Evaluation of buffaloes reproductive performance in Akabiluru Subdistrict, West Sumatra

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ABSTRACT

This study aimed to evaluate the reproductive performance of adult female buffaloes on smallholder farms in Akabiluru Subdistrict, Lima Puluh Kota Regency, West Sumatra. The method used was a survey through direct observation and structured interviews using questionnaires. Respondents were selected by purposive sampling, namely farmers with adult female buffaloes that have given birth at least twice, with 66 people with 71 female buffaloes. The parameters observed included age at first mating, service per conception (S/C), age at first calving, and calving interval. Data were analyzed descriptively by calculating the average, standard deviation, and percent. The results showed that the age at first mating (33.17 ± 7.84 months) and S/C (1.62 ± 0.85) were within the optimal range. However, the age at first calving (46.17 ± 10.36 months) and calving interval (23.46 ± 7.03 months) were not optimal. Efforts are needed to improve farmers' reproductive management skills, feed quality, and technical training to improve buffalo reproductive performance and farmer welfare in Akabiluru Subdistrict.

Keywords: Age of first calving, Age of first mating, Calving interval, Reproductive management, Service per conception

INTRODUCTION

Buffalo (Bubalus bubalis) is one of Indonesia's valuable local livestock genetic resources, supporting integrated farming systems, especially in rural areas. Besides being used as a source of meat, labour (such as ploughing rice fields), and organic fertilizer, buffaloes also have high socio-cultural value, especially in West Sumatra, where they play an important role in customary and traditional activities. Figure 1 shows the landscape of an area in West Sumatra where swamp buffalo rearing is an integral part of daily life and livelihoods for rural communities. However, the buffalo population continues to decline, both in Indonesia and in West Sumatra. BPS (2025) reported a decline in the buffalo population of 5.85% per year in Indonesia and 7.75% per year in West Sumatra during 2014-2024. If this continues, the buffalo population in Indonesia may become extinct. Therefore, serious attention is needed from all stakeholders to solve this problem.

Buffalo's reproductive productivity is a key factor in determining the success of livestock farming because reproductive parameters directly affect population development and livestock availability (Reswati et al. 2021). Reproductive parameters such as age at first mating, service per conception (S/C), age at first calving, and calving interval (CI) are the main indicators in evaluating reproductive performance. Various studies have shown that the reproductive productivity of buffalo in Indonesia is still relatively low compared to other large ruminant livestock, such as cattle (Nardi et al. 2017; Reswati et al. 2021; Widi et al. 2021). The low reproductive performance of buffalo can be seen from the slow age of first mating and age

at first calving, the high S/C rate, and the long calving interval (Reswati and Putra 2023). In addition to genetic factors, the low reproductive performance of buffalo is due to the traditional maintenance system, and the limited knowledge and skills of farmers in mastering livestock maintenance technology.

Figure 1. Buffalo farming in Akabiluru Subdistrict, West Sumatra

In Lima Puluh Kota Regency, which ranks fourth for the largest buffalo population in West Sumatra, buffalo remain an important part of rural community life. One of the subdistricts with the largest buffalo population is Akabiluru Subdistrict, which is ranked third among 13 subdistricts in Lima Puluh Kota Regency. In general, farmers in this area still apply traditional husbandry systems, which can reduce buffalo reproductive performance. However, information regarding the evaluation of buffalo reproductive performance in this area is still limited. Therefore, this study aimed to evaluate buffalo reproductive performance in Akabiluru Subdistrict, West Sumatra. The results of this study are expected to be a valuable source of information in formulating recommendations for more effective and sustainable buffalo husbandry management. In addition, the findings of this study are expected to be a basis for policymakers in formulating strategies for developing buffalo farming in the area to support food security and the sustainability of local Indonesian livestock genetic resources.

