Attachment #6

Organic no-till leads to updating of Farming Systems Trial

Rodale Institute combines two groundbreaking projects to push the envelope on how agriculture done right can curtail climate change.

By Dan Sullivan

Rodale Institute farm manager Jeff Moyer rolls a hairy vetch cover crop.

Beginning this growing season, the Rodale Institute began combining two exciting projects—organic no-till and the Institute's long-term Farming Systems Trial (FST)—to see what complementary and synergistic benefits might be produced. This initiative is assisted by funding from a Northeast Sustainable Agriculture Research and Education (SARE) grant.

Now in its 28th year, the FST has compared conventional farming using Penn State Agronomy Guide input recommendations to both legume- and manure-based organic systems. Results have shown organic yields to be within 5 percent of conventional yields in most years and the organic systems outperforming the conventional system in years of extreme weather patterns such as drought.

In 2002, Rodale Institute also designed, built and began experimenting with a no-till roller-crimper, which allowed for the marriage of two best management practices—**organic farming and no-till**. The roller allows for the mechanical killing of cover crops without conventional no-till's typical reliance on herbicides. The resulting living-mulch mat acts as a barrier against weeds, conserves moisture, protects the soil, provides an extensive rhizosphere (root zone) for beneficial microorganisms, and—in the case of leguminous cover crops such as hairy vetch—provides a source of nitrogen to the cash crop. Rodale Institute's own success with this system was followed by an **ongoing NRCS-funded project** that paired farmers and researchers across the country using the no-till roller approach under a variety of conditions and cropping systems.

Research has shown that both organic and no-till cropping systems have the capacity to store significant amounts of carbon. What has not been quantified to date is the carbon storage potential of combining the two systems—that is, determining the long-term capacity of agricultural soil to store carbon if the combined approaches of composting, cover cropping, crop rotation and no-till methods are implemented.

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"Organic no-till"—while accurate for some crop years—is a misnomer when describing the complete rotation. Instead of plowing before both cover and cash crops, plowing is done only to establish the cover crops. However, when considering carbon-sequestration capacity, emerging research comparing biennial tillage to strict no-till indicates that this occasional tillage might actually be a benefit to increasing soil organic matter (and therefore the ability to store carbon).

Project co-coordinator and Rodale Institute agroecologist Matt Ryan explained that one goal of the SARE project is to get conventional and organic farmers talking to each other and sharing critical information about the use of cover crops and no-till farming methods.

"Both types of farmers share the same goal—produce good yields while improving their soil—and it's time to start focusing on the similarities rather than the differences between the systems," Ryan said. "Improving cropping system sustainability is too important to be dogmatic."

The project also gives the Institute the opportunity to enhance its conventional system with the benefit of feedback from conventional farmers, he said. "We're introducing no-till into our organic systems and updating our conventional system," Ryan said, adding that no-till management strategies will be overlaid onto the three existing systems—conventional, legume-based organic, and manure-based organic—for a total of six systems.

"This should help address some perceived biases by updating and integrating best-management practices into our conventional system and also taking a massive leap forward with organic no-till," Ryan said. Those management practices, he said, include incorporating the use of genetically engineered corn and soybean into the conventional systems.

"With the FST we have been early pioneers," Ryan said. "Regardless of our results, we have gotten others on board with this type of research. Now it's time to update our trial so that we're not just preaching to the choir but engaging conventional farmers and getting them to take a serious look at this option."

Ryan said that as another research project wrapped up Rodale scientists began taking stock of the FST—the longest comparison trial of its kind in the U.S. and second longest in the world—and realized that both the conventional and organic systems were somewhat dated. Adding organic no-till to the mix was the next logical step, he said.

Earlier this year, Rodale Institute began an aggressive campaign to show how organic farming can fight climate change. Part of that message has been that converting all U.S. agricultural lands to management practices utilizing cover cropping, crop rotation and compost application instead of farming with mineral fertilizers and synthetic pesticides could be the carbon-offsetting equivalent of removing nearly 80 percent of all operational vehicles from U.S. roadways. The Institute believes that the addition of organic no-till would significantly increase that mitigation capacity. Now, through the benefit of the SARE grant, scientists there have the opportunity to put that idea to the test.

"This SARE grant is allowing us to use the Farming Systems Trial as the centerpiece for our outreach," Ryan said. "We received a $145,000 grant to form an advisory panel to help guide our management decisions and to conduct a series of outreach training events for farmers."

Also, part of the project will include an energy analysis across all systems, Ryan said. "We expect organic no-till to be favorable....much more energy efficient."

Partners include The Pennsylvania State University, University of Maryland, USDA/ARS Beltsville and Cornell University.

"We're very excited at Penn State to be collaborating on this project," said Bill Curran, Ph.D., professor of weed science in the Department of Crop and Soil Sciences at Penn State. "Many of us think that organic no-till is sort of the nirvana of agriculture, but we also realize the challenges involved in trying to obtain that.

"We see this project as a way to marry some of the best things about organic and some of the best things about more conventional systems—one of those being no-till."

Curran, who is involved in an advisory capacity incorporating no-till methods and cover crops into conventional farming systems, said it's exciting to be working with the long-running FST.

"Certainly one of the criticisms many have had, including myself, about the conventional system is that it's really not sustainable at all," Curran said. "And it tends toward a Midwest focus. So were excited about putting more of a Northeast twist on it and bringing in no-till and cover crops."

The other side of the same coin, Curran said, is the opportunity to introduce no-till methods into the organic systems and quantify the results. "I think we're all thinking about a rotational no-till system," he said. "How we can fit that in and make it work is a very exciting thing."

Dan Sullivan *is senior editor with the communications department of the Rodale Institute.*

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The Learning Process

Submitted by old farmer (not verified) on Sat, 05/22/2010 - 10:51.

I note that some of the recent work at Rodale has hit upon the logical conclusion that more carbon storage in the soil can be accomplished by the correct principle of incorporating organic matter into the soil to create fresh new organic matter there. Avoiding getting crop residue buried forces it to decay into the air releasing its breakdown products of carbon dioxide and water *duh*!

Thus to a great extent the "before GMO beans" rotation of corn with its residue incorporated ahead of planting soybeans stimulated the formation of new organic matter rather than the oxidation (slow burning, really) of the tons/per acre of corn stalks, leaves and cobs into the air.

It is high time that "the rest of the story" was considered- instead of national tillage labs stats on CO2 release following turning the soil with a plow as an operation vs allowing long term oxidation release more CO2 !

The GMO bean has increased the acreage of soybeans planted into standing last years stalks. A "fun" way to farm: plant, spray, and harvest- to hell with what is right!

It has been absolutely alarming that farmers went "head over heels" for this new technology. In the earlier years og GMO soybeans you not only had to pay about 50% more for the seed but the actual yield might be up to 5 bu/ acre less (according to some university trials).

So the GMO planter is out there just for fun- even if he loses money!

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reply

Organic No-till

Submitted by Iestyn Hosking (not verified) on Sun, 03/28/2010 - 18:40.

Has there been any research to do the reverse crop of what is currently done? ie Rolling a summer crop such as Japanese Millet and sowing wheat, barley, peas, rye, broad beans, lentils, or chickpeas into this?

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reply

GMO & research

Submitted by Anonymous (not verified) on Sat, 09/05/2009 - 23:34.

As a conventional farmer who routinely plants GMO seed products, I would not consider results