

Oats

Management Highlights

- Target pH: 6.0
- Split N applications to increase N-use efficiency in oats. Apply a small amount at planting or in late winter and the bulk of the N requirement (50-75%) when growth resumes in spring.
- Monitor crop for Mn deficiency, especially when soil test Mn is 3.4 lbs/ac or less.

Yield Goals

Grain yields of oats are influenced by many factors, including the cultivar selected, planting date, weather conditions, soil type and water-holding capacity, nutrient and water availability, weed, insect and disease pressure and crop management practices. In Delaware, oat production can be separated into two general categories -- winter oats and spring oats -- with two different yield goals as shown in Table 1.

Table 1. Oat yield goals as a function of cropping category.

Crop Category	Yield
	---- bu/ac ---
Winter oats	75 - 150
Spring oats	50 - 75

When field history supports the use of a different yield goal, growers should use that information to adjust management decisions and fertility programs accordingly.

Soil pH and Liming

The target pH for oats on most Delaware soils is 6.0. Soils that are high in organic matter ("black" soils) 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 buffer pH measurements using

the steps outlined in *Calculating the Lime Requirement -- Chapter 3, Section 3.4*. Avoid overliming in order to prevent deficiency of micronutrients such as manganese.

In most cases, the lime requirement can be met by either calcitic or dolomitic limestone.

Dolomitic limestone is recommended if:

- soil test Mg is less than 50 FIVs, or
- soil test Mg is between 50 and 100 FIVs *and less than soil test Ca*.

Calcitic limestone is recommended if:

- soil test Mg is greater than 100 FIVs, or
- soil test Mg is between 50 and 100 FIVs *and greater than soil test Ca*.

Nitrogen Management

Nitrogen (N) recommendations for oats are dependent upon the type of oats grown (winter or spring), the soil type of the field and the management practices used by the grower. A summary of N rates recommended by the University of Delaware are given below in Table 2.

Table 2. Recommended N rates for oats as a function of soil type.

Soil Type	N Rate	
	Winter Oats	Spring Oats
	---- lbs N / ac ---	
Loamy sands	70 - 90	60-80
Sandy loams, loams, black loamy sands, black sandy loams	60 - 80	50-70
Silt loams, black loams, black silt loams	50 - 80	40-60

Higher N rates are recommended for sandier soils and for management systems utilizing a single application in order to compensate for greater leach-

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ing losses. Split applications of N have been shown to increase N-use efficiency, thus requiring less total N to achieve the same grain yield. In general, increasing N rate may increase grain production but can also increase lodging, reducing *harvestable*, and thus *economic*, yield.

Winter Oats

When winter oats are being produced and a single application is planned, N should be top-dressed in early spring when growth resumes (e.g., "green-up"). When split applications will be utilized, apply a small portion of the total N requirement at planting (25%) or in late winter (50%). Apply the remaining N (50 - 75%) in early spring when growth resumes ("green-up").

When planting into fields where manure has been applied or a legume crop precedes oats, fertilizer N rates should be reduced. To calculate the adjustment, see *Nitrogen Rate Adjustments – Chapter 3, Section 3.5.1.2*.

Phosphorus Management

Yield-limiting phosphorus (P) deficiency is rarely a concern on Delaware soils. Long-term applications of fertilizers and manures have resulted in P accumulations in many soils that are capable of supplying crop needs for several years with no further additions.

To determine whether P fertilization is necessary for a specific field, conduct a routine soil test. University of Delaware P recommendations for oats are dependent upon the soil test P value. A summary of those P recommendations are given in Table 3 below. When the soil test P index is *Low* (25 FIVs or less), broadcast and incorporate P in the fall. When the soil test P index is *Medium or Optimum* (greater than 25 FIVs), P can be top-dressed in the spring or fall.

Table 3. Broadcast application rates of P for oats.

P Index Value						
0	10	20	30	40	50	60
----- lbs P ₂ O ₅ / ac -----						
140	120	100	80	60	40	0-20

Potassium Management

The need for potassium (K) fertilization of oats is best determined by the use of a routine soil test. Potassium recommendations are based on the the soil test K value and the K needs of the crop. A summary of University of Delaware K recommendations for oats is given in Table 4. Potassium can be broadcast prior to or shortly after planting.

Table 4. Broadcast application rates of K for oats.

K Index Value						
0	10	20	30	40	50	60
----- lbs K ₂ O/ac -----						
110	95	80	60	45	25	0

NOTE: When oats are being grown in double-crop rotation with soybeans or sorghum and additional K is needed for the subsequent crop, the combined K can be applied as a single application to the oat crop. This will reduce application costs and often allows the purchase of K fertilizer at a time when prices are near their yearly low.

Magnesium Management

Mg application to oats is recommended if the soil test Mg value is less than 38 FIVs. If liming is also recommended, use dolomitic limestone to raise soil pH and increase soil Mg. If, however, liming is not necessary but Mg fertilization is still indicated, apply Mg as Mg sulfate or Mg chloride to increase soil Mg. Application rates are summarized below in Table 5.

Table 4. Application rates for soluble Mg as a function of Mg fertility index value.

Mg Index Value								
0	5	10	15	20	25	30	35	40
----- lbs soluble Mg / ac -----								
80	70	60	50	40	30	20	10	0

Manganese Management

Manganese (Mn) deficiency may occur in oats grown on Delaware soils, most often as a result of overliming soils that are naturally low in Mn. The University of Delaware Soil Testing Program uses an availability index based on the soil test Mn value and soil pH to predict the likelihood of Mn deficiency. That availability index is calculated using the equation:

$$MnAI = 101.7 - (15.2 \times pH) + (2.11 \times ST-Mn)$$

where:

MnAI = Mn availability index
 pH = water pH of the soil
 ST-Mn = Mehlich 3 soil test Mn in lbs/ac.

Table 3-14 in *Chapter 3, Section 3.5.5.2 (Manganese Management)* gives a summary of MNAI values for various soil pH-soil test Mn combinations. Interpretations of the Mn availability index for oats are given below in Table 5.

Table 5. Interpretation of the Mn availability index for oats.

MnAI Value	Interpretation
Less than 17	Mn deficiency is likely at this soil pH and Mn concentration.
17 to 25	Mn deficiency is possible at this soil pH and Mn concentration. Monitor crop for deficiency symptoms if liming has been recommended.
Greater than 25	Mn deficiency is unlikely.

Suspected Mn deficiency can be confirmed by tissue analysis. Confirmed deficiency situations can be corrected in season by foliar applications of Mn of 1-2 lbs/ac of actual Mn as Mn sulfate, Mn oxide or Mn chelate.

If deficiency is predicted by the availability index or was observed during the previous growing season, it can be prevented by a broadcast application of 20-30 lbs/ac of actual Mn. Broadcast applications of acid-forming fertilizer, which lower soil pH in the area of plant roots, may help correct Mn deficiency without the addition of Mn fertilizer but are less effective than foliar or broadcast applications of Mn.

Other Nutrients

No other nutrients are known to be limiting to oat production in Delaware.

Additional Information

See Soil Test Notes 1, 2, 4 and 5 (Appendix APP-7) for additional information concerning nutrient management of oats.