



# Grape Notes



## Introducing the San Joaquin Valley Vineyard Drip Irrigation Scheduler

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The San Joaquin Valley Drip Irrigation Scheduler (Scheduler) allows the user to customize drip irrigation schedules for their vineyard. Daily irrigation requirements are presented both as gallons per acre and gallons per vine. An end of season summary calculates total water applied along with that applied during specific phenological stages: bud break to berry set, berry set to veraison, veraison to harvest, (Tables 1 and 2).

The Scheduler was prepared using Excel, and it is posted in the viticulture section of our office Web page: [cetulare.ucdavis.edu](http://cetulare.ucdavis.edu).

The Scheduler is also available on CD at the Tulare County Cooperative Extension office at 4437-B Laspina Street in Tulare (phone: 559/685-3303).

**Simple to Use:** The Scheduler requires four inputs by the user: Drip system efficiency (%); canopy in July (%); irrigation amount/deficit irrigation (%); and vines per acre. These four inputs are displayed in boxes at the top of the Scheduler. Changing these inputs and observing the effects on the bottom line can be very enlightening. Values to enter in the four boxes are based on the following criteria.

1. **Drip System Efficiency:** A newly installed system is normally designed to provide an emission uniformity or system efficiency of 90 percent. This level of efficiency may deteriorate over time, but with proper maintenance efficiency can be sustained near 90 percent. The efficiency can drop to less than 70 percent when dripper flow rates are affected by sediments, chemical precipitants, biological activity, or pressure variability.
2. **Canopy in July:** Vineyard water use is proportional to the size of the vineyard canopy. The canopy size is determined by the percentage of the vineyard floor shaded at mid-day in July. The following list gives examples of vineyard and trellis designs and their corresponding canopy in July.
  - a. Raisin or wine grape vineyard with a vertical trellis or short crossarm and with 12' row spacing: July Canopy will range from 50 to 60 percent.
  - b. A traditional table grape vineyard having a 3' to 4' crossarm and with 11' to 12' row spacing: July Canopy will range from 60 to 80 percent.
  - c. Vineyards with 5' to 7' wide open gable trellis and with 11' to 12' row spacing: July Canopy will range from 80 to 100 percent.
  - d. Vineyards with an overhead trellis: July Canopy is 100 percent for table grapes; 85 to 90 percent for DOV raisin vineyards with alternating middles.
  - e. High density vineyards having 8' to 10' row spacing: July Canopy will range from 70 to 85 percent.

**3. Irrigation Amount (Deficit Irrigation):** An irrigation amount of 100 percent represents applying full irrigation. The Scheduler calculates deficit irrigation amounts when values are entered below 100%. Fruit quality and production of table, raisin, and wine grape vineyards can often benefit from some degree of deficit irrigation applied at the proper time and in the proper amounts. However, weak vineyards compromised by root pests or soil problems should not be stressed for water (deficit irrigation) at any time during the season. The following scenarios illustrate the use of deficit irrigation to overcome specific production problems.

- a. The situation is a vigorous Selma Pete raisin vineyard plagued with poor maturity, straggly clusters, and excessive growth. The solution is to cut irrigation amounts in early July from 100 percent down to 50 or 60 percent and maintain that level of deficit irrigation until the end of the season. Yield and maturity improve dramatically. Soil moisture in the drip profile is recharged with a plentiful irrigation in November.
- b. The situation is a vigorous Crimson Seedless table grape vineyard with a history of inadequate fruit color, irregardless of crop load and light management. The solution is to cut back irrigation in early July to 80 percent and further reduce irrigation amounts in early August to 50 percent until the end of the season. Fruit color is dramatically improved. Soil moisture in the drip profile is recharged with a plentiful irrigation in November. Note: An excessively vigorous Crimson vineyard on a high vigor site may require more severe levels of deficit irrigation to manage vine growth.
- c. The situation is a Zinfandel vineyard plagued with bunch rot, even when the fruit zone is adequately ventilated by canopy management. The solution is to cut irrigation by 50 percent beginning at veraison and continuing through harvest. The result is reduced losses from bunch rot, advanced maturity, and an increase in production. Soil moisture in the drip profile is recharged with a plentiful irrigation in November.
- d. The situation is a young Thompson Seedless vineyard plagued with delayed and poor bud break in the spring. The solution is to cut back irrigation amounts to 70% beginning in August. This eliminates active shoot growth in the fall, advances cane maturity, and improves bud break the following spring. Soil moisture in the drip profile is recharged with a plentiful irrigation in November.

**4. Vines per Acre:** A vine per acre input is needed since the scheduler calculates both gallons per acre and gallons per vine. The gallon per vine values is calculated by dividing the gallons per acre by the number of vines per acre.

**Things to Consider:** The Scheduler is based on historical seasonal evaporative demand which remains fairly constant from year to year in the San Joaquin Valley. Tensiometers or other soil- or plant-based

irrigation monitoring tools should be used to verify the accuracy of the irrigation schedule. Vines should be closely observed, a bio-tensiometer if you will, paying attention to the level of active shoot growth,

drying of shoot tip tendrils, and general canopy appearance. When you use the scheduler, increase the irrigation amounts during unseasonable hot weather and decrease amounts during unseasonably cool weather by about 15 percent.

