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Natural Resource Management in Sirohi District, Rajasthan: A Review

Ravendra Singh Chauhan
Assistant Professor - Sri Jai Narain Mishra PG College, Lucknow

Gitam Singh
Madhav University, Sirohi-307026, Rajasthan, India

Rakesh Dudwal
M.Sc. Research Scholar, RBS College, Bichpuri, Agra - 283105

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ABSTRACT

Sirohi district, located in the southwestern part of Rajasthan, India, is characterized by its diverse topography, ranging from the semi-arid plains to the hilly terrains of Mount Abu. The district's natural resources, including water, soil, and forests, play a crucial role in sustaining the livelihoods of its predominantly agrarian population. However, challenges such as over-exploitation of groundwater, soil degradation, and deforestation have necessitated the implementation of effective natural resource management (NRM) strategies. This review examines the current status of natural resources in Sirohi, the challenges faced, and the management practices adopted to ensure sustainable development. Effective natural resource management in Sirohi district is crucial for sustainable development and improving the livelihoods of its residents. While significant challenges persist, the adoption of integrated and community-driven approaches offers a pathway towards the sustainable utilization of natural resources. Continuous monitoring, policy support, and stakeholder engagement are essential to ensure the long-term success of these initiatives.

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Introduction

Natural resources are fundamental to the socio-economic development of any region. In Sirohi district, agriculture forms the backbone of the economy, making the management of natural resources vital for food security and livelihood sustenance. The district's unique geographical features, including the Aravalli range and the semi-arid plains, contribute to its varied natural resource base. India today stands first in the area of milk production at the world level, with an annual growth rate of about 4%. The country's milk production in 2010 was estimated to be 110 million tons. A large quantity of milk produced in the country, amounting to over 46%, is being consumed as liquid milk. The production and use of animal products in the use of human diet is receiving tremendous attention. India today, stands first in the area of milk production at the world level, with an annual growth rate of about 4% (Singh et al 2012). The productive improvements among dairying animals can be made through proper management, feeding and handling, etc (Singh et al 2013). According to Singh and Sharma (2013a), the number of goats in our nation grew from 47.14 million in 1951 to 124.5 million in 2005. Although an individual's genetic makeup sets a limit, improvements can be made by appropriate management, feeding, handling, and other environmental factors that will affect character expression (Singh et al 2013b). According to Singh and Sharma (2014), goats are an essential component of livestock production and have a significant impact on the socioeconomic structure of rural impoverished people. A number of governmental and non-governmental organizations have acknowledged the significance of poultry farming as a job-generating enterprise and are working to encourage an increasing number of entrepreneurs to pursue this business (Singh et al 2014a). In Asian agriculture, goats are essential to the socioeconomic system, especially for those with little resources who live in difficult environments (Singh et al., 2014b). There are currently 921 million goats in the world, with more than 90% of them living in developing nations (Singh et al 2014c). Due to illicit trade and killing, this benefit is frequently not included in national statistics (Singh et al 2014d). Goat milk is less prone to cause lactose intolerance than cow's milk since it contains less lactose. Since milk doesn't contain the protein agglutinin, it is spontaneously homogenized (Singh et al 2014e). Archaeological remains found in western Asia show that the goat was domesticated as early as 6-7 BC (Singh et al 2014f). The majority of Indians rely on agricultural systems for their daily needs, including goat husbandry, which is a significant rural enterprise for small-scale marginal farmers and laborers without land (Singh et al 2014g). Age at first conception, age at first calving, length of first gestation, and other factors are used to control an animal's reproductive management (Singh et al 2014h). Goat milk is less likely to cause

lactose intolerance than cow's milk since it contains less lactose (Singh and Sharma, 2015). Since then, it has contributed significantly to the economical development of human civilization worldwide (Singh and Sharma, 2015a). Due of its higher biomass, farmers favored Deda over Kona (Singh and Sharma, 2015b). Resource-poor farmers' knowledge of risk and concentration on reducing it are crucial factors in this respect (Singh and Sharma, 2016). Goats are abundant and physiologically diversified throughout the nation (Singh and Sharma, 2016a). Breed, diet, lactation stage, season, and other factors all have an impact on the composition of milk, which in turn affects its nutritional value (Singh and Sharma, 2016b). The foundation of Indian agriculture is livestock production, which accounts for 7% of the country's GDP and provides jobs and a living for 70% of the country's rural population (Singh et al., 2017). A significant amount of protein and other nitrogen-containing foods are consumed by animals raised in intensive production systems (Singh et al 2017a). In tropical and subtropical nations, small ruminants significantly affect the food supply and economy of the populace (Singh and Sharma, 2017b). In Asian agriculture, goats are essential socioeconomically, especially for those with little resources who live in hostile regions (Singh et al. 2025e). About 15% of the milk consumed by people globally comes from non-cattle sources (Singh et al. 2025d). About 59% of the goat milk produced worldwide comes from Asia (Singh et al., 2018). The Indian subcontinent is the birthplace of the Jamnapari (or Jamunapari) goat breed. They have been sent to Indonesia since 1953 and have been quite successful there (Singh et al. 2025c). They are known as Etawa goats and their mixing with a local goat known as "PE," peranakan Etawa, or Etawa mix. The Yamuna, Jamuna (West Bengal), and Jamuna (Bangaladesh) rivers in India and Bangladesh are the sources of the name (Singh et al., 2025). Although coat color varies greatly, the normal coat color is white with little tan spots on the neck and head (Singh et al. 2024e). The breed is known for having a very convex nose line with a hair tuft that resembles a parrot's mouth (Singh et al 2017c). The phenotypic traits of wild goats changed as a result of domestication, leading to the emergence of numerous goat breeds or varieties (Singh et al. 2024d). Human migration and translocation, typically brought on by shifting climatic conditions and natural resources, resulted in the distribution of these breeds or types around the world (Singh and Sharma, 2017d). We get our meat and eggs from a sizable industrial chicken industry (Singh, G. 2019). Bacterial toxins can harm the cow's milk-secreting tissues and other ducts, and occasionally the udder sustains irreversible damage (Singh et al. 2024c). Even in cows that recover from severe acute instances, there may be repercussions for the remainder of the lactation and future lactations (Singh and Singh, 2020). All initiatives meant to alleviate rural poverty and improve food and nutrition security now include livestock as a crucial component (Singh et al. 2025a). According to Singh and Somvanshi (2020a), dairy livestock farmers

