



Change in forest cover scenario in last decade in Karauli, Rajasthan, India: A review

Sampat Singh Meena*

Department of Botany, Government College Tonk, Rajasthan, India

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Abstract

Forest cover plays a significant role in our life whether directly or indirectly and play vital role for ecological stability, a wide range of forest resources are obtained from it. Over the past two decades, climate change and anthropogenic activities have a significant impact on forest cover. The present study focusses on change in forest cover scenarios between 2013 to 2023 in karauli, Rajasthan. During last few decade forest cover area change in very dance forest, moderate forest, open forest and total forest science 2013 to 2023 on basic of India state forest report (ISFR) of forest survey of India (FSI). This research article analyzes the changes in Karauli's forest area based on the Forest Survey of India's (FSI) ISFR reports (2013, 2015, 2017, 2019, 2021 and 2023) and the Rajasthan Forest Department reports (2013-2025). The result of present study during the period 2021 to 2023 showed a decline in forest cover by 3.69 km² in karauli and Rajasthan decline in forest cover by 83.80 km², but net change in forest cover and tree cover Rajasthan added 394.5 km². Impact of deforestation and decline in forest cover change has significant socio-economic consequences, such as climate change, the loss and destruction of natural habitat, the loss of water and forest resources, drought conditions, soil erosion, and air pollution. So, there is an urgent and critical need to raise awareness about the importance of forests and their sustainable use. Furthermore, it is recommended that corrective measures be taken to minimize the adverse effects caused by deforestation.

Keywords: Forest Survey of India, India State Forest Report, Dang Area, Aravalli Mountain

Introduction

Forest cover plays a significant role in our life whether directly or indirectly and play vital role for ecological and environmental stability, biodiversity conservation playing a key role for climate conservation and ecosystem regulation. Change in forest cover is a dynamic and widely spread natural and climate change presser by anthropogenic process like forest land use as agriculture, fire wood, timber, charcoal production, these are the responsible for forest cover decreasing due to deforestation owing to development agenda and impact on natural ecosystem. (Khan *et al.*, 2023; Sharma & Govindarajan, 2023) ^[9] According to Keenam *et. al.* 2015 forest area decrease from 4128 million hectare to 39999 million hectare between 1990 to 2015 and according to the Food and Agriculture Organization (FAO)'s Global Forest Resources Assessment (GFRA) 2025 ^[12], significantly decreased annual rate of forest cover has dropping from 10.7 million hectares per year (1990–2000) to 4.12 million hectares per year (2015–2025). India has approximately 2 percentage forest area of the world total forest area (72,739 thousand hectares). According to the 18th India State of Forest Report (ISFR) 2023 ^[8], total forest cover of India is 715343 km² which is 21.76 percentage of total geographical area of the country and Rajasthan's total forest cover is 16548.21 km² which is 4.83% of total geographical area of the state and total forest cover and tree cover area is 27389.33 km², which is 8.00% of total geographical area of Rajasthan.

The eastern part of Rajasthan, is unique due to unique terrains and diverse ecosystems, services as significant ecological buffer zone. According to the Rajasthan forest statics 2025 ^[12] of Rajasthan Forest department legal status, biogeographically, tropical dry deciduous forest found in karauli. It is situated at overlapping influences of the ancient Aravalli and Vindhyan Mountain ranges, with 5524 km²

geographical area is known as dang region due to rugged Velly, narrow Chambal ravines that locally known as Khoh / Behad and the ravines of cambial makes southern, southeastern boundary of district. Furthermore, district's forests are integrated components of larger wildlife corridors. A major portion of the district's forest covered by the Kela Devi Wildlife Sanctuary which is the part of Ranthambhore tiger reserve and parts of the newly notified Dhaulpur-Karauli Tiger Reserve. Karauli is known as queen of the dang area of Rajasthan. Karauli, among the select districts in Rajasthan with the Biodiversity and highest forest cover percentage; however, it has also recorded the highest rate of forest degradation over the past ten years. it situated in southern -eastern part of Rajasthan. it has semi-arid and subtropical climate with rugged landscape like Rockey Terren steep valleys, deep grove and Chambal River ravines along with Vindhya-Chal and Aravalli Mountain.

