

Getting to the Root of the Problem

Ralph Upton, Jr., Springerton, Illinois

Long-Term Benefits of Cover Crops and Crop Rotation

Coordinator: Ralph Upton, Jr.

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In trials conducted on his Springerton farm, Ralph Upton compared three cover crops: ryegrass, hairy vetch, and cereal rye. Ryegrass turned out to be the best of the three, with better rooting depth and more water availability. It also boosted corn productivity.

Ralph Upton was curious. While walking his cornfields one day, he noticed a patch of corn in very poor condition standing within a mere 20 feet of his healthy corn. To investigate, Upton ran a backhoe through his field and found something under his ground that would lead to dramatic changes in farming methods—changes that would lead to better rooting, higher yields, and fewer pests in his crops.

What Upton found beneath his ground was a siltpan—a naturally deposited layer of silt due to weathering soil. The siltpan prevented crop roots from penetrating any deeper than a few inches into the ground, stunting his corn.

"Where we had good corn, there was no siltpan. The roots were able to get down deeper," says Upton, who farms 2,000 acres of corn, soybeans, and wheat in Southern Illinois.

After witnessing successful uses of cover cropping on a trip to Tennessee, Upton was curious to see if he could solve the siltpan problem if he no-till planted winter cover crops every year. So, in 2004, he received a SARE grant to research cover crops and their effects on soil quality and productivity.

Upton's land is predominantly Bluford soil—a thin soil with a lot of restrictive



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rooting characteristics. The siltpan layer was about 2 inches thick and could be found roughly 4 to 6 inches below ground.

Upton brought in a soil scientist to assess the situation. But the scientist told him there was no way he would be able to get roots more than a couple of feet below his soil.

But Upton proceeded anyway, conducting trials in which he compared three cover crops: ryegrass, hairy vetch, and cereal rye. Mike Plumer, a University of Illinois Extension natural resources educator, helped Upton conduct his trials and record the data.

According to Plumer, the hairy vetch worked well but was extremely difficult to manage. He also says the cereal rye did not root as deeply as the others and could grow to 7 feet tall, making it tough to handle.

"The ryegrass, which grows to 18 inches, turned out to be the best of the three," says Plumer. "It gets better rooting depth and has more water availability. And for some reason, it seems to increase the productivity of the crop."

When Upton planted ryegrass, he was able to get roots down to 55 to 60 inches, over 2 feet deeper than the soil scientist's assessment.

Despite the deeper rooting, the siltpan

still exists, says Plumer. But in the top 12 inches, bulk density is decreasing, which is a measurement of soil compaction. He says it takes a number of years to fully break through the siltpan.

In 2005, Upton and Plumer did a number of trials comparing productivity from conventional tillage, no-till with no cover crops, and no-till with cover crops. They found that conventional tillage yielded 87 bushels per acre of corn, no-till with no cover crop yielded 124 bushels, and no-till with a cover crop yielded 137 bushels.

"The results for no-till ryegrass were greater because of better rooting and moisture retention," says Plumer. "We saw an improvement in soil fertility, a reduction in bulk density, and an increase in yields. So, all across the board, we've had improvements."

As an added bonus, Upton unexpectedly discovered that ryegrass causes soybean cyst nematode populations to decrease. Apparently, ryegrass exudes a substance that causes the nematodes to hatch in the fall instead of the spring. When that happens, Upton says, the winter kills them off.

Despite the successful results, Plumer thinks that ryegrass cover cropping is primarily effective on soils similar to Upton's. He is currently working on comparisons with darker soils located further north.

"Black soils normally don't have as severe root restrictions, so it's not as big of an issue for them," he says.

However, Plumer says that roughly 35 to 40 percent of the soil in Southern Illinois is similar to Upton's soil, but only about 2 percent of that land is being cover cropped. Regardless of what the other farmers are doing around him, Upton is sticking to his guns.

"No matter what, every year I try to get my cover crops planted," he says. "I think of my soil quality now compared to 20 years ago, and there's just no comparison."

By Jason Peterson