle is less and majority of the informants, predominantly youngsters were more aware of the declining success rate, associated emerging fertility issues and the need for suitable remedial measures.

Keywords: Artificial insemination, Breeding, Cattle, fertility, Livestock Inspectors

INTRODUCTION

Artificial insemination (AI) has become the routine intervention employed in cattle breeding and was the major technological tool used for the conversion of around 95 % cattle in Kerala in to crossbreds of three exotic dairy breeds (Prasad and Kumar, 2022). However, from its inception, AI technology is showing

continuous decrease of success rate, not only in the state but even as a universal phenomenon (Lucy, 2001). Besides, various consequences of persistent artificial breeding across many generations are manifested by a multitude of newly emerging fertility issues in AI bred cattle (Kutty, 2004). This in turn necessitates various interventions to ensure satisfactory success rate of AI including steps to ensure bio friendliness of the technology with natural process (Kutty, 2006). Livestock inspectors (LI) being the major category of employees involved in catering AI technology in cattle (Bimal *et al*, 2022), objective of this study was to assess the awareness and attitude of these personnel regarding the declining success rate of AI, altered manifestation of fertility issues, pertinent reasons, and remedial measures often adopted.

MATERIALS AND METHODS

A survey based on pre structured questionnaire was carried out among Livestock Inspectors working within the district under Animal Husbandry department of Kerala. The participants of three trainings organized by the KVK at three locations within Malappuram district formed the informants. A total of 20 questions were included asking the response in the form of some numbers based on their experiences / practice and also few questions to pick

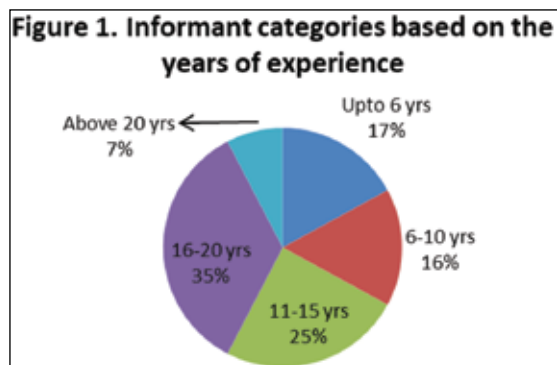
the correct answers from multiple choices of responses provided. The responses were analysed for descriptive statistics and the pattern of variations among three age groups using SPSS software and the findings are summarized.

RESULTS AND DISCUSSION

A total of 170 livestock inspectors distributed throughout the district participated in the study. All of them were actively involved in providing AI service for breeding dairy cattle with an average experience of 13.36 ± 0.51 years. Categories of informants based on the years of experience are shown in fig. 1

The average number of AI done per person was 289.49 ± 20.35 per year and the average success rate of their AI reported was 53.51 ± 1.05 . Success rate of AI was assessed indirectly based on the number of breedable cattle in their jurisdiction (374.83 ± 20.26), semen straw usage per year (411.08 ± 22.18) and number of calvings recorded by them (149.21 ± 12.00) being part of their routine work. Assuming that each semen straw was used for inseminating cows/ heifers at the rate of one straw per AI, and there was no unusual incidence of pregnancy loss in the herd, success rate of AI appeared to be 36.29 % as against 53.51 % reported. This much variation can be attributed to over reporting, being the human tendency to report higher figures

whenever performance of oneself is being assessed. Availability of 108 breeding bulls was reported in the service area of 33 informants out of 170 providing breeding service covering a total of 52210 breedable cattle. Accordingly a sizable proportion of calves born might be contributed by the bulls, further reducing the actual success rate of AI, even if deduction is made for pregnancy loss and abortion at the usual rate of incidence.



As the contributory factors for the low success rate of AI, occurrence of various fertility issues were asked for and the responses included, 1. Incidence of prolonged oestrus (beyond 24 hours) in 38.61 ± 2.01 % and as a corrective measure insemination of more than one straw was reported by 27.27 % informants making the average usage of semen straws per cycle 1.25 ± 0.45 . In spite of many prolonged oestrus cases, preferred time mentioned for AI from the onset of oestrus was 12.94 ± 7.26 hours, which may lead to non availability of sperms for fertilization

at the time of ovulation occurring later than the expected normal interval (Kutty, 2021). Best site for depositing cryo-preserved semen was mentioned as mid cervix, anterior cervix, uterine body and uterine horn by 25.00 %, 40.47 %, 32.74 % and 1.79 % respectively. In order to minimize contamination of the anterior segments of the female reproductive tract, proper AI should be completed quickly preferably within 20 seconds (Kutty *et al*, 2022). However, confidence for completion of AI process within at least 30 seconds was mentioned by only 38 (22.35 %) informants, while others reported more time to the extent of even 300 seconds (by 15(8.82%) persons) and the overall average of time taken for performing the actual process of AI was 41.30 ± 3.50 seconds per animal.

