PARATILLING FREQUENCY EFFECTS ON RUNOFF AND SEDIMENT YIELDS FOR NO-TILL SYSTEMS IN THE TENNESSEE VALLEY REGION OF ALABAMA

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ABSTRACT

Erodible soils of the Tennessee River Valley in northern Alabama are susceptible to soil consolidation and compaction, especially under conservation tillage systems. Paratilling, a non-inversion deep tillage technique, eliminates soil consolidation and compaction in conservation tillage systems, yet is expensive and time-consuming. Our objective was to quantify runoff and sediment yields associated with time since paratilling in no-till (NT) systems on a Dewey silt loam. Five NT treatments representing paratilling (P) frequency were evaluated: NT without paratilling (NT-P), NT with paratilling 6 months previous (NT+P6), NT with paratilling 18 months previous (NT+P18), NT with paratilling 36 months previous (NT+P36), and NT with paratilling 42 months previous (NT+P42). NT plots had winter fallow (no cover crops) which was burned down with Roundup prior to simulating rainfall. Rainfall simulation plots ($6m^2$, 2 m wide x 3 m long) were established on three (of four) NT treatments, and exposed to simulated rainfall (50 mm h^{-1} for 60 min). Infiltration and runoff, each expressed as a percent of rainfall, decreased and increased respectively with decreased paratilling frequency. Differences between infiltration and runoff percentages for a given treatment ranged from 55% (NT+P6) to 0% (NT-P). Maximum runoff rate (R_{max}) steadily increased with decreased paratilling frequency, ranging from 19 (NT+P6) to 40 mm/h (NT+P42). R_{max} values significantly increased with decreased partilling frequency for the first 36 months. No significant trends were found between paratilling frequency and soil loss, however, the NT-P treatment had the greatest soil loss, soil loss rate, and shortest time to maximum soil loss rate compared to other paratilled NT treatments. Paratilling soils in the Tennessee valley is a beneficial practice for farmers of this region because paratilling increases rainwater infiltration and decreases runoff, thus promoting more efficient water utilization.