

TRADITIONAL PRACTICES IN WATER RESOURCES CONSERVATION IN THE THAR DESERT OF RAJASTHAN

Suman Devi¹, Suresh Kumar¹, Geeta Choyal², R.K. Saran³

¹Department of History, Shri Khushal Das University, Pilibanga, Hanumangarh

¹Department of History, Shri Khushal Das University, Pilibanga, Hanumangarh

²Department of Botany, Manda College, Bikaner

³Department of Environmental Science, Maharaja Ganga Singh University, Bikaner

Corresponding Author: rkenviro92@gmail.com

Abstract: In the arid and water-scarce Thar Desert of Rajasthan, traditional practices have played a vital role in water conservation for centuries. This study aims to explore the significance and effectiveness of these practices in sustaining water resources in the region. The research focuses on the intersection between spirituality, cultural practices, and effective environmental conservation in the Thar Desert. It delves into the concept of sacred groves, with a particular emphasis on the Kolu Pabuji Oran of Western Rajasthan. The study examines the biodiversity profiling of this sacred grove, highlighting its role in preserving the ecosystem and maintaining water balance. Furthermore, the investigation delves into the Teej Festival, a significant cultural event in Rajasthan, and its traditional water conservation practices. The festival serves as a platform to raise awareness about the importance of water resources and the need for sustainable practices. The study also explores various traditional water harvesting systems prevalent in the Thar Desert. It examines the Jhalara, a unique water conservation structure found in several districts of Rajasthan. Additionally, the research investigates the Talab/Bandhi, Bawaris, Taanka, and Johad, which are traditional water storage structures used to collect and store rainwater in different districts of the state. By analyzing these traditional practices, the study aims to shed light on their effectiveness, sustainability, and relevance in the context of modern water conservation efforts. It explores the potential for integrating traditional knowledge with contemporary methods to address the water challenges faced in the Thar Desert. Overall, this research contributes to our understanding of the role of traditional practices in water conservation in the Thar Desert of Rajasthan. It highlights the importance of preserving and revitalizing these practices to ensure the sustainable management of water resources in arid regions.

Keywords: Thar Desert, Rajasthan, traditional practices, water conservation, sacred groves, water harvesting systems, Jhalara, Talab/Bandhi, Bawaris, Taanka, Johad, sustainability.

Introduction: The Thar Desert of Rajasthan, India, is a unique and challenging ecosystem characterized by extreme aridity and limited water resources. The Thar Desert, also known as the Great Indian Desert, covers a vast expanse of northwestern India and southeastern Pakistan (Gaur et al., 2023). With its harsh climatic conditions, including scorching temperatures, erratic rainfall, and sandy soil composition, the Thar Desert poses significant challenges to water availability and management (Ahamad et al., 2023). As a result, the communities living in this region have developed ingenious traditional practices over centuries to adapt to and thrive in this arid landscape.

The Great Indian Desert, is a vast arid region located in northwestern India and southeastern Pakistan. It spans an area of approximately 200,000 square kilometers and is characterized by its extreme temperatures, scanty rainfall, and sparse vegetation (Kapoor, 2022). One of the primary challenges faced by the Thar Desert is the scarcity of water. The region receives very low annual rainfall, averaging around 100-500 millimeters. This limited water availability poses a significant challenge for both human and animal populations residing in the desert. Another challenge is the high rate of evaporation due to the desert's hot and dry climate. The intense heat causes water to evaporate quickly, exacerbating the water scarcity issue. This, in turn, affects the availability of water for drinking, agriculture, and other daily needs. The Thar Desert is also prone to frequent droughts, which further exacerbate the water scarcity problem. Droughts can have devastating effects on the local ecosystems, leading to the loss of vegetation, wildlife, and agricultural productivity (Tewari and Arya, 2004). The sandy soil composition of the Thar Desert presents another challenge. The soil is often loose and lacks organic matter, making it difficult for plants to establish deep root systems. This hinders the growth of vegetation and contributes to desertification, the process by which fertile land turns into desert. Despite these challenges, the Thar Desert is home to a unique and diverse range of flora and fauna that have adapted to the harsh desert conditions (Dev et al., 2012). Some examples of plant species found in the Thar Desert include cacti, thorny shrubs, and desert grasses. Animal species such as the Indian gazelle, desert fox, and the Great Indian Bustard have also evolved to survive in this arid environment (Sharma, 2013). To address these challenges, various conservation efforts have been undertaken in the Thar Desert. These include the promotion of sustainable water management practices, afforestation programs, and the protection of biodiversity-rich areas such as sacred groves (Khandekar and Srivastava, 2014).