MATERIAL AND METHODS
Location, Tools, and Materials of the Research
This research was conducted in Akabiluru Subdistrict, Lima Puluh Kota Regency, West Sumatra. This area was considered representative of the condition of the smallholder buffalo farming business because it has the third largest buffalo population among other districts in Lima Puluh Kota Regency. The tools and materials used during this research include questionnaires to interview farmers, cameras, stationery, vehicles, and questionnaires.

Methods, Parameters, and Data Analysis
This research used a survey method through direct observation of smallholder livestock farming and structured interviews with farmers in Akabiluru Subdistrict, Lima Puluh Kota Regency. Respondents were selected by purposive sampling, namely farmers with adult female buffaloes that have given birth at least 2 times. The number of respondents who fulfilled the criteria was 66 people, and a total of 71 female buffaloes were owned. The parameters observed were the age of first mating (months), service per conception (S/C), which is the number of mattings until pregnancy occurs, age of first calving (months), and the calving interval (months) calculated from the average distance between two consecutive births. Supporting data was

demographics of respondents consisting of age, education, livestock experience, primary occupation, and number of livestock ownership. The data obtained were analyzed using descriptive statistics by calculating each parameter's average, standard deviation, and percent.

RESULTS AND DISCUSSION
General Overview of the Research Area

Akabiluru Subdistrict is one of the 13 subdistricts in Lima Puluh Kota Regency, with an area of 109.33 km2. This area has seven villages, namely Koto Tangah Batu Ampa, Batuhampar, Sariak Laweh, Sungai Balantiak, Suayan, Pauh Sangik, and Durian Gadang, with an altitude ranging from 500-700 m above sea level (BPS 2024). The population is 30,232 people, consisting of 15,142 women and 15,090 men. The majority of the population of Akabiluru Subdistrict works as a farmer for food crops and plantations, as well as horticulture. The primary commodities produced in this area include rice, coconut, corn, and various vegetables. In addition, the livestock sector is also quite developed, namely cattle, goats, buffalo, and chickens (BPS 2024).

Respondent Demographics

A total of 144 farmers were interviewed, and the total population was 292 buffaloes. However, only 66 farmers met the criteria as respondents, namely, having female buffaloes that had given birth at least twice. The number of female buffaloes owned by the respondents was 71. The characteristics of the respondent farmers can be seen in Table 1.

Table 1. Respondent demographics in Akabiluru Subdistrict

Number	Parameters	Average
1	Age (years old)	51.30±10.63
2	Education (%):	
	a. Elementary School	43.94
	b. Junior High School	34.85
	c. Senior High School	21.21
3	Livestock raising experience (years)	14.61±10.98
4	Main occupation (%):	
	a. Agricultural Farmers	89.39
	b. Trader	4.55
	c. Livestock Farmers	1.52
	d. Head of Village	1.52
	e. Entrepreneur	1.52
	f. Mason	1.52
5	Number of livestock ownership (heads)	2.45±1.19

The characteristics of respondents, including age, education level, and livestock farming experience, influence on their ability to manage livestock businesses (Efu and Simamora 2021). The characteristics of respondents in the Akabiluru Subdistrict showed that the average age of farmers was 51.30 ± 10.63 years. It shows that most farmers are of productive age (15-64 years) but are relatively approaching old age. Age is an important factor that influences behavior and performance in running a business, where the level of productivity tends to be higher when someone is of productive age and will decrease with age. Work activities depend on physical

strength, especially in the livestock sector. Therefore, the older the farmer, the greater the tendency for a decrease in livestock business productivity (Ikun 2018).

Elementary School graduates dominate the education level of farmers in Akabiluru Subdistrict farmers at 43,94%, Junior High School graduates at 34.85%, and Senior High School graduates at 21.21%. The education level affects farmers' adaptation and innovation in running their businesses (Mulyawati et al. 2016). Low education levels can impact the understanding and application of livestock reproduction and maintenance technology. However, Utami et al. (2015) found different research results that showed that the level of education did not affect the number of livestock owned.

