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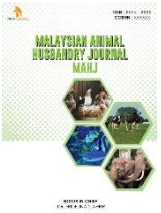

RESEARCH ARTICLE

MANAGEMENT OF BREEDING CATTLE AND BUFFALO BULLS IN GAURADAHA MUNICIPALITY

Raju Dahal, Shramik Wagle, Bikram Kumar Tiwari, Amir Pandit, Nirmal Katuwal

Institute of Agriculture and Animal Science, Tribhuvan University, Nepal
**Corresponding Author Email: dahalraju262@gmail.com*

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ABSTRACT

The management of breeding cattle and buffalo bulls is considered crucial because breeding bulls play an important role in enhancing the productivity of both cows and buffaloes. A survey was conducted in Gauradaha Municipality during June and July, 2023 to study the management practices of breeding bulls. A selective sampling method was used to select 29 farmers from Gauradaha and quantitative analysis of the survey data was conducted using MS Excel and SPSS v. 26. Results from the study revealed that 43% farmers prefer Holstein Friesian bulls for breeding cows and 75% of buffalo bull rearing farmers prefer Murrah cross bulls for breeding buffaloes. The average age at which the first service was provided by cow bulls was found to be 21.36±5.73 months, while for buffalo bulls, it was 30±4.89 months. After being put into service, breeders typically retained the bulls on the farm for an average of 3.12±1.43 years. Approximately 52% of breeders use bulls for service 4-6 times a week. All surveyed farmers heavily rely on paddy straw as a feed source. As of concentrate, 86% used wheat bran and 52% farmers used rice bran. Regarding fodder cultivation, 64% of farmers cultivated Napier grass, while only 21% cultivated maize. To maintain the health and performance of their breeding bulls, 76% of breeders deworm their animals every 6 months. Only 34% of breeding bull rearers are found to maintain records of their breeding bulls. Supplementation of vitamins and minerals was also found poor in Gauradaha as only 38% of farmers supply vitamins and minerals to their breeding bull.

KEYWORDS

Age of first service, Breeding bulls, Breeding preferences, Feeding practices, Livestock

1. INTRODUCTION

The livelihoods of more than two-thirds of the rural population rely heavily on livestock as it holds a crucial position within the realm of agriculture, serving as a vital cornerstone for ensuring nutritional security among populations (Kumar et al., 2021). Livestock plays a significant role in Nepal's economy, making up approximately 6.01% of the total national GDP, and a substantial part (24.01%) of the agricultural GDP (AGDP) (MoALD, 2021; MoALD, 2022). Comparing the data of 2021 and 2022, number of cattle and buffalo populations are on decreasing trend, whereas milking cattle and miking buffaloes are on increasing trend (MoALD, 2022). A group researchers illustrates two major methods adopted mostly for breeding dairy animals - natural and artificial mating (Khan et al., 2012). In natural mating, simply a bull is mounted on the cow in estrus. Despite its traditional nature, this method remains in use across numerous countries globally. Artificial insemination, introduced in Nepal in 2018 BS, represents an advanced technique where male semen is meticulously gathered, processed, stored, and intentionally introduced into the female reproductive system for conception (NLBC, 2014).

The adoption of artificial insemination has broadened, resulting in significant enhancements in both the caliber of animals and the overall outcomes of breeding programs (Patel et al., 2017). Efforts to boost cattle production have mainly concentrated on improving the females, as they have a significant and lasting impact on the quality of the offspring (Funston et al., 2012; Endecott et al., 2013; Diskin and Kenny, 2014). However, it is important to note that a bull's role in improving production efficiency might be even more significant than initially thought. This is especially true when a breeding bull has multiple offspring during a breeding season. Several factors, such as environmental conditions and nutrition can have adverse effects on bull fertility (Parkinson, 1987; NRC, 2000; Thomas, 2009).

Poor nutrition significantly hampers bull reproductive performance which impact breeding bull overall fertility and causes low conception rate (Short and Adams, 1988; Coulter et al., 1999; Singh et al., 2018). Till now many efforts have been made to improve cow and buffalo production but all were focused mainly on improving female cows and buffalo. However, breeding bulls play a significant role in improving cattle or buffalo production as bulls may have multiple offspring during breeding. There is a limited number of research done to identify the management practices adopted by farmers for the improvement of overall bull's performance. The survey would provide information on practices like breeding bull selection, feeding, off mating with onset of estrus and disease prevention practices, vaccination which contribute to increased animal reproduction.

