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On-farm assessment of animal-based welfare indicators in sheep and goat production systems in Telangana

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Abstract

This study assessed the welfare status of sheep and goats using animal-based indicators in smallholder production systems of semi-arid Telangana, India. A cross-sectional survey was conducted on 776 animals using a modified AWIN protocol. Indicators included body condition score (BCS), lameness, coat condition, hoof overgrowth, lesions, faecal soiling, ocular and nasal discharge, ectoparasites, respiratory distress, thermal stress, FAMACHA score, and human-animal interaction. Results showed that 49.5% of animals had ideal BCS, while a considerable proportion were thin or emaciated. Lameness (44.6%) and hoof overgrowth (43.2%) were common, indicating locomotor issues. Ectoparasite infestation (53.4%) and clinical signs such as discharge and respiratory distress were also observed. Behavioural responses varied across animals. Overall, animal-based indicators proved effective for welfare assessment, highlighting the need for improved nutrition, health care, and management practices.

Keywords: Animal welfare, sheep and goats, animal-based indicators, small ruminants, AWIN protocol, welfare assessment

1. Introduction

Sheep and goats are integral to global livestock production systems and play a crucial role in supporting the livelihoods of smallholder farmers, particularly in developing countries. In India, these small ruminants significantly contribute to food security and rural income through the production of meat, milk, fibre, and manure (Srinatha *et al.*, 2024; Dhara *et al.*, 2024) ^[2, 3]. Their socio-economic importance is reflected in their steadily increasing population, with recent estimates reporting 148.88 million goats and 74.26 million sheep (BAHS, 2024). Telangana, in particular, has a high concentration of sheep, highlighting the regional importance of small ruminant farming. Despite their adaptability to harsh environmental conditions, including feed scarcity and climatic stress, maintaining optimal welfare is essential for ensuring sustainable productivity (Koluman, 2023) ^[4].

Animal welfare is defined as the physical and mental state of an animal in relation to the conditions in which it lives and dies (OIE, 2022; Broom, 2022) ^[5]. Poor welfare is often associated with reduced growth, impaired reproduction, and increased disease incidence (Whay, 1997) ^[6]. Among various assessment approaches, animal-based health indicators are considered reliable as they directly reflect the actual condition of the animal. Common indicators include body condition score, lameness, lesions, parasitic infestation, faecal soiling, and ocular or nasal discharge (Hernandez *et al.*, 2020; Nisan & Newas, 2022) ^[7, 8]. However, welfare assessment in Indian small ruminant systems remains limited due to lack of standardized protocols and low farmer awareness. Therefore, integrating animal-based indicators into welfare assessment is essential for improving animal health, productivity, and sustainability of livestock systems (Doyle *et al.*, 2022) ^[9].

2. Materials and Methods

2.1 Study Area and Design

The present study was carried out in selected semi-arid regions of Hyderabad and its adjoining

districts—Medak, Rangareddy, Medchal, and Vikarabad—in Telangana, India. A cross-sectional field survey was undertaken on small ruminant farms to evaluate the welfare status of sheep and goats using animal-based indicators.

2.2 Study Period

The investigation was conducted from March to July 2025, a period characterized by high ambient temperatures, increased parasitic burden, and variability in feed resources. These seasonal factors are known to significantly influence the health and welfare of small ruminants.

2.3 Welfare Assessment Protocol

Welfare assessment was carried out using a modified Animal Welfare Indicators Network (AWIN, 2015) protocol for sheep and goats. The evaluation focused specifically on animal-based indicators, as they provide direct insight into the physiological condition and health status of animals. Initially, each flock was observed for approximately 20 minutes to assess general behaviour and condition. This was followed by individual animal assessments, with each animal examined for about 5 minutes to record specific health parameters.

2.4 Animal-Based Welfare Indicators

The following animal-based indicators were systematically assessed to evaluate the health and welfare status of sheep and goats:

- **Body Condition Score (BCS):** Assessed through visual appraisal and palpation to determine body reserves and nutritional status.
- **Lameness:** Evaluated by observing gait, posture, and mobility to identify abnormalities associated with pain or locomotor disorders.
- **Fleece/Hair Coat Condition:** Examined for cleanliness, matting, alopecia, and coat texture as indicators of hygiene, health status, and parasite burden.
- **Hoof Condition:** Inspected for overgrowth, cracks, deformities, and lesions affecting locomotion and comfort.

