

Field Information Worksheet

Step 1: Pick one field at your map to use for calculations. Find the Field History sheet that corresponds with your chosen field.

Step 2: Using the Field History sheet, find the following information from the soil and water test results. Then using the dry erase marker, add this info to the blank on the Field Information Card:

- 1) Sampling depth for surface soil sample in inches (i.e. 0-6", 0-8", 0-10")
- 2) Residual soil nitrate for surface soil sample in ppm
- 3) Sampling depth for subsoil sample in inches (i.e. 6-24", 8-36", leave blank if only a surface sample was collected)
- 4) Residual soil nitrate for subsoil sample in ppm (Leave blank if only a surface sample was collected)
- 5) % Organic matter or OM
- 6) Water nitrate level in ppm (if field is irrigated)

Step 3: Using the Field History sheet and Table 1 below, determine which years of corn yields you will use to determine a corn yield goal for the next cropping season. Using the dry erase marker, circle on the Field History sheet the years that you will use in your calculations.

Table 1. Yield Goals

Use only years with relatively normal weather conditions and no unusual events that caused extremely low or high yields.

For irrigated corn the yield goal should be within 105 to 110% of the average of the past five to six corn years harvested (e.g., avg. of past five years in continuous corn or past 3 or 4 corn harvests in a corn-soybean rotation).

Dryland corn yields are more variable than irrigated yields. Use the 5 to 10-yr yield average for setting yield goals in dryland corn.

Step 4. Add together all of your circled years' actual yield data to get a Total Yield.

$$\frac{\text{_____}}{\text{Total Yield}} \text{ (bu/ac)}$$

Step 5. Divide the Total Yield from Step 4 by the number of years of data to calculate average yield.

$$\frac{\text{_____ (bu/ac)}}{\text{Total Yield}} / \frac{\text{_____ (years)}}{\text{\# of years}} = \frac{\text{_____ (bu/ac)}}{\text{Average Yield}}$$

Step 6. Determine % Yield Increase to expect this year above the Average Yield (circle one).

0% more 5% more 10% more 15% more 20% more

Step 7. Determine the Yield Goal Multiplier by adding 100% plus your % Yield Increase and then dividing by 100:

$$(100\% + \frac{\text{_____}}{\text{\% Yield Increase}} (\%))/100 = \frac{\text{_____}}{\text{Yield Goal Multiplier}}$$

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Field Information Worksheet

Step 8. Multiply the Yield Goal Multiplier from Step 7 by the average yield from Step 5 to determine your yield goal. Then using the dry erase marker, add this info to the blank on the Field Information Card:

$$\frac{\text{Yield Goal Multiplier}}{\text{Yield Goal Multiplier}} \times \frac{\text{Average Yield (bu/ac)}}{\text{Average Yield}} = \text{Yield Goal (bushels/ac)}$$

Step 9. Using the same math as Steps 4 and 5, calculate the historical average of Irrigation Water Applied. Then using the dry erase marker, add this info to the blank on the Field Information Card:

$$\frac{\text{Total Irrigation Applied (in/ac)}}{\text{Total Irrigation Applied}} / \frac{\text{\# of years (years)}}{\text{\# of years}} = \text{Average Irrigation Applied (in/ac)}$$

Step 10. Group Discussion - What are the implications if one chooses to use a yield goal that is 20 bushels too high?

Credits Worksheet – Soil Nitrogen

Using the information gathered in the Field Information Worksheet, the next step is to use the UNL nitrogen rate calculator for corn to determine a nitrogen application rate. This will calculate the total nitrogen requirement as well as nitrogen credits that can be used to determine the nitrogen application rate before applying any adjustments for timing or the corn to nitrogen price ratio.

Step 1: Calculate your Crop Nitrogen Requirement using the following equation and then record on the Field Info Card using a dry erase marker:

$$\text{Crop Nitrogen Requirement (lbs/ac)} = (\text{Yield Goal} \times 1.2) + 35$$

$$\left(\frac{\text{Yield Goal (bu/acre)}}{\text{(from Field Information Card)}} \times 1.2 \right) + 35 = \text{Crop Nitrogen Requirement (lbs/ac)}$$



Step 2: Calculate your Soil Organic Matter (SOM) Nitrogen Credit using the information below in Table 1 from the UNL N calculator and the formula below. The SOM credit accounts for the contribution to crop N uptake provided by mineralization of soil organic matter, which is a natural process driven by microbial activity, soil temperature, soil water, etc.

Table 1. SOM Credit

The SOM credit uses the soil organic matter content (%) in the 0-8" soil depth.

If the soil organic matter is >3%, the algorithm will automatically use 3% for estimating soil organic N supply.

If no soil test organic matter is available, assume 1% for sandy soils and soils in the Panhandle, and 2% for other soils in Nebraska.

Yield goal is included as it takes into account increased N mineralization in high-yielding crops.

