Factors Affecting the Performance of Artificial Insemination in Cattle at the Kalmunai Veterinary Range

Assanar Thaiuba[1] and R.M. Nikzaad[2*]

[1]*Government Veterinary Office, Department of Animal Production & Health, Kalmunai, Sri Lanka*
[2]*Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka.*

[1]drthaiuba@gamail.com, [2]mnikzaad@seu.ac.lk

Abstract

Artificial insemination has created a great deal of interest in genetic circles during the last few years. The objective of this study was to find the success rate, and factors affecting the AI performance of the smallholder, and to expand the efficiency of AI services. The research revealed that in the last five years the total number of AI was 65 to 70 and it's covering the average 55 of the total cattle population of the government veterinary range Kalmunai. And the total conception rate was 79.4%, with crossbreeds having a higher conception rate. The frequency of repeated AI was relatively low, and no-repeat AI performance was observed in 2017. Last five years, most AI performed with Jersey (34.2 %), Sahiwal (32.8 %) and Friesian (27.4 %). Further, the overall success rate of AI and its impact on genetic variation of the breed-able cattle population were low in the studied area. Performance and efficiency were influenced by poor infrastructural facilities, low motivation and mobility of field staff, inadequate veterinary coverage and resources and farmers' ignorance and low motivation. These results suggested the need for farmer awareness, training, and extension in this region. This is a result of farmers' lack of knowledge of the significance of the proper time of service and inadequate communication across smallholding farms. Therefore, emphasis must be placed on resolving these defects

Keywords: Artificial insemination, Cross breed cattle, Conception rate, Farmer awareness

I. INTRODUCTION

Food and nutritional security; climate change; sustainable consumption, production, and development; rural livelihoods; human health; animal welfare; and the environment are all positively impacted by Sri Lanka's cattle sector. To improve resilience, food security, and rural livelihoods while reducing negative impacts, the cattle sector must be included in Nationally Determined Contributions (NDCs), National Adaptation Plans (NAPs), and policies. The livestock industry in Sri Lanka is mostly structured on smallholder farming, especially dairy and poultry. The dairy industry contributes significantly to the economy of both developed and developing nations. The preponderance of cattle in Sri Lanka is crossbred, with crosses primarily between indigenous *Bos indicus* (Zebu) cattle and improved Zebu strains from the Indian subcontinent, or between Zebu and *Bos taurus* (European/American) dairy breeds. Sindhi and Sahiwal are the major improved Zebu breeds utilized in dairy production in Sri Lanka, whereas Holstein/Friesian and Jersey are the main European breeds adopted (Alexandratos and Bruinsma, 2012). The National Livestock Development Board (NLDB) was mandated to supply superior breeding stock to farmers, but it covers only 20 % of the demand due to the lack of organized livestock markets for farmers to sell and buy animals (Hitihamu and Epasinghe, 2015). Meanwhile, artificial insemination (AI) serves only 10% of breed-able cows and 2% of breed-able bulls; Because there was a dearth of natural services for reproduction in regions without access to artificial insemination (Demetrio *et al*., 2007).

Although AI has been regarded the main tool for cow breeding in the dairy sector, it still only accounts for around 10% of yearly calving in Sri Lanka and just 20% of the breed-able cattle population (Chebel *et al*., 2004). Since only half of all newborn calves are female and male calves are known to be lost at a high rate, the national cow herd does not get a very large dose of new genetic material. Although the AI service is available across the whole island, this service has acquired traction and established itself as the dominant breeding method in just a few provinces. Only

around 10% of the projected breed-able cattle population (about 600,000 animals) is given with more than 50% coverage. The remaining ninety percent of the population is supplied with very limited coverage, and more than two-thirds are still bred spontaneously, mostly by scrub bulls (Alexandratos and Bruinsma, 2012). This poor level of coverage on a national scale and in some regions of the country seems to be the result of a many of issues. And it is acknowledged that AI is the major instrument for genetic advancement in dairy cattle breeding. In order to evaluate the coverage and effectiveness of AI at the national, provincial, and district levels, as well as the success rate and variables influencing in Wet Country Intermediate Zone (WCIZ) with several research context available but very rear in dry zone's cattle management. Therefore, the current study will take corrective actions and/or identify future research needs to enhance the effectiveness of AI services in Kalmunai veterinary range.

