

## SUSTAINABLE FOOD GARDENING: CONSERVE WATER by Master Gardener, Stephanie Wrightson

We can be responsible water stewards AND have a thriving food garden.

Our responsibility to our crops relative to irrigation is 1) to replace the water loss through evapotranspiration (ET)<sup>1</sup> and 2) to irrigate in a manner that encourages optimum plant health and production. If we take care of replacing ET loss in a water-wise manner by using direct water methods, composting to increase water-holding capacity and mulching to reduce evaporation, we won't waste a drop and our crops will thrive.



**Drip irrigation is the most efficient way to deliver water to your crops.** Drip tubing releases water slowly, prevents run-off and delivers water directly to the plant. There is little evaporation during this irrigation process. If you are not using drip irrigation, it is [easy to install](#).

Some gardeners may not be able to use drip irrigation because the water source is too distant, the community garden does not allow drip or other factors exist that prohibit effective use of drip. Or, a gardener may prefer to hand water. While drip irrigation is highly recommended, there can be advantages to hand watering. Gardeners can use watering time to observe plant growth and health, inspecting every inch of their crops. While hand watering is time-intensive, the specific moisture needs of each plant can be addressed if the garden is not hydrozoned (hydrozoning is grouping crops by water need) or are heavily intercropped in a year-round food garden. If you are required or choose to hand-water, apply the same principles in replacing water loss through ET in order to conserve water and ensure plant health and production.

### **Direct water to the active root zone.**

Whether we are watering with drip irrigation or hand watering, we want to direct water to the active root zone of our crops. For many of our veggies, the active root zone is in the top 3 to 8 inches of the soil. Some deep-rooted crops, like tomatoes, are happy at 12 to 18 inches if we have friable or easily worked soil. However, with a heavier soil (e.g., clay), their active root zone may stay in the top 12 inches. We want to keep the soil in the active root zone moist, not wet...moist, like a well wrung-out sponge.

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<sup>1</sup> Evapotranspiration—or “ET”—is evaporation of water from the soil surface along with transpiration from the plant. Transpiration is water vaporizing inside the plant leaves and being released through the plant pores into the air.



### How much water do our food gardens need?

Evenly moist soil in the active root zone of our crops supports optimum plant health and production. Let's consider a cubic foot area of soil (1' x 1' wide and 1' deep). This amount of moist soil holds 2 inches of water. There will be water loss from ET. Also, some water may move into deeper soil (especially, if we overwater). **The average water loss during a Sonoma County summer is 1 inch per week per square foot of garden.** This is about 2/3 gallon per week per square foot of soil (or, for you exacting types: 0.623 gallons per sq. ft.). As caretakers of our crops, it is our responsibility to replace this water loss.

Remembering that evenly moist soil in the active root zone of our crops is our goal, we don't want to deliver the weekly water replacement all at one time. That would result in alternating wet and dry soil which leads to stunted crops and uneven production. Given Sonoma County's long, hot, dry summers, the recommendation is to divide the weekly amount of water needed into daily portions/applications. This will keep the active root zone of crops moist (not wet), and in a near ideal condition throughout each week.

What if we can't water our garden daily because of watering restrictions in a drought or due to other factors that prevent it? We can divide the weekly amount by the maximum number of days we are able to water in a week. At the *very minimum*, we should divide the weekly water replacement needs into two portions/applications if we have heavy soil (clay) or into three portions/applications if we have light soil (sand). There are exceptions such as when we transplant seedlings—these need more frequent but shallow watering until they mature a bit.

To determine our own garden's watering need, we can use the following formula:

$$0.6 \text{ gal/sq. ft. (1" equivalent)} \times \# \text{ sq. ft.} / \text{number of watering days} = \text{gallons needed to water on each watering day}$$

The final result of the following three simple steps will tell you the amount of water to apply each watering day whether you use drip irrigation or you hand water.

Worksheet:

1. \_\_\_\_\_ feet (width of garden) x \_\_\_\_\_ feet (length of garden) = \_\_\_\_\_ square feet (sq. ft.)
2. 0.6 gallons x \_\_\_\_\_ (result of step 1) = \_\_\_\_\_ gallons
3. \_\_\_\_\_ gallons (result of step 2) / \_\_\_\_\_ (# watering days) = \_\_\_\_\_ gallons

If you hand water, you will need to add one more step to determine how long you must water. Using your gentle flow hose attachment, time how long it takes to fill a 1 gallon container.