To calculate your SOM N Credit, use the formula:

$$\text{SOM N Credit (lbs/acre)} = 0.14 \times \text{Yield Goal (bu/ac)} \times \text{Soil OM\% (Enter as a whole number, e.g. 3\%=3)}$$

$$0.14 \times \frac{\text{Yield Goal (bu/ac)}}{\text{(from Field Information Card)}} \times \frac{\text{Soil OM (\%)}}{\text{(from Field Information Card)}} = \text{SOM N Credit (lbs/ac)}$$

Using a dry erase marker, add the SOM N Credit amount to the Field Info Card.

Then place the soil organic matter credit card on the map if you feel comfortable taking this nitrogen credit.



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Step 3: Collect data needed for the Soil Nitrate N Credit.

Soil nitrate-N is leftover nitrogen present in the soil. N that is present at planting time is available for crop uptake. However, nitrate is leachable so there is value in knowing how deep the nitrate is throughout the profile.

What is the sampling depth range for the surface sample in inches? _____ (inches)
(from Field Information Card)

What is the sampling depth range for the subsoil sample in inches? _____ (inches)
(from Field Information Card)

What is your soil nitrate from the surface sample? _____ (ppm)
(from Field Information Card)

What is your soil nitrate from the subsoil sample? _____ (ppm)
(from Field Information Card)

Step 4: Estimate Soil Nitrate N Credit using Tables 2-5.

Use the tables on the following pages to estimate your soil nitrate N credit. First find the correct table that has the same depth range of surface and subsoil samples as your depths listed above. Next, using the correct table, find the column that best matches the soil nitrate value from the surface sample. Then find the row that best matches the subsoil nitrate value. Lastly, find the intersecting value in the chart that represents the soil nitrate N credit in lbs per acre.

_____ (lbs/ac)
Soil Nitrate N Credit

Using the dry erase marker, add the Soil Nitrate N Credit amount to the Field Info Card.

Discuss amongst your group and place the soil nitrate N credit card on the map if you feel comfortable taking this nitrogen credit.

Table 2.

Soil Nitrate with 0-8" and 8-36" Samples (lbs/acre)

Shallow Soil Sample ppm (0-8")

Deep Sample ppm (8" TO 36")	Shallow Soil Sample ppm (0-8")														
	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28
0	0	8	11	14	17	19	22	25	28	31	34	36	39	42	45
2	15	17	20	23	26	29	31	34	37	40	43	46	48	51	54
4	24	27	30	32	35	38	41	44	47	49	52	55	58	61	64
6	34	36	39	42	45	48	50	53	56	59	62	65	67	70	73
8	43	46	49	51	54	57	60	63	66	68	71	74	77	80	83
10	53	55	58	61	64	67	70	72	75	78	81	84	87	89	92
12	62	65	68	70	73	76	79	82	85	88	90	93	96	99	102
14	72	74	77	80	83	86	89	91	94	97	100	103	106	108	111
16	81	84	87	90	92	95	98	101	104	107	109	112	115	118	121
18	91	94	96	99	102	105	108	110	113	116	119	122	125	127	130
20	100	103	106	109	112	114	117	120	123	126	129	131	134	137	140
22	110	113	115	118	121	122	127	130	132	135	138	141	144	147	149
24	119	122	125	128	131	133	136	139	142	145	148	150	153	156	159
26	129	132	134	137	140	143	146	149	151	154	157	160	163	166	168
28	138	141	144	147	150	152	155	158	161	164	167	169	172	175	178

Table 3.

Soil Nitrate with 0-8" and 8-24" Samples (lbs/acre)

Shallow Soil Sample ppm (0-8")

Deep Sample ppm (8" TO 24")	Shallow Soil Sample ppm (0-8")														
	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28
0	0	13	16	18	21	24	27	30	33	35	38	41	44	47	50
2	15	18	21	24	26	29	32	35	38	41	43	46	49	52	55
4	21	23	26	29	32	35	38	40	43	46	49	52	55	57	60
6	26	29	32	35	37	40	43	46	49	52	54	57	60	63	66
8	32	34	37	40	43	46	49	51	54	57	60	63	65	68	71
10	37	40	43	45	48	51	54	57	60	62	65	68	71	74	77
12	43	45	48	51	54	57	59	62	65	68	71	74	76	79	82
14	48	51	54	56	59	62	65	68	71	73	76	79	82	85	87
16	53	56	59	62	65	67	70	73	76	79	82	84	87	90	93
18	59	62	64	67	70	73	76	79	81	84	87	90	93	96	98
20	64	67	70	73	76	78	81	84	87	90	93	95	98	101	104
22	70	72	75	78	81	84	87	89	92	95	98	101	104	106	109
24	75	78	81	84	86	89	92	95	98	101	103	106	109	112	115
26	81	83	86	89	92	95	98	100	103	106	109	112	115	117	120
28	86	89	92	94	97	100	103	106	109	111	114	117	120	123	126

Table 4.

