Corn Silage

Management Highlights

- Target pH: **6.0**
- Split N applications to increase N use-efficiency. Apply a small amount (20-25%) at planting and the bulk of the N requirement (75-80%) at sidedressing.
- In irrigated corn where fertigation is possible, split N applications to increase N use-efficiency. Apply a small amount (20-25%) at planting and split the remainder into equal increments to be applied with the irrigation water from the 5-6 leaf stage through silking.
- Watch for Mn deficiency, especially when soil test Mn is less than 3.4 lbs/ac.

Yield Goals

Silage yield of corn is influenced by many factors, including the cultivar selected, planting date, soil type and water-holding capacity, nutrient and water availability, weed, insect and disease pressure and crop management practices. Table 1 shows typical yield goals for silage corn grown on Delaware soils.

Table 1. Corn silage yield goals as a function of soil type and irrigation use.

	Non-irrigated		Irrigated
Soil Type	**CT***	**NT****	
	--------- tons / ac -------		
Loamy sands	15	20	30
Sandy loams, loams, black loamy sands, black sandy loams	20	25	30
Silt loams, black loams, black silt loams	25	30	30

*CT = conventional tillage
**NT = no-tillage

As indicated, irrigation use can increase yields significantly. Likewise, since no-tillage production systems favor water conservation and an early planting date, silage corn grown using no-till management often produces higher yields than does silage corn grown conventionally on the same soil type. Use of conservation-tillage practices can be expected to produce yields between the management extremes of conventional- and no-tillage systems.

Soil pH and Liming

The target pH for corn silage grown on most Delaware soils is **6.0**. Soils that are higher in organic matter ("black" soils) have a lower target pH (5.6) because organic matter moderates some of the 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.*** Use care to avoid overliming in order to prevent micronutrient deficiencies (e.g., manganese or zinc).

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) rates for corn silage production are dependent upon a realistic yield goal for the crop and the soil type of the field. A summary of N rates recommended by the University of Delaware are given in Table 2.

Table 2. Recommended N rates for corn silage as a function of yield goal.

Yield Goal	N Rate
----- tons / ac ----	---- lbs N / ac ----
15	100 - 120
20	120 - 150
25	150 - 180
30	180 - 220

The higher rate of N is recommended for management systems utilizing a single application in order to compensate for greater leaching losses. Split applications of N have been shown to increase the efficiency of N use by the crop and thus require less total N to achieve the same yield.

Nitrogen rates also need to be adjusted when planting into a field with a legume cover crop or where manure has been applied. To calculate the N adjustment required, 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 corn silage are dependent upon yield goal and soil test P value. A summary of P recommendations for corn silage is shown in Table 3.

Table 3. Broadcast application rates of P for corn silage production.

	P Index Value						
Yield	**0**	**10**	**20**	**30**	**40**	**60**	**80**
ton/ac	---------- lbs P_2O_5 / ac ----------						
15	130	114	98	82	66	33	0
20	130	114	98	82	66	33	0
25	160	140	120	100	80	40	0
30	190	166	142	118	94	47	0

Note: These rates are for a broadcast application. If P is to be applied in a fertilizer band, rates should be cut by half.

Potassium Management

The need for potassium (K) fertilization of silage corn is best determined by the use of a routine soil test. As with P, K recommendations are based on expected silage yield and soil test K value. A summary of University of Delaware K recommendations for corn silage production is given in Table 4. Potassium can be broadcast prior to planting or applied in the fertilizer band. ***To avoid salt injury to seedlings, do not band more than 75 lbs K_2O/ acre. If N and K are banded together, total nutrient rate should not exceed 75 lbs/ac.***

Table 4. Potassium recommendations for silage corn.

	K Index Value						
Yield	**0**	**10**	**20**	**30**	**50**	**70**	**90**
bu/ac	---------- lbs K_2O / ac ----------						
15	200	182	164	146	115	85	35
20	200	182	164	146	115	85	35
25	240	220	200	180	140	100	40
30	280	255	230	205	157	111	45

Calcium and Magnesium Management

Calcium (Ca) and magnesium (Mg) needs of corn silage 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

Manganese Management

Manganese (Mn) deficiency may occur in silage corn 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:

$$MNAI = 101.7 - (15.2 \times pH) + (2.11 \times ST\text{-}Mn)$$

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 index for corn silage are given below in Table 6.

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 an application of 8-10 lbs/ac of actual Mn in the fertilizer band. Band applications of acid-forming fertilizer, which lower soil pH in the area of plant roots, may correct Mn deficiency without the addition of Mn fertilizers.

Table 6. Interpretation of Mn availability index for corn silage.

MnAI Value	Interpretation
Less than 17	Mn deficiency is possible. Monitor the crop for symptoms.
17 or greater	Mn deficiency is unlikely at this soil pH.
Exception: MNAI>17 but ST-Mn is less than 3.4 lbs/ac, pH is less than 6.0 and lime has been recommended.	Mn concentration is adequate at this soil pH. Liming, however, may induce deficiency. Monitor crop for symptoms.

Other Nutrients

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

Additional Information

See Soil Test Notes 1, 2, 4 and 5 (Appendix 7) for additional information concerning fertilization of corn silage.