Drought Survival With Conservation Tillage

Sometimes the adage that less is more certainly rings true. That's the case with conservation tillage.

Conservation tillage reduces the amount of soil disturbance on a field because it leaves crop residue on the soil surface. With conventional tillage, plant residue is removed or incorporated into the soil. Conservation tillage helps to reduce runoff and soil erosion, a particular problem with the sandy soils of the southeastern United States.

Southeastern soils have been intensively cropped and are prone to drought and erosion. While rainfall registers about 50 inches per year, growers often have to irrigate their crops during extended drought periods. Producers in this region face a major problem: maintaining crop yields and water-use efficiency while addressing soil and water quality concerns associated with sediment, fertilizer, and pesticide losses to off-site areas.

Scientists at the Southeast Watershed Research Laboratory in Tifton, Georgia, are evaluating conservation tillage systems to measure how well they reduce runoff and erosion, increase plant-available water in soil, and improve overall soil productivity. Conservation tillage systems can either be no-till, in which crops are planted through the previous crop's residue; or strip-till, in which crops are planted in tilled rows 4-6 inches wide.

The research, led by soil scientist Clint Truman and hydraulic engineer David Bosch, indicates that strip-till reduces runoff and erosion, increases water infiltrating the soil, and improves soil quality. "This research could conceivably help producers increase water-use efficiency and reduce irrigation. By doing so, they could increase the profit margin while maintaining water supplies and minimizing off-site environmental contamination," says Truman.

Plant residue left on the ground acts as a barrier to water evaporation from the field. It also keeps raindrops from falling directly on the soil, which decreases movement of soil, pesticides, and nutrients off the field.

The study site was on 4.6 acres on the University of Georgia Gibbs Farm located in Tifton and was divided into six half-acre plots, with a seventh 1-acre plot set aside for companion rainfall-simulation studies. A crop rotation of cotton and peanuts—common crops in the Southeast—was used.

The study, which began in 1999, makes a good case for conservation tillage, in this case strip-till. In the first 3 years, surface runoff from the conventional-till plots was considerably greater than that from the strip-till plots. Strip-till plots showed 3 to 9 percent of rainfall ran off the surface, while in the conventionally tilled plots 12 to 22 percent of rainfall ran off. Peak surface runoff rates observed from the conventional-till plots were up to five times greater than those observed from strip-till plots.

In simulated-rainfall studies, runoff characteristics for strip-till and conventional-till systems changed during the study. In the fall of 1999, no differences were observed in the runoff volumes from the two tillage systems. In later simulations, researchers observed about twice the runoff from the conventional-till plots as from the strip-till plots.

Another plus for strip-till systems: soil loss from these plots was consistently lower than from the conventional-till plots. In the fall of 2000, soil loss from conventional-till plots was more than four times that from the strip-till plots, increasing to five times by the spring of 2001. "This data shows that strip-till systems have the potential to substantially decrease sediment loss from fields," says Bosch.

Strip-till systems may be catching on. Georgia farmers' use of strip-till systems has increased about 35 percent since 1998, with acreage approaching 950,000 acres in 2002—about 28 percent of the total cultivated acres for that year.—By **Sharon Durham,** ARS.

This research is part of Water Quality and Management (#201) and Soil Resource Management (#202), two ARS National Programs described on the World Wide Web at www.nps.ars.usda.gov.

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