General awareness of LIs on various aspects of AI process was assessed by including questions such as number of active sperms expected in a frozen semen dose at the time of AI and the correct response was given by only 22 (28.20 %) persons out of 78 responded and 92 (54.12 %) did not respond, indicating their ignorance. Mean success rate of AI in the state as reported by the LI s was 48.98 ± 11.43 . Possible consequences of untimely AI reported was low success rate (66.67 %) and harmful (27.16 %), while 3.09 % each reported no issue and beneficial respectively. Success

rate of AI over the years was reported to be increasing, decreasing and no change by 38.06 %, 51.61% and 10.32% respectively, indicating that majority of inseminators are aware of the declining trend of AI success already established (Lopez-Gatius, 2003; Lucy, 2001).

Affection of reproductive processes by continuous enforcement of AI was agreed by 52.53 %, while 20.89 % disagree and 26.58 % mentioned no idea. In the changed context of many animals exhibiting prolonged oestrus (Singh *et al*, 2012), need for increasing the semen dose was felt by 58.82 %, while 28.76 % disagree and 12.42 % expressed no idea. Opinion regarding reinstatement of bull rearing for natural breeding as an essential step to address fertility issues was expressed as no need by 39.61 %), while 48.70% mentioned the need for coexistence of breeding bulls in the herd, 7.79 % felt bull rearing as an essential step and 3.90 % expressed the need for promoting rearing of bulls. Thus 60.39 % of the informants were of the opinion that breeding bulls are needed in the herd in concurrence with the earlier report of Kutty (2019).

Informants were categorized based on the years of experience, to assess the variation in technical knowledge, attitude and practice and are summarized in table No 1. Most of the parameters studied did

not vary significantly between age groups, except highly significant ($P<0.01$) variation with respect to the number of AI done by each age groups highest being for LIs above 30 years of service. The LIs having more experience occupy urban localities based on seniority. Hence, the number of breedable cattle reported was comparatively low in their institution jurisdiction. However, they extend their service to more areas and had done more AI compared with their juniors. The LIs with lesser experience work in remote places and often restrict their service within areas of limited access to AI service, despite higher cattle population. Supporting this observation, the number of breeding bulls were more ($P<0.05$) and conception rate by AI (or success rate of AI) was less in the areas served by less experienced LIs.

Knowledge, attitude and practices of livestock inspectors in relation to routine cattle breeding activities with special emphasis on newly emerged issues (Table No.2) did not show striking variation between different experience based groups with respect to most of the parameters. Mean proportion of prolonged oestrus reported among the animals presented for AI was 38.61 ± 2.01 , concurring the earlier report of Kutty (2021). Double insemination at an interval during the same oestrus period being the usual practice to tackle prolonged

Table 1. Breeding related information provided by the informants based on the experience

Breeding related information	Informant categories based on the experience					
	Upto 6 yrs	6-10 yrs	11-15 yrs	16-20 yrs	Above 20 yrs	Mean
Breedable cattle	365.37 ± 75.02	432.22 ± 52.10	416.49 ± 39.47	331.57 ± 29.50	332.83 ± 49.83	374.83 ± 20.27
Calvings recorded	101.64 ± 12.50	141.42 ± 17.93	181.21 ± 43.05	144.83 ± 12.52	190.33 ± 30.84	149.21 ± 12.00
AI done in one year	185.69 ± 22.03 ^a	191.11 ± 20.39 ^a	329.50 ± 63.13 ^a	316.19 ± 25.74 ^a	481.07 ± 91.02 ^b	289.49 ± 20.35**
Semen straws used	342.30 ± 31.58	355.77 ± 23.59	462.00 ± 70.74	411.66 ± 27.18	500.00 ± 89.34	411.08 ± 22.18
Breeding bulls	2.06 ± 0.70 ^a	1.45 ± 0.75 ^{ab}	0.38 ± 0.13 ^b	0.43 ± 0.17 ^b	0.54 ± 0.33 ^b	0.79 ± 0.17*
Assessment of AI success	49.35 ± 3.01	57.78 ± 2.42	53.73 ± 2.03	52.64 ± 1.70	56.84 ± 3.68	53.51 ± 2.03

