

**CACHUMA RESOURCE CONSERVATION DISTRICT**  
**in cooperation with**  
**USDA, NATURAL RESOURCES CONSERVATION SERVICE**  
**Santa Maria, California**

**SUMMARY OF IRRIGATION SYSTEM EVALUATION**

Farm/Ranch	: No-Name Vineyard	Evaluator(s)	:
Contact	: Joe Farmer	Date	: 07/xx/2014
Location	: Goleta	Irrigation Type	: Drip
County	: Santa Barbara	Crop	: Winegrapes

SYSTEM CHARACTERISTICS FOR NO-NAME VINEYARD:

**Job no: IWM-1187**

Site Tested: Block F – Test Acres 8.5

No. of Emitters/plant	: 1.0
Average system operating pressure	: 20.0 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 1.11 gph</b>
Average application (gal/hr/vine)	: 1.1
Average gallons per vine per 10 hr. set	: 11.0

SYSTEM OBSERVATIONS:

The measured distribution uniformity (DU) of the drip irrigation system was **91 percent** compared to a system standard of 85 percent, which is the minimal DU level for a well-designed and functioning micro-irrigation system. The performance of this system was excellent and ranks in the top 10 percent of the 1,200 evaluations conducted in Santa Barbara and San Luis Obispo counties. The 91 percent DU should also be thought of as a set distribution uniformity, which reflects the discharge from the emitters, but does not necessarily describe the water distribution under the foliage or in the root zone.

Observation: This system performed well however, the few rows along the Northwest side of the block did not receive water. The system appeared to run out of water. The pressure was below 3psi. This area was not included in the DU analysis.

Recommendation: Monitor pressure at the closest regulator and determine the inlet and outlet pressure. Check hose riser tee screens for plugging which can cause the reduced flow.

**Job no: IWM-1188**

Site Tested: Block B – Test Acres 19.16

No. of Emitters/plant	: 1.0
Average system operating pressure	: 29 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 1.13 gph</b>
Average application (gal/hr/vine)	: 1.13
Average gallons per vine per 10 hr. set	: 11.3

**SYSTEM OBSERVATIONS:**

The measured distribution uniformity (DU) of the drip irrigation system was **91 percent** compared to a minimum system standard of 85 percent. The performance of this system was very good and ranks in the top 10 percent of the 1,200 evaluations conducted in Santa Barbara and San Luis Obispo counties.

Observation: This irrigation system also performed well during the test event. Overall elevated operating pressure (29 psi) was identified during this irrigation event. High overall operating pressure does not cause poor uniformity, but can be hard on the system hardware.

Recommendation: If there is an electric motor/pump in the system a combined pump test and DU study should be utilized to identify the cost of water and potential cost savings by reducing energy consumption.

**Job no: IWM-1189**

Site Tested: Block C – Test Acres 12.3

No. of Emitters/plant	: 1.0
Average system operating pressure	: 24.2 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 1.11 gph</b>
Average application (gal/hr/vine)	: 1.11
Average gallons per vine per 10 hr. set	: 11.1

**SYSTEM OBSERVATIONS:**

The measured distribution uniformity (DU) of the drip irrigation system was **89 percent** compared to a minimum system standard of 85 percent.

Observation 1: System operating pressure was very good.

Observation 2: Beginning signs of emitter plugging which causes reduced flow with good operating pressure.

Recommendations: Flush periodically, usually 2-3 times per season depending on water quality. Continue water additive for plugging and consider replacing emitters when DU test results reach the 70-75 percent range.

**Job no: IWM-1190**

Site Tested: Block H – Test Acres 42.98

No. of Emitters/plant	: 1.0
Average system operating pressure	: 23.0 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 1.12 gph</b>
Average application (gal/hr/vine)	: 1.12
Average gallons per vine per 10 hr. set	: 11.2

**SYSTEM OBSERVATIONS:**

The measured distribution uniformity (DU) of the drip irrigation system was **88 percent** compared to a minimum system standard of 85 percent.

Observation 1: This system had reduced uniformity due to areas of low pressure and consequently low flow, see pressure map.

Recommendation: Check inlet pressures to the regulators in the low pressure areas. If below regulator setting then back track through the piping design for adequate pressure readings. If insufficient pressure then evaluate the pressure sustaining valve at the filter discharge.

Observation 2: Dirty water for more than 10 seconds was observed from surface lateral hose ends.

Recommendations: Flush hose ends at least 2 times per season. Check filter operation by monitoring pressure difference between the inlet and outlet points at the filter. If hard water is an issue, then use water additive to control calcium precipitation.

