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Nutrient Management Suggestions for Corn

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This publication edition provides information about a newly developed web-based nitrogen (N) recommendation tool for corn grain, adopted from our previous N recommendation equation. The N recommendations are based on expected yield, soil nutrient availability, residual nitrate, soil type, soil organic matter, water use, fertilizer cost, and time of application. Recommendation information for phosphorus, potassium, sulfur, iron, zinc, and lime remains unchanged from the previous edition.

Nutrient Needs

Crop production in Nebraska typically requires nitrogen (N) fertilization to supplement what is available from the soil. After N, phosphorus (P) is the nutrient most likely to be deficient for profitable corn production. Criteria for other nutrients are given, but the need varies across the state.

We highly encourage accounting for residual nitrate in fields to fine-tune N fertilizer recommendations to enhance profitability and minimize nitrogen losses. Deep core soil sampling is especially encouraged where elevated residual nitrate concentration might occur with recent manure applications, large fall or late season fertilization and subsequent above normal-precipitation, drought damage, hail damage, and compromised crops due to pests or other mishaps.

Soil nitrate sampling generally is not needed for corn grown after soybean or other legume unless the fields have a recent manure history. Sampling to 4 ft for residual nitrate will provide the most accurate recommendations, but a minimum sample depth of 2 ft is acceptable. To determine P, potassium (K) and micronutrient needs, and soil organic matter content, collect soil samples from a depth of 0 to 8 inches every three to five years in the fall (http://extensionpubs.unl.edu/publication/9000016364877/guidelines-for-soil-sampling/). Most Nebraska soils supply adequate amounts of potassium, sulfur, zinc, and iron, but on some soils, the corn crop will benefit from applying one or more of these nutrients. Calcium, magnesium, boron, chlorine, copper, manganese, and molybdenum are seldom, if ever, deficient for corn production in Nebraska and toxicities may occur with overapplication. The complete University of Nebraska–Lincoln nutrient recommendations for all crops are available at http://extensionpubs.unl.edu/publication/9000016363764/nutrient-management-for-agronomic-crops-in-nebraska/ and up-to-date nutrient management information at https://cropwatch.unl.edu/tags/nutrient-management.

Nitrogen Requirement

Our recommendations for fertilizer N are based on expected yield, the amount of residual soil nitrate-N (NO_3-N), soil organic matter, other nitrogen credits (previous legume crop, manure, other organic material applied, irrigation water N), timing of application, and price of fertilizer and corn. These N recommendations remain a valuable option in planning and financial budgeting. Alternative N management is suggested to improve fertilizer use efficiency, maintain or increase profit, and minimize environmental nitrogen losses. The fertilizer N recommendations for corn grain are available in a web-based digital nitrogen recommendation tool provided on the link here: https://cropwatch.unl.edu/nitrogen-tool. This N recommendation has proven to be very accurate for profit maximization on average, but the economic optimum

N rate varies by year and application of about 60 percent of the fertilizer N in-season in response to crop needs should be considered on sandy soils (see section on N timing). The expected yield should be about 105 percent of the five- year yield average (see NebGuide G481 *Setting a Realistic Yield Goal*). A higher yield goal may be appropriate if management improvements are expected to result in increased yield.

The N recommendation equation for corn silage (lb/ac) =

$$[35 + (7.5 \times EY_s) - (8 \times NO_3\text{-N ppm}) - (0.85 \times EY_s \times OM) - \text{other N credits}] \times Price_{adj} \times Timing_{adj}$$

where: EY_S = expected silage yield in t/ac and NO_3 -N, OM, N credits, and adjustment factors are the same as those listed above.

Optimal N rates are sensitive to wide fluctuations in fertilizer and corn prices. Research conducted from 2002 to 2004 provides the basis for economic adjustments to the N recommendation equation, and is summarized in papers available at https://agronomy.unl.edu/nitrogen. The price factor in the N equation ($Price_{adj}$ Price adjustment factor = 0.263 + (0.1256*Corn:N) – (0.00421* $(Corn:N)^2$) is based on the diminishing effect of increasing N rate on corn yields (as N is increased there is less yield increase per unit of N applied). As N becomes more expensive relative to corn price, less N per bushel should be applied.

