



REGIONAL CLASSIFICATION AND DYNAMICS OF COMMON FOREST AND LAND RESOURCES IN INDIA: AVAILABILITY AND CHANGING PATTERNS

Uma Nag¹ & Dr. Navin Kumar Rajpal²

RESEARCH ARTICLE



Author Details:

¹ Research Scholar,
Department of Economics,
Sidho-Kanho-Birsha University,
Purulia, West Bengal, India;

² Assistant Professor,
Department of Economics,
Sidho-Kanho-Birsha University,
Purulia, West Bengal, India

Corresponding Author:

Uma Nag

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Abstract

In India, common property resources, especially forests and grazing areas, have been historically essential to rural livelihood. These resources contribute to the overall ecological balance in addition to supporting cattle and crops. However, over the years, there have been significant fluctuations in the availability of common forest and land resources in India due to growing population pressures, destruction of forests, land use changes, and industrial expansion. This study presents a comprehensive regional classification of common forest and land resources in India, and analyses their availability and changing patterns over the time period. Data from the India State of Forest Reports (ISFR) and the Directorate of Economics and Statistics are analysed to understand the variations and their changing patterns of forest cover, and in different land uses. To differentiate all the states and union territories of India, a regional approach is adopted with special consideration. To quantitatively assess interactions among different land use categories, Pearson's Correlation Matrix is applied. Further, the study provides insights into how these changes influence resource management strategies and policy-making.

Keywords: Common forest resources, land resources, regional assessment, changing patterns, Pearson's Correlation Matrix

Introduction

Natural resources are considered assets that arise spontaneously, implying humans have no role in creation but have exploited them for economic production and consumption needs. Land, water, forest, atmosphere, and biodiversity are the natural resources considered essential for survival. Furthermore, these essential natural resources make a significant contribution to the rural economy by providing sustenance to the rural inhabitants.

India's rural economy relies heavily upon common property resources (CPR), as 48 percent of rural households derive their livelihoods from the different common property resource materials (National Sample Survey Organisation, 1999). CPRs, in addition to consumption needs, also provide a source of employment and revenue in the rural economy (Adhikari, 2005; Jodha, 1986; Sahoo & Swain, 2013). Several studies classified CPRs into three major categories, i.e., land, forests, and water resources. From the perspective of India, there exist several types of common property resources, e.g., community pasture, community forests, wastelands, common dumping and threshing grounds, watershed drainages, rivers, rivulets, and their banks, beds, and village ponds (Jodha, 1990). Moreover, CPRs also include village forests and woodlots, protected and unclassified government forests, water reservoirs, canals, tanks, and irrigation channels (NSSO, 1999). Further, the NSSO (1999) report estimates the availability of common property land resources in rural India, based on the data collected using the *de jure* approach, as shown in Table 1.

As per the *de jure* approach, the above items are included in the common property land resources (CPLRs). In India, 15 percent of the total geographical area is under Common Property Land Resources. Furthermore, community pastures and grazing grounds, village woods and woodlots, and village sites are also covered by the Common property land resources, over which the villagers have legal control. On the other hand, all Panchayat lands that have been leased to an individual or organisation are included in this category except for Government Forest and Revenue land. The CPLRs are generally accessed and managed by the rural communities, such as village panchayat grazing land or pasture land, village forest and woodlot, van panchayat forests, and village sites and threshing floors (NSSO, 1999) also tremendously benefited the life and the economy of rural households. Apart from the dependency on agriculture and extraction from common property forest resources, a large part of the rural

population is dependent on animal husbandry to sustain their livelihood. As a result, most of the herdsmen rely on grazing land or pasture to supply fodder.

CPRs in India, particularly forests and lands, especially grazing and barren land, are the backbone of rural economies, providing essential resources for agriculture, livestock, and daily sustenance. Despite their importance, these resources have become increasingly strained due to population growth, deforestation, changing land-use patterns, and so on. This paper thus explores the classification and evolving patterns of CPRs in India, focusing on forests and land, and the drivers behind their transformation over the decades.

