



## Organic Farming System Improves Soil Compared with Conventional No-tillage System

Crop production without tillage is well known for increasing soil organic carbon, which results in many other improvements in soil structure, water-holding capacity, and nutrient availability. Organic farming also can potentially increase soil carbon and improve soil quality because of the use of organic amendments and green manure crops for fertility. However, there is skepticism as to whether organic farming can improve soils as well as conventional no-tillage systems because of the requirement for tillage to prepare a crop seedbed, incorporate amendments, and control weeds.

The September–October issue of *Agronomy Journal* includes a nine-year comparison of four minimum-tillage strategies for grain production of corn, soybean, and wheat on a sloping, droughty site in Beltsville, MD from 1994 to 2002. Systems included in the study, conducted by a USDA-ARS research team led by John Teasdale at the Sustainable Agricultural Systems Laboratory, were a standard no-tillage system typical of that used in the mid-Atlantic region, a cover crop based no-tillage system, a no-

tillage crownvetch living mulch system, and a minimum-tillage organic system. The organic system reduced tillage to chisel plowing and high residue cultivation for weed control and kept the soil covered with crops, cover crops, and/or residue throughout as much of the rotation as possible. After nine years, corn yields were similar in the standard no-tillage and cover crop systems but were 12% lower in the crownvetch system and 28% lower in the organic farming system than in the standard no-tillage system. Competition from the perennial crownvetch living mulch and inability to adequately control weeds in the minimum-tillage organic system accounted for yield losses.

An assessment of soil carbon and nitrogen concentration at the conclusion of the nine-year study showed that carbon and nitrogen levels were higher in the organic system compared with those in all other systems, despite the use of tillage in the organic system. A uniformity trial was conducted from 2003 to 2005 with conventional no-tillage corn grown on all plots. In this uniformity trial, yield of corn grown on plots with a nine-year

history of organic management were 18% higher than those with a history of conventional no-tillage production. Higher corn yields were attributed to increased nitrogen availability in the soils following organic production, probably as a result of higher soil carbon and nitrogen levels.

“These results suggest that organic farming systems can provide greater long-term soil improvement than conventional no-tillage systems, despite the use of tillage in organic systems,” Teasdale explains. “However, these benefits may not be realized because of difficulty controlling weeds in organic systems.”

Teasdale says this study confirms that, with additional research to refine weed management, organic systems can be viable grain production systems that have the potential to surpass conventional systems in soil improvement. Alternately, conventional no-tillage systems could benefit from additional organic inputs and/or perennial rotational crops to improve the sustainability of these systems.

*Teasdale, J.R., C.B. Coffman, and R.W. Mangum. Potential long-term benefits of no-tillage and organic cropping systems for grain production and soil improvement. Agron. J. 99: 1297–1305. The full article will be posted online in mid-September at <http://agron.scijournals.org/content/vol99/issue5/>*



New research suggests that organic farming systems may improve soil conditions better than conventional no-tillage systems. Organic corn shown above.

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