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# Migration of Deccani Sheep Herds over Traditional Routes and Current Scenario of Maan Tahasil, Dist. Satara, M.S., India.

***Doulat Agatarao Vaghamode*[1] *and Nivedita Amarendra Ghayal*[2]**

[1]*Annasaheb Kulkarni Department of Biodiversity, MES Abasaheb Garware College, Pune – 411 004, Maharashtra, India*

[2]*Department of Botany, MES Abasaheb Garware College, Karve Road, Pune – 411 004, Maharashtra, India.*

**Abstract:** Drought is a complex, multidimensional stress or with significant biophysical and socio-economic impacts, particularly in arid and semi-arid regions where livelihoods depend on climate-sensitive resources. This study examines the implications of drought, grazing resource decline and adaptive livestock management strategies among pastoral and agro-pastoral communities, with a focus on small ruminant production systems. A mixed-methods approach integrating qualitative and quantitative techniques was employed, including Focus Group Discussions, key informant consultations and structured interviews supported by a pre-tested questionnaire administered through Google Forms. The sample size adhered to established methodological recommendations for field-based research.Results indicate that free grazing systems dominate, with 43.6% of respondents practicing non-migratory grazing, while 11.2% follow migratory systems. Sheep and goat rearing constitutes the primary livestock composition (39.4%). Feeding practices rely heavily on locally available fodder resources, crop residues and natural pastures. Access to grazing land is largely dependent on Common Property Resources (CPRs), rented land, or mixed arrangements, reflecting limited private land ownership. Seasonal migration, particularly from Satara district to neighboring regions, emerges as a key adaptive strategy to address fodder and water scarcity.Economic analysis reveals that the majority of respondents (65.3%) earn approximately ₹10,000 per sheep annually. However, increasing grazing pressure, land-use change and degradation of CPRs have reduced carrying capacity and forage availability, undermining system sustainability. The findings highlight that drought-induced resource constraints disproportionately affect resource-poor households, necessitating migration for livelihood security. Strengthening grazing land management, enhancing fodder availability and promoting equitable resource access are critical for sustaining small ruminant production and improving resilience in drought-prone agro-ecosystems.

**Keywords:** Migration, pastoralists, traditional knowledge, food, water.

## INTRODUCTION

Drought is a complex and multi-dimensional environmental stress that generates both biophysical and socio-economic consequences, including crop failure, depletion of surface and groundwater resources and reduced availability of fodder for livestock. These impacts are particularly severe in arid and semi-arid ecosystems, where livelihoods are strongly dependent on climate-sensitive natural resources. Under such conditions, pastoral and agro-pastoral communities such as the Rebari pastoralists of Rajasthan frequently resort to migration as an adaptive response to acute shortages of water and feed resources (Gaur et al., 2016). In recent decades, grazing resources have undergone continuous decline due to agricultural intensification, land-use change and expansion of livestock populations, especially small ruminants. Many grazing lands are further constrained by inadequate management and biological degradation, resulting in reduced forage productivity. These pressures collectively weaken the sustainability of pastoral production systems and compel households to adopt seasonal or long-distance migration to protect livestock assets, stabilize income and maintain livelihood security in arid regions of India. Key factors driving such mobility include rising human population pressure, increasing herd sizes and shrinking access to common grazing lands. Viable pastoral systems are also influenced by access to markets and herd reproductive efficiency, often supported through cyclical migration patterns.

Climatic variability further intensifies these challenges. Rainfall in arid zones is highly seasonal, with the majority occurring during the southwest monsoon months (June–September) and only sporadic precipitation during winter months. Inter-annual rainfall variability is substantial, as reflected in low recorded totals in certain years, alongside marked thermal extremes, with summer temperatures reaching about 45 °C and winter minima falling near 5 °C. Such variability directly affects pasture growth, forage availability and livestock performance. Grazing remains one of the most cost-effective livestock feeding strategies; however, evidence indicates a persistent reduction in the extent and productivity of grazing lands. Reports from herders and national assessments show that the area under permanent pastures and grazing lands has declined considerably over time, accompanied by the disappearance of improved





***Corresponding Author:** Doulat Agatarao Vaghamode

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grass and legume species and a consequent reduction in quality fodder supply (Jodha, 2008; Dixit et al., 2015). Simultaneously, grazing pressure expressed as livestock numbers per unit grazing area has increased substantially, while the ecological carrying capacity of these lands has remained low. Some states have recorded particularly high grazing intensities relative to available pasture area.

