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Editorial: Land degradation and forest management

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Editorial on the Research Topic

Land degradation and forest management

Forest land degradation poses a significant threat to forest ecosystems, and biodiversity including human livelihoods worldwide. This encompasses the deterioration of its land quality due to various factors, including deforestation, unsustainable land use practices, urbanization, and climate change. The implications are profound, leading to loss of soil fertility, reduced water quality, and increased vulnerability to natural disasters. As the global population continues to grow, the pressure on land resources intensifies, making effective management of our forests more crucial than ever. Forest management plays a pivotal role in addressing land degradation. Sustainable forest management (SFM) practices are designed to maintain and enhance forest ecosystems while, ensuring their capacity to provide essential services, such as biomass production, carbon sequestration, habitat for wildlife, and recreational spaces for communities. By adopting integrated approaches that combine conservation with responsible forest resource use, degraded forested lands can be restored while, improving resiliency against climate change. This editorial calls for a multifaceted approach to forested land management that recognizes the interconnectedness of forests and non-forest land use systems with community involvement, innovative technologies, and suitable policy frameworks.

[Hashim et al.](#) explores species diversity and vegetation pattern in temperate conifer forests along altitudinal gradients in the Western Himalayas. Using ordination (DECORANA) and classification techniques, no clear disjunct vegetation patterns were observed, though altitude and soil types influenced vegetation distribution. Factors such as soil chemistry, litter cover, and rockiness were linked to vegetation changes along the altitudinal gradient. The study highlights the importance of habitat heterogeneity in forest management and biodiversity conservation, emphasizing the need for broad-scale information to guide conservation efforts.

The research article by [Kumar et al.](#) highlights the factors influencing tree biomass and carbon stock in the Western Himalayas, India which are significant reservoirs of tree biomass and carbon stock. The carbon stock is primarily influenced by structural attributes like tree diameter (DBH), total basal area (TBA), and tree height while, species diversity, elevation, and climatic factors play a minor role. A few dominant large-diameter species contribute most of the carbon stock, stressing the need for regulated harvesting to ensure long-term ecosystem sustainability. The study concluded with emphasizing the

importance of protected areas for achieving carbon neutrality of Western Himalayan Temperate forests. In addition to legal protection of these forests, stricter monitoring and periodic evaluation are recommended for regulating the human activities like tourism. Lastly, the study emphasized the need of further research to explore the factors influencing the forest biomass and carbon storage.

The research article by [Bueno et al.](#) highlights the potential of *Opuntia ficus-indica* (prickly pear cactus) toward ecosystem resilience, forest restoration, and restricting desertification for restoring Mediterranean forests. The species is highly drought-resistant, adaptable to arid conditions, and capable of improving soil fertility and structure. Planting the species in degraded areas can help combat soil erosion, increase organic matter, and enhance water retention, making the environment more suitable for the re-establishment of native forest species.

The research article by [Li et al.](#) emphasizes the need to understand the spatial patterns of ecological risk for effective management and conservation planning in Qilian Mountain National Park, particularly in addressing biodiversity protection and regulating anthropogenic activities. There is significant spatial variation in ecological risks, with higher risks in areas with more anthropogenic activities (like grazing and infrastructure development) as compared to remote, and undisturbed areas.

The research article by [Negi et al.](#) reports significant changes in species composition, plant diversity, and biomass distribution with altitude at mountain ecosystems of the eastern Himalayas, India i.e., vegetation shifts from diverse, dense forests to sparser, less diverse communities from lower to higher altitudes. These elevation-driven changes in vegetation are found closely linked to temperature, soil properties, and moisture availability.

The review article by [Wani et al.](#) presents a bibliometric analysis of studies on threat assessment and species prioritization for conservation discussing key methodologies used in threat assessments (including the IUCN Red List criteria), regions and species groups. The review emphasized conservation prioritization and better resource allocation using GIS and machine learning particularly for the underrepresented regions and species.

