

Irrigation Extra

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Drain and irrigate: best of both worlds

By LYNN BETTS

It's expensive up front, and it doesn't work everywhere. But a relatively new conservation drainage and subirrigation combo that's catching on in Missouri and drawing interest in Minnesota has a quick payback — and other benefits.

In soils with a restrictive layer at about the usual tile drainage depth, tile drains are being designed with water control structures to both drain excess water and to add water back into the soil profile, as needed.

"There are about 2 million acres of soils in Missouri where this subirrigation and drainage duo could apply," says John Hester, USDA Natural Resources Conservation Service area engineer, Bloomfield, Mo. Hester and fellow NRCS engineer Mark Nussbaum of Jackson, Mo., have helped farmers install systems on 2,500 to 3,000 acres, mostly in Cape Girardeau and Scott counties in the southeastern part of Missouri, over the past 10 years.

"Subirrigation with tile doesn't work where the restrictive layer is closer to the surface, or where the soil is highly permeable without a clay layer," Hester says. "But it can work really well on flatter soils with a restrictive layer at that 4-foot depth or deeper. Those waterlogged soils are difficult to plant in the spring. The soil needs tile for drainage then, but later in June and July it gets dry, and you want that water back in the soil profile."

"The tile that drains excess water in drainage mode can also be used to hold the water table high enough in the soil profile that water can wick up to the crop root zone in irrigation mode," using in-line water control structures that have stop

Key Points

- Payback is quick for subsurface drainage-irrigation systems.
- The combo systems work only on soils with impermeable layers.
- Drainage-irrigation systems offer consistent yields year after year.

logs to control the water table level, says Nussbaum. "In-line water control structures have removable stop logs that can help store rainfall in the tile and the soil profile, or raise and maintain levels from water pumped into the tile from wells. The water wicks up from the tile line as much as 20 inches, to within about a foot of the surface. It's available to plants when they need it."

Because water is absorbed and held in the soil profile longer, water-quality benefits accrue with the dual system. Controlling water in the system can reduce overland flows by 29% to 65%, and peak runoff by 15% to 30%, according to NRCS. The system cuts phosphorus loss up to 45%, and sediment loss from 16% to 65%.

Retrofit or new system

Drainage-subirrigation systems can be retrofitted to existing tile, but most of the Missouri systems are being installed in brand-new tile lines, Nussbaum says. The difference in the dual use from drainage only systems is tile spacing: Maximums for pattern drainage only are 60 feet lateral spacing, but for subirrigation the maximum is 45 feet.

Most systems are in creek bottoms, in 10- to 40-acre fields. The fields are typically very wet in spring and fall, but fertile, with a restrictive layer about 4 to 6 feet down.



PHOTOS BY MARK NUSSBAUM

LITTLE TO SEE: The control box with stop logs is all there is to see with controlled drainage and subirrigation systems, except for optimal yields. One of the first systems Mark Nussbaum helped design yielded 72 bushels of soybeans/acre in droughty 2007.



NRCS soil scientists investigate sites to determine the depths to restrictive layers.

"We're seeing the cost of a dual drainage-subirrigation system is about 20% higher than for drainage only," Hester says. "For that relatively small add-on, some farmers are opting to set up now with closer spacing, even if they don't use the water control structures now for subirrigation."

Betts writes from Johnston, Iowa.

■ See more on this topic beginning on Page IE 2

WATER WICK: In soils with a restrictive layer at about the tile depth, blocked tile or tile pumped full of water results in water wicking upward, as close as a foot from the surface. That's how water control structures can be used to both drain and subirrigate land.

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