The average livestock farming experience of respondents was 14.61 ± 10.98 years. This shows that most farmers have sufficient experience in managing buffalo livestock farming. This fairly long experience has the potential to equip farmers with adequate knowledge and skills in buffalo maintenance so that it can support the success and development of the livestock business being run. Efu and Simamora (2021) stated that the longer experience, the greater the ability of farmers to overcome various problems in the field and to seize opportunities to develop their livestock business. In addition, a high level of experience, if supported by adequate training, can further increase the capacity of farmers to manage livestock businesses effectively and sustainably.

Most respondents' main occupation was agricultural farmers (89.39%). In comparison, a small number worked as traders (4.55%), livestock farmers (1.52%), and other jobs such as head of village (1.52%), entrepreneur (1.52%), and mason (1.52%). The fact that most respondents are agricultural farmers shows that buffalo farming is still a side business, not a primary work. It can affect the level of attention and management of livestock reproduction, including monitoring reproductive performance and body condition, which impacts suboptimal management.

Age of First Mating

The reproductive performance of buffalo in Akabiluru Subdistrict, which consists of the age of first mating, service per conception, age of first calving, and calving interval is presented in Table 2. The age of the first mating in buffalo in Akabiluru Subdistrict is 33.17±7.84 months. The age of the first mating of this buffalo is still within the ideal range recommended by Windusari et al. (2016), which is 24-36 months. This shows that, in general, buffalo in this area have been mated at an age close to the ideal standard. Although several factors influence the variation in the age of first mating, the average value shows that the age of first mating buffalo in Akabiluru Subdistrict is sufficient to support livestock reproductive efficiency.

Table 2. Reproductive Performance of Buffalo in Akabiluru Subdistrict

No.	Parameters	Average	Reference
1.	Age at first mating (months)	33.17±7.84	24-36[1]
2.	Service per Conception	1.62±0.85	1.6-2.0[2]
3.	Age at first calving (months)	46.17±10.36	40-45[3]
4.	Calving interval (months)	23.46±7.03	13-14[3]

Notes: [1] Windusari et al. (2016), [2] Toelihere (1993), [3] Ditjennak (1992)

However, the age of the first mating of buffalo in Akabiluru Subdistrict is still later than that of the first mating in Cianjur Regency, which was recorded at 26.6 months (Komariah et al. 2015). However, this age is similar to the first mating age of buffaloes in Lanting Island, Jempang District, West Kutai Regency, East Kalimantan, which is 34.90 ± 1.03 months (Salsabela 2023). On the other hand, the age of first mating of buffalo in Akabiluru Subdistrict is faster than that of Kalang buffalo in South Kalimantan, which reaches the age of first mating at 51.4 months (Widi et al. 2021). Variations in maintenance management, feed availability,

and the level of knowledge of farmers in each region can cause this difference in the age of first mating. In addition, environmental factors and maintenance habits also affect the time of first mating of buffalo in various regions.

The age of first mating is one of the main indicators in assessing livestock reproductive performance. Livestock that reach puberty and are mated at the right age will be able to produce more offspring during their lifetime, thus providing greater benefits for farmers (Faiza et al. 2024). It will increase the productivity and sustainability of livestock businesses.

Service per Conception

Buffalo mating in Akabiluru was conducted through natural mating with males available around the maintenance location. The S/C value of buffalo is 1.62±0.85. This data shows that, in general, each pregnancy required more than one mating. In theory, a low S/C value (approaching 1) indicates good reproductive efficiency, where the female was able to get pregnant in one mating. According to Toelihere (1993), a good buffalo S/C value is in the range of 1.6 to 2.0. Thus, the S/C value of buffalo in Akabiluru Subdistrict was still within the range that supports reproductive productivity.

The S/C value of buffalo in Akabiluru Subdistrict is higher than the S/C of buffalo in Ngawi Regency, East Java Province, which was recorded at 1.4 (Budiarto et al. 2019), and the S/C value of buffalo in Siborong-Borong District, North Tapanuli Regency, which was 1.17 (Lumbantoruan and Sihombing 2018). However, the S/C value in Akabiluru Subdistrict is still relatively efficient in supporting the sustainability of buffalo farming businesses in the area. This S/C rate can be made more efficient or reduced through improved reproductive management, such as providing males with good genetic quality, training farmers in proper estrus detection, and improving the nutrition of the mother before and during the mating period.