Figure 1 is a graph of the price adjustment equation cited above with the range of price ratios and resulting adjustment. Read across the horizontal axis for the corn price: N price ratio that is appropriate for the cost of N and find the $Price_{adj}$ on the vertical axis. We restrict the range of price adjustment to between ratios of 4:1 to 12:1, to avoid situations of inadequate or excessive N application with extreme corn or N price situations. Most often, the ratio is around 8:1. $Price_{adj}$ is applied after the other calculations are made. The previously mentioned link for the digital N recommendation tool provides an option to adjust for these calculations.

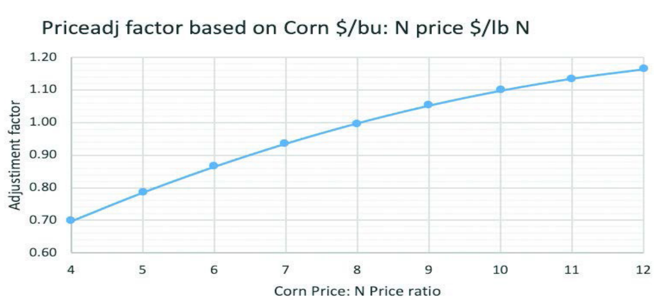


Figure 1. Price adjustment factor based on the Corn Price in U.S. dollars, $/Nitrogen (lb of actual N in $).
Note: Adjustment factor for situations where Corn: N price ratio is between 4 and 12.
Price adjustment factor = 0.263 + (0.1256*Corn:N) –(0.00421* $(Corn:N)^2$)
Example corn price ratio: when corn is $3.00/bu and nitrogen is $ 0.50/lb N = 3/0.5 = 6

Nitrogen Adjustment for Soil Nitrate-N

Corn will use soil nitrate-N remaining in the rooting zone from the previous year. This residual nitrate-N should be credited in calculation of N rates. The average nitrate-N concentration (in parts per million: ppm) in the root zone (or the depth-weighted concentration) is considered in the university's N digital tool and is averaged across several soil depths. Soil nitrate-N can be estimated by sampling soil with a single 0–2 foot sample. A default value for the 2 foot depth of 3.0 ppm is suggested for medium and fine textured soils and 1.5 ppm for sandy soils.

Table I. Estimated N credit from legumes and other crops for medium/fine textured soil and coarse soils.

Legume Crop	*Fertilizer-N reduction by soil texture (lb/acre)*	
	Fine–Medium[1]	*Coarse*[2]
Soybean	45	35
Dry bean	25	25
Alfalfa (70–100% stand, >4 plants/ft^2)	150	100
Alfalfa (30–69% stand, 1.5–4 plants/ft^2)	120	70
Alfalfa (0–29% stand, <1.5 plants/ft^2)	90	40
Sweet clover and red clover	80% of credit allowed for alfalfa	
Sugar beets	50	50

[1]All textural classes except those defined under coarse textured
[2]Includes sand, loamy sand, and sandy loam

The depth-weighted average is then calculated as the sum of the nitrate-N concentration for 0–2 ft depth soil sample plus 3.0 (which is the assumed nitrate-N concentration below 2 ft) divided by 2. For example, if there was 5.0 ppm nitrate-N for the 0–2 ft depth, then the depth-weighted average = (5.0 + 3.0)/2 = 4.0 ppm. The recommended N need is reduced by 8 lb/ac for each ppm of the average nitrate-N concentration for the 0–4 foot depth (e.g. 4.0 × 8 = 32 lb/ac N credit). This credits about 50 to 55 percent of the residual soil nitrate-N as equivalent to fertilizer N. Some soil testing laboratories may report estimates of all or some fraction of nitrate-N in lb/ac rather than ppm. When soil test results for nitrate-N are not available, a default value of 3.6 ppm for the 0–4 foot depth is used for medium/fine textured and 1.9 ppm for sandy soils to calculate N rates.

If soil samples indicate greater than 15 ppm in the top 2 ft, it is likely that the horizons below are greater than the 3 ppm assumed. Further testing might be warranted to determine the nitrate level in the 2–4 ft depths.

If root growth is restricted to less than 2 feet due to a high water table, a hardpan, or a layer of gravel, rock, or shale, residual nitrate is estimated for the effective rooting depth only rather than for the 4-foot depth.