2. METHODS

Gauradaha Municipality, located at a latitude and longitude of 26°33'32.4'' N, and 87°43'4.04'' E and altitude of 157.5 masl was selected purposively to carry out research on management of breeding cattle and buffalo bull during March-April of 2023. Municipality covered an area of 149.86 sq. km. and had a population of 60,451 (Census, 2021). Primary data were collected by face-to-face interviews with selected farmers in the research area using a semi-structured questionnaire. Secondary data were collected from articles, reports, journals, websites, and various institutions and organizations like Central Bureau of Statistics (CBS), Nepal Agriculture Research Council (NARC), Department of Agriculture,

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Ministry of Agriculture Development and Agriculture Knowledge Centre. Almost all breading bull rearers, a total of 29 were taken as samples for study. Information was collected from the survey in M-water survey software and entered into the computer. Statistical Package for Social Sciences (SPSS) was used for data analysis. Descriptive analysis such as mean, standard deviations and frequency were used. Variables like breed of breeding bulls, age of first service, feed distribution, fodder cultivation, deworming of animals etc. were considered for the descriptive analysis. Microsoft Excel was used for producing descriptive statistics in the form of bar- diagrams, pie-charts etc.

3. Results and Discussion

3.1 Experience in cattle or buffalo farming and bull rearing

Of the total 29 farmers, 90% (26) have been rearing cattle and buffaloes for more than 20 years and 10% (3) farmers for less than 20 years.

Table 1: Experience of breeding bull rearing and providing breeding service

Years	Frequency	Percentage
1-10	18	64
11-20	8	26
21-30	3	10
Total	29	100

Table 1 shows that the majority of respondents (64%) have less than a decade of experience in breeding bulls, followed by a smaller group (26%) with 11 to 20 years of experience and an even smaller group (10%) with 21 to 30 years of experience.

3.2 Breed of cattle and buffalo bulls

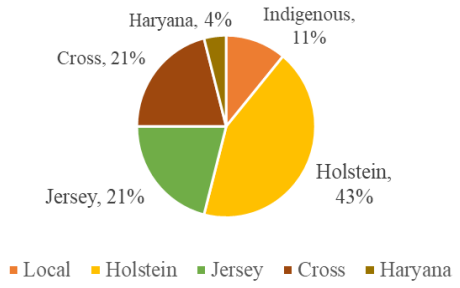

Figure 2: Different breed of cow bulls

Figure 2 shows the different breeds used by bull rearers for mating cows. According to the figure, 43% of farmers prefer Holstein Friesian breed and 21% prefer Jersey for breeding cows. The preference of people for local and Haryana breeds was found to be lower. Holstein bulls were preferred more for their higher milk production trait whereas Jersey bulls were preferred for higher fat percent and wider adaptability.

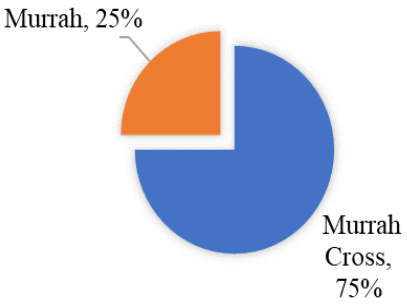

Figure 3: Different breed of buffalo bulls

According to the figure most farmers 75% (3) were found to prefer Murrah cross and 25% (1) prefer Murrah breed for breeding buffalos.

3.3 Source of breeding bulls

Table 2: Source of breeding bulls

Original location of bull	Number of farmers	Percentage
Born at farm	7	24
Local private farm	2	7
Outside private farm	9	31
Government breeding farm	1	3
Brought from another farmer	10	34
Total	29	100

Table 3 shows whether the farmer brought bulls from other places or were born at the farm. According to the table 24% of farmers bulls used by them were born at their farm whereas 34% of farmers brought bulls from another farmer. 31% of farmers brought breeding bulls from outside private farms. Bulls brought from government breeding farms and local private farms were found to be minimal.

3.4 Age of first service of cow and buffalo bull

Table 3: Age of first mating service

Bull Type	Mean Age (Months)	S.D (Months)
Cow Bull	21.36	5.73
Buffalo bull	30	4.89

Table 3 shows age of first breeding service of cow and buffalo breeding bulls of Gauradaha Municipality. The age of the first service of cow bull was found to be 21.36±5.73 months (14-36 months) and for buffalo bull, it was 30±4.89 months (24-36 months). It shows that breeding bulls are mature enough for mating which improves conception rate.

