

drought tips

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Irrigation Water Management Made Simple

Effective water management requires knowing the relationships between flow rate into the field, acres irrigated, irrigation times, and the amount of applied water. The following equation can be used to provide this information:

$$Q \times T = 449 \times A \times D$$

where:

Q = flow rate of water being applied to the field in gallons per minute;

T = actual hours used to irrigate the field;

A = acres irrigated;

D = the gross depth to be applied, which includes soil moisture replenishment plus deep percolation and surface runoff (surface irrigation only).

The following questions can be answered using this equation:

How many inches of water are applied during an irrigation?

$$D = \frac{Q \times T}{449 \times A}$$

Example 1:

How many inches are applied to 40 acres where the pump flow rate is 300 gpm and irrigation time is 22 hours per day for 10 days?

$$\begin{aligned} Q &= 300 \text{ gpm;} \\ A &= 40 \text{ acres;} \\ T &= 22 \text{ hours per day} \times 10 \text{ days} \\ &= 220 \text{ hours.} \end{aligned}$$

$$\begin{aligned} D &= \frac{300 \text{ gpm} \times 220 \text{ hour}}{449 \times 40 \text{ acres}} \\ &= 3.7 \text{ inches} \end{aligned}$$

What flow rate is needed to irrigate the field?

$$Q = \frac{449 \times A \times D}{T}$$

Example 2:

What flow rate is needed to apply 3 inches of water over 100 acres with a total irrigation time of 180 hours?

$$\begin{aligned} Q &= \frac{449 \times 100 \text{ acres} \times 3 \text{ inches}}{180 \text{ hours}} \\ &= 748 \text{ gallons per minute} \end{aligned}$$

How many acres can I irrigate with my water supply?

$$A = \frac{Q \times T}{449 \times D}$$

Example 3:

How many acres can I irrigate with a flow rate of 200 gpm?

The desired depth to be applied is 3 inches per set, each set is 12 hours long, and the number of sets is 10.

$$\begin{aligned} T &= 12 \text{ hours per set} \times 10 \text{ sets} \\ &= 120 \text{ hours} \end{aligned}$$

$$A = \frac{200 \text{ gpm} \times 120 \text{ hours}}{449 \times 3 \text{ inches}}$$

$$= 17.8 \text{ acres, or } 18 \text{ acres}$$

How long should I irrigate?

$$T = \frac{449 \times A \times D}{Q}$$

Example 4:

How long should I operate my irrigation system to apply 4 inches over 80 acres? The flow rate into the field is 600 gpm.

$$\begin{aligned} T &= \frac{449 \times 80 \text{ acres} \times 4 \text{ inches}}{600 \text{ gpm}} \\ &= 239 \text{ hours of operation} \end{aligned}$$

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