

Sometimes the Smaller Drink is Better

A response to an argument in favor of the “big drink”

Mark Greenspan



Dr. Mark Greenspan has more than a quarter-century of scientific viticulture research and viticultural field experience. He specializes in irrigation and nutrition management, yield and canopy management, vineyard climate and microclimate, vineyard design and vineyard technology. He is the founder of Advanced Viticulture, Inc. based in Windsor, California (www.advancedvit.com), providing consulting, technology, vineyard management and vineyard development for wineries, winemakers and wine growers devoted to producing premium wines. Please direct queries to mark@advancedvit.com or 707-838-3805.

SCOTT SUMMERS

MAYBE SOME OF YOU have been following the “controversy” that has evolved over the years. Not sure it is a controversy for the ages, but it’s important enough for me to address it now because an article came out last month by Dr. **Thibaut Scholasch** in favor of the “big drink” style of irrigation¹. I, on the other hand, wrote in support of the “small drink” style about five and a half years ago², and I have tended to allude to that practice in other articles on the topic of irrigation, a topic I write about frequently because it is one of my most-studied subjects.

Some may feel that Dr. Scholasch is my nemesis or my enemy as we have publicly debated this topic before. He is neither of those. He is well-studied in this topic also, and we happen to have a professional disagreement about this. In truth, I can find some things in his article with which I agree. I’ll mention those as I go along.

Does Deep Irrigation Develop a Deeper Root System?

In general, it is wise to develop a deeper root system in grapevines, especially as water resources are limited in most regions of the West Coast. However, the approach I promote to develop a deeper and more extensive root system may or may not involve irrigation. As I’ve said before, in the North Coast, we receive ample rainfall every winter to “fill the tank.” That is, the soil profile, from the top to the bottom of the root system, is almost always at field capacity or higher at the time of budbreak. The best and most effective way to discourage a shallow root system is to delay the onset of irrigation for as long as possible. Once irrigation begins, whether shallow or deep, the non-wetted portions of the root system will become less active. Rainfall fills the profile, up and down, left and right, to and fro. Let the roots find the water.



We see things from the ground up, all of the small details that go into the big picture of ranching. **Because agriculture is what we know, it's all we do.**

Call 800.800.4865 today
or visit AgLoan.com

A part of the Farm Credit System. Equal Opportunity Lender.