Improvement of community grazing lands through scientific interventions such as mixed-species pasture development using grasses and legumes (e.g., *Stylosanthes hamata* (L.) Taub. and *Cenchrus setigerus Vahl*) offers significant scope for enhancing forage productivity. However, limited resource endowments, restricted access to improved technologies and weak institutional support continue to constrain pastoral households, contributing to recurring migration in search of fodder and water. These dynamics highlight the need for integrated drought, pasture and livestock management strategies to strengthen the resilience of pastoral production systems. Range grazing is widely recognized as one of the most economical and resource-efficient feeding systems for livestock, particularly small ruminants and forms a critical foundation of pastoral and smallholder production systems. It contributes substantially to household livelihood security by supporting livestock-based income, asset formation and risk buffering among pastoralists and farming communities. A large proportion of rural households maintain livestock, highlighting the central role of animal husbandry in strengthening resilience and sustaining smallholder farming systems (Tyagi and Singh, 1988). However, rapid population growth and competing land uses have led to a steady decline in open-access grazing areas, increasing dependence on alternative feed resources such as crop residues and agro-industrial by-products, including straw, bran and oil seed cakes. In response to this greater attention has recently been directed towards integrating fodder trees and soil-conserving forage crops as supplementary sources of protein-rich animal feed (Roy, 2009). Livestock ownership in rural India is predominantly concentrated among small, marginal and landless households, for whom animal husbandry serves as a key livelihood component.

Among small ruminants, sheep represents an economically significant species within the Indian agrarian economy, especially in arid, semi-arid and hilly regions. Sheep production supports the livelihoods of smallholders, marginal farmers and landless laborers through the generation of meat and wool as primary commercial outputs. Sheep-derived products such as wool and skins also provide raw materials for rural-based industries, while sheep manure contributes to soil fertility enhancement as an organic nutrient source (Khalangare et al., 2023). Growing grazing pressure on permanent pastures and common grazing lands has raised serious concerns regarding ecological sustainability and feed security for small livestock holders. Resource adequacy is commonly evaluated in terms of carrying capacity, expressed as the number of adult cattle units that available pasture resources can sustainably support (Dixit et al., 2015). The contraction of common grazing resources has severe in several states where small and marginal landholdings predominate and dependence on shared fodder resources is high. The livestock sector provides relatively stable and continuous income, especially in arid and semi-arid regions where crop production is highly vulnerable to climatic variability and recurrent failure. In addition to its economic importance, livestock production generates multiple positive environmental externalities (Dikshit and Birthal, 2013). Indian agriculture is largely dominated by small and marginal farmers, who constitute the majority of farm households but operate a disproportionately smaller share of total agricultural land, yet play a crucial role in agricultural growth and poverty reduction. A defining characteristic of the Indian livestock production system is its strong reliance on low-cost and locally available feed resources, including crop residues, agricultural by-products, grasses, weeds and tree leaves collected from cultivated and uncultivated areas, as well as grazing on common lands and post-harvest fields (Dixit et al., 2015). The role of grazing is particularly pronounced in arid regions, where a substantial proportion of farmers depend on grazing-based feeding strategies (Kumar and Singh, 2008). However, multiple studies have reported a continued decline in both the extent and quality of common property grazing resources, especially in rainfed ecosystems (Jodha, 1992).

**Free-Range Grazing versus Managed Feeding**

Government policies and institutional support mechanisms play a decisive role in influencing farmers' adoption of free-range grazing (FRG) or managed feeding (MF) systems. Free-range grazing is widely practiced by pastoralists and





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traditional livestock keepers because it enables low-input utilization of natural vegetation and common property resources, thereby optimizing the use of limited financial capital and locally available feed. In contrast, managed feeding systems based on stall feeding or regulated grazing are more commonly adopted by farmers with restricted access to grazing lands, where dependence on open or communal pastures is not feasible and controlled feeding becomes necessary.Pastoral production in India is strongly associated with community-based livestock traditions. Most indigenous livestock breeds are historically linked with specific tribal and caste-based groups. These breeds have evolved through the sustained efforts of specialized pastoral and breeder communities practicing nomadic and roving herd management, involving long-distance seasonal grazing across diverse agro-ecological landscapes. Such systems have contributed to breed adaptability, functional traits and resilience under low-input production conditions.

**Study Area**

The present study was conducted in the Maan block of Satara district, located in the western region of Maharashtra, India. Geographically, the area lies at approximately 17.70° N latitude and 74.54° E longitude. Maan is characterized by semi-arid climatic conditions and forms part of the rain-shadow region of the Western Ghats. Agriculture and livestock rearing are the predominant livelihood activities in the region and land use is largely shaped by these traditional rural practices. The area receives an average annual rainfall of about 500 mm, most of which occurs during the southwest monsoon season. The mean temperature ranges from 28°C during cooler months to a peak of around 40°C in the summer, reflecting the region's warm and dry climate.The combination of low rainfall, high temperature variability and dependence on open grazing systems influences livestock health and productivity, making Maan an important area for studying traditional migration practices.

