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Water erosion during a 17-year period under two crop rotations in four soil management systems on a Southbrazilian Inceptisol

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Soil erosion still remains a persistent issue in the world, and this in spite of the efforts to ameliorate soil management systems taken into account the point of view of environmental protection against soil losses. In South Brazil water erosion is mainly associated to rainfall events with a great volume and high intensity, which are more or less evenly distributed all over the year. Nowadays, direct drilling is the most widely soil management system used for the main crops of the region. However, some crops still are grown on conventionally tilled soils, which means mainly ploughing and harrowing and less frequently chisel ploughing. In Lages-Santa Catarina State, Brazil, a plot experiment under natural rain was started in 1992 on an Inceptisol with the aim of quantifying soil and water losses. Treatments included bare and vegetated plots. The crop succession was: oats (*Avena strigosa*), soybean (*Glycine max*), vetch (*Vicia sativa*), maize (*Zea mays*), fodder radish (*Raphanus sativus*) and beans (*Phaseolus vulgaris*). Soil tillage systems investigated in this study were: i) conventional tillage (CT), ii) reduced tillage (MT), iii) no tillage (NT) under crop rotation and iv) conventional tillage on bare soil (BS). Treatments CT and BS involved ploughing plus twice harrowing, whereas MT involved chisel ploughing plus harrowing. Rainfall erosivity from January 1 1992 to December 31 2009 was calculated. Soil losses from the BS treatment along the 17 year study period were higher than 1200 Mg ha^{-1}. Crop cover significantly reduced erosion, so that under some crops soil losses in the CT treatment were 80% lower than in the BS treatment. In turn soil losses in the MT treatment, where tillage was performed by chiselling and harrowing, were on average about 50% lower than in the CT treatment. No tillage was the most efficient soil management system in reducing soil erosion, so that soil losses in the NT treatment were about 98% lower than in the BS treatment. The three vegetated treatments, CT, MT and NT showed a lower efficiency in reducing water losses than soil losses. Water losses by runoff during a number of events were of the same order of magnitude for all the management systems studied here; which was mainly true when the volume of rainfall was high and the lag between successive events was small. In general, soil losses in the autumn-winter seasons were lower than under the spring-summer seasons. Soil losses showed a positive correlation with rainfall erosivity. However, the degree of dependence between these two variables decreased as the efficiency of soil management in controlling soil erosion increased. The large soil and water losses in the BS and CT treatments suggest that there is a need to implement soil conservation measures in the study region. In this context soil conservation would take advantage from soil cover by previous crop residue as well as from terrace building.

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