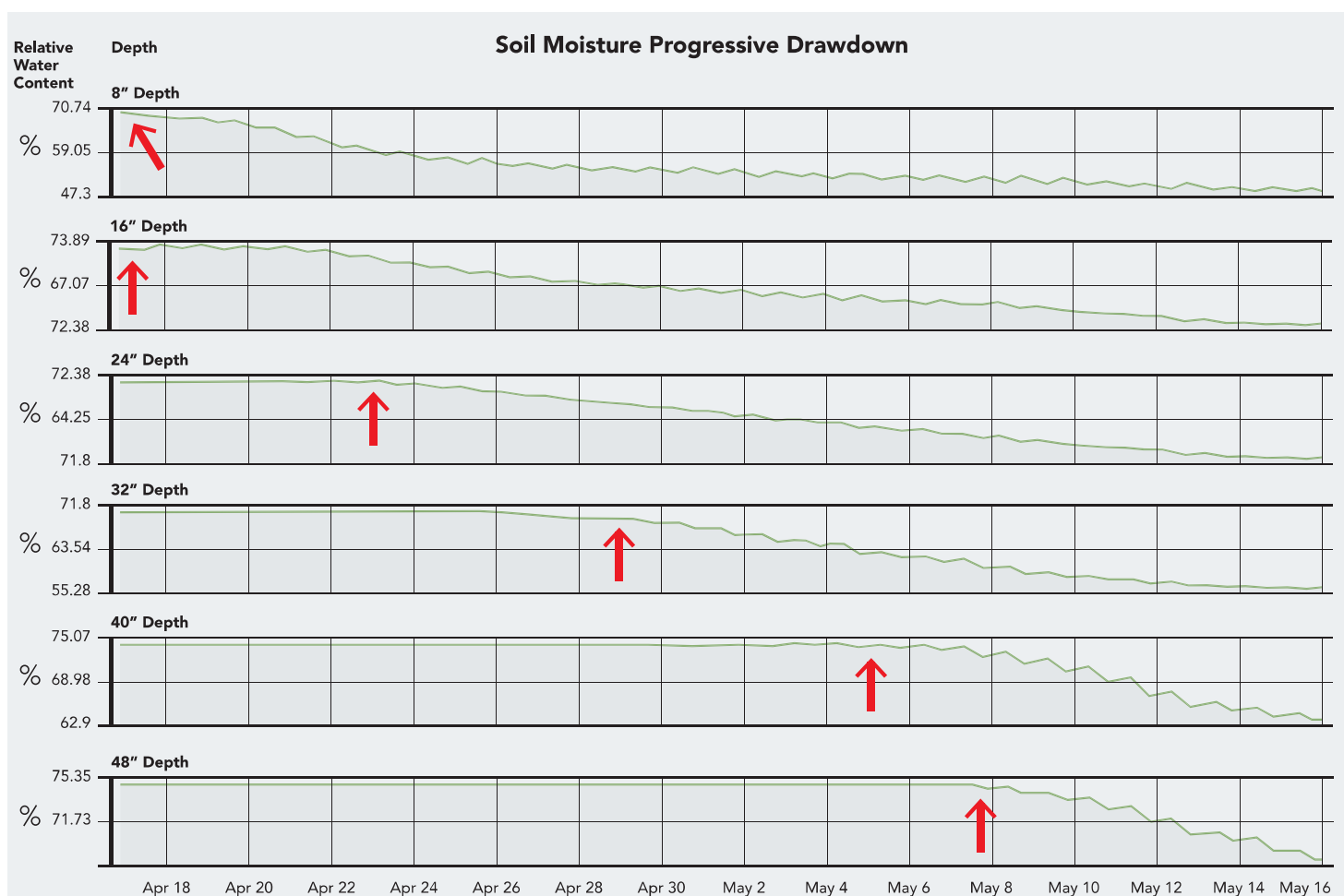


FIGURE 1: “Stacked” charts of soil moisture content at depths from 8 inches to 48 inches in 8-inch increments. This is a snapshot in time during late spring in a north coast vineyard showing when moisture uptake begins at each soil depth. The red arrows indicate approximately when we begin to see root activity and the onset of uptake. Note that uptake begins shallowly and then progresses more deeply.

As an example, take a look at soil moisture at several depths in **FIGURE 1**. This shows soil moisture being depleted by roots beginning at the shallower depths and progressing down the profile over time as the moisture at shallower depths becomes less available. By delaying heavy, early irrigations we allow the full profile to be explored by roots and have found that initiation of the irrigation sequences can be delayed further into the season after successive years of this practice. We can also see that irrigating too early discourages uptake and activity of the deeper roots (**FIGURE 2**). Indeed, it is the postponing of early irrigation more than deep irrigation that helps to develop a more resilient root system. If one does not measure soil moisture, one has no idea of how much moisture remains in the soil, especially 4 feet down.

Interestingly, we have seen that if irrigations are not deep, root activity and moisture depletion actually do continue at deeper depths. After reviewing hundreds of moisture profiles, I find that deep root activity only slows down if the early irrigations are deep, resuming once again when the irrigations are ceased, or at least reduced, in volume and/or frequency (again, refer to **FIGURE 2**).

While offered only as an example, I was surprised to see how early irrigations were applied in Scholasch’s examples from Napa Valley. Beginning in mid-June, we typically look to start irrigations about four weeks after that

in Napa and about six to eight weeks after that in much of Sonoma County. Considering my argument about delaying irrigation in the North Coast, I don’t believe this to be nit-picking. Rather, I believe it to be a key element of the approach I prefer to take for irrigation of fine winegrape vineyards: push the irrigation “season” as late as possible to get control over the vines and allow deep root penetration.

