



Planting cover crops after wheat harvest is a way to eliminate excess water before planting corn the following spring, says Dwayne Beck.

A Quiet Revolution

Water management via tools like no-till and cover crops spurs a crop revolution in South Dakota.

Back in 1990, Dwayne Beck was a panel speaker during a central South Dakota program about how the region could boost its agricultural output.

"I got up and said if we no-till here, I think we can grow corn and grow crops like peas (every year)," says Beck, who today manages the Dakota Lakes Research Farm near Pierre, South Dakota. "All the calves that go through Fort Pierre livestock auction going to Oklahoma to eat corn produced under irrigation from an aquifer that is going dry, we can feed here. The other three people on the panel told everyone how stupid I was."

Beck and the region's farmers have had the last laugh. Today, there is a cornucopia of crops that traditional winter wheat-fallow farmers could only dream about a generation ago. Grain bins built to house increased grain production form striking silhouettes against scarlet sunsets. Dust storms, once common decades ago, are

now nil due to the year-round crop cover present on many fields.

"It is all about managing water," says Beck. Water management through tools like no-till and cover crops has helped farmers intensify crop rotations. It's led to an increase in revenue of \$1.123 billion from 1990 to 2009 in central and north-central South Dakota.

SEARCH FOR SOLUTIONS

Thirty years ago, this area supported an uneasy mix of winter wheat followed by a year of fallow punctuated by corn irrigated with Missouri River water. Wheat prices, which supported winter wheat-fallow in the 1970s, crashed when exports to the former Soviet Union dwindled in the early 1980s. Meanwhile, high energy prices that resulted from pulling water several hundred feet upward from the Missouri River nixed irrigated corn profits.

That caused the region's farmers and researchers to search for solutions.

Before managing the Dakota Lakes farm, Beck studied reduced tillage and crop rotations at the South Dakota State University James Valley Research and Extension Center near Redfield in northeastern South Dakota in the 1980s. Typically spring wheat country, Beck's research showed no-till systems with diverse rotations could fit high water-use crops like corn into spring wheat. Ditto for soybeans, which are now a staple in that area.

About this time, Mark Stiegelmeier, Selby, South Dakota, began dabbling with a precursor to no-till. "We planted some grain sorghum using a Concord air seeder," he says. Although the knives used by the air seeder disturbed the soil much more than today's no-till units, it was a start.

"The thing that really drove me to do it was soil conservation," says Stiegelmeier. "We were doing wheat-fallow, which was typical for this area. We were trying flax strips for erosion control, but we got tired of watching the soil blow."

There were drawbacks to air seeding, though. "I felt we were basically replanting weed seeds with the air seeder," he says. "If we wanted to do a preplant herbicide option, we moved too much soil and broke the herbicide barrier."

To minimize soil disturbance, Stiegelmeier bought a 750 John Deere no-till drill in 1990. Initially, downsizing from a 40-foot air seeding swath down to a 15-foot drill swath slowed fieldwork. "We could just cover 85 acres in a day with that drill," he says.

Still, it set him on a path to low soil disturbance and successful no-till. Besides wheat, Stiegelmeier's crops now include corn, soybeans, lentils, and field peas.

"No-till really took off when Roundup Ready crops became available (in 1996)," he adds. "Before, working with all types of chemicals made (application) timing important. If it wasn't done right the ➤"

Crop Bushel Changes for Central and North-Central South Dakota*

	1990	2000	2009	Change
Spring wheat	30.3 million	33.3 million	36.5 million	6.2 million
Winter wheat	17.8 million	22.1 million	22.5 million	4.7 million
Corn	52.2 million	117.6 million	220.3 million	168.1 million
Soybeans	6.9 million	46.7 million	55.0 million	48.1 million

* Includes 17 South Dakota counties in these regions.

Radishes are a cover crop Mark Stiegelmeier plants after wheat to break up compaction and to cycle nutrients before he plants next spring's crop.

end, we end up with the same amount of moisture plus the benefit that cover crops provide," he

says. Besides sucking up moisture, cover crops like radishes and turnips help break up compaction and cycle nutrients back to the soil.

"It adds more of a labor requirement because we have to have a drill ready right after harvest," he notes. "Our biggest challenge with cover crops is getting moisture at the right time to get them started. With smaller seed sizes, we open that ground during seeding. If we get warm breezy days that dry out the soil, seeds can't germinate."

Overall, though, the cover-crop strategy is working for him. Plus, the rotation intensity has helped him boost residue that builds his soil's organic matter. "When we started, our soil's organic matter ranged from 1.5% to 2%," says Stiegelmeier. "Now, it ranges from 3.2% to 5.9%, with most soil tests in the low 4% area."

Increased organic matter amounts pays dividends. Small organic matter amounts by weight greatly impact soil pore space, since it only weight one-fifth as much for the same volume. Research has shown a 1% to 3% increase in soil organic matter approximately doubles soil water capacity, notes Beck.

THE NUMBERS SPEAK

Honing these components into a smooth-running system takes time. Eventually, though, steps like these have clicked across the region. Total crop production and value zoomed from 1990 to 2010 (using August 2010 prices) in 17 central and north-central South Dakota counties as follows:

- Spring wheat's 6.2 million-bushel increase is valued at \$37.3 million.
- Winter wheat's 4.7 million-bushel increase is valued at \$25.6 million.
- Corn's 168.1 million bushel-increase is valued at \$593.4 million.
- Soybean's 48.1 million bushel-increase is valued at \$467.1 million.

"Without steps like no-till, there wouldn't be near the corn and soybeans there are in this country," says Stiegelmeier. "Those are the crops that generate the most income. Because of that, it has revolutionized this area." •

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first time, it was a mess. When Roundup Ready came in, it became easy. The adoption rate of no-till would not have been as fast had it not been for Roundup Ready."

No-till is just a tool, though, for managing water. "Even in Pierre, when we harvest wheat in July and plant corn the next spring, it's often too wet the following spring," says Beck. "Our soil will only hold 8 inches of water at a time."

Enter cover crops. In this situation, a cover crop planted following wheat harvest will suck up excess moisture prior to planting corn the following spring.

"We started planting them four years ago," says Stiegelmeier. Typically, they include broadleaves like turnips, tillage radishes, sunflowers, vetch, lentils, and peas.

"I have worried about cover crops in this country because there is not excess moisture in this area by any means," he says.

Still, Stiegelmeier says the cover that cover crops provide can prevent moisture from evaporating. "I'm hopeful that in the