



Short Note

Assessment of Vegetation Changes in Community-Managed Grazing Areas of the Indian Thar Desert and Strategies for Restoring Their Productivity

Aman Singh¹ and J.P. Singh^{2*}

¹Krishi Avam Paristhitiki Vikas Sansthan (KRAPAVIS), Alwar 301 001, India

²Former Principal Scientist, ICAR-Central Arid Zone Research Institute, Jodhpur 342 003, India

Received: August 31, 2024 Accepted: March 24, 2025

OPEN ACCESS

Editor-in-Chief

Praveen Kumar

Editors (India)

Anita Pandey

Hema Yadav

Neena Singla

Ritu Mawar

Sanjana Reddy

Surendra Poonia

R.K. Solanki

P.S. Khapte

Editors (International)

M. Faci, Algeria

M. Janmohammadi, Iran

*Correspondence

J.P. Singh

Citation

Singh, A. and Singh, J.P. 2025. Assessment of vegetation changes in community-managed grazing areas of the Indian thar desert and strategies for restoring their productivity. *Annals of Arid Zone* 64(3): 477-482
<https://doi.org/10.56093/aaz.v64i3.155822>
<https://epubs.icar.org.in/index.php/AAZ/article/view/155822>

<https://epubs.icar.org.in/index.php/AAZ>

The Great Indian Desert, holds the distinction of being the most populous desert in the world, with its inhabitants historically relying on its resources for sustenance and livelihood (Singh and Singh, 2024a). The region is characterized by extreme temperatures, low and erratic rainfall, high evapotranspiration, intense solar radiation, and strong winds. As a consequence of these harsh conditions, the Thar Desert hosts sparse and scattered vegetation, dominated by thorny trees, shrubs, and grasses, and classified as Tropical Thorn Forest by Champion and Seth (1968). Livestock in this region mainly rely on natural grasslands found in common grazing and water catchment areas. Among these resources, common grazing areas are particularly vital for supporting the livestock population in the region and are conserved by the community. These Community Conserved Silvi-Pastoral Areas (CCSAs), often named in honor of local deities or saints across the Indian Thar Desert, are locally called *Orans* (Singh, 2016). Livestock farming plays a major role in the livelihoods of local communities and forms a significant component of the regional economy and thus *Orans* play very important role (Bhati and Joshi, 2007; Yadav *et al.*, 2019; Yadav *et al.*, 2020).

Various *Orans*, are spread across Barmer, Bikaner, Jaisalmer, Jodhpur, Jalore, Nagaur, Phalodi, and other districts (Singh and Singh, 2024b) in western Rajasthan. Additionally, *Orans* in the western Rajasthan region tend to be larger compared to those in other part of the state. For example, the Bhadaria Rai Mata *Oran* in Jaisalmer district spans over 18000 ha (Singh and Singh, 2024b). Apart from being feed source of animals *Orans* also serve as repositories of rich biodiversity, housing native climax or sub-climax species such as *Prosopis cineraria* (L.) Druce], *Acacia senegal* (L.) Willd., *Salvadora oleoides* Decne, *Ziziphus mauritiana* Lam., *Kair Capparis decidua* (Forsk.) Edgew., *Cenchrus ciliaris* L., *Lasiurus indicus* Henr. etc., forming a natural silvi-pasture system.

However, these *Orans* now face a range of threats, including high levels of grazing and browsing pressure; encroachment on *Oran* lands for agricultural, settlement and other purposes; a decline in socio-cultural norms; and proliferation of invasive

Table 1. Past and present occurrence of key plant species in Orans of Jaisalmer district (Number of Orans studied 100)