According to the India state forest report (ISFR) 2023 and Rajasthan forest statics 2025 ^[8, 12], the district features a high proportion of forest land, with recorded forest area approximately 1,802.81 square km area as significant green footprint, representing roughly 35.69% of its total geographical area due to rich geographical feature, unique forest zones. In the term of forest conservation karauli district ranked in leading district in the state. The local vegetation of district classified as tropical dry deciduous forests with dominant plant species, like *Conocarpus pendulus* (Edgew.) Standard. and *Anogeissus latifolia* (DC.) Wall.ex Guill. & Perr. (Dhok), *Senegalia catechu* (Khair), and *Acacia nilotica* (L.) Delile (Desi babool), *Butea monosperma* (Lam.) Taub. (Cheela) which are highly adapted to the district's extreme condition and dry summer seasons. Forest divided into very dense forest, moderate forest, open forest and scrub forest. The recorded percentage forest area as on 31.03.2025 ^[12] w. r. t. of the karauli district

in Rajasthan is 1810.76 square km in 118 forest blocks (36.16% of geographical area) and per capita forest area is 0.12 Ha., reserved forest cover 62.99 square km in 9 forest blocks, protected forest 1693.13 square km in 91 forest blocks and unclassified forest is 54.64 square km in 18 forest blocks.(Forest Survey of India, 2013, 2015, 2017, 2019a, 2019b, 2021, 2023 [2, 3, 4, 5, 7, 8]; Rajasthan Forest Department, 2021, 2025 [7, 12]; Rajasthan forest Department, 2025) [11].

Despite its environmental significance, in the last two decades forest cover area of Karauli has undergone notable changes. Recently, green cover areas increase due to environmental restoration program of government, such as the Mission Hariyalo Rajasthan and the regulation of community resources have helped increase green cover in certain areas; however, significant counter-pressures persist. Rapid urbanization, localized mining activities, illegal logging, open cattle grazing, and a growing population have placed immense ecological strain on these fragile dry deciduous regions.

Material and Methods

1. Description of the Study Area

The district Karauli is situated between 26° 02' and 27° 00' North Latitude, 76° 28' and 77° 25' East Longitude at overlapping influences of the ancient Aravalli and Vindhyan Mountain ranges. It is bordered by Bharatpur District in the north, by Dholpur district in the north- east, by Dausa District in the west, by Sawai-Madhopur District in the south-west and south-eastern boundary of the district by the Chambal River forms the, 5 km from Mandrayal across which lies the state of Madhya Pradesh. Karauli district

come into existence in the year 1997, in the term of size, Karauli district ranks 23rd with 5524 square kilometres area. Most of the area of district, approximately 1579 square kilometres area is wasteland with rugged Velly, narrow Chambal ravines that locally known as Khoh / Behad and the ravines of cambial makes southern, southeastern boundary of district and Banas River flow along with southern-eastern border. Some seasonal rivers like Gambhir, Gajar, Kali-Sil, Bhadravati and Bhainsawat play an important role in ecological environment, biodiversity and helpful in ground water level recharge. In summer seasons temperature is very high, ranging from 40 degree to 48 degree caesious and very cold in winters, ranging from 6 degree to 10 degree caesious. Average annual rainfall approximately 655mm to 720mm but actual rainfall in 2025 [11] is 1280 mm and relative humidity between 20% to 85 %. Karauli have rich biodiversity due to high forest areas in eastern region. The Kela-devi sanctuary spread over most of the Sapotra and karauli Blocks was established in1983-84. Kela-devi sanctuary makes important wildlife corridor that provide natural habitat for the dispersing tigers from core region of Ranthambhore tiger reserve and Northen extension as buffer zone of the Ranthambhore tiger reserve.at present, many times tigers movement of Kuno-Palpur and sheopur, Madhya Pradesh has Veen seen in this Areas. The main occupations of the inhabitant of this region are agriculture and animal husbandry; there are 8 Tehsils in Karauli with 1458248 of which male and female were 783639 and 674609 respectively as per 2011 census wich is 2.13% of Rajasthan's population. The geographical areas of Rajasthan and Karauli are represented in Figure 1and 2 blow.