The obstacle faced by farmers in Akabiluru Subdistrict was the difficulty of obtaining adult male. Based on the survey, only 13 adult males were found in Akabiluru Subdistrict, while the number of adult females was 142 and 45 virgin buffaloes. The locations of these males were also widely spread out and dispersed. This phenomenon made it difficult to mate females, so they often remained unmated during estrus because no males were available. Artificial Insemination (AI) has not been widely implemented in this area because it is difficult to determine the right mating time for buffaloes, which often leads to unsuccessful AI attempts.

Age at First Calving

The age of the first calving of buffalo in Akabiluru Subdistrict was 46.17±10.36 months or almost 4 years. This figure is slightly slower than the optimal age of first calving, according to DITJENNAK (1992). The late age of first calving extends the unproductive period of females from birth until they give birth to their first calf. This condition also contributes to the low lifetime productivity of livestock.

The age of the first calving of buffalo at this research location is almost the same as the results of Salsabela (2023), which reported the age of the first calving of buffalo on Lanting Island at 45.93±2.1 months. Meanwhile, the age of the first calving of Kalang buffalo in South Kalimantan is slower, around 63.4 months (Widi et al. 2021). However, the age of the first calving of buffaloes in Cianjur Regency (Komariah et al. 2015) and Central Java (Rianto et al. 2025) was faster, around 37.6 months and 39.6 months, respectively. The later age of the first calving of buffaloes in the Akabiluru Subdistrict compared to those in Cianjur and Central Java is likely due to the later age of first mating and the S/C number greater than 1.

Calving Interval

The calving interval of buffalo in Akabiluru Subdistrict was 23.46±7.03 months. This calving interval was longer than buffalo in several other areas, such as in Lanting Island

13.61±0.98 (Salsabela 2023), in Ngawi Regency 14.3 months (Budiarto et al. 2019) and buffalo in South Kalimantan 16.5±0.70 months (Widi et al. 2021). According to DITJENNAK (1992), the ideal calving interval for buffalo is 13-14 months. The long calving interval in the Akabiluru Subdistrict is likely due to the extended estrus return after giving birth, inaccurate estrus detection, difficulty obtaining males, or reproductive health problems. The long calving interval impacts the low number of calves born throughout the productive life of the female buffalo. In addition, the long weaning age of the calves was also thought to contribute to the slow return of the female to pregnancy. Farmers in the Akabiluru Subdistrict weaned their calves at 10.93±4.21 months.

Bharti et al. (2017) reported that the group of female buffalo that were allowed to breastfeed their calves experienced estrus again after giving birth longer than the group of mothers whose calves were weaned immediately after giving birth and mothers whose calves were weaned at the age of 45 days. Nava-Trujillo et al. (2020) reported that buffaloes that breastfed their calves experienced their first post-partum ovulation on the 87th day, while weaned buffaloes ovulated for the first time on the 51.6th day. The results of this study showed that weaning calves early could accelerate the normal functioning of the reproductive organs so that the reproductive cycle could continue. Although weaning after birth was not commonly practiced in swamp buffaloes, it can be carried out at the age of at least 205 days (7 months).s

CONCLUSION

This study concluded that the age of first mating (33.17±7.84 months) and S/C rate (1.62±0.85) were still within the optimal range. However, the age of first calving (46.17±10.36 months) and calving interval (23.46±7.03 months) were not optimal. Therefore, it is essential to improve reproductive management, feeds quality improvement, bulls' provision and technical training in buffalo maintenance for farmers in the Akabiluru Subdistrict is essential. These efforts aim to improve buffalo reproductive performance and support the welfare of farmers.

CONFLICT OF INTEREST

There is no conflict of interest with any party regarding the material discussed in the article, funding, and differences of opinion between the authors.

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