[Zhumasheva et al.](#) reports community-based traditional management practices are crucial in balancing forest conservation with resource use ensuring sustainable harvesting of nuts and fuelwood for improved livelihoods and forest health in the Jalalabad region of Kyrgyzstan. However, overharvesting, lack of infrastructure, and climate change were identified as major challenges to forest resiliency and sustainable resource management.

[Aabeyir et al.](#) through remote sensing identifies agricultural expansion, deforestation, and human encroachment as significant drivers of habitat degradation in terms of biodiversity and ecosystem services at Gbele Resource Reserve of Ghana's Upper West Region. The study recommends sustainable land management practices, regular monitoring and empowering forest-dependent communities to protect the Reserve's ecological integrity.

Similarly, in Heilongjiang Province, China [Ren et al.](#) also recommends empowering and participation of local community for sustainable forest management practices using technology for

successful biodiversity conservation and ecological restoration. The study emphasized the support of adequate and pro-people policy frameworks with optimum and timely financial support for success of these efforts.

The study by [Verma et al.](#) reveals that parasitism affects the growth rates and physiological traits of sandalwood, leading to reduced biomass and altered nutrient uptake. These complex host-parasite interactions need a better understanding of host responses to improve sandalwood cultivation and management practices to improve plant health and productivity of the sandalwood.

The study by [Sur et al.](#) integrates multi-sensor data (e.g., satellite imagery from various sources) with advanced machine learning algorithms for achieving accuracy and reliability of vegetation degradation assessments. In addition to distinct patterns of degradation related to factors such as land use changes, urbanization, and climate variability, short-term fluctuations and long-term trends in vegetation health were also detected.

Understanding the plant distribution, ecological traits, and diversity patterns in subtropical managed forests are important for developing effective forest management strategies ([Waheed et al.](#)). Species diversity and composition are the function of management practices, soil characteristics, and climate. Adaptive management approaches considering these ecological insights can enhance biodiversity conservation, improve forest resilience, and optimize resource use.

Spatial patterns and quantum of deforestation in the Eastern Carpathians of Romania was assessed using fractal algorithms by [Diaconu et al.](#) Superiority of fractal analysis in estimating forest loss over traditional methods that overlook complex patterns of fragmentation and degradation was highlighted. The study identifies land use changes and topographical variations as the primary drivers of irregular deforestation patterns and thus recommends fractal algorithms-based forest management and conservation strategies for effective forest restoration.

The review by [Gunawardena et al.](#) highlights the importance of integrating management options with collaborative frameworks to achieve both land degradation and carbon neutrality for improving ecosystem services and conserving biodiversity. Conflicting interests in land use, data gaps, and lesser stakeholder engagement were identified as the main challenges to achieve the neutrality goals.

Importance of seed traits, germination rates, and seedling growth in understanding the mechanism of adaptation by tree species in harsh treeline environment of western Himalayas was reported by [Singh et al.](#) Seed size and dispersal mechanisms significantly influence the distribution and establishment of seedlings in this environment. Temperature, moisture, and soil conditions are critical for seedling success and survival. The study emphasizes the need for conservation strategies that consider these ecological dynamics to support the resilience of treeline ecosystems in the face of climate change and habitat disturbance.

[Kryszk et al.](#) examine the declining interest in afforestation within the framework of the Common Agricultural Policy (CAP) in Poland and Lithuania. Despite the potential benefits of afforestation for biodiversity and climate change mitigation, there is a notable reduction in landowners' engagement in afforestation initiatives in

these two countries. Factors contributing to this decline include insufficient financial incentives, bureaucratic barriers, and a lack of awareness about the ecological and economic advantages of afforestation. The study recommends adequate pro-people policy support and targeted awareness campaigns to reinvigorate interest in afforestation practices among landowners in these countries.

Author contributions

GS: Conceptualization, Project administration, Writing – original draft. AN: Project administration, Writing – review & editing. SC: Project administration, Supervision, Writing – review & editing. PP: Supervision, Writing – review & editing. AS: Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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