Table 1: Availability of common property land resources in rural India

<i>Items</i>	<i>Estimate</i>
<i>1. Percentage of common property land resources in total geographical Area</i>	15
<i>2. Common property land resources per household (ha)</i>	0.31
<i>3. Average household size</i>	5.04
<i>4. Common property land resources per capita (ha)</i>	0.06
<i>5. Components of common property land resources: (Percentage)</i>	
• <i>community pastures and grazing grounds</i>	23 (3.45 %)
• <i>village forests and woodlots</i>	16 (2.40 %)
• <i>other</i>	61 (9.15 %)

Note: The figures in parentheses in Item 5 represent percentages to geographical area.

Source: NSS 54th Round, 1998

Objectives

- To assess the availability of common forest and land resources across different regions of India.
- To analyse the changing patterns in the availability of these resources over the selected periods.
- To understand the correlation between different land uses in India.

Literature Review

Numerous researchers and policymakers have explored various aspects of common property forest and land resources, such as their availability, patterns of usage, legal and policy frameworks, and the challenges posed by changing land use dynamics. This literature review synthesizes key academic contributions on the subject i.e. focusing on regional classifications, disparities, resource availability and accessibility, and the changing patterns of these crucial resources in India. Iyengar (1989), in his study mainly highlighted the changing size, status, and use of the CPR land in Gujarat. The prior research revealed that over the last few decades (1960 to 1985-86) the CPR land in Gujarat was substantially reduced due to privatisation through encroachment. Moreover, the study asserted, that extensive use of CPR land and for over-exploitation environmental degradation has also occurred. Meiyappan et al. (2016) explore the dynamics and determinants of land change in India, integrating satellite data with village-level socio-economic indicators. It seeks to provide insights into the patterns of forest degradation, agricultural expansion, and urban encroachment over the last two decades, while examining the socio-economic drivers that underlie these changes. After analysing the India State of Forest Reports (ISFR) from 2001 to 2017, Talukdar (2018) found that a negative change in forest cover, which indicates deforestation. Takle et al. (2007) found that during the 30 years from 1970–71 to 1999–2000, Maharashtra’s land use change showed a positive and significant growth rate in land under non-agricultural uses (1.46%), miscellaneous tree crop (1.65%), and both fallows (3.24%), while forest (-0.16%), barren and uncultivable land (-0.49%), and permanent pasture land (-1.47%) showed negative and significant growth over time. Similarly, Gharke et al. (2013) examined land use data in Maharashtra state over 20 years, from 1990–1991 to 2009–2010, using the compound growth rate. Areas under non-agricultural use, permanent pastures, bare land, present fallow, areas seeded more than once, and gross cultivated area were found to have expanded significantly.

Additionally, Reddy (1991) found that the degree of Andhra Pradesh’s adoption of contemporary technology, such as tractors, irrigation, commercialization, etc., had a major impact on the land use pattern. Similarly, Wani et al. (2009) found that the growth in the rural population relative to the cultivated land had significantly increased the area currently covered by fallows in Jammu & Kashmir. According to Sinha et al. (2017b), the region of Bihar’s land use pattern was altered by urbanization, population growth, land holding fragmentation, and a dropping water table. Additionally, it was found by Sinha et al. (2017a) and Ahmad et al. (2018) that the level of current fallows was significantly influenced by road length and rainfall. Kannan et al. (2011) found that the decline trend of common land was three times over the period 1950-51 to 2000-2001, due to the conversion of common land to private land by the growing population of both humans and animals. Arnold (1993) also found the same that common property resources continuously decrease due to deterioration of the traditional product and management system. Further, he pointed out several reasons for CPR degradation, such as increasing population pressure, technological change, social and political change, and the migration of outsiders, etc. The study of Kannan et al. (2018) analysed the availability of common property land resources in the rural areas of Tamil Nadu state and further classified them into common land and private land. His study also depicted the declining pattern over the period in that state.

