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Zero Tillage cotton systems and soil quality

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Monocropping in cotton production systems negates the benefits of zero tillage. With cotton in a 3-year rotation including other summer and cover crops, such as soybeans and intensive-rooting Brachiaria spp., research on sandy soils in Bahia improved soil fertility, structure and biological activity. Cotton is a deep tap-rooted crop, sensitive to physical and chemical impediments to root development; this has engendered a paradigm of heavy soil preparation operations to remove these. But, ZT can overcome such obstacles, allowing the cotton crop to benefit from cost reductions and a number of other benefits, especially erosion control.. Soil quality has three principal dimensions. Maximum yields only occur when soil fertility, structure and biological activity are in balance. Under Zero Tillage management of Brazilian soils, the processes of nutrient availability, nutrient cycling and efficiency result from increasing SOM and higher CEC. ZT system fertility is also strongly influenced by total annual aerial and root biomass generation; C:N ratios of the biomass, changes in aeration in residue breakdown processes (for roots, dependent on internal drainage), reduced fixation of Phosphorus fertilizers, the possibility of surface application of P and K, use of deep-rooted cover crops to re-cycle nutrients and deleterious effects of over-liming. Soil physical parameters undergo a transformation : greater water holding capacity, a small increase in bulk density (ameliorated by a reversal of soil aggregate breakdown inherent to conventional tillage by the binding action of root exudates and fungal hyphae), enhanced particle aggregate size protects SOM from oxidation; old root holes create semi-permanent macro-pores which facilitate rooting, aeration and rainfall infiltration.. Soil life of all types benefits from ZT management and contributes to soil fertility and structural improvements, plus enhancing certain biological controls of pathogenic organisms and allelopathic control of weeds by root exudates and residue breakdown products. Monocropping in cotton production systems negates the benefits of zero tillage. With cotton in a 3-year rotation including other summer and cover crops, such as soybeans and intensive-rooting Brachiaria spp., research on sandy soils in Bahia improved soil fertility, structure and biological activity.