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Soil quality monitoring in an area with land use change

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The characterization of the soil quality through soil quality indicators (SQI), provides an effective method for the monitoring of the impacts to soil by use and management decisions. The key is to identify variables that are sensitive to changes in the soil functions and processes. The native forest area of Entre Ríos (Argentina) is associated with a constant change in land use, with an increase in recent years in agricultural use, especially for soybean crop. The aim was to monitor soil quality in three soils of an area of this area where native forest is being replaced by an agricultural system based in soybean crop, using a a minimum data set (MDS) previously selected for three soil type. The three soils selected were a Vertic Argiudoll, an Aquic Argiudoll and a Vertic Ocracualf. Treatments included plots with continuous cropping with different number of years under soybean crop, crop-pasture rotation, long-term pasture (PP), and uncropped land (UC) in pristine situation, which was taken as a reference. The crops were sowed under no tillage system and some plots were systematized with terraces contour to runoff management. The selection of a group of soil indicators in a MDS, was developed locally because it must be different for each soil type and each particular use. Total organic carbon (TOC), aggregate stability and pH were common indicators. Furthermore, it was assessed macroporosity, total porosity, cation exchange capacity two biological indicators (microbial biomass Carbon and potentially mineralizable Nitrogen) and A horizon soil mass, as a measure of the soil erosion. Statistical analysis, as linear regression analysis, ANOVA and cluster analysis were used. The soil indicators showed the changes caused by soil use, being more marked deterioration in the Vertic Ocracualf. TOC, microbial biomass Carbon and aggregate stability were the most sensitive SQI. However, positive changes were observed in potentially mineralizable Nitrogen, wiht PP. In the Vertic Argiudoll, the changes caused by agricultural use were significant in the plots with most years of continuous cropping as compared with UC and PP treatments, whereas in the Vertic Ocracualf with few years under agriculture, processes of soil deterioration started to be detected. The Aquic Argiudoll showed high resilience through all SQI. In the Vertic Ocracualf, we recommended that the period of crops rotation should be shorter than the period under pasture, to maintain the soil quality. The native forest should be the basis of sustainable production systems in the area. In addition, the agricultural use should be defined according to the soil limitations, and the dynamic soil qualities.