**Study Period and Location**

The study was conducted between 2023 and 2025 in the Maan block of Satara district to migratory region of Solapur, Osmanabad, Latur district, Maharashtra, India. The region lies in the semi-arid, rain-shadow zone of the Western Ghats and is predominantly dependent on agriculture and livestock rearing.

## MATERIAL & METHODS

**Study Design and Data Collection**

The study employed a mixed-methods approach integrating qualitative and quantitative techniques to obtain comprehensive information on livestock management practices and feeding systems. Primary data were collected through **Focused Group Discussions (FGDs)** with community members, consultations with traditional knowledge holders and structured personal interviews with shepherds. To enhance accessibility and response accuracy, a structured questionnaire was also developed using Google Forms in the local language. Prior to full-scale implementation, the questionnaire was pre-tested through a pilot survey to ensure clarity, reliability and contextual relevance. Respondents involved in the pilot study were included in the final survey after confirming consistency in responses.

**Sample Size Consideration**

The adequacy of the sample size was determined based on methodological recommendations. According to Hayuni et al. (2023), sample sizes both above and below 500 respondents are considered statistically sufficient for social science and field-based research, depending on study design and population characteristics. The final sample size of 383 respondents met these recommended criteria.

**Classification of Livestock Management Systems -**

Respondents were categorized according to prevailing livestock rearing systems. The distribution of management systems was as follows

**Table 1** - Livestock Management Methods

| Livestock Management Methods | Count | Percent |
|---|---|---|
| Free Grazing / Migratory | 38 | 9.9% |
| Free Grazing / Non migratory | 167 | 43.6% |
| Free Grazing / Non migratory, Stall Feeding | 93 | 24.3% |
| Migratory | 43 | 11.2% |
| Stall Feeding | 42 | 11.0% |

**Livestock Composition**

Livestock species composition among respondents was recorded and expressed in percentage terms:





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**Table 2 -** Type of Livestock

| Type of Livestock | Count | Percent |
|---|---|---|
| Cow, Buffalo, Sheep & Goat | 23 | 6.0% |
| Cow, Sheep & Goat | 55 | 14.4% |
| Goat | 11 | 2.9% |
| Sheep | 63 | 16.4% |
| Sheep & Buffalo | 6 | 1.6% |
| Sheep & Cow | 4 | 1.0% |
| Sheep & Goat | 151 | 39.4% |
| Sheep, Goat & Buffalo | 56 | 14.6% |
| Sheep, Goat & Pony | 7 | 1.8% |
| Sheep, Goat, Buffalo & Pony | 7 | 1.8% |

**Fodder Resources and Feeding Practices -**

Information on fodder availability and feeding practices was documented based on farmer responses. The major fodder combinations reported were:

**Table 3 -** Type of Fodder

| Green Fodder | Count | Percent |
|---|---|---|
| All the Above | 75 | 19.6% |
| Carrot, Sweat Potato, Groundnut | 58 | 15.1% |
| Jowar Green Fodder | 6 | 1.6% |
| Jowar Green Fodder, Carrot, Sweat Potato, Groundnut, Shevari, Subabhul, Maize Green Fodder, Nepier Grass | 126 | 32.9% |
| Jowar Green Fodder, Tur, Chickpea Biomass | 38 | 9.9% |
| Jowar Grteen Fodder, Maize Green Fodder, Bajara Green Fodder | 62 | 16.2% |
| Maize Green Fodder | 2 | 0.5% |
| Shevari, Subhabhul | 16 | 4.2% |

## RESULT & DISCUSSION

Sheep rearing was identified as one of the oldest and most significant extensive livestock production systems in the study region. The animals were primarily maintained on crop stubbles, natural pastures and agricultural by-products. Their close grazing habit enables efficient utilization of sparse, low-growing vegetation, allowing survival under resource-poor conditions. This adaptive grazing behavior facilitates exploitation of marginal and uncultivated lands, thereby supporting livelihoods in ecologically fragile areas.

