Middle Reach Russian River Vineyard Irrigation Demonstration Project

Background

In 2012, the Sotoyome Resource Conservation District, with funding from Syar Industries and in partnership with the Westside Association to Save Agriculture, contracted with Advanced Viticulture, Inc. to conduct a vineyard irrigation demonstration project for the Middle Reach area of the Russian River Valley. The demonstration included vineyards along Westside Road exhibiting a variety of soil types typical to the area.

This project aimed to demonstrate an effective range of irrigation water application rates and management practices using a set of tools that provide information on soil moisture reserves and vine water status. Resulting data approximates agronomic irrigation rates designed to avoid undesirable levels of vine stress while avoiding deep percolation beyond the root zone.

Methodology and Equipment

The following measurements were taken at each of eight sites, all in white grape (chardonnay and viognier) vineyards:

Parameter	***Equipment***
Soil moisture (continuous)	Probes took measurements at 8" intervals to a 48" depth
Irrigation volume (every event)	Pressure switches on irrigation lines connected to data loggers
Vine water status (periodic)	Pressure chamber, leaf porometer

Use of soil moisture and vine water status measurement equipment provides a solid basis for interactive irrigation scheduling that avoids both over-irrigation and undesirable levels of vine stress.

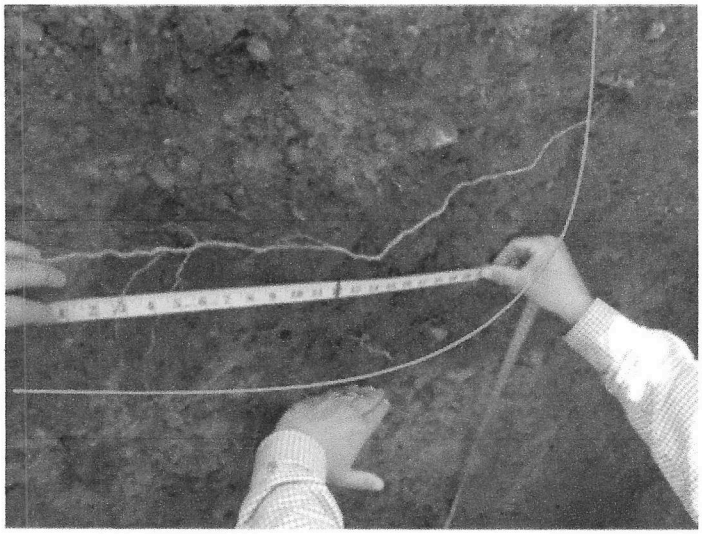
In addition to direct field measurements, crop evapotranspiration (ETc) rates were calculated using data from the Windsor CIMIS station, to demonstrate another common method of irrigation scheduling, and compare projected water use between the two methods.

Soils moisture probes – full length shown (left) and installed in the vine row (right)

Findings

Grapes are efficient water users and the vines use far less water than the ET model, sometimes used as a reference by vineyard managers, predicts. For this reason, the ET method may not be as useful for irrigation scheduling as once thought. In this demonstration, nominal irrigation amount was 2.1 inches (51 gal/vine), or 17% ET between June 29th and October 15th. Excluding outliers (accidental irrigations and faulty irrigation systems), average applied irrigation was 1.7 inches (42 gal/vine), or 14% Etc. In hotter or windier years, expected irrigation amounts may be higher, but not markedly so.

Deep soils and high water tables commonly found in this region allow for late and reduced irrigation relative to ETc in this region. The residual water availability in the soil satisfies water needs early in the season, and water table levels at some sites resulted in a soil moisture profile with no required irrigation to meet vine water needs. The amount of spring rainfall that occurs after budbreak is an important determinant of irrigation timing and seasonal irrigation needs, as it is a major factor determining the residual water available for vines to uptake prior to irrigation initiation.



Gravelly loam soil exhibiting strong stratification at 23" depth. Wetted bulb was wide and never moved deeper than 23" during the course of the field trial.

Movement of water in stratified soils is contrary to conventional wisdom during summer irrigation season. Deep percolation of drip irrigation is unlikely in gravelly and especially stratified soils, yet is more likely in heavier, more uniform soils. Stratification or discontinuity in the soil, which results in strongly defined boundaries between soil strata, causes higher root densities at the boundaries of the interfaces (roots turn horizontally), and impedes moisture percolation below the boundary or discontinuity. Field data showed that it was often difficult or impossible to move water below 24" or through the stratification boundary, where water moved laterally in the soil or even ponded at the surface. However, with an eight-hour irrigation, the heavier clay soils showed wetting to 48 inches, with little or no lateral wetting.
Word did not find any entries for your table of contents.*Deep percolation of water applied through drip irrigation is possible under some circumstances.*

1. Very long duration irrigations may result in deep percolation even when the soil was not previously saturated. Field data showed that a large volume, over 24 hour duration accidental irrigation allowed moisture to go through the stratified interface, reaching as deep as 48 inches.
2. Saturated soils allow deep percolation below the root zone. Rainfall and sprinkler irrigation both saturate the soil uniformly in the horizontal dimension and will result in deep percolation past the interface between soil layers. When water has no drier place in the soil to move laterally, it is forced downward through soil strata boundaries.

Fall and winter rains, which in this region are on the order of 35-40 inches per season, may move residues of leachable contaminants present in the soil after the vines enter dormancy below the root zone. Though leaching does not appear to be a concern from standard applications of drip irrigation alone, leaching from typical rainfall in this region may threaten groundwater quality if high residues of leachable materials are present in the soil.

Management Practices to Maintain Soil and Water Quality

Irrigation Initiation and Scheduling

- Shorter, more frequent irrigations make water uptake easier for vines and reduces vine stress. As discussed in the section on Soil Stratification, with drip irrigation, longer irrigations may not percolate deeper but result in lateral movement of irrigation water in the soil, or even ponding of water at the soil surface.
- Timing the irrigation season is important, as irrigations too early stimulate leaf growth which may not be ideal for crop production. Waiting until soil moisture levels drop and result in very mild stress on grapevines controls vegetative vigor and improves the water use efficiency of the vines.

Post-harvest Fertilization

- Post-harvest, many vineyard managers use a long duration irrigation to rehydrate the vines and to deliver fertilizer. The role of post harvest irrigation is to stimulate growth, hold green leaves for as long as possible and to get nitrogen and other nutrients in the vine and carbohydrate into the root zone.
- It is important not to apply excess nutrients in these long duration irrigations as excess nutrients may add to potential groundwater or stream contamination upon rainfall.