What about arid regions? This is where I am more closely aligned with Scholasch’s opinion about irrigating deeply to encourage deeper rooting. Only I approach it differently than he is suggesting. I have worked with growers in the Central Coast, eastern Oregon and Washington, and in Chile and Argentina. All of those regions feature winter and spring seasons that receive about 12 inches or less of rainfall. Unlike the North Coast, the soil is rarely naturally at field capacity throughout the profile at budbreak, so the best practice is to provide a long irrigation to fill the profile as much as possible (i.e., “filling the tank”). Keep in mind that it is not always possible to fully wet the profile by using drip irrigation. Water may move vertically more than horizontally in some soils. In other soils, it may hit a stratification boundary and then flow horizontally more than vertically. Very uniform soils will benefit from a thorough wetting, both deep and wide, but such uniform soils are rare in California. But, irrigating for 18 to 24 gallons per vine will

ENTAV INRA®

FOR IMMEDIATE RELEASE January 2019

ENTAV International announces Propagation of ENTAV-INRA® vine plant material in United States is carried out exclusively by licensed nurseries:



The ENTAV-INRA® trademark was created in 1995 by the world renowned French vine selection institutions, IFV and INRA, and launched in the United States in 1998. The trademark is significantly valuable due to the considerable clonal selection work developed over 50 years (over 150 clones available), cutting-age research, continual innovated launching of a diversity of new clones and new varieties resistant to downy mildew and powdery mildew. Royalties collected for the sale of trademarked clones help support the efforts to better provide the best plant material for the industry.


Buying ENTAV-INRA® plant material from a non-licensee nursery will expose the buyer to be misled regarding the health sanitary and the performance of the plants.

It also leaves the buyer and the seller open to a lawsuit for fraud.


To learn more, please contact

Tel : +33 4 66 51 17 55

email : samiha.elguerne@vignevin.com



BAICOR[®] LC



**Organic and
Amino Acid Based Fertilizers**

**Specializing in Micronutrients
and Secondary Nutrients**

LOGAN, UTAH
435.752.2475
www.baicor.com

OMRI LISTED
MADE IN U.S.A.



Bryan Bins Inc.

Macro Bins • Totes • Trellising • Vineyard Supplies

**We are always here and always here for you.
See you at WiVi in March!**

www.bryanbinsinc.com
831-905-5155 ~ Ask for Nancy



Sometimes the Smaller Drink is Better

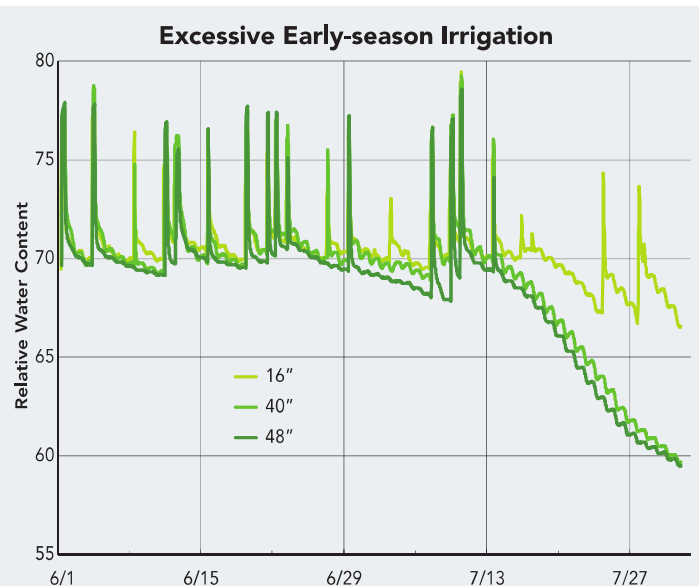


FIGURE 2: Chart of soil moisture content at a shallow (16 inch) and two deeper (40 and 48 inches) depth of a north coast vineyard receiving early and excessive irrigations. Note that water content spiked at the deepest depth during each irrigation, indicating that the irrigations were percolating past the deepest depth being monitored. Also note that uptake of moisture did not begin to occur until the irrigations were curtailed later in the springtime. Excessive and deep irrigations discouraged moisture uptake while reducing (or eliminating) early-season irrigation allowed the deep moisture to be tapped into by the root system.

usually wet the profile sufficiently to simulate winter rainfall. That is the only time I ever recommend applying that much irrigation at a single time. This is my only foray into the “big drink.”

