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Editorial

Nutrient Cycling Studies: A Novel Approach to Assessing Reclamation Processes and Ecosystem Function Restoration in Tropical Degraded Lands

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EDITORIAL NOTE

For more than fifty years, researchers have been studying nutrient cycling all over the world. The earliest of these experiments were conducted in temperate natural forests and based on a limited number of litterfall processes (e.g. nutrient return, nutrient release). Nutrient cycling studies were later increasingly located in tropical and subtropical forests, and started to integrate other nutrient cycling pathways as well, such as those linked to hydrological fluxes and edaphic processes, due to growing interest in tropical forests and an apparent lack of information about their working.

A long list of scientists can be credited with pioneering studies that provided useful knowledge of nutrient cycling in tropical forests, including H. Jenny, C.F. Ecosystem services are dependent on ecosystem structure and processes, and their availability is reduced as ecosystems degrade. According to De Groot et al.s ecosystem functions have associated products and services that humans appreciate. They are characterised as the ability of natural processes and components to provide goods and services that satisfy human needs, either directly or indirectly.

Ecosystem functions that are usually vital to human well-being are altered when natural habitats are converted to other territory. Regulation functions, which include the ability of natural and semi-natural ecosystems to regulate critical ecological processes and life support systems through bio-geochemical cycles and other biospheric processes, are among these functions (e.g. nutrient regulation, water supply, water regulation, soil retention, soil formation).

When deforestation statistics in tropical countries are considered, the effect of habitat destruction on these ecosystem functions is amplified, with the FAO estimating that 10.4 million hectares of tropical forest were permanently lost each year between 2000 and 2005. In tropical countries, land and environmental planning agencies must acquire proper knowledge of both structural and functional ecosystem parameters so that they can use this knowledge to measure degrees of land degradation.

Regulation mechanisms are one of these classes of parameters, and the nutrient cycling mechanism is one of them. It offers a broad variety of useful services to humans, both directly and indirectly. Many restoration-reclamation interventions on degraded lands may be redirected toward re-establishing ecosystem health and human welfare, which can be accomplished by nutrient recycling activation, according to a new perspective of integrative ecosystem management. According to some nutrient cycling reports, native forests have a higher nutrient supply to soils than tree plantations.

This tends to be an ecological benefit for recovering and preserving the key ecosystem working elements, which should be considered in heavily degraded land restoration programmes. The structural and functional aspects of native and non-native ecosystems were used to develop passive and active regeneration models for the recovery of degraded lands. Passive restoration models based on natural regeneration processes are easy and inexpensive, but they aren't always efficient. Active restoration models, on the other hand, allow for the rapid restoration of ecological processes such as nutrient cycling and carbon sequestration, as well as the restoration of biodiversity habitat.

Planting trees in high densities is the most popular successful regeneration model, which has been shown to be beneficial for the recovery of soils and biological diversity in degraded tropical lands. The reactivation of the biogeochemical cycle of litterfall production and decomposition is responsible for this recovery. In the soil, the processes reactivated in these ecosystems by nutrient cycling increase organic matter and nutrients, control pH, enhance aggregate stability, and provide greater water storage capacity, regardless of the model. Processes such as fine litterfall and litter decomposition rates, nutrient release rates and trends, above-ground litter and nutrient accumulation, soil microorganism respiration, nutrient canopy exchange (leaching and washing processes), and nutrient losses may be investigated in nutrient cycling studies that look at these restoration models (deep drainage and runoff).

An appropriate method for assessing these and other important functional ecosystems parameters relevant to nutrient cycling will provide scientific guidance to decision-makers working in the dynamic field of tropical degraded land reclamation/restoration.

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