Southern Minnesota has some of the richest, most productive farm land in the world. Any cash grain producer will tell you, if you don’t get 200 bushels of corn per acre, you’re doing something wrong.

“High yield and high efficiency through precision agriculture are part of the big picture when it comes to conservation,” says Windom farmer James “Tony” Thompson. “I put great stock in efficiency — that it is part of caring for the world, and part of farming, to always strive for ways to do more with less.”

For Thompson, there is no contradiction in doing conservation agriculture on a 3,000-acre operation. His 24-row cultivator and planter — at 60 feet of toolbar each — are not the biggest pieces of equipment traversing the landscape by any means, but many a battle-hardened environmental warrior might mutter the phrases “industrial agriculture” or “factory farm” at such a sight.

But Thompson isn’t blinking.

He believes his operation demonstrates how the concepts of high-yield farm production and conservation of natural resources can converge. Devising an agriculture system using the latest technologies of global positioning, biotech crop varieties and inputs at the right scale is what allows him to consider the natural environment and assure that his farm has the lightest footprint possible.

ON RIDGES

Ridge-till cultivation, banding fertilizer and conservation drainage methods all become possible by striking that balance. While assuring a commercially viable yield, Thompson experiments with things like native seed production, cover crops and wood-chip bioreactors. Though the market for prairie plant seeds is somewhat dormant now, at one point when poor markets and disastrous weather put his crop production business in the red, the native plant seed business kept the farm afloat.

Ridge tilling, where effectively only about a third of the field is disturbed, prevents rill and sheet erosion, keeping more than 2 tons of topsoil per acre in place in the rolling topography of Willow Lake Farm. Because phosphorus molecules stick to soil particles, erosion prevention is a key to water quality restoration and preservation.

“One of the advantages of ridge till, compared to conventional cultivation, is fertilizer efficiency,” says George Rehm, a retired nutrient management specialist with the University of Minnesota who now directs the Minnesota Discovery Farm Network. “Planting in the same row, year after year after year — if you band in the same spot, you get more efficient use, particularly of your phosphorus and potash. We have demonstrated that we can cut phosphorus and potassium by half compared to broadcast fertilizer methods. What you gain with repeated banded applications, you get a zone right underneath the row that has higher fertility. When we compared ridge till to broadcasting in the early 1990s, we saw producers get another 20 to 30 bushels of corn in a ridge till.”

Thompson also keeps to a 50-50 rotation of corn and soybeans to get the nitrogen lift offered by soybeans. He splits the application of nitrogen, doing part in the fall and then an application once the plant has emerged.

But nowhere is the convergence of conservation and maximum yield more apparent than in Thompson’s use of precision agriculture techniques.

NUTRIENT MANAGEMENT PLAN

“Our production follows a two-year cycle,” explains Thompson. “We harvest our soybeans, and the stubble remains. Then we go in and apply with precision [using RTK-based GPS] diammonium phosphate and potash,
Tony Thompson grew up on a farmstead nestled on a hill shaded by burr oaks and majestic cottonwoods, with Willow Lake on one side and Fish Lake on another. Over the past half century, he has witnessed the wide variations of the hydrologic cycle; there have been times when the lakes were little more than marshy mudflats.

These days, the lakes are beautifully filled to the brim. But the plentiful rain of the past few decades that helps keep them that way also brings with it nutrient runoff from the surrounding farmland.

The cycle of algae blooms that interfere with enjoyable swimming, and sometimes even lead to oxygen depletion and fish kills, led Thompson to become interested in a new technology called a wood-chip bioreactor. It’s a simple concept: Channel runoff water through a tube that has a layer of wood chips in it. Not only does it slow down the water and allow sediment to settle out, but bacterial action caused by the wood chips would eat up nitrogen and phosphorus before they can drain down into the lake.

Thompson went to work applying for a cost-share and getting a bioreactor installed at the edge of his land where it drains into Fish Lake. He also started talking to the neighbors and getting them interested in treating all the runoff to help Fish Lake make a real turnaround.

Seeing that Thompson had gotten the ball rolling, the Jackson and Cottonwood soil and water conservation districts (SWCD) and the Minnesota Department of Natural Resources (DNR) got involved. They have adopted it as a joint project. Eventually they hope to install 15 such bioreactors on the properties of eight landowners surrounding the lake, according to Dave Bucklin, district technician for the Cottonwood SWCD.

