

## Hops

### Crop Highlights

- Target pH: 6.2
- Little data is available on hops production in this region. Recommendations are based on guidelines from nearby states where research is being conducted.
- Apply 75 lb/ac nitrogen (N) during establishment, with equal applications at one, three, and six weeks after planting.
- Apply 100 to 170 lb/ac of total N in subsequent seasons. Split applications to increase N use efficiency on sandy soils.
- Do not apply N after flowering.
- Boron (B) deficiency has been identified on hops grown in the Mid-Atlantic region. Apply 1.0 to 1.5 lb/ac elemental B when Mehlich 3 soil test B <3.0 lb/ac.

### Yield Goal

Yield of hops is influenced by many factors, including the variety selected, planting date, weather, soil type and water-holding capacity, nutrient and water availability, pest and disease pressure, and crop management practices. **Yield data is not available for hops grown on Delaware soils. Based on data from nearby states with similar soils and climates, a dry yield of 1,000 to 1,250 lb/ac is a realistic yield goal for an established hops yard in a good to average year** (assuming 8% moisture and a planting density of 1,000 plants per acre). Yields in the first year or two of production will be lower.

Delaware growers should use field history to determine the yield goal for each field and use that information to adjust management decisions and fertility programs accordingly. Delaware nutrient management law requires the use of optimal rolling average for determining the yield goal for a specific field when field history is available. To calculate the optimal rolling average yield, see University of Delaware Extension Fact Sheet [Estimating Yield Goal for Crops](#).

### Soil pH and Liming

#### Target pH: 6.2 for most soils

Soils that are high in organic matter (e.g., "black" soils; soil organic matter >6.0%) have a lower target pH (5.6) because organic matter moderates some of the negative effects of excessive soil acidity (e.g., aluminum toxicity).

The lime recommendation for a specific field is calculated from the soil pH and Adam-Evans buffer pH measurements using the steps outlined in University of Delaware Extension Fact Sheet [Calculating the Lime Requirement Using the Adams-Evans Soil Buffer](#). Avoid over-liming to prevent deficiency of micronutrients such as manganese (Mn).

The recommended liming source is dependent upon Mehlich-3 (M3) soil test calcium (Ca) and magnesium (Mg) reported in University of Delaware fertility index value (FIV) and can be determined using Table 1.

**Table 1. Recommended type of lime as a function of Mehlich-3 soil test calcium and magnesium concentrations.**

Soil Test Levels	Recommended Lime Type
M3-Mg is less than 50 FIV	Dolomitic
M3-Mg between 50 and 100 FIV AND M3-Mg is less than M3-Ca	Dolomitic
M3-Mg greater than 100 FIV	Calcitic
M3-Mg is greater than 50 FIV AND M3-Mg is greater than M3-Ca	Calcitic

## Nitrogen

The University of Delaware recommends a nitrogen (N) application of 75 lb/ac to hops in the planting year. Split applications of N are recommended to increase N use efficiency, with equal applications of N at one-, three-, and six-weeks after planting.

Nitrogen recommendations are higher for established hops. The University of Delaware recommends a total N application of 100 to 150 lb/ac to hops in the second cropping year. After the second year, apply 150 to 180 lb/ac of total N. Split applications are recommended to improve N use efficiency. Apply 25% of the total N requirement to the crop during the first week of April, the fourth week of April, the third week of May, and the second week of June.

Do not apply N after flowering starts to avoid excessive vegetative growth.

## Phosphorus

**Table 2. Broadcast phosphorus application rates for hops.**

	M3-P (FIV)										
	0	10	20	30	40	50	60	70	80	90	100
lb P <sub>2</sub> O <sub>5</sub> /ac	150	110	90	70	50	30	30	20	25	10	0

1. If M3 soil test P (M3-P) is recommended (Table 2), broadcast and incorporate the recommended rate of phosphate prior to planting.
2. If M3 soil test P is "Excessive" (e.g., greater than 100 FIV), the application of P fertilizers or manures is NOT RECOMMENDED.
3. If P fertilizers are banded, reduce the rates in Table 2 by one-half.

## Potassium

**Table 3. Recommended potassium application rates for hops.**

	M3-K (FIV)										
	0	10	20	30	40	50	60	70	80	90	100
lb K <sub>2</sub> O/ac	170	140	110	90	70	50	40	30	20	10	0

1. Broadcast and incorporate or band potash prior to planting.
2. For banded applications, reduce the rates in Table 3 by one-half.
3. To avoid salt injury to seedlings, do not band more than 75 lb K<sub>2</sub>O/ac at planting. When N and K<sub>2</sub>O are banded together, the sum of the N rate and the K<sub>2</sub>O rate should not exceed 75 lb/ac.

## Magnesium

**Table 4. Recommended application rates of soluble magnesium as a function of Mehlich-3 soil test magnesium.**

Soluble Mg	M3-Mg (FIV)								
	0	5	10	15	20	25	30	35	40
lb soluble Mg/ac	80	70	60	50	40	30	20	10	0

1. Magnesium (Mg) is recommended when M3 soil test Mg is less than 40 FIV.
2. If M3 soil test Mg is less than 40 FIV and lime is recommended, use dolomitic limestone.
3. If M3 soil test Mg is less than 40 FIV and lime is not needed, apply soluble Mg according to the rates in Table 4.

## Sulfur

Sulfur (S) deficiency is occasionally observed in hops grown on sandy soils in this region. The use of ammonium sulfate as the N source or the addition of a small amount of ammonium sulfate to liquid UAN can prevent S deficiency from occurring.

## Boron

Boron (B) deficiency has been observed in this crop when grown in nearby states. If B deficiency symptoms appear or M3 soil test B is <3.0 lb/ac, apply 1.0 lb/ac of elemental B to prevent B deficiency. Do not apply B at rates exceeding 1.5 lb/ac, as toxicity may occur.