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Soil Quality Indicators and Weed Infestation in an Amazonian Land-Use System as Affected by Soil Cover and Residue Quality

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Abstract

In humid tropical land-use systems weed diversity and aggressiveness are extremely high, posing serious limitations to no-tillage agriculture. This paper investigates the effects of combining low- and high-quality organic residues on soil quality indicators and on weed abundance and biomass. For this purpose, a field experiment was installed in January 2002 on-station at Maranhão State University, comprising four legume species: *Leucaena leucocephala* (Lam.) De Wit., *Cajanus cajan* (L.) Millsp, *Clitoria fairchildiana* R.A.Howard and *Acacia mangium* Willd., resulting in the following treatments in a completely randomised block design with 4 replications: *L. leucocephala* + *C. cajan*; *A. mangium* + *C. cajan*; *C. fairchildiana* + *L. leucocephala*; *C. fairchildiana* + *C. cajan*; *L. leucocephala* + *A. mangium* and control (no legumes). Sampling was conducted in 2005 and 2007. It was determined weed abundance and biomass, and N, P, K, Ca, lignin e polyphenol contents of the residues. In the topsoil we determined pH, the contents of organic matter, P, K, Ca, Mg, and H+Al, and soil density, total porosity and aeration capacity. In alley cropping systems, the application of prunings of woody legumes affects chemical soil quality indicators such as the sums of bases and base saturation as well as soil aeration capacity in very specific manners, as a result of the quality and quantity of applied plant residues. The lower lifetime of high-quality prunings and the insignificant effects of the residues derived from their decomposition enables weed populations to increase their density and abundance and to take advantage of the improvements of chemical soil quality caused by the application of such legume tissues. Combination of low- and high-quality residues application provides important features of sustainability for no-tillage agriculture with legume mulch: improvements of soil physical quality indicators, efficient nutrient cycling and reduction of weed infestation.

Keywords: Humid tropical, legume species, nutrients, sustainability

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