Data Sources

The study is entirely based on secondary sources obtained from various authorised national sources. Forest cover data are drawn from the India State of Forest Reports (ISFR), published by the Forest Survey of India (FSI), during the period from 2001 to 2021. These reports provide consistent and comprehensive information about the forest cover and different tree resources, their density classes in Indian states and union territories. Data on land use statistics are obtained from the Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare, during the period from 2012-13 to 2021-22. This report contains state-wise data on various land use classifications in detail. Together, both datasets are crucial for the regional assessment of forest cover and land use over time.

Regional Classification

To facilitate a systematic analysis of forest cover and land-use dynamics at the state level, the study classifies India into the Southern, North-Eastern region, Eastern region, Western region, Northern, Central region, and Union Territories. This regional classification framework is primarily based on cardinal direction grouping, establishing distinct and non-overlapping regional boundaries, therefore preventing ambiguity among states and maintaining uniformity in regional comparisons. Table 2 below shows the regional classification of India based on cardinal direction grouping.

Table 2: Regional classification of India based on cardinal direction grouping

Region	States included
Southern Region	Andhra Pradesh, Telangana, Karnataka, Kerala, and Tamil Nadu
North-East Region	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura
Eastern Region	Bihar, Jharkhand, Odisha, and West Bengal
Western Region	Goa, Gujarat, and Maharashtra
Northern Region	Haryana, Himachal Pradesh, Punjab, and Rajasthan
Central Region	Chhattisgarh, Madhya Pradesh, Uttar Pradesh, and Uttarakhand
Union Territory	Andaman & Nicobar Islands, Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Delhi, Lakshadweep, Puducherry, Jammu & Kashmir, and Ladakh

Methodology

To assess the availability and changing patterns in Common Forest and Land Resources of the different states and union territories of India, a regional approach is adopted with special consideration, and all the regions are classified as the Southern Region, North-Eastern Region, Northern Region, Eastern Region, Western Region, Central Region, and Union Territories. A comparative regional analysis is conducted to classify the regional disparities in resources and examine their availability trends. To quantify the forest and land resources in each region, a simple percentage analysis is used, and a Pearson's correlation matrix is applied to evaluate the relationship between various land uses.

An Overview of Forest Cover in India

The forest sector is the second-largest land use in India, after the agriculture sector, and more than 300 million tribals and other local people depend on the forest fringes. Two key concepts are widely used by the ISFR to assess the extent of forest: Forest Cover (FC) and Recorded Forest Area (RFA), which differ in definition, scope, and purpose.

The ISFR defines Forest Cover as any area of land that has at least one hectare or more in size, having a tree canopy density of more than 10 percent, regardless of land use, ownership, and legal status. Forest Cover in India is further classified into five major categories for assessment by the Forest Survey of India (FSI), as shown in Table 3. In every subsequent gap of two years, the FSI publishes a comprehensive and comparative study on India's forest and tree resources assessed through the remote sensing-based methodology.

On the other hand, Recorded Forest denotes such geographical areas recorded as forests and under the government records. It mainly includes three legal categories: Reserved forests, Protected Forests, and Unprotected Forests. However, RFA is a more administrative and legally documented area than FC.

Meanwhile, forest cover represents the actual biophysical presence of trees and captures the changes like afforestation, deforestation, and degradation. So, for this study, our prime focus is only on the Forest Cover. The overall forest cover in India, as estimated by the Forest Survey of India, is 7,13,789 sq km, which is 21.71% of India's total Geographical Area (GA). According to the FSI's most recent evaluation, 99,779 sq km (3.04%), 3,06,890 sq km (9.33%), and 3,07,120 sq km (9.34%) of land have come under Very Dense Forest (VDF), Moderately Dense Forest (MDF), and Open Forest (OF), respectively. Table 3 shows that 43.03% of the Total Forest Cover (TFC) is enclosed by OF, followed by MDF (42.99%) and VDF (13.98%). This indicates that the majority of India's land is classified as OF and MDF, while only a small portion is classified as VDF. Furthermore, Scrub areas are recorded but not recognized as part of the forest cover, although they are estimated by the FSI to account for 1.42% (4,6,539 sq. km) of the total geographical area.

