



## **Sequestration of Soil Organic Carbon by Long-Term No-Tillage in a Cool Semi-Arid Region**

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Management choices are known to influence soil organic carbon (SOC) amounts and distribution in agricultural soils. No-tillage (NT) has been viewed as a management technique that sequesters SOC, but some recent studies have brought this into question. These studies have indicated that NT concentrates SOC in shallow horizons while depleting SOC at depth rather than increasing SOC throughout the entire soil profile, with no statistical difference between total profile SOC when soils are sampled to depths greater than about 20-30 cm. Therefore, this study was conducted to determine if long-term NT management in a cool semiarid environment showed SOC sequestration as compared to clean-tillage (CT) and reduced-tillage (RT) management when soil depths >30 cm were considered. Soil samples were collected from 0-30, 30-60, and 60-90 cm depth intervals in research plots arranged in a randomized complete block design. No-tillage, RT, and CT treatments had been maintained in these plots at Dickinson, ND, USA for  $\geq 19$  yr. Data was analyzed using a mixed model where tillage and soil depth were considered fixed and blocks were considered random effects. SOC levels were higher under NT (64 Mg ha<sup>-1</sup>) than CT and RT ( $\leq 55$  Mg ha<sup>-1</sup>) management in the 0-30 cm depth interval. The same trend was detected in the 30-60 cm depth interval under NT compared with RT, but not when NT was compared with CT. SOC levels were higher under NT (29 Mg ha<sup>-1</sup>) than under RT (23 Mg ha<sup>-1</sup>) in the 60-90 cm depth interval. Through the upper 90 cm of the soil profile, SOC levels were significantly higher under NT (127 Mg ha<sup>-1</sup>) than under CT and RT ( $\leq 112$  Mg ha<sup>-1</sup>). The results of this research indicate that NT can increase SOC levels in the 0-90 cm soil depth interval in cool semiarid environments when compared to CT and RT.