Irrigation Considerations in a Dry Year

UC Cooperative Extension

Paul Verdegael
UC Farm Advisor
San Joaquin County

CAFF-LWC Meeting
12 May 2015
<table>
<thead>
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Note: The table shows the rainfall in inches for each month from 2001 to 2015. The data is a cumulative total of the average rainfall for each year.
<table>
<thead>
<tr>
<th>Year</th>
<th>Date in March</th>
<th>Budbreak = 10% of buds at 1/2 inch shoot length or first leaf unfolding</th>
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<tbody>
<tr>
<td>2009</td>
<td>25</td>
<td>1999</td>
</tr>
<tr>
<td>2008</td>
<td>14</td>
<td>1998</td>
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<tr>
<td>2014</td>
<td>13</td>
<td>2013</td>
</tr>
<tr>
<td>2015</td>
<td>2</td>
<td>2014</td>
</tr>
<tr>
<td>2016</td>
<td>28 Feb</td>
<td>2015</td>
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</table>

Chardonnay Budbreak Season Start
• Muscat blanc
• Pinot Grigio
• Chardonnay
• Pinot noir
• Petite Sirah
• Merlot
• Sauvignon blanc
• Syrah
• Cabernet Sauvignon
• Malbec

Varieties
Cover Crop
Competition (weeds)
Variety/Rootstock

Depth
Texture
Soil

Trellis
Spacing

Time of season (canopy expansion)
Size of canopy (KC)
Sun Interception

Wind Temperature

For External Forces
Evapotranspiration Reference (ET0)
Climate

Water Use
420A
Televi PC
SO4
3309C
101-1487
Kober BBB
1103 Paulsen
Freedom
110R
140 Ridge
Dog Ridge
Ramsey (Salt Creek)
St. George

Rootstocks
<table>
<thead>
<tr>
<th>Texture</th>
<th>Soil Type</th>
<th>Available Waterholding Capacity (in. of water/foot of soil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.60 - 2.50</td>
<td>Sandy clays, silty clays, clays loams</td>
<td></td>
</tr>
<tr>
<td>1.75 - 2.50</td>
<td>Clay loams, silty clay loams, sandy clay</td>
<td></td>
</tr>
<tr>
<td>1.50 - 2.30</td>
<td>Very fine sandy loams, loams, silt loams</td>
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<tr>
<td>1.25 - 1.75</td>
<td>Sandy loams, fine sandy loams</td>
<td></td>
</tr>
<tr>
<td>0.75 - 1.25</td>
<td>Coarse sands, fine sands, loamy sands</td>
<td></td>
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<tr>
<td>0.4 - 0.75</td>
<td>Very coarse sands</td>
<td></td>
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</tbody>
</table>
20% more Irrigation
Winter rains used
↓
Total water use

Cover Crops
Monitoring Vine stress & Start Threshold

- Direct (Plant)
  - Shoot tip Rating
  - Pressure Chamber (Bomb)
- Indirect (Soil or Air)
  - Tensiometer
  - Gypsum block/Water Mark
  - Soil Capacitance
  - Neutron Probe
  - Surface Renewal
When to Irrigate?

- Early
- Mid
- Late
- Postharvest

Stage I
- Bud break to flower set

Stage II
- Flower set to 30 days post bloom

Stage III
- 30-40 days post bloom

Veraison to harvest

No stress
Timing of Water Deficits

- Early Season
- Mid Season
- Post Harvest
- Harvest
- Greatest Effect
- Set Through
- Bud Break
- 2015
How much to Irrigate?
<table>
<thead>
<tr>
<th></th>
<th>North Coast</th>
<th>Lodi</th>
<th>San Joaquin Valley</th>
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</thead>
<tbody>
<tr>
<td>Deficit/Full</td>
<td>43</td>
<td>50</td>
<td>72</td>
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<tr>
<td>Requirement (in)</td>
<td>20</td>
<td></td>
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<tr>
<td>Gross Irrigation</td>
<td>6.7</td>
<td>10</td>
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<tr>
<td>Irrigation Efficiency (%)</td>
<td>90</td>
<td>60</td>
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<tr>
<td>Net Irrigation Requirement (in)</td>
<td>6</td>
<td>9</td>
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<tr>
<td>Soil Storege (in)</td>
<td>10</td>
<td>9</td>
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<tr>
<td>Deficit Irrigation use (in)</td>
<td>16</td>
<td>18</td>
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<td>Full Water Use (in)</td>
<td>24</td>
<td>27</td>
<td>29</td>
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</table>

Irrigation Water Comparison: Full/Deficit In Three Areas
Crop Coefficient $K_c = 0.30 \times 2.7 = 0.51$

LS5% = 0.30

Midday

Land Surface Shaded
Cover Crop advances and increases maximum at 60% cover increases until bloom begins at budbreak.

