Case Study: Interseeder Research Plots, Mill Hill Farm, Williamsburg, PA

Farmer Jim Biddle cooperated with Penn State Extension and King's AgriSeeds Inc.

Various cover crop mixes interseeded into MCT 5375 corn, June 18, 2015

Mill Hill Farm is a no-till dairy farm in Williamsburg, Blair County, PA. Jim Biddle is the owner and also a Certified Crop Advisor, in addition to running the on-site business, Mill Hill Farm Supply.

The farm's soil preservation philosophy is to keep as many acres covered for as many days of the year as possible, in order to feed microbes that help build soil health and structure. To that end, every possible acre is double-cropped.

Everything is no-tilled – as Jim puts it, "my vertical tillage equipment is my corn planter and my no-till drill, and that's it".

The farm is 570 acres and has 285 mature cows and 250 replacements. The typical rotation is three years of corn silage, followed by three years of alfalfa-grass. Triticale forage is included in half of the corn acres, in rotation with the corn. A third of this triticale is blended with crimson clover, and a third is blended with radish.

Although Jim is a firm believer in the value of the interseeding practice and knows how to manage it in terms of herbicides and timing, he does not currently own the equipment. Since his growing season is long enough and he takes his corn for silage, he usually has enough time to get the double-crop triticale or rye in after the corn with a traditional seeding.

In the corn that he harvests for grain, Jim often drills cover crops through the stalks. Depending on the year, this can turn into a dormant seeding application (if it gets cold early, the seed may not germinate until early spring).

When he started working with cover crops, Jim was a purist, keeping cover crops strictly for soil-building and not forage use. Now he uses about 40 percent of his cover cropped acres for forage, and finds he still gets many of their soil benefits while building his forage inventory.

Research Plots

In cooperation with Penn State and King's AgriSeeds, Jim Biddle laid out interseeded plots. Side-by-side plots would give the team a chance to compare commercial mixes as well as experimental mixes, and judge which species did well in the context of a mix, and which did not express themselves quite as well.

In the corn field where the plots were interseeded, triticale had been planted September 25, 2014, originally intended for cover crop use, to be terminated in the spring before soybeans. 5000 gallons of dairy manure was applied October 2, 2014. Instead of spraying and killing the triticale, however, they decided to take it for forage. They harvested 4.7 tons/A at 65% moisture.

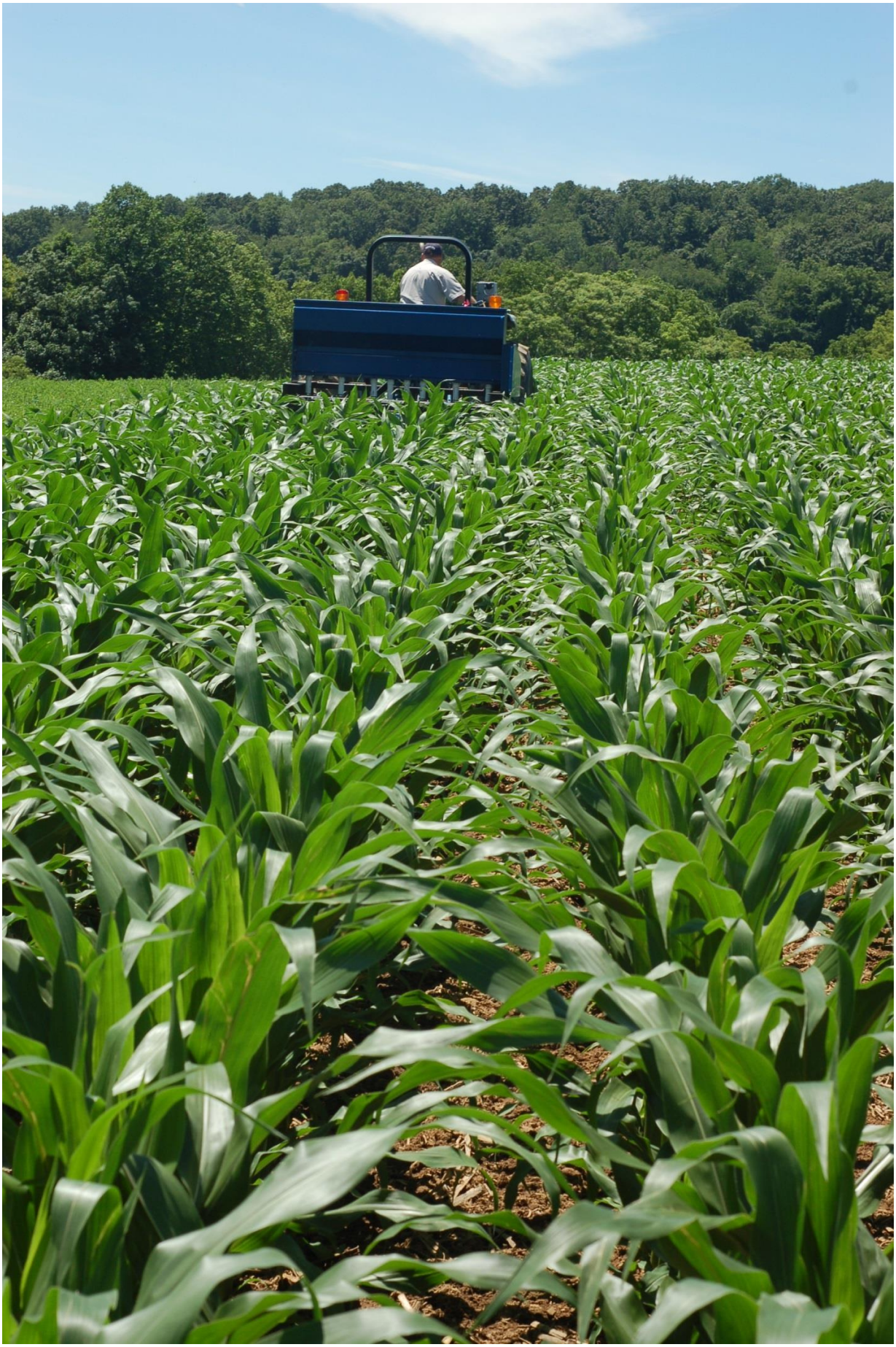
They had not applied any additional N in the early spring and decided to follow with corn to use it for the Interseeder research plots.

