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## Establishment of Silvopastoral Systems Supports Early Indicators of Soil Restoration in Low-Input Agroecosystems of Nicaragua

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### Abstract

Pasture degradation hinders livestock production and ecosystem services that support rural smallholder communities throughout Latin America. Silvopastoral systems, featuring improved pasture grass species, are promising restoration strategies. However, studies evaluating the impact of such systems, in conjunction with common management practices, on indicators of soil health are lacking. We sought to evaluate the impact of low-input, improved pasture grass establishment on soil health indicators, in actively grazed silvopastoral systems. In August 2013, paired pasture management treatments (improved vs. traditional) were established on nine farms with similar management histories and edaphic characteristics in the Matagalpa department of Nicaragua. On each farm, one treatment was left as traditional pasture with naturalized grass species *Hyparrhenia rufa* while the adjacent treatment was sown with the improved *Brachiaria brizantha* cv. Marandu species and planted with tree saplings. Fertilisers were not used during this study, as such inputs are not commonly accessible for smallholders of the region. We measured a suite of soil chemical, biological, and physical variables as well as standing biomass in August 2015, two years after establishment of the trial. The improved (*B. brizantha*) pastures were found to produce more standing grass biomass and support higher levels of earthworm populations and permanganate oxidisable carbon (POXC) compared to the traditional control. Correlation analysis revealed that earthworms and POXC were associated with incipient improvements to soil aggregate stability and water holding dynamics. We report measurable improvements to soil health within just two years following the establishment of improved silvopastoral systems under common smallholder management practices and suggest that promotion of these systems, even with minimal fertility inputs, has the potential to enhance sustainability in this region.

**Keywords:** *Brachiaria brizantha* cv. Marandu, earthworms, macrofauna, pasture degradation, permanganate-oxidisable carbon (POXC), soil health