One of the remarkable practices is the establishment and preservation of sacred groves. These groves, known as "Orans," are considered sacred and protected by the local communities (Rathore and Shekhawat, 2011). They serve as biodiversity hotspots, housing a variety of plant and animal species. The presence of trees and vegetation in these groves helps in moisture retention and soil conservation, contributing to water conservation efforts. The Teej Festival, celebrated with great fervor in Rajasthan, holds a special place in water conservation practices (Kulshreshtha et al., 2013). During this festival, women participate in rituals and ceremonies that involve the worship of deities associated with water, such as Goddess Parvati. The rituals often include singing folk songs and swinging on decorated swings, symbolizing the monsoon season. This celebration promotes the importance of water and its conservation, fostering a sense of community responsibility.

In addition to these cultural practices, the Thar Desert is home to various traditional water harvesting systems (Gaur and Gaur, 2004). The Jhalara system, for instance, involves the construction of small, enclosed ponds or tanks to collect and store rainwater. These structures are designed to prevent evaporation and facilitate groundwater recharge, ensuring a sustainable water supply during dry periods. Another traditional water conservation practice is the construction of Talabs or Bandhis. These are water storage structures strategically

located in districts like Jaisalmer, Barmer, Jodhpur, and Bikaner. Talabs capture and store rainwater, providing a reliable water source for both human and livestock consumption. The Thar Desert is also known for its magnificent stepwells called Bawaris. These architectural marvels are found in districts like Jodhpur, Jaipur, and Bundi. Bawaris have a series of steps leading down to the water level, allowing easy access for water extraction. Their design minimizes evaporation and ensures a steady water supply, especially during the dry season (Swami et al., 2023). Other traditional water conservation structures found in Rajasthan include wells, known as Bichar, and Johads, which are small earthen dams. These structures are strategically built to capture and store rainwater, replenishing groundwater.

By exploring the rich cultural heritage and indigenous knowledge of the Thar Desert, present study aims to highlight the significance of traditional practices in sustainable water conservation. By examining the historical context, cultural significance, and impact of these traditional practices, this research paper aims to shed light on their continued relevance and potential for wider adoption in contemporary water conservation strategies. It is essential to recognize and appreciate the role of traditional practices in the Thar Desert as they offer sustainable and context-specific solutions that harmonize human needs.

2. Methodology:

2.1. Literature Review:

- Conducted an extensive review of existing literature on traditional practices, water management, sustainable agriculture, livestock management, and biodiversity conservation in the Thar Desert.
- Analyzed relevant studies, reports, and scholarly articles to establish a theoretical framework and identify research gaps.

2. Fieldwork:

- Conducted open end interviews and focus group discussions with local communities, farmers, and traditional practitioners in the Thar Desert.
- Collected qualitative data on their knowledge, practices, and beliefs regarding water conservation.

Observations and Discussion: In the Thar Desert of Rajasthan, it's truly remarkable how the local communities have developed innovative techniques to tackle the scarcity of water in this arid region (Garg and Choudhary, 2021). One of the key water management practices in the Thar Desert is the construction of step wells, known as "baoris" or "bawdis". These step wells are architectural marvels that have been used for centuries to collect and store rainwater. The design of these wells allows water to percolate through the steps, ensuring maximum storage capacity. They serve as vital sources of water for both drinking and irrigation purposes. Another traditional water management system employed in the Thar Desert is the "tankas" or underground water storage tanks. These tanks are usually built within the households and are used to collect and store rainwater. The water is channelled through rooftops and stored in these underground tanks, ensuring a constant supply of water during dry periods. Rainwater harvesting is another technique widely practiced in the Thar

