



## Chapter 5

# **VINEYARD WATER MANAGEMENT**

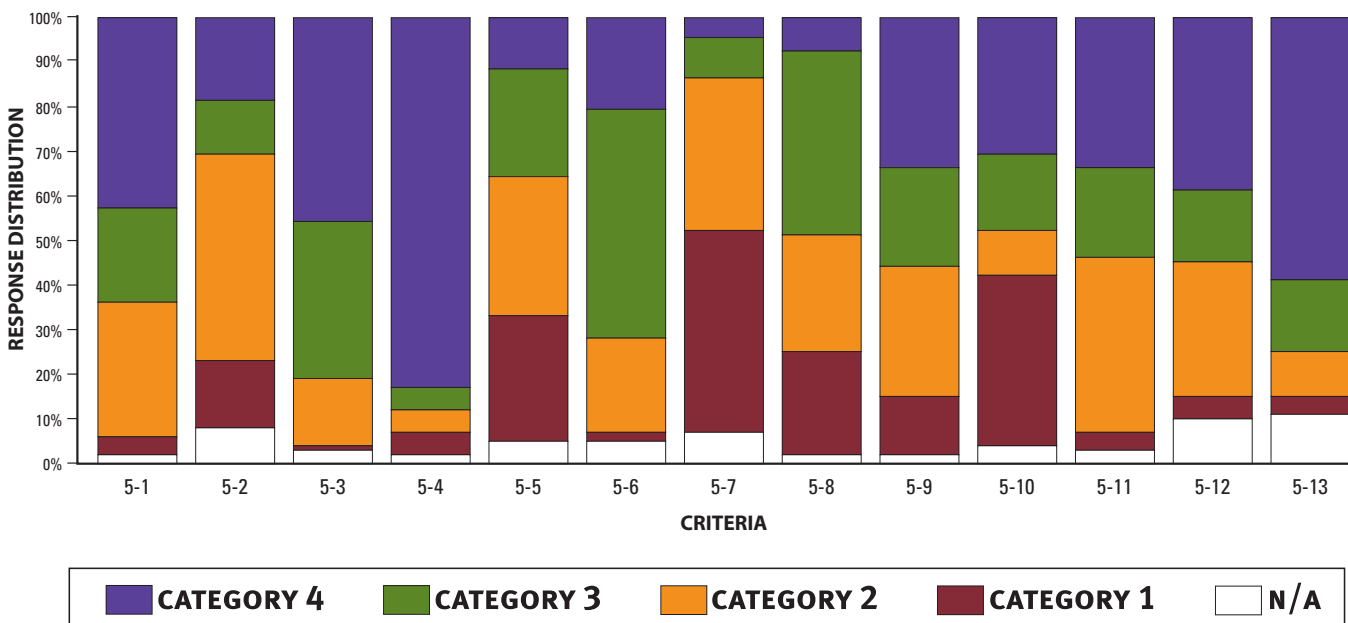
## Background

While winegrapes use less water than many agricultural crops, there is an increasing need to manage this precious resource as effectively and efficiently as possible. Water is a limited natural resource. Where the soil is deep enough, some farmers practice dry farming of winegrapes, which is the ultimate in irrigation water conservation. However, not all soils can be dry farmed and reliably produce a grape crop of a size and quality growers and wineries need. Thus most growers use some form of irrigation in their vineyards.



Drip irrigation has revolutionized viticulture in many regions of the state. With drip irrigation, water is applied directly to each vine in quantities needed to support that vine's growth. But, like any new technology, drip irrigation systems are not always managed to their full potential. Problems, such as clogged emitters, rob growers of the full benefits of the system. Growers need to commit to monitoring flows, inspecting lines and recording water use to build a historical profile of the vineyard over time. The great benefit of drip irrigation is the control that it gives the growers in deciding exactly how much water to apply and when to apply it. This flexibility, however, brings with it the responsibility to schedule irrigations as efficiently as possible. Numerous methods of monitoring water use and plant water status aid growers in irrigation scheduling.

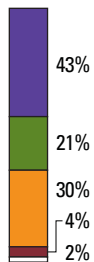
### VINEYARD WATER MANAGEMENT BENCHMARK DATA



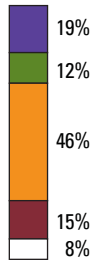
The context of water conservation and appropriate water use is reflected in the water management strategy that growers develop and implement. The goal is to provide enough water to produce a quality crop, but not too much. Excess water can lead to run-off issues and will result in excessive vine growth, requiring more canopy management, and poor quality grapes and wines. Many growers use deficit irrigation, i.e. stress vines by providing only a portion of the water they need, thereby reducing the need for water and energy to pump it.

