

Effect of long-term tillage and sources of nitrogen on crop yields of sorghum-sunflower rotation and soil carbon sequestration in rainfed vertisols

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ABSTRACT

Reducing tillage intensity and addition/ recycling of organic matter are two important components of conservation agriculture which contributes towards the buildup of soil organic carbon (SOC) but their impact on crop yields and extent of SOC buildup is not known under rainfed conditions in tropical regions. A long-term (10 years) experiment was conducted to study the impact of reduced tillage systems and addition of organic matter on sorghum – sunflower yields and organic carbon buildup. Split-plot design was used, in which the main factor was different tillage systems and sub plots consists of addition of organic matter ranging from 2.5 to 5 t⁻¹ ha⁻¹ year compared with that of farmers' practice of application of chemical fertilizers. Sorghum yields were higher by 10% in conventional tillage over minimum tillage but the differences were not significant between the three tillage systems. Grain yields of sorghum (14.3 q ha⁻¹) and sunflower (9.1 q ha⁻¹) were highest with 100% recommended dose of fertilizers. Differences in total carbon (TC), inorganic carbon (TIC) and organic carbon (TOC) levels between tillage treatments and organic matter additions after 10 years of cropping were not significant, but higher in comparison to the fallow land use. Improvement in the SOC level in 0 - 20 cm depth ranged from 1.60 to 3.56 Mg C ha⁻¹ due to various tillage and nitrogen sources over a period of 10 years resulting in C sequestration rates of 160 to 356 kg C ha⁻¹ yr⁻¹. Reducing the tillage intensity did not have a significant influence on crop yields and application of recommended dose of nitrogen either through organic or chemical fertilizers contributed to carbon sequestration.