• Significant at 5 % level, ** Significant at 1 % level

Values with different superscripts vary significantly between each other

oestrus, mean numbers of semen straws used per cycle were 1.25 ± 0.03 . Thus, even though double insemination is practiced in 25 % of total inseminations, there was an inverse relationship between number of semen straws used per cycle and the years of experience of LIs attributable to better awareness of youngsters on emerging fertility issues. Mean of best timing for AI reported is 12.94 ± 0.57 hours and there was a tendency for late AI among more experience groups, may be due to more number of AI done by them. Awareness of the state average of conception rate reported (Mean 48.98 ± 1.05) was highly variable ($P < 0.05$) with youngsters reporting more and more experienced informants reporting less. Strikingly conception rate of AI achieved by more experienced informants

was much higher than the state average as reported by themselves, and vice versa in the case of less experience groups.

Practice and attitude of informants related to AI in the context of various emerging fertility issues prevailing in the herd are summarized and compared across experience categories in figures 2 to 7. Regarding preferred site of AI using cryo preserved semen anterior cervix followed by uterine body were more prevalent necessitated by the low dose of semen. There was decrease in the preference of posterior cervix site for AI with increase of experience and vice versa for the anterior cervix, which can be attributed to the enhancement of the AI skill with increasing experience.

Table No. 2. Knowledge, attitude and practices of the informants in relation to newly emerged issues and breeding management of cattle

Parameters assessed	Informant categories based on the experience					
	Upto 6 yrs	6-10 yrs	11-15 yrs	16-20 yrs	Above 20 yrs	Mean
Mean Exp. yrs	3.57 ± 0.23	7.57 ± 0.28	12.67 ± 0.20	18.79 ± 0.14	24.77 ± 0.97	13.36 ± 0.51
Prolonged oestrus occurrence (%)	36.71 ± 5.25	39.71 ± 4.56	38.10 ± 4.07	39.54 ± 3.60	37.62 ± 0.49	38.61 ± 2.01
Semen straws used / cycle	1.32 ± 0.10	1.29 ± 0.80	1.23 ± 0.72	1.24 ± 0.05	1.11 ± 0.08	1.25 ± 0.03
AI time (Hours after oestrus onset)	12.34 ± 1.65	11.56 ± 0.61	11.30 ± 0.50	14.84 ± 1.25	13.15 ± 1.52	12.94 ± 0.57
Conception rate of AI in the state (%)	53.42 ± 2.83 ^a	53.75 ± 2.39 ^a	46.56 ± 2.19 ^{ab}	48.21 ± 1.69 ^{ab}	43.00 ± 2.49 ^b	48.98 ± 1.05 *

• Significant at 5 % level., Values with different superscripts vary significantly between each other