**Job no: IWM-1191**

Site Tested: Block J – Test Acres 7.05

No. of Emitters/plant	: 1.0
Average system operating pressure	: 29.7 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 1.18 gph</b>

Average application (gal/hr/vine)	: 1.18
Average gallons per vine per 10 hr. set	: 11.8

**SYSTEM OBSERVATIONS:**

The measured distribution uniformity (DU) of the drip irrigation system was **94 percent** compared to a minimum system standard of 85 percent. The performance of this system was very good for an older system and ranks in the top 5 percent of the 1,200 evaluations conducted in Santa Barbara and San Luis Obispo counties.

Observation: Overall block operating pressure was higher than required and ranged between 22 - 35 psi. High overall operating pressure does not cause poor uniformity, but can be hard on the system hardware. High pressure can be a sign of excess energy use and high irrigation costs.

Recommendation: Determine if the block needs to be operated at the high pressures. Consider the combined pump test and DU study that is utilized to identify the cost of water and potential cost savings by reducing energy consumption. Contact Kevin Peterson with Cachuma RCD for details.

**Job no: IWM-1192**

Site Tested: Block E – Test Acres 32.29

No. of Emitters/plant	: 1.0
Average system operating pressure	: 28.0 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 1.16 gph</b>
Average application (gal/hr/vine)	: 1.16
Average gallons per vine per 10 hr. set	: 11.6

**SYSTEM OBSERVATIONS:**

The measured distribution uniformity (DU) of the drip irrigation system was **91 percent** compared to a minimal system standard of 85 percent. The performance of this newer system was very good and ranks in the top 10 percent of the 1,200 evaluations conducted in Santa Barbara and San Luis Obispo counties.

Observation: A wide range of field pressures were observed during this irrigation event. A low of 8 to a high of 55 psi. was measured. Low pressure was typically found at the higher elevations. This was mostly due to elevation and shape of the block. This variation had no significant impact on the uniformity which was very good.

**Job no: IWM-1193**

Site Tested: Block D/N – Test Acres 20.70/2.86

No. of Emitters/plant	: 1.0
Average system operating pressure	: 31.2 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 1.16 gph</b>
Average application (gal/hr/vine)	: 1.16
Average gallons per vine per 10 hr. set	: 11.6

**SYSTEM OBSERVATIONS:**

The measured distribution uniformity (DU) of the drip irrigation system was **93 percent** compared to a minimum system standard of 85 percent. The performance of this system was very good and ranks in the top 10 percent of the 1,200 evaluations conducted in Santa Barbara and San Luis Obispo counties.

Observation: The overall block operating pressure is generally higher than required, (see pressure map). High overall operating pressure does not cause poor uniformity, but can be hard on the system hardware. High pressure can be a sign of excess energy use and high irrigation costs.

Recommendations: Determine if the block needs to be operated at the high pressures. Consider the combined pump test and DU study that is utilized to identify the cost of water and potential cost savings by reducing energy consumption. Contact Kevin Peterson with Cachuma RCD for details. Check Western side of the block for low pressure, see map.

**Job no: IWM-1194**

Site Tested: Block L – Test Acres 39.8

No. of Emitters/plant	: 1.0
Average system operating pressure	: 25.0 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 1.16 gph</b>
Average application (gal/hr/vine)	: 1.16
Average gallons per vine per 10 hr. set	: 11.6

**SYSTEM OBSERVATIONS:**

The measured distribution uniformity (DU) of the drip irrigation system was **95 percent** compared to a system minimum standard of 85 percent. The performance of this system was excellent and ranks in the top 5 percent of the 1,200 evaluations conducted in Santa Barbara and San Luis Obispo counties.

Observation 1: A wide range of field pressures were observed during this irrigation event. A low of 8 to a high of 45 psi. was measured. Low pressure was typically found at the higher elevations. This was mostly due to elevation, as expected, along the North side of the block. Other variation was due to undulating topography throughout the block. This variation had no significant impact on the uniformity which was excellent.

**Job no: IWM-1195**

Site Tested: Block I – Test Acres 43.39

No. of Emitters/plant	: 1
Average system operating pressure	: 24.4 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 1.05 gph</b>
Average application (gal/hr/vine)	: 1.05
Average gallons per vine per 10 hr. set	: 10.5

**SYSTEM OBSERVATIONS:**

The measured distribution uniformity (DU) of the drip irrigation system was **83 percent** compared to a minimum system standard of 85 percent. This test indicates a decline in block uniformity.

Observation: The uniformity decline does not appear to be from plugged emitters. It is due to low pressure areas that cause low flow, see pressure map.