Name of species	Local name	Previously reported	Now considered extinct/no longer present
Perennial Grasses			
<i>Cenchrus ciliaris</i> L.	Dhaman	73	40
<i>Dichanthium annulatum</i> (Forsk.) Stapf.	Karad	7	01
<i>Lasiurus sindicus</i> Henr.	Sewan	90	57
<i>Panicum turgidum</i> Forsk.	Murath	26	01
Tree and Shrub species			
<i>Acacia senegal</i> (L.) Willd.	Kumat	54	03
<i>Prosopis cineraria</i> (L.) Druce	Khejri	91	01
<i>Salvadora oleoides</i> Decne.	Khara-jaal	79	01
<i>Tecomella undulata</i> (Sm.) Seem	Rohida	24	07
<i>Ziziphus mauritiana</i> Lam.	Ber, Bor	98	-
<i>Capparis decidua</i> (Forsk.) Edgew.	Kair	98	-
<i>Calligonum polygonoides</i> L.	Phog	12	03
<i>Commiphora wightii</i> (Arn.) Bhandari	Guggal	28	17
<i>Grewia tenax</i> (Forsk.) Fiori	Gangeran	24	7
<i>Haloxylon salicornicum</i> (Moq.) Bunge ex Boiss.	Lana	11	1
<i>Lycium barbarum</i> L.	Morali	51	-

species like *Prosopis juliflora* (Swartz) DC., among others (Singh and Singh, 2024a). Given this, mapping is essential to define the boundaries of the *Orans* (Singh and Singh, 2023). From the perspective of the *Orans'* origins, shrubs and trees are essential components of the vegetation. Shankarnarayanan (1984); Chriyaa (2009); and Singh and Rathore (2022) observed that in arid regions, animals feed more on shrubs and trees than on grasses and pasture legumes. The specific advantage of tree and shrubs over annuals, such as grasses and legumes, includes their deep root systems and ability to withstand drought, often serving as the main source of forage during dry season. Therefore, *Orans* have a prominent place in thriving the livestock-based economy in the arid region. Restoring these pristine woodland resources, to their full productive potential can bridge the gap between the supply and demand of feed and forage to livestock while offering added benefits to the hot arid environment (Singh *et al.*, 2012).

To achieve this, several steps were undertaken by an organization known as Krishi Avam Paristhitiki Vikas Sansthan (KRAPAVIS) (i) reviving traditional water storage structures within the *Orans* to provide water resources for village livestock and wild animals; (ii) enhancing vegetation cover by removing

undesirable species such as *Prosopis juliflora*, planting suitable native species based on habitat suitability, and reseedling with desirable perennial grasses; (iii) creating community awareness, with a particular focus on engaging the younger generation in active participation in *Oran* activities; and (iv) advocating for improved management and conservation of *Orans* in light of the challenges posed by global climate change. This paper aims to assess the contribution of these efforts for revitalization of *Orans* in the Indian Thar Desert, thereby promoting the sustainability of livestock production systems in the region.

A study was conducted on 100 *Orans* in the Indian Thar Desert, focusing specifically on the Jaisalmer district of Rajasthan. Data was collected using a comprehensive 129-question survey designed to capture detailed information on various aspects of *Orans*, including location, water structures, cultural practices, biodiversity (covering livestock, wildlife, and vegetation), ownership and management, threats, and ecosystem services (Singh and Singh, 2024b). Information was gathered through interviews with residents, pastoralists, and herders associated with the *Orans*, supplemented by secondary sources. Plant species were identified by consulting regional Floras such as Bhandari (1990) and Shetty and Singh (1987, 1991, 1993).

The study indicated that vegetation in most *Orans* of the Jaisalmer district is generally in a depleted condition, with a significant decline in the perennial grass component. Singh *et al.* (2017) also reported that high ecological status grasses such as *Lasiurus indicus* Henr., *Cenchrus ciliaris* L., and *Dichanthium annulatum* (Forsk.) Stapf. have been largely replaced by lower ecological status grasses like *Ochthochloa compressa* (Forsk.) Hilu and *Dactyloctenium indicum* Boiss. in many of these *Orans*. *L. indicus* is the most affected species, followed by *C. ciliaris*, with their disappearance observed in most *Orans* where they were once commonly found. In the study of 100 *Orans* in the Jaisalmer district, the disappearance of *L. indicus* was reported in approximately 57 *Orans*, while *C. ciliaris*, was reported missing in about 40 *Orans* (Table 1) suggesting an urgent need to reseed these species in the *Orans* and to conserve its diversity in the areas where they still exist.