Nitrogen Adjustment for Soil Organic Matter

Nitrogen is released as ammonium-N from organic matter in the soil through mineralization. Mineralization is a microbial process that is favored by conditions favorable to high corn yield; thus, the estimated credit for N from organic matter is related to expected yield. When a soil test for organic matter is not available, 1 percent organic matter is assumed for coarse soils and soils in the Panhandle, and 2 percent is assumed for other soils. The maximum soil organic matter content used in the algorithm is capped at 3 percent organic matter since few Nebraska soils above this level were represented in the database used to develop the equation.

Nitrogen Credits for Legumes, Manure, Other Organic Materials, and Irrigation Water

Preceding legume crops result in improved N supply to the corn crop because legume crop residues decompose faster than cereal crop residues and cause less soil and fertilizer N immobilization or tie-up. When corn follows a legume in rotation, the N rates are reduced by the legume N credit (*Table I*).

The soybean credit of 35 lb/ac N for coarse soils is a revision based on recent research in Holt County unless soybean yield was less than 30 bu/ac when the credit is 1 lb of N per bushel harvested. Soybeans are good scavengers of soil nitrate; therefore, residual soil nitrate-N after soybean harvest is often between 3 to 4 ppm nitrate-N. Soil sampling for nitrate-N following soybean is only recommended if organic amendments were applied within the previous two years or if the soybean crop yield was poor due to hail, weather, or insect damage.

Soybeans do not add N directly to the soil. In most cases, soybean doesn't leave a positive soil N balance. On average 55 percent of soybean N uptake is from the air and 45 percent from the soil. Soybean scavenges soil nitrate efficiently and does not add N to the soil. The apparent N credit from soybean is due to greater availability of mineralized soil N. High C:N ratio residue from a preceding corn crop will immobilize mineralized soil N during residue decomposition, making it unavailable for crop use. Low C:N ratio residue from a soybean crop immobilizes less mineralized soil N, leaving it more available for the following crop. The recommended credits were established empirically through the findings that corn needs less N when grown in rotation with soybeans.

When manure is applied in a rotation that includes corn, the recommended rates of N should be reduced according to the manure type and its N content, the amount applied, and the method of application. See NebGuide G1335 *Determining Crop-Available Nutrients from Manure*. The preplant soil nitrate test does not estimate future manure N availability.

Deposition of ammonium-N can be big credit near an animal feeding operation. It can be more than 100 lb/ac N/yr near to the operation but likely to drop off to less than 50 lb/ac within a mile or more but the amount is poorly estimated. If less than 75 lb/ac N is applied preplant, ammonium-N deposition can be accounted for by using a crop canopy sensor to direct an in-season N application rate.

Irrigation water often contains a significant amount of nitrate-N that is readily available to corn. When the season total amount of N supplied in irrigation water exceeds 15 lb N per acre it should be deducted from the recommended N. For each foot of effective irrigation water applied, one ppm nitrate-N in water is equal to 2.7 lb N per acre. Irrigation amounts vary from year to year, and the N credit for irrigation should be based on the three-year average irrigation amount up to the corn R3 (milk) stage. Overall, in Nebraska 65 percent of the total irrigation amount is applied by August 1. Long term, average amounts of irrigation are estimated to be 8 in/yr in eastern Nebraska, 9 in/yr in central Nebraska, 12 in/yr in west central Nebraska, and 20 in/yr at the western Nebraska border with Wyoming (simplified from Sharma and Irmak, 2012).

Table II. Timing adjustment factors ($Timing_{adj}$) and definitions for adjusting calculated N rate for fine-medium textured soil and coarse texture soils.

Timing	*Definition*	*$Timing_{adj}$ Factor by soil texture*	
		Fine-Medium[1]	*Coarse[2]*
Split (BMP)	At least 30 percent of N applied by sidedress and fertigation N	0.95	1.00 (when >60% in-season)
Mostly pre-plant	Less than 30 percent sidedress and fertigation N and preplant N>fall N	1.00	Do not apply
Mostly fall	Mostly fall applied N and less than 30 percent sidedress and fertigation N	1.05	Do not apply

[1]All textural classes except those defined under coarse textured

[2]Includes sand, loamy sand and sandy loam

Nitrogen Application Timing

Timing, placement, rate and form of N applied determines efficiency and profitability. Managing N is similar to managing risk exposure. For example, fall applications are generally less efficient than in-season applications because of the increased risk of N loss from either leaching or denitrification associated with excessive rainfall, hence the 1.05 factor in our recommendations (*Table II*). Multiple applications of N are usually more efficient than single large doses since it minimizes the amount of N exposed to loss while meeting crop demand, especially for coarse soils.