who keep cattle and buffaloes are still uninformed about scientific management techniques. India has a sizable portion of the world's cattle population, which is increasing consistently and gradually (Singh et al. 2025b). Buffalo are primarily found in underdeveloped nations with high livestock and human population densities and inadequate feed supplies (Singh et al. 2024b). Dairy cattle typically rely solely on native or imported pastures for nutrition in tropical and subtropical areas. During crucial times of the year, like the winter or dry season, the animals are unable to meet their nutritional needs due to a lack of forage or poor quality (Singh, G., 2019a). The goat has the broadest ecological range of any domesticated animal species, with the exception of dogs, and is believed to be the first ruminant to be domesticated (Singh et al., 2024a). Goats originated in Asia and have since spread to every continent, living in nearly every climate zone from the arctic to the equator (Singh, G., 2024). Essential proteins, vitamins, and minerals are abundant in goat milk (Singh et al., 2023). Because of its high nutritional content and therapeutic benefits, goat milk is used by many people (Singh et al. 2024f). These difficulties can be lessened by adaptive breeding techniques, nutritional interventions, and efficient management techniques (Singh et al. 2025e). The Latin terms ager or agri, which means soil, and culture, which means cultivation, are the roots of the English word agriculture (Singh, et., al. 2025g). Mastitis milk is similar to blood in composition (Singh and Rodricks, 2025). Sixty percent of milk production costs are related to feed alone (Singh and Rodricks 2025a). According to Singh and Rodricks (2025b), the nutritional requirements are often stated separately for each function, while an overall figure for the combined functions may also be included.

Water Resources

Water resources in Sirohi are primarily dependent on monsoonal rainfall, which is both erratic and unevenly distributed. Mount Abu, located in the district, receives the highest rainfall in Rajasthan, averaging 163.8 cm annually, while the plains receive significantly less. Groundwater serves as the main source of irrigation and drinking water. However, over-extraction has led to a decline in water tables, with four out of five blocks in the district classified as over-exploited. The Central Ground Water Board's aquifer mapping indicates that the stage of groundwater extraction in these blocks exceeds 100%, highlighting the critical need for sustainable water management practices.

Soil Resources

The district's soils are diverse, ranging from sandy loam to clayey soils. Over the period from 1957-58 to 2020-21, there has been only a marginal increase in net sown area. The acreage of cereal crops has declined, with a shift towards irrigated and cash crops like castor. This shift, coupled with inadequate soil conservation measures, has led to soil erosion and fertility loss. The adoption of integrated livestock-based farming systems has been suggested as a key option towards agricultural development and soil conservation.

Forest Resources

Sirohi's forest cover is primarily concentrated around the hills of Mount Abu, classified as Central Indian Sub-tropical Hill Forests. These forests comprise semi-evergreen and evergreen species, contributing to the district's biodiversity. However, a significant portion of the forest cover is in a degraded state due to deforestation and overgrazing. Efforts are underway to restore these forests through afforestation and community participation initiatives.

Challenges in Natural Resource Management

The primary challenges in NRM in Sirohi include:

- **Over-extraction of Groundwater:** Intensive agriculture and lack of regulation have led to unsustainable groundwater use.
- **Soil Degradation:** Erosion and nutrient depletion have reduced soil productivity.
- **Deforestation:** Clearing of forests for agriculture and fuel has led to habitat loss and reduced biodiversity.

- **Climate Variability:** Erratic rainfall patterns exacerbate water scarcity and impact crop yields.

Management Strategies and Initiatives

To address these challenges, several strategies have been implemented:

i. **Water Conservation:** Promotion of rainwater harvesting, construction of percolation tanks, and adoption of micro-irrigation techniques like drip and sprinkler systems to enhance water use efficiency.

ii. **Soil Conservation:** Implementation of contour bunding, agroforestry, and crop rotation practices to prevent erosion and maintain soil fertility.

iii. **Afforestation Programs:** Community-based tree plantation drives and protection of existing forests to restore degraded areas.

iv. **Sustainable Agriculture:** Encouraging the cultivation of drought-resistant crop varieties and integrated farming systems to reduce dependence on groundwater.

Conclusion

Effective natural resource management in Sirohi district is crucial for sustainable development and improving the livelihoods of its residents. While significant challenges persist, the adoption of integrated and community-driven approaches offers a pathway towards the sustainable utilization of natural resources. Continuous monitoring, policy support, and stakeholder engagement are essential to ensure the long-term success of these initiatives.

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