UNIVERSITY OF FLORIDA
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# Using Reference Evapotranspiration Data[1]

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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 which relates 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 may be more appropriate for subirrigation (seep) or microirrigation (drip or spray jet) systems.

Conversion of ETo values presented in depth units (such as inches) to volumetric units (gallons) can help the irrigation manager with scheduling irrigations. An acre-inch of water equals a volume of 27154 gallons. For example an ETo value of 0.12 inches per day is roughly equal to 3260 gallons per acre [(0.12)(27154)]. Average daily ETo estimates for three Florida regions are provided in Table 1. The northern region extends from Ocala north through the panhandle, the central region extends from Ocala south to Ft. Pierce on the east coast and Sarasota on the Gulf coast, and the southern region contains the remaining southern portion of Florida. Values are expressed as inches per day and as gallons per acre per day.

Microirrigation systems apply water in gallons per hour per unit length of tube, per drip emitter, or per spray jet emitter. Therefore, irrigation zones should be assessed for size (such as acres, rolls of plastic, number of trees, etc.) and flow requirements. Conversions which change the production area to hundred bed-feet per acre (HBFAC) would have units compatible with the application rates of drip tubes (gals per min per 100 ft or gpm/100 ft). An acre has 43560 $ft^2$ of area. Therefore, divide the bed spacing (ft) into 43560 to get the number of linear bed feet per acre (LBFAC) and then divide that value by 100 to get the equivalent HBFAC value. For example, a crop with a bed spacing of 6 ft has an associated LBFAC value of [(43560)/(6)=] 7260 and a HBFAC value of 72.6. For crop requirements divide the HBFAC value into the volume of water required per acre. An ETo value of 3260 gal/ac would require water amounts of [(3260)/(72.6)=] 45 gallons per 100 ft. A drip tube with a delivery rate of 0.5 gpm/100 ft would take 90 minutes to apply 45 gallons per 100 ft (@100% efficiency). Similarly, if a citrus grove has 120 trees per acre, a water requirement of 3260 gallons per acre is equivalent to [(3260)/(120)=] 27 gallons per tree. Therefore, if each tree had a 15 gph spray jet, 1.8 hours of run time would be required to apply the 27 gallons (@100% efficiency).

Crop coefficients and irrigation system efficiency should be considered when determining the total irrigation requirement for the crop. Each of the above examples were based on 100% application efficiency, thus additional time and water will need to be scheduled for the actual conditions in individual

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fields. Finally, irrigation run time will depend on other system requirements such as minimum run time to fill pipes, chemigation needs, or opportunity time for water to move from the emitters into the crops root zone.

Summary of Conversions

* 1 Acre-inch = 27154 gals/ac
* 1 Acre = 43560 $ft^2$
* LBFAC = 43560/bed spacing
* HBFAC = LBFAC/100
* Water required per 100 bed feet
  = [gals/ac]/[HBFAC]
* Water required per tree
  = [gals/ac]/[#trees per acre]

**Table 1.** Estimated average daily reference ET data for Florida[1].

| MONTH | NORTH FLORIDA | | CENTRAL FLORIDA | | SOUTH FLORIDA | |
|---|---|---|---|---|---|---|
| | (inches) | (gal/ac/day) | (inches/day) | (gal/ac/day) | (inches/day) | (gal/ac/day) |
| JAN | 0.06 | 1630 | 0.09 | 2440 | 0.10 | 2720 |
| FEB | 0.09 | 2440 | 0.12 | 3260 | 0.13 | 3530 |
| MAR | 0.12 | 3260 | 0.15 | 4070 | 0.16 | 4340 |
| APR | 0.16 | 4340 | 0.19 | 5160 | 0.19 | 5160 |
| MAY | 0.19 | 5160 | 0.20 | 5430 | 0.19 | 5160 |
| JUN | 0.19 | 5160 | 0.20 | 5430 | 0.18 | 4890 |
| JUL | 0.18 | 4890 | 0.19 | 5160 | 0.18 | 4890 |
| AUG | 0.17 | 4620 | 0.17 | 4620 | 0.17 | 4620 |
| SEP | 0.15 | 4070 | 0.16 | 4340 | 0.15 | 4070 |
| OCT | 0.12 | 3260 | 0.14 | 3800 | 0.14 | 3800 |
| NOV | 0.08 | 2170 | 0.11 | 2990 | 0.12 | 3260 |
| DEC | 0.06 | 1630 | 0.08 | 2170 | 0.10 | 2720 |

[1]Data source includes University of Florida, Cooperative Extension Service Bulletin 205 "Potential Evapotranspiration Probabilities and Distributions in Florida".