Table 3: Forest cover of India (in sq km)

Class	Area	Percentage of GA	Percentage of TFC
VDF	99,779	3.04	13.98
MDF	3,06,890	9.33	42.99
Open Forest	3,07,120	9.34	43.03
Total Forest Cover (TFC)	7,13,789	21.71	100
Scrub	4,6,539	1.42	
Non- forest	25,27,141	76.87	
Total Geographical Area (GA)	32,87,469	100.00	

Source: ISFR, 2021

Regional distribution of India's Forest Cover and its Changing Patterns

India exhibits substantial regional disparities due to wide variations in physiography, climate, land use patterns, etc. Consequently, forest cover is not evenly distributed across the different states of India and shows distinct regional concentration and characteristics. Therefore, a region-wise distribution has been analysed in this study to prevent ambiguity among states and maintain uniformity in regional comparisons. A region-wise distribution of forest coverage is shown in Table 4. In 2001, India's total forest cover (TFC) was 6,75,538 sq. km., accounting for 20.55 percent of the total geographical area. By 2021, that amount had exceeded by 38251 sq. km., representing 21.71 percent of the total geographical area. A slight fluctuation in forest area coverage was observed from 2001 to 2013. Comparing 2015 w.r.t the previous year (2013), there was a 5.43 percent increase, indicating a favourable and noteworthy growth. Nevertheless, the forest area decreased after 2015, but there was a notable increase observed from 2017 to 2021. Significant regional variation in India's forest cover occurred over the two decades (from 2001 to 2021), indicating diverse environmental and socioeconomic circumstances around the nation.

In terms of regional classification, a consistent and significant rise in forest cover has been observed in the Southern part of India from 2001 to 2021, which accounts for 15.78 percent of positive growth. The state's afforestation initiatives and improved conservation efforts are probably to blame for the notable increase observed between 2017 and 2021. Further, the North-Eastern region witnessed a tendency of fluctuation, from 2001 to 2007. It peaked in 2015 at 2,06,058 square km, then it started to decline gradually. In 2021, it decreased by 1020 square km. In these environmentally vulnerable areas, shifting cultivation, deforestation, and changes in land use may be the cause of this loss. Additionally, the Eastern region showed a moderate increase in forest cover, from 87,888 sq. km. (2001) to 1,00,090 sq. km. (2021), a positive growth of approximately 13.9%. The consistent rise indicates the region's positive efforts in forest management and rehabilitation. Throughout the year, the Western region displayed only a marginal increase. This 5 % growth reflects the challenges of expanding forest cover in this arid and less forested area of India. The Northern region also showed a fluctuating tendency, forest cover decreased from 2001 to 2003, after that it has increased gradually, and insufficient positive growth has been found (1.82 percent) in 2021 w.r.t 2001, which highlights conservation initiatives in hilly and mountainous areas. On the other side, forest cover of Central region remained relatively stable, with minor variations over time, reflecting balanced forest management in this key forest belt of India. Additionally, the forest cover in the Union Territories also remained mostly unchanged, showing minimal variation over the period, with 8.24 percent positive change in 2021 w.r.t 2001. Moreover, an overall 5.66 percent positive growth of TFC has observed in India.

Table 4: Region-wise distribution of Forest cover in India (in sq. km.)

Year \ Region	2001	2003	2005	2007	2009	2011	2013	2015	2017	2019	2021	% Change of 2021 w.r.t. 2001
Southern Region	118670	119088	118262	121954	123735	123508	124014	128020	132988	135802	137400	15.78
North- East Region	169366	173297	173316	173780	173768	173219	172592	206058	171306	170541	169521	0.09
Eastern Region	87888	88983	88957	91547	91547	91720	97916	97948	99044	99438	100090	13.88
Western Region	64729	63967	64355	67421	67482	67484	67504	67512	67668	67872	67968	5.00
Northern Region	34913	33276	33364	33962	33962	34138	34127	34222	35097	35515	35548	1.82
Central	171397	171010	170445	172406	172214	172208	172000	171749	171935	172202	172333	0.55
Union Territory	28575	28712	28389	29829	29686	29750	29745	30258	30505	30879	30929	8.24
Total	675538	678333	677088	690899	692394	692027	697898	735767	708543	712249	713789	5.66

