Distribution Uniformity and Energy Savings using AquaMate®.

...As the rate of application increased, the amount of water delivered cumulatively through the season increased as a result of emitters not being clogged; and we have seen a linear increase in yield.

CASE STUDY

Grower	Oakville Station
Agronomist	
Location	
Crop	Viticulture

Demonstration Purpose

A 0.93 hectare (2.3 acre) Cabernet Sauvignon vineyard at the Oakville Station was used. In this vineyard the vines were spaced 9' x 6' and equipped with 2 pressure compensating emitters capable of delivering 0.53 gph. There was a difference of 8 metre in elevation between the pump outlet and water level. The ump set-point was fixed: 75 gpm @ 64 psi . Water traveled from the pump outlet to the study vineyard through 3-in PVC pipe for 292 metres. Linear head losses due to friction along the water conveyance were calculated based on the flow rate of 75 gpm (0.167 cfs) as HLF = 1.4 metre.

Demonstration Set Up

Vineyard was irrigated for one hour. Emitter output was collected from 24 emitters that were equi-distantly spaced in the vineyard after one hour. Pressure at the manifold was also measured. Into the irrigation stream, 2.5 litres of AquaMate® was injected in 2000 litres of water and let sit overnight. The following day, the irrigation system was switched on and emitters were flushed. The results of pressure and distribution uniformity are presented in the below table.

Factor	Pressure	Distribution Uniformity
Pre cleaning *	22 b	0.70 b
Post cleaning	28 a	0.95 a
t-test	0.0001	0.0001

The baseline conditions for water and energy savings are described below.

Baseline conditions (B) refer to the pre-cleaning of the micro-irrigation system

Average measured low-quarter baseline distribution uniformity: DUB = 0.70
Average measured emitters' application rate: AR B = 0.494 gph (1.87 l/h)

Average measured pressure head available at the inlet of the manifold: HB = 22 psi

Enhanced conditions (E) refer to the post-cleaning of the micro-irrigation system with **AquaMate®**

Average measured low-quarter baseline distribution uniformity: DUE = 0.95

Average measured emitters' application rate: ARE = 0.515 gph (1.95 l/h)

Average measured pressure head available at the inlet of the manifold: HE = 28 psi

Methods and Assumptions

The actual consumptive vine water use (ETa) was measured with a commercial surface renewal energy flux station (Tule Technologies, Inc.) along the grapevine growing season of 2021.

The required gross irrigation depth (GID) was determined from the measured ETa, and the resulting water depletion in the effective rooting zone, and the measured system DU values to optimize the application efficiency (EQ). EQ is the water application efficiency of the low quarter and represents the percentage of gross water applied that is beneficially utilized for actual vine evapotranspiration.

For micro-irrigation, EQ is calculated as the mean low-quarter volume of irrigation water per unit area infiltrated and stored in the root zone. According to Keller and Bliesner (2000), EQ is primarily a function of DU, but it also depends on minor losses (runoff, leaks, filters and line flushing, and drainage), unavoidable losses to deep percolation (through cracks or water percolation beyond the root zone), and avoidable losses resulting from poor irrigation scheduling.

For well-watered crops grown with adequately maintained and properly operated micro-irrigation systems and accurately scheduled irrigation, EQ approximates the system DU.

For this specific study, given the well-watered conditions, the adequate irrigation system maintenance and advanced irrigation scheduling, we assumed that EQ ~ DU.

As such, dividing the ETa by DU (instead of by EQ) provides an estimate of the water depth that will infiltrate into the low quarter of the irrigated vineyard block (in well-drained soil). In this way, the low-quarter of the vineyard will receive sufficient water to return to field capacity and maintain good vine growth and production, while the remainder of the vineyard will receive more than sufficient water to refill the soil to field capacity.

Demonstration Results

The results of the demonstration showed a very positive response to the application of **AquaMate®**. Improvement in water pressure and water distribution through its advanced cleaning abilities and water distribution technology that has led to the below cost saving on water and energy.

Potential cost saving for reduced water usage, assuming an average water cost of $205/meg:

Cost Saving Water: 0.75 megalitre /ha x $205/meg = $153/ha

Potential cost saving for reduced energy usage, assuming an average energy cost of $0.18/kWh:

Cost Saving Energy = 66 kWh/ha x $0.27kWh = $17.82/ha

Conclusion

This demonstration has shown that **AquaMate®'s** advanced cleaning and water distribution technology has the ability to clean the hardest of situations in an irrigation system and maintain it.

It has sustained removal from the filter system and drippers resulting in improved water use efficiency, improved crop production and considerable savings in labour, water and energy.

Estimated reduction in GHG emissions could also be calculated.

Meanwhile, applied fertilizer uptake (Nitrogen, Potassium, Calcium and Magnesium) increased linearly with the increase in AquaMate® application. Year-over-year, repeatable results were seen with the 20 ppm application rate without detrimental effects on fruit composition with this AquaMate®.

About Advanced Nutrients

Advanced Nutrients is a leader in the development of innovative, environmentally benign fertilisers which cost less and deliver more. For the last 22 years, smart agricultural, horticultural and livestock producers throughout Australia, Africa, Asia and the Middle East have been using our products to cut input costs, boost returns and reduce farming costs.