



Photographs: Mike Holmberg

Paul Butler (right) was concerned about how Jeff (center) and Doug Martin's plans to raise continuous corn would affect the soil on land rented from his family.

more moisture during that time," says Palle Pedersen, Iowa State University Extension agronomist.

Thus, rain frequently falls during corn's critical pollination and kernel-setting phase in late July. In comparison, rain falls less frequently in August during the crucial soybean pod-set and seed-fill phase. That's what happened last year, when corn had already locked in yields before the drought intensified in August.

Diseases and insects – such as sudden death syndrome and soybean cyst nematode – have also stymied soybean yields and increased production costs. A widespread 2003 outbreak of soybean aphids heightened concerns that this pest will chronically infest soybeans, thereby adding annual spraying expenses of \$10 to \$25 per acre.

Finally, there's the specter of South America. USDA projects the South American spring 2004 soybean crop to exceed 2003 U.S. soybean production by more than 50%, says Bob Wisner, Iowa State University Extension agricultural economist. This level will lead to South America producing 51% of the world's soybeans.

Facing the competition

"We thought we'd better get our house in order, with South America producing more soybeans," says Jeff Martin. Martin and his family grow 400 to 500 acres of their 3,500 acres in a corn/corn/soybean rotation.

"We've also had problems with soybean cyst nematode in soybeans, and we've seen that reduced by going to two years of corn," says Martin. So far, soybean yields are 5 to 10 bushels per acre higher in the corn/corn/soybean rotation compared to soybeans in the corn/bean rotation. Corn-on-corn yields are similar to corn/soybean yields, hovering around 200 bushels per acre in 2003.

Yet, yield won't always transfer into profitability. University of Illinois (U of I) analysis indicates farmers will be better off with a corn/soybean rotation in 2004 (see sidebar on next page). 

May I cut in?

A range of factors is prompting farmers to shift soybean acres to corn, but is that wise?

By Gil Gullickson

Jeff Martin, Mt. Pulaski, Illinois, wanted to plant strip-till corn three or four years in a row to build up the soil on a farm he is renting from Paul Butler's family. That left Butler questioning whether it's really wise to go away from a rotation.

Corn and soybeans are to crop rotations what a bat and glove are to baseball. Yet, Martin and an increasing number of farmers are considering growing less soybeans and more corn.

Why? Corn yields are beating the pants off soybean yields.

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Let's flash back to 2003, when a late summer Corn Belt drought shredded midsummer expectations of a record soybean crop into the smallest one since 1996. Meanwhile, corn thrived.

Weather conditions, especially in recent years, are simply more conducive to growing corn than soybeans. "In the Midwest, we receive more fronts moving in June and July than in early August, and those fronts bring



Jeff Martin is a long-term no-till and strip-till advocate concerned about improving the tilth on land he farms.

May I cut in?

There's nothing like 300- to 400-bushel-per-acre corn yields to turn farmers' heads. "A lot of the interest in continuous corn has revolved around the high yields that Herman Warsaw (the late Saybrook, Illinois, farmer) had in the mid-1980s, or that Francis Childs (a Manchester, Iowa, farmer) has recently had or some of the Nebraska farmers have had," says Gyles Randall, a University of Minnesota soil scientist.

Numerous university studies show decreased corn-on-corn yields compared to corn in a corn/soybean rotation. A 1983-2001 Illinois study shows an average 10% yield decline (a 15- to 20-bushels-per-acre drop) in corn following corn vs. corn following beans.

"In some cases, corn following corn yielded 100 bushels per acre less than

Agro-Connect: Finding solutions

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Push a pencil first

Before you deep-six soybeans in favor of more corn, make sure it's profitable. This decision largely depends upon price and yield. Gary Schnitkey, a University of Illinois Extension farm management specialist, says Illinois farmers are better off sticking with an even corn/soybean rotation in 2004.

Using data from the Illinois Farm Business Farm Management Association (FBFM), Schnitkey examined crop revenue performance for northern, central, and southern Illinois after subtracting variable costs for corn, soybeans, and wheat. He based 2004 projections upon five-year average yields and commodity prices per bushel of \$2.25 for corn, \$5.70 for soybeans, and \$3.40 for wheat.

"While long-run conditions may favor growing more corn and fewer

soybeans in Illinois, planning prices for 2004 harvesttime do not suggest shifting more acres to corn, particularly for northern and southern Illinois," says Schnitkey.

Regional differences

Planting corn following corn may increase profits in 2004 for central Illinois. However, Schnitkey points out, long-term yield reductions could occur by increasing the amount of corn in the rotation. And in southern Illinois, Schnitkey projects wheat to be more profitable than corn, with wheat and double-crop soybeans an attractive alternative.

He adds that projections could be altered by changes in relative yields or prices. But for now, changing the corn/soybean rotation by bumping up corn acres returns less money and also increases risk. ■

corn following soybeans," says Emerson Nafziger, U of I Extension agronomist. "We don't have a good answer as to how much extreme risk there is from continuous corn."

Rotation's benefits remain

The corn/soybean rotation no longer packs the pest control punch it used to. For example, corn rootworm has thwarted the rotation by finding ways to survive until the next time corn is planted. Yet, the rotation effect is still valuable. It breaks up many weed, pest, and disease cycles and creates better soil structure and water infiltration.

The rotational benefit particularly surfaces in stressful years, such as 2003. "There was beautiful corn-on-corn until mid-July, when it ran out of water and really struggled," says Randall. "Corn following soybeans appeared to have a more favorable rooting pattern and seemed to better weather the dry conditions."