Rani *et al.* (2022) pointed out that grasslands dominated by *L. indicus* have a higher carrying capacity compared to those with other species, indicating its adaptability to the native environment with minimal management inputs. Therefore, maintaining the population of *L. indicus* in Jaisalmer district, which is its native habitat, is of vital importance. In most *Orans*, *Ochthochloa compressa* is one of the prevalent low perennial grasses that provide forage for livestock. Among the annual grasses, *Cenchrus biflorus* Roxb. locally known as Bhurat, and species of *Aristida* locally called Lampa, also offer forage to grazing animals. Kumar *et al.* (2017) highlighted that in arid rangelands, low perennials like *O. compressa* and annual *C. biflorus* during the monsoon and post-monsoon seasons help reduce the consumption of perennials, thereby prolonging the duration of range use. In some *Orans*, heavily grazed tussocks of *D. annulatum* can be observed. This species is highly preferred in grazing lands but requires high moisture conditions. In sand dunes and also in sandy plains, Murath (*Panicum turgidum* Forsk.) is a key grass species. Although it is grazed by animals with low preference, it becomes an important resource during the periods of forage scarcity within the *Orans*.

Among the herbaceous species, *Indigofera cordifolia* Heyne ex Roth, is a common annual legume found in most *Orans* and is grazed by

livestock. In arid region, among range legumes, species of *Indigofera* are a rich source of nutrients and thrive in a wide range of habitats under low rainfall conditions. Additionally, *I. cordifolia*, produces a large number of seeds upon maturity and spreads naturally (Natrajan *et al.*, 2002). Other important species grazed by livestock in the *Orans* include *Boerhavia diffusa* L., *Citrullus colocynthis* (L.) Schrad., *Corchorus depressus* (L.) Stocks, *Euphorbia granulata* Forsk., *Trianthema portulacastrum* L., *Tribulus pentrandus* Forsk., and *T. terrestris* L. Notably, *B. diffusa* is also consumed by wildlife, as reported by herders. Some of these herbaceous species have the potential to grow even under sub-normal rainfall conditions. Singh *et al.* (2006) emphasized that the nutritional attributes of annual weeds suggest these species can significantly improve the quality of range biomass, leading to better health, growth and productivity of livestock, particularly during lean periods. Therefore, some of these weeds play an important role for grazing animals and wildlife in the *Orans*.

Woody perennials - trees, shrubs, and woody climbers- within the *Orans* serve as crucial sources of browse for both livestock and wildlife. Among the trees, *Ziziphus mauritiana* and *Capparis decidua* are the most prevalent species in most *Orans* followed by *Prosopis cineraria*, *Salvadora oleoides*, *Acacia senegal*, *Acacia nilotica* (L.) Willd. ex Del. ssp. *indica* (Benth.) Brenan, and *Tecomella undulata* (Sm.) Seem. Among these species *T. undulata* is the most affected, having disappeared from seven out of 24 *Orans* (Table 1). Additionally, *A. senegal* has also disappeared from three out of 54 *Orans*. These species are important for providing nutritious feed to livestock in the *Orans*. *Z. mauritiana*, in particular, plays a vital role as browse material, especially in the *Oran* of Jaisalmer district, where it is frequently browsed by goats and camels. *A. senegal* is also an important browse species, especially in *Magra* (rocky) areas, where heavily browsed plants can be observed in the *Orans*. *S. oleoides* is an important fodder tree species, particularly in the Jaisalmer district. In addition to its browse value, its fruits are consumed by animals and are believed to enhance milk production.