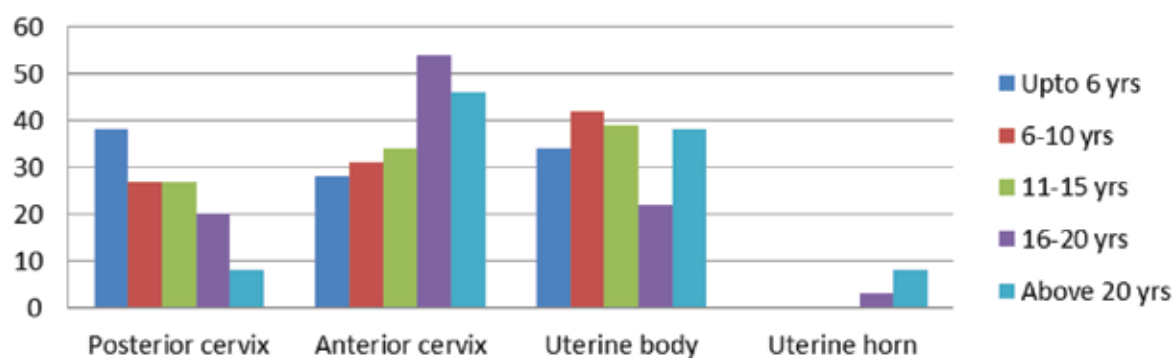
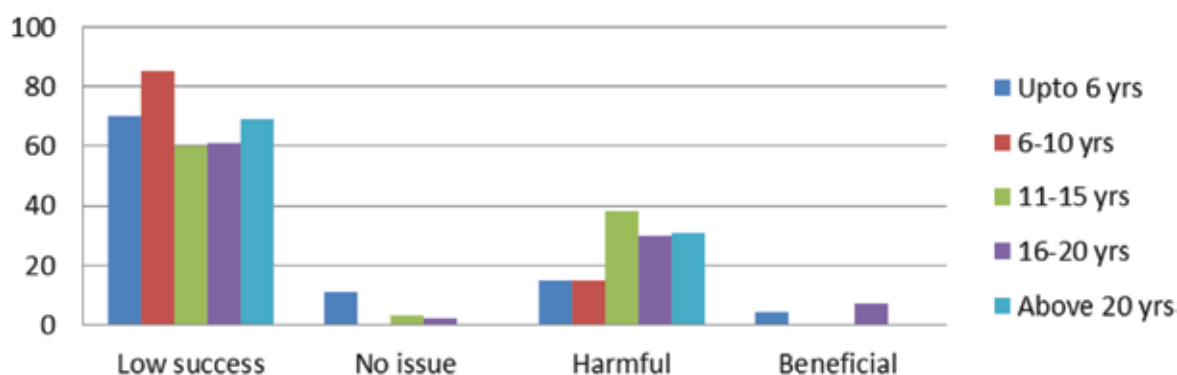
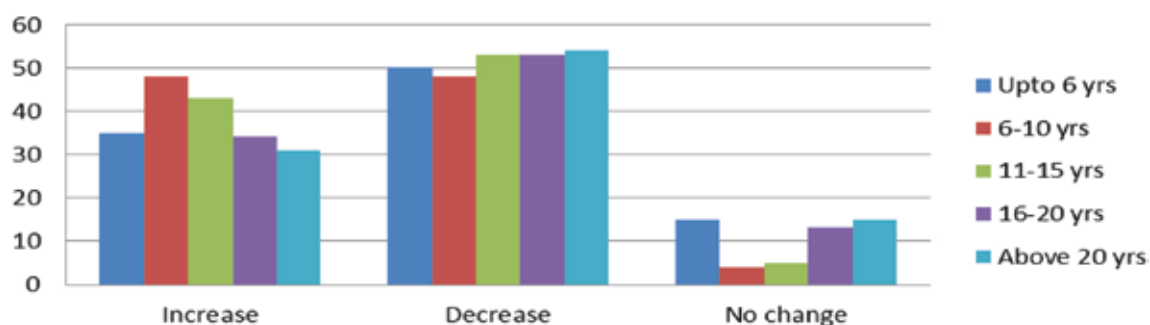
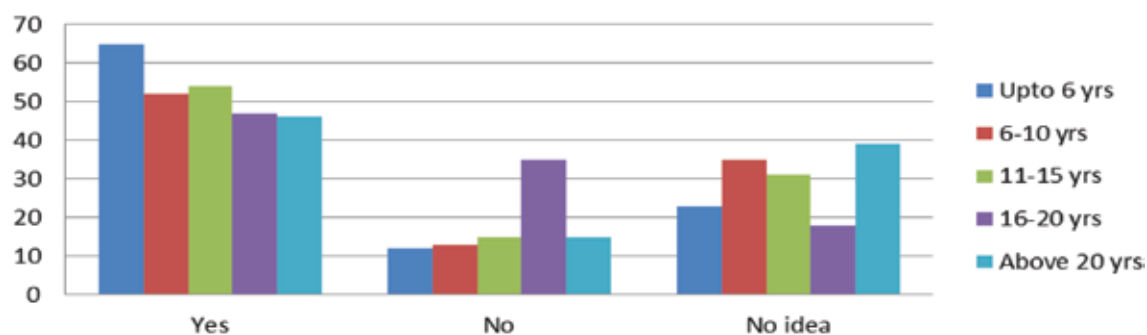
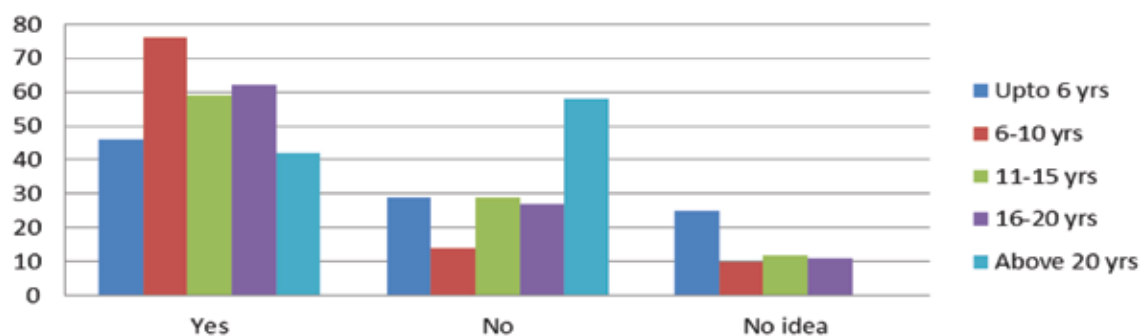
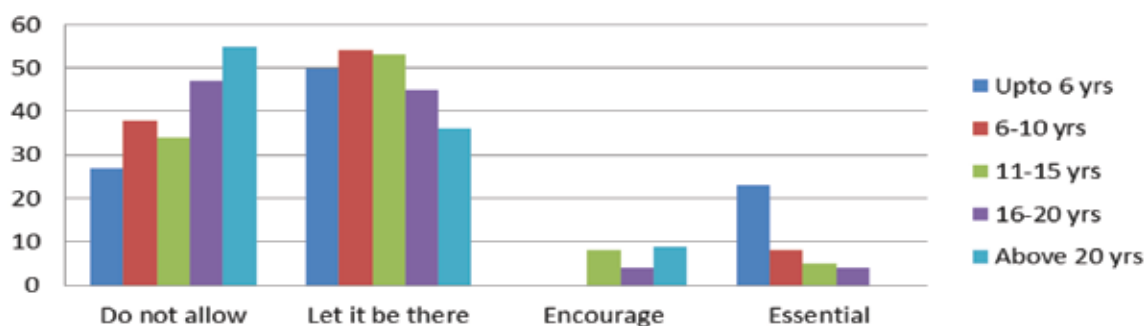
Fig. 2. Site of insemination preferred across experience groups**Fig. 3.** Consequences of untimely AI as reported by the experience categories