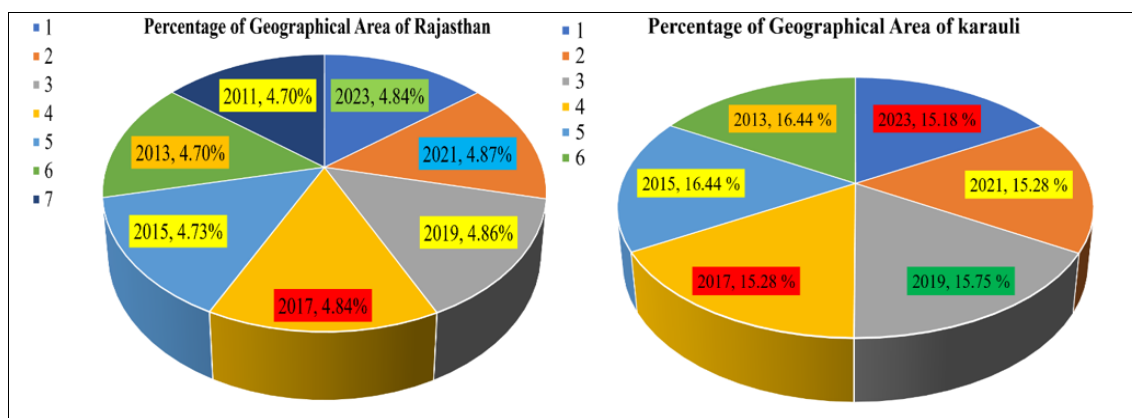


Fig 1: Percentage of geographical areas of Rajasthan and Karauli district

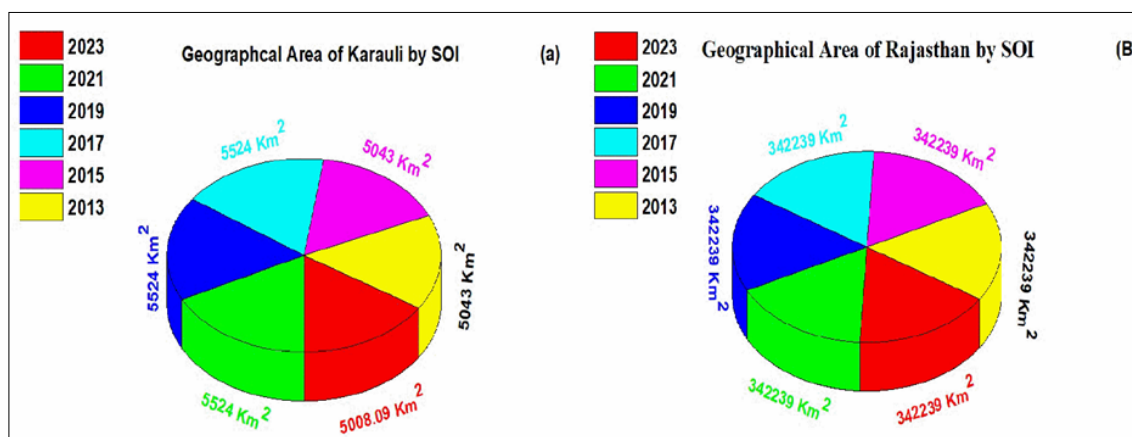


Fig 2: The geographical areas of Rajasthan and Karauli district

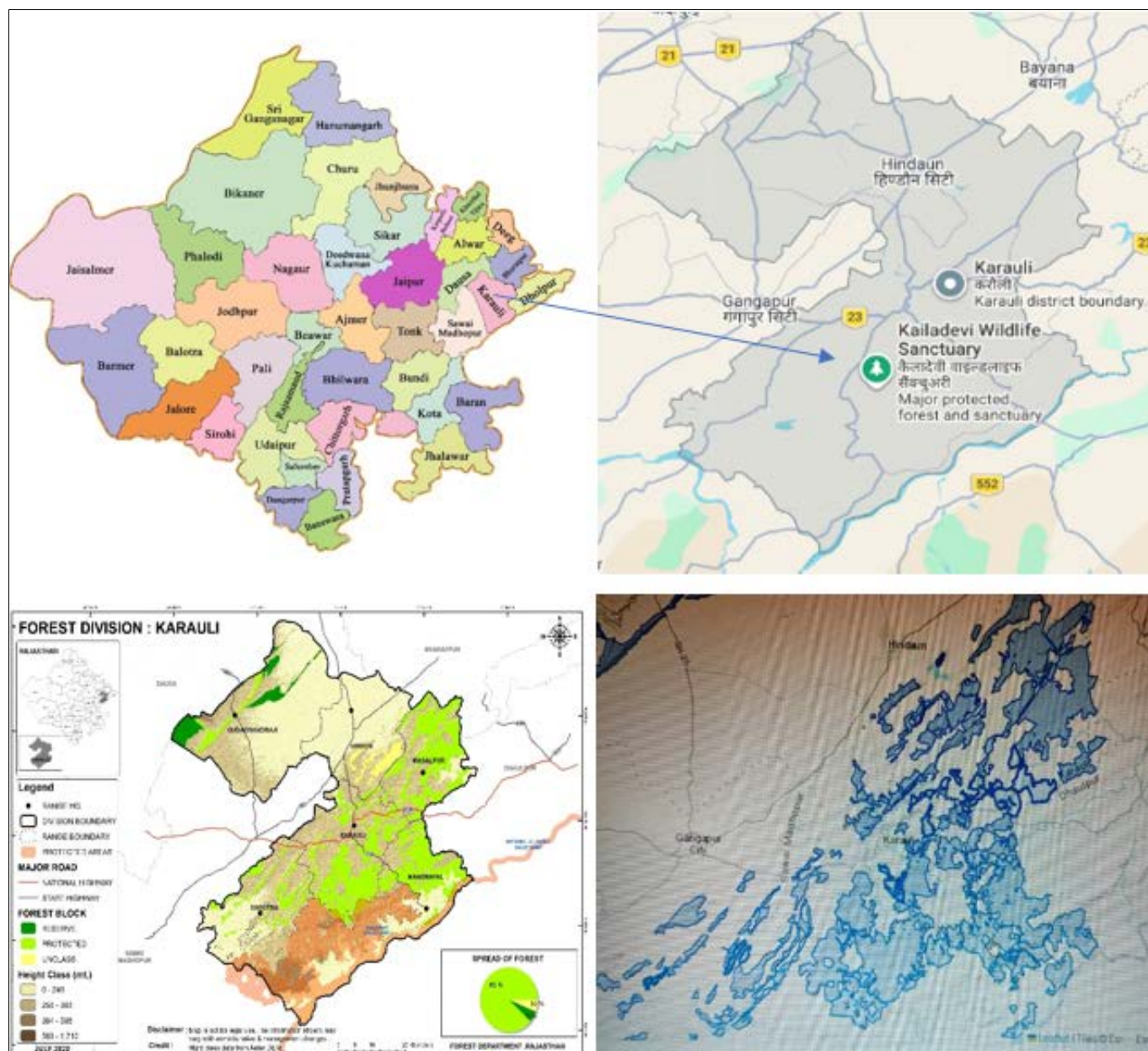


Fig 3: Boundary and Forest Cover Map of Karauli district

2. Techniques of Data Collection

A comprehensive literature and data were collected from various scientific research, books, review articles, research journals search by the help of Google Scholar, Scopus, Web of Science, Science Direct and google for biodiversity, study of forest cover change, systematically assess the long-term changes in last decade in land use patterns in the Karauli district of Rajasthan, India. Primary data and peer-reviewed research were extracted from prominent scientific and governmental databases, including Google Scholar, Scopus, Web of Science, and Science Direct. For Review on Changing in Forest Scenario in Karauli, Rajasthan, data was collected from official website of Rajasthan Forest department and India State of Forest Reports (ISFR) published by the Forest Survey of India (FSI).

Results and Discussion

