

Grass-Alfalfa Mixtures

Management Highlights

- Target pH: **6.5**
- Monitor soil P and K levels. It is more economical to maintain soil fertility than to re-establish the stand.
- High levels of soil P and K will encourage legume growth in mixed grass and legume pastures.

Yield Goals

Forage yield of grass/alfalfa mixed fields is dependent upon many factors: the cultivars selected, seeding date, age of the stand and degree of establishment, stand composition, soil type and water-holding capacity, nutrient and water availability, weed, insect and disease pressure, crop and grazing management practices. *On Delaware soils, 3.0-3.5 tons/ac of hay is a realistic yield goal for grass-alfalfa mixed fields in a good to average year.* When field history data 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 grass/alfalfa fields on most Delaware soils is **6.5**. If the soil pH is **5.3 or lower**, the soil is too acidic for good growth of grass-alfalfa mixtures. Apply the recommended rate of lime and plow down before re-seeding the field. If the soil pH is **5.4 or higher**, lime can be topdressed.

The lime recommendation for a specific grass-alfalfa 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*. Use care to avoid overliming in order to prevent micronutrient deficiencies.

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

The nitrogen (N) requirement of grass/alfalfa fields is dependent upon stand composition. Alfalfa is a leguminous plant and capable of fixing sufficient N to meet some or all of the N needed by the crop. Stands containing high percentages of alfalfa require less N once established than those dominated by grass. Overapplication of N to stands high in alfalfa increases the competitiveness of the grass species and will result in loss of the alfalfa from the stand.

Table 1 gives a summary of recommended N rates for grass/alfalfa fields as a function of stand composition. Nitrogen should be applied after each cutting to encourage stand recovery and subsequent growth.

Table 2. Recommended N rates for grass/alfalfa fields.

| Stand Composition | N Rate |
|-------------------|----------------------|
| | ----- lbs / ac ----- |
| 0 - 25% alfalfa | 50/cutting |
| 25 - 50% alfalfa | 25/cutting |
| >50% alfalfa | 0/cutting |

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 many years with no further additions.

Adequate concentrations of soil test P are important to grass/alfalfa hay production and stand longevity. To determine whether P fertilization is necessary for a specific field, conduct a routine soil test. University of Delaware P recommendations for grass/alfalfa fields are dependent upon stand age and soil test P value. A summary of P recommendations for Delaware grass/alfalfa fields are given in Table 3.

Table 3. Phosphorus recommendations for grass/alfalfa fields.

| P Index Value | | | | | | |
|--|-----|----|----|----|----|----|
| 0 | 10 | 20 | 30 | 50 | 70 | 90 |
| ----- lbs P ₂ O ₅ / ac ----- | | | | | | |
| 120 | 104 | 88 | 74 | 50 | 17 | 0 |

If soil test P is Low (less than 25 FIVs), satisfactory growth of grass/alfalfa hay is unlikely. Few, if any, legumes will survive. Grass yield and longevity will be poor. *Do not attempt to correct the problem by topdressing P. Instead, broadcast the recommended rate of P, plow down and re-seed to obtain optimum yields.*

When soil test P is *Medium* or *Optimum* (greater than 25 FIVs), topdressing the recommended rate of P should be effective in meeting crop needs.

Potassium Management

Potassium (K) is very important to grass/alfalfa growth and stand longevity. The need for K fertilization is best determined by the use of a routine soil test. Recommended K rates are based on the soil test K index value. A summary of K rates for grass/alfalfa hay is given in Table 4.

Table 4. Potassium recommendations for grass/alfalfa fields.

| K Index Value | | | | | | |
|---------------------------------------|-----|-----|-----|-----|----|----|
| 0 | 10 | 20 | 30 | 50 | 70 | 90 |
| ----- lbs K ₂ O / ac ----- | | | | | | |
| 180 | 165 | 150 | 135 | 105 | 75 | 45 |

If the recommended K rate is **90 lbs K₂O/ac or less**, potash can be broadcast in a single application. When the recommended rate is **greater than 90 lbs K₂O/ac**, apply K in two applications: one in June after the first or second cuttings and one after the last cutting in August.

To decrease the potential for grass tetany, avoid K over-fertilization on hay fields that are predominantly grass species. Waiting until after the first cutting to apply K helps to reduce the potential danger.

Calcium and Magnesium Management

Calcium (Ca) and magnesium (Mg) needs of grass/alfalfa fields are usually met through routine liming. **Magnesium application is recommended if the soil test Mg value is less than 38 FIVs.** If liming has been recommended, use dolomitic limestone to raise soil pH and increase soil Mg. If, however, liming is not necessary but Mg is still indicated, apply Mg as Mg sulfate or Mg chloride to increase soil Mg. Appropriate application rates are given below in Table 5.

Table 5. 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 |

Boron Management

Hay fields containing legumes such as alfalfa should be fertilized with **0.5 to 1.0 lbs B/ac** each year. Boron can be topdressed in a blended, broad-

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cast fertilizer or applied as a foliar spray, generally in late May or June.

Caution: *Although B is required for maximum productivity of alfalfa, even slight over-application of B can be toxic to the crop. When applied as a foliar spray, be certain to apply the correct rate.*

Manganese Management

Manganese (Mn) deficiency may occur in grass/alfalfa fields 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 = 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 grass or grass/clover pastures are given below in Table 6.

Table 6. Interpretation of the Mn availability index for grass/alfalfa fields.

| MnAI Value | Interpretation |
|---------------|---|
| Less than 12 | Mn deficiency is likely at this soil pH and Mn concentration. |
| 12 or greater | 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 in the fertilizer band. Broadcast applications of acid-forming fertilizer, which lower soil pH in the area of plant roots, may correct Mn deficiency without the addition of Mn fertilizer but may be less effective than applications of Mn.

Other Nutrients

No other nutrients are known to be limiting to grass/alfalfa hay production in Delaware.

Additional Information

See Soil Test Notes 1, 3, and 4 (Appendix 7) for additional information concerning fertilization of grass/alfalfa hay.