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Soil cracking and shrinkage in a silty loam under different management regimes

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Silty loams are believed to have poor volumetric response to soil wetting-drying (W/D) cycles, which was attributed to the lack of swelling clays in their mineral matrix. In the present work clod shrinkage and cracking were determined in a silty loam (Typic Argiudoll), by comparing Pasture, conventionally tilled (CT) and eroded conventionally tilled (CTer) nearby situations. In CTer soil the shallow A horizon was clay-enriched by plowing, which increased its swell-shrink index. All studied silty loams showed significant swelling and shrinkage. Residual shrinkage prevailed over basic shrinkage in Pasture and CT soils, but this did not change their specific volume at zero water content, α (0.65 – 0.72 m^3 Mg^{-1}) and air entry point, θ_A (0.18 – 0.21 m^3 Mg^{-1}). Low crack volume (2 cm^3) and large cracks (1^{st} to 3^{rd} order) were found after both 4- and 12 –month W/D cycles in these soils. Range of normal shrinkage, θ_B – θ_A, increased from 0.15-0.2 (Pasture and CT soils) to 0.3-0.35 m^3 Mg^{-1} (CTer soil), and normal slope, n, from 0.37-0.62 to 0.69-0.87. In CTer soil desiccation cracks were larger ($>$ 6 cm^3), and belonged to the 1^{st} and 2^{nd} size orders. Instead of increasing air filled porosity, clay-enrichment only increased soil swelling in this soil. It can be then concluded that the studied silty loams do not have poor response to W/D cycles, but poor creation of air filled pores during shrinkage. This was not improved by the artificial addition of swelling clay in the CTer soil.