SL-213

UF UNIVERSITY of FLORIDA
IFAS Extension

# Water Requirements for Drip-Irrigated Tomato Production in Southwest Florida[1]

C.D. Stanley and G.A. Clark[2]

Water management in drip irrigated tomato production requires information about the water needs of the crop as well as the water holding characteristics of the soil. Excessive irrigation can leach crop nutrients from the root zone while soil moisture deficit can result in crop stress. This publication will briefly present estimates of tomato plant water requirements under drip irrigated conditions for crops produced in the southwest Florida region.

Reference evapotranspiration (Eto) refers to the expected water use from a uniform green cover crop surface such as a grass. Actual crop use is generally less and is determined by using a crop coefficient relating crop ET (ETc) to ETo. Reported values of ETo are generally expressed as inches of water use over the surface. This choice of units is appropriate for use with sprinkler irrigation systems. However, volumetric units are more appropriate for drip systems. Actual crop ET depends on reference ET as well as crop development. Typical daily ETc values for the southwest Florida area during the fall and spring tomato production periods for several transplanting periods are provided in Table 1. Values are expressed as gallons per acre per day. Irrigation amounts should then be scheduled to meet the crop ET requirements within the constraints of the irrigation system.

Drip irrigation in Florida tomato production uses roughly 7200 feet of tube per production acre (6 ft bed spacing). Drip tubing water discharge is generally rated as flow per unit length, such as 0.5 gallons per minute (gpm) per 100 feet. Therefore, tubing water discharge per production acre would be about 36 gpm. This information is necessary for properly scheduling irrigations. Table 2 converts tubing flow in gpm per 100 feet to gallons per hour (gph) per 100 feet, gallons per minute per acre, and run time in minutes needed to apply 1000 gallons per acre at 100% efficiency. Actual irrigation time will be longer due to system inefficiencies, soil conditions, and crop cultural characteristics. However, Table 2 may be used with Table 1 to establish initial management guidelines. For example, the initial plant water requirements for plants set in August are estimated at 1000 gallons per acre per day. This requires 28 minutes of run time for a tube that discharges 0.5 gpm/100 ft and that applies water @ 100% efficiency. However, some commercial systems may require 35 to 45 minutes of

1. This is document SL-213, a publication of the Soil and Water Science Department, Florida Cooperative Extension Service, IFAS, University of Florida. Published February 2004. Please visit the EDIS Website at http://edis.ifas.ufl.edu
2. C.D. Stanley, professor, Soil and Water Science Department, Gulf Coast Research and Education Center, Florida Cooperative Extension Service, University of Florida, Gainesville, FL; G.A. Clark, professor, Biology and Agricultural Engineering, Kansas State University, Manhattan, Kansas.

run time to move the applied water from the water source, through the pipe network, and from the dripper into the root zone of the crop.

Soil properties should also be known and monitored for an effective irrigation management program. The volume of readily available water to the crop depends on the soil water holding properties and the crop root zone. Water should be applied when no more than half of the available water has been depleted. For a well-developed, drip-irrigated tomato crop, the root zone may extend 8 to 10 inches from the drip tube. The amount of water that would be available to the crop between field capacity and 50% depletion may range from 1000 gallons per acre for very coarse sand, to 2000 gallons per acre on medium to fine textured sands, to in excess of 3000 gallons per acre on some of the heavier, finer textured soils. Therefore, some sandy soils with low water holding capacities will require frequent irrigations (such as daily) with relatively short durations during low crop ET periods or even multiple cycles per day during high crop ET periods. However, soils with greater water holding capacities can be managed with less frequent irrigations and longer irrigation durations. The irrigation run time should be sufficient to re-wet the active root zone, apply needed chemicals (fertilizers), and meet the constraints of the irrigation system and scheduling program.

Proper water management in drip irrigated production systems requires knowledge of crop water requirements, soil water holding and water distribution properties, and close monitoring of the irrigation system, the crop, and atmospheric conditions. The information in this report is provided for use as initial guidelines for developing an effective and conservative water management program. Because actual field conditions and requirements vary, this information is intended for general management purposes only.

**Table 1.** Estimated crop ET values for drip irrigated tomato plants in the southwest Florida area expressed in gallons per acre per day at five periods of time based on Days After Transplanting (D.A.T.) for transplants set at different periods. (This table assumes 6 foot bed centers or 7260 linear bed feet per acre.)

| D.A.T. | Month of Transplanting | | | | | |
|---|---|---|---|---|---|---|
| | Aug | Sept | Oct | Jan | Feb | Mar |
| | gallons per acre per day | | | | | |
| 0-20 | 1000 | 1000 | 1000 | 600 | 800 | 900 |
| 20-40 | 2400 | 2200 | 2000 | 1800 | 2000 | 2200 |
| 40-60 | 3600 | 3200 | 2200 | 3200 | 3800 | 4000 |
| 60-80 | 3200 | 2700 | 2000 | 4000 | 4600 | 4600 |
| 80-100 | 2100 | 1800 | 1800 | 3600 | 4000 | 4000 |

**Table 2.** Comparison of tubing flow rates to irrigation discharge per acre and run time needed to apply 1000 gallons per acre at 100% efficiency. (This table assumes 6 foot bed centers of 7260 linear feet per acre.)

| Tubing Flow Rate | | Irrigation | Time to Apply |
|---|---|---|---|
| (gpm per 100 feet) | (gph per 100 feet) | (gpm per acre) | (minutes @ 100% eff.) |
| 0.2 | 12 | 14 | 71 |
| 0.3 | 18 | 22 | 45 |
| 0.4 | 24 | 29 | 34 |
| 0.5 | 30 | 36 | 28 |
| 0.6 | 36 | 43 | 23 |