

United States Department of Agriculture



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Transmitted via Email

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MINNESOTA BULLETIN NO. 190-8-19

SUBJECT: ECS – NUTRIENT MANAGEMENT

Purpose. Distribute guidance on University of Minnesota Field Corn Nitrogen Guidelines and also distribute revised NRCS in Minnesota guidance on Allowable Deviations from University of Minnesota Fertilizer Guidelines.

Expiration Date. September 30, 2009.

The University of Minnesota (UofMn) revised its field corn fertilizer guidelines in December 2006. Subsequently the Minnesota Pollution Control Agency (MPCA) issued revised guidance on nitrogen rates used to determine manure applications on fields going into field corn. Attached is NRCS in Minnesota's guidance on use of UofMn field corn nitrogen fertilizer guidelines. The NRCS guidance is similar to MPCA guidance when manure is used as a source of nitrogen.

The final page of Minnesota Amendment 19 (August 2003) to the National Planning Procedures Handbook (NPPH) contains guidance on deviations allowed from University of Minnesota fertilizer guidelines. The attached deviation guidance can be used instead of the deviation guidance found in Minnesota Amendment 19 to the NPPH.

Direct questions concerning the attached guidance to Jeff St.Ores, Water Quality Specialist at (651) 602-7869 or [jeff.st.ores@mn.usda.gov](mailto:jeff.st.ores@mn.usda.gov).

/s/

WILLIAM HUNT  
State Conservationist

Attachment:

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## FIELD CORN NITROGEN RATE GUIDELINES

University of Minnesota (Uof Mn) nitrogen (N) fertilizer guidelines and recommendations have been based on expected yields and soil fertility indicators. However the most recent UofMn field corn N guidelines are based on ratios determined by dividing per unit price of nitrogen by crop value. NRCS allows the use of either the most recent or previous Uof Mn field corn N guidelines but N rates are capped by NRCS if previous guidelines based on expected yield and soil organic matter are used (table 1).

**TABLE 1 – FIELD CORN MAXIMUM N RATES**

Previous Crop	Maximum Rate (Pounds per Acre)
Barley, Buckwheat, Canola, Corn, Grass Hay, Grass Pasture, Oats, Potatoes, Rye, Sorghum-Sudan, Sugarbeets, Sunflowers, Sweet Corn, Vegetables, Wheat	180*
Edible Beans, Field Peas	160
Soybeans, Alfalfa (1 plt. or less/ft <sup>2</sup> ), Small Grains with stubble tilled after harvest in SE Minn.	140
Alsike Clover, Birdsfoot Trefoil, Grass-Legume Hay, Grass-Legume Pasture, Fallow, Red Clover	105
Alfalfa (2-3 plts/ft <sup>2</sup> )	80
Alfalfa (4 or more plts/ft <sup>2</sup> )	30
* Subtract 75, 50 or 35 respectively from 180 when alfalfa 4 or more plants/ft <sup>2</sup> , alfalfa 2-3 plants/ft <sup>2</sup> or red clover preceded the planned corn crop by 2 years (i.e. corn will be grown in the second year following alfalfa or red clover).	

## DEVIATIONS FROM UNIVERSITY OF MINNESOTA NITROGEN (N), P<sub>2</sub>O<sub>5</sub> AND K<sub>2</sub>O GUIDELINES

On a case by case basis, NRCS may allow deviations from Uof Mn fertilizer guidelines (tables 2-4). Deviations must be justified and should not be automatically incorporated into all plans.

### NITROGEN DEVIATIONS

Nitrogen deviations should be considered for livestock or poultry operations that exhibit one or more of the following conditions:

1. Solid manure sources - *particularly beef and dairy.*
2. Have inconsistent manure analyses within the same source, within the year or through multiple years (e.g. vary by 15% or more) - This could include *operations with no or short term storage* or *systems where manure loads from the same source have differing nitrogen concentration (e.g. poultry buildings and dairy compost buildings and large pits that cannot be agitated sufficiently).*
3. Field conditions during normal application times result in inconsistent rates as manure is applied across a field.