A. Background of the Study

In Sri Lanka, the increased milk production appears mainly due to the upgrading of dairy cattle through the national artificial insemination (AI) program (Demetrio *et al.,* 2007). The national AI program for dairy cattle was carried out according to the national breeding policy. The type of semen according to the agro-climatic zone, management system, and the breed of the cow is recommended. Therefore, continuous maintenance of different breeds of semen donor bulls is essential. This is a challenge for AI services since their intended farmers are sometimes unmotivated to use them and, as a result, fail to notice heat symptoms in their animals on time. This demonstrates that farmers need education (Chebel *et al.,* 2004).

However, owing to the limited resources that these relatively few veterinarians have access to in terms of qualified staff, mobility, and operating finances, they are unable to complete this work. This is the case since there are so few veterinarians in these locations. When comparing the intermediate zone with the dry zone, relatively better infrastructural facilities were observed in that zone, but the dry zone lack from resources. Development employees in the cattle industry are faced with a challenging issue because of the variance in coverage as well as the poor performance of AI in the various agro-ecological zones (Alexandratos and Bruinsma, 2012). But AI has been designated as the prime breeding tool in genetic up-grading efforts, and it will boost production efficiency and raise the dairy industry's economic profit. This approach may need to be reconsidered in light of persistently inadequate coverage and performance, notably in the majority of dry and intermediate zones. This problem has also been voiced in a large number of earlier consulting reports. Due to logistical, administrative, and budgetary restrictions, inadequate heat detection, and wrong timing of insemination, the country's AI service is inefficient.

II. METHODOLOGY

The study was conducted from November 2016 to May 2021 in Government veterinary range Kalmunai, Ampara district of the Eastern province, it covers approximately 222 m^2 of land area and consists of 29 Grama Niladari Divisions. A cross-sectional study was conducted to determine the risk factors of AI service efficiency

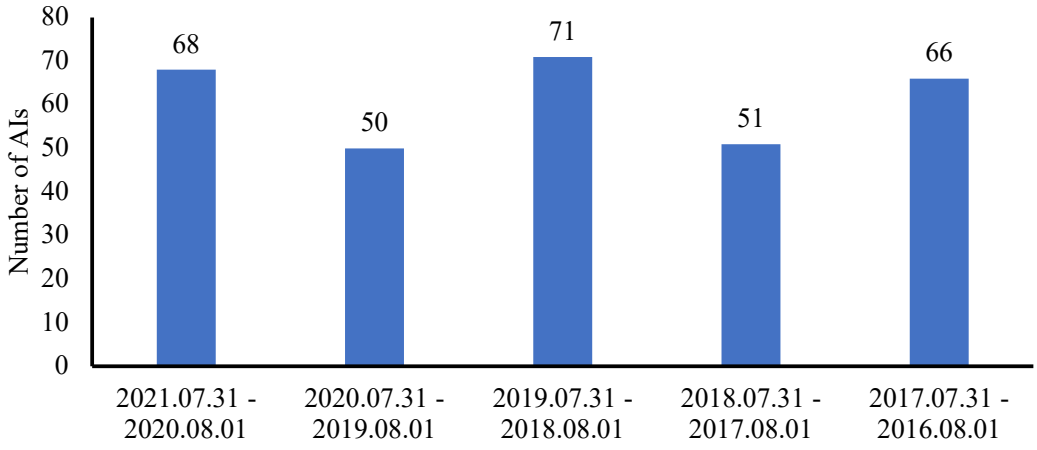

Figure 1. Number of Ais from 2016 to 2021

through random sampling technique using registered farm list in veterinary range, the sample size was 29 to 35 along the years. The secondary data was collected from the Kalmunai veterinary office's livestock statistical detail based on Ampara district from census and Department of Animal Production and Health (DAPH) and from the annual report. The following information was gathered from the records of the Government veterinary office in Kalmunai: I) The quantity of AI Services ii) the total number of cattle in the region, and iii) the number of successful AI and calving record. All data were input into a Microsoft Excel 2018 spreadsheet, coded, and analyzed using descriptive illustrations.