Shrubs such as *Commiphora wightii* (Arn.) Bhandari, *Crotalaria burhia* Buch.-Ham. ex Benth., *Grewia tenax* (Forsk.) Fiori, *Haloxylon*

salicornicum (Moq.) Bunge ex Boiss., *Lycium barbarum* L., and *Seddera latifolia* Hochst. and Steud. hold a prominent place in the *Orans* as key sources of browse for livestock in the Jaisalmer district. Some of these species like *G. tenax*, *C. wightii* and *L. barbarum*, are heavily browsed by goats and camels, leading to a decline in their population within the *Orans*. *C. wightii* is the most affected species, having disappeared from 17 out of 28 *Orans* (Table 1). *G. tenax* has also been much impacted, with disappearance recorded in seven out of 24 *Orans*. Furthermore, *C. polygonoides* has disappeared from three out of 12 *Orans* (Table 1). Additionally, *Calotropis procera* (Ait.) Ait, which is prevalent in most *Orans*, plays a crucial role during times of scarcity and drought.

Currently, there are three specific legislations - namely the Biological Diversity Act, 2002 (BDA), the Panchayats (Extension to the Scheduled Areas) Act, 1996 (PESA), and the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA, 2006) - which can be effectively used for the conservation and management of *Orans* and other such ecosystems. These laws feature overlapping and complimentary provisions, which strengthen efforts related to documentation, recognition and conservation management. Under the BDA, the State Biodiversity Boards and Biodiversity Management Committees at the Gram Panchayat level are responsible for ensuring that the People's Biodiversity Register (PBR) includes documentation of Sacred Natural Sites of the villages including *Orans*, groves, waterbodies, hills, peaks, woodlands, etc. are mentioned. As per section 4D of PESA, every Gram Sabha shall be competent to safeguard and preserve the traditions and customs of the people, their cultural identity, community resources, and the customary mode of dispute resolution. Similarly, under Section 3-1 (i) of the FRA, 2006, the rights to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use are vested with the Gram Sabha. *Orans* can also be recognized as Other Effective Area-based Conservation Measures (OECMs) or Community Conserved Areas (CCAs), in accordance with international frameworks such as the International Union

for Conservation of Nature (IUCN) and the Convention on Biological Diversity (CBD).

Importantly, the recent judgment by the Hon'ble Supreme Court, in clause 58 (iii), emphasizes the need for developing a national-level policy for sacred groves in India, to be formulated by the Ministry of Environment, Forest and Climate Change (MoEFCC). This ruling provides a crucial impetus for advancing the conservation of sacred groves across the country. Shri. Aman Singh, Founder of "Krishi Avam Paristhitiki Vikas Sansthan" (KRAPAVIS), filed petition I.A. No. 41723 of 2022, advocating for the conservation of *Orans* in Rajasthan. On December 18, 2024, the Supreme Court delivered a landmark judgment concerning this writ petition, addressing both the rights of local communities and the conservation of *Orans*, Dev-vans, and Rundhs (CCAs) in Rajasthan. The Court directed the Government to carry out a "detailed on-ground and satellite mapping" of all *Orans*, Dev-vans, and Rundhs.

The Supreme Court has also directed the urgent recognition of *Orans* in Rajasthan, which hold immense ecological value and are deeply revered in local cultures. These *Orans* will now be protected under Section 36-C of the Wildlife Protection Act, 1972, which allows for the declaration of "community reserves". In addition, the Court has suggested that *Oran* communities be recognized under the Forest Rights Act (FRA), a crucial step toward empowering these communities as legitimate stakeholders in conservation efforts. The Supreme Court has placed particular emphasis on the importance of local communities in conservation. It has recommended that the Rajasthan Government formally recognize these traditional communities as custodians of *Oran* conservation and grant them the authority to regulate access, prevent harmful activities, and promote sustainable conservation practices for future generations. Furthermore, the Ministry of Environment, Forest and Climate Change (MoEFCC) is also tasked with creating policies and programs that protect the rights of these communities and involve them directly in forest conservation. The Court has also directed MoEFCC to formulate a national policy for the governance and management of sacred groves across the country. This includes conducting a nationwide survey to identify, mark, and map

the boundaries of sacred groves wherever they are found in India.