The Scheduler gives daily irrigation amounts beginning April 1<sup>st</sup>; however, it is not necessary to begin irrigating this early. On all but sandy or shallow soils, soil moisture stored from rainfall will support the vine until early May. Drip irrigation should begin in mid to late-April, depending on soil water storage.

Ideally, drip irrigations should be applied on a daily basis in amounts indicated by the Scheduler. Daily amounts are given on a per acre basis for those of you with water meters or on a per vine basis for those of you without. System design or irrigation water availability may not allow daily irrigation,

but irrigations should not be applied in intervals longer than three days. For example, if the Scheduler calls for the daily application of ten gallons per vine, then the manager should apply 10 gallons/vine/day or 20 gallons/vine/2-days or 30 gallons/vine/3-days. An interval during summer months longer than three days reduces irrigation efficiency and contradicts the principles of drip irrigation.

The Scheduler is designed for vineyards with-out cover crops. You will need to apply additional water, particularly early in the season, when a cover crop is grown. Typically, a spring cover crop will increase water use by about 20%.

We hope you find the Scheduler useful and please contact us with any comments or suggestions that could improve the Scheduler.

1. Bill Peacock is a farm advisor and Pete Christensen is a specialist, emeritus, both with UC Cooperative Extension.

#### References

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Table 1. The Scheduler allow the user to develop custom daily drip irrigation amounts for their vineyard. It requires four inputs: system efficiency; July canopy; irrigation amount (full or deficit irrigation); and vines per acre.

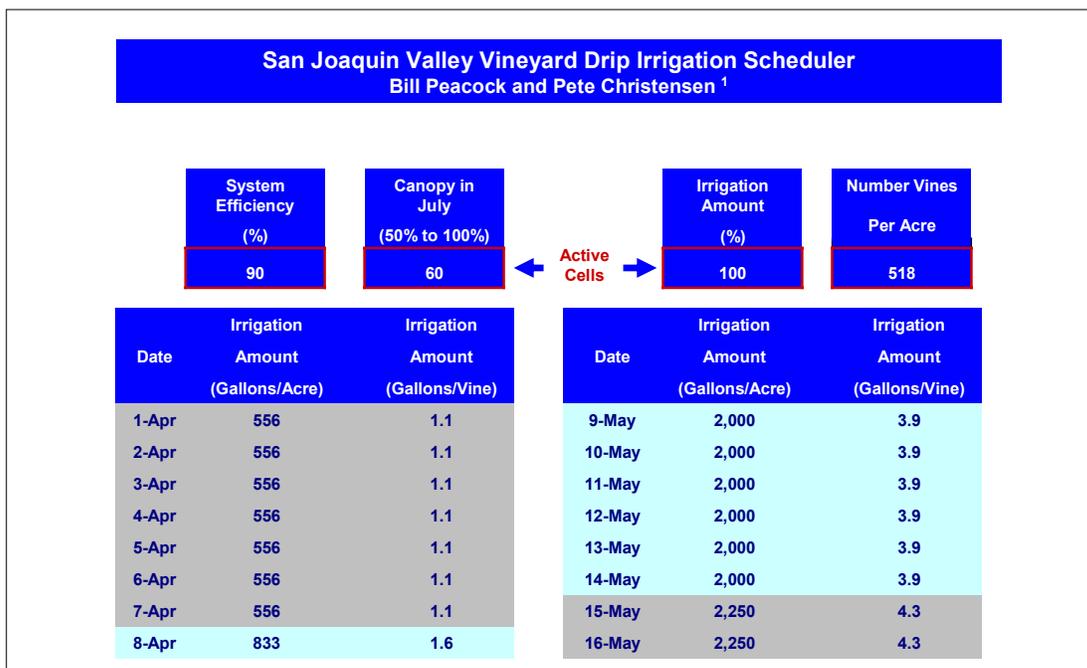


Table 2. The Scheduler provides an end of season summary that calculates total water applied along with that applied during specific phenological stages: bud break to berry set, berry set to veraison, and veraison to harvest.

Note: Values shown below are for a vineyard with following inputs: system efficiency = 90%; July Canopy = 60%; irrigation amount = 100%; vines per acre = 518 (Table 1).

Month	Total Amount (gallons/acre)	Total Amount (acre-inch)
April	29,500	1.0
May	67,372	2.5
June	101,995	3.8
July	127,123	4.7
Aug	119,801	4.4
Sept	90,500	3.3
Oct	62,167	2.3
<b>Total :</b>	<b>598,458</b>	<b>22.0</b>

Growth Period	Total Amount (gallons/acre)	Total Amount (acre-inch)
Bud break to berry set:	78,976	2.9
Berry set to Veraison:	139,639	5.1
Veraison to harvest in late:		
July;	103,373	3.8
August;	223,423	8.2
September;	313,923	11.6
October.	376,090	13.9

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