By doing this, we can then apply the practice of delaying the first irrigation for the purpose of encouraging a more extensive, and less drought-sensitive, root system than if we had babied the vines along with early irrigations.

Do Shorter Irrigation Intervals Induce More Severe Water Deficit?

Scholasch contends that shorter irrigation intervals, applied with smaller irrigations, do create more water stress on the vines; and after the short irrigations, vine transpiration decreases quickly and remains low until the succeeding irrigation is applied. With this point, I am in agreement. Indeed, large irrigation applications raise vine water status and maintain it for a longer period of time compared to the same amount of water applied in shorter bursts.

My difference in opinion is that we desire some water stress in our winegrapes: Not too much and not too little and at the right time. I wrote about this recently³; and while it was my own opinion that I was writing about, there is ample evidence to support the general approach I outlined therein: No stress up to and through fruit set, progressively increasing stress up to the “magic window” about two weeks prior to and through veraison, and a relief of some of that stress after veraison and up to harvest. So, controlled stress is the goal, especially for red varieties, for a specific phenological period of time.

This strategy was not developed by accident or by trial and error (well, maybe some of that), but it has been shown in many studies that water stress, via the stress hormone abscisic acid (ABA), stimulates expression of many genes that code for enzymes involved in the berry's secondary metabolism. Yes, water stress during this period may also reduce berry size, which could have a depressing effect on cluster weight. This can be countered with changes in cluster-thinning practices that can easily counter yield-depressing effects of reduced berry size at harvest.

While we don't measure ABA in real-time in practice, we can measure stomatal conductance in vines to provide insight into ABA's effect on induction of stomatal closure. Indeed, stomatal conductance (measured with a portable leaf porometer device) is a highly useful, if not automatable, tool for helping us to control vine stress during the critical phenological stages. For instance, for a variety like Cabernet Sauvignon, we are looking for midday stomatal conductance levels around 125 to 175 $\text{mmol m}^{-2} \text{s}^{-1}$ during that "magic window." After that, we can and probably should allow that stress level to be relieved.

I don't have a lot of experience with the "big drink" approach throughout the growing season, but I do have some growers who use both approaches within the same vineyard. Midday stomatal conductance for two vineyard blocks in 2017 are shown in **FIGURE 3**, along with target values of each during the "magic window," that is also shown. The "big drink" block received three large irrigations in mid-July, late July and late August while the "small drink" block received about 16 small, but frequent, irrigations beginning in late July (veraison was about July 25th that year).

Mind you, this is not a scientific study and is only an example, but you can see that the target stress levels for stomatal conductance were achieved and held during the "magic window" period. Is it always this easy? No. But applying short irrigations allows us to develop the desired stress without excessive and undesirable relief from that stress during the phenological period it is ideally applied. Note that you can also see that the values swung wildly after veraison in both blocks due to some extreme variations in weather.

