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Research Article

Climate Variability and Land-Use Change Effects on Earthworm Diversity and Soil Ecosystem Functions: A Review

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ABSTRACT

Earthworms play a crucial role as ecosystem engineers in soil formation, nutrient cycling, and overall ecosystem function. This report covers the effects of land-use change and climate variability on earthworm diversity and related soil ecosystem processes. With an emphasis on India, a comprehensive literature review of around 48 peer-reviewed papers at both regional and global levels was carried out using major scientific databases including Google Scholar, Scopus, and Web of Science. The overview demonstrates that soil physicochemical properties (such as soil organic carbon, nitrogen, pH, and texture) and climatic parameters (such as temperature and precipitation) have a significant impact on earthworm distribution, variety, and survival. Land-use changes including urbanization, deforestation, and increased agriculture have been shown to reduce native earthworm diversity and alter community composition, while invasive species like *Pontoscolex corethrurus* contribute to biotic homogenization and disruption of soil processes. The review highlights the detrimental consequences of climate variability and human disturbances on soil biodiversity and ecosystem functioning. The lack of long-term datasets and the insufficient mechanistic understanding of species-specific responses to environmental change are two examples of critical knowledge gaps. This study emphasizes the need for long-term monitoring and sustainable land management practices to maintain soil ecosystem services and preserve earthworm variety, particularly in climatically and physiographically diverse locations like India.

Key words: Biodiversity, Climate change, Earthworm invasions, Soil organisms, Anthropogenic disturbance