The report of ISFR forest cover between 2013 to 2023 [2, 9] in km² were analysed for forest cover change in the study area. The data of Rajasthan state and karauli district were compiled and consolidate by the help of Rajasthan state

forest statics and ISFR report are given in Table 1 and Table 2. Total forest cover in Rajasthan is given in Figure 4 (a) and 4(b).

1. Forest Cover and Change Detection

According to India state forest report 2023 [8] (ISFR) of forest survey of India (FSI) district has 760.42 square km area (15.18 % of calculated area by Sol) out of 5008.09 square km area, under, Total Forest cover of very dense forest (VDF), in Rajasthan is given in Figure 7. but in karauli, very dense forest (VDF) is zero square km, moderate dense forest (MDF) 87.87 square km, shows in Figure 6, open forest 672.55 square km, shows in Figure 5 and scrub 269.28 square km. With respect India state forest report 2023 [8] (ISFR), net forest area decreases in 83.42 square km (0.10%), MDF decreases 96.04 to 87.87 and open forest decreases 747.8 to 672.55 in 2021 [7] ISFR respectively. (Forest Survey of India, 2013, 2015, 2017, 2019a, 2019b, 2021, 2023 [2, 3, 4, 5, 7, 8]; Rajasthan Forest Department, 2021, 2025 [10, 11]; Rajasthan Forest Department, 2025) [11]

