

Vineyard Irrigation Scheduling Part 1: Evapotranspiration

A vineyard Lubbock, Texas is divided into 4 irrigation blocks. Each block has 10 rows of vines with 200 vines per block being irrigated with two, 1 GPH emitters per vine. Each row of vines is approximately 120 feet long with a 6 feet row spacing.

1. What is the average monthly ETo in July for Lubbock, Texas?

$$7.63 \text{ inches}$$

2. If the wine grapes have a crop coefficient of 0.8, what is the monthly water requirement in July (in inches) assuming no rainfall?

$$\begin{aligned} WR &= ETo \times Kc \\ &= 7.63 \text{ in} \times 0.8 \\ &= 6.1 \text{ inches} \end{aligned}$$

3. What is the daily water requirement (in inches)?

$$\begin{aligned} \text{July} &= 31 \text{ days} \\ \frac{6.1 \text{ in/month}}{31 \text{ day/month}} &= 0.2 \text{ in/day} \end{aligned}$$

4. What is the weekly water requirement (in inches)?

$$\begin{aligned} 7 \text{ day} &= 1 \text{ week} \\ 0.2 \text{ in/day} \times 7 \frac{\text{day}}{\text{week}} &= 1.4 \text{ in/week} \end{aligned}$$

Key

Vineyard Irrigation Scheduling Part 2: Precipitation Rate

A vineyard is divided into 4 irrigation blocks.

- Each block has 10 rows of vines, with 20 vines per row.
- Each row is 120 feet long, with 6 feet spacing between rows.
- The drip irrigation system is installed with two emitters per vine.
- The flow rate of the emitters is 1 GPH.

1. What is the flow rate of each irrigation block in gallons per minute?

$$\frac{2 \text{ emitters}}{\text{vine}} \times 1 \text{ GPH} = \frac{2 \text{ GPH}}{\text{vine}} \times \frac{20 \text{ vines}}{\text{row}} = \frac{40 \text{ GPH}}{\text{row}} \times \frac{10 \text{ row}}{\text{block}} = \frac{400 \text{ GPH}}{\text{block}}$$

$$\frac{400 \text{ GPH}}{60 \frac{\text{min}}{\text{hr}}} = \underline{6.67 \text{ GPM}}$$

2. What is the area of each irrigated block in square feet?

$$\frac{120 \text{ ft long}}{\text{row}} \times \frac{6 \text{ ft wide}}{\text{row}} = \frac{720 \text{ ft}^2}{\text{row}} \times \frac{10 \text{ row}}{\text{block}} = \boxed{\frac{7200 \text{ ft}^2}{\text{block}}}$$

3. What is the precipitation rate of each block in inches per hour?

$$\text{PR} = \frac{96.25 \times \text{GPM}}{\text{Area}}$$

$$\text{PR} = \frac{96.25 \times 6.67 \text{ GPM}}{7200 \text{ ft}^2} = \underline{0.09 \text{ in/hr}}$$

4. If the grapes have a weekly water requirement of 1.40 inches, how many minutes per week of irrigation are needed in July?

$$\text{RT} = \frac{\text{WR}}{\text{PR}} = \frac{1.4 \text{ in}}{0.09 \text{ in/hr}} = \frac{15.56 \text{ hr}}{\text{week}} \times \frac{60 \text{ min}}{1 \text{ hr}} = \underline{934 \text{ minutes}}$$