- **Skin Lesions and Injuries:** Recorded for the presence of wounds, abrasions, swellings, or dermatological abnormalities.
- **Faecal Soiling (Dag Score):** Assessed in the perineal region to indicate diarrhoea, parasitic infection, or poor hygiene.
- **Ocular Discharge:** Evaluated for abnormal lacrimation or mucopurulent discharge indicative of ocular irritation or infection.
- **Nasal Discharge:** Observed for serous, mucous, or purulent secretions associated with respiratory disorders.
- **Ectoparasite Infestation:** Determined by the presence of ticks, lice, or mites and associated clinical signs such as pruritus and hair loss.
- **Respiratory Distress:** Assessed through clinical signs including coughing, dyspnoea, nasal flaring, and abnormal respiratory sounds.
- **Thermal Stress:** Evaluated based on behavioural and physiological responses such as panting, open-mouth breathing, and restlessness.
- **Mucous Membrane Colour (FAMACHA):** Assessed using conjunctival colour to detect anaemia, particularly due to gastrointestinal parasitism.
- **Udder Health:** Examined in lactating animals for signs of mastitis, swelling, asymmetry, or lesions affecting milk production.
- **Human–Animal Interaction Test:** Conducted to assess behavioural responses to human approach, indicating levels of fear, stress, or habituation.

2.5 Scoring of indicators

All animal-based welfare indicators were scored using a structured coding system based on a modified AWIN (2015) protocol. Each indicator was assigned numerical categories to ensure uniformity and ease of statistical analysis. The classification and scoring scheme used for each parameter are presented in Table 1.

Table 1: Scoring for Animal-Based Welfare Indicators

No.	Variable Name	Code and Category
1	Body Condition Score (BCS)	1 = Emaciated, 2 = Thin, 3 = Ideal, 4 = Fat, 5 = Obese
2	Lameness	1 = None, 2 = Moderate, 3 = Severe, 4 = Recumbent
3	Fleece/Hair Coat	1 = Clean, 2 = Dirty, 3 = Matted
4	Hoof Overgrowth	1 = Absent, 2 = Present
5	Injury / Lesions	1 = Absent, 2 = Present
6	Faecal Soiling	1 = Absent, 2 = Present
7	Ocular Discharge	1 = Absent, 2 = Present
8	Nasal Discharge	1 = Absent, 2 = Present
9	Ectoparasites	1 = Absent, 2 = Present
10	Respiratory Distress	1 = Absent, 2 = Present
11	Udder Lesions	1 = Absent, 2 = Present
12	Thermal Stress	1 = None, 2 = Mild–Moderate, 3 = Severe
13	Mucosa Colour (FAMACHA)	1 = Optimal, 2 = Acceptable, 3 = Borderline, 4 = Danger, 5 = Fatal
14	Human Approach	1 = Friendly, 2 = Neutral, 3 = Avoids

2.6 Statistical Analysis

The collected data were analysed using IBM SPSS Statistics (Version 29). Descriptive statistical tools, including mean, standard deviation, frequency, and percentage, were used to summarise the distribution and prevalence of animal-based welfare indicators.

3. Results

A total of 776 sheep and goats were assessed at the individual level using animal-based welfare indicators. Of these, 51.5% of the animals were reared under semi-intensive systems, while 48.5% were maintained under extensive production systems.

Assessment of body condition score (BCS) revealed that nearly half of the animals (49.5%) were in ideal condition. However, a considerable proportion of animals were classified as thin (34.7%), indicating potential nutritional deficiencies. Emaciated animals accounted for 5.5%, while only a small percentage were categorized as fat (9.5%) or obese (0.3%) presented below in table 2

Table 2: Individual Animal Welfare Indicators (n = 776 animals)

Variable	Category	Frequency (n)	Percent (%)
Production system	Semi-intensive	400	51.5
	Extensive	376	48.5
Body Condition Score (BCS)	Emaciated	43	5.5
	Thin	269	34.7
	Ideal	384	49.5
	Fat	74	9.5
	Obese	2	0.3
Lameness score	No lameness	430	55.4
	Moderate	274	35.3
	Severe	58	7.5
	Recumbent	14	1.8
Hair coat condition	Clean	320	41.2
	Dirty	335	43.2
	Matted	121	15.6
Hoof overgrowth	Present	335	43.2
	Absent	441	56.8
Injury/lesions	Present	241	31.1
	Absent	535	68.9
Fecal soiling	Present	266	34.3
	Absent	510	65.7
Ocular discharge	Present	142	18.3
	Absent	634	81.7
Nasal discharge	Present	166	21.4
	Absent	610	78.6
Ectoparasite presence	Present	414	53.4
	Absent	362	46.6
Respiratory distress	Present	126	16.2
	Absent	650	83.8
Udder lesions	Present	81	10.4
	Absent	695	89.6
Thermal stress	No	430	55.4
	Mild-moderate	265	34.1
	Severe	81	10.4
	Optimal	125	16.1
	Acceptable	268	34.5
FAMACHA score (mucosa colour)	Borderline	284	36.6
	Danger	82	10.6
	Fatal	17	2.2
	Neutral	381	49.1
Human approach (HAR)	Avoids	196	25.3
	Friendly	199	25.6