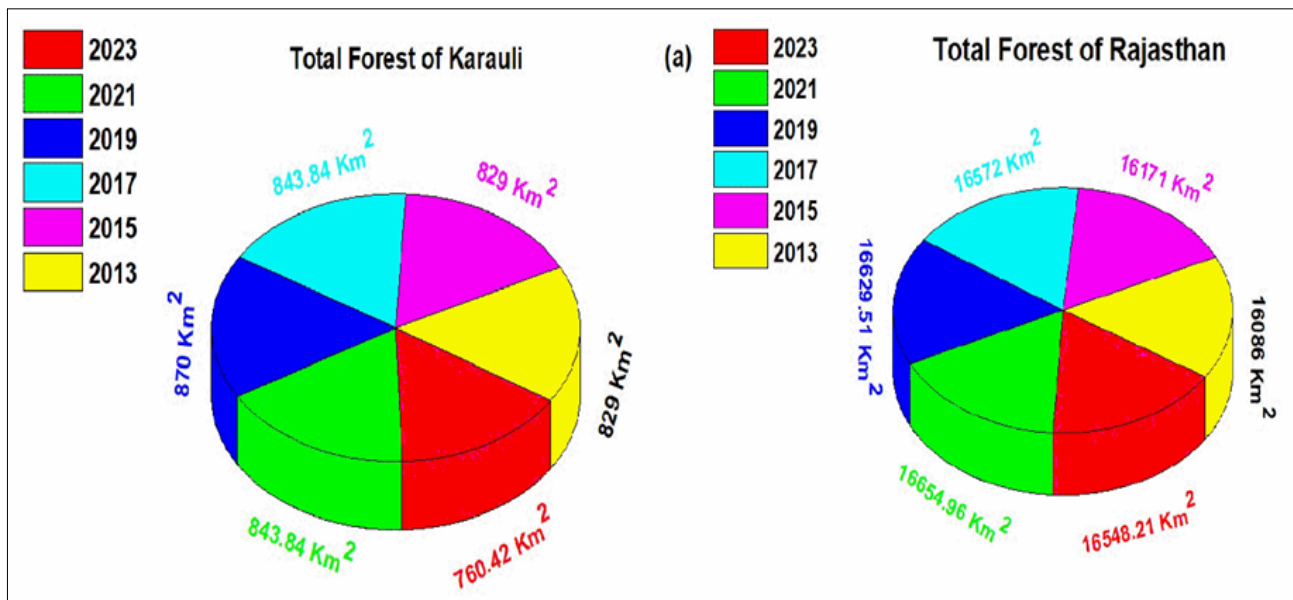


Fig 4: Comparatively Forest Cover Map of Rajasthan and Karauli

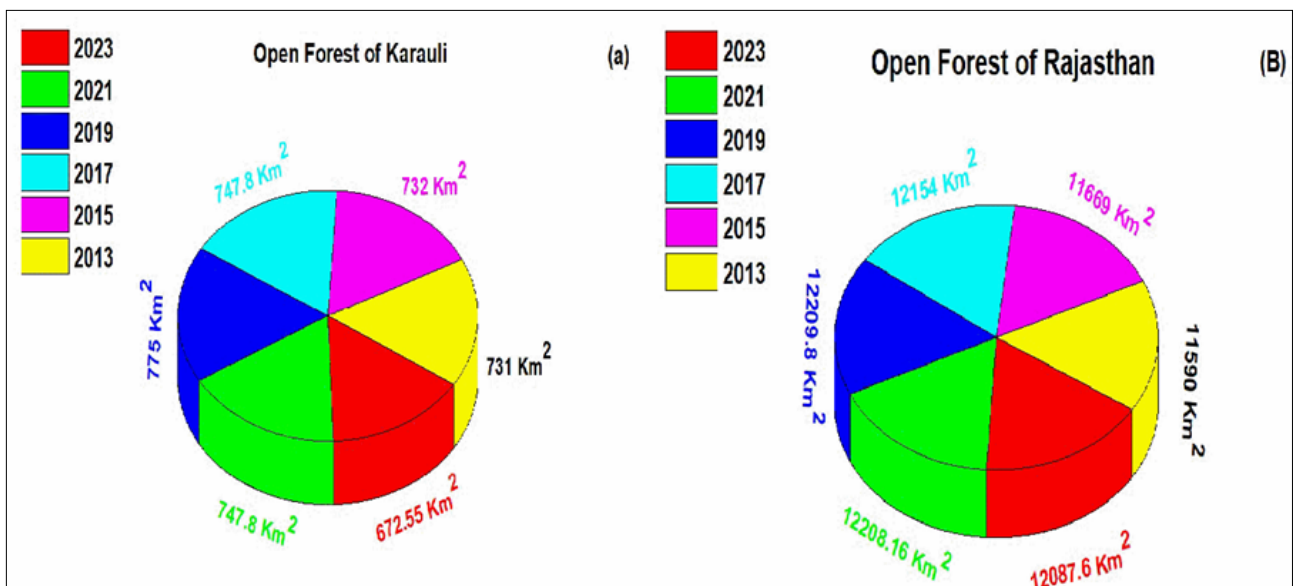


Fig 5: Comparatively Open Forest Cover Map of Rajasthan and Karauli

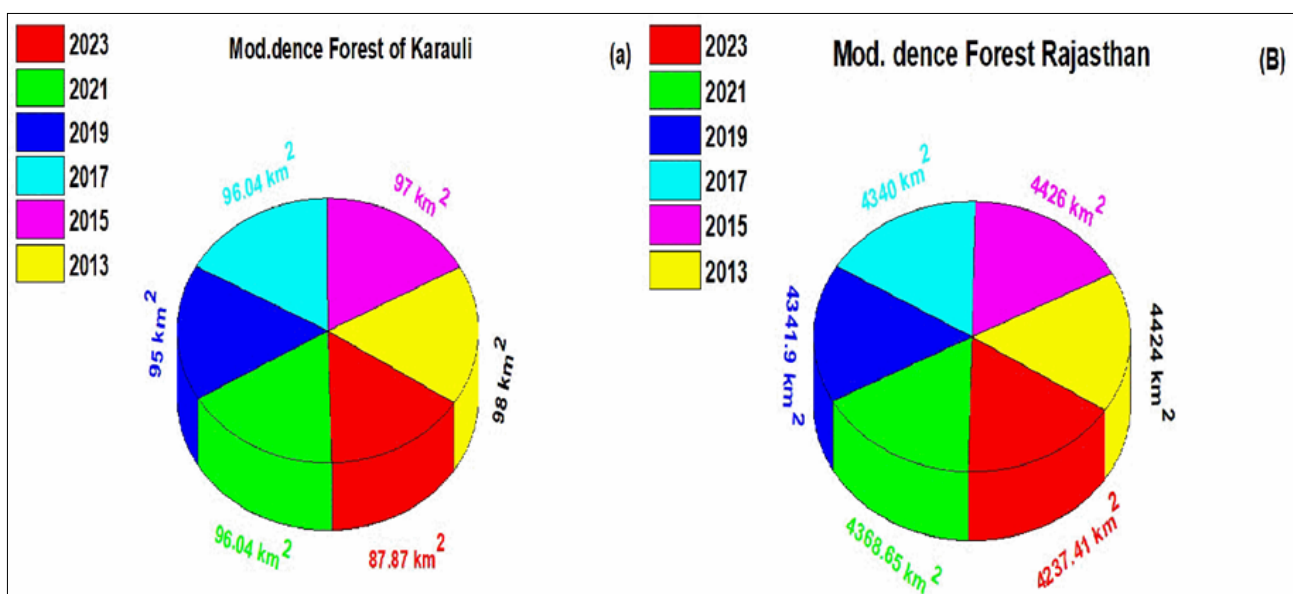


Fig 6: Comparatively Moderate Forest Cover Map of Rajasthan and Karauli

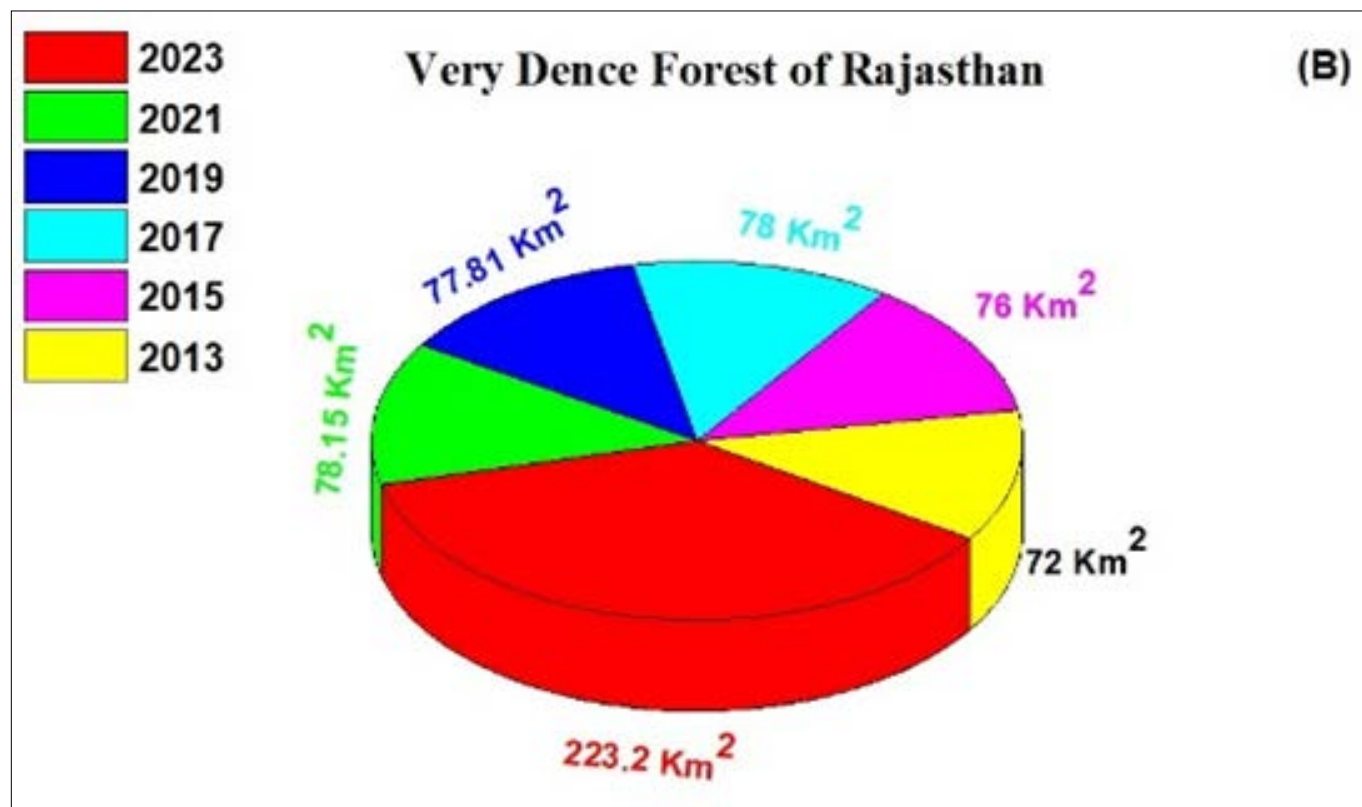


Fig 7: Very Dense Forest Cover Map of Rajasthan

2. Study of Change in Forest Area from 2013 to 2023 ^[2, 8]

Table 1: Index of Changing in Forest Area of Karauli from 2013-2023 ^[2, 8] in km² (Source-ISFR report).

Year	Geographical Area by SoI	Very Dense Forest	Moderate Forest	Open Forest	Total Forest	%of Geographical Area
2023	5,008.09	0	87.87	672.55	760.42	15.18
2021	5524	0	96.04	747.8	843.84	15.28
2019	5524	0	95	775	870	15.75
2017	5524	0	96.04	747.8	843.84	15.28
2015	5043	0	97	732	829	16.44
2013	5043	0	98	731	829	16.44

Table 2: Index of Changing in Forest Area of Rajasthan from 2013-2023 ^[2, 8] in km² (Source-ISFR report).

