Organic corn: Increasing rotation complexity increases yields

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While demand for organic meat and milk is increasing by about 20% per year in the United States, almost all organic grain and forage to support these industries in the mid-Atlantic region is imported from other regions. To meet this demand locally, area farmers need information on expected crop yields and effective management options.

Scientists in the Sustainable Agricultural Systems Laboratory at the USDA-Agricultural Research Service (ARS) Beltsville Agricultural Research Center (BARC) in Maryland have studied the impact of diverse organic cropping systems on crop yields over a ten year period. Results from the study, which was funded by USDA-ARS, were published in the May-June issue of *Agronomy Journal*.

The researchers collected data on crop yields, nitrogen inputs, weed densities, and crop populations from the USDA-ARS Beltsville Farming Systems Project (FSP), a long-term cropping systems trial with two conventional and three organic systems that was established in 1996. The three organic systems differed in crop rotation length and complexity.

The study revealed that corn and soybean yields in organic systems were, on average, 76 and 82%, respectively, of those in conventional systems in years with normal weather. Winter wheat yields were similar among systems. Corn yields were lower in the organic than in the conventional systems primarily due to lower nitrogen availability in the organic systems, which rely on legume crops and animal manures. Weed competition also contributed to lower corn grain yields in organic

systems. For soybean, weed competition alone accounted for differences in yield between organic and conventional systems.

Among organic systems crop rotation length and complexity had a strong impact on corn grain yield. A crop rotation that included corn, soybean, wheat and hay resulted in average corn grain yield 30% greater than in a simple corn-soybean rotation and 10% greater than in a corn-soybean-wheat rotation. Differences were due to increased nitrogen availability and lowered weed competition with increasing crop rotation length and complexity. Crop rotation length and complexity did not affect soybean and wheat yields.

Dr. Michel Cavigelli, lead author of the study, stated, “These research results show that longer, more complex crop rotations can help address the two most important production challenges in organic grain crop production: providing adequate nitrogen for crop needs and decreasing weed competition.” This research should help organic farmers and those considering transitioning to organic farming select crop rotations best suited for the mid-Atlantic region. Since the FSP is one of only a handful of long-term cropping systems trials that includes diverse organic crop rotations, these results will also be of interest to organic farmers and those working with organic farmers nationwide.

Ongoing research at the USDA-ARS Sustainable Agricultural Systems Lab at BARC is designed to increase soil nitrogen availability and decrease weed pressure in organic grain crop rotations.

Source: American Society of Agronomy