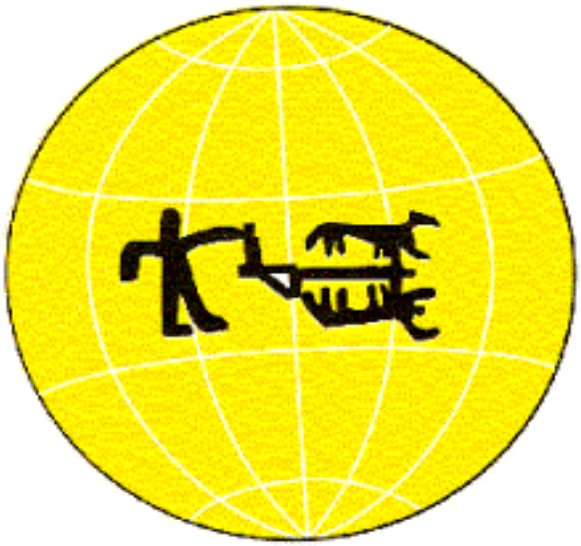

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ABSTRACT

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Twenty years no-till crop-pasture rotation systems impacts on soil organic carbon.

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Abstract

Soil organic carbon (SOC) is a key soil quality indicator for agricultural systems sustainability. We evaluated 20 yrs. soil use intensity effects on SOC (0-5 cm and 5-15 cm depth) in a 72 ha no-till crop-pasture rotation experiment under direct grazing (33°:15'36"S, 54°:29'26"W, 60-m elevation) in Uruguay (Abruptic Argiaquolls and Oxiaquic Vertic Argiudolls). Initial treatments included forage crops-pasture rotations (FCPR): 1) Continuous Cropping (CC) of *Lolium multiflorum* Lam. or *Avena sp*. in winter and *Sorghum bicolor* L. or *Setaria italica* in summer; 2) Short Rotation (SR): two years idem CC and two years pasture of *Trifolium pretense* L. and *Holcus lanatus* L.; 3) Long Rotation (LR) two years idem CC and four years pasture of *Festuca arundinacea* L., *Trifolium repens* L. and *Lotus corniculatus* L.; 4) Permanent Pasture (PP): natural pasture overseeded with legumes used in LR. All rotation phases were present in 6 ha plots each year. After 10 yrs., FCPR plots were split and grain crops included, resulting grain crops- pasture rotations (GCPR). Grain crop sequence was: *Avena sativa* L., *Sorghum bicolor* L., *Avena sp*., (as a winter cover crop), *Glycine max* L. and *Triticum aestivum*, maintaining same pasture phases in LR and SR. After 20 yrs., SOC differences (0-5 cm depth) between GCPR and FCPR were found only in CC (21.5 g kg^{-1} vs. 19.5 g kg^{-1}), respectively. However significant SOC differences were observed between rotations in GCPR and FCPR. In GCPR, CC had 17 % lower SOC than SR and LR (25.9 g kg^{-1}) and 31% lower than PP (31.3 g kg^{-1}), respectively. Similarly, in FCPR, CC had 28 % lower SOC than SR and LR (26.9 g kg^{-1}) and PP (31.3 g kg^{-1}), respectively. No SOC differences were found between SR and LR, but they had lower SOC than PP, both in GCPR and FCPR. A SOC decrease trend of 12% was observed in PP compared to the original undisturbed soil under natural pastures (35.3 g kg^{-1}). No SOC differences (5-15 cm depth) were found between treatments that included pastures, but they had 14% and 28% higher SOC than CC (11.7 g kg^{-1} in GCPR and 10.2 g kg^{-1} in FCPR, respectively). Results suggest that, even under no-till and pasture rotations, cropping systems reduced SOC compared with permanent pastures. For undisturbed Mollisols incorporated to cropping systems, like those prevalent in Eastern Uruguay, perennial pastures are critical to mitigate SOC losses during cropping.

Keywords: Soil quality, conservation systems, carbon sequestration, long-term experiments