



# Efficiency underground

Subsurface drip irrigation involves applying low volumes of water at low pressure through drip tape buried near plant roots. The system saves water and saves energy, said Kevin Stewart, director of marketing for Rivulis, a leading manufacturer of subsurface drip irrigation systems. PHOTO COURTESY RIVULIS

## Subsurface drip irrigation tape emerges as an effective option

BY MITCH LIES

**T**wenty-five years ago, subsurface drip irrigation was little more than a niche concept in the nursery industry. It was being used in a select number of ornamental tree operations, according to Kevin Stewart, director of marketing for Rivulis, a leading manufacturer of subsurface drip irrigation systems.

Today, as water resources have become scarce and energy costs have soared, more and more nurseries are turning to the technology as a means to improve water- and energy-use efficiency.

“We estimate that around 50 percent of the fruit and ornamental tree nurseries are using subsurface drip to efficiently water their crop,” Stewart said.

While the technology may not fit all operations and all fields, growers who have adopted the system say it provides multiple benefits and is worth working

through issues to get the system up and running.

At its core, subsurface drip irrigation involves applying low volumes of water at low pressure through drip tape buried near plant roots.

“Instead of applying a lot of water with flood irrigation and then coming back in seven days and doing it again, with drip irrigation, you’re applying a much smaller amount of water, but you’re doing it every two or three days or when it is needed at a very high efficiency rate, typically as high as 90–95%,” Stewart said.

Growers will typically bury drip tape between 4–6 inches deep, Stewart said, and just off center from the root zone of trees. Sam Doane, production horticulturalist at **J. Frank Schmidt & Son Co.** in Boring, Oregon, which was an early adopter of subsurface drip irrigation, said he buries the drip tape 5 inches deep and 5 inches off center in the shade tree fields.

“If you go too shallow, there are problems with soil settling, and some of

the tape can be too close to the surface,” Doane said. “And if you go too close to the tree row, when you put the stakes in, you can puncture the drip tape. So, it’s sort of a compromise solution.”

Noe Rodriguez, production manager at **John Holmlund Nursery**, said the Boring, Oregon, nursery buries tape between 5–6 inches deep and just 2–3 inches from plant roots in an effort to ensure that water and nutrients reach roots.

The nurseries will leave tape in for the duration of a crop, typically two to five years, before digging up the old tape and replacing it with new tape.

### The benefits

Subsurface drip irrigation reduces a nursery’s water use, energy use, fertilizer use and provides significant savings on labor.

“The water savings are amazing, because the water is not affected by wind,” said Nancy Seida, sales representative for **H.D. Fowler Company** in Wilsonville, Oregon, which works with several drip tape manufactur-



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Workers install drip tape approximately five inches deep while planting ornamental trees at one of J. Frank Schmidt & Son Co.'s farms in Canby, Oregon. PHOTO COURTESY J. FRANK SCHMIDT & SON CO.

ers. “There’s no overthrow and there’s no wind effect. The water gets directly to the root zone of the plants, where it can be consumed by that plant.”

“We confidently feel like there is a 20 percent benefit in water savings as far as moving from overhead sprinkler irrigation to drip,” Stewart said.

Many growers also are finding benefits in injecting fertilizer through subsurface drip systems, according to Stewart. “They’re maximizing the full value of that delivery service because you’re providing the fertilizer directly to where it is needed, which is right near the root zone of the crop,” he said.

Doane said J. Frank Schmidt & Son reduced the amount of fertilizer it uses by about 30 percent when it switched to a subsurface drip system.

Energy savings can also be significant, in part because the improved efficiencies of subsurface drip systems allow growers to have shorter irrigation run times. “Since you’re watering so much more efficiently,

you tend to water for a lesser run time,” Seida said. “And if you have a lesser run time, then you have lower electrical costs on your pumps.”

Also, Stewart noted that operating pressure of a Rivulis system is around 10 pounds per square inch (PSI) versus the 50 to 60 PSI that most sprinklers utilize. “If you’re pulling water out of a well or a ditch, it requires more than 10 PSI to lift that water and convey it to the field,” Stewart said. “So, it’s not 10 PSI at the pump. It might be 30 PSI at the pump, but you’re still looking at 30 PSI versus 60, so that is pretty significant in terms of energy savings.”

Doane said the energy savings provided by the drip system alone covers the cost of the drip tape. Other costs, such as the installation costs of the infrastructure to operate the system, the piping, manifolds and other equipment, need to be amortized over time, Doane said.

Another benefit of the technology is in the increased acreage a nursery is able to irrigate in any one day.

“We are able to cover a lot more ground when we use drip tape versus overhead irrigation,” Rodriguez said. “If you set a line of sprinklers, you can water maybe 15 to 20 rows at a time, and it uses a lot of water because you’re watering 100 percent of the field. With the drip tape, you can water maybe four or five times as many rows and you’re only watering the root zone.”

