# DETERMINING WHEN TO BEGIN IRRIGATING ALMONDS USING ET, SOIL WATER HOLDING CAPACITY, AND EFFECTIVE RAINFALL

Knowing when to begin almond irrigation and how much to apply requires knowledge of crop water use, the level of moisture stored in the root zone, and the effectiveness of spring rainfall.

**Factors that determine the root zone available-water reservoir are:**

- Root zone depth
- Soil water holding capacity (largely determined by soil texture)
- Estimate of the effective rainfall

## Plant-available water holding capacities of various textured soils

| Soil Texture | Plant-Available Water Holding Capacity (in. of water per ft. of soil) |
|---|---|
| Very coarse sands | 0.40 – 0.75 |
| Coarse sands, fine sands, loamy sands | 0.75 – 1.25 |
| Sandy loams, fine sandy loams | 1.25 – 1.75 |
| Very fine sandy loams, loams, silt loams | 1.50 – 2.30 |
| Clay loams, silty clay loams, sandy clay loams | 1.75 – 2.50 |
| Sandy clays, silty clays, clays | 1.60 – 2.50 |

Source: Adapted from: Schwankl, L.J. and T. L. Prichard. 2009. University of California Drought Management website. http://UCManageDrought.ucdavis.edu

**Example:** A sandy loam with a 4-foot root zone:
1.5 inches per foot x 4 feet = 6 inches available water capacity

## Estimating the effective rainfall to fill the root zone

A study by the California Department of Water Resources conducted over a four-year period developed relationships for determining effective rainfall in California. Monthly rainfall is factored by the evaporative effect using bare soil. The table below indicates the effective rainfall by month for each inch of rainfall.

| Rainfall (inches) | Effective Rainfall (inches) | | |
|---|---|---|---|
| | Oct | Nov-Feb | Mar-April |
| 1 | 0.6 | 0.4 | -0.2 |
| 2 | 1.2 | 1.3 | 0.6 |
| 3 | 1.8 | 2.3 | 1.4 |
| 4 | 2.5 | 3.2 | 2.3 |
| 5 | 3.1 | 4.2 | 3.1 |
| 6 | 3.8 | 5.1 | 4.0 |

Below is an example using Merced average rainfall to estimate effective rainfall showing rainfall in inches totaling 9.2 and effective rainfall calculated as 6.2 inches.

| | Rainfall (inches) | Effective Rainfall (inches) |
|---|---|---|
| Oct | 0.8 | 0.5 |
| Nov | 1.3 | 0.7 |
| Dec | 2.1 | 1.4 |
| Jan | 2.6 | 1.9 |
| Feb | 2.4 | 1.7 |
| **Total** | 9.2 | 6.2 |

In this example, the estimated effective rainfall would fill the root zone reservoir capacity. If the effective rainfall exceeds the root zone capacity, it is lost; so the reservoir would be 6 inches.

## When to irrigate?

The difference between estimated crop water use and the sum of the in-season effective rainfall and available soil storage is a good method to estimate when to begin and how much to apply.

| Zone 12 (inches) | Merced OWR* | 2016 | | |
|---|---|---|---|---|
| | | Effective Rainfall | Stored Moisture | Irrigation Application |
| March | 2.1 | 2.5 | 0.0 | 0.0 |
| April | 4.1 | 1.5 | 1.0 | 1.6 |
| May | 6.4 | 0.0 | 1.0 | 5.4 |
| June | 8.2 | 0.0 | 1.0 | 7.2 |
| July | 8.9 | 0.0 | 0.0 | 8.9 |

*Orchard Water Requirement

It is generally recommended to only use 50% of the available water in the root zone to prevent water stress. That would be 50% of 6 inches or 3 inches. In this example, one third (1 inch) was used in the months of April, May, and June.

**March.** Effective rainfall exceeded OWR. No soil water reservoir use or irrigation.

**April.** Effective rainfall provided 1/3 of the OWR. The remainder is made up from soil storage (1.0 inch) and irrigation (1.6 inches).

**May.** No effective rainfall. Soil storage 1.0 inch and 5.4 inches from irrigation.

**June.** No effective rainfall. Soil storage 1.0 inch and 7.2 inches from irrigation.

**July.** No effective rainfall or soil storage. 8.9 inches from irrigation.

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