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## Drip changing tomato production rules

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While yield potential for processing tomatoes is considerably higher under drip irrigation, the system can also present unique management challenges like water placement, salinity issues and fertility.

According to Blaine Hanson, University of California, Davis, irrigation and drainage specialist growers have been questioning traditional drip line placement. "The traditional approach has been to place the drip line in the middle of the beds from 8 to 14 inches deep," Hanson says. "The advantage of that is the roots are concentrated where the water is concentrated."

However, that limits crop rotations and some growers started looking at alternate row configurations where the drip line is placed in every other furrow. "The problem with that configuration is that the drip line is as far away as possible from the plant row," he says. "There are weed problems and the drip line is removed before harvest, so it requires twice the time that buried drip requires."

"We had somewhat mixed results," Hanson says of a four-year research trial looking at drip line placement. "However, over the past two years, we found that the every furrow placement yielded similar to the buried drip placement."

"The drip line placement did not seem to have much of an effect on solids," he says, "but it did have an effect on the way water moved and the way roots were distributed."

Yields have increased dramatically since the 1960s and the question becomes has the crop water coefficient changed? In a number of trials to answer that question, Hanson found that the main factors affecting crop water coefficient were the planting date and the season.

"Using your planting date, you can come up with a fairly reasonable crop water coefficient," he says. "There are perhaps adjustments to be made depending on whether tomatoes are transplanted or direct seeded. Transplanted tomatoes have a faster canopy development. We found no difference in plant water use between drip and furrow irrigation. The average evapotranspiration (ET) in the studied fields was about 25.5 inches which correlates with the 1960s data."

"That tells us that ET of tomatoes is controlled by climate conditions and not anything that is going on with the plants that resulted in higher yields. So there were no differences between this average and the historical values."

Hanson also looked at drip irrigation under saline soil conditions on the West Side of the San Joaquin Valley. The problem in that area is often compounded by shallow groundwater.

Options for growers with a perched water table include land retirement, conversion to different irrigation systems, reusing drain water along with various other scenarios. Conversion to drip appears to hold promise for growers who still want to grow tomatoes. In fact, preliminary observations on three commercial tomato fields that converted to subsurface drip from sprinklers showed that growers could increase their yields from about 33 tons per acre to 42 tons per acre. That translated into a profit per acre of around \$400-\$500 simply by converting to drip, according to Hanson.

Fertility management with drip irrigation is another area that UC researchers have been evaluating to get a better handle on crop nutrient needs. Tim Hartz, UC Davis vegetable crop specialist, conducted several fertigation trials in 2007.

"Over the past five or six years we've seen a revolution in the number of acres that have gone to drip irrigation, and our yield expectations on those acres are really climbing," he says. "But what is the amount of N, P, K needed to reach those goals, what is the demand by crop stage, and how effective are different plant monitoring techniques?"

Not surprisingly, the rate of nitrogen uptake varies reliably with growth stage.

"All three elements behave in essentially the same way," Hartz says. "Peak vine content of N, P, K occurs at full bloom. From that point forward, regardless of how much you apply, the fruit will mine the plants of those elements."

Anything in excess of about 200 pounds of nitrogen per acre is wasted. Excess nitrogen will end up in the fruit which is not what you want, according to Hartz.

"In terms of phosphorous management — our experience is that if you have enough phosphorous up front there is very little need to run it in fertigation," he says. "Potassium is harder to pin down."

Sampling techniques have a huge impact on results whether it's the sampling procedure itself or how the sampling was conducted.

Hartz cautions, "If you're sampling in a field with buried drip over multiple years, draw your samples from where the roots are drawing those elements."

There can be a tremendous difference from samples drawn in the root zone versus the furrow or other areas. Additionally, petiole analysis versus whole leaf analysis can make a difference in results.

"There are limitations to petiole analysis," Hartz says. "Petiole samples are very volatile. If you went out and sampled daily, the numbers would vary widely. Whole leaf analysis correlates with whole plant nutrient status and changes more slowly than petiole analysis. If sampled daily, it would give you a steady progression as compared to petiole analysis."

The differences should be taken into consideration when making fertigation decisions, according to Hartz. "If you're interested in pursuing petioles, whole leaf analysis is a better way to get a feel for what's going on."

In general, growers could probably back off fertigation rates in drip and still be okay, particularly in terms of nitrogen, he says. As the cost of nitrogen and other fertilizers go up, that may become a more important economic decision.

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