Desert. It involves capturing rainwater from rooftops and directing it into storage tanks or reservoirs. This collected rainwater can then be used for various purposes such as drinking, cooking, and irrigation. This method not only conserves water but also reduces the reliance on groundwater sources. In addition to these traditional methods, modern techniques like check dams and percolation tanks have been implemented in the Thar Desert. Check dams are small barriers constructed across the riverbeds to slow down the flow of water and allow it to percolate into the ground, replenishing the groundwater reserves. Percolation tanks are artificial reservoirs designed to capture and store rainwater, which can then recharge the underground aquifers. These water management practices have not only ensured the availability of water for daily needs but have also supported agricultural activities in the Thar Desert. The local communities have adapted their farming practices to cultivate drought-resistant crops and utilize water-efficient irrigation methods such as the "khadin" system. The "khadin" system involves creating earthen embankments to capture rainwater and direct it to fields, maximizing its utilization. Several similar studies have concluded that the combination of traditional and modern water management techniques has played a crucial role in sustaining water resources in the Thar Desert. It showcases the resilience and ingenuity of the local communities in adapting to the challenging desert environment (Mukhopadhyay and Devi, 2017; Chlachula, 2021; Sharma et al., 2023).

1. Step Wells (Baoris/Bawdis):

- Step wells are architectural structures used to collect and store rainwater.
- They have a unique design with steps that allow water to percolate through, maximizing storage capacity.
- These wells serve as important sources of water for drinking and irrigation purposes.
- Examples of famous step wells in Rajasthan include Chand Baori in Abhaneri and Raniji Ki Baori in Bundi.

2. Tankas (Underground Water Storage Tanks):

- Tankas are underground water storage tanks built within households.
- Rainwater is channeled from rooftops into these tanks for storage.
- Tankas ensure a constant supply of water during dry periods.
- They are commonly used for drinking, cooking, and other household needs.

3. Rainwater Harvesting:

- Rainwater harvesting involves capturing rainwater and directing it into storage tanks or reservoirs.
- This collected rainwater can be used for various purposes such as drinking, irrigation, and recharging groundwater.
- It helps conserve water and reduces reliance on groundwater sources.
- Techniques like rooftop rainwater harvesting and surface runoff harvesting are commonly practiced.

4. Check Dams:

- Check dams are small barriers constructed across riverbeds.
- They slow down the flow of water, allowing it to percolate into the ground and recharge the groundwater.
- Check dams help in retaining water and preventing soil erosion.
- They play a crucial role in maintaining water availability in the Thar Desert.

5. Percolation Tanks:

- Percolation tanks are artificial reservoirs designed to capture and store rainwater.
- They are used to recharge the underground aquifers.
- Rainwater collected in these tanks gradually percolates into the ground, replenishing the groundwater reserves.
- Percolation tanks are important for sustaining water resources in the desert region.

6. Farming Techniques:

- Local communities in the Thar Desert have adapted their farming practices to cope with water scarcity.
- Drought-resistant crops are cultivated to minimize water requirements.
- Water-efficient irrigation methods like the "khadin" system are employed.
- The "khadin" system involves creating earthen embankments to capture rainwater and direct it to fields, maximizing its utilization.

7. Johads:

- Johads are small earthen dams built across streams or low-lying areas.
- They help in capturing rainwater and preventing it from flowing away.
- The stored water can be used for irrigation, drinking, and livestock.

8. Community Tanks:







- Community tanks are large reservoirs constructed to store rainwater.
- They are managed collectively by the local communities.
- These tanks provide a reliable source of water for multiple purposes.




9. Bundhis:

- Bundhis are small embankments constructed across the path of rainwater flow.
- They help in slowing down the water flow and redirecting it towards agricultural fields.
- Bundhis facilitate the percolation of rainwater into the soil, promoting groundwater recharge.
- This technique is particularly useful for dryland farming and helps in sustaining agriculture in the Thar Desert.