Fig 1: Emaciated Body Condition



Fig 2: Matted Hair Coat Condition



Fig 3: Presence Overgrown Hooves

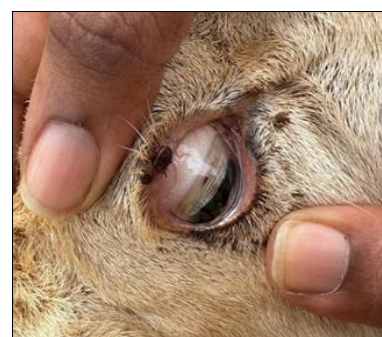


Fig 4: Presence of Ectoparasite Infestation in animal



Fig 5: Faecal Soiling in Animal

Lameness evaluation showed that 55.4% of animals exhibited normal locomotion, whereas 35.3% showed moderate lameness. Severe lameness and recumbence were observed in 7.5% and 1.8% of animals, respectively, indicating the presence of mobility-related welfare concerns.

Hair coat condition assessment indicated that 43.2% of animals had dirty coats, while 41.2% were clean and 15.6% showed matting. Hoof overgrowth was recorded in 43.2% of animals, suggesting inadequate hoof care practices. Additionally, 31.1% of animals exhibited visible injuries or lesions, and 34.3% showed faecal soiling, reflecting hygiene and health management issues.

Clinical observations revealed that ocular discharge was present in 18.3% and nasal discharge in 21.4% of animals. Ectoparasite infestation was notably high, affecting 53.4% of the animals. Respiratory distress was observed in 16.2% of animals, while udder lesions were recorded in 10.4% of lactating individuals.

Thermal stress assessment showed that 55.4% of animals were free from heat stress, whereas 34.1% experienced mild to moderate stress and 10.4% were severely affected.

FAMACHA scoring indicated that only 16.1% of animals were in the optimal category, while a substantial proportion fell under acceptable (34.5%) and borderline (36.6%) categories. Alarming, 12.8% of animals were classified under danger and fatal categories, indicating significant anaemia.

Evaluation of human–animal interaction revealed that 49.1% of animals showed neutral behaviour, while 25.6% exhibited friendly responses and 25.3% demonstrated avoidance behaviour, reflecting variability in handling practices and levels of animal habituation.

4. Discussion

A total of 776 sheep and goats were evaluated using animal-based welfare indicators, providing insight into the health and management conditions of small ruminant production systems. Nearly half of the animals (49.5%) exhibited an ideal body condition score (BCS), indicating satisfactory nutritional status in a portion of the population. However, the high proportion of thin (34.7%) and emaciated (5.5%) animals highlights underlying nutritional deficiencies and possible parasitic burdens, which are commonly reported in semi-intensive and extensive systems (M'Hamdi *et al.*, 2021; Nayak *et al.*, 2021) [15, 10]. The distribution of FAMACHA scores, with a considerable proportion of animals falling under borderline to fatal categories, further supports the presence of anaemia and internal parasitism.

Lameness was identified as a major welfare concern, affecting 44.6% of animals in varying degrees. This is closely associated with the high prevalence of hoof overgrowth (43.2%), indicating inadequate hoof care and prolonged exposure to unsuitable walking conditions. Similar findings have been linked to pain, reduced mobility, and productivity losses (Hamer & Busin, 2020; Deeming *et al.*, 2023) [11, 12].

Hygiene-related indicators revealed that a large proportion of animals had dirty (43.2%) or matted coats (15.6%), along with faecal soiling (34.3%), suggesting poor environmental sanitation and parasite challenges. Comparable observations have been reported in smallholder systems with limited housing management (Atoma *et al.*, 2024) [1].