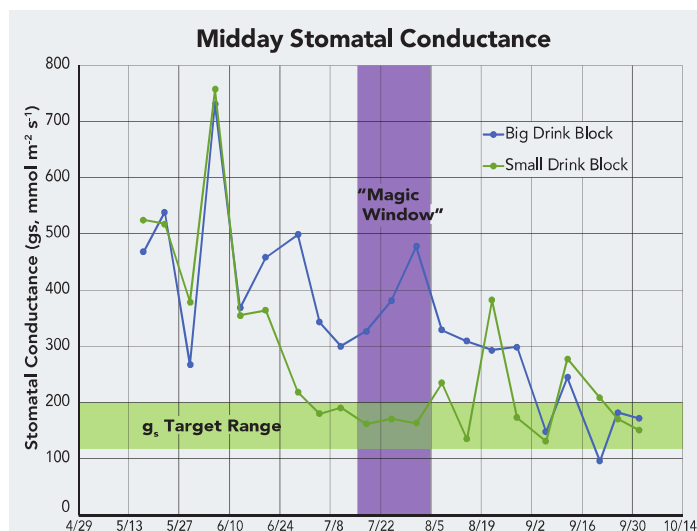


FIGURE 3: Stomatal conductance over time for two blocks in the same vineyard. One block had a "big drink" irrigation approach and the other a "small drink" irrigation approach. Magic window indicates the target time frame for beneficial effects of water stress on fruit maturation (about 2 weeks prior to veraison and through veraison).

Protecting Your Estate? Passing on your legacy? Modernizing your management? Expanding? Call Now!

In business since 1976 using 2018 technology, Ray Carlson and Associates, Inc. can help by providing Surveys, GIS, Mapping, Historical Research and more. You may be surprised at what we find!

Products	GIS/GPS	Surveys
Tentative Maps	Vineyard/Winery	Drone
Subdivision Maps	Aerial Photos	Pond
Records of Survey	Land Development	Estate
Custom AVA Maps	Data Management	Boundary
Topographic Maps	As-Built	Aerial Control



RAY CARLSON
AND ASSOCIATES, INC.
Mapping for a Better World™

LAND SURVEYING • GIS • PLANNING • RESEARCH

411 Russell Ave. • Santa Rosa, CA 95403

Phone: 707-528-7649

www.rcmaps.com • rca@rcmaps.com

vineyard and orchard

specialists

BRANCHLOK™

Used for lateral training of trellised branches and cordons to 12-14 gauge wire. Branchlok™ is available in three lengths: 2½", 3¼", 3¾".

Patent No. 4,665,000

For your nearest dealer, contact:

AgFast™
CORPORATION

Toll-Free: 877-552-4828

909-464-1373 • Fax: 909-464-1603 • www.agfast.com

Super Premium Winegrowing Estate

Price Reduced!

Award winning winery, vineyard and beautiful estate home in prestigious appellation.

Turnkey with inventory, brand and owner/winemaker willing to consider continued involvement.

Home purchase optional with winery. Pre-qualification and NDA requested.

Allan Hemphill (bre 01388236)
North County Properties
707-480-1764 ~ vinguru@comcast.net

Sometimes the Smaller Drink is Better



SCOTT SUMMERS

If vines get too stressed, then relief of that stress can come about very quickly, by either shortening the interval between irrigations or by increasing the volume of irrigation. On the other hand, if vines dive into less-than-desired stress levels, the irrigation interval can be stretched to quickly modulate the stress level as needed. It is an interactive and intensive level of management, but the window of time is brief.

It is not necessary or desirable to maintain the maximum stress level after veraison is complete. Scholasch stresses that the large volume irrigation approach allows vines to function at a higher water status and the post-veraison period is where I again agree with him that deeper irrigations are allowable and often desirable. I tend to practice a hybrid approach during ripening, neither adhering to a “small drink” or “large drink” philosophy. While I generally increase the volume of irrigations after veraison, I still would be thought of as a “small drinker.” However, as all farmers must be aware of the weather, a preemptive irrigation prior to a heat event is likely to call for a larger drink than that which is typical before veraison.

The approach I describe, I feel, provides the best of both worlds—controlled stress for quality followed by reduced stress for maintenance of ripening. But I believe Scholasch puts too much emphasis on sugar loading and not enough emphasis on secondary metabolism in his discussion. We indeed want to maintain leaf function by keeping vine hydration at a proper level. But we also need to stimulate the “flavor ripening” aspects of berry maturation by applying controlled water stress at the right time. And I feel this is best achieved by delaying the initial irrigation followed by a “small drink” approach to scheduling.