Example: $30 \times 0.017 = 0.51 Kc$

**Shaded and Vineyard KC**

Relationship between Percent Land Surface

LE = Williams

Percent Shaded Area at Midday

0 0.5 1 1.5

$Kc$

0 10 20 30 40 50 60 70 80

Relationship between Percent Land Surface
Comparison of Spacings

```
5 x 11
7 x 10

792
660

0.30 " 34 " 0.24 acre inch 41 gals per vine
0.10 hours @ 1 acre inch
```

Spacings

Vines / Acre @ 10 hours
\[ 7 \times 11 \times 2 \text{ emitters per vine} = 42 \text{ inches} \]

\[ 0.46 = 2.4 \times 0.5 \times 1.6 \div 42 \text{ inches} \]

\[ \text{Acres inches} = \text{(hours x GPH x 1.6) / emitter spacing inches} \]

\[ 1.0 \text{ acre inch} = \frac{48 \times 1.6}{7 \times 11} \]

\[ \text{Acres inches} = \frac{\text{Gallons per vine} \times 1.6}{\text{vine spacing ft}} \]

\[ 48 \text{ gal/vine} = 1.0 \text{ in} \times 7 \times 11 \times 0.623 \]

\[ \text{Gallons/vine} = \text{acre inches water x vine spacing ft x 0.623} \]

Irrigation Application
Information on Scheduling & Strategies
• Keep a record of applied water (and rainfall)
• Begin irrigation sooner rather than later
• Monitor vines
• And/or place soil monitoring devices
• Auger or dig down 3 feet or more
  – Distribution Uniformity test
  – Leaks vs plugs
  – Flush the laterals
  – Check system
• Run water analyses [E.C./TDS, NO₃-N, HCO₃, PH, Na, Ca (Fe)]
• Test well or water source

To Do List
Dry Farming – Opportunity, Not The Answer

- Is dry farming the most sustainable strategy for drought solution?
- Will severe water stress advance or delay harvest date?
- Does continuous year after year water deficits harm the vines?
- Can I go too far and reduce yield or quality?
- Does cluster thinning reduce water use?
- Does shoot thinning help reduce water use?
- What if I have strong shoot growth?
- Does trellis design matter with water use?
- How often is best to irrigate?
- Is there a relationship between soil water content and leaf water potential?
Expect much lower crop

Keep a record of rainfall events (amounts and timings)

Monitor vines for spider mites and leafhoppers (and VMB)

Cluster Thin - may help reduce stress on vine (not reduce water

Leak Removal - may help slightly; caution on exposure

Moving severely will help some

Cultivation early to reduce cover crop/weed competition (or

Shoot Thin - will help

Rootstock - Strong, Healthy, Drought Tolerant

Effective Winter Rainfall - Minimum 12 to 18 inches

Adequate Root Zone

Dry Farming – Opportunity, Not The Answer
Water Stress vs. "Hang Time"
Post Harvest Irrigation if possible

If available

After full verasion (~18-20° Brix) apply more,

Increase stress early verasion (8-10° Brix)

Apply savings during 100 F spells

Early morning or night sets

Irrigate prior to any possible rain

Apply 50% of ET maybe?

Save water early; budbreak to bloom

usual water; apply at 40% ET

If short supply at percent of total available (40% of

Spread available water evenly for over the season,

When is it "Best" to Irrigate?
Church of choice
Post Harvest: apply if available until leaves sense and/or attend
After full harvest (~18-20° Brix) apply more if available
Increase stress early harvest (8 to 10° Brix)
Use "savings" during 100°F spells
Budbreak to bloom: Apply 50% of ETC maybe?
Save water early when possible
Spread available water evenly for the season, if in short supply
Irrigate prior to any predicted rain

Monitor vines for "threshold" of acceptable stress after budbreak
Account for cover crops water use
Set irrigation schedule by ET/ETc demand (historical or real time)
Set goals for variety & rootstocks
Evaluate soil moisture status (visual vs measured)
Check out system & determine distribution uniformly periodically

Summary
Aurelius

in the ranks of the insane. — Marcus

The object of life is not to be on the side of

the majority, but to escape finding oneself

You been

longed.

running

has shaped the world

our college

WAPS