

Innovation In Winegrape Irrigation

A winegrape grower trains vines to require half as much water.

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By [David Eddy](#)



Grasses In Vineyards

Photo credit: Knights Bridge Winery

Tim Carl has developed an irrigation method that not only has reduced the water use on his Napa Valley vineyard by 50%, he has increased the quality of the wines. Carl, a managing partner at Knights Bridge Winery in St. Helena, CA, calls it the “big drink” method, as he will apply a huge amount of water, but only a few times over the season.

Carl developed the method in the course of trying to make his operation more sustainable. As with any system, he says you monitor what you do, and look for ways to improve. It’s an approach he has pursued in the past as a researcher, obtaining his Ph.D. in genetics from Harvard, where he later served a fellowship. At Knights Bridge, the sixth-generation grape grower started by taking out a frost protection system that employed overhead microsprinklers, installing wind machines instead.

Then he examined their irrigation schedule, which was pretty standard for the area, calling for 10 gallons per vine per week from May to September. “That’s what the models say, and it’s the

industry standard for a reason — the vines do well,” he says. “But if you can manage stress, you can train your vines to use less water per week.”

A lot less, as it turns out. “Now we only water at bloom, at veraison, and then at about 20 Brix,” he says. “And bloom might drop out if there’s a lot of moisture in the soil.”

Three-Pronged Strategy

Knowing there will be some disbelievers out there, Carl emphasizes that you don’t simply use the big drink method on a schedule and that’s it. It has taken him four years to fully train his vines to be acclimated to fewer waterings. If you tried to switch over in one season, you’d lose your crop. Carl trained his vines with a three-pronged approach, changing the way they managed the soil, cover crop, and canopy.

Soil — The idea was not to increase the nutrients so much as the water-holding capacity, which is absolutely critical. They increased the organic content by a great deal with everything from mulched cuttings to the cereal crops they grow as cover crops.

Cover Crop — He uses a wide variety of fescues among other things to put back into the soil, but the cover crops also serve another purpose: competing with the vines for water to stress them. “During a wet spring you let the cover crops grow and grow and grow so the vines have to compete,” he says. “During a dry spring you mow earlier so they don’t have to compete as much.”

Canopy — Stressing the vines early enough is critical because the leaves’ stomata will become more efficient at water retention, says Carl, adding that you also want to lignify the canes as early as possible. The canopy must be carefully managed because new leaves will come out later in the season, and new leaves use about three times as much water as an old leaf. “A leaf can last 240 days, and you want those because their stomata have been trained and they are so much more efficient,” he says. “You end up with these vines that are really efficient at using water.”

Vines “On The Edge”

Carl says that it’s important to emphasize that the system requires liberal application of the grower’s shadow. The vines must be carefully monitored to make sure they’re not over-stressed. For example, the system might only call for watering three times — each time about 16 to 24 gallons per vine over 24 to 48 hours, depending on the number of emitters. But if there’s a heat wave and the vines start wilting, you’ll need to apply additional water. “Even though you’ve trained your vines, they are on the edge,” he says. “You don’t want to go on vacation in the middle of July.”

Carl is asked why, if many growers are so concerned about sustainability in general and, especially for Westerners, saving water in particular, the big drink method isn’t more prevalent. “Farmers generally do what their parents did; they figure why change if it’s not broken,” he says. “Besides, a lot of things that are good seem obvious, but it’s not obvious until it’s obvious.”

Not Just For Fine Wines

The “big drink” method is not just for smaller growers of certain varieties of grapes, emphasizes Tim Carl. It works on all the varieties he grows: Cabernet Sauvignon, Chardonnay, Sauvignon Blanc, Malbec, Merlot, Cabernet Franc, and Petite Verdot. “All varieties are fine,” he says. “It’s the rootstock that manages the water.”

That said, Knights Bridge Winery does produce ultrapremium wines. The big drink method just aids in that effort. Carl says quality has improved across the board. First, as one might guess with more stressed grapevines, the intensity of the desirable flavor has increased. But the flavor has also improved because the vines are less vigorous, and vigorous vines tend to produce greater amounts of pyrazine which can make for undesirable vegetal or “green bean” wines.

Besides increased quality, the system calls for less overall water usage, something that will become increasingly important in coming years. In addition, the system calls for less labor. Yes, there is a little more leaf pulling, but you can do mechanical hedging, and increased labor on the canopy is easily offset by the reduced labor for irrigation. “Every single time you’re watering you have to pay someone to do it,” he says.

In addition, while Carl farms 70 acres, he believes the system could be used by growers who farm several hundred acres. “If I were a big grower, I would look to see how to modify this to reduce costs and increase quality,” he says. “I think there’s a hybrid that can be achieved.”

Not only that, but Carl believes it can be used on virtually any crop, noting that he also uses it on his tomatoes. He waters a lot early to establish the root system, then at bloom, veraison, and a week before picking. Though he does monitor them carefully during heat waves, which is key. “The most important part of the system is you commit to a relationship with the crop that’s different than before,” he says. “You can’t just tell your guys to water on this schedule; you have to really watch the plants.”

David Eddy is editor of *Western Fruit Grower*, a Meister Media Worldwide publication.