Irrigation Management of Strawberries

Michael Cahn
Irrigation and Water Resources Advisor
University of California, Cooperative Extension, Monterey County
Irrigation Scheduling

- Deciding when to irrigate
- Deciding how much to irrigate
Approaches to Irrigation Scheduling

- Weather-based
- Plant-based
- Soil-based
Tools for irrigation scheduling

- Flowmeters and pressure regulators
- Crop ET
- Soil moisture sensors
How much water did you apply?
Total Seasonal Applied Water 2011

Avg = 24.8 inches

January – May = 7.9 inches (32% of Total)
2010 Average system flow rate variation = 19%
Flow rate vs Time

Flow rate (gpm)

Time

0
10
20
30
40
50
60

12:00 13:00 14:00 15:00 16:00 17:00 18:00

Flow rate vs Time

Flow rate (gpm)

Time

0
10
20
30
40
50
60

12:00 13:00 14:00 15:00 16:00 17:00 18:00
Regulate Pressure of Blocks
Evapotranspiration can be estimated using CIMIS weather stations:

- Solar Radiation
- Wind Speed
- Relative Humidity
- Air Temperature

Active CIMIS Stations:
- Santa Ynez (64)
- Cuyuma (88)
- Goleta Foothills (94)
- Santa Barbara (107)
- Sisquoc (165)
- Lompoc (231)
- Santa Maria II (232)
- Nipomo (202)
- San Luis Obispo West (160)

wwwcimis.water.ca.gov
Spatial CIMIS ETo Reporting
My Reports

The My Reports allows you to perform single-click reporting, select report preferences, and prepare custom reports. There are three station lists (List 1, List 2, and List 3) and each list can hold up to a maximum of 10 stations. A list must contain at least one station before executing reports from this page. You can add and remove station(s) from the list by clicking on Create/Change Station Lists and clicking on Remove. Once a list has been created, clicking on a station number will provide detailed information about the station.

After specifying Station Lists, you can generate a report in any one of the report options listed under Quick Reports by clicking on the list number to the right (list 1, list 2, or list 3). These reports are generated using the Preferences listed at the bottom of the Station Lists. Preferences for Quick Reports can be changed by clicking on Change Preferences at the bottom of the Station Lists. Custom reports allows the user to select the options (climatic parameters), to be reported.

Quick Reports

Report Options
Standard Hourly (using prefs)
Standard Daily (using prefs)
Standard Daily ETo Variance (using prefs)
Standard Monthly (using prefs)
Standard Monthly Average ETo (using prefs)

My Custom Reports

Report Options
pajaro
salinas
undefined
undefined

Tip: When specifying the stations for station-lists, group stations by geographic proximity. You can then report by geographic region. Reports based on stations in close proximity can be a useful tool for understanding data patterns in and around the area of interest.
Evapotranspiration

Ranch System

CIMIS weather station

Atmometer
Comparison of different methods of estimated ETo

Cumulative ET (inches)

Spatial Cimis
Gilroy Cimis
ET gauge
Crop coefficients for strawberry were based on canopy cover:

$$ET_{crop} = ET_{ref} \times K_{crop}$$

$K_c$ varied from 0.05 to 0.95

wwwcimis.water.ca.gov
Canopy development was similar among varieties and planting configurations.
Crop ET vs Applied Water in Strawberries

Cumulative Water (inches)

Date
Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov

Applied Water
Crop ET
Applied Water as Percentage of ET (June – October 2011)

Field Number

1  2  3  4  5  6  7  8  9  10  11  12  13  14

Applied Water (% crop ET)

0  50  100  150  200  250

June - October

Avg = 124%
Soil probe for Gravimetric Moisture
Tensiometers monitor the matric potential (tension) of the soil.

Measurement of soil moisture that is most related to water status in a plant.
Logging tensiometers improves interpretation of readings

Electronic gauge
Soil tension sensor

**Granular Matrix Blocks**

+ inexpensive
+ low maintenance
+ can interface with datalogger
+ range of 0 – 199 cbar
+ relatively easy to install

- require good soil contact
- slow response time
- salinity interference > 2 dS/m
- wear out after 1 or 2 seasons
Dielectric Sensors (Volumetric):

- Time domain reflectometry (TDR)
- Frequency domain reflectometry (FDR)
- Capacitance

+ potentially accurate volumetric measurement
+ many configurations
+ interface with datalogger

- salinity and soil texture interference
- FDR and capacitance sense a small volume
- some types are difficult to install
Examples of Dielectric Sensors
## Soil Texture, Water Holding Capacity, and Available Moisture

<table>
<thead>
<tr>
<th>Soil Texture</th>
<th>Available Moisture</th>
<th>Tension 5 kPa</th>
<th>Tension 30 kPa</th>
<th>Tension 80 kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>inches/foot</td>
<td>%</td>
<td>inches/foot</td>
</tr>
<tr>
<td>Silty clay</td>
<td>45.7</td>
<td>5.48</td>
<td>42.6</td>
<td>0.37</td>
</tr>
<tr>
<td>Silty clay loam</td>
<td>38.6</td>
<td>4.63</td>
<td>35.5</td>
<td>0.38</td>
</tr>
<tr>
<td>Loam</td>
<td>31.1</td>
<td>3.73</td>
<td>27.2</td>
<td>0.47</td>
</tr>
</tbody>
</table>
Dielectric Soil Moisture Data in Strawberry
Summary

- An integrated approach to irrigation scheduling (ET and soil moisture monitoring) seems to work the best for berries.

- Many types of soil moisture sensors available—use as a tool to cross-check irrigation schedule.

- Improving irrigation management can potentially save water and fertilizer and optimize yield and quality.
Thank you!

¡Muchas Gracias!