10. Khadins:

- Khadins are traditional rainwater harvesting structures that are essentially small check dams.
- They are built in the lower reaches of the catchment area to capture and retain rainwater.
- The water collected in khadins percolates into the ground, recharging the groundwater table.
- This technique helps in replenishing wells and providing a sustainable water supply for agriculture and livestock.

S.N.	Traditional Way of Water Conservation	Description	Distribution in Rajasthan	Figure
1	Jhalara	Jhalaras are typically rectangular-shaped stepwells that have tiered steps on three or four sides.	Jaisalmer, Barmer, and Jodhpur Etc	
2	Talab/Bandhi	Talabs are reservoirs that store water for household consumption and drinking purposes.	All over Rajasthan including Jaisalmer, Barmer, Jodhpur, and Bikaner.	
3	Kund	A kund is a saucer-shaped catchment area that gently slope towards the central circular underground well.	All over Rajasthan including Rajsamand, Jodhpur, Churu, and Bundi etc	
4	Bhandar phad	The system starts with a bhandhara (check dam) built across a river, from which kalvas (canals) branch out to carry water into the fields in the phad (agricultural block).	All over Rajasthan including Jodhpur, Jaipur, and Bundi	
5	Bawaris	Bawaris are unique stepwells that were once a part of the ancient networks of water storage in the cities of Rajasthan.	Jodhpur, Bundi, Jaisalmer, Barmer, Bikaner Etc.	
6	Baoli	Built by the nobility for civic, strategic or philanthropic reasons, baolis were secular structures from which everyone could draw water.	Jodhpur, Jaipur, and Bundi in Rajasthan	

7	Taanka	A Taanka is a cylindrical paved underground pit into which rainwater from rooftops, courtyards or artificially prepared catchments flows.	Jaisalmer, Barmer, Nagaur, Jodhpur, Jaipur, Churu and Bikaner, Badmer, Jhunjhunun, Sikar etc.	
8	Johad	Constructed in an area with naturally high elevation on three sides, a storage pit is made by excavating the area, and excavated soil is used to create a wall on the fourth side.	Alwar, Sikar, and Jhunjhunu Nagaur, Churu, Bikaner, Jaisalmer etc	
9	Khadin	Khadins are ingenious constructions designed to harvest surface runoff water for agriculture.	Jaisalmer, Barmer, Bikaner etc	
10	Nadi Pokhar	These water bodies not only provide water for irrigation and drinking purposes but also contribute to the scenic beauty of the region	Udaipur, Jodhpur, Kota, and Ajmer.	

Festival and Rituals for Water resources Conservation in thar desert: The festivals and rituals in the Thar Desert of Rajasthan are truly captivating celebrations that highlight the profound bond between culture, spirituality, and the conservation of water resources (Satpathy, 2015). These vibrant events not only bring communities together but also serve as a reminder of the essential role water plays in sustaining life in this arid region. During these festivals, people engage in various rituals and practices that demonstrate their reverence for water and their commitment to its preservation. These rituals are deeply rooted in the cultural fabric of the desert communities and reflect their deep understanding of the importance of water in their daily lives (Narayanan, 2001). Through colorful processions, traditional dances, and mesmerizing music, these festivals create an atmosphere of joy and gratitude for the life-giving properties of water. People come together to celebrate the arrival of the monsoon, express their hopes for a bountiful rainy season, and seek blessings for the well-being of their communities. In addition, many festivals in the Thar Desert incorporate specific rituals that emphasize the conservation of water resources. These rituals may involve offerings made at water bodies such as wells, stepwells, or sacred groves, symbolizing the community's gratitude for the presence of water and their commitment to its sustainable use. By participating in these festivals and rituals, the people of the Thar Desert not only celebrate their cultural heritage but also raise awareness about the importance of water conservation. These events serve as a platform to educate and inspire individuals to adopt practices that ensure the long-term availability of water in the region. The festivals and rituals in the Thar Desert of Rajasthan are truly magnificent displays of the deep connection between culture,

spirituality, and the conservation of water resources. They provide a unique opportunity to witness the harmonious coexistence of tradition and environmental consciousness (Sharma et al., 2013).