The involvement of local communities as custodians of *Orans* and ecosystems has long been a core principle of community-driven conservation. Communities have strong cultural links with *Orans* and recognize the value of these areas and the lands surrounding them. They demand for the restoration of these habitats to increase fodder production and revive traditional water bodies. Livestock rearing is a primary occupation, and maintaining a sustainable livestock population requires adequate fodder and water – needs that can only be met through the restoration of grasslands and pasturelands with native, palatable grass species, along with the revival of traditional water harvesting and storage systems. In the desert region, relying on fodder production through irrigation is unsustainable. To address these challenges, various organizations have initiated restoration activities in and around *Orans*, including the establishment of *Oran Samitis* (*Oran* Committees) at the village level to promote community participation. The restoration efforts focus on traditional water harvesting structures within the *Orans*, including *Talabs* (ponds), *Nadi* (small ponds), *Tankas* and *Kunds* (water storing tanks), which are vital for livestock, wildlife, and local communities. As part of these efforts, indigenous species, such as Khejri (*Prosopis cineraria*), a vital tree in the Thar Desert, have been planted, along with native perennial grasses like Sewan (*Lasiurus indicus*) and Dhaman (*Cenchrus ciliaris*) within the *Orans*. There has also been a concerted effort to remove the invasive species, such as Vilayati-babul (*Prosopis juliflora*) from the *Agor* (catchment area) of water bodies within the *Orans*, with active participation from the *Oran Samitis* to foster community engagement. To further raise awareness, community meetings are held, and an 8-page bulletin “*Oran-Devani Re Baat*” is published. This bulletin features case studies on *Orans* and the latest news, helping to strengthen community knowledge and involvement.

Conclusions

Orans play a crucial role in supporting both livestock and wildlife in the Thar desert. Native shrubs and trees within these *Orans* are vital sources of animal feed, especially

during times of scarcity and drought. These plants not only provide essential nourishment but also offer shelter with their large canopies. However, there has been a significant decline in understory vegetation, particularly perennial grasses such as Sewan (*L. indicus*) and Dhaman (*C. ciliaris*). This decline has led to a proliferation of low-growing perennials and annuals, which now cover the spaces once occupied by these important grasses within the *Orans*. Yadav *et al.* (2020) rightly emphasize that the traditional management of *Orans* (sacred groves), *Gauchers* (common grazing lands), and *Agors* (water catchment areas) in western Rajasthan, which have historically harboured agro-biodiversity, are exemplary practices that are losing their relevance in the current scenario. Restoring the depleted grass cover and enhancing the woody components is imperative for sustainable grazing and resource management.

Acknowledgements

We gratefully acknowledge the support received from the Rural India Supporting Trust (RIST) and the Wildlife Conservation Society for conducting documentation of 100 *Orans* in Jaisalmer district. We are thankful to the generosity of the local communities, pastoralists, and herders who patiently shared information with us during the survey. Also, we express our deep appreciation for the support provided by the dedicated field research team of the Krishi Avam Parishitiki Vikas Sansthan (KRAPAVIS).

References

- Bhandari, M.M. 1990. *Flora of the Indian Desert*. MPS Repro, New Pali Road, Jodhpur, 435 p.
- Bhati, T.K. and Joshi, N.L. 2007. Farming systems for the sustainable agriculture in Indian arid zone. In: *Dryland Ecosystem: Indian Perspective* (Eds. K.P.R. Vittal, R.L. Srivastava, N.L. Joshi, A. Kar, V.P. Tewari and S. Kathju), pp 325. Central Arid Zone Research Institute and Arid Forest Research Institute, Jodhpur.
- Champion, H.G. and Seth, S.K. 1968. *A Revised Survey of the Forest Types of India*. Govt. of India, Delhi.
- Chriyaa, A. 2009. The use of shrubs in livestock feeding in low rainfall areas. *Land Use, Land Cover and Soil Sciences*. Vol. 5. EOLSS, Oxford, UK.
- Kumar, S., Singh, J.P., Venkatesan, K., Mathur, B.K. and Bhatt, R.K. 2017. Changes in seasonal vegetation and sustenance of tussocky arid

