White Clover Hay - Established Stand

Crop Highlights
• Use in conjunction with a forage grass such as Kentucky bluegrass • Ladino-type cultivars are the only useful white clovers for hay • Unless planted with a companion crop, yield will be low consisting of leaves and flowers • Inoculum is often not needed due to how widespread clover use has been but won't hurt • White clover stands will share N with companion grasses

Yield Goal

The target yield goal for this crop is 2.0 tons per acre per year. When field history supports a different yield goal for this crop, adjust nutrient rates accordingly.

Target pH: 6.5

Recommended Liming Source:

Table 1. Recommended type of lime as a function of soil test Ca and Mg concentrations.

Soil Test Levels	Recommended Lime Type
Soil Test Mg less than 50 FIVs	Dolomitic
Soil Test Mg between 50 and 100 FIVs AND LESS than Soil Test Ca	Dolomitic
Soil Test Mg greater than 100 FIVs	Calcitic
Soil Test Mg GREATER than 50 FIVs AND GREATER than Soil Test Ca	Calcitic

Nitrogen:

1. Nitrogen application is not recommended if the available forage contains at least 25% legumes. Applied N makes the grasses more competitive and can result in the loss of legumes.
2. If the available forage is less than 25% legumes, follow the management practices outlined below for a grass hay crop:
3. After each cut, apply 40 - 60 lbs N/ac per ton of expected per acre yield for the next cut (e.g., if the expected yield of the next cut is 2 tons/ac, apply 80 - 120 lbs N/ac).
4. Adjust the N application rate as expected yield changes from cut to cut and with expected weather conditions.
5. To promote deeper rooting of the grass plants, enhance winter survival and enhance spring recovery, apply 40-50 lbs N/ac between mid-October and mid-November.
6. Early spring N rates should be reduced by the rate of N applied in late fall.
7. Early spring N applications can lead to excessive spring tonnage which will increase the time and difficulty encountered in drying hay to an acceptable level.

Phosphorus

Table 2. Recommended phosphorus rate at 2.0 ton/ac yield goal. See adjustments below for higher yield goals.

	UD FIVs										
Nutrient	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs P_2O_5/ac	120	100	90	70	60	50	40	20	0	0	0

1. If soil test P is “Low” (e.g., 25 FIVs or less), satisfactory growth is unlikely. Evaluate the stand density to decide if replanting is appropriate since broadcasting and plowing down the recommended rate of P_2O_5 will produce higher yields sooner than will topdress applications.
2. If soil test P is “Medium” or “Optimum” (e.g., 26 to 100 FIVs), topdress phosphorus after the first grazing cycle.
3. If soil test P is “Excessive” (e.g., P-FIV’s >100), the application of phosphorus in fertilizers or manures is NOT RECOMMENDED
4. Increase recommended P rate by 15 lbs P_2O_5 /ac/ton for each additional ton of expected yield

Potassium

Table 3. Recommended potassium rate at 2.0 ton/ac yield goal. See adjustments below for higher yield goals.

	UD FIVs										
Nutrient	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
lbs K_2O/ac	180	165	150	135	120	105	90	75	60	45	0

1. Topdress potash after the first cutting.
2. Application rates of 120 lbs K_2O /ac or higher should be split into two treatments. Apply ½ of the recommended rate after the first cutting and the remainder in late August or September.
3. Increase recommended K rate by 50 lbs K_2O /ac/ton for each additional ton of expected yield.

Magnesium

1. Magnesium is recommended when Soil Test Magnesium is less than 38 FIVs.
2. If Soil Test Mg is less than 38 FIVs and lime is recommended, use dolomitic limestone.
3. If Soil Test Mg is less than 38 FIVs and lime is not needed, apply soluble Mg according to the rates in Table 4, below.

Table 4. Recommended application rates of soluble magnesium as a function of soil test Mg index value.

	UD FIVs								
Soluble Mg	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
lbs soluble Mg/ac	80	70	60	50	40	30	20	10	0

Sulfur

1. Monitor forage for sulfur deficiency or, if applying N, use ammonium sulfate as an N source to supply needed S. Long-term applications of ammonium sulfate or other acid-forming fertilizers may lower pH of the soil surface and require correction with lime. Monitor surface pH with a 0-2 inch soil sample.

2. Sulfate-S is available immediately for crop uptake immediately after application. If a reduced form of S is applied (e.g., thiosulfate or elemental S), allow adequate time for oxidation of the applied S to the sulfate form to occur.
3. If deficiency symptoms occur, contact your county agent for assistance with diagnosis and/or corrective recommendations.

Manganese

Manganese (Mn) needs are predicted by an Availability Index that includes M3 soil test Mn and soil pH. Interpretation is crop specific.

MnAI = 101.7 – (15.2 X soil pH) + (2.11 X M3-Mn)

Where:

MnAI = Mn availability index
Soil pH = Soil pH measured in water (1:1 V:V)
M3-Mn = Mehlich 3 soil test Mn in lbs/ac

Table 5. Interpretation of Mn availability index.

Mn Availability Index	Interpretation
Less than 12	Mn deficiency is possible. Monitor the crop for symptoms
12 or greater	Mn deficiency is unlikely.

1. If Mn deficiency is predicted or was observed in the previous growing season, broadcast 20-40 lbs actual Mn/ac.
2. Broadcast applications of acid forming fertilizers may correct Mn deficiency without the actual application of Mn in some cases, but may be less effective than applications of Mn. Long term application of acid forming fertilizers will require pH correction with lime.
3. If Mn deficiency symptoms appear during the growing season or after an application of lime, a foliar application of 0.5 to 2.0 lbs/ac actual Mn as Mn sulfate or chelated Mn can alleviate the symptoms and restore yield potential. ***Apply only when adequate growth is present to aid absorption of foliar Mn.*** Foliar application can be repeated if symptoms reappear.

Zinc

Zinc (Zn) deficiency is predicted by an Availability Index that includes not only M3 soil test Zn, but also soil pH and M3 soil test P.

Table 6. Interpretation of Zn availability index.

Soil Test Criteria	Interpretation
M3-Zn is less than 1.9 lbs/ac	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is higher than 7.0	Zn deficiency is predicted
M3-Zn is less than 3.1 lbs/ac **AND** soil pH is 6.6 or higher **AND** M3-P is 100 FIVs or higher	Zn deficiency is predicted
M3-Zn is 3.2 lbs/ac or higher	Soil should be sufficient in Zn

If zinc deficiency is predicted by the availability index or was observed the previous year, one of the following treatments can be applied:

1. Broadcast 10-12 lbs/ac actual Zn as Zn sulfate or Zn oxide or 2-3 lbs/ac actual Zn as Zn chelate. Broadcast applications should correct Zn deficiency for several years.
2. Foliar application of 1 lb/ac actual Zn as Zn sulfate or Zn oxide or 0.5 lb/ac actual Zn as Zn chelate in 20 to 50 gallons of water. ***Apply only when adequate growth is present to aid absorption of foliar Zn.*** Application should be repeated if symptoms re-appear.

Boron

1. Apply 0.5 - 1.0 lbs B/ac each year.
2. If the forage is less than 25% legumes, boron (B) application is not required.
3. Boron can be applied in a blended, broadcast fertilizer, as a soil spray or applied in a foliar spray, generally in late May or June. ***Foliar applications should only be made when adequate growth is present to aid absorption of foliar B.***
4. **Caution:** Although B is required for maximum productivity of hay fields containing legumes, even slight over-application can be toxic to the crop. When applying B as a foliar spray, be certain to apply the correct rate.