Source: India State of Forest Report

An overview of Land use classification in India

Land is a limited resource on the Earth and is used for multiple activities. This resource is simultaneously utilized by humans as well as other living beings, including livestock and wildlife, for both subsistence and ecosystem sustainability. Land resources are generally managed by human societies to support economic production and environmental conservation.

Land use classification is the systematic grouping of land based on its current use and management. The Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare, published land use statistics for all-India and state-wise land-use classifications. These statistics are crucial for understanding the utilization pattern of land and its current scenario. Thus, they are especially important for policymakers in making decisions about resource allocation, development, and environmental management. In India, land is classified into nine broad categories, covering 305 million hectares of reported area, while the remaining 24 million hectares are considered non-reported (7 percent of the total land area). These reported areas are classified under nine broad heads. The nine-fold classification is explained in Table 5:

Table 5: The concept and definition of the nine-fold land use classification

Sl. No.	Land Use	Concepts and Definition
1.	Forest Land (FRL)	The land is identified as forest under any legal act and administered as forest, whether state-owned or private. Also include those cropped areas raised in forest and grazing lands, or that open area used for grazing within the forests.
2.	Area under non-agricultural uses (NAU)	Includes those lands which are occupied by buildings, roads, railways, or under water (river, canals, etc.) and the lands used for non-agricultural purposes.
3.	Barren and Unculturable land (BUL)	It comprises the land covered by mountainous terrain, deserts, and other such areas, which are not suitable for cultivation except at an exorbitant cost, and is classified as unculturable land.
4.	Permanent pasture and other grazing land (PPGL)	Includes all the grazing lands, whether they are permanent pasture or not. Also, cover the village common grazing land in this.
5.	Land under miscellaneous tree crops and groves etc. (MTG)	Comprises all the cultivable land which is not included in Net Area Sown but is used for some agricultural purpose. The land that is not under Orchards (like casuarina trees, bamboo bushes, thatching grasses, and other groves for fuel, etc.) is also under this category.
6.	Culturable Waste Land (CWL)	Consider those lands which are available for cultivation, and include those lands either cultivated for once or not cultivated for five years or more in succession. Include such lands may be either fallow or covered with shrubs and jungles, which are unused.
7.	Fallow Lands other than current Fallows (FL)	The cultivable lands that are left temporarily for a period not less than one year or not more than five years.
8.	Current Fallows (CF)	The cropland is left uncultivated during the current year.
9.	Net Area Sown (NAS)	Includes the total area that is sown with crops and orchards more than once in the same year, counted only once.

The current data of the Directorate of Economics and Statistics (2022-23) revealed that the total reported area by all states and union territories accounts for 306650 thousand hectares, which is 93.28 percent of the total geographical area (328755 thousand hectares). The following Pie Chart (Fig 1) shows that the majority of land is occupied by Net Area Sown. In 1950-51, forest land was 14.24 percent; it has increased to 23.49 percent in 2022-23. According to the Forest Research Institute, Dehradun, predicted that the increase in forest cover has been achieved by planting more trees outside the forests, near the highways, or in the agroforestry sector. Further, only 9 percent of the total geographical area is under non- agricultural uses. The barren land was recorded as 13.42 percent in the year 1950-51, and reduced to 5.4 percent in 2022-23. This reduction is due to an increase in some developmental and economic activities in such areas. The remaining land use has contributed to a negligible percentage share of the overall geographical area.