Fertilizer N is most efficiently used when most is applied near the beginning of rapid N uptake or about the eighth leaf stage (V8). Applications as late as R2 may have a profitable yield response to N but applying N after R3 is not recommended. On very sandy soils, 67 percent or more of N should be applied in-season such as with multiple fertigation applications after corn is 1 foot tall (*Table II*). Up to 33 percent of the planned N may be applied pre- or at planting to ensure adequate early N availability. Crop sensors or remote imagery can be used to determine the sidedress N rate.

Phosphorus Fertilization

Several soil P tests are used by commercial laboratories to determine P availability. Most research has been conducted on calibrating Bray-1 P with corn response. The following equations can be used to convert results from a soil test to a "Bray-1 P equivalent":

For Mehlich II:	Bray-1 = 0.9 * Mehlich II
For Mehlich III:	Bray-1 = 0.85 * Mehlich III
For Olsen P:	Bray-1 = 1.5 * Olsen P

Soil P availability is commonly managed by either the deficiency correction (DC) or the build and maintain approach. Nebraska and most Midwestern states use DC, which determines P rates according to the difference between the field's soil test P and a critical level, and above which there is a small probability of response. The build and maintain approach to P management is to build soil P availability to a targeted level that is above the DC critical level and to maintain it at that level.

Results of diverse studies have validated DC for corn in Nebraska although results from the mid-2000s indicated a need for a higher critical level if the previous crop was corn (Bray-1 P 20 ppm) rather than soybean (Bray-1 P 15 ppm). See *Figure 2*. Band application of starter fertilizer P is very efficient for meeting crop P needs, especially for early growth, but yield increases at Bray-1 P above 20 ppm are unlikely.

Our recommendations are for the least cost and most likely to be profitable combination. Land ownership and other considerations may influence specific decisions on a field.

For current corn grain yields of 220 bu/acre or greater, it is important to apply adequate fertilizer P to meet crop demand without excessively mining soil P resources. Therefore, when Bray-P is less than 20 ppm for corn after corn (C/C) or 15 ppm for corn after soybean (C/S) (if the soil test is other than Bray-P convert with above formulas), the recommendation is to apply P according to the highest rate determined from two options (download Excel fertilizer P_2O_5 rate calculator):

Option 1: The P rate equals harvest P removal if Bray-1 P <20 ppm for C/C or <15 ppm for C/S. For C/C, if Bray-1 P is between 20–25 ppm, and for C/S if Bray-1 P 15–20 ppm, apply at 50% of these rates.

a. For corn after corn, P_2O_5 rate (lb/ac) = 0.33 × bu grain.

b. For corn after corn with grain and stover harvest, P_2O_5 rate (lb/ac) = 0.33 × bu grain + 4 × ton of stover harvested.

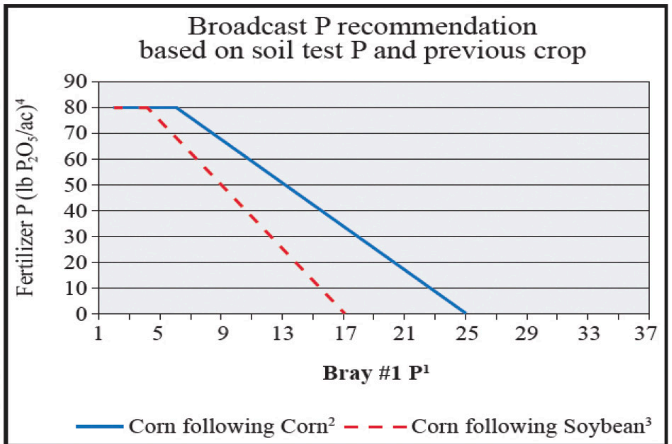
c. For corn after soybean, P_2O_5 rate (lb/ac) = 0.88 lb × bu soybean grain harvested.

d. If all fertilizer P is applied only previous to corn for both the corn and soybean years, and no stover is removed (grain harvest only): P_2O_5 rate = 0.33 × bu/ac corn grain + 0.88 lb × bu soybean grain.

