

Using the Fundamental Relationship to Calibrate Multi-Row Sprayers

Lynn R. Wunderlich

UC Cooperative Extension Farm Advisor-Central Sierra

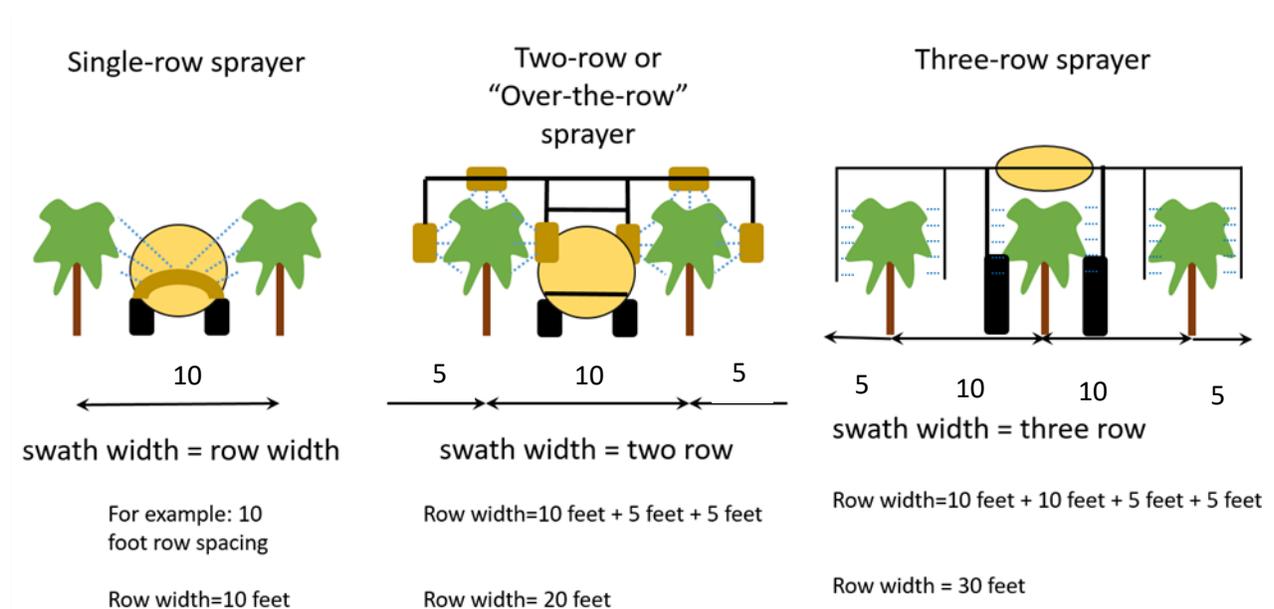
lrwunderlich@ucanr.edu

The Fundamental Relationship for Calibration:

$$\text{Spray Volume} \left(\frac{\text{gallons}}{\text{acre}} \right) = \frac{\text{Flow rate (gal/min)}}{\text{Land rate (ac/min)}}$$

1. Determine row spacing

In this example, our row spacing is 10 feet.



2. Use the row spacing as determined in 1.) above and measured ground speed to determine land area rate.

For this example,

Our sprayer travel speed is 193.6 feet/minute (2.2 MPH)

The row width is 10 feet and we are using a two row sprayer, so the swath-row width for calibration = 20 feet.

