BREEDING PRACTICES FOLLOWED BY SMALL RUMINANT FARMERS FOR SUSTAINABLE PRODUCTION SYSTEMS

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ABSTRACT

Small ruminants, particularly sheep and goats, are integral to livestock-based farming systems in India, providing income, employment, and nutritional security, especially in arid and semi-arid regions. Sustainable small ruminant production depends not only on routine management but also on effective breeding practices, which influence productivity, genetic improvement, and resilience to environmental stressors. The present study aimed to analyze the breeding and general management practices followed by small ruminant farmers across ten agro-climatic zones of Rajasthan. Using a multistage random sampling method, 360 respondents actively engaged in sheep and goat farming were interviewed. The results revealed that 81.25 per cent of farmers had aware about heat signs and majority were aware of recommended male-to-female breeding ratios, indicating a reasonable conceptual understanding of breeding management. However, adoption of scientific practices such as controlled mating, flushing, separate housing of sexes, and timely rotation of breeding males was limited. Traditional flock mating (100%) and reliance on extended male rotation periods were predominant. In terms of general management, majority (90%) practiced culling, semi-intensive rearing (73.33%), maintained semi-pucca housing (70%) and cent per cent provided drinking water, while practices like separate housing for sick animals (26.94%) and protection from extreme weather (61.39%) were less common. The findings highlight a gap between awareness and practice, emphasizing the need for targeted extension interventions to enhance the adoption of improved breeding and management strategies for sustainable small ruminant production.

Key words: Small ruminants, breeding management, general practices, agro-climatic zones, sustainable production

Introduction

Small ruminants, particularly sheep and goats, constitute a vital component of livestock-based farming systems in developing countries due to their adaptability, low initial investment, and ability to thrive under harsh agro-climatic conditions. In India, livestock plays a significant role in the national economy, contributing about 4.11% to the total Gross Value Added (GVA) and nearly 30% to the agricultural GVA (Government of India, 2023). According to the 20th Livestock Census (2019), India possesses approximately 74.26 million sheep and 148.88 million goats, accounting for a substantial share of the world's small ruminant population (DAHD, 2019). These species are predominantly reared by small, marginal, and landless farmers and are especially important in arid and semi-arid regions where crop agriculture is risky and uncertain.

Sheep and goat farming contributes significantly to rural livelihoods, employment generation, food and nutritional security, and poverty alleviation. Goats are often referred to as the "poor man's cow" due to their multifunctional utility and quick returns, while sheep are valued for meat, wool, and manure (Kumar *et al*., 2015; Meena *et al*., 2024). In states like Rajasthan, Gujarat, Karnataka, and Andhra Pradesh, small ruminant rearing forms a backbone of the rural economy and acts as a climate-resilient livelihood option (Birthal *et al*., 2017).

Sustainability in small ruminant farming encompasses economic viability, environmental soundness, and social acceptability (FAO, 2018). Among the various management components influencing sustainability-such as feeding, health care, housing, and marketing-breeding practices play a decisive role, as they directly affect productivity, reproductive efficiency, genetic improvement, disease resistance, and adaptability to local environments (Kosgey & Okeyo, 2007). Sustainable breeding practices ensure optimal use of genetic resources while maintaining resilience against climate variability and disease challenges.

Traditionally, sheep and goat farmers in India follow indigenous and experience-based breeding practices, including natural mating, selection of breeding animals based on physical traits, reliance on community breeding males, and preference for locally adapted indigenous breeds (Kumara *et al*., 2017). While these practices help preserve genetic diversity and adaptability, they are often associated with uncontrolled mating, indiscriminate breeding, inbreeding, poor buck/ram management, and lack of systematic selection, which may limit productivity and long-term sustainability (Gowane *et al*., 2016). Scientific studies have shown that poor breeding management can lead to low growth rates, poor reproductive performance, increased kid/lamb mortality, and reduced economic returns (Kosgey *et al*., 2008). Conversely, adoption of improved breeding practices-such as timely replacement of breeding males, avoidance of inbreeding, selection based on performance traits, and use of improved or superior indigenous germplasm-has been found to enhance productivity and profitability while supporting sustainable farming systems (Rangnekar, 2014; FAO, 2019).

Despite the recognized importance of breeding practices, empirical documentation of the existing breeding practices followed by sheep and goat farmers at the field level remains inadequate, particularly in relation to sustainability indicators. The adoption of recommended breeding practices is often influenced by farmers' socio-economic characteristics, access to extension services, availability of quality breeding stock, and traditional beliefs (Meena *et al*., 2024; Kumar *et al*., 2015). Understanding the prevailing breeding practices and identifying gaps between recommended and adopted practices is

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therefore essential for formulating effective extension strategies and policy interventions.

In the context of sustainable livestock development, there is a growing emphasis on farmer-participatory and location-specific breeding strategies that integrate indigenous knowledge with scientific interventions (FAO, 2018). However, successful implementation of such strategies requires a clear understanding of farmers' existing breeding behavior and its implications for sustainability. Therefore, the present study was undertaken to analyze the breeding practices followed by sheep and goat farmers in sustainability of small ruminant production systems. The findings of this study are expected to provide valuable insights for extension professionals, researchers, and policymakers to design sustainable, farmer-centric breeding interventions for sheep and goat production systems.

Materials and Methods

A multistage random sampling technique was used for the selection of respondents representing all the 10 agro climatic zones of Rajasthan. One district was randomly selected from each agro-climatic zone. Thus 10 districts were selected for the study. From these districts two tehsils were randomly selected. From each selected tehsils two villages were randomly selected and nine respondents were randomly selected which were actively involved in SR farming from each selected village. Thus total 360 respondents were selected for the present study. The data was collected through personal interview technique from each selected respondent. To analysis the collected information, several basic statistical tools and methods were used.

