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Hujaz Tariq
 Regional Research and
 Training Centre, Talwara,
 Guru Angad Dev Veterinary
 and Animal Sciences
 University, Ludhiana, Punjab,
 India

Gagandeep Singh
 Regional Research and
 Training Centre, Talwara,
 Guru Angad Dev Veterinary
 and Animal Sciences
 University, Ludhiana, Punjab,
 India

RK Sharma
 Regional Research and
 Training Centre, Talwara,
 Guru Angad Dev Veterinary
 and Animal Sciences
 University, Ludhiana, Punjab,
 India

Niharika Thakur
 Regional Research and
 Training Centre, Talwara,
 Guru Angad Dev Veterinary
 and Animal Sciences
 University, Ludhiana, Punjab,
 India

Corresponding Author:
Gagandeep Singh
 Regional Research and
 Training Centre, Talwara,
 Guru Angad Dev Veterinary
 and Animal Sciences
 University, Ludhiana, Punjab,
 India

Biosecurity and health management practices followed by goat farmers of the Kandi area

Hujaz Tariq, Gagandeep Singh, RK Sharma and Niharika Thakur

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Abstract

Biosecurity and sound health management are vital for sustainable goat production, particularly under the low-input, semi-intensive systems predominant in the Kandi region of Punjab. The present study was undertaken to assess the prevailing biosecurity and health management practices among goat farmers, who often face challenges such as limited access to veterinary care, inadequate housing, poor-quality feed and fodder, and low-producing animals. Data were collected through structured interviews and field observations to evaluate awareness, adoption, and constraints related to cleaning, disinfection, vaccination, deworming, and housing hygiene. The findings revealed that most goat farmers had limited awareness and poor adoption of recommended biosecurity measures. Regular cleaning and disinfection of sheds were rarely practiced, while ectoparasite control received minimal attention. Vaccination against enterotoxaemia (ETV) was the most common preventive measure, though its schedule was often irregular. Goats were generally housed on *kuccha* floors with poor drainage, overcrowding, and inadequate sanitation. Udder health issues, including udder oedema in transition goats and mastitis in high-yielding does, were common due to poor hygiene and nutritional deficiencies. Kid management was inadequate, with insufficient colostrum feeding and overcrowded housing, often resulting in high kid mortality during winter. The study emphasizes the need for region-specific, low-cost biosecurity and management interventions and farmer training to enhance goat health, productivity, and profitability in the Kandi region.

Keywords: Biosecurity, goat, Kandi region, mastitis

Introduction

Goat farming is an integral component of the livestock sector in India, contributing substantially to rural livelihoods, nutritional security, and income generation, particularly for small and marginal farmers. According to the 20th Livestock Census (2019) ^[1], small ruminants account for 41.57% of the total livestock population of the country. Goats possess several biological advantages, including high adaptability to diverse agro-climatic conditions, efficient utilization of low-quality feed resources, early maturity, high reproductive efficiency, and relatively lower investment requirements, making them an ideal enterprise for resource-poor households (Singh *et al.*, 2024) ^[12]. Increasing domestic demand for chevon and expanding export opportunities have further enhanced the economic importance of goat production in India.

Despite their resilience, goat production is constrained by infectious and parasitic diseases that adversely affect growth, reproduction, milk production, and overall profitability. Disease occurrence is often associated with inadequate preventive health care, unrestricted animal movement, communal grazing, poor sanitation, and limited implementation of farm biosecurity measures (Chadda *et al.*, 2026) ^[4]. The World Organisation for Animal Health (WHO, 2019) ^[16] defines biosecurity as the implementation of managerial and physical measures designed to reduce the introduction, establishment, and spread of animal diseases within and between animal populations. Recommended biosecurity measures include quarantine of newly introduced animals, vaccination, parasite control, sanitation and disinfection, controlled visitor access, proper carcass disposal, feed and water hygiene, and vector control. Implementation of biosecurity measures plays a crucial role in improving animal health and welfare, enhancing productivity, reducing economic losses associated with disease outbreaks, minimizing antimicrobial use, and lowering the risk of zoonotic disease transmission (Mariasusai *et al.*, 2025) ^[7].