- rangeland under different grazing pressures. *Range Management & Agroforestry* 38: 35-42.
- Natrajan, S., Mitra, J. and Jain, R.K. 2002. Species description and soil seed bank of *Indigofera cordifolia*. In: Abstract *Proceedings of National Symposium on Grassland and Fodder Research in the New Millenium*, pp. 35-37. IGFR, Jhansi.
- Rani, R., Singh, J.P., Sanyal, A., Rajora, M.P. and Trivedi, A. 2022. *Lasiurus indicus* Henr., a key perennial fodder grass for desert ecosystem. *Arid Land Research and Management*. DOI: 10.1080/15324982.2022.2060149.
- Shankarnarayan, K.A. (ed.) 1984. *Agroforestry in Arid and Semi-arid Zone*. Central Arid Zone Research Institute, Jodhpur.
- Shetty, B.V. and Singh, V. (eds.) 1987. *Flora of Rajasthan*. Vol.1. Botanical Survey of India, Calcutta.
- Shetty, B.V. and Singh, V. (eds.) 1991. *Flora of Rajasthan*. Vol. II. Botanical Survey of India, Calcutta.
- Shetty, B.V. and Singh, V. (eds.) 1993. *Flora of Rajasthan*. Vol. III. Botanical Survey of India, Calcutta.
- Singh, A. 2016. *Orans*: Indigenous Community Conserved Areas of Rajasthan-Lessons from Past, Future Perspectives. KRAPAVIS, Alwar, Rajasthan.
- Singh, A. and Singh, J.P. 2023. Mapping of *Orans* in the Indian Thar Desert. <https://cicada.world//files/newsletters/CICADA-newsletter-10-EN.pdf>. McGill University, Canada
- Singh, A. and Singh, J.P. 2024a. *Orans* in the Indian Thar Desert, Rajasthan: Ideal sites for conservation of plant genetic resources. *THE CATALYST Newsletter*, USA - Issue 03 (22 April 2024): Celebrating Earth Day.
- Singh, A. and Singh, J.P. (eds.). 2024b. *Orans of Thar- A passage to Jaisalmer*. Krishi Avam Paristhitiki Vikas Sansthan (KRAPAVIS), Alwar, Rajasthan, India.
- Singh, J.P. and Rathore, V.S. 2022. Integration of woody perennials in production systems to augment feed availability in hot arid region: A review. *Annals of Arid Zone* 61: 143-154.
- Singh, J.P., Mondal, B.C., Soni, M.L. and Beniwal, R.K. 2006. Annual weeds add to the nutritional level of forage from desert rangelands. *Annals of Arid Zone* 45: 189-193.
- Singh, J.P., Roy, M.M. and Bhati, T.K. 2012. Rehabilitation of *Orans* (sacred groves) in western Rajasthan: An Overview. In: *Symposium on Managing Stress in Drylands under Climate Change Scenarios*. AZRAI, ICAR-CAZRI, Jodhpur. December 1-2, 2012. pp 225-227.
- Singh, J.P., Kumar, S. and Rathore, V.S. 2017. Managing grazing lands for drought mitigation. In: *Drought Mitigation and Management* (Eds. S. Kumar, S.P.S. Tanwar and Akhat Singh), pp. 194-208. Scientific Pub. (India) Jodhpur.
- Yadav, A., Gendley, M.K., Sahu, J., Patel, P. K., Chandraker, K. and Dubey, A. 2019. Silvopastoral system: A prototype of livestock agroforestry. *The Pharma Innovation Journal* 8(2): 76-82.
- Yadav, O.P., Singh, J.P., Kakani, R.K., Mahla, H.R., Rajora, M.P., Singh, A., Meghwal, P.R. and Verma A. 2020. Managing agrobiodiversity of Indian drylands for climate-change adaptation. *Indian Journal of Plant Genetic Resources* 33(1): 3-16.