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# Effect of Conversion from Natural Grassland to Arable Land on Soil Carbon Reserve in the Argentinean Rolling Pampas

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The evaluation of the effect of land use change on accumulation of soil organic carbon (SOC) requires reliable data obtained from georeferenced sites with land use history records. The purpose of this study was to evaluate long term changes in the reserves of SOC in a typical Argiudol of the Pergamino series after the introduction of agriculture. Measures of soil organic carbon concentration and bulk density of Ap and A12 horizons were carried out in three sites of the Pergamino County (N of Buenos Aires province): a reference field with untilled pristine soil (33° 57' S; 60° 34' W), a field with 31 years (1980-2011) of agriculture (31Y) located next to the former, and a third field (33° 46' S; 60° 37' W) with 80 years (1910/1990) of agriculture (80Y). 31Y has been under continuous soybean cultivation with conventional tillage (CT) that consists of moldboard plow or double disk harrowing. At 80K the cultivation sequence was: 44 years of corn + 9 years of flax + 2 years of wheat + 17 years of wheat/soybean double cropping + 1 year of lentil; mostly under CT, some years under chisel plow during the 70's and a few years under zero tillage in soybean after wheat sown with conventional tillage during the 80's. Before the introduction of mechanical harvesting (1947) crop residues were burnt as well as the wheat stubble during the conventional double cropping period (1970-1980). Soil texture (23$\pm$1% clay, with predominance of illite) and field slopes (<0.5%) were similar in the three sites. Nitrogen and phosphorus fertilization rates were minimal due to the low crop response. The results are expressed in Mg ha-1 for an A soil horizon mass of 2500 Mg ha-1. The introduction of agriculture decreased SOC stock: 31Y varied from 68.3 to 40.1 Mg ha-1 (41.3% loss) and 80Y from 68.3 to 47.2 Mg ha-1 (30% loss). The SOC loss was the result of the mineralization of a large amount labile SOC present in the pristine soil and low annual additions of carbon issued from crop residue (3.5 and 3.3 Mg ha-1 corresponding to 31Y and 80Y, respectively). The lower loss of carbon in 80Y compared to 30Y can be explained by the accumulation of stable SOC fractions produced by the burnt stubble. We conclude that current agricultural systems of the Rolling Pampas are not sustainable.