Effective application of pesticides depends on many factors. One of the more important is to correctly calculate the amount of material needed. Unless you have the right amount of pesticide in your tank mix, even a correctly calibrated sprayer can apply the wrong rate.

Manufacturers provide application rate instructions on every pesticide label. Due to the variety of ways in which these recommendations are stated (such as pounds of active ingredient [a.i.] per acre, pounds of formulation per 100 gallons of spray, or ounces of a.i. per 1,000 square feet), it is often necessary to adapt the recommendations to different areas and volumes, or even other units. Sometimes the amount of active ingredient must be converted to the amount of actual product. This process can be very confusing.

### Conversion Factors

To use this conversion table, multiply the number in the left-hand column by the conversion factor in the center column. This converts your original number to the units in the right-hand column.

#### Examples:

1. 1.0 gallon equals how many ounces?
   - 1.0 gallon x 128 = 128 fluid ounces
2. 2.5 gallons equals how many ounces?
   - 2.5 gallons x 128 = 320 fluid ounces

<table>
<thead>
<tr>
<th>Multiply</th>
<th>By</th>
<th>To get</th>
<th>Multiply</th>
<th>By</th>
<th>To get</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres</td>
<td>43,560</td>
<td>Square feet</td>
<td>Gallons</td>
<td>128</td>
<td>Ounces (liquid)</td>
</tr>
<tr>
<td>Acres</td>
<td>4,840</td>
<td>Square yards</td>
<td>Gallons</td>
<td>8</td>
<td>Pints (liquid)</td>
</tr>
<tr>
<td>Acres</td>
<td>0.405</td>
<td>Hectares</td>
<td>Gallons</td>
<td>4</td>
<td>Quarts (liquid)</td>
</tr>
<tr>
<td>Bushels</td>
<td>64</td>
<td>Pints</td>
<td>Gallons, H₂O</td>
<td>8.345</td>
<td>Pounds of water</td>
</tr>
<tr>
<td>Bushels</td>
<td>32</td>
<td>Quarts</td>
<td>Grams</td>
<td>0.001</td>
<td>Kilograms</td>
</tr>
<tr>
<td>Cubic feet</td>
<td>1,728</td>
<td>Cubic inches</td>
<td>Grams</td>
<td>1,000</td>
<td>Milligrams</td>
</tr>
<tr>
<td>Cubic feet</td>
<td>0.037</td>
<td>Cubic yards</td>
<td>Grams</td>
<td>0.035</td>
<td>Ounces</td>
</tr>
<tr>
<td>Cubic feet</td>
<td>7.481</td>
<td>Gallons</td>
<td>Grams per liter</td>
<td>1,000</td>
<td>Parts per million</td>
</tr>
<tr>
<td>Cubic feet</td>
<td>59.84</td>
<td>Pints (liquid)</td>
<td>Hectares</td>
<td>2.47</td>
<td>Acres</td>
</tr>
<tr>
<td>Cubic feet</td>
<td>29.92</td>
<td>Quarts (liquid)</td>
<td>Inches</td>
<td>2.54</td>
<td>Centimeters</td>
</tr>
<tr>
<td>Cups</td>
<td>8</td>
<td>Ounces (liquid)</td>
<td>Kilograms</td>
<td>1,000</td>
<td>Grams</td>
</tr>
<tr>
<td>Cups</td>
<td>16</td>
<td>Tablespoons</td>
<td>Kilograms</td>
<td>2.205</td>
<td>Pounds</td>
</tr>
<tr>
<td>Feet</td>
<td>30.48</td>
<td>Centimeters</td>
<td>Kilometers</td>
<td>3,281</td>
<td>Feet</td>
</tr>
<tr>
<td>Feet</td>
<td>12</td>
<td>Inches</td>
<td>Kilometers</td>
<td>0.621</td>
<td>Miles</td>
</tr>
<tr>
<td>Feet</td>
<td>0.305</td>
<td>Meters</td>
<td>Liters</td>
<td>0.264</td>
<td>Gallons</td>
</tr>
<tr>
<td>Feet</td>
<td>1/3 or 0.333</td>
<td>Yards</td>
<td>Liters</td>
<td>2.113</td>
<td>Pints (liquid)</td>
</tr>
<tr>
<td>Gallons</td>
<td>3.785</td>
<td>Liters</td>
<td>Liters</td>
<td>1.057</td>
<td>Quarts (liquid)</td>
</tr>
</tbody>
</table>
Formulations such as wettable and soluble powders, emulsifiable concentrates, and flowables are sold as concentrates and must be diluted in the spray tank with an appropriate carrier. Water is the most common carrier, but kerosene, oil, and other liquids are sometimes used. Below are examples of how to properly calculate how much pesticide should be added to a spray tank.

