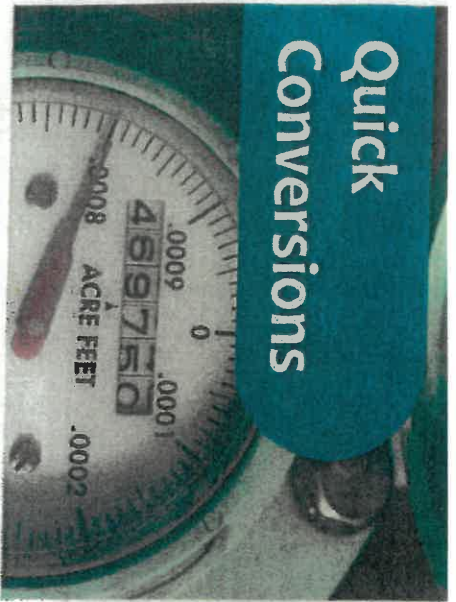


Quick Conversions



Installing a flow meter to measure water usage can help to apply the proper amount of water to the field, avoid over- and under-irrigation, and save water and energy throughout the season.

How to Calculate System Application Rate (No Meter)

Measure a timed flow from an emitter or nozzle and calculate out to gallons/hour:

$$\text{ml of water collected in 30 seconds} \times 0.0317 = \text{discharge rate} \left(\frac{\text{gallons}}{\text{hour}} \right)$$

$$\frac{\text{discharge rate}}{\text{emitter spacing}} \times 20 = \text{flow} \left(\frac{\text{gpm}}{100\text{ft}} \right)$$

$$\frac{\text{flow}}{\text{lateral spacing (inches)}} \times 11.55 = \text{Application rate} \left(\frac{\text{inches}}{\text{hour}} \right)$$

How to Convert Measured Flow to Inches Applied

If the flow meter measures in gallons:

$$\frac{\text{gallons} \times 0.000037}{\text{irrigation set (hours)}} = \frac{\text{acre inches applied}}{\text{hour}}$$

In acre feet:

$$\frac{\text{acre ft} \times 12}{\text{irrigation set (hours)}} = \frac{\text{acre feet applied}}{\text{hour}}$$

Irrigation Tips and Tricks

- Determining the right irrigation set time and frequency depends on the irrigation method and design, water availability, soil texture, and soil type.
- Take care to keep the water application rate appropriately matched with the infiltration rate of the soil to avoid infiltration problems, ponding, and surface runoff.
- Heavier soils should be irrigated for longer periods, but can have more time between irrigations (longer irrigation intervals).
- Sandy soils should have shorter irrigation sets and more frequent irrigation runs.
- Take note if a field has different soil types (texture) and, if possible, split sections using valves.
- Repair leaks and breaks. These issues can quickly leach nitrate and other nutrients out of the root zone and make it unavailable to the crop.
- Soil moisture sensors are a great tool to provide information about the water status in soil profile at representative areas in the field.
- Avoid sprinkler irrigating when windy.
- When fertirrigating, take the length of the pipeline into consideration. The longer the pipeline, the longer it takes for fertilizer to reach the emitters.

OSP 148392



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Irrigation Guide



CALIFORNIA DEPARTMENT OF
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Soil Texture and Water Holding Capacity

(Adapted from Brady-Weil 2003)



Soil feel test

Moisten a walnut-sized amount of soil, adding a small amount of water at a time, until the soil does not stick to your fingers. If you add too much water, add more soil.

- High clay content: sticky feel and stiffness
- High silt content: silty and smooth feel, no stick or resistance to deformation
- High sand content: gritty feel and grinding noise when rubbed against itself

Water Holding Capacity

Soil texture is a primary factor in determining its ability to hold water; known as soil water holding capacity.

We are able to estimate the amount of water available to crops by pairing the water holding capacity with a crop's active root zone depth. The table below shows the ranges of water holding capacities for various soil textures.

Textural class	Water holding capacity <i>inches/foot of soil</i>
Coarse sand	0.25 - 0.75
Fine sand	0.75 - 1.00
Loamy sand	1.10 - 1.20
Sandy loam	1.25 - 1.40
Fine sandy loam	1.50 - 2.00
Silt loam	2.00 - 2.50
Silty clay loam	1.80 - 2.00
Silty clay	1.50 - 1.70
Clay	1.20 - 1.50

Weather-Based Irrigation Scheduling

Know your crop water requirement.

The crop water requirement or crop evapotranspiration (ET_c) can be estimated using the equation:

$$ET_c \times K_c = \text{Crop water requirement}$$

$$ET_o = \text{the reference evapotranspiration}$$

$$K_c = \text{Crop coefficient}$$

The California Irrigation Management Information System (CIMIS) can provide estimates for reference evapotranspiration (ET_o), estimated by weather stations all over the state.

Go to www.cimis.water.ca.gov/

- > Create login
- > Navigate to the data tab
- > Select closest station to your ranch / area of interest
- > Using the menu at the top, select the report style and data range. Select "Run Report" to get the ET_o.

K_c is crop-specific and depends on crop type, stage and health. The K_c for several crops at various stages can be found at:

www.fao.org/docrep/x0490e/x0490e0b.htm

Other information on crop ET:

www.iirc.org/reports/pdf/californiacrop.pdf

To determine the irrigation run time for applying a certain irrigation depth:

$$\frac{\text{inches of water needed to apply}}{\text{application rate of system} \left(\frac{\text{inches}}{\text{hour}} \right)} = \text{Run time (hrs)}$$

Nitrogen Management



Nitrate is highly mobile with water. Because of this, nitrogen management is heavily dependent on irrigation management.

Especially in fertigation, the fertilizer application is only as efficient as the irrigation application. For an accurate measurement of your irrigation system's distribution uniformity, contact your local irrigation district, USDA-NRCS, or a UC ANR representative and ask about getting an irrigation evaluation from your local mobile irrigation lab.

Find out what type of soil is in the field and the depth of the active root zone of the crop. This can assist with making irrigation decisions, so that irrigation events do not exceed water holding capacity of the soil in the active root zone.

Nitrate in well water is available as a nutrient for crops. Account for this nitrate content to reduce fertilizer usage.

Fertigate at the middle to late portions of irrigation sets to ensure that nitrate remains available in the active root zone, but does not remain in the line after the system has been shut off.

Do not over-irrigate. Keep nitrate from leaching below the active root zone or converting into runoff that leaves the field.

When planning irrigation or fertigation, always consider the 4Rs: Right source, Right rate, Right time, Right place.

For information on specific crop nutrient uptake requirements, see the California fertilization guidelines on the FREP website:

www.cdifa.ca.gov/go/FREPguide