Nitrogen deviations may be justified in the short term for livestock or poultry operations exhibiting one or more of the following conditions:

1. Operations with less than 3 years of manure analysis history (including new operations or operations with new facilities).
2. Application equipment limitations (e.g. limited ability to adjust rates and inconsistent delivery to the field).
3. Manure source(s) applied by multiple individuals or multiple application equipment on the same farm.

Nitrogen deviations should seldom be considered for fields that frequently receive manure applications-particularly continuously manured fields and/or seldom considered for liquid swine or stockpiled turkey manure operations exhibiting all of the following conditions:

1. Three or more years of manure analysis
2. Analyses are consistent (e.g. vary by less than 15%).
3. Application equipment is relatively new or manure applied by a commercial hauler.

Nitrogen deviations should seldom be needed for fields receiving only commercial nitrogen applications. Deviations should only be considered based on application equipment rate and fertilizer source limitations after all options have been evaluated.

**TABLE 2 - DEVIATIONS FROM N FERTILIZER GUIDELINES**

All Crops	Pounds per acre over UM Recommendation or over NRCS maximum N rate if field corn
Manure NOT used to supply nitrogen	15
Manure used to supply all or a portion of nitrogen <sup>1</sup>	25 <sup>2</sup>

<sup>1</sup> N recommendation for legumes receiving manure applications are based on N estimated to be removed in harvested plant biomass.  
<sup>2</sup> Manure deviations are the same as reducing calculated manure nitrogen credits by 25 pounds per acre

**P<sub>2</sub>O<sub>5</sub> AND K<sub>2</sub>O DEVIATIONS**

P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O deviations are most applicable where:

1. Site specific soil conditions can be shown to justify the increased rates or where recent crop specific research indicates higher rates can be beneficial to yield and net income
2. U of Mn guidelines suggest the use of a starter or row applied application regardless of soil test values.
3. Application equipment rate or fertilizer source limitations exist.

**TABLE 3 - DEVIATIONS FROM P<sub>2</sub>O<sub>5</sub> GUIDELINES**

Fields Not Receiving Manure		
Soil Test Phosphorus (STP)		Pounds per acre over UM Recommendation
Bray P1	Olsen	
0 – 25 ppm	0 – 20 ppm	30
26+ ppm	21+ ppm	20
Fields Receiving Manure		
When P2O5 supplied by manure exceeds UM guideline by any amount *		Additional Commercial P <sub>2</sub> O <sub>5</sub> that may be applied
		20 pounds
* P <sub>2</sub> O <sub>5</sub> supplied by manure applied on a nitrogen basis will frequently exceed crop needs. This is acceptable.		
<i>When manure applications are based on rotational P<sub>2</sub>O<sub>5</sub> removal, the additional P<sub>2</sub>O<sub>5</sub> supplied by commercial fertilizer must be included in the total amount applied. Removal refers to P<sub>2</sub>O<sub>5</sub> contained in harvested above ground biomass. Applying manure in one year at rates low enough to approximate P<sub>2</sub>O<sub>5</sub> removal or replacement will not be possible with some manures, crops and equipment. In such cases manure is normally applied in the 1<sup>st</sup> year of a rotation based on that year's crop nitrogen needs. Then manure is not applied in the following years of the rotation until extra P<sub>2</sub>O<sub>5</sub> provided by the initial application is removed by succeeding crops (2-6 years).</i>		

**TABLE 4 - DEVIATIONS FROM K<sub>2</sub>O GUIDELINES**

Fields Not Receiving Manure	
Soil Test	Pounds per acre over UM Recommendation
0 – 160 ppm	60 <sup>1</sup>
161+ ppm	30 <sup>1</sup>
<sup>1</sup> Reduce deviations by half when using Univ. of Minn. guidelines specific to ridge-till, no-till or strip till in a corn/soybean rotation.	
Fields Receiving Manure	
When K <sub>2</sub> O supplied by manure exceeds UM guideline by any amount. *	Additional Commercial K <sub>2</sub> O that may be applied
	30 pounds
*K <sub>2</sub> O supplied by manure applied on a nitrogen basis will frequently exceed crop needs. This is acceptable.	