## Benchmark Data

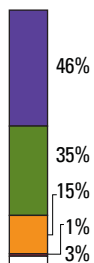
**Grower Response**



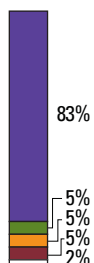
**5-1. WATER MANAGEMENT STRATEGY** Development and implementation of a water management strategy is key to making effective and efficient vineyard water use decisions. 94% of the growers have defined comprehensive water strategies and grape-growing goals, with 64% having in place the tools to accomplish those goals and 43% having implemented the strategy for over one year. 4% of the growers have not developed a water management strategy for their vineyards. 2% of the growers replied N/A, not applicable or information not available.



**5-2. MONITORING & AMENDING WATER QUALITY** Knowledge of water quality can help growers prevent problems with irrigation systems. For example, some areas have high levels of iron, which can plug emitters. 31% of the growers are testing their water quality at least annually, with 19% conducting even more comprehensive testing. 46% test occasionally and 15% have never tested the quality of their irrigation water. 8% replied N/A, not applicable or information not available.

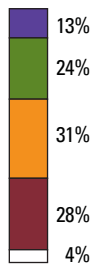


**5-3. OFF-SITE WATER MOVEMENT** Preventing water runoff not only conserves water for the vineyard but eliminates off-site contamination of waterways from chemicals and siltation. 96% of the growers create no runoff from their irrigation practices. 81% have incorporated additional practices such as cover crops to minimize or eliminate rainfall runoff, with 46% adding drainage systems and maintaining soil permeability as well. The remaining 15% do have runoff from high rainfall events. 1% have irrigation runoff and another 3% replied N/A, not applicable or information not available.

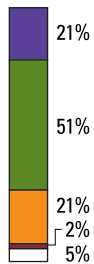


**5-4. IRRIGATION SYSTEM** At the heart of vineyard water management is the irrigation system itself. 83% of the growers have an engineered micro-irrigation system installed in their vineyard with another 5% having an engineered sprinkler irrigation system. 5% have a high volume irrigation system and 5% have a non-engineered system. 2% replied N/A, not applicable or information not available.

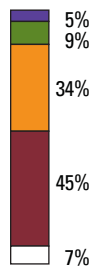
**Grower Response**



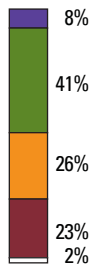
**5-5. MONITORING IRRIGATION SYSTEM** Having an irrigation system to conserve water is only effective if the system is in good working order. That requires checking and monitoring the system to make sure that it is not leaking and that the emitters are not clogged. 37% of the growers are monitoring the irrigation system annually and 13% are checking the emitters and the pressure differences across the block. The other 24% are just focusing on the emitters. 31% of the growers are only checking the emitters occasionally while 28% never check their irrigation system. 4% replied N/A, not applicable or information not available.



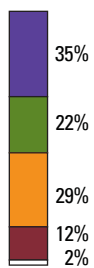
**5-6. FILTERS & LINES** Water filters in the irrigation system are important components for the systems to operate effectively. 72% of the growers inspect the filters and flush the lines 2-4 times yearly. 21% also operate automatic flushing systems for the filters and include the irrigation systems as part of a regular maintenance program. 21% flush lines each spring and check filters when they notice a pressure difference and 2% did not inspect filters or flush lines. 5% replied N/A, not applicable or information not available.



**5-7. FLOW METERS** The amount of water used is knowledge that can aid the grower in producing higher quality fruit. It is also part of the energy equation since each gallon of water requires energy to move it out of the well and through the lines. 48% of the growers have flow meters on their wells or pumps, with 9% also monitoring the irrigation flow and checking the flow meters as part of a regular maintenance schedule every 2 years. 5% of these growers also record the volume of each irrigation. 45% do not have flow meters and 7% replied N/A, not applicable or information not available.

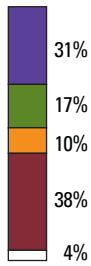


**5-8. SOIL WATER-HOLDING CAPACITY** Knowing the water holding capacity of the vineyard soils is important in understanding the water balance for the vineyard. 8% of growers have quantified the soil water-holding capacity and have used the information to develop a water budget for the vineyard. Another 41% have knowledge of their soil and use this in their irrigation scheduling and overall water management. 26% are guessing at the capacity and 23% don't know. 2% replied N/A, not applicable or information not available.