Year	Geographical Area by SoI	Very Dense Forest	Moderate Forest	Open Forest	Total Forest	% of Geographical Area
2023	342239	223.2	4,237.41	12,087.60	16,548.21	4.84
2021	342239	78.15	4368.65	12208.16	16654.96	4.87
2019	342239	77.81	4341.9	12209.8	16629.51	4.86
2017	342239	78	4340	12154	16572	4.84
2015	342239	76	4426	11669	16171	4.73
2013	342239	72	4424	11590	16086	4.7

The Geographical area of karauli district is 5008.09 square km after resettlement of district boundary, before resettlement geographical area of karauli district was 5524 square km. It has no very dense forest area, moderate forest area was 98 square km in 2013, 97 square km in 2015 ^[2, 3], 96.04 square km in 2017, 95 square km in 2019, 96.04 square km in 2021, 87.87 square km in 2023. Open forest area was 731 square km in 2013, 732 square km in 2015 ^[2, 3], 747.8 square km in 2017, 775 square km in 2019, 747.8 square km in 2021, 642.55 square km in 2023. Total forest area was 829 (16.44%) square km in 2013 ^[2], 829 (16.44%) square km in 2015, 843.84 (15.28%) square km in 2017, 870 (15.75%) square km in 2019, 843.84 (15.28%) square km in 2021, 760.42 (15.18%) square km in 2023. (Forest Survey of India, 2013, 2015, 2017, 2019a, 2019b, 2021, 2023 ^{[2, 3, 4, 5, 7,}

^{8]}; Rajasthan Forest Department, 2021, 2025 ^[10, 11]; Rajasthan Forest Department, 2025) ^[11]

On the basis of the Forest Survey of India's (FSI) ISFR reports (2013, 2015, 2017, 2019, 2021 and 2023) ^[2, 3, 4, 5, 7, 8] and the Rajasthan Forest Department reports (2020-21, 2021-22, 2022-23, 2023-24 and 2021 ^[8, 10]-22), status of Karauli District show high Forest Percentage, in the terms of the proportion of geographical area, Karauli ranks among the leading districts in Rajasthan with the highest forest cover with 15.83%. Whereas the forest cover across Rajasthan is only 4.83%. Total forest cover area was around 829 sq. km in 2013, whereas in the report of 2023 ^[2, 8] recorded total forest cover was 760.42 sq km. Over the past decade, the district has witnessed a slight decline in actual

forest cover, primarily due to the degradation of open forests and pressures arising from local development activities or mining.