A. Multiply the speed in (feet/minute) by the row width in (feet)

$$\text{Speed} \left(\frac{193.6 \text{ feet}}{\text{minute}} \right) \times \text{Row width (20 feet)} = \text{Area covered} \frac{3,872 \text{ feet}^2}{\text{minute}}$$

B. Convert area in $\frac{\text{feet}^2}{\text{minute}}$ to acres per minute $\left(\frac{\text{acres}}{\text{minute}} \right)$

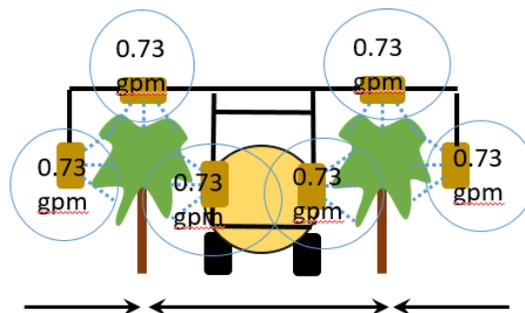
$$\frac{3,872 \text{ feet}^2}{\text{minute}} \times \frac{1 \text{ acre}}{43,560 \text{ feet}^2} = \frac{.089 \text{ acres}}{\text{minute}}$$

3. Use the flow rate that correlates to the row width used. If we use 20 feet in this example, we would use the entire sprayer nozzle flow rate.

For example, in this over the row sprayer, there are 6 banks of nozzles-3 on each side of the sprayer.

Each bank of nozzles produces a flow rate of 0.73 gallons per minute.

The entire sprayer flow rate (all nozzles)=0.73*6= 4.38 gpm



Row width=10 feet + 5 feet + 5 feet

Row width= 20 feet

4. To calculate GPA:

For the entire sprayer

$$\text{Spray Volume} \left(\frac{\text{gallons}}{\text{acre}} \right) = \frac{\text{Flow rate (gal/min)}}{\text{Land rate (ac/min)}} = \frac{4.38 \text{ (gal/min)}}{.089 \text{ (ac/min)}} = 49 \text{ gallons/acre}$$

Notice that you will come to the same GPA, if you use half of the row width and the correlating half of the nozzle flow rate. Always use the nozzle flow rate that covers the swath (row width) you are using.

So, in this example,

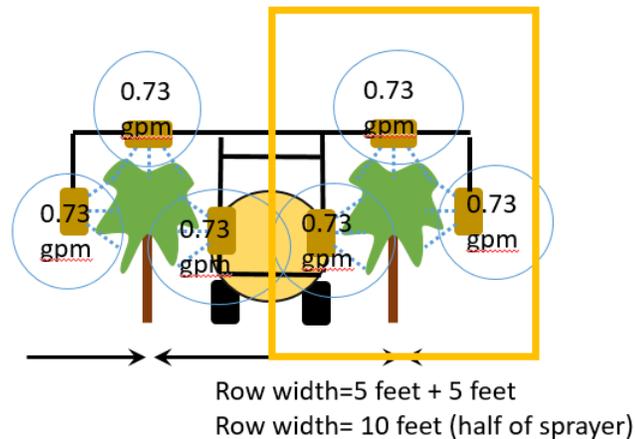
If row width = 10 feet, and speed remains the same, Land rate:

A. Multiply the speed in (feet/minute) by the row width in (feet)

$$\text{Speed} \left(\frac{193.6 \text{ feet}}{\text{minute}} \right) \times \text{Row width (10 feet)} = \text{Area covered} \frac{1936 \text{ feet}^2}{\text{minute}}$$

B. Convert area in $\frac{\text{feet}^2}{\text{minute}}$ to acres per minute $\left(\frac{\text{acres}}{\text{minute}} \right)$

$$\frac{1936 \text{ feet}^2}{\text{minute}} \times \frac{1 \text{ acre}}{43,560 \text{ feet}^2} = \frac{.045 \text{ acres}}{\text{minute}}$$



And flow rate for the nozzles covering half of the sprayer=0.73 + 0.73 + 0.73 = 2.19 gallons/minute

$$\text{Spray Volume} \left(\frac{\text{gallons}}{\text{acre}} \right) = \frac{\text{Flow rate (gal/min)}}{\text{Land rate (ac/min)}} = \frac{2.19 \text{ (gal/min)}}{.045 \text{ (ac/min)}} = 49 \text{ gallons/acre}$$