The different rooting systems spawned by a crop rotation enhance soil properties. "When you diversify your cropping system, you introduce new elements to the soil environment, namely the bacteria populations that fix nitrogen (N) and enhance the

metabolism of microbial activities," says Mahdi Al-Kaisi, an Iowa State University soil scientist. "That will fix more carbon. Eventually, that carbon is going to work well in the final decomposition to structure soil particles together. This leads to better soil aeration, better water holding capacity, and a whole new set of soil properties."

Residue: friend and foe?

Continuous corn also can enhance soil properties due to the carbon it pumps into soils via large quantities of decaying residue.

"Continuous corn is the fastest way to build soil organic matter due to the large quantities of residue produced," points out Mike Plumer, U of I Extension natural resources management educator. He points to a field in a U of I trial where the organic matter rose from 0.7% to 2.5% after 10 years of continuous no-till corn.

Randall adds that the prolific residue produced by continuous corn also helps boost soil tilth and a rich microbial population in the rooting zone. "I'm a firm believer that these high yields can be obtained with continuous corn, but it will take more nutrients," he adds. ■

May I cut in?

That's because soybeans normally add an N credit of 40 pounds per acre that has to be replaced in corn on corn. If you're applying 120 pounds per acre every other year in a corn/soybean rotation, you'll need to apply 160 pounds per acre of N each year. That increases production costs.

The huge amount of residue produced under continuous corn helps protect the soil against water and wind erosion. However, the same residue can result in cool, wet soils that delay planting and emergence.

Simply burying residue via tillage isn't the answer. "Every time you till the soil, it's like hitting the foundation of a house with a bulldozer," says Al-Kaisi. "It takes time and energy to build it together and cluster all of those soil particles. Just by itself, tilling the soil compromises a lot of soil property entities, destroys soil structure, and reduces infiltration."

What do you do?

One way is to shave the amount of residue on the field by adopting a corn/corn/soybean rotation on a share of your acres as Martin has done.

Next, plant corn-on-corn on well-drained soils. They handle the increased moisture and cold spring soils that result from prolific residue better than poorly drained soils.

Then, examine production systems that sparingly use tillage. No-till is an option, but a difficult one, given the prolific residue that results.

Strip tillage is an attractive option, since it clears residue from the seedbed without the destructive force of deep tillage or a moldboard plow. In the fall, a tillage pass creates an 8-inch-wide by 8-inch-deep zone.

To dodge residue, Plumer advises injecting N. Under strip-till, growers can inject N, phosphorus, and potassium during the fall tillage pass. The following spring, they can add pop-up fertilizer with the seed to enhance early growth. This fertility strategy, combined with the black soil in the cleared zone that rapidly warms up, enhances seed germination and quick and even emergence.

Growers can tailor this strategy as it

Corn is more apt to build the soil

Here's a sampling of responses in the Crop Scouting discussion group of Agriculture Online™ about a tenant wanting to raise corn three years in row to build the soil.

I would have no objection if my tenants wanted to no-till corn for three or four years. It is a good way to build more humus in the soil and will control erosion better than soybeans. —Mike L.

Beans remove more carbon from the soil than they produce. He is right about building soil carbon with corn. Give him the green light.

Sounds like a tenant that knows what he's doing. I would try to keep him. —Bob

My neighbors have been no-tilling corn on some fields now for 15 years without rotation. With manure, soil testing, and good disease and pest management, they're improving fertility and organic matter year after year. —Ontario

It is good to hear that someone cares about the land. A lot of farmers I know are just concerned about themselves and rape the land for short-term benefit. —SA ■

fits their operation. After applying 200 pounds per acre of N laced with a denitrification inhibitor, Martin combines a late-March preplant chemical application with a 10-gallons-per-acre 28% application. This substitutes for the pop-up application and boosts operation efficiency during a busy spring.

Martin also applies N throughout the growing season, such as a drop-on application 10 days prior to pollination. Multiple split applications also can better match N uptake with plant growth, he says.

The strip-till strategy works well for Martin. "I thought I'd have some problems this year after 200-bushels-per-acre corn residue last year, but it looked good," says Martin. "There was no trash plugging up, and the stalks are rotting from previous years."

One drawback is that fall N application is not recommended in some states such as Minnesota, says Randall. In a Minnesota trial, corn

yields dropped 36 bushels per acre when N was applied in the fall compared to the spring due to N losses.

The increased residue from corn-on-corn can also create a haven for disease. Since some hybrids are sensitive to gray leaf spot, it's important to pick a hybrid with resistance to this disease, says Nafziger.

Should you do it?

Long term, questions linger about the sustainability of both continuous corn and the corn/soybean rotation, says Doug Karlen, soil scientist at the USDA National Soil Tilth Laboratory in Ames, Iowa.

"When you look 200 to 500 years ahead, I'm very uneasy about what we're trying to do. We're gearing our entire infrastructure on corn and soybeans," says Karlen. "When it becomes more profitable to pull beans out of South America or corn out of China, U.S. farmers will be left holding the bag because we don't have a set of new choices."

For now, the recent bin-busting yields of corn make corn-on-corn a tempting choice. But more needs to be known about how to bring corn-on-corn yields up to those of corn following soybeans, says Nafziger.

"I do believe that people can learn to manage residue and put on a little extra N and possibly choose hybrids better for corn after corn, but it's a moving target," he points out. **SF**

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