Water Use in Plasticulture

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Most vegetable crops need an average of 1 inch of water per acre per week throughout the growing season. They may need one-half inch/week during the early season, one inch during bloom, and as much as 1.5 inches during harvest. Some crops need more, tomatoes being one of the largest consumers of water.

There are 27,154 gallons of water in an acre-inch; dividing that amount by 7 days, you find that most crops need 3,879 gallons per day**.** Calculate the amount of water your system delivers and the length of time needed to apply 1 inch per acre per week. First, based on row spacing, determine the number of feet of tubing per acre (Table 1). Most plasticulture fields typically have 5-ft row spacing.

Table 1. Feet of tubing per acre based on plant row spacing

Row Spacing (ft)	Tubing (ft/acre)
4	10,890
5	8,712
6	7,260
8	5,445
12	3,630

Next, calculate the amount of water being delivered to the crop. All drip tapes indicate how much water is discharged (flow rate). The flow rate is listed either as the amount per emitter per hour or the amount per minute per 100 feet of tape.

A typical rate is 0.25 gallon per hour per emitter. Use the following formula to calculate how much water your system delivers per hour:

tubing flow rate (gal./hr/emitter) × [12 in./ft ÷ *emitter spacing* (in.)] × *amount of tubing* (ft/acre)
= *field flow rate* (gal./hr/acre)

For a 1-acre crop with 5-ft row spacing, a tubing flow rate listed as 0.25 gallon per hour per emitter and a 12-inch emitter spacing, the calculation is as follows:

0.25 × 1 × 8,712 = 2,178 gal./hr/acre.

Water needed in one day = 3,879 gal./day/acre
System flow rate = 2,178 gal./hr/acre

3,879 ÷ 2,178 = 1.78 hr/day for irrigation/fertigation is needed to achieve 1 inch/acre/week, if run daily. This flow rate is considered low flow and is the normal tape used in most fields.

Some farmers use high-flow tapes if soils are very sandy or if row lengths are unusually short. When picking your irrigation tape and flow rate, remember to check for maximum row length as determined by the flow rate. The higher flow tapes have shorter maximum row lengths.

A typical *high*-flow-rate tape puts out 0.4 gallon per emitter per hour; therefore, if emitter spacing stays at 12 in., then 0.4 × 1 × 8712 = 3485 gal./hr.

Another typical flow rate is 0.5 gal./min/100 ft of tape.

Tubing flow rate (gal./min/100 ft of tape) × 60 min × *number of 100-ft sections* in your acre = *field flow rate (gal./hr/acre)*: 0.5 × 60 × 87.12 = 2614 gal./hr/acre

3,879 divided by 2614 = 1.48 hr/day

On sandy soils, applying all the needed water at once is likely to move nutrients out of the crop's feeding root zone. The water also tends to move straight down through the soil profile and does not do as good a job moving laterally and, therefore, wetting the entire rooting zone under the plastic (resulting in dry shoulders). To overcome this problem, apply water/fertigation in several cycles throughout the day in keeping with the general soil type. Sandy soils may need to be irrigated more frequently in short durations; heavy clay soils will tolerate longer durations and, therefore, can be watered less frequently.

Always talk with your irrigation supplier and/or a knowledgeable person before ordering irrigation supplies.

It is a good idea to have your source water tested annually before use by the NCDA&CS Agronomic Division. This test, known as solution analysis, costs $5 per sample.