Rodale Field Study Measures Long-Term Effects Of Organic Farming

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KUTZTOWN (Berks Co.) — A 23-year research project conducted by the Rodale Institute shows that organic farming methods build carbon and nitrogen levels in the soils, reduce greenhouse gases in the atmosphere, and match or exceed conventional corn and soybean yields, according to Paul Hepperly, Rodale research manager.

On Oct. 10, the institute hosted a tour of the 12-acre research site at Rodale's 333-acre organic farm near Kutztown.

Hepperly explained the study's findings to about 50 invited guests, including Dennis Wolff and Kathleen McGinty, secretaries of the Pennsylvania departments of agriculture and environmental protection, respectively.

According to Wolff, the study's findings on greenhouse gas reduction show "beyond the shadow of a doubt" the potential for developing a market for "carbon credits," in which farmers would be rewarded for using methods that capture carbon dioxide from the atmosphere.

Three different farming systems were tested in the study, which began in 1981. Two of the systems were organic, using no commercial fertilizers, herbicides, or pesticides. The third was a "conventional" row crop system, using applications of synthetic fertilizers, herbicides, and pesticides based on Penn State recommendations.

All three systems were based on a corn/soybean crop rotation and conventional tillage, although the organic plots used longer rotations that included small grains, hay, and cover crops.

Both organic systems used legume cover crops to boost nitrogen levels in the soil. The only difference is that one of them also received applications of dairy cow manure once every five years.

For many farmers, yield results might be the most surprising upshot of the study.

Hepperly reported that corn and soybean yields from all three trials were not significantly different in years with adequate rainfall.

After a transition period of four years, the organic plots produced 125-150 bushels of corn and 40-45 bushels of soybeans per acre in years with good rainfall, same as in the conventional system.

But during droughty seasons (six out of the past 12 years, according to Hepperly), the organic plots yielded 20-30 percent higher in both corn and soybeans, he said.

In the drought of 2002, Hemperly said both organic plots produced 118 bushels of corn per acre, while the conventional row crop system yielded 87 bushels per acre. Soybean yields showed a similar disparity, he noted.

The structure of soil built up by the organic system allows plant roots better access to water and makes the difference in dry years, according to Hepperly. Building up measurable levels of stable organic matter in the soil is a slow process, but results can be seen in several years, he noted.

In 23 years, the organic plots that used legumes and cow manure as soil amendments increased from about 1.8 to 2.5 percent in organic matter. The plots using legumes alone went from 2.0 to 2.4 percent.

"You wouldn't even be able to see this process in the short term," Hepperly said. However, "after three or four years, you can notice a significant difference."

This accumulation of organic — or carbon-based — matter in soil excites people concerned about global warning because it means less of the "greenhouse gas" carbon dioxide is free in the atmosphere.

In other words, soil that is accumulating organic matter acts as a carbon "sink" and reduces the threat of global warming, according to Rodale's interpretation of the study.

Hepperly reported that organically farmed soil in the trials captured 600-1,000 pounds of carbon per acre per year in the top foot of soil. The process is known as "carbon sequestration."

The study results also show that nitrogen levels increased by 44-88 pounds per acre per year in the top 12 inches of soil in the organic plots.

In the conventional system, neither carbon nor nitrogen levels increased significantly in the soil, according to Hepperly's report.

Other findings noted in the study report include:

- Organic systems emitted one third fewer greenhouse gases by eliminating energy inputs required to produce synthetic pesticides and fertilizers.
- Production costs were 26 percent lower in the organic systems.
- The organic systems reduced groundwater pollution by eliminating the use of chemicals such as atrazine.

The Pennsylvania departments of agriculture and environmental protection have agreed to support further study, education, and outreach efforts of Rodale Institute to better understand the effects of organic farming on global warming.

"Pennsylvania is fortunate to be at the center of this exciting research," said Dennis Wolff, Pennsylvania secretary of agriculture. "We have thought for years that carbon sequestration and the development of a market for carbon credits offers new income opportunities for farmers, even as they help the environment. (Rodale's) research results show that potential beyond the shadow of a doubt."

Kathleen McGinty, Pennsylvania DEP secretary, said "Rodale's findings will be most helpful in the development of future greenhouse gas mitigation strategies that will be beneficial to Pennsylvania's citizens, its farmers, and its business owners."

According to a Rodale Institute statement, the study was the first to differentiate organic farming from conventional ag in its carbon sequestration ability.

"Organic farming is a powerful tool in the global warming arsenal," said Anthony Rodale, chairman of Rodale Institute. "It puts agriculture into a lead role — in regenerating the environment."

Wolff said that a carbon credit system would offer a certain number of dollars per acre to farmers using no-till and/or organic practices. He and McGinty will be having meetings on developing such a program within the month, he said.

"It's one way Pennsylvania could lead the nation, through that kind of approach," Wolff said.

Paul Hepperly, Rodale research manager, stands in a mixed cover crop of wheat and hairy vetch used in organic rotation with corn and soybeans in field trials.

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