Despite these well-established benefits, the adoption of biosecurity practices remains inadequate across livestock production systems due to factors such as limited farmer education, inadequate veterinary and extension services, economic constraints, and low perception of disease risk (Saxena *et al.*, 2025) ^[11]. Although considerable research has focused on intensive livestock production systems, information on the implementation of biosecurity measures in extensive goat production systems, particularly in developing countries, remains limited. This knowledge gap is especially relevant in Punjab, where the small ruminant sector is largely dominated by extensive and semi-intensive goat production systems (Chadda *et al.*, 2026) ^[14]. The Kandi region of Punjab is characterized by rainfed agriculture, undulating terrain, fragmented landholdings, and mixed crop-livestock farming (NAIP, 2014) ^[8]. In this region, goats are commonly managed under extensive and semi-intensive systems involving communal grazing, frequent inter-flock contact, and unrestricted animal movement, all of which increase the risk of disease transmission and highlight the need for effective biosecurity and health management practices (Tariq *et al.*, 2025) ^[15]. Scientific information regarding the adoption of biosecurity and health management practices by goat farmers in this region is scarce. Assessing existing farm practices and identifying associated constraints are essential for developing targeted extension programmes and region-specific disease prevention strategies. Therefore, the present study was undertaken to evaluate biosecurity and health management practices adopted by goat farmers in the Kandi region of Punjab and to identify opportunities for improving disease prevention and sustainable goat production.

Materials and Methods

A field survey was conducted among 50 existing goat farmers from the Hajipur, Talwara, Mukerian, and Dasuya blocks of Hoshiarpur district, Punjab. The selected farmers had previously participated in training programmes, awareness camps, goat melas, and other extension activities organized by the Regional Research and Training Centre (RRTC), Talwara. The study covered farmers from the villages of Sathwan, Jakhrawal, Bela Sariana, Bhatoli, Roli, Mehatpur, Gera, and Talwara Juggy Colony, representing the Kandi region of Hoshiarpur district. The respondents were selected using the available database of goat farmers, supplemented through referrals from associated farmers and records of farmers who had attended livestock training programmes and melas organized at the Regional Research and Training Centre (RRTC), Talwara, Hoshiarpur, Punjab. Information on the demographic and socio-economic profile of the respondents, including age, education, family size, farming experience, herd size and training exposure, was collected to characterize the study population and to understand the background of the goat farming households. Data on biosecurity and health management practices were collected using a pre-tested structured questionnaire through face-to-face interviews and on-farm observations. Information on biosecurity measures included daily cleaning of animal sheds, shed disinfection, use of footbaths or limestone at farm entry, isolation of sick animals, visitor control, ectoparasite control, farm record keeping, housing facilities, feed storage practices, manure disposal, carcass disposal, personal hygiene of animal handlers, and placenta disposal practices. Information on health management

practices included regular deworming, vaccination against enterotoxaemia, vaccination against peste des petits ruminants (PPR), scientific kidding management, timely colostrum feeding, mineral mixture supplementation, adequate fodder availability, transition feeding, udder hygiene and management, protection against wild animals, animal identification through tagging, provision of separate kidding pens, and availability of veterinary services. In addition, farmers were interviewed to identify the major constraints affecting the adoption of recommended biosecurity and health management practices.

The collected data were compiled and entered into Microsoft Excel for analysis. Descriptive statistics, including frequencies and percentages, were used to summarize the findings. Adoption levels for biosecurity and health management practices were categorized as low (<20%), medium (20-60%), and high (>60%) based on the proportion of farmers adopting each practice. Similarly, the severity of constraints was classified as low (<20%), medium (20-60%), and high (>60%) according to the percentage of respondents reporting each constraint.