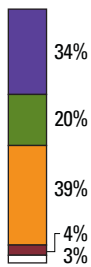


**5-9. SOIL MOISTURE & PLANT WATER STATUS MONITORING METHODS** Soil and plants must also be checked to ensure that the correct amount of water is available in the soil to provide the vine what it needs to produce fruit before scheduling irrigation. 35% of growers use soil and plant based tools to measure water availability in addition to visual methods, while another 22% use soil based tools and visually monitor shoot tips and tendrils to monitor water status. 29% use a shovel or bucket auger to judge water availability in the soil while 12% do not measure soil moisture for determining irrigation scheduling. 2% replied N/A, not applicable or information not available.

**Grower Response**



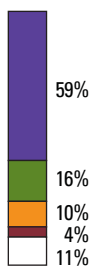
**5-10. EVAPOTRANSPIRATION** Having water in the soil is only part of the equation of developing an effective water budget and applying the correct amount of water to the vineyard. Another key part of the equation is evapotranspiration (ET), or how much water the vines are using. 58% of growers use a California Irrigation Management Information Service (CIMIS) station to determine irrigation requirements. 31% of also use CIMIS to verify their in-field weather station and another 17% use CIMIS to verify a weather station near the vineyard. 38% do not monitor ET and 4% replied N/A, not applicable or information not available.



**5-11. WATER BUDGET** Creating a water budget allows the grower to get the “whole picture” of the water needs of the vineyard before scheduling irrigation. 34% know the amount of water used by the vineyard between each irrigation by determining the ET, soil moisture availability and plant moisture status. Another 20% base the amount applied on soil moisture availability and plant moisture status. 39% use vine appearance and general weather conditions. 4% go by the calendar and 3% replied N/A, not applicable or information not available.



**5-12. PLANNED DEFICIT IRRIGATION THROUGH RDI OR PARTIAL ROOT ZONE DRYING** Information collection becomes more critical for growers practicing planned deficit irrigation. This requires that the grower monitor water availability to stress the vine between bloom and veraison. 39% of growers use a predetermined level of regulated deficit irrigation (RDI), partial root zone drying (PRD), or dry farming. 16% are experimenting with RDI or PRD while 30% apply stress by backing off on the irrigation. 5% use plenty of irrigation so no stress occurs and 10% replied N/A, not applicable or information not available.



**5-13. FERTIGATION** Understanding the irrigation demands and flows allows growers to deliver fertilizers and amendments to the vines through the irrigation system. This process is known as fertigation. 85% of the growers practice fertigation. 59% also calculate the timing and frequency of applications to prevent leaching of fertilizer below root zone and also have back-flow prevention devices in place between the well and the injection pump. Another 16% have back-flow devices but base their applications on convenience and don't know if fertilizer is leaching below the root zone. The remaining 10% of these growers practice fertigation without checking soil or vine nutrient status. 4% apply fertilizers without the irrigation system and 11% replied N/A, not applicable or information not available.

## Best Practices

**Statewide Strengths:** The majority of growers reported practices that contribute to an excellent soil management program. These practices include having a sound water management strategy, preventing off-site movement of water, using water conserving irrigation systems, using water budgets and deficit irrigation techniques, and using appropriate fertigation techniques.

Mount Palomar Winery in Temecula follows a Regulated Deficit Irrigation program to conserve water resources, eliminate irrigation runoff, and improve grape and wine quality. Working with the Resource Conservation District, Mount Palomar uses both direct and remote soil moisture sensors and plant stress monitors as a guide in attaining significantly reduced water use. “Compared to our traditional irrigation methods, we are reducing water use by at least sixty percent,” says Mount Palomar Winery President Peter Poole. “The fact that it helps us produce a better product is a real bonus.”



*Regulated Deficit Irrigation methods improve wine quality by producing smaller berries, which display better tannins, body, color and flavor.*

## Targets for Continual Improvement

**Statewide Opportunities for Improvements:** There is an opportunity to improve specific water management practices for the majority of growers. These practices include monitoring and amending irrigation water (criteria 5-2), testing the distribution and uniformity of irrigation system (criteria 5-5), installing and monitoring flow meters (criteria 5-7), increasing knowledge of soil water holding capacity (criteria 5-8), and using available evapo-transpiration (ET) to help determine irrigation timing.

The California Sustainable Winegrowing Alliance has set a desired goal of 20% improvement in the average scores indicated below that are less than 3. By harvest 2009, CSWA will strive to increase the average winegrower scores to the positions marked in green. For practices that are already 3 or above, CSWA anticipates that winegrowers will demonstrate continuous improvement by the 2009 harvest. To reach these goals, CSWA needs partners. If you are interested in improving vineyard water management practices, please email [info@sustainablewinegrowing.org](mailto:info@sustainablewinegrowing.org).