Results and Discussion

1. Breeding practices

The findings presented in Table 1 depict the existing breeding management practices followed by small ruminant farmers in the study area. A substantial proportion of respondents (81.25%) possessed adequate knowledge of heat signs in sheep and goats, indicating a reasonably good level of awareness regarding estrus detection. However, 18.75 per cent of the farmers still lacked such knowledge.

Only 12.5 per cent of respondents practiced separate housing of male and female animals, and flock mating was universally followed by all farmers (100%). Hand mating was completely absent, reflecting the predominance of traditional and uncontrolled breeding practices among small ruminant farmers. Similarly, restriction on mating was not practiced by any of the respondents.Awareness regarding the recommended breeding male to female ratio (ram/buck to ewe/doe) was reported by 92.50 per cent of the respondents, suggesting good conceptual knowledge related to breeding management. Despite this awareness, no farmer reported adopting scientific practices such as flushing prior to breeding.

With respect to breeding season, the majority of farmers (70.00%) followed breeding during the months of June to August, while 30.00 per cent preferred January to March, indicating a clear inclination towards seasonal breeding in small ruminants. A large proportion of respondents (83.75%) practiced rotation of breeding males (ram/buck), which is an important measure to avoid inbreeding. However, the duration of rotation varied considerably; 40.00 per cent of farmers rotated breeding males after five years or more, followed by 32.50 per cent after four years and 11.25 per cent after three years. Notably, 16.25 per cent of the respondents did not follow any breeding male rotation. Regarding the method of rotation, only 18.75 per cent of the farmers practiced exchange of breeding males.

Overall, the results indicate that although small ruminant farmers possessed fair knowledge regarding certain aspects of breeding management, the actual adoption of scientific breeding practices such as controlled mating, flushing, and timely rotation of breeding males was limited. These findings are in line with the findings of Tanwar *et al.* (2014) and Siyak *et al.* (2024).

2. General management practices

The Data in Table 2 revealed that a majority (90.00%) of small ruminant farmers practiced culling of unproductive

Table 1: Breeding practices followed by small ruminant farmers in achieving sustainability

S. No.	Breeding Management Practices	Category	Frequency (n)	Percentage (%)
1	Knowledge on heat signs	Yes	293	81.25
		No	67	18.75
2	Male and female animals kept separately	Yes	45	12.50
		No	315	87.50
3	Mating practices	Hand mating	0	0.00
		Flock mating	360	100.00
4	Awareness on breeding male to female ratio (Ram/Buck: Ewe/Doe)	Yes	333	92.50
		No	27	7.50
5	Restriction on mating	Yes	0	0.00
		No	360	100.00
6	Flushing practiced before breeding	Yes	0	0.00
		No	360	100.00
7	Breeding season followed	June–August	252	70.00
		January–March	108	30.00
8	Breeding male (ram/buck) rotation	Yes	302	83.75
		No	58	16.25
9	Period of breeding male rotation	3 years	41	11.25
		4 years	117	32.50
		5 years & above	144	40.00
		Not followed	58	16.25
10	Method of breeding male rotation	By exchange	68	18.75

Table 2: General management practices followed by small ruminant farmers in achieving sustainability

S. No.	General Management Practices	Category	Frequency (n)	Percentage (%)
1	Culling practiced	Yes	324	90.00
		No	36	10.00
2	Type of rearing	Extensive	96	26.67
		Semi-intensive	264	73.33
3	Cleaning of animal shed	Yes	252	70.00
		No	108	30.00
4	Type of housing	Semi-pucca	252	70.00
		Kutcha	108	30.00
5	Provision of drinking water	Yes	360	100.00
		No	0	0.00
6	Adequate ventilation in shed	Yes	238	66.11
		No	122	33.89
7	Protection from extreme weather	Yes	221	61.39
		No	139	38.61
8	Regular removal of dung/manure	Yes	280	77.78
		No	80	22.23
9	Separate housing for sick animals	Yes	97	26.94
		No	263	73.06
10	Use of low-cost/local housing material	Yes	281	78.06
		No	79	21.94

animals regularly and remaining 10.00 per cent were not practicing it. Semi-intensive rearing was predominant (73.33%), while only 26.67 per cent followed extensive rearing systems. Cleaning of animal sheds was reported by 70.00 per cent of respondents, whereas 30.00 per cent did not practice regular cleaning. Similarly, 70.00 per cent of farmers housed animals in semi-pucca sheds and remaining used kutcha structures. Provision of drinking water was universal (100%) and majority (66.11%) of SR farmers ensured adequate ventilation in sheds. Protection from extreme weather was reported by 61.39 per cent of respondents. Regular removal of dung/manure was followed by 77.78 per cent of SR farmers, while only 26.94 per cent provided separate housing for sick animals. Majority (78.06%) used low-cost or locally available materials for housing construction. These findings are similar to those reported by Tanwar *et al.* (2007), Regar *et al.* (2019), Kakraliya *et al.* (2022) and Bagri *et al.* (2024).

Conclusion

The findings indicate that small ruminant farmers in the study area generally possessed reasonable awareness regarding animal husbandry and breeding management, such as estrus detection, provision of drinking water, and appropriate male-to-female breeding ratios. However, the actual adoption of scientific practices was limited. While routine management practices like culling, semi-intensive rearing, shed cleaning, and dung removal were widely followed, advanced practices such as separate housing of sexes, controlled mating, flushing prior to breeding, and timely rotation of breeding males were poorly implemented. This suggests a reliance on traditional methods and highlights the need for targeted extension interventions to enhance the adoption of improved breeding and management practices for sustainable small ruminant production.

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