III. RESULTS AND DISCUSSION

The study reveals that in the last five years the total number of AI was 65 to 70 (Figure 1) and it's covering the average 55 of the total cattle population of the government veterinary range Kalmunai. In the present research, the total conception rate was 79.4 %, and crossbreeds had a higher conception rate. This variance in conception may be attributable to genetics, the precision of heat detection, and farmers' desire to handle crossbred cattle better than native cattle (Alexander et al., 1997). A Zebu cow does not display obvious estrus signals like crossbred cows, which may contribute to the reduced percentage of indigenous animals who conceive at first insemination. Cows who were inseminated in the midst of estrus had a greater conception rate. Estrus symptoms have been known to be brief, unpredictable, and generally less visible or quiet heat, necessitating careful monitoring and early insemination for a healthy pregnancy (Anzar *et al.,* 2003)

The discrepancy may be related to changes in the handling of the sperm and the inseminator's capacity to appropriately fertilize the egg. To enhance the likelihood of conception, cows should be inseminated within six hours after the onset of heat. Late insemination may impact conception rates (Douphrate *et al*., 2013). Researcher found that null ratio recorded from 2018 to 2019 in repeat AIs (Figure 2) and high number of AI (n=71) preformed (Figure 1) in the same period; which indicating that AI success rate is 100%. From this repeating AI and PD farmers spent additional cost in dairy production at this veterinary range. Abeygunawardena *et al.* (2001) found that the owner's profit dropped when the cow required more than three attempts at insemination before giving birth to a calf. The repeat AI ratio highly (4) recorded from 2020 to 2021 year (Figure 2). The present study found that in last five years most of the AI performed with Friesian (27.4 %), Sahiwal (32.8 %) and Jersey (34.2 %) and semen types. According to Figure 3, in 2018 to 2019 period mostly Jersey (46 %) semen used to preform AI, Sahiwal 30 % and Frisian 24 %.

0

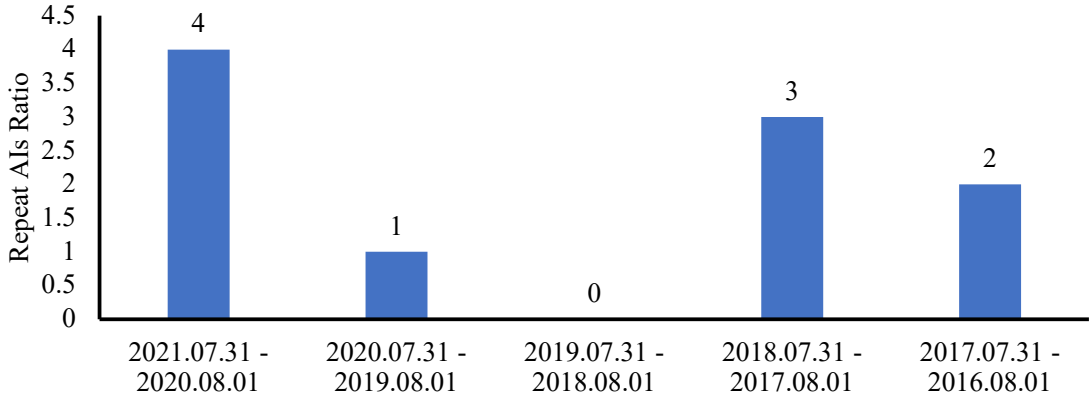

Figure 2. Repeat AIs Ration from 2016 to 2021

The animals that are raised on the smallholder farms are almost exclusively *Bos taurus* genotypes, and the management types may either be extensive or semi-intensive. The majority of farmers in studied area used AI to breed their cows. This is either because they are aware of the benefits of AI for getting a calf with a greater dairy potential or because there is a lack of stud bulls of sufficient quality in their localities (Marshall *et al*., 2020). According to the findings of the current research, the majority of farmers had no special preferences for breeds or types of sperm, showing a lack of understanding of the relative benefits and appropriateness of various breeds for their unique farming area (Figure 5). This highlights the critical need of educating farmers on breeding objectives and the proper use of AI to accomplish and sustainable diary production in a particular area. The time between calving and the first service was well over four months, and this might most certainly be attributed to the lack of information that farmers have about the reproduction planning of the cattle (Jeganathan, 1955). Due to the widespread belief that early re-breeding harms both the milk production of the cow and the development of the calf, the majority of farmers waited many months (06 to 08 months) following the birth of their calves before mating (Mohamed *et al.,* 1990). It is probable that farmers did not breed cows even they returned to estrus early in the postpartum period due to the aforementioned misconceptions. The long average time from calving to first service in this research may be attributed to the presence of postpartum estrus

