



Quantifying Nitrogen Biogeochemistry in Diverse Indian Terrestrial Ecosystems Survey

Paled Maheshwari, Dept. of Chemistry, Research Scholar, SunRise University, Alwar (Rajasthan)

Abstract

Nitrogen is an essential element governing ecosystem productivity, soil fertility, plant growth, and the functioning of terrestrial ecosystems. However, alterations in nitrogen cycling caused by land-use change, agricultural intensification, industrial activities, and climate variability can significantly affect ecosystem stability and environmental quality. This survey examines the patterns and processes of nitrogen biogeochemistry across diverse Indian terrestrial ecosystems, including tropical and temperate forests, grasslands, croplands, agroforestry systems, and arid and semi-arid regions. The study focuses on major nitrogen pools and transformations, including nitrogen fixation, mineralization, nitrification, denitrification, plant uptake, soil nitrogen storage, atmospheric deposition, leaching, and gaseous nitrogen losses. Particular emphasis is placed on understanding how variations in climate, soil characteristics, vegetation composition, land-use practices, and anthropogenic nitrogen inputs influence nitrogen availability and cycling rates. Available information from field studies, published literature, soil analyses, and ecosystem-level observations can be synthesized to identify spatial and temporal variations in nitrogen dynamics. The survey also highlights the environmental consequences of excessive nitrogen inputs, including soil degradation, water pollution, biodiversity changes, and increased emissions of nitrous oxide. Understanding nitrogen biogeochemical processes across India's varied ecosystems is essential for developing sustainable nutrient-management strategies, improving agricultural productivity, conserving natural ecosystems, and supporting climate-change mitigation. The study further identifies knowledge gaps and emphasizes the importance of standardized methodologies and long-term monitoring of nitrogen cycling.

Keywords: Nitrogen biogeochemistry, terrestrial ecosystems, India, nitrogen cycling, soil nitrogen, nitrogen fixation, nitrification, denitrification, nutrient dynamics, ecosystem sustainability.