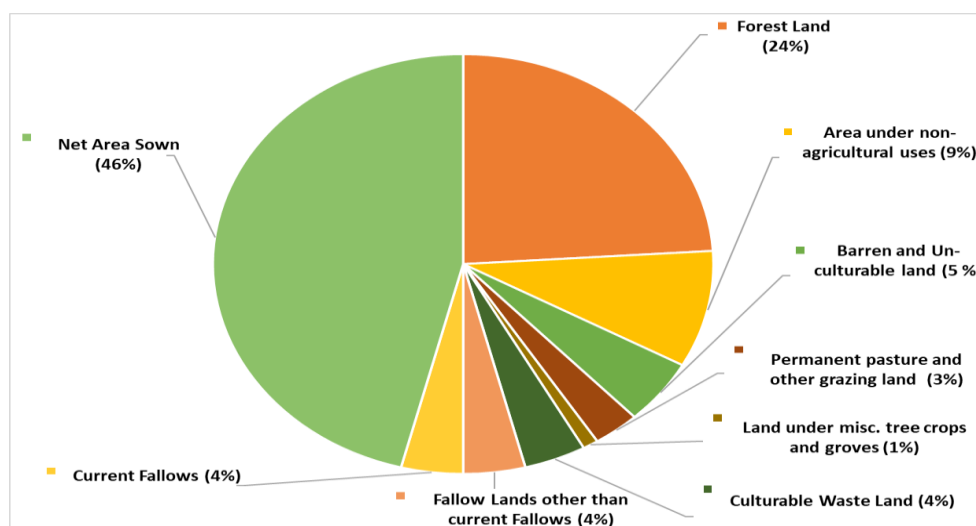


Fig 1: Percentage of Land Use Classification (2022-23)

Barren and Uncultivable Land and Permanent Pastures and Other Grazing Lands in India

This study only highlights two land uses among nine land use classifications: Barren and Uncultivable Land availability and Permanent Pastures and Other Grazing Lands. These lands are taken into consideration for this paper, as they are the most crucial components of common land use systems, and are generally accessible to the local communities for various collective purposes. Although these lands are not suitable for cropping, they often support grazing and livestock rearing by providing essential fodder and supporting pastoral and mixed farming livelihoods.

Region-wise Barren and Uncultivable Land availability in India, its trend and Changing Patterns

To ensure accuracy and reliability of the analysis, certain States and Union Territories were excluded from the study due to the non-availability of data for certain time periods in the Directorate of Economics and Statistics (2022–23), such as Telangana is excluded from the Southern region; similarly, Sikkim and Tripura from the North-East Region, Goa from the Western Region, and Chandigarh, Dadra & Nagar Haveli, Daman and Diu, Lakshadweep, and Ladakh from the Union Territory.

Table 6: Region-wise Barren Land availability in India (in thousand Hectares)

Regions \ Years	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	% Change (2021-22 w.r.t. 2012-13)
Southern Region	3251	2629	2639	2611	2608	2606	2582	2556	2545	2545	-21.73
North- East Region	1379	1378	1366	1375	1367	1392	1391	1393	1385	1353	-1.89
Eastern Region	2120	2063	2089	1316	2056	2001	2036	1972	2129	2004	-5.48
Western Region	4036	4038	4125	3839	3896	3904	3926	3959	4039	4055	0.48
Northern Region	3339	3334	3353	3333	3341	3319	3487	3373	3339	3344	0.17
Central	2383	2328	2335	2329	2309	2349	2329	2328	2288	2256	-5.34
Union Territory	326	326	324	324	323	323	328	317	315	315	-3.44
Total	16833	16095	16232	15128	15900	15894	16077	15898	16040	15871	-5.72