5000 gallons of dairy manure was applied May 14, 2015, and MCT 5375 was planted May 19, 2015 with 65 lbs/A N. On May 24, the field was sprayed with 2.0 qt/A Degree Xtra; 1.0 qt/A Gramoxone SL; 1.0 qt/A Accomplish LM; and 28 gal/A UAN (90 lbs. N). A post treatment of glyphosate (24 oz/A Touchdown Hi-Tech) and fungicide (2.0 oz/A Stratego YLD) on June 16, 2 days ahead of the Interseeder. The fungicide was used in response to some Gray Leaf Spot appearing on the lower leaves.

The plots were interseeded into the corn on June 18, 2015.

Any wet weather ended on July 15, the start of an extreme drought and heat wave in the area. On August 28, Jim harvested 20.4 tons/A of corn silage and applied 5000 gal of dairy manure on September 2 on top of the interseeded over crops that remained.

Chris Houser, Penn State Extension, interseeding cover crops in corn



Chris Houser showing a picture of interseeded crimson clover growing between corn rows in late July

Coulters and disk openers on interseeder

Corn and soil picture after broadcaster was interseeded

Interseeded King's Broadcaster mix 5 months after interseeding: Annual Ryegrass, Crimson Clover, Common Medium Red Clover, Daikon Radish, and Yellow Blossom Sweet Clover. Photo Credit Dr. Greg Roth (PSU)

Close-up King's Broadcaster mix 5 months after a June interseeding: Annual Ryegrass, Crimson Clover, Common Medium Red Clover, Daikon Radish, and Yellow Blossom Sweet Clover. Photo Credit Dr. Greg Roth (PSU)

Green Spirit, 3-Way Clover, and Crimson Clover Interseeded, with mostly the Green Spirit Italian Ryegrass blend dominating the mix. Photo Credit: Dr. Greg Roth (PSU)

(Scotti-Mix) Winter Cereal Rye, Annual Ryegrass, Hairy vetch, and Medium red clover. Picture November 18, 2016, five months after interseeding. Photo Credit: Dr. Greg Roth (PSU) This mix was trialed successfully in New York, Pennsylvania and Maryland. The Radish seen in this mix in the field are not part of the mix but were from residual seed in the planter box.

Close-up (Scotti-Mix) Winter Cereal Rye, Annual ryegrass, Hairy vetch, and Medium red clover. Picture November 18, 2016, five months after interseeding. Photo Credit: Dr. Greg Roth (PSU) This mix was trialed successfully in New York, Pennsylvania and Maryland.

No-till not enough

BY **JOHN VOGEL**

Key Points

- Pennsylvania farmer's no-till soils improved with cover cropping.
- Early-fall cover crop plantings fit dairy farm's cropping system.
- Triticale is a key base ingredient for his system.

JIM Biddle has figured it out: Better, healthier soils produce better yields at lower costs. And he didn't have to move to another farm to make it happen.

Since 2002, the veteran no-tiller from Williamsburg, Pa., has been cover-cropping each acre of Mill Hill Farm in Blair County.

"He really saw soils respond to no-tilling once he started using cover crops," says Penn State Extension agronomist Greg Roth. "Last fall, he had a wide range of great cover crops — triticale, triticale-radish mixes, some mixes with ryegrass and/or crimson clover, and loads of earthworm castings."

Triticale is the base ingredient on all 580 acres of corn, soybeans and some double-crop forage sorghum, says Biddle. It fits the dairy farm's systems approach for top-quality feed, plus timing of manure application and planting. Triticale is harvested in mid-May and followed by no-till corn and soybeans.

"That allows three to four weeks extra root growth where we use triticale for a spring forage harvest," adds Biddle.

Biddle and son Josh, who manages the dairy, drill their cover crops between late August and late October.

