

Tillage mediates effects of winter cover crop on soil water relationships

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ABSTRACT

Winter cover crops (CC) use water, which can have negative, neutral, or positive effects on soil water storage and supply for the subsequent summer crop. There is a lack of information on how tillage impacts water utilization by CC. A plot-scale Long-Term Agro-Ecosystem Research (LTAR) experiment was initiated in October 2018 at Stoneville, MS, to estimate crop water use and depletion (net loss) in two CC treatments [no-cover (NC) and CC (Austrian pea, *Pisum sativum* L.)] under two tillage [conventional tillage (CT) vs. no-tillage (NT)] practices in cotton (*Gossypium hirsutum* L.) and sorghum (*Sorghum bicolor* L.) cropping systems. Soil volumetric water content (VWC, %) was monitored using capacitance sensors at 12 soil depths to 115 cm. In-field measurement of VWC was recorded every 30 minutes. In the first year (Dec 2019–May 2020), the total VWC of the 0-45 cm soil profile was similar for all treatments until mid-March, when CC plots depleted more water than NC, especially for CT. No effect of CC on VWC was observed in the 45-115 cm profile. The CC did not affect VWC in NT plots. In the second year (Nov 2020–May 2021), NT (both CC and NC) quickly restored water depleted by cotton or sorghum (May to October 2020) in the whole 0-115 cm soil profile, whereas, for CT, VWC was not restored in the 45-115 cm depth until February. The CC-CT depleted more water in 35-55 cm depth in April and May, relative to NC-NT and CC-NT treatments. The business-as-usual CT-NC management system consumed soil water intermediate between NT systems and CC-CT during most of the measurement period. These results demonstrated that NT-CC can benefit row crop production systems with minimal use of water and supply water compared to NC for cotton and sorghum production.