Results and Discussion

Socio-demographic profile of goat farmers

The socio-demographic characteristics of the respondents are presented in Table 1. Most of the goat farmers belonged to the middle-aged group, followed by older farmers, while younger individuals constituted the smallest proportion of the respondents. Goat farming was predominantly practiced by males, although female participation was also observed. Similar age distribution and male predominance in goat farming have been reported by Mallikarjuna *et al.* (2021) ^[6] and Bhikya *et al.* (2021) ^[3]. Regarding educational status, most respondents had attained higher secondary education, followed by those educated below the secondary level and those who had completed secondary education. Only a small proportion of the respondents had graduated or attained higher educational qualifications. A comparable educational profile among goat farmers was also reported by Atta *et al.* (2026) ^[2].

With respect to farming experience, most respondents had more than ten years of experience in goat rearing, followed by those with moderate and relatively fewer years of experience. Similarly, the majority of respondents maintained relatively large goat herds, while medium-sized herds were also common and only a few farmers kept small herds. This distribution may be attributed to the sampling strategy adopted in the present study, as respondents were selected from the available database of goat farmers and records maintained at the Regional Research and Training Centre (RRTC), Talwara, which predominantly included established goat farmers. These findings are consistent with those reported by Tariq *et al.* (2025) ^[15], who documented similar farming experience and herd size patterns among goat farmers in the Kandi region. Comparable herd size distributions have also been reported by Mallikarjuna *et al.* (2021) ^[6] and Reddy *et al.* (2017) ^[9] among smallholder goat farmers.

Adoption of biosecurity and health management practices

The adoption of biosecurity measures by goat farmers is presented in Table 2. Overall, the adoption of recommended biosecurity practices was generally low, indicating

inadequate implementation of preventive disease control measures at the farm level. Among the various practices assessed, basic hygiene-related measures such as proper disposal of placenta, maintenance of housing facilities, and personal hygiene of animal handlers showed relatively better adoption than other biosecurity interventions. In contrast, important disease prevention practices, including scientific manure and carcass disposal, shed disinfection, ectoparasite control, restriction of visitor entry, isolation of sick animals, and use of footbaths at farm entrances, were poorly adopted, highlighting significant gaps in farm biosecurity.

Field observations further indicated that uncemented (kachha) flooring, inadequate shed sanitation, and poor ecto-parasite control by farmers were important risk factors associated with a higher prevalence of tick infestation and tick-borne diseases, particularly in semi-intensive goat production systems. Similar observations were reported by Sajid *et al.* (2020) [10]. The moderate adoption of proper housing practices observed in the present study is also in agreement with the findings of Dhaliwal *et al.* (2021) [5], who reported a similar level of adoption of scientific housing practices among goat farmers in Punjab. Although farmers adopted certain basic hygiene measures, comprehensive biosecurity practices remained inadequate. Mariasusai *et al.* (2025) [7] similarly reported low levels of knowledge, positive attitudes, and husbandry practices related to zoonotic disease prevention among livestock farmers. Chadda *et al.* (2026) [4] highlighted that inadequate biosecurity measures and distress sale of animals increase the risk of disease transmission, posing threats to both animal and public health. Likewise, Singh *et al.* (2024) [12] identified critical gaps in feeding, general management, disease prevention, and reproductive management among goat farmers in the Kandi region, emphasizing the importance of strengthening scientific awareness and extension programmes to improve productivity and profitability. Dhaliwal *et al.* (2021) [5] and Singh *et al.* (2018) [14] further reported that organized goat farms exhibited better adoption of scientific management practices than unorganized farms in Punjab and Madhya Pradesh respectively.

The adoption of health management practices is presented in Table 3. Preventive health care practices showed varying levels of adoption among goat farmers. Vaccination against enterotoxaemia was the most commonly adopted health intervention, whereas most of the remaining recommended practices were adopted at only moderate or low levels. Similar observations were reported by Chadda *et al.* (2026) [4], who found that preventive health management practices were inadequately implemented among livestock farmers. Practices related to udder hygiene, access to veterinary services, timely colostrum feeding, fodder availability, scientific kidding management, regular deworming, predator protection, mineral mixture supplementation, and vaccination against peste des petits ruminants (PPR) demonstrated moderate adoption, indicating partial acceptance of scientific health management recommendations. These findings are consistent with Singh *et al.* (2020) [13], who reported suboptimal feeding and health management practices among goat farmers across different agro-climatic regions of Punjab. Similarly, Atta *et*