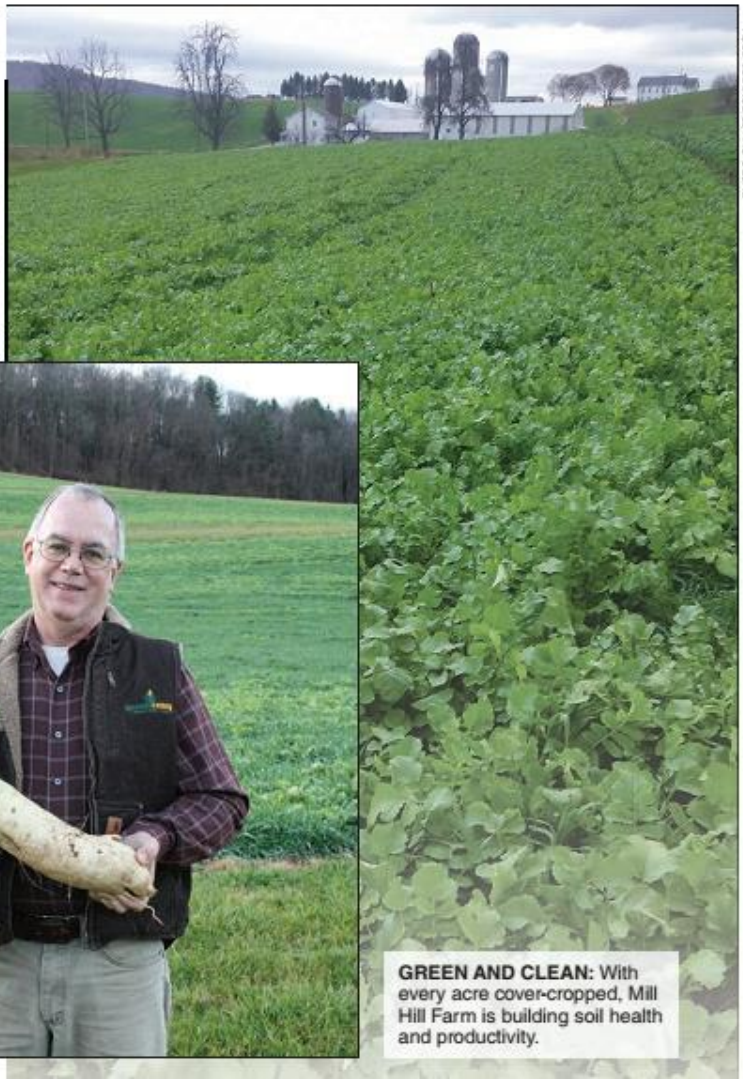
"Since there are huge advantages to multispecies," Biddle says they add radishes in early September and crimson clover in late September.

Clover needs a longer season to build soil nitrogen. The triticale cover crop benefits, as well, with longer root growth and higher forage protein quality and close to 8-ton yields. Biddle also notes that only 25% of the farm's cover crops are harvested.

No-till helps build soil structure. Cover crops increase soil microbial activity, which in turn feeds the entire food chain up to and including earthworms, he says.

"The key to cover cropping is in the roots, which feed those microbes and create soil pores to allow air and water to flow through a larger portion of the soil profile," notes Biddle. "It's a proactive process to building soil carbon levels and improving soil health."

Biddle considers cover cropping just as important as no-till. It keeps every acre protected and biologically active year-round. That's one reason Mill Hill Farm won Pennsylvania's Chesapeake Bay Clean Water Farm Award.



PHOTOS: ERIN STATLER/GREG ROTH

GREEN AND CLEAN: With every acre cover-cropped, Mill Hill Farm is building soil health and productivity.

SHOVEL-BUSTER: Jim Biddle broke the fiberglass handle on his shovel digging out this cover crop "tool."

SOIL IS ALIVE: Proper care and feeding of soil's microbial populations will start building organic matter and plant health within two years, says NRCS agronomist Ray Archuleta.

Where no-till missed the mark

RAY Archuleta may be a fervent no-till "preacher," but even this Natural Resources Conservation Service agronomist agrees: "No-till is not enough — not for building soil health.

"I don't recommend it without cover crops and excellent rotations. No-till stops soil destruction, but doesn't feed it," he says. "While it does better than conventional tillage, it's no match for no-till and cover crops grazed by animals."

NRCS initially promoted no-till incorrectly by making it the central focus. "We missed the mark. However, no-till plus cover crops changes the whole equation."

Thinking in terms of a holistic system best mimics regenerative nature — keeping soils covered 100% of the time and building healthy soil microbial populations to feed crops, he explains. This has reduced fertility needs more than 50%, completely eliminated insecticides and fungicides, and reduced herbicide applications by 90%. Teaming up no-till with covers has improved soil infiltration rates and increased water-holding capacities.

"Our best producers use no-till, cover crops and animals to graze the cover crops," says Archuleta. "These guys have reduced inputs by huge amounts. It's raising great corn yields at costs of only $1.75 per bushel. It's systems synergism!"

Jim Biddlle's farm featured in American Agriculturalist, Feb 2016, for his success with no-till practices