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Content of Deep Organic Carbon and Total Nitrogen in Oxisol: Long-Term Effect of Tillage and Crop Rotation

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The expansion of agriculture with the intensive use of tillage systems (plowing, disking, among others) promoted the decrease of up to 75% of the original levels of organic matter of the soils under forest or natural pastures. In 12,000 years of agriculture and most notably in the last 200 years, about 133 trillion tons were lost due to the increase in the rate of mineralization of organic matter or erosion of agricultural soils under intensive tillage. In contrast, the development of new agricultural production systems, such as the no-tillage system, promoted the partial recovery of soil carbon content, contributing to greater sustainability in agriculture. In this way, the objective of this study was to evaluate the impact of 32 years of soil management systems and crop rotation about the carbon and nitrogen content up to 0.90 m deep of an Oxisol. The experiment was established in 1985 on a Typic Hapludox in Cruz Alta-RS (Brazil) under a no-tillage (NT) and conventional tillage (CT). Three different cropping systems were studied: wheat (*Triticum aestivum* L.)/soybean (*Glycine max* (L) Merr.) (R1); oat (*Avena strigosa* (L.) Schreber)/soybean/oat+vetch (*Vicia sativa* (L.) Walp.)/corn (*Zea mays* L.)/radish (*Raphanus sativus* L.)/wheat/soybean (R2) and oat/soybean/wheat/soybean (R3). The NT was performed by sowing the crops with a minimal soil disturbance while CT consisted of disk plow (20cm) followed by harrow disk (10cm) prior summer crops sowing and disk harrow before the winter crops. Further soil and crop management practices followed regional best management practices. Total C and N were determined by dry combustion using a CN Soil Flash Elemental Analyzer EA 1112 Series (Thermo Finnigan Italy, S.p.A., MI, Italy) using 50 mg soil sample. Results were tested throughout ANOVA using the R software. The main results show a tillage x depth interaction and means reveal that the use of NT enhance C and N levels when compared to CT, mainly at the 0-5cm top layer. The C content was 2.77 and 1.72 g kg⁻¹, under NT and CT respectively. The N content was 2.20 and 1.30 g kg⁻¹ under NT and CT respectively. The results demonstrate that NT system under tropical conditions is effective in maintaining and sustaining organic soil carbon and nitrogen.

Keywords: Soil management, Sustainability, Soil quality, No tillage

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