Recommendation: Check inlet pressures to the regulators in the low pressure areas. If below regulator setting then back track through the piping design for adequate pressure readings. If insufficient pressure, then evaluate the pressure sustaining valve at the filter discharge. It may also be necessary to increase regulator outlet pressure to customize the pressure requirement for the specific area providing there is adequate initial pressure.

**Job no: IWM-1196**

Site Tested: Block M – Test Acres 32.14

No. of Emitters/plant	: 1.0
Average system operating pressure	: 30.4 psi
<b>Nominal Emitter Flow Rate</b>	<b>: 1.00 gph</b>
<b>Average Field Emitters Flow Rate</b>	<b>: 0.96 gph</b>
Average application (gal/hr/vine)	: 0.96
Average gallons per vine per 10 hr. set	: 9.6

## SYSTEM OBSERVATIONS:

The measured distribution uniformity (DU) of the drip irrigation system was **67 percent** compared to a minimum system standard of 85 percent. The performance of this system was significantly below the minimum value set for micro irrigation systems.

**POTENTIAL WATER SAVINGS:** Bases on the 67% DU and 32 acres for the test block the potential water savings would be approximately 10.4 acre feet per year. If greater acreage also had this DU value then the water savings would be much higher.

Observation 1: The main observation and problem with this block was mixed emitters. Apparently 0.5 gph emitters have been introduced into part of the block. These lower flow emitters were added to several of the rows along the East side of the block and scattered around this general area, but not anywhere around the perimeter of the rest of the block.

Recommendation: Limit this practice to a small area and verify that the entire block does not have these lower flow emitters scattered throughout.

Observation 2: There were areas of low pressure observed in the block, see pressure map. Also, there was a wide range of operating pressure throughout the block due to undulating topography and slope in multiple directions. The Northeast corner had low hose end pressure probably because of the extra emitters placed on the hose.

Recommendation: Since there was high pressure, check inlet pressures to the regulators and if there is surplus pressure then reduce the pressure to lower hose pressure down the vine row. Remember to maintain at least 10 psi at any hose end. Since this block had pre-set regulators new factory set regulators would need to be utilized as needed.

## IRRIGATION MANAGEMENT

The following paragraph will describe the concept of scheduling based on weather, soil, and irrigation system. Santa Ynez, Sisquoc, and Santa Maria II CIMIS stations are all in the greater surrounding area. To obtain actual ETo values for any of these weather stations call **1-888-246-4728** or use the following website: [www.cimis.water.ca.gov](http://www.cimis.water.ca.gov). Through the website daily, monthly, and annual historic data can be accessed.

Irrigation timing and duration should correspond to replacing the moisture lost by evapotranspiration. Irrigations should be initiated after a managed allowable deficit (MAD) of 40-60 percent of the available water holding capacity of the soil has been reached. Given the effective water storage capacity of the soil (soil survey) and the net irrigation application rate (irrigation test), the frequency and duration of irrigation at peak ET could be determined.

Typically due to the small wetted volume of soil with drip irrigation systems, the irrigation interval should be frequent enough so that plant stress does not occur. This doesn't always apply. For example, deficit irrigation is sometimes practiced under conditions of water shortage and if the cost of water is high in relation to the value of the crop. It may also be

employed with certain horticultural crops, such as wine grapes, for marketing reasons. This may be a rational economic decision under those criteria; however, the operator should expect a potential yield reduction.

## **OTHER OBSERVATIONS AND RECOMMENDATIONS:**

### **WATER QUALITY AND PLUGGING**

During the test, hose laterals were flushed to observe irrigation water quality. Those hoses located hydraulically farthest from the pump or at the end(s) of the most distant down slope hose end of the block were typically observed per protocol. These would tend to be the dirtiest and therefore observed first for an indication of plugging due to physical contaminants in the water. Occasionally a hose lateral was observed to have dirty water flow for more than 10 seconds, but for the most part there was no evidence that any filters were not performing as required.

According to general water quality information associated with wells in this area, the following are associated with the use of this water through drip irrigation systems:

The local ground water does have hardness and since calcium tends to precipitate out of solution when the pH of the water is elevated, any treatment of the water that lowers the pH or acidifies the irrigation water would be a beneficial practice. According to the FAO Tolerance Tables suggest no yield loss with irrigation water with EC of 1.0 and a 90% potential yield loss when the water has an EC of 1.7. Annual leaching from rainfall or extra irrigation would also help manage any potential build-up of salt in the root zone.

Some minor emitter plugging was observed from algae, sediment, sand, and/or inorganics such as plastic etc. If possible, inject all fertilizers etc. before the filters in order to minimize any potential plugging.

The prevention of plugging is more cost effective than attempting to reclaim a plugged drip irrigation system after plugging has occurred. Also, crop yield will likely be enhanced with the more uniform application of water and nutrients.