Nitrogen Fertilization for Corn

100

John Heard CCA, Crops

50.



.150



4R Nutrient Stewardship

✓ Right rates
✓ Right sources
✓ Right placement
✓ Right timing





Are rate recommendations becoming easier?

- Current guidelines based on soil test and yield goal
- Traditional thumbrule of 1.2 lb N/bu yield (less soil N)
- But 4R practices should narrow this to 1.0 lb N/bu.
- (corn actually removes about 0.75 lb N/bu)

Manitoba N recommendation for cornbased on target yield



Appendix Table 8, p 39 Soil Fertility Guideecent research has validated circled rates

North Dakota Corn Nitrogen Calculator



Region: West River: O Eastern ND: O Field Information (If in Eastern ND): No-Till for 6+ Years Irrigated Corn Conventional Till/Minimal No-Till Conventionally-Tilled No-Till for 1-5 years High-Clay Soils Historic Yield > 160 bu/a Historic Yield less than 160 bu/a Historic Yield > 160 bu/a Historic Yield > 160 bu/a Historic Yield less than 160 bu/a Historic Yield less than 160 bu/a

Input Nearest Corn Price (\$/Bushel): Input Nearest Nitrogen Cost (\$/Pound): Soil Test for Nitrogen Analysis (lbs/acre 2-ft depth): Percent Organic Matter In Soil:

4.00 0.60 40 4

Previous Crops Planted

- No nitrogen-supplying crop
- O Soybean, Field Pea, Dry Bean, Lentil, Chickpea or harvested Sweet Pea
- O Sugarbeet with yellow-green leaves
- O Sugarbeet with green leaves
- Harvested Alfalfa or unharvested Sweet Clover (>5 plants/sq-ft)
- Harvested Alfalfa or unharvested Sweet Clover (3-4 plants/sq-ft)
- Harvested Alfalfa or unharvested Sweet Clover (1-2 plants/sq-ft)
- Harvested Alfalfa or unharvested Sweet Clover (less than 1 plant/sq-ft)

Nitrogen Recommendation: 110

plus/minus 30 lbs.

These soils would benefit greatly from a sidedress N application due to their high susceptibility to leaching in all but the driest of years. Base preplant rates on the Nitrogen Recommendation Rate Calculator above. Base side-dress rate on the medium-textured soil with historic yields greater than 160 bushels per acre less whatever base rate, residual N and N credits are given in the Calculator above. A better sidedress rate strategy would be to apply an N-rich strip preplant and use the active-optical sensor algorithm for the medium-textured soil with historic yields greater than 160 bushels per acre. If there is significant rain that might contribute to N leaching between preplant N application and sidedess, the N-rich strip might have to be reapplied about a week before sidedress application.



- O Sugarbeet with green leave
- rate because of losses O Harvested Alfalfa or unhar
- O Harvested Alfalfa or unhar
- Harvested Alfalfa or unharvested Sweet Clover (1-2 plants/sq-ft)
- Harvested Alfalfa or unharvested Sweet Clover (less than 1 plant/sq-ft)

per acre. If there is significant rain that might contribute to N leaching between preplant N application and sidedess, the N-rich strip might have to be reapplied about a week before sidedress application.

il with historic yields greater than dits are given in the Calculator h strip preplant and use the activevields greater than 160 bushels

Timing more important than rate in wet soils?

So when and how are MB farmers applying N ^I now?







Credit: Pioneer Crop Insight March 2014

Potential NH₃ Losses in Corn





UAN placement

UAN dribble

UAN spray



Side dress ammonia application

CAUTION

AND REAL PROPERTY AND A DESCRIPTION OF A



Side dress UAN application





£



Y-drop applicator for UAN

Will it work in MB? Inquiring minds want to know.

2016 - Site 1





St Adolphe Yield goal = 125 bu/ac Scanterbury clay, tile drained Previous crop = soybeans CHU = 112% of normal Precip = 122 % of normal Soil nitrate = 71 lb N/ac OM = 7.6%1. MB Ag = **95 lb N/ac** 2 NDSU = 0 lb N/ac AgVise = 80 lb N/ac 3. 4. PSNT = 50 lb N/ac 5. MERN = 0 lb N/ac

Alfalfa and long-ago manure history









Arborg Yield goal = 125 bu/ac Peguis clay – poorly drained Previous crop =wheat CHU = 106% of normal Precip = 93 % of normal Soil nitrate = 106 lb N/ac OM = 8.6%1. MB Ag = 0 Ib N/acNDSU = 0 **Ib** N/ac 2. 3. AgVise = 45 **lb N/ac** 4 MERN = 125 lb N/ac

Wet clay, weed control





Morden Yield goal = 150 bu/ac Neuenburg sandy loam Previous crop = potatoes, rye cover crop CHU = 106% of normal Precip = 139% of normal Soil nitrate = 38 lb N/ac OM = 2.5%1. MB Ag = 170 **lb N/ac** 2. NDSU = 110 **Ib N/ac** 3. AgVise = 145 **Ib N/ac**

- 4. PSNT = 170 **Ib N/ac**
- 5. MERN = 100 **Ib N/ac**





What happened in 2016?