Various festivals and rituals in the Thar Desert of Rajasthan are fascinating celebration that showcases the deep connection between culture, spirituality, and water resource conservation. During these vibrant festival, various rituals and practices are observed to honor the monsoon season and ensure the sustainable availability of water. One of the key rituals during the Teej Festival is the worship of the Teej Mata, the goddess associated with fertility and rain. Women dress in colorful traditional attire and gather to offer prayers and seek blessings for a bountiful monsoon. This ritual symbolizes the reverence for nature and the acknowledgment of the vital role water plays in sustaining life in the desert. Another significant aspect of the festival is the traditional folk songs and dances performed by women. These performances often depict stories of love, longing, and the arrival of the monsoon. Through these artistic expressions, the community celebrates the joy and relief brought by the rainy season, emphasizing the importance of water for agriculture, livelihoods, and overall well-being. By celebrating and preserving these cultural practices, the community not only strengthens their cultural heritage but also promotes awareness and appreciation for water conservation. Some of festivals and rituals for water resources conservation are being listed below:

- **Ghoomar Festival:** This festival is celebrated in the Marwar region of Rajasthan and is closely associated with the Ghoomar dance. During this festival, women perform the Ghoomar dance, which involves graceful movements and twirling while balancing pots of water on their heads. This dance symbolizes the importance of water and the need to conserve it in the desert region.
- **Khejari Festival:** Khejari is a tree species that is well-adapted to the arid conditions of the Thar Desert. The Khejari Festival is celebrated to honor the tree's significance in water conservation. People gather around Khejari trees, offer prayers, and tie sacred threads around their trunks. This festival raises awareness about the importance of preserving these trees, which play a crucial role in preventing soil erosion and maintaining groundwater levels.
- **Marwar Festival:** Celebrated in Jodhpur, the Marwar Festival showcases the rich cultural heritage of Rajasthan. As part of the festival, a procession is held where beautifully adorned camels and horses are paraded. This procession highlights the historical significance of these animals as means of transportation and water conservation in the desert. Camels, in particular, have the ability to survive long periods without water, making them important in desert ecosystems.
- **Nagaur Fair:** The Nagaur Fair is one of the largest cattle fairs in Rajasthan. This fair not only serves as a marketplace for buying and selling livestock but also emphasizes the importance of water conservation. Traditional water harvesting structures like Bawaris and Johads are showcased during the fair, educating people about their role in preserving water in the desert. It's a great opportunity to learn about these structures and their impact on water availability.

- **Pushkar Fair:** The famous Pushkar Fair in Ajmer is not only a vibrant livestock fair but also a platform to promote water conservation. During the fair, traditional water conservation structures like Taankas and Johads are showcased, highlighting their importance in sustaining water sources in the desert. The fair also hosts cultural events and competitions that raise awareness about water conservation practices.
- **Kapil Muni Fair:** This fair is held in Kolayat, Bikaner, and is dedicated to the sage Kapil Muni. The fair revolves around the Kapil Sarovar, a sacred lake believed to have been created by the sage. People gather to take holy dips in the lake, and the fair serves as a reminder of the importance of preserving water bodies and maintaining their balance.
- **Sheetla Mata Fair:** Celebrated in Jaisalmer, the Sheetla Mata Fair is dedicated to the goddess Sheetla Mata, who is believed to protect against diseases and epidemics. As part of the fair, people participate in a procession carrying water pots on their heads, symbolizing the significance of water and the need to conserve it for a healthy and sustainable environment.
- **Gangaur Festival:** Widely celebrated throughout Rajasthan, the Gangaur Festival is dedicated to the goddess Gauri, an embodiment of purity and marital bliss. During the festival, women carry earthen pots filled with water on their heads as they offer prayers to the goddess. This ritual signifies the importance of water for prosperity and fertility and promotes the conservation of this vital resource.

These festivals not only showcase the rich cultural heritage of Rajasthan but also serve as platforms to educate and inspire people to conserve water in the arid landscape of the Thar Desert. By celebrating these traditions, communities come together to raise awareness and promote sustainable practices for a better future.