### Mixing Soluble and Wettable Powders

**Pounds per 100 gallons**: Directions for wettable or soluble powders may be given in pounds of pesticide formulation per 100 gallons of carrier. You must know the capacity in gallons of your spray tank (or the number of gallons you will be adding to your spray tank if the job requires only a partial tank load). Then use the following formula:

\[
\text{Gallons in tank} \times \text{pounds per 100 gallons recommended} \quad \frac{\text{100 gallons}}{} = \text{pounds needed in tank}
\]

**Example:**

Your spray tank holds 500 gallons. The label calls for 2 pounds of formulation per 100 gallons of water. How many pounds of formulation should you add to the tank?

\[
500 \text{ gallons} \times \frac{2 \text{ pounds}}{100 \text{ gallons}} = 10 \text{ pounds}
\]

You should add 10 pounds to the tank.

**Example:**

You need to spray only 1 acre, and your equipment is calibrated to spray 60 gallons per acre. The label calls for 2 pounds of formulation per 100 gallons of water. How many pounds of formulation should you add to the tank to make 60 gallons of finished spray?

\[
\text{Gallons in tank (60) } \times \frac{2 \text{ pounds}}{100 \text{ gallons}} (2) = \frac{\text{pounds needed in tank (1.2, or 19.2 ounces)}}{100 \text{ gallons}} \quad 60 \times 2 \div 100 = 1.2
\]

Number of pounds to add is 1.2, or 19.2 ounces.

**Pounds per acre**: The label may list the recommended dosage as pounds per acre. If the job requires a full tank, you must know how many gallons your equipment applies per acre and spray tank capacity. Use these formulas:

**Example:**

Your spray tank holds 500 gallons. The label calls for 2 pounds of formulation per 100 gallons of water. How many pounds of formulation should you add to the tank to make 60 gallons of finished spray?

\[
500 \text{ gallons} \times \frac{2 \text{ pounds}}{100 \text{ gallons}} = 10 \text{ pounds}
\]

You should add 10 pounds to the tank.
400 ÷ 15 = 26.7

Acres sprayed per tank X pounds formulation per acre = pounds of formulation needed in tank

**Example:**
Your sprayer applies 15 gallons per acre and your tank holds 400 gallons. The label rate is 3 pounds of formulation per acre.

Gallons in tank (400) \( \div \) gallons per acre (15) = acres sprayed per tankful (26.7)

26.7 \( \times \) 3 = 80.1

Add 80 pounds of pesticide formulation to the tank.

If the job requires less than a full tank, you must know how many acres you wish to treat and how many gallons your sprayer is pumping per acre. You must figure both the number of gallons needed in the tank and the pounds of formulation to add. Use these formulas:

\[
\text{Gallons per acre} \times \frac{\text{acres to be treated}}{\text{acres sprayed per tankful}} = \text{gallons needed in tank}
\]

\[
\frac{\text{Acres to be treated} \times \text{pounds formulation per acre}}{\text{acres sprayed per tankful}} = \text{pounds of formulation needed in tank}
\]

**Example:**
You wish to spray 3.5 acres, and your equipment is applying 15 gallons per acre. The label rate is 3 pounds per acre.

Gallons per acre (15) \( \times \) acres to be treated (3.5) = gallons needed in tank (52.5)

3.5 \( \times \) 3 = 10.5

If the recommended dosage is given as pounds of active ingredient per acre, you must first convert that figure to pounds of formulation per acre. Use the following formula:

\[
\text{Pounds of a.i. needed per acre} = \frac{\text{pounds of a.i. per gallon of formulation}}{\text{percent of a.i. in formulation}} \times \frac{100}{100}
\]

**Example:**
You wish to apply 2 pounds of active ingredient per acre. Your formulation is 80% WP.

\[
2 \times 100 \div 80 = 2.5
\]
**Square Feet vs. Acre Mixing**

The label rate is sometimes given in pounds, pints, quarts, or gallons per 1,000 square feet. If you have calibrated your equipment in terms of 1,000 square feet, you must adjust the formulas above from an acre to 1,000 square feet. The following formulas may be used with either liquid or dry formulations:

\[
\text{Gallons per tank} = \frac{\text{gallons applied per 1,000 square feet by equipment}}{\text{number of 1,000-square-foot sections per tankful}}
\]

Number of 1,000-square-foot sections sprayed per tankful \times \text{pints, quarts, gallons, or pounds of formulation needed per 1,000 square feet} = \text{amount of formulation to add to tank.}

However, if you have calculated the target area in acres, you must convert the 1,000-square-foot rate to a rate per acre as follows:

\[
\frac{43,560 \text{ square feet per acre}}{1,000 \text{ square feet}} = 43.5
\]

Pints, quarts, gallons, or pounds per 1,000 square feet \times 43.5 = pints, quarts, gallons, or pounds of formulation to apply per acre.

To convert from the rate per acre to a rate per 1,000 square feet (or 100 square feet):

\[
\frac{\text{Pints, quarts, gallons, or pounds of formulation recommended per acre}}{43.5 (435 for 100 square feet)} = \text{pints, quarts, gallons, or pounds of formulation per 1,000 square feet (or 100 square feet)}
\]

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From Penn State *Pesticide Education Manual*, third edition

The section on conversion tables was adapted from the *Pocket Pesticide Calibration Guide*, compiled by Frank Boys and Frank Murphey, University of Delaware.

The section on pesticide calculations was adapted from *Applying Pesticides Correctly: A Guide for Private and Commercial Applicators*, North Carolina State University.