

Title: Characterization of Degree of Eco-restoration by Tree- Grass Interaction in Degraded lands of Semi-Arid Tropics

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Abstract

Introduction

Land degradation has been one of the major causes of diminishing soil quality. Restoration of degraded lands involves careful planning and adopting land use options. The main objective of the study was to assess the changes in soil organic carbon pools as affected different eco-restoration strategies involving trees and grasses.

Materials and Methods

The study site is located at Jhansi, India. Three fodder trees, namely, *Ficus infectoria*, *Morus alba*, *Acacia nilotica* and a shrub i.e. *Leucaena leucocephala* (occurring naturally in most of arid and semiarid regions) were selected. Combination of three grass species viz., *Cenchrus ciliaris*, *Chrysopogon fulvus* and *Panicum maximum* were tried along with tree component. Soil samples were collected in four replicates from each eco-restored land at two depth layers (0–15 and 15–30 cm). Carbon management index (CMI), biological activity index (BAI), and eco-restoration efficiency of each system (ERE) were calculated.

Results and Discussion

Land under *Ficus*, *Morus*, *Acacia* and *Leucaena* had ~ 63, 105, 87 and 81% greater TOC than fallow land in surface layer and 78, 97, 109 and 77% greater TOC than fallow land in subsurface layer, respectively. *Ficus*, *Morus*, *Acacia* and *Leucaena* boosted up CMI by 51, 84, 71 and 65% at surface layers, respectively over fallow land. Grasses although improved CMI over fallow land, but their impacts were similar at surface layers. BAI describes the overall improvement in nutrient cycling in the ecosystems as it encompasses the activities of C, N and P cycling enzymes. However, BAI under *Ficus*, *Morus*, *Acacia* and *Leucaena* were ~a) 3.6, 6.2, 3.7 and 4.5 times and b) 3.8, 4.6, 8.8 and 4 times greater than fallow land at surface and subsurface soil layers, respectively (Table 1). Based on ERE values, we found that *Morus* and *Acacia* were the most efficient trees for restoration of degraded land and *Panicum* was the most efficient grass for restoration of degraded land under tropical climate of *Bundelkhand* region of India and their ecorestoration efficiency was ~10 times greater than fallow land.

Conclusion/Recommendation

Hence, *Morus* + *Panicum*, *Acaia* + *Panicum* could be effective restoration strategies for eco-restoration under degraded lands of tropical climates.

Key words: Land degradation; Carbon sequestration; Carbon management index; Biological activity index