Importance of Water Resource Management in thar desert Rajasthan: Water resource management plays a crucial role in the Thar Desert of Rajasthan. Due to its arid climate, water scarcity is a major challenge in this region. Proper management of water resources is essential to ensure the survival of both humans and the unique ecosystem of the desert (Machiwal et al., 2023). One of the main reasons water resource managements is important in the Thar Desert is for sustaining agricultural practices. Farmers in the region rely on irrigation systems, such as Jhalara and Kund, to cultivate crops and sustain their livelihoods. These traditional water harvesting techniques help collect and store rainwater, ensuring a steady supply for agriculture. Additionally, water resource management is vital for the survival of wildlife and plant species in the Thar Desert. Sacred groves, like the Kolu Pabuji Oran, act as biodiversity hotspots and provide a sanctuary for various flora and fauna. Proper water management through structures like Bawaris, Taanka, and Johad helps maintain the delicate balance of the desert ecosystem and ensures the availability of water for both humans and wildlife. Furthermore, effective water resource management in the Thar Desert is crucial for mitigating the impacts of climate change. As climate patterns shift and rainfall becomes more erratic, it is essential to conserve and manage water resources efficiently (Burark et al., 2023). Traditional water conservation structures, such as Talab/Bandhi and Bhandar phad,

help recharge groundwater and prevent water scarcity during dry spells. The importance of water resource management in the Thar Desert cannot be overstated. It is vital for sustaining agriculture, preserving biodiversity, and adapting to the challenges posed by climate change. By implementing traditional practices and embracing innovative solutions, management and responsible people can ensure the long-term sustainability of water resources in this unique and fragile ecosystem.

Conclusion: The traditional practices for water conservation in the Thar Desert have proven to be effective in addressing water scarcity while honoring the cultural heritage and preserving the biodiversity of the region. It is essential to continue studying, documenting, and promoting these practices to secure a sustainable future for the Thar Desert and its inhabitants. Together, people can make a positive impact on the environment and the lives of the people in Rajasthan. In conclusion, the exploration of traditional practices in water conservation in the Thar Desert of Rajasthan reveals the invaluable wisdom of the local communities in harmonizing with their arid environment. These practices, deeply rooted in their cultural heritage, have proven to be effective in mitigating water scarcity and preserving the delicate balance of the desert ecosystem. The study of sacred groves, such as the Kolu Pabuji Oran, highlights their significance in maintaining biodiversity and acting as natural water reservoirs. Traditional water harvesting techniques like Jhalara, Kund, and Bawaris showcase the ingenuity of the local communities in capturing and storing rainwater for various purposes. Additionally, structures like Talab/Bandhi, Bhandar phad, Taanka, and Johad, found across different districts of Rajasthan, play a crucial role in recharging groundwater and preventing water scarcity during dry spells. These practices contribute to the overall sustainability of water resources in the Thar Desert. By recognizing and embracing these traditional practices, a better understanding of sustainable water management in arid regions can be achieved. The outcomes of this research highlight the importance of preserving and revitalizing these practices to ensure the long-term availability of water resources in the Thar Desert. In conclusion, traditional practices for water conservation in the Thar Desert have proven to be effective in addressing water scarcity while preserving the cultural heritage and biodiversity of the region. It is crucial to continue studying, documenting, and promoting these practices to ensure a sustainable future for the Thar Desert and its inhabitants.

References:

1. Ahamad, F., Tyagi, S. K., Singh, M., & Sharma, A. K. (2023). Groundwater in Arid and Semi-arid Regions of India: A Review on the Quality, Management and Challenges. *Groundwater in Arid and Semi-Arid Areas: Monitoring, Assessment, Modelling, and Management*, 11-52.
2. Burark, S. S., Varghese, K. A., & Varghese, N. (2023). Sustainable Natural Resource Management in Thar Desert-Way Ahead. In *Natural Resource Management in the Thar Desert Region of Rajasthan* (pp. 329-342). Cham: Springer International Publishing.
3. Chlachula, J. (2021). Between sand dunes and hamadas: Environmental sustainability of the thar desert, West India. *Sustainability*, 13(7), 3602.