al. (2026) [2] documented poor kidding management and high kid mortality among goat farmers. The least adopted health management practices included animal identification through ear tagging, provision of separate kidding pens, and transition feeding during the periparturient period. Thus, udder health issues, including udder oedema in transition goats and mastitis in high-yielding does, were common due to poor hygiene and nutritional deficiencies. The poor adoption of these practices suggests limited awareness among farmers regarding their importance in improving reproductive performance, maternal health, kid survival, and overall herd productivity.

Constraints affecting the adoption of biosecurity and health management practices

The major constraints affecting the adoption of biosecurity and health management practices are presented in Table 4. Lack of awareness regarding scientific biosecurity practices emerged as the most important constraint, followed by poor ventilation in animal shelters during winter and seasonal scarcity of green fodder. In addition, high kid mortality during winter and inadequate training on scientific health management practices were identified as important challenges limiting the adoption of recommended management practices. These findings indicate that insufficient knowledge, poor housing conditions, seasonal feed shortages, and limited access to technical guidance continue to hinder the implementation of scientific goat farming practices in the Kandi region of Punjab. Similar observations were reported by Atta *et al.* (2026) [2], who identified poor kid management and high kid mortality as major constraints affecting goat production. Likewise, Singh *et al.* (2020) [13] reported inadequate housing as one of the major challenges faced by goat farmers in Punjab.

Overall, the findings highlight the need for strengthened extension services, regular farmer training programmes, improved veterinary support, and greater dissemination of scientifically validated biosecurity and health management practices. Such interventions would enhance the adoption of scientific goat husbandry practices, reduce disease incidence and kid mortality, and ultimately improve the productivity and profitability of goat farming systems in the Kandi region of Punjab.

Table 1: Socio-Demographic Profile of Goat Farmers

Variable	Category	Frequency	Percentage (%)
Age	18-30 years	12	24
	31-45 years	24	48
	>45 years	14	28
Gender	Male	45	90
	Female	05	10
Education	Below 10 th	17	34
	10 th	12	24
	12 th	19	38
	Graduate and above	02	04
Experience in farming	<5 years	12	24
	5-10 years	18	36
	>10 years	20	40
Herd Size	<5 animals	07	14
	5-20 animals	19	38
	Above 20	24	48

Table 2: Adoption Level of Biosecurity Measures among Goat farmers of Kandi area (n = 50)

Biosecurity Measure	% Adoption	Level
Daily cleaning of shed	28%	Low
Disinfection of shed	16%	Low
Footbath/Limestone use at entry	6%	Low
Isolation of sick animals	10%	Low
Control of visitors	12%	Low
Regular ectoparasite control	14%	Low
Data recording	22	Low
Proper housing facility	38	Medium
Proper Storage of feed	24	Low
Manure disposal	18	Low
Carcass disposal	26	Low
Personal cleaning and hygiene	38	Medium
Handling of placenta	44	Medium

Table 3: Adoption Level of Biosecurity Measures among Goat farmers of Kandi area (n = 50)

Health Practice	% Adoption	Adoption Level
Regular deworming	36	Medium
Vaccination against Enterotoxaemia (ETV)	74	High
Vaccination against PPR	30	Medium
Scientific Kidding management	38	Medium
Timely colostrum feeding	42	Medium
Use of mineral mixture	34	Medium
Adequate fodder availability	42	Medium
Transition feeding	08	Very low
Udder cleaning and management	48	Medium
Prevention against wild animals	36	Medium
Tagging of animals	18	Low
Separate housing facility for kidding	12	Low
Veterinary services available	46	Medium

Table 4: Severity levels of constraints perceived by goat farmers of Kandi area

Constraint	% Farmers Reporting	Severity Level
Poor winter ventilation	82	High
Seasonal scarcity of green fodder	68	High
Lack of biosecurity awareness	84	High
Lack of training on health practices	46	Medium
High kid mortality in winter	56%	Medium

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