4. \_\_\_\_\_ seconds (to fill one gallon) x \_\_\_\_\_ (result of step 3) = \_\_\_\_\_  
seconds (divide by 60 for minutes)

The result of step four is the amount of time you must hand water (using a gentle nozzle setting) to adequately irrigate your *entire* summer food garden on a watering day. The first time you try this, you may want to water only one square foot for the period of time that it took to fill up a 1 gallon container. This will give you a sense of how to move the hose around the bed—from square foot to square foot—so that water is evenly distributed. A slow, gentle flow avoids soil splash which may result in wet spores clinging to the plant—an environment that may facilitate fungal disease. In addition, a slow, gentle application of water avoids run off which moves soil nutrients away from our plant, and allows applied water to soak in to reach the active root zone.

If you use drip irrigation, refer to the following guide and worksheet to calculate how long you need to run your drip system: [How Much Water Does My Garden Need?](#) and [Worksheet](#).



### **Check your soil moisture before watering.**

Whether watering by hand or by drip irrigation, always check the soil moisture first! Some gardeners watch for plant water stress before watering. Paying attention to the condition of your crops is very important, but the symptom(s) we observe may fool us. Take wilt for example. Wilt may be caused by dry soil. But, it also may be caused by wet soil when all the soil pores are filled with water, drowning the roots. Or, maybe it's a hot, sunny summer afternoon when large-leaved plants naturally droop from transpiration but may recover overnight (squash and pumpkins, for example). The only way you can determine whether to irrigate now or not is to test the soil.

You can check your soil by pushing your finger into the soil. Is it dry? Then, water. Is it glistening? It's too wet; re-test in a couple days. Just moist with a few flecks of soil clinging to it? It's just right; come back the next day to check again. You also can use a wooden dowel or chopstick to do the same thing—insert it near the dripline of the plant to the depth of the root zone, and apply the same criteria as you would if you insert your finger. Some gardeners will dig a hole 6 to 8 inches deep at the edge of the plant's dripline and squeeze soil in their hand. If the clump falls apart easily when lightly touched, it's time to water. Or use a moisture meter—but, periodically, use one of the methods above to make sure that your meter is giving you an accurate reading.

### Tips for watering wisely:

- Water when evaporation rates are low—early in the morning is ideal. If you can't water then, water while still light in early evening. Avoid watering on windy days.
- Wet the soil, not the plant. This is especially important if you are watering in the evening. A wet leaf may lead to fungal disease like leaf spot or downy mildew. And when watering in the morning on a sunny day, wetting the plant may result in leaf burn.
- Use a gentle flow nozzle. This avoids soil splash which may cause spores to cling to your leaves, leading to fungal disease. Also, with no run-off, nutrients are not moving away from the plant, and water reaches the active root zone where it is needed. A long-reach nozzle, like a rain wand, is ideal to reach under the leaf canopy without stepping on the soil. Compacting soil is discouraged.
- Add organic, well-decomposed compost to your soil. It improves the water-holding capacity of soil. Set a goal of adding 1 inch of compost to the top of your soil before your spring and fall planting. If you have especially heavy or light soil, aim for 2 inches. Don't worry about digging it in—nature and irrigation/rainfall will take care of incorporating it.
- Water according to plant need.
  - Pay special attention to crops during their flower/fruitlet stages. Evenly moist soil during this period is especially important for optimum taste and production.
  - Shallow-rooted crops, like lettuce, may need more frequent watering. Deliver the needed weekly water in smaller portions, more often during the week.
  - Established, deep-rooted crops (like tomatoes), may be watered less frequently after fruit has developed.
  - Seeds require constant moisture (but not wet soil) in order to germinate. Daily shallow, gentle watering may be required until germination. The top 3 to 4 inches of soil should be kept moist (not wet) until seedlings are 4 to 5 inches high.
- Organic mulch (3 to 4 inches deep) will slow evaporation and choke out weeds that compete for water. But, do not cover germinating seeds with mulch; wait until the seedlings are well-established to pull the mulch near them.



For more information about sustainable water use, drought strategies and instructions on installing drip irrigation in your food garden, visit the [Food Gardening with Less Water page](#) on the Master Gardeners of Sonoma County website. Watch an informative video made by the Master Gardener Food Gardening Specialists and avail yourself of information about conserving water. Be a steward of the environment AND grow a thriving vegetable garden.

This is one of a series of articles about [Sustainable Food Gardening](#).