3.5 Period for which bulls provide service in the locality

Table 4: Number of years of service by a bull at the farm area

Category	Mean Age (Years)	S.D (Years)
Breeding Bull	3.12	1.43

Table 4 shows that farmer retained their bull up to 3.12±1.43 years of age. The typical age up to which breeding bulls are retained for the breeding program is 3.12 years but there is variation and some bulls may be retained up to only for 1.69 years or as used for service as late as 4.55 years. This data gives information on when farmer replaced or culled breeding bull. When breeding bulls are retained and used for extended period such as more than three years, there is higher likelihood of them mating with their own offspring or closely related animals which can contribute to increased inbreeding in the locality.

3.6 Feeds and fodder use

3.6.1 Cultivation of fodder

76% (22) farmers cultivate different type of fodder whereas 24% (7) breeders do not cultivate any fodder types.

Table 5: Different fodder types and their cultivations

Fodder Type	Frequency	Percentage of farmers	Total Area (Kattha)	Mean Area (Kattha)	Minimum Area (Kattha)	Maximum Area (Kattha)
Napier	21	73	34	1.61	0.5	20
Maize	7	24	74.5	10.6	2.5	40
Bhatmase	1	3	5	5	5	5
Others	2	7	13	6.5	5	9

Table 5 provides information for each type of fodders. This provides clear overview on number of farmers cultivating different types of fodder and variation in cultivation area of each type. Among different fodders, Napier emergers as the mostly widely cultivated fodder with 73% farmers dedicating an average of 3 kattha land to its cultivation. Second most cultivated fodder is maize and bhatmase (*Flemingia sp*) and other fodder crops are least cultivated. The preference of Napier as a fodder is high because it is drought tolerant, has perennial growth, high biomass production and ease of propagation.

3.6.2 Feed resources

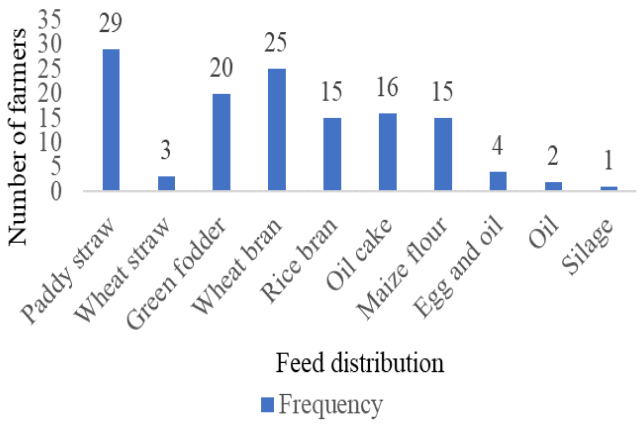

Figure 4: Feedstuffs used for breeding bulls

Figure 4 describes the feed used by people for feeding their breeding bulls. According to the table, 100% farmers feed paddy straw to their bull, making it the most common feed for breeding bulls. Similarly, only 10 % farmers were found using wheat straw. As of concentrate, 86% farmers use wheat bran making it the most preferred concentrate. Oil cake was used by 55% farmers making it the second-highest preferred concentrate feed used and the third-highest used was maize flour and rice bran 52% farmers. Some people were also found to feed other feed such as eggs and oil (14%) and silage (3%).

3.6.3 Amount of concentrate feeding

Table 6: Concentrate fed per day

Feed/day	Frequency	Percentage
1-2.5 kg	16	55
3-4.5 kg	5	17
5-6.5 kg	6	21
7-8.5 kg	1	3
9-10.5 kg	1	3
Total	29	100

The results reveal that the majority of farmers, approximately 55%, provide their animals with a daily concentrate feed quantity ranging from 1 to 2.5 kilograms. A significant portion, around 17%, opt for a moderately higher feed range of 3 to 4.5 kilograms daily. Furthermore, 21% of the farmers feed their livestock in the range of 5 to 6.5 kilograms, indicating a propensity for more substantial daily feed quantities. A smaller fraction, comprising 6% of the farmers, reported a notably higher feed amount between 7 to 10.5 kilograms. However, it was revealed through focus group discussion that farmers used on an average 3-5 kg concentrates per day. According to the study from the amount of concentrate required for breeding bulls of age 1-2 years is 3kg per day (Ranjhan et al., 1998).

