

Controlled drainage puts producers in charge of moisture

By Dick Hagen

The Land Staff Writer

January 16, 2009 03:19 am

— Even though tiling continues to be the No. 1 tool to improve crop production land in Minnesota, new tiling projects or updates to aging drainage systems may include technologies akin to the “lock and dam” system that controls water flow and barge movement on the Mississippi River.

Water table management through controlled drainage makes it possible to vary drainage intensity with the seasonal variation in drainage demand, which in turn controls the amount of water and soluble nutrients exported from the system.

Spokespersons for this new “controlled flow” drainage speak of it as a technological upgrade for both crops and the environment.

“We know drainage provides a better environment for most crop farmers in Minnesota,” said Craig Schrader, University of Minnesota Extension educator in Soil Science, “but the downside to the extensive pattern tiling of Minnesota cropland is the rapid drainage of spring rains, especially after sudden downpours, which also flushes fertilizer and other nutrients down the Mississippi River eventually dumping into the Gulf of Mexico.”

Controlled drainage

Enter something called controlled drainage systems. It permits free drainage of excess soil water in the spring and fall but switches to controlled drainage after planting by “stop logs” strategically placed in edge-of-field water level control structures. Water in the soil profile would then be available for later crop usage, especially if the summer season turns dry. This would also stabilize nitrogen and other soil nutrients.

“Nitrogen is very mobile in water, but if the water isn’t draining, then that nitrogen stays in the root zone available to the growing crops,” Schrader said.

Drainage specialists speak of the Golden Rule of Farm Drainage: Only drain the amount of water necessary to ensure trafficable conditions for field operations and to provide an aerated crop root zone, but not a drop more.

“We need to be doing a better job controlling what is coming out of our tile lines into drainage ditches and watershed rivers,” said Leonard Binstock, executive director of the Agricultural Drainage Management Coalition. He maintains that because of rising crop production costs, more efficient use of water becomes even more critical, citing that an unregulated drainage system drains 40 percent more water over the course of a growing season than does a controlled system.

“In essence you are wasting reserve moisture,” Binstock said. “How much added value might that have been for many corn and soybean fields in 2008?” He said that with 300-bushel corn yields within 15 years or sooner, the limiting factor for this explosion of yields is likely going to be water.

“We know how to do the management. We already have the genetics and will keep getting more. We have the sunshine and we have some of the best soils in the world,” Binstock said, “but it takes water to grow corn and we saw that again this year. ... One of the problems we’re always dealing with is having the moisture at the right time and that’s what drainage management is all about.”

Though most speak of these systems as drainage water management, Binstock prefers calling it reserve subsurface drainage. “And that’s really what we’re doing, we’re manipulating the water table during the growing season.”

More trial data needed

So are farmers buying into this new drainage strategy, especially with costs of \$100 per acre or more?

“We’re early into the learning cycle,” Binstock said, “but as soon as we get enough yield data showing farmers the economic returns, it’s going to go like wildfire. We’ve already had some yield trials showing as high as a 40-bushel increase with controlled drainage. The yield advantage may not be there every year because even Mother Nature is capable of a near-perfect rainfall pattern sometimes. But get just a few years of yield bonuses and you’ve got a system paid for.”

Cleaner water into the Minnesota River watershed (nearly 11 million acres) and eventually into the Mississippi River

basin, will be additional perks as more cropland gets into drainage management systems. Watershed systematic environmental affects will also include agricultural water retention ponds and the advent of saturated buffers. There are literally thousands of miles of ditches and stream banks across the Corn Belt with grass buffers already in place. Binstock suggested that if those buffers also had controlled “sub-surface” drainage (saturated buffer strips) greatly slowing water movement into the ditch, natural vegetation in the buffer strip would clean up much of the nitrates and other nutrients in the discharge water before flowing into the streams.

He indicated the new farm bill has classified drainage water management as a conservation practice, which means that under the Environmental Quality Incentives Program, it will be cost-sharable. Typically this has been a 50 percent cost share but this could vary with counties depending upon how they allocate their U.S. Department of Agriculture monies.

The Conservation Stewardship Program pays for the management and operational costs for five years after installation plus a five-year renewable option. Estimated payment would be about \$18 per acre according to Binstock, and would permit up to \$200,000 funding over a five-year period.

Huge potential

Redwood County farmer Brian Hicks, who hosted a Soil & Water Management Field Day last fall and has the first controlled drainage research site in Minnesota, summarized the role of managed drainage systems.

“If you’re going to pay \$5,000 for land, you got to have a drainage system,” he said. “The benefit of being able to manage that drainage system is huge. You can keep back much of that water for late-June and July when rains lessen and soils typically start getting drier. Plus you’re also keeping back the nutrients that crop needs, especially your nitrogen.”

Based on data collected by Jeff Strock, a soil scientist at the University of Minnesota Southwest Research and Outreach Center near Lamberton, two years of research on Hicks’ 90-acre field with 55 acres of controlled drainage and 35 acres with conventional drainage, data showed a 91 percent reduction in nitrate loads and a 75 percent reduction in phosphorous loads in the water moving through the controlled drainage system.

Hicks has over 300 acres of managed drainage including about 200 acres with pumps lifting drainage water over a dike into the Cottonwood River and 125 acres now fitted with pattern tile and gated structures for releasing and shutting down drainage water as needed.

Like money in the bank

Attending workshops on drainage management got Hicks interested about the technology for “stockpiling” water in the soil profile for usage as needed. At the field day he hosted, Hicks and backhoe operator Jimmy Zeug installed an \$800 Agri Drain water table management structure for a 53-acre field to be pattern tiled in 2009.

“We’re still young in this business so we don’t have yield data to verify the investments,” he said, “but even a reduction in field loss of nitrogen could be cost-effective. Cost of fertilizer these days gets your attention and quickly convinces you that hanging on to every pound of commercial N is money in the bank.”

Starting from scratch with a total system including the field tile plus structures and outlets runs to about \$500 an acre, Hicks estimated. But with a 20-year amortization schedule for these systems, plus possible cost-sharing opportunities through various USDA programs, he sees this “new thinking” on farmland drainage expanding rapidly.

“But I question the optimism of Binstock,” he said. “I have not had much success sourcing EQIP funding but producers do need to be proactive about drainage. There are many misconceptions out there. We need to show that properly planned drainage is not negative to the environment.”

Charlie Schafer, president of the Adair, Iowa-based Agri Drain Corp., indicated the most interest in drainage water management is those areas where topography is relatively flat, 1 percent slope or less, and they already have an intensive systematic subsurface system in place, or planned. Also, interest bumps up if the practice is supported by some form of USDA/NRCS cost share.

“Farmers realize the value of adequate moisture during the growing season so they consider undrained water in their soil profile as an asset, like money in the bank,” Schafer said.

Drained farmland in the Midwest

State -- Acres -- % Drained

Illinois -- 9.8 million -- 35

Indiana -- 8.1 million -- 50

Iowa -- 7.8 million -- 25

Ohio -- 7.4 million -- 50

Minnesota -- 6.4 million -- 20

U.S. Department of Agriculture data (2004).

