Indexes of Land Use Change to Predict Aggregate Stability in a Mollisol and a Vertisol of Argentina

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In several areas of South America, the extensive cropping systems in traditional agricultural lands have increase the area cropped with soybean, mainly as a single annual crop. Also nowadays agriculture has a progressive expansion toward more environmentally fragile areas that were traditionally occupied by livestock or native forests. This change of land use may be characterized through different indexes as the length of the growth period or the frequency of a particular crop in the cropping sequence. On the other hand the consequences of land-use changes on soil physical condition may be monitored through the aggregate stability, which is directly related to soil functionality. However, there are different methods for aggregate stability analysis, which may vary in their potential for prediction. The aim of our work was to assess different quantitative indexes of change in the land use on aggregate stability through two methods in two soils differing in the main agents of aggregation. The study was conducted in a Mollisol and a Vertisol from Argentina. Eleven fields (agricultural and crop-pasture rotation) under no-tillage and one natural grassland were selected in each soil type. The fraction of annual time with vegetal cover (as a measure of the intensification in the land use - ISI) and the frequency of a given crop (soybean – SCF; wheat – WCF; and wheat plus maize – CCF) in the cropping sequence over a 6-year period were calculated. Samples were collected at 0-5 and 5-15 cm depths from each soil. The mean weight diameter (MWD) of the soil aggregates where determined by two methods: Le Bissonnais with three pretreatment (fast wetting, slow wetting and stirring after prewetting) and by wet sieving using an instrument similar to the Yoder apparatus. The MWD by wet-sieving was affected by ISI and SCF, but the impact only was recorded in 0-5cm depth of the Mollisol. The MWD by fast and slow wetting and the means of three pretreatments (MWDm) were directly related to ISI, SCF and WCF in both depth of the Mollisol. Although in the Vertisol, the aggregate stability in natural grassland was higher than under agricultural use, indexes did not show the change in the land use for any pretreatment or depth, except by ISI and SCF in the slow wetting pretreatment at 5-15 cm depth. The method of Le Bissonnais was more sensitive to predict changes in the land use driven by the frequency of a given crop in the cropping sequence that the wet-sieving, mainly in the Mollisol.