3.6.4 Vitamins/minerals supplementation

Table 7: Respond of farmer for vitamins/minerals supplementation

Response	Frequency	Percentage
Yes	11	38
No	18	62

The 62% (18) of breeding bull rearers do not supply any kind of vitamins or minerals and 38 % (11) of breeders were found to supply vitamins and minerals.

3.7 Types of breeding

Table 8: Preference of natural or artificial insemination

Species	Preference ratio of NI vs AI	Percentage %	
		NI	AI
Cattle	7.86	78.6	21.4
Buffalo	2.14	80	20

According to the table 78.6% of farmers prefer NI over AI for cow and 80 % of farmers prefer NI whereas preference of A I in buffalo is low from breeder's point of view. A study conducted by sapkota et al., (2016) in Nawalaprasi and Chitwan finds that the adoption of AI was low in buffaloes due to difficulties in detecting silent heat and poor capacity and practices of AI service with inefficient methods of handling.

3.8 Frequency of service by bulls

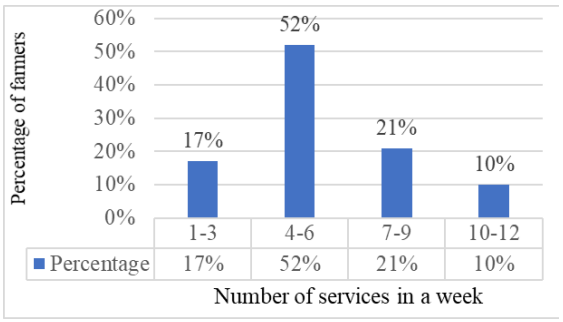

Figure 5: Number of services in a week

The above column diagram describes about the weekly use of bulls for mating. According to the figure 17% (5) breeders were found to use their bull for 1-3 services in a week and 52% (15) were found to use bull for 4-6 services. Some farmers were found to use bulls for more than seven services in a week which means the use of bull frequently for 2 services for 2 to 3 days in a week.

3.9 Use of bulls more than once a day

Table 9: Frequency of service more than a day

More than once a day	Frequency	Percentage
Occasionally	22	76
Frequently	7	24
Total	29	100

Table 9 shows that 76% (22) breeders occasionally used their bulls more than once a day while 24% (7) breeders frequently used their bulls for more than once a day.

3.10 Conception rate

Almost all farmers claimed the conception rate to be 70-80% for both cow and buffalo bull. According to report from AITC (2080) conception rate in cow is 56% and buffalo is 48%.

3.11 Breeding season of cow and buffalo bull

Regarding the breeding season 79% cows breed during Baisakh to Ashwin with the peak in the months of Jestha and Ashad. About 21% breeding in cows are during Kartik to Chaitra. Similarly in case of buffaloes, high rates of breeding i.e. 60% occur in Shrawan to Poush and only 40% in other months.

3.12 Fees for breeding service

From the field survey it was found that most breeders charge Rs.500 per service for cow and minimal number of farmers charge Rs.700 while for buffalo farmers charge Rs.1,000 per service. Regrading repeated services most farmers claimed that it is free for 3 services or up to 3 months and after that same service charge is taken.

3.13 Timing of services

Almost all breeding bull rearers are reported that cattle and buffalo farmers bring their animal for service after more than 12 hours of onset of heat.

3.14 Disease problems and their prevention

3.14.1 Common disease problems faced by breeding bull rearers

Table 10: Common disease problem	
Problem	**Rank**
Fever	1
Foot and Mouth Disease	2
Lumpy skin	3

Table 10 shows different common diseased problem faced by farmer. According to table main disease problem faced by farmer was fever and secondly FMD. Some farmer also faced the problem of lumpy skin but in small number.

3.14.2 Vaccination

Table 11: Use of vaccines		
Vaccination of breeding bulls	**Frequency**	**Percentage**
Regularly	0	0
Occasionally	11	62
Do not vaccinate	18	32
Total	29	100

Table 11 shows whether farmer vaccinate their animals or not. From the table it is evident that 62% farmers to vaccinate their animals occasionally and 32% do not provide any kind of vaccination. Regular vaccination practice was nil.