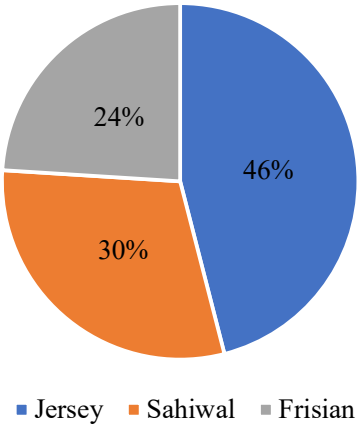

Figure 3. Used Semen Types from 2018 to 2019

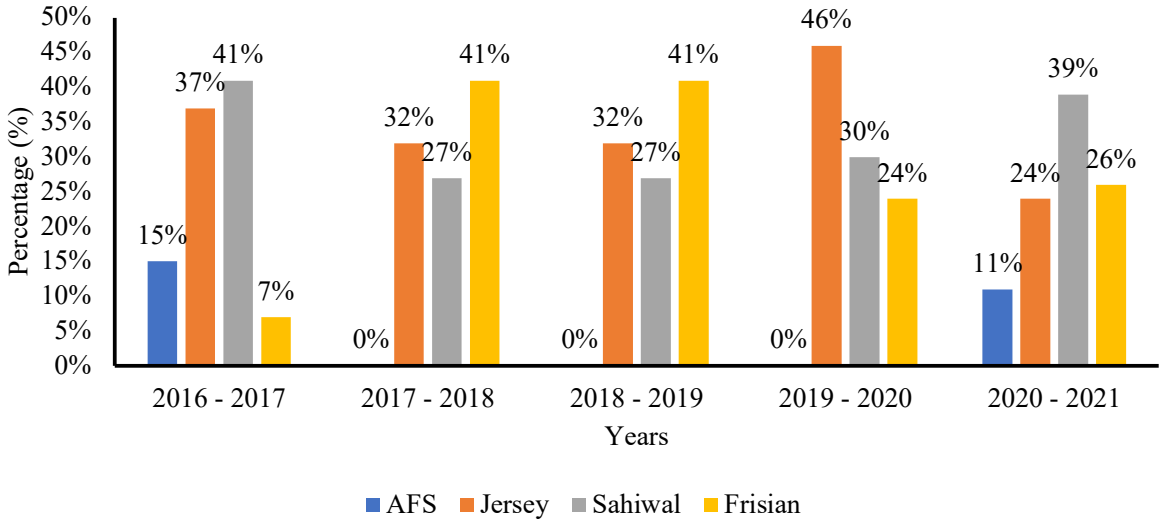

Figure 4. Defferent types of Semen used for AI from 2016 to 2021

cycles. These inaccuracies in estrous identification would have contributed considerably, without a shadow of a doubt, to the poor success rates of artificial insemination that were seen in this investigation. These results lend credence to the findings and highlight the need of providing education, training, and extension services to farmers in this sector.

These findings give insight into how the fertility of cattle in this area and the AI service may be enhanced. Animals given concentrates as a supplement to roughages tended to have a greater Conception Rate (CR) than those not fed concentrates. The previous study shows that cows with a strong Body Conditional Score (BCS) had a propensity to exhibit greater CR than those with low BCS is another piece of data that demonstrates the significance of proper feeding (Alexandratos and Bruinsma, 2012). Therefore, better nutrition will not only shorten the postpartum anestrous phase, as several studies have shown, but it will also lead to an increase in CR (Douphrate *et al*., 2013). This may involve improved feeding and heat detection, which would allow for the cow to be milked at the optimal time concerning her estrous cycle, leading to increased fertility (Chebel *et al*., 2004). It is well known that the time of insemination relative to the initial detection of heat is crucial for getting a high CR (Anzar *et al.,* 2003). The delay lengthened from six to twenty-four hours, then started to go shorter again. In principle, 12 to 18 hours following the beginning of "standing" heat is the best time to begin providing service (Jeganathan, 1955).

