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No-Till and Direct Seeding into the Mulch of Legume Prunings as a Sustainable Land-Use Alternative for the Humid Tropics

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Abstract

In northern Brazil, the grand challenge to develop sustainable land-use systems has yet to be resolved. Rural population still depends on fire for land preparation, thereby causing negative impacts both on local and global environment and lacking any type of social benefits. This situation creates a vicious feedback cycle in which rural poverty increases the pressure on natural resources and in which the degradation of these resources in turn increases rural poverty. The main challenge for research in this region is in the development of alternative technologies which unite the enormous potential for biomass production with the poor capacity of soils to provide adequate conditions for crop roots. Research conducted by the MSc course of Agroecology of Maranhão State University points to no-till with permanent soil cover and soil acidity correction as the most important management measures for sustainable agriculture in the region. Alley cropping with no-till combined with direct seeding into the mulch of legume prunings takes advantage of rapid tree growth and has been found to be capable of meeting such requirements, offering the following advantages: **(i)** unification of grain production and fertility restoration processes in the same time and in the same field; **(ii)** maintenance of continuous soil cover and efficient nutrient cycling by the combination of tree legumes with high and low residue quality; **(iii)** two harvests per year consisting of annual rotations of medium-cycle crops such as maize and upland rice followed by short-cycle crops such as beans or sorghum; **(iv)** maintenance or even increase of soil organic matter, essential for the sustainability of humid tropical agroecosystems, and **(v)** accumulation of mineral nutrient reserves accessible by microbially mediated processes providing an economically promising alternative to the soil saturation of soluble nutrients for sustainable land use.

Keywords: Alley cropping, organic matter, soil fertility