Table 12: Disease against which vaccines are used		
Disease	**Frequency**	**Percentage**
Foot and Mouth Disease	5	46
Lumpy skin	6	36
Hemorrhagic septicemia	2	8
Black quarter	2	8
Total	15	100

According to Table 12, farmers recently vaccinate their animals against FMD (46%), 36% against lumpy skin disease and 8% against haemorrhagic septicaemia and black quarter.

3.14.3 Treatment against worms

Table 13: Deworming of breeding bull		
Deworm animals	**Frequency**	**Percentage**
Whenever problem arise	3	10
Every 6 months	22	76
Others	4	14
Total	29	100

Table 13 describes about deworming of breeding bull by farmers. More than 2/3rd of the farmers deworms their breeding bulls in every 6 months whereas 10 % breeders were found to deworm their animals whenever problems arise. Some people deworm their animals every 3 or 4 months and some say they have not dewormed their animals till now.

3.15 Record keeping practice

Table 14: Record keeping		
Response	**Frequency**	**Percentage**
Yes	10	34
No	19	66

The Table 14 describes whether the breeding bull rearer kept a record of service or not to keep track of bull service or bull performance. The data in the table shows that 66% breeders do not keep any record of bull services and less than 35 % of farmers kept record of services.

3.16 Capacity building training

Table 15: Response whether received any training or not		
Response	**Frequency**	**Percentage**
Yes	4	14
No	25	86

Table 15 shows that only 14% farmers have received some training on breeding bull management while 86% have not received any kind of training.

3.17 Problems other than disease faced by breeders

Table 16: Problem other than disease	
Problem	**Rank**
Bull aggressive behavior	1
Difficult to find pure breed bull	2
High cost of feed	3
Reluctance to pay service charge	4

Table 16 shows about problems other than disease faced by breeding bull rearers of Gauradaha Municipality. Most farmers face problem of bull's aggressive nature and difficulty in handling is a major problem. Secondly finding a pure breeding bull was also a problem faced by many rearers. High cost of feed is another important problem reported. People also find difficult in paying Rs. 500 charges for bull service but this problem was minimal.

3.18 Satisfaction level of farmer by rearing breeding bulls

Table 17: Farmer's satisfaction level		
Satisfaction Level	Frequency	Percentage
Highly satisfied	4	14
satisfied	23	79
Neutral	0	0
Dissatisfied	1	3
Highly dissatisfied	1	3

According to the Table 17, 79% of breeding bull rearers are satisfied and 14% of farmers are highly satisfied whereas 3% of people or dissatisfied or highly dissatisfied.

4. Conclusion

This study was conducted to assess the management practices adopted by cattle and buffalo breeding bull rearers at Gauradaha Municipality. From the study it was found that most farmer prefer exotic breed like Holstein and Jersey breed 43% and 21% respectively for breeding cattle and Murrah cross (75%) for mating buffalo. Most farmers use cow bull for service at an age of 21.36 months and buffalo at age of 30 months. Total period of bull retention at the farm was found to be 3.12 years. Almost all farmers feed paddy straw. Regarding concentrates feeding, majority of farmers prefer wheat bran than oil cakes. The 3rd prefer concentrate was rice bran 52% and maize flour as 52%. Some farmers were also found feeding egg to supply protein in diet and also feed oil. From breeder's point of view, it was found that most farmer prefer natural insemination over artificial insemination. Services per week was most frequent mating rate (55%). Breeding season in cow was maximum during Baisakh to Ashwin with peak the peak period in the months of Jestha and Asadh. Similarly in case of buffalo high rate of breeding occurs in Shrawan to Poush. The charge per services for cow bull was Rs.500 and for buffalo bull was Rs.1000. Regarding repeated breeding most farmers claimed that it was free for 3 services or up to 3 months. Talking about fodder cultivation most farmer prefer Napier with 21 farmers preferring it. Vaccinating animals and record keeping was found poor in this area. 86% farmer respondent that they had not received any kind of training in breeding bull management.

Authors' Contributions

Raju Dahal conducted the experiment, data collection, data analysis, and the write-up of this research article. Amir Pandit assisted with the experimental setup and data collection. Nirmal Katuwal served as the advisor and advisory committee member, suggesting the research topic, supervising the experiment, and providing guidance throughout the data

collection and analysis processes. Additionally, Shramik Wagle and Bikram Kumar Tiwari contributed to the data collection efforts.

COMPETING INTEREST

In this paper, all other authors declare no conflicts of interests.

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