Forest cover break down change in Rajasthan (2021-2023) ^[8, 10]

According to the comparison of ISFR (2021) and ISFR-2023 shows that net change in forest cover was decline by 83.80 km² in 2023 ^[9] but net change in forest cover and tree cover Rajasthan added 394.5 km² (26995 km² in 2021 ^[10] to over 27389 km² in 2023) and ranked 6th in all over India. Very dense forest increased by 145.05 km², moderately

dense forest decrease by 131.24 km² and open forests declined by 120.56 km² due to plantation and protection activities.

Forest cover break down change in karauli (2021-2023) ^[7, 8]

According to the ISFR (2021) and ISFR-2023, net change in forest cover was decline by 3.69 km² in 2023 ^[9]. Karauli has zero Very dense forest, moderately dense forest decrease from 843.84 km² (ISFR 2021) ^[7] down to 760.42 km², open forest decrease from 747.8 km² (ISFR 2021) ^[7] down to 672.55 km².

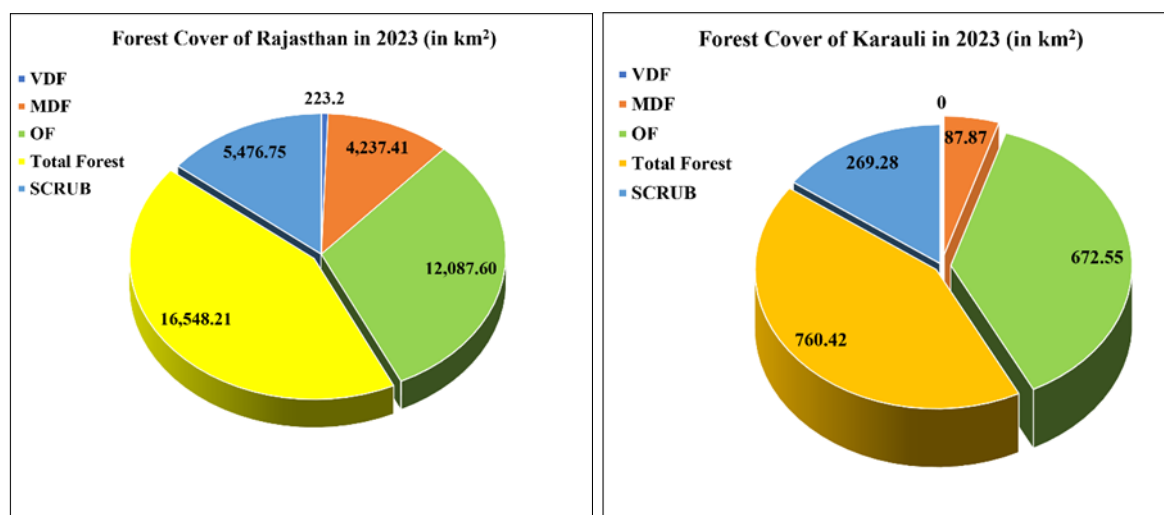


Fig 8: Class wise Forest Cover of Rajasthan and Karauli in 2023 ^[9] (in km²)

Conclusion

Based on assessments from ISFR (2021) and ISFR-2023, a comparison of forest cover changes in Rajasthan showed a decline in forest cover by 3.69 km² in Karauli and Rajasthan decline in forest cover by 83.80 km², but net change in forest cover and tree cover Rajasthan added 394.5 km². While Karauli district has consistently shown a decline in both the percentage and total geographical area of forest cover, Rajasthan had witnessed continuous growth in these metrics from 2013 onwards; however, the 2023 report indicates a decrease in both the percentage and total geographical area of forest cover. Impact of deforestation and decline in forest cover change has significant socio-economic consequences, such as climate change, the loss and destruction of natural habitat, the loss of water and forest resources, drought conditions, soil erosion, and air pollution. So, there is an urgent and critical need to raise awareness about the importance of forests and their sustainable use. Furthermore, it is recommended that corrective measures be taken to minimize the adverse effects caused by deforestation.

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