Soil Nitrate with 0-10" and 10-24" Samples (lbs/acre)

Shallow Soil Sample ppm (0-10")

ppm	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28
0	0	14	17	21	24	28	31	35	38	42	45	48	52	55	59
2	15	18	22	25	29	32	36	39	43	46	50	53	57	60	64
4	19	23	26	30	33	37	40	44	48	51	55	58	62	65	69
6	24	28	31	35	38	42	45	49	52	56	59	63	66	70	74
8	29	32	36	39	43	46	50	54	57	61	64	67	71	75	78
10	34	37	41	44	48	51	55	58	62	65	69	72	76	80	83
12	39	42	45	49	52	56	60	63	66	70	74	77	81	84	88
14	43	47	50	54	57	61	64	68	71	75	78	82	86	89	93
16	48	51	55	58	62	66	69	73	76	80	83	87	90	94	97
18	53	56	60	63	67	70	74	77	81	84	88	92	95	99	102
20	58	61	64	68	72	75	79	82	86	89	93	96	100	103	107
22	62	66	69	73	76	80	83	87	90	94	98	101	105	108	112
24	67	70	74	78	81	85	88	92	95	99	102	106	109	113	116
26	72	75	79	82	86	89	93	96	100	104	107	111	114	118	121
28	77	80	84	87	91	94	98	101	105	108	112	115	119	122	126

Table 5.

Soil Nitrate with 0-10" and 10-36" Samples (lbs/acre)

Shallow Soil Sample ppm (0-10")

ppm	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28
0	0	9	12	16	19	23	27	30	34	37	41	44	48	51	55
2	14	17	21	24	28	31	35	38	42	46	49	53	56	60	63
4	23	26	30	33	37	40	44	47	51	54	58	61	65	69	72
6	32	35	39	42	46	49	53	56	60	63	67	70	74	77	81
8	40	44	47	51	54	58	62	65	69	72	76	79	83	86	90
10	49	53	56	60	63	67	70	74	77	81	85	88	92	95	99
12	58	62	65	69	72	76	79	83	86	90	93	97	100	104	108
14	67	70	74	77	81	85	88	92	95	99	102	106	109	113	116
16	76	79	83	86	90	93	97	100	104	108	111	115	118	122	125
18	85	88	92	95	99	102	106	109	113	116	120	123	127	131	134
20	94	97	100	104	108	111	115	118	122	125	129	132	136	139	143
22	102	106	109	113	116	120	123	127	131	134	138	141	145	148	152
24	111	115	118	122	125	129	132	136	139	143	146	150	154	157	161
26	120	123	127	131	134	138	141	145	148	152	155	159	162	166	169
28	129	132	136	139	143	147	150	154	157	161	164	168	171	175	178

Credits Worksheet – Other Credits

Step 5: Identify your Previous Crop N Credit

Use Table 1 below to identify the nitrogen credit as determined by the previous crop and soil texture for your field as shown on the Field Information Card.

_____ (lbs/ac)
Previous Crop N Credit

Using the dry erase marker, add the Previous Crop N Credit amount to the Field Info Card.

Then, discuss amongst your group and place the previous crop N credit card on the map if you feel comfortable taking this nitrogen credit.

Table 1.

Previous Crop N Credit (lbs/acre)			
Previous crop	Soil Texture		
	Med./Fine	Sandy	
Corn	0	0	Corn, other non-legumes
Soybean	45	30	Soybean
Alfalfa >70*	150	100	Alfalfa 70-100% stand
Alfalfa 30-69*	120	70	Alfalfa 30-69% stand
Alfalfa 0-29*	90	40	Alfalfa 0-29% stand
Clover >70*	120	80	Clover 70-100 % stand
Clover 30-69*	95	55	Clover 30-69% stand
Clover 0-29*	70	30	Clover 0-29% stand
Dry bean	25	25	Dry beans
Sugar Beet	50	50	Sugar beet

* Identify this based on what you would do on your own farm.

Step 6: Calculate your Irrigation Water N Credit.

If you have an irrigated field, find the required information from the field information card and previous calculations, and perform the needed calculations below. If your field is dryland/rainfed you do not need to do this step.

What is your water nitrate level? _____ (ppm)
 (from Field Information Card)

What is your average irrigation applied? _____ (inches)
 (from Step 9 of the Field Information Worksheet)



for Group Discussion

Continue calculations on next page

Based on discussion, determine how much of the average irrigation applied you are going to use for the irrigation water N credit.

What is your estimated irrigation? _____ (inches)

To calculate your Irrigation Water N Credit, use the formula:

Irrigation Water N Credit (lbs/ac) = Estimated Irrigation (inches) x 0.227 x Water Nitrate Level (ppm)

$$\frac{\text{Estimated Irrigation (from above)}}{\text{(inches)}} \times 0.227 \times \frac{\text{Water Nitrate Level (from previous page)}}{\text{(ppm)}} = \frac{\text{Irrigation Water Credit N}}{\text{(lbs/ac)}}$$

You can compare your results to Table 2 below to check your math.

Table 2.

IRRIGATION WATER CREDIT					
Nitrate in water (ppm)	5	10	15	20	25
Water Applied (inches/acre)	Pounds of Nitrogen Added Per Acre with Irrigation Water				
2.5	3	6	9	11	14
5	6	11	17	