Source: Directorate of Economics and Statistics, 2023

Table 6 shows the regional trend of Barren and Uncultivable Land and its changing patterns. The data revealed a considerable regional variation over the period. The Southern Region shows the most pronounced decline. It decreases approximately 706 thousand hectares from 2012-13 to 2021-22, representing a decrease of 21.73 percent, indicating a substantial contraction over the period. In contrast, the North-Eastern Region remains relatively stable, with only a marginal decline of 1.89 percent, suggesting limited long-term fluctuation. Both the Eastern Region and Central Region record moderate reductions of 5.48 percent and 5.34 percent, respectively, reflecting gradual downward trends. The Western Region exhibits a slight increase from 4,036 to 4,055, i.e., 0.48 percent growth, making it the only region with a net positive change. Similarly, the Northern Region remains almost unchanged, with a marginal increase of 0.17 percent, indicating overall stability. Furthermore, a decreasing trend has shown in Union Territories, i.e., 3.44 percent. Despite the regional variations, the total declines at the national level from 16,833 (2012–13) to 15,871 (2021–22) thousand hectares, representing an overall fall of 5.72 percent. The overall data reflects both the regional geographic conditions and land use patterns in India. Regions with severe climates or challenging terrains, such as the

Western and Northern Regions, show relatively stable or increasing barren land, while areas like the Central and Southern Regions, which may have more scope for reclamation, show a decrease. These changes are influenced by a variety of variables, including government initiatives, urbanization, industry, sustainability concerns, and efforts to rejuvenate barren land.

Regional distribution of Permanent Pastures and Other Grazing Lands availability in India and its Changing Patterns

After analyzing the areas under Barren and Uncultivable Land across different regions of India, the same approach of excluding the States and Union Territories was also applied to analyze Permanent Pastures and Other Grazing Lands. The data is not available for Kerala, Telangana, Meghalaya, Nagaland, Sikkim, Chandigarh, Dadra & Nagar Haveli, Daman and Diu, Lakshadweep, Puducherry, and Ladakh. Permanent pastures and grazing lands are crucial for livestock rearing, especially in rural areas, where they support livelihoods by providing fodder.

Regions \ Years	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	% Change (2021-22 w.r.t. 2012-13)
Southern Region	1532	1228	1226	1226	1224	1222	1189	1185	1183	1185	-22.69
North- East Region	200	200	199	198	201	211	203	204	205	205	2.49
Eastern Region	668	656	656	1021	640	656	667	683	687	657	-1.61
Western Region	2048	2045	2039	2055	2155	2093	2128	2161	2154	2154	5.16
Northern Region	3239	3241	3218	3204	3206	3202	3249	3346	3326	3278	1.21
Central Region	2405	2430	2447	2448	2450	2494	2482	2507	2379	2425	0.82
Union Territory	118	118	116	114	115	112	112	111	111	110	-6.64
Total	10210	9918	9899	10267	9991	9990	10029	10197	10046	10013	-1.93

Source: Directorate of Economics and Statistics, 2023

The above Table 7 shows the regional distribution of Permanent Pastures and Other Grazing Lands availability in India, its trend, and Changing Patterns. The table depicts the regional trends from 2012–13 to 2021–22 with noticeable variation across regions. The Southern Region records the largest decline, decreasing by 22.69 percent, reflecting pressure from other land uses such as agriculture, urbanization, or land degradation. The Union Territories also show a moderate decline of 6.64 percent, indicating a substantial contraction over the decade. In contrast, several regions exhibit marginal growth, like the Western Region, which records the highest increase (5.16 percent), possibly due to policy efforts aimed at conserving grazing resources, which are essential for livestock-based livelihoods. The North-Eastern Region shows a small positive change (2.49 percent) while the Northern Region (1.21 percent) and Central Region (0.82 percent) remain largely stable with slight increases. The Eastern Region experiences a marginal decline of 1.61 percent, indicating relatively stable conditions with minor fluctuation. At the national level, the total decreases slightly by 1.93 percent, suggesting that overall change during the period is modest, with regional gains in some areas partially offsetting declines in others. Managing these lands is crucial for sustaining livestock, ensuring the livelihood of rural communities, and maintaining the ecological balance, particularly in regions heavily reliant on grazing land for livestock rearing.

Correlation between Different Land Use (2012-13 to 2021-22)

A Pearson’s Correlation Matrix is used to assess the degree and direction of association among various land-use classifications. This matrix reflects how the expansion of one land-use type is associated with expansion or contraction in other land uses.

