The impact of different tillage practices on soil stability and erosion in a red soil hilly region, China

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Abstract

Tillage practices can change moisture content, nutrient retention and soil properties and so affect crop growth and significantly influence soil stability. The objectives of this study were to evaluate the effects of tillage practices (conventional tillage, CT; soil compaction, CM; subsoil tillage, ST; no tillage, NT; and subsoil tillage and soil compaction, SCM) on soil stability in a hilly region of red soil in China. The parameters of soil stability were soil aggregate stability (SAS), wet aggregate stability (WAS), and soil mechanical stability (SMS). These parameters are closely related to soil erodibility (SE). The results indicated that SAS, WAS, SMS and SE varied significantly across the five tillage methods. The aggregate stability indexes (ASI) of CM (2.64) and CT (2.61) were greater than for other methods, which indicates that CM increased the compactness of soil particles and that the soil structure for NT was relatively stable and less disturbed than for other methods. NT and CM significantly increased soil shear strength (SS) and soil compactness (SC) compared to other methods. NT significantly increased soil resistance to erosion compared to other methods, with K factor = 0.26. NT (ASI = 0.43) had the greatest soil stability and resistance to erosion (SSE), followed by SCM (ASI = 0.41), for which ASI can potentially be increased. The results provide reference parameter values for selecting a suitable tillage method to reduce soil erosion and improve soil productivity in red soil sloping farmland.

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