For example, with the corn-soybean rotation with stover removal and one application in two years, and with Bray-1 P <15 ppm:

- Corn yield: 220 bu/ac corn
- Corn stover removed: 3 tons/ac
- Soybean yield: 75 bu/ac
- P_2O_5 rate (lb/ac) = 0.33 ×220 bu/ac corn grain + 4 × 3 t of corn stover + 0.88 lb × 75 bu/ac soybean grain
- P_2O_5 rate = 151 lb P_2O_5 /ac.

Option 1 is expected to increase Bray-1 P in the 0–8 inch soil depth. When Bray-1 P is >20 ppm, P rates should be reduced to less than harvest P removal to maintain Bray-1 P at near 20 ppm. No P should be applied if Bray-1 P is >25 ppm. This avoids sacrifice of profit for maintenance of excessive soil P availability while reducing the potential for P loss to water bodies due to runoff and erosion. If Bray-1 P is above the maintenance level of 15 or 20 ppm and less than 25 ppm, apply at 50 percent of removal and retest the soil after four years to adjust the annual rates.



1. Bray P-1 for acid and neutral soils. For other extractants use the formulas in the text to calculate a "Bray-1 P" equivalent.
2. The following equation is graphed above for continuous corn: If Bray-1 P <= 25 ppm: P-rate (lb P_2O_5/ac) = (25 - Bray-1 P) x 4; maximum rate = 80 lb P_2O_5/ac
If Bray-1 P > 25 ppm: P-rate (lb P_2O_5/ac) = 0
Bray-1 P = Bray-1 P (ppm) in 0-8 inch depth
3. The following equation is graphed above for corn following soybeans: If Bray-1 P <= 17 ppm: P-rate (lb P_2O_5/ac) = (17 - Bray-1 P) x 6; maximum rate = 80 lb P_2O_5/ac
If Bray-1 P > 17 ppm: P-rate (lb P_2O_5/ac) = 0
4. Apply half the broadcast P rate when banding preplant or beside the row at planting.

Figure 2. Broadcast P recommendation based on soil test P and the previous crop.

Option 1 is expected to supply sufficient P to avoid yield loss on areas of the field with very low Bray-1 P but would over-apply on areas of the field with unusually high Bray-1 P. If Bray-1 P has been built to >20 ppm, P application could be reduced or skipped for a year if P costs are exceptionally high P, but application on a harvest P removal basis should be resumed within one or two years.

Option 2: For average yield of <150 bu/ac (< 50 lbs P_2O_5 removal) or Bray-1 P <7 ppm, Option 1 may apply less P than needed. The P rate should be calculated with the following formula (*Figure 2*)

a. (25 – Bray-1 P) * 4 for corn following corn or crops other than soybean; or

b. (17 – Bray-1 P) * 6 for corn following soybean.

c. Apply P according to option 2 if it gives a higher P rate than option 1.

Variable rate P application with Option 1 should be based on yield maps or mean yields for management zones of the previous one or two harvests, coupled with grid soil sample results to avoid unneeded application on parts of the field with Bray-1 P >20 ppm. Variable P rate application for Option 2 should be based on grid or management zone soil sampling results.

Phosphorus Application Methods

Phosphorus fertilizers can be broadcast prior to planting or by placing the fertilizer in bands in the root zone. Tillage and P incorporation do not affect corn response to applied P while tillage increases the potential for P loss in runoff and erosion. Crop residue cover with reduced evaporation of soil water allows root proliferation at the soil surface for surface-applied P uptake.

Application of P fertilizer in bands is usually more efficient in the short term than broadcast application when soil P levels are low. Use half the recommended rate when banding. Fertilizer P can be applied in preplant bands or banded beside the row, over the row, or in the furrow when corn is planted. Preplant banding with anhydrous ammonia (dual-placement) and placement in strip tillage are also effective application methods. However, as described in the P rate discussion, as soil P levels decrease below the critical level, P at removal rates may be necessary to maintain the critical level.

Potassium Fertilization

Most Nebraska soils are capable of supplying enough potassium for excellent corn yields, but soil K deficiency can occur. Tests of 0–8 inch soil samples are useful in determining K fertilizer needs for corn (*Table III*).

Table III. Potassium fertilizer suggestions.

