Abstract

Restoration of degraded arid and semi-arid lands (ASALs) dryland ecosystems gained traction globally with the enactment of the Bonn Challenge and UN Decade of Restoration. This has been domesticated in Kenya's context by The Forest and Landscape Restoration Implementation Plan (FOLAREP). However, effectively monitoring restored ecosystems is crucial but challenging because of data gaps and technical hurdles, highlighting the need for innovative approaches to assess and restore biodiversity. This study aimed to pilot soil environmental DNA (eDNA) metabarcoding to detect species compositions rapidly, evaluate population structures and abundances, and characterize taxonomic groups. The results from this study serve as a foundational step toward monitoring the impact of water bunds, a restoration approach on biodiversity conservation, in Lower Naibunga Community Conservancy in Laikipia County, Kenya. This study used 16S rDNA and rbCL metabarcoding to assess prokaryotic and plant diversity. Plant growth-promoting rhizobacteria species attributed to enhancing nutrient availability and improving plant resilience to abiotic stress were prevalent across all six sites: Lorubai (Site 1), Burtany (Site 2), Nkirashi (Site 3), Losopukia (Site 4), Munushoi (Site 5), and Loika (Site 6). Plant species attributed to drought tolerance and rangeland rehabilitation were also identified. The study demonstrates the potential of eDNA metabarcoding as an effective tool for monitoring nature-based solutions (NbS) interventions to enhance biodiversity and ecosystem restoration in ASALs.