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Green Revolution 2.0: Food+Energy and Environmental Security

123-12 Long-Term Conventional and No – Tillage Management, Crop Growth and Field Hydrology.

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See more from this Session: The Blue-Green Revolution: Why Water Availability and Water Management Will Be Key to Success in Bio-Energy and Environmental Security: I

Monday, November 1, 2010
Long Beach Convention Center, Exhibit Hall BC, Lower Level

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In the U.S. Southern High Plains wheat (*Triticum aestivum* L.) and grain sorghum [*Sorghum bicolor* (L.) Moench] are grown using a 3-year wheat-sorghum-fallow (WSF) rotation. Crop yield levels have been stabilized with stubblemulch-tillage (SM) or increased with no-tillage (NT) because of increased conservation of precipitation as soil water for crop use. Our objectives were to quantify the effects of tillage method on the field water balance and the growth and yield of wheat and sorghum during a long-term study. Beginning in 1984 all WSF rotation phases were established in large, > 2 ha, paired graded terrace plots with either SM or NT practices on a gently sloping Pullman silty clay loam (fine, mixed, superactive, thermic Torrertic Paleustoll) at the USDA-ARS, Conservation and Production Research Laboratory, Bushland, TX. We measured crop growth and yield, precipitation, stormwater runoff, soil water at the beginning of each phase and chloride (Cl) concentration from borehole cores taken to a depth of ~ 15 m. An overall 25 mm increase in fallow precipitation stored as soil water with NT increased mean sorghum grain yield approximately 10% compared with SM tillage. Wheat grain yields were unaffected. Crop growth factors including tiller number and leaf area likewise favored NT residue management plots. Data show that, compared with native rangeland, SM and NT increased the Cl displacement downward, but exceeded the estimated rooting depth only in NT plots. The calculated annual soil water drainage in NT plots averaged 11.5 mm or almost double the 6 mm yr^{-1} recharge rate estimated for the region. Compared with the more conventional SM tillage, implementation of NT residue management in dryland production systems has, effectively, increased the water availability for crop use and potential groundwater recharge.

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