IV. CONCLUSION

In conclusion, the study's results show that the percentage of breed-able cattle serviced by AI and the overall success rate of AI are insufficient to have a discernible effect on the genetic makeup of the government veterinary range Kalmunai cow population. Numerous reasons, such as farmer ignorance and a lack of drive, insufficient infrastructural facilities, inadequate veterinary coverage and resources, poor motivation, and field worker mobility, have all contributed to this low level of performance and efficiency. The overall success rate of artificial insemination on small-holder farms within the government veterinary range Kalmunai is within the lower limit of tolerance, with a significant degree of inter-locational variability. Inadequate heat detection and delays in completing AI stand out as the most significant contributing causes. These findings support and highlight the need for farmer education, training, and extension in this area. This is due to farmers' lack of knowledge about the necessity of service scheduling and inadequate communication amongst smallholding farms. As a result, priority on reproductive record keeping must be focused on resolving these inadequacies.

REFERENCES

Abeygunawardena, H., Alexander, P., & Abeygunawardena, I. S. (2001) 'Artificial insemination of cattle in Sri Lanka: status, performance and problems'.

Alexander, P., Abeygunawardena, H., Perera, B., & Abeygunawardena, I. S. (1997) 'Current status and factors affecting the success of artificial insemination in small-holder farms in the mid country wet zone of Sri Lanka', *Tropical Agricultural Research*, 9(1997), 204–216.

Alexandratos, N., & Bruinsma, J. (2012) 'World Agriculture Towards 2030/2050: The 2012 revision'.

Anzar, M., Farooq, U., Mirza, M. A., Shahab, M., & Ahmad, N. (2003) 'Factors affecting the efficiency of artificial insemination in cattle and buffalo in Punjab, Pakistan', *Pakistan Veterinary Journal*, 23(3), 106–113.

Chebel, R. C., Santos, J. E. P., Reynolds, J. P., Cerri, R. L. A., Juchem, S. O., & Overton, M. (2004) 'Factors affecting conception rate after artificial insemination and pregnancy loss in lactating dairy cows', *Animal Reproduction Science,* 84(3–4), 239–255.

Demetrio, D. G. B., Santos, R. M., Demetrio, C. G. B., & Vasconcelos, J. L. M. (2007) 'Factors affecting conception rates following artificial insemination or embryo transfer in lactating Holstein cows', *Journal of Dairy Science,* 90(11), 5073–5082.

Douphrate, D. I., Hagevoort, G. R., Nonnenmann, M. W., Lunner Kolstrup, C., Reynolds, S. J., Jakob, M., & Kinsel, M. (2013) 'The dairy industry: a brief description of production practices, trends, and farm characteristics around the world', *Journal of Agromedicine*, 18(3), 187–197.

Hitihamu, H., & Epasinghe, S. (2015) 'Socio-Economic Condition of Dairy Industry in Mahaweli H Area', Hector Kobbekaduwa Agrarian Research and Training Institute Colombo, Sri Lanka.

Jeganathan, P. (1955) 'A review of the progress of artificial insemination of cattle in Ceylon', *Ceylon Veterinary Journal*, 3, 6–31.

Marshall, K., Salmon, G. R., Tebug, S., Juga, J., MacLeod, M., Poole, J., Baltenweck, I., & Missohou, A. (2020) 'Net benefits of smallholder dairy cattle farms in Senegal can be significantly increased through the use of better dairy cattle breeds and improved management practices', *Journal of Dairy Science*, 103(9), 8197–8217.

Mohamed, A. R., Sivakanesan, R., & Rajamahendran, R. (1990) 'Oestrus detection and reproductive performance of cattle in Sri Lanka. Studies on the Reproductive Efficiency of Cattle Using Radioimmunoassay Techniques', *Proceedings of the Final Research Co-Ordination Meeting*, 5-9 September 1988, Vienna, Organised by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, 73–85.