Mineralization/Immobilization Turnover (MIT)

- <u>rate</u> of immob'n or mineral'n increased by general factors affecting microbial growth and activity:
 - highly available food source:
 - - young plant tissue
 - - physical mixing of soil by tillage
 - high population of microorganisms (eg. soil type)
 - high soil pH (<u>bacteria</u> like <u>basic</u> conditions)
 - - high [O₂], good aeration
 - soil moisture near field capacity
 - warm temperatures

Site	Check Yield	Est .N uptake ³	Soil nitrate 0-2'	Starter fertilizer N	Mineralized N est.
	Bu/ac		lb	N/ac	
St Adolphe	202				
Carberry	120				
Arborg	154				
Morden	178				
Melita	187				

Site	Check Yield	Est .N uptake ³	Soil nitrate 0-2'	Starter fertilizer N	Mineralized N est.
	Bu/ac		lb	N/ac	
St Adolphe	202	226			
Carberry	120	134			
Arborg	154	172			
Morden	178	199			
Melita	187	209			

Site	Check Yield	Est .N uptake ³	Soil nitrate 0-2'	Starter fertilizer N	Mineralized N est.
	Bu/ac		lb	N/ac	
St Adolphe	202	226	71	4	
Carberry	120	134	55	6	
Arborg	154	172	106	10	
Morden	178	199	35	4	
Melita	187	209	57	4	

Site	Check Yield	Est .N uptake ³	Soil nitrate 0-2'	Starter fertilizer N	Mineralized N est.
	Bu/ac		lb	N/ac	
St Adolphe	202	226	71	4	151
Carberry	120	134	55	6	73
Arborg	154	172	106	10	56
Morden	178	199	35	4	160
Melita	187	209	57	4	148

What might aid estimate of inseason mineralization (and losses)?

ADAPT-N

 Cornell University

adapt-N

Climate Corporation

• Monsanto



Encirca DuPont/Pioneer





FarmCommand N Manager

N-MANAGER



FARMCOMMAND"					~
FarmCommand N-Manager N-Manager		Zone: 3			
Subfiled 1 (Scenario: Corn, Grai	in-May 2:	Status: Warning			+
No additional nitrogen needed	о т	Checkstrip: No	are currently under nitrogen stress	G	1
N Waiting for Planting	ror calcula	Last Updated: 2016-06-13 09:51am			Ô
Zone: 1	Zon	Yield Target: 200 bu/acre	ə: 4		₩
Status: Good	Statu	Area: 40.43 Acres	: Warning		er. P
Last Updated: 2016-06-13 09:51am	Last I	V6 Date: 31-05-2016	strip: No		5
Yield Target: 180 bulacre Area: 25.33 Acres	Yield Area:	Predicted Yield: 202bu/acre	larget: 210 bu/acre 47.53 Acres		
V6 Date: 31-05-2016 Predicted Yield: 192bu/acre	V6 Da Predi	Recommended side-dress rate: 70lbs/acre	te: 31-05-2016 ted Yield: 212bu/acre		
	Reco		nmended side-dress rate: 85lbs/acre		



How an Ontario CCA estimates mineralization: Determines Delta Yield: Low Rate N Strips



↑ Delta = larger N management impact



Delta Yield: Determining N Rate

<u>Delta Yield (bu)</u>	<u>N Side-Dress Rate</u> (Ib/A)	
10	25	
15	50	
20	61	
30	80	
40	90	
50	101	
60	110	
70	117	
80	125	
90	132	
100	147	
110	162	

Source: Ontario Corn Nitrogen Estimator





Presidedress Soil Nitrate Test PSNT



	Expected Yield (bu/ac)					
PSNT Value	135	167	200			
	N Ra	N Rate Recommendations				
ppm		Ibs N/acre				
0	183	212	240			
5	159	185	211			
10	133	158	183			
15	105	129	153			
20	70	99	124			
25	0	52	90			
30	0	0	0			

Table 3. Refitted PSNT Nitrogen Rate Recommendations for Expected Yields of 135 to 200 bu/ac across a range of PSNT values . OMAF





Yield Summary 2015 Y Drop Trials (9 Ontario sites)

	N-Rate Lbs/ac	Low N Strip Yield	Yield Side Dress	Yield Y Drop	Yield Difference	Delta Yield
Grower Rate	150	163	201	200	-1	38
75% Grower Rate	117	163	196	201	5	38
125% Grower Rate	190	163	203	204	1	41

Low End Nitrogen Rate	44 Lbs/ac
Max. Delta Yield	77 Bu/ac
Min. Delta Yield	12 Bu/ac



No Summary – just stay tuned:

More corn work to:

- Predict in-season N need
- Validate timing
- Test these in-season decision services On-farm-tests planned by MCGA for 2017:
- N timing
- N rate = base N, & 40, -40
- In-season UAN, +/- Agrotain Plus
- SuperU vs urea



A very wet season thwarted harvest and normal fall fertilization practices

Canada







Did all nitrate denitrify? Where did it go?

Poor corn

 Stalk nitrate = 56 ppm (deficient <250 ppm)

N by foot lb N/ac



- 28
- 66
- <u>58</u> • 168



Better corn

• Stalk nitrate =216 ppm