Health-related indicators such as injuries (31.1%), ocular (18.3%) and nasal discharge (21.4%), and ectoparasite infestation (53.4%) indicate widespread health challenges. These conditions may arise from poor housing, inadequate

veterinary care, and environmental stressors. Respiratory distress (16.2%) further reflects compromised health status, possibly due to infections or climatic stress (Sejian *et al.*, 2021) [13].

Thermal stress was evident in a substantial proportion of animals, with 34.1% showing mild to moderate stress and 10.4% severe stress, which is expected under semi-arid climatic conditions. Heat stress adversely affects physiological functions, immunity, and productivity.

Behavioural assessment revealed that only 25.6% of animals exhibited friendly responses, while 25.3% avoided human contact, indicating variability in human–animal interactions. Poor handling practices can increase fear and stress, negatively affecting welfare and productivity (Celozzi *et al.*, 2022) [14].

5. Conclusion

The study revealed that while some sheep and goats maintained acceptable welfare status, a considerable proportion showed signs of compromised health, nutrition, and management. Indicators such as low body condition, lameness, poor hygiene, ectoparasite infestation, and thermal stress highlight key welfare challenges under field conditions. The findings emphasize that animal-based indicators are effective tools for identifying on-farm welfare issues. Improving feeding practices, health care, parasite control, housing, and human–animal interactions is essential to enhance welfare, productivity, and sustainability in small ruminant farming systems.

Conflict of Interest: not available

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References

1. Atoma T, Szonyi B, Haile AF, Fries R, Baumann MP, Randolph DG, *et al.* Assessment of health problems of sheep and goats based on ante-mortem and post-mortem inspection at Addis Ababa abattoir, Ethiopia. *Frontiers in Veterinary Science*. 2024;11:1406801.
2. Srinatha TN, Prashant P, Manish KL, Kiran SP, Naik PB, Hanji SS, *et al.* Market dynamics and profitability in small ruminant marketing in Southern Karnataka. *Scientific Research and Reports*. 2024;30(9):181-190.
3. Dhara KC, Banerjee D, Das PD, Datta A, Ghosh S. Sheep farming technology in Indian practice. In: *Sheep farming—sustainability from traditional to precision production*. 2024.
4. Koluman N. Goats and their role in climate change. *Small Ruminant Research*. 2023;228:107094.
5. Broom DM. Animal welfare concepts. In: *Routledge handbook of animal welfare*. Routledge; 2022:12-21.
6. Whay HR, Waterman AE, Webster AJF. Associations between locomotion, claw lesions and nociceptive threshold in dairy heifers. *Veterinary Journal*. 1997;154(2):155-161.
7. Hernández RO, Sánchez JA, Romero MH. Iceberg indicators for animal welfare in rural sheep farms using the five domains model approach. *Animals*. 2020;10(12):2273.
8. Nisan SN, Newas S. Welfare assessment of Black Bengal goat in small scale farming system. *Chattogram Veterinary & Animal Sciences University*; 2022.
9. Doyle RE, Campbell AJD, Dione MM, Woodruff ME, Munoz CA, Alemayehu G, *et al.* The role of animal

- welfare in improving the future of farming. *Animal Production Science*. 2022;62(11):937-943.
10. Nayak S, Rath PK, Panda SK, Mishra BP, Mishra R, Biswal SS. Etiopathological and hematobiochemical profiles in goats with gastrointestinal disorders. *Veterinary World*. 2021;14(7):1760-1760.
 11. Hamer K, Busin V. Harnessing technology to control lameness in sheep. *Veterinary Record*. 2020;186(12):382-383.
 12. Deeming LE, Beausoleil NJ, Stafford KJ, Webster JR, Cox N, Zobel G. Evaluating the long-term conformation and hoof growth effects of starting hoof trimming at 5 months of age in dairy goats. *Journal of Dairy Science*. 2023;106(2):1065-1077.
 13. Sejian V, Silpa MV, Reshma Nair MR, Devaraj C, Krishnan G, Bagath M, *et al.* Heat stress and goat welfare: Adaptation and production considerations. *Animals*. 2021;11(4):1021.
 14. Celozzi S, Battini M, Prato-Previde E, Mattiello S. Humans and goats: Improving knowledge for a better relationship. *Animals*. 2022;12(6):774.
 15. M'Hamdi N, Darej C, Attia K, Guesmi H, Znaïdi IEA, Bouraoui R, *et al.* Assessment of meat-type sheep welfare using animal-based measures. *Animals*. 2021;11(7):2120.

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