With funding from the Clean Water Legacy program, a special sales tax approved by Minnesota citizens to fund water-quality projects, SWCD staff surveyed the land around the lake and found all the tile and surface water outlets.

“We when install a bioreactor, we intercept the tile on the edge of the cropland,” says Bucklin. “We dig a trench about 5 feet deep, and at each end we place a water control structure that we can access. The trench is lined with plastic, filled with wood chips and then covered with a foot of top soil. The tile water flows through the wood chips. Nitrate in the tile water is removed by denitrification in which nitrate is converted to nitrous oxide and nitrogen gas by the bacteria in the wood chips. The structure at the other end allows water an outlet to the lake. Because the process removes most of the oxygen from the water, ideally, you want to build a splash pool with rocks that the water tumbles over — that helps it to oxygenate again.”

Each bioreactor costs between $6,000 and $10,000, depending on the length of the trench and the amount of materials needed.

“Fish Lake is one of the deeper lakes, and it’s unique in the area,” says Bucklin. “Most of the lakes here are 5 to 6 feet deep, and were formed by glaciers. This one has a sandy bottom, and it’s over 20 feet deep, so it has a lot of recreational appeal. That may be one reason why the landowners are so willing to cooperate. Massive algae blooms can make these lakes almost unbearable. When algae dies in the fall, the dissolved oxygen in the water can crash and kill fish. These bioreactors are a neat project to take nutrients out and help solve that problem.”

In addition to the bioreactors themselves, several other projects are being installed, including grade stabilizations and alternative tile intakes.

In most cases, the grade stabilization projects will work in concert with the wood-chip bioreactor. For example, the new outlets on the bioreactors will no longer flow into a gully. The outlet water will be safely discharged closer to the lake, reducing the overall erosion in the area and eliminating some severe lakeshore erosion issues.

“We don’t have a lot of experience with [wood-chip bioreactors] yet,” says Bucklin. “A lot are being installed [throughout the Midwest], all of them somewhat experimental. We’re optimistic that we are getting what we want out of it. The DNR regional office has jumped on board, doing some pre-project water testing on the lake, so we can measure the effect after all the projects are in place.”

Thompson plants at 5 mph. With 24-row equipment, that’s about 30 acres per hour.

“With 1,500 acres of each crop, that’s 50 hours of planting corn assuming everything worked perfectly,” says Thompson. “Add 30% for turning on the ends, and 50 hours for planting soybeans plus 20%. Our plan is to get each crop planted in 10 days or less. It is difficult to find 50 contiguous hours to plant at that point in the spring in Minnesota.

Thompson has arrived at this scale and rate of planting through careful work with crop consultants Klay Walinga of Fairland Farm Management and Steve Sodeman of United Ag Tech. Together, the two experts gather and disseminate the collective experience of hundreds of successful farmers, producers across southern Minnesota. Willow Lake Farm employees Tom Quiring and Fred Heming bring their experience with the land to the mix.

“Can’t imagine that I would have the time or resources to invest in conservation work without these relationships. I like to think of it as the perfect team,” says Thompson.

Timely planting means more bushels. Keeping a steady pace with a bigger machine allows the farm to use less fuel per bushel and reduce the farm’s carbon footprint. Conservation tillage also saves fuel.

Gaining Recognition

On May 26, Thompson became one of three laureates who accepted the 2011 Siehl Prize for Agriculture. The prize recognizes his long-term achievement in agricultural production.

In his acceptance speech, Thompson compared his notion of the ideal farmer to the widely held ideal of a family practice doctor.

“I think the ideal physician, upon meeting a patient, would check the vital signs and interview the patient and then try to understand the life that that patient leads,” Thompson told the packed audience at the University of Minnesota’s McNamara Alumni Center. “So first the vital signs are checked; then the physician would inquire about the wellness of the rest of the family and what are the rest of the family eating and who are you keeping company with and are you getting proper sleep. I think ideally we would hope that farmers, rather than just producing bushels of grain, that farmers could have the opportunity, professionally, to act as the ideal physician does, taking a more epidemiological or ecological view of the landscape.”

While he remains optimistic that agriculture will be a sector that continues to reduce its environmental impact over time, Thompson promotes the idea, even in these times of fiscal constraint, that the public consider expanding its investment in farm conservation measures. Government programs represent the only way farmers can recoup some of the time and expense of conserving resources for everyone’s benefit.

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