Table 8 provides insight into how land use types in India are correlated to each other (2012-13 to 2021-22). A significant positive correlation has found between FRL and FL (0.645, $p < 0.05$), which shows that areas with larger forest land also have more long-term fallow land. Generally, such land is often located near forest areas and is less suitable for intensive farming. Expansion of farming will probably result in the contraction of forest land. However, it shows a positive relationship with FL and other developed areas, indicating the close association between forest land, land productivity, and human land-use decisions. Further, the correlation reveals that NAU has a significant negative correlation with BUL and CWL (-0.681, $p < 0.05$ and -0.786, $p < 0.01$, respectively). As land is diverted to NAU, like urbanisation, infrastructural development, industry, etc., both BUL and CWL have declined, because these lands are a prime target for conversion into industrial, mining, and urban use. On the other hand, NAU has a significant positive correlation with PPGL, since these lands are socially sensitive and are less frequently converted directly. BUL has a positive but insignificant relationship with CWL. Barren land tends to coincide more with wasteland, due to several environmental constraints such as poor quality of soil, water scarcity, etc. The negative correlation between PPGL and CWL shows that many waste lands are being brought under grazing use for livestock. At the same time, due to the overuse of grazing land and improper management, they can lose productivity and turn into the wasteland category. A significant positive correlation between CWL and CF indicates that the less productive lands are often classified as wasteland. Both FL and CF have a strong negative correlation with NAS (-0.913, $p < 0.01$), which reflects agricultural intensification. The lands that were earlier kept as fallow land are now being brought for cultivation due to better irrigation, use of fertilizer, etc. The interrelationships

between land use changes are well depicted in the table below, which also shows the trade-offs between agricultural development and other land uses, particularly forest, grazing, and barren land.

Table 8: Correlation between Different Land Use (2012-13 to 2021-22)

Land use classifications	FRL	NAU	BUL	PPGL	MTG	CWL	FL	CF	NAS
FRL	1								
NAU	0.581	1							
BUL	-0.449	-0.681*	1						
PPGL	-0.039	0.669*	-0.411	1					
MTG	-0.087	-0.414	0.240	-0.109	1				
CWL	-0.179	-0.786**	0.627	-0.738*	0.625	1			
FL	0.645*	0.337	-0.341	0.261	0.355	0.003	1		
CF	0.298	-0.340	0.129	-0.480	0.625	0.740*	0.560	1	
NAS	-0.560	-0.115	0.158	0.013	-0.473	-0.331	-0.913**	-0.823**	1

**& * Correlation is significant at the 0.01 level & 0.05 level (2-tailed).

Source: Author's Calculation

Conclusion

Concerning the common forest and land resources, especially the barren and permanent pasture and other grazing lands, this paper provides a comprehensive overview of regional disparities in distribution, their trends, and changing patterns. In India, these resources are highly diverse due to the country's unique geographical area and climate. The findings reveal significant regional disparities in resource availability, with some regions experiencing positive trends in forest cover while others face ongoing deforestation and land degradation. Due to urbanization, industrialization, climate change, and also due to population pressure, India's forest and land resources are at risk. The study has found the highest positive change (15.78 percent) of forest cover in the Southern region of India, whereas the lowest change (0.09 percent) was found in the North- East Region from 2001 to 2021. Moreover, again in the Southern part of India, the Barren and Unculturable Land reduced more, i.e., 21.73 percent, from 2012-13 to 2021-22. Additionally, this land has increased by a negligible amount in the Western and Northern Region during that period. Unexpectedly, the Permanent Pastures and other Grazing Land have reduced more in the Southern Region (22.69 percent), whereas in the Western Region it has increased more (5.16 percent). Although the forest cover at the national level has increased gradually, government intervention is more crucial to sustain this resource by strengthening conservation efforts, promoting sustainable forest management programmes, and active community participation. On the contrary, overall common land resources are gradually shrinking at the national level, which reduces the area of barren and grazing land together and directly affects the rural livelihood who primarily rely on livestock as well as forest-based resources. Therefore, region- specific policies and sustainable land management programmes are essential to conserve these common forest and land resources.

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