Potassium Soil Test, ppm K	*Relative Level*	*Amount to Apply Annually (K_2O), lb/ac*		
		Broadcast[1]		*Row[2]*
0 to 40	Very Low (VL)	120	plus	20
41 to 74	Low (L)	80	plus	10
75 to 124[3]	Medium (M)	40	or	10
125 to 150	High (H)	0		0
Greater than 150	Very High (VH)	0		0

Potassium test-exchangeable K

[1]The following equation provides an alternative to using table values: K_2O (lb/ac) = 125 – soil test (ppm) K; if soil test K < 125.

[2]Banded beside seed row but not with the seed.

[3]When soil test levels are above 100 ppm the probability of a yield response to fertilizer K is very low. Consider the value of corn and the cost of K before deciding to apply K, expecting little chance of profitable response if the price ratio of a bushel of corn to a pound of K is less than 8 (for example $4.00/bu corn and $ 0.50/lb of K_2O).

Sulfur Fertilization

Nebraska soils generally supply adequate sulfur (S) for excellent corn production. Corn yield increase due to S application is expected only on coarse soils that are low in organic matter. Sulfur application on medium to fine texture soils may result in early greening of leaves in cool weather but is unlikely to increase yields. The ability of soils to supply S to plants varies greatly in Nebraska. The need for S also depends on the S content of irrigation water. The S content of irrigation water is generally low in the Sandhills but is usually adequate to meet the needs of crops irrigated with groundwater elsewhere in the state. Guidelines for broadcast or row applications of S are given in *Table IV*.

Table IV. Sulfur fertilizer recommendations (coarse[1] soils only).

Sulfur Soil Test ppm SO^4-S	*Amount to Apply Annually (S), lb/ac*		
	Soil Organic Matter 1% or less		***Soil Organic Matter Greater than 1%***
Irrigation water with less than 6 ppm SO_4-S			
	Broadcast	*Row[2]*	*Row[2]*
Less than 6	20	10	5
6–less than 8	10	5	0
8 and greater	0	0	0
Irrigation water with 6 or greater ppm SO_4-S			
Less than 6	10	5	0
6–less than 8	10	5	0
8 and greater	0	0	0

Sulfur test-$Ca(H_2PO_4)_2$ extraction

[1]Includes sand, loamy sand, and sandy loam

[2]Applied in a band next to row but not with seed

Sulfur must be in the sulfate form to be used by plants; thus, elemental S must be oxidized to the sulfate form to be utilized. Where S is applied preplant on very sandy soils, one-half of the applied S should be finely ground elemental S and the rest sulfate S. Elemental S can be granulated or flaked with a binding agent, but prilled S is rarely effective. Applying some elemental S at planting reduces leaching losses in sands during wet springs and allows adequate time for oxidation to sulfate. Band application is the most effective method of applying S. When S is band-applied at planting, use sulfate or thiosulfate-S as the oxidation process is not rapid enough for elemental S to be effective. Ammonium thiosulfate (12–0–0–26S) also is effective, but should NOT be placed with the seed because of the potential for poor seed germination. Ammonium thiosulfate is an excellent source when injected into irrigation water for sprinkler application and can provide S in-season if deficiency symptoms occur. Gypsum is an excellent source of sulfate-S.

Zinc Fertilization

Zinc deficiency in corn occurs most often where subsoil is exposed on soils leveled for irrigation. In western Nebraska calcareous soils that are low in organic matter or of sandy texture are more likely to show a need for zinc. Soil zinc can be easily raised to adequate levels by broadcasting zinc fertilizer, usually ammoniated zinc or zinc sulfate (*Table V*). Chelated zinc sources are more available and have efficiencies up to four times the mineral zinc sources. However, they are water-soluble and will not stay in the root zone as long as zinc sulfate. Periodic soil testing to an 8-inch depth is suggested to assess zinc levels in soils. Zinc applied in a band beside the row also is effective, provided about 10 lb of N is placed in the same band.

Iron Fertilization

Symptoms of iron chlorosis, observed as interveinal yellow striping on corn leaves, may occur on highly calcareous or saline-sodic soils with pH levels above 7.8. In some instances, excessive soil nitrate can make chlorosis more severe.

Correction of iron chlorosis may require several practices. First, select hybrids that are tolerant to chlorosis as this may be adequate in overcoming iron problems. If chlorosis persists, iron fertilizer may need to be applied. Application at planting in the seed furrow of 50–100 lb of ferrous sulfate heptahydrate ($FeSO_4 \bullet 7H2O$) per acre can be effective in correcting high pH induced iron chlorosis. This material is selling at around $90/ton (2019 prices) and would be a cost-effective amendment but requires dry fertilizer application equipment on the planter.

