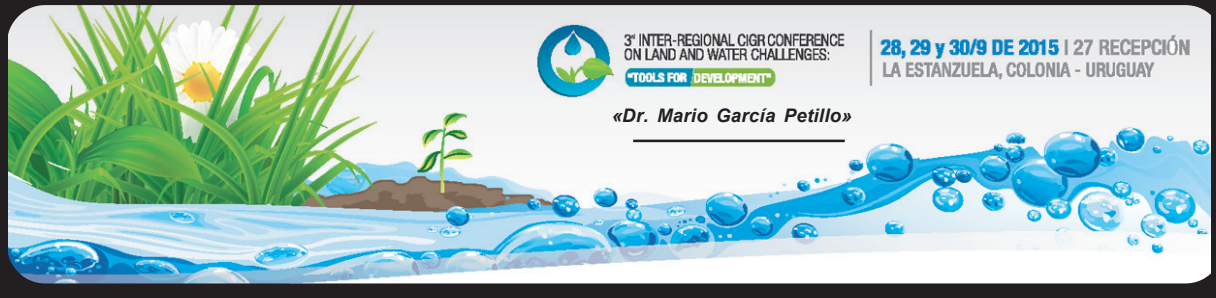
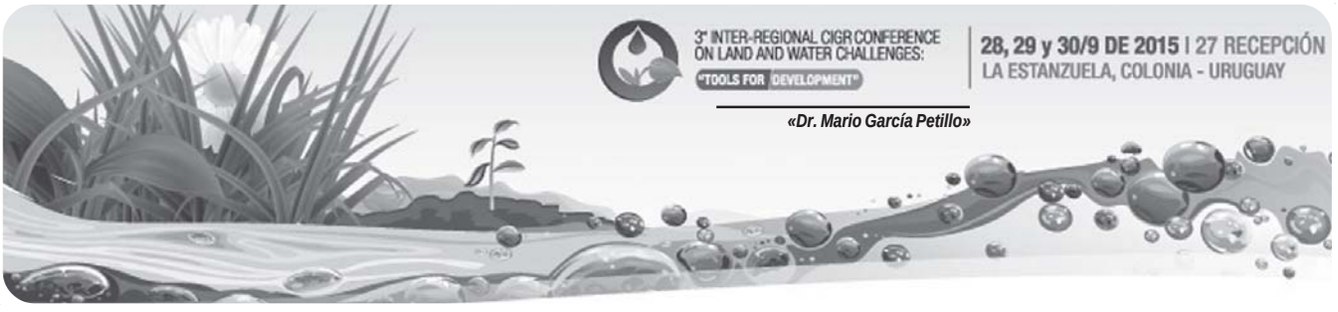
ISSN 1510-0839

agrociencia Uruguay



3rd Inter-Regional CIGR Conference on Land and Water Challenges: Tools for developing *«Dr. Mario García Petillo»*

Revista científica de la Facultad de Agronomía, Universidad de la República, y del Instituto Nacional de Investigación Agropecuaria

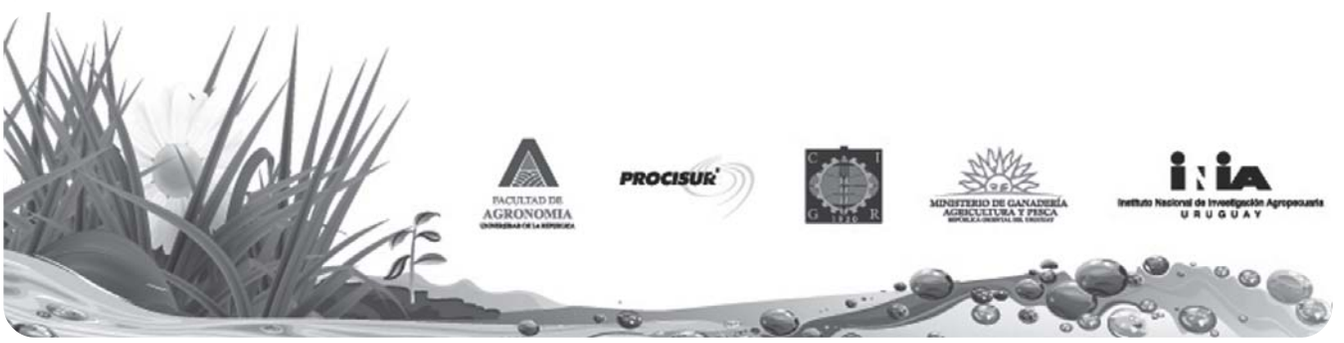


3rd Inter-Regional CIGR Conference on Land and Water Challenges:

Tools for developing

«Dr. Mario García Petillo»

SETIEMBRE 2015



Soil Use Intensity Effects on Soil Organic Carbon in No-till Crop-pasture Rotations Systems

Macedo I*[1], Cantou G[1], Terra J A[2]

[1]*Production and Environmental Sustainability Program, National Agriculture Research Institute, Route 8 km 281, Treinta y Tres, CP: 33000, Uruguay;*
[2]*Research Program Leader: Production and Environmental Sustainability, National Agriculture Research Institute, Route 8 km 281, Treinta y Tres, CP: 33000, Uruguay.*
E-mail: imacedo@inia.org.uy

Abstract

Soil organic carbon (SOC) is a key soil quality indicator for cropping 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 (33°:15'36"S, 54°:29'26"W, 60-m elevation) in Treinta y Tres, Uruguay (Abruptic Argiaquolls and Oxiaquic Vertic Argiudolls). Treatments between 1995-2005 were: Continuous cropping (CC) of ryegrass (*Lolium multiflorum* Lam. or oat *Avena sp*. in winter and sorghum (*Sorghum bicolor* L.) or foxtail millet (*Setaria italica*) in summer; 2) Short Rotation (SR): two years idem CC and two years pasture of red clover (*Trifolium pretense* L.) and *Holcus lanatus* L.; 3) Long Rotation (LR) two years idem CC and four years pasture of tall fescue (*Festuca arundinacea* L.), white clover (*Trifolium repens* L.) and birdsfoot trefoil (*Lotus corniculatus* L.); 4) Permanent Pasture (PP): natural pasture overseeded with legumes used in RL. Since 2005 until now, grain crops substituted forage crops in the «cropping phase» of all rotations (CC, SR, LR), maintaining without modifications the pasture phase of them. Grain cropping sequence was: Oat (*Avena sativa L.), Sorghum bicolor (L.),* black oat *(Avena sp.,* as a winter cover crop), soybean *(Glycine max L.)* and wheat *(Triticum aestivum).* After 20 years, significant SOC differences (0-5 cm) were found between rotations. Continuous cropping decreased SOC by 16%, 18%, 31% compared to SR (25.55 g kg^{-1}), LR (26.17 g kg^{-1}) and PP (31.32 g kg^{-1}), respectively. Although no SOC differences were found between rotations that include perennial pastures (SR and LR), both had 18% lower SOC than PP. A trend of SOC decrease (12%) was observed also in PP compared to the original situation that existed at the beginning of the experiment (natural pasture 35.25 g kg^{-1}). No SOC differences were found in the 5-15 cm depth between treatments that included pastures. However, there was an average SOC increase of 14% in these treatments (13.34 g kg^{-1}) compared to CC. The aggregate of data suggest that, even under no-till, continuous cropping reduced SOC compared with cropping systems that include some proportion of pastures in the rotation. For undisturbed fragile soils incorporated to grain production, like those prevalent in 1 million ha in Eastern Uruguay, the inclusion of perennial pastures in the rotations is critical for soil conservation and mitigation of SOC losses in cropping systems.

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