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Assessing the physical properties of Mollisols in Chaco: effects of no-till

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No-till (NT) farming has increased worldwide in recent decades, particularly in Argentina. In the province of Chaco, forest clearance across large areas of native land has resulted in a significant expansion of land for agricultural use. One of the most important effects of land-use change is the alteration of the original properties of native forest soils. The objective of this work was to evaluate the changes produced by agricultural use in some parameters associated with soil structural stability, porosity and water retention in Mollisols in the dry region of Chaco, Argentine Republic. The assay was performed in the province of Chaco. The experimental sampling design was completely randomized, with two treatments: native forest (BN) and no-till soybean with rotations (NT) of corn or cotton. Nine plots were located per treatment and samples were taken at the 0-0.05 and 0.05-0.10 m depths. The following parameters were determined: bulk density (Da), texture, stability of aggregates (EA), equivalent moisture (HE), total porosity (PT), air space (AS), equivalent humidity (HE), volumetric humidity (Hv), pH, critic bulk density (Dac). The results were analyzed through an ANOVA and mean comparison by the LSD test at 5% probability. Also, a Pearson's correlation test was performed ($P \leq 0.05$). Following deforestation and the subsequent conversion of land for agricultural use, bulk density significantly increased for the two depths under study ($P = 0.0015$; $P < 0.0001$). Total porosity and air space levels were higher under pristine conditions, with significant differences between both depths. Agricultural use enhanced soil density and reduced aggregate stability to 24 and 34% for the first and second depths, respectively ($P < 0.0007$; $P < 0.0001$). Water-holding capacity in no-till soils was significantly reduced by 3.6% only for the first depth ($P < 0.0325$), indicating that it has been affected by land use. The EA was positively and significantly associated with the HE and the PT, showing its direct relationship with the water retention capacity in these soils. The Da was negatively and significantly associated with the EA and the AS. Forest clearance and no-till farming (NT) favored soil density and reduced aggregate stability, total porosity, air space and the soil's capacity to hold water for the crops. Even though these parameters have shown non-critical values, a trend has been observed towards the loss of physical properties in soils under agricultural land management.