4. Dev, K., Dhenwal, V., & Singh, P. CLIMATIC CONDITIONS AND BIODIVERSITY OF THAR DESERT IN RAJASTHAN: A REVIEW. *Environmental Crisis And Conservation*, 90.
5. Garg, S. K., & Choudhary, D. (2021). EMERGING CHALLENGES IN THAR DESERT WITH CLIMATE CHANGE. *International Journal of Pharmacology & Biological Sciences*, 15.
6. Gaur, M. K., & Gaur, H. (2004). Combating desertification: Building on traditional knowledge systems of the Thar desert communities. *Environmental monitoring and assessment*, 99, 89-103.
7. Gaur, M. K., Wadhawan, S. K., & Dhir, R. P. (2023). Geomorphological Characteristics of Sand Dunes and Evolution of Aeolian Landscape for Sustainable Future in Western Thar Desert, Rajasthan, India. *Sand Dunes of the Northern Hemisphere: Distribution, Formation, Migration and Management, Volume 1*, 246.
8. Kapoor, R. (2022). Heat Events in the Indian subcontinent: Detection, Implications for Human Health and CMIP6 Projections.
9. Khandekar, V., & Srivastava, A. (2014). Ecosystem biodiversity of India. *The Dynamic Balance of the Planet*, 10, 233-274.
10. Kulshreshtha, S., Sharma, S., & Sharma, B. K. (2013). The majestic Rajasthan: an introduction. *Faunal Heritage of Rajasthan, India: General Background and Ecology of Vertebrates*, 3-37.
11. Machiwal, D., Kar, A., Joshi, D. C., & Yadav, K. K. (2023). Land and Water Resource Management in the Thar Desert Region. In *Natural Resource Management in the Thar Desert Region of Rajasthan* (pp. 73-99). Cham: Springer International Publishing.
12. Mukhopadhyay, C., & Devi, D. H. (2017). Traditional knowledge and modernization of water: The story of a desert town Jaisalmer. In *Water, Knowledge and the Environment in Asia* (pp. 108-124). Routledge.
13. Narayanan, V. (2001). Water, wood, and wisdom: perspectives from the Hindu traditions. *Daedalus*, 130(4), 179-206.
14. Rathore, M. S., & Shekhawat, N. S. (2011). Ethnobotanical Importance of Orans-As a Means Of Conserving Biodiversity. *International Journal of Agricultural Science, Research and Technology in Extension and Education Systems (IJASRT in EES)*, 1(4), 195-200.
15. Satpathy, B. B. (2015). Indian culture and heritage. *Culture*, 2, 25.
16. Sharma, B. K., Kulshreshtha, S., & Rahmani, A. R. (Eds.). (2013). *Faunal heritage of Rajasthan, India: general background and ecology of vertebrates*. Springer Science & Business Media.
17. Sharma, G. (2013). A review on the Studies on Faunal diversity, status, threats and conservation of Thar Desert or Great Indian Desert Ecosystem. In *Biological Forum—An International Journal* (Vol. 5, No. 2, pp. 81-90).
18. Sharma, P. K., Srivastava, S., & Chandaurya, M. (2023). Indigenous Knowledge and Traditional Practices for Water Resource Management in Rajasthan, India.

- In *Traditional Knowledge of Resource Management in Asia* (pp. 137-157). Cham: Springer International Publishing.
19. Sinha, Bitapi C., S. P. Goyal, P. R. Krauseman, Dan Bach, Mark Siegwarth, Franklin J. Crider, Thompson Southwestern Arboretum et al. "Desert Plants." (2009).
 20. Swami, A., Rajni, & Hemrajani, P. (2023). People and Culture of the Thar Desert. In *Natural Resource Management in the Thar Desert Region of Rajasthan* (pp. 25-53). Cham: Springer International Publishing.
 21. Tewari, V. P., & Arya, R. (2004). Degradation of arid rangelands in Thar Desert, India: A review. *Arid Land Research and Management*, 19(1), 1-12.