Fig. 4. Trend of AI success over the years as reported by the informant categories**Fig. 5. Opinion on harmful consequences of persistent AI in a herd****Fig. 6. Attitude on the need for increasing semen dose to tackle prolonged oestrus****Fig. 7. Attitude of informants on rearing breeding bulls to tackle infertility**

Regarding untimely AI, majority of the informants were aware of the chances for low success, but unaware of the consequences, especially as the major causation for reproductive tract infection (Kutty *et al*, 2022). Regarding the trend of AI success over the years, majority of the informants were aware of the declining success across years already well established (Lopez-Gatius, 2003), however, an almost equal proportion were either unaware or even thought of increasing the success rate across the years.

Majority of informants were aware that persistent AI in a herd causes various harmful consequences in the animals (Kutty, 2004), while there was sizeable proportion of informants having opinion of no harmful consequences or unaware of any such changes. Youngsters were found to be more aware of the fertility issues and there was a decreasing trend with advancement of experience. Prolonged oestrus proportion being very high, majority of informants were of the opinion that semen doses need to be increased, mainly to minimize the use of double straws at a time or after an interval to ensure sperm availability.

Finally, as a remedial step for emerging fertility issues, rearing of breeding bulls were favored by more than half of the informants, few of them even mentioning it as an essential step and need

to be encouraged. Again as mentioned earlier, youngsters were more favouring the need for rearing breeding bulls than more experienced informants.

CONCLUSION

Success rate of AI done by LIs were assessed indirectly as 36.29 % as against 53.51 % reported by them. Incidence of prolonged oestrus in the herd 38.61 ± 2.01 % and double insemination was carried out in 27.27 % of oestrus. Preferred time for first AI was 12.94 ± 7.26 hours from the onset of oestrus, site of semen deposition was anterior cervix or uterine body in 40.47 % and 32.74 % respectively and the actual process of AI took an average of 41.30 ± 3.50 seconds per animal. Regarding the emerging fertility issues in AI bred animals, majority of inseminators were aware of the issues and across the age categories, youngsters were more concerned for adoption of remedial measures than more experienced informant categories.

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CONFLICT OF INTEREST

The author has no conflict of interest to declare

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