Table V. Zinc fertilizer recommendations.

Zinc Soil Test Level		*Amount to Apply (Zn), lb/ac[1]*			
DTPA Extraction	*Relative Level*	*Calcareous Soils[2]*		*Noncalcareous Soils*	
PPM ZN		BROADCAST	BAND	BROADCAST	BAND
0 to 0.4	Low (L)	10	2	5	2
0.41 to 0.8	Medium (M)	5	1	3	1
> 0.8	High (H)	0	0	0	0

[1]Rates are for inorganic forms of zinc such as zinc sulfate and ammoniated zinc.

[2]Calcareous soils defined as soils with moderate to excess lime.

A second approach is to apply a stable iron chelate (FeEDDHA) with the seed as a liquid. At least 2.5–4 lb of FeEDDHA per acre is required. Based on research at WCREC (North Platte), chlorosis correction from FeDDHA ($4.50/acre) has not been as effective as that of FeSO4-7H2O ($3.60/acre). The FeEDDHA works well for correcting soybean chlorosis on high pH soils, but because of differences in iron uptake chemistry between grasses and legumes, it is less effective on corn.

Foliar sprays using ferrous sulfate or FeEDDHA are not always effective in producing significant yield responses. Treatment needs to begin as soon as chlorosis first becomes visible and repeated every 7 to 10 days until newly emerged leaves remain green. Spray must be directed over the row to be effective. A standard application rate is 20 gallons per acre of a 1 percent iron sulfate solution.

Lime Suggestions

Corn is less sensitive than legumes to acid soils. Where corn is grown continuously or with other grain crops, lime application is advised when the soil pH is 5.5 or less, except in the central and western parts of the state where the surface soil may be acidic and lower depths of the soil are calcareous. If subsoil samples from 8 to 16 inches show pH below 5.5, liming should be considered. Actual lime rates are determined by a buffer pH test. More specific and detailed recommendations are given in NebGuide G1504 *Lime Use for Soil Acidity Management*.

Where corn is irrigated with groundwater, sufficient lime in the water may maintain a satisfactory soil pH level. Before applying lime on irrigated fields, soil pH change should be monitored for three to five years to determine if the soil pH is declining. If subsoil samples from 8 to 16 inches show pH below 5.5, liming should be considered. Since liming is an expensive practice and can only be economical on a long-term basis, on leased land a discussion with the landowner about shared costs is reasonable.

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Resources

Attia, A., C. Shapiro, W. Kranz, M. Mamo, and M. Mainz. 2015. Improved yield and nitrogen use efficiency of corn following soybean in irrigated sandy loams. SSSAJ. 79:1693–1703. http://doi:10.2136/sssaj2015.05.0200

Dobermann, A., C.S. Wortmann, R.B. Ferguson, G.W. Hergert, C.A. Shapiro, D.D. Tarkalson, and D. Walters. 2010. Nitrogen Response and Economics for Irrigated Corn in Nebraska. Agron. J. 103:67–75. doi:10.2134/agronj2010.0179

Sharma, V. and S. Irmak. 2012. Mapping spatially interpolated precipitation, reference evapotranspiration, actual crop evapotranspiration, and net irrigation requirements in Nebraska: Part II. Actual crop evapotranspiration and net irrigation requirements. Trans. ASABE 55:923–936.

Wortmann, Charles, Charles Shapiro, Timothy Shaver, and Mike Mainz. `````2018. High soil test phosphorus effect on corn yield. Soil Science Society of America. 82:1160–1167. doi:10.2136/sssaj2018.02.0068

Wortmann, C.S., D.D. Tarkalson, C.A. Shapiro, A.R. Dobermann, R.B. Ferguson, G.W. Hergert, and D. Walters. 2010. N use efficiency for three cropping systems in Nebraska. Agron. J. 103:76–84. doi:10.2134/agronj2010.0189

Wortmann, C.S., A.R. Dobermann, R.B. Ferguson, G.W. Hergert, C.A. Shapiro, D.D. Tarkalson, and D. Walters. 2009. High yield corn response to applied phosphorus, potassium, and sulfur in Nebraska. Agron. J. 2009 101:546–555.

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