Also, with subsurface drip, workers are able to work in a field while irrigation is taking place, something they often aren’t able to do in overhead systems.

“If you’re overhead irrigating, it’s pretty difficult to have workers out there doing whichever horticultural job is being called for,” Doane said.

Also, Doane said, it is easier to drive tractors through fields when the area between the trees isn’t getting irrigated, a benefit drip provides over sprinkler irrigation.

And because tape is buried, there is less likelihood that a worker will damage the tape during routine work, Seida said.



A fertilizer injection station and subsurface drip irrigation system manifold are pictured at J. Frank Schmidt & Son Co. The nursery applies liquid fertilizer through the system. PHOTO COURTESY J. FRANK SCHMIDT & SON CO.

“Because the tape is buried, you don’t hurt it, you don’t slice it accidentally if you’re doing hoeing or some other work. You’re not damaging the tape because it’s underground.”

One of the biggest benefits nurseries derive from using subsurface drip irrigation can be found in labor savings, an issue of particular importance to West Coast nurseries due to the high state minimum wages and now the additional requirement in Oregon of paying overtime wages to farmworkers.

Doane said J. Frank Schmidt saw a significant reduction in the amount of labor required to run its irrigation system after switching to subsurface drip. “Our drip irrigation crew on our Canby farm, which is about 1,200 acres, is three or four people,” he said. “If we had overhead, we would probably have a crew of 16 for our irrigation.”

Other benefits, such as reduced weed pressure, are less obvious, but still significant, Stewart said, as by putting water only where it is needed, a grower isn’t watering between the rows and promoting weed growth. “You’re not irrigating the

entire field and so your weed reduction is going to be significant,” Stewart said.

Subsurface drip also can reduce disease pressure as drip irrigated fields tend to be less humid than sprinkler irrigated fields. “You’re not putting excess water out there, which can create really moist conditions, which can be ideal for fungi to grow in,” Stewart said. “With drip, you have a better chance of reducing the impact of those diseases.”

### The drawbacks

Still, there are drawbacks to subsurface drip irrigation that need to be considered when growers are mulling whether to switch to the system, one of which is the system’s high installation costs, a cost that Doane said can be substantial.

Also, removing the drip tape between crops can be labor-intensive, Doane said. “Probably the least efficient part of the process is getting the tape out of the field,” he said. Getting a recycler to take the used drip tape can be difficult, given that the tape typically is dirty and needs to be cleaned before it can be recycled. “The price for the recycled plastic has to be high

enough that there are recyclers willing to work through those headaches,” Doane said. “When the market is down, they just say, ‘Call back later,’ or ‘No thank you,’ and the tape just sits in the yard until we get a big enough pile that somebody is interested in taking it off our hands.”

And drip systems have limitations when it comes to jobs like watering in pre-emergent herbicides or washing dust off leaves to minimize spider mite habitat.

“We will still do a couple of overhead irrigations (a year) just to help with that,” said Doane, who noted that J. Frank Schmidt still has dedicated lines for overhead in its drip irrigation fields.

Also, with overhead irrigation, a grower can lower the temperature in a field more so than with subsurface drip, a benefit that can be particularly beneficial in excessive heat events, such as the heat dome that struck Oregon’s Willamette Valley in 2021.

“I’ve seen substantial changes in field temperature following overhead irrigation that you don’t see with drip,” Doane said.

Also, overhead can provide frost protection during cold snaps, something

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drip can't do.

Another potential drawback to sub-surface drip irrigation is that an operation might not discover a problem until the problem escalates in importance. "You can't see that there's a problem," Seida said. "You can't see water spraying out. It's not visible." Eventually, a grower will notice an overly wetted area, she said, but in the meantime between the occurrence of the tape's puncture and the identification of the problem, trees at the end of the row will have gone without adequate water for a period of time.

And, depending on the water source, growers often have to apply filters to systems to prevent dirty water from clogging emitters.

### No silver bullet

The bottom line, Stewart said, is sub-surface drip irrigation is not a silver bullet that can solve all your irrigation issues, but rather a tool that can help growers improve their water-use efficiency.

"Some challenges that need to be considered when adopting drip irrigation are field topography, rodent and insect pressure and water quality," Stewart said. "Each of these challenges can be overcome with proper tape selection, a great field design, proper filtration and a good strategy to address insects and rodents."

Also, Doane said, in some ball-and-burlap production systems where trees are harvested individually, subsurface drip often isn't the best choice, given the likelihood that the drip tape will be punctured in the harvest operation.

Still, Doane said that the benefits of subsurface drip irrigation are such that it can be worth working through issues when they arise. "I would encourage people to not quit when they run into a problem, to instead work toward a solution," Doane said, "because I think the benefits of subsurface drip irrigation are very significant." ©

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