**Grazing Land Ownership and Access Patterns**

Considerable variation was observed in pasture ownership and access arrangements, reflecting the adaptive strategies adopted by shepherds to ensure feed availability. The distribution of grazing land access was as follows:

**Table 4 -** Ownership of Grazing Land

| Ownership of Grazing land | Count | Percent |
|---|---|---|
| Common Property Resources | 50 | 13.1% |
| Migratory herds (with Compensation from land owner) | 38 | 9.9% |
| On Rent | 39 | 10.2% |
| On Rent, Common Property Resources | 69 | 18.0% |
| Owned Pasture land | 71 | 18.5% |
| Owned Pasture Land & Common Property Resources | 40 | 10.4% |
| Owned Pasture Land & on Rent | 34 | 8.9% |
| Owned Pasture Land & with Compensation from Land Owner | 6 | 1.6% |
| Owned Pasture Land, Common Property Resources, With Compensation from land owner | 16 | 4.2% |
| Owned Pasture Land, On Rent & Common Property Resources | 13 | 3.4% |
| Owned Pasture Land, On Rent, with Compensation from Land Owner | 7 | 1.8% |





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The dependence on CPRs and rented lands indicates limited private grazing resources among sheep rearers. The practice of compensating landowners during migration reflects negotiated access to crop residues and fallow lands, highlighting the socio-economic interdependence between pastoralists and cultivators.

**Seasonal Migration Patterns -**

Due to constraints in grazing land, fodder and water availability, shepherds practiced semi-extensive migration. Flocks originating from Maan tehsil of Satara district seasonally migrated to Solapur, Latur and Osmanabad districts of Maharashtra. Migration was reported as an economically viable strategy, reducing expenditure on purchased fodder and enhancing resource utilization efficiency. Such mobility supports sustainability in rainfed and drought-prone agro-ecosystems.

**Economic Returns from Sheep Rearing**

Annual income per sheep varied among respondents:

**Table 5** - Annual Production per sheep

| Annual production per sheep | Count | Percent |
|---|---|---|
| 10000 | 250 | 65.3% |
| 10000 to 15000 | 131 | 34.2% |
| 15000 to 20000 | 1 | 0.3% |
| More than 15000 to 20000 | 1 | 0.3% |

The majority of rearers earned up to ₹10,000 per sheep annually, indicating moderate but consistent economic returns under extensive systems. Higher income categories were marginal, suggesting scope for productivity enhancement through improved breeding, feeding and health management practices.

Sheep generally produced one to two lambs per lambing, with shorter lambing intervals observed in migratory flocks. Migratory sheep were reported to produce three lambs in two years compared to two lambs in two years among non-migratory flocks, indicating better reproductive efficiency under migratory management.

**Reproductive Performance**

The distribution of lambing intervals in migratory flocks was:

**Table 6**: Sheep Lambing Interval

| Sheep breeding season (yearly) (Lambing interval) | Count | Percent |
|---|---|---|
| 1 Year | 162 | 42.3% |
| 5 Months | 20 | 5.2% |
| 8 Months | 167 | 43.6% |
| 8 Moths, 1 Year | 34 | 8.9% |

Shorter lambing intervals in migratory systems may be attributed to improved nutritional intake through diversified grazing resources across regions. This suggests that mobility enhances reproductive performance by reducing feed scarcity during critical physiological stages.

**Implications for Rural Livelihoods and Food Security**

The findings underscore the vital role of sheep farming in sustaining rural livelihoods and contributing to household income security. The study highlights key aspects of sheep production systems, including socio-economic characteristics of farmers, livestock composition, management practices, feeding strategies and reproductive performance.

Overall, sheep farming in the study area represents a resilient production system adapted to semi-arid environments. However, dependence on common property resources and seasonal migration reflects vulnerability to land-use changes and resource degradation. Strengthening pasture management, improving fodder availability and enhancing veterinary and extension services could further improve productivity and sustainability of the sector.

## CONCLUSION

In summary, small ruminant production particularly sheep rearing remains a critical livelihood component for resource-poor farmers who depend heavily on communal pastures and shared grazing resources. The availability, quality and management status of grazing lands are key





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determinants of flock productivity and the output of livestock-derived products. However, sustained overgrazing and un-managed grazing pressure contribute significantly to the degradation of common property resources and adversely affect rainfed agro-ecosystems. Declining primary productivity serves as a reliable indicator of ecosystem deterioration, especially in drylands regions, where reductions in forage biomass, grass cover and vegetative density directly translate into lower biological and economic returns.

Drought-driven migration further accentuates these challenges and disproportionately impacts economically vulnerable households within catchment areas, as their subsistence and livestock systems are closely tied to local natural resources. In contrast, relatively better-resourced groups are more capable of sourcing fodder and feed from external markets and alternative supply chains, reflecting unequal levels of resource dependence and adaptive capacity. These disparities highlight the need for targeted interventions in grazing land management, drought resilience and equitable access to fodder resources to ensure sustainable small ruminant production and livelihood security.

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