TERRAVANT WINE COMPANY

TRULY INNOVATIVE CUSTOM WINE SERVICES



CUSTOM CRUSH

Central Coast Expertise
\$30 Million State-of-the-Art facility



SHINER PROGRAM

60+ On-Going Domestic &
International Wines



GLOBAL PORTFOLIO

Sourcing wine spanning over 9
different countries



CREATIVE DESIGN

In-house Team with 10 awards
from prestigious competitions

Take a virtual tour @ www.terravant.com
Contact us: joe@terravant.com | 805.686.9400 x406
BUELLTON - CALIFORNIA

Does “Small Drink” Irrigation Apply More Water Than “Big Drink”?

The answer to this question is “it depends.” I will concede that deeper irrigations are more efficient in that the direct evaporative losses from the soil surface are smaller compared to the frequent wettings and dryings imposed by “small drinks.” However, “small drinks” induce water stress, as shown above, and bring the vines into a higher water use efficiency range than if the vines are operating at a higher water status and higher transpiration rate.

It is difficult to compare apples to apples here because these practices are rarely tested side-by-side, let alone in a scientific manner, but when I examine the levels of irrigation I apply using a “small drink” approach, guided largely using soil moisture profile measurements, I am usually in the ballpark of 25 percent of full crop ET (i.e., ETc). How do I irrigate so little? Most likely because the vines are kept under a mild water stress where their stomata are not fully open, and thus the vines are operating in a condition of high water use efficiency.

Scholasch tossed out some examples of irrigating with “big drinks” at a seasonal application of about 75mm (3 inches). This is very much in line with how much I usually apply per season (2 to 3 inches in the coastal regions), though often the delayed irrigation allows us to irrigate even less than that. I see very little reason to accept that “big drink” irrigation applies less water than “small drink,” though each approach can be mismanaged. For “small drink” irrigation, very short irrigations can lead to application inefficiencies, especially in hillsides where water is more voluminously applied to the bottoms relative to the tops of hills.

However, I have seen what amounts to almost criminal over-application of water in the “big drink” approach. While I have only an intellectual disagreement about the overall approach, I have seen irrigation applications so long (24 to even 72 hours) that the applied water almost certainly was driven below the root system. To me, this is a terrible waste of a precious resource as well as a possible means to move nitrates and chemicals deep into the profile, beyond where vines can extract them. If a grower practices this “extreme drink” irrigation in this manner without some means to monitor soil

moisture profiles during the irrigation, they are doing so irresponsibly. I will presume that this type of irrigation practice is rare, but I ask those who are doing it to please consider the consequences and at least have the means to monitor what you are doing. [WBM](#)

References

- ¹ Scholasch, T. Irrigation Strategies to Maintain Natural Grapevine Mechanisms Through a Drought. *Wine Business Monthly*. December 2018.
- ² Greenspan, M. ‘Small Drink’ Irrigation Better Choice for Coastal Winegrapes. *Wine Business Monthly*. June 2013
- ³ Greenspan, M. Water Stress Management: Do We Have it Figured Out? *Wine Business Monthly*. May 2018.

Open Season for Wood Diseases



Rally® 40WSP

FUNGICIDE

Rally® Fungicide.

Rainy, foggy weather during pruning season can spell trouble. Wood disease spores land on fresh cuts and invade grapevines. As diseases spread, plant vigor and yields slowly decrease. Eventually, vines are killed.

But ongoing university research has shown that double pruning followed by an application of Rally fungicide can help prevent infection by fungi that cause these wood canker diseases. Rally can be tractor- and backpack-applied as a directed spray to pruning wounds.

 **CORTEVA**
agriscience
Agriculture Division of DowDuPont

Visit us at corteva.com

®™Trademark of Dow AgroSciences, DuPont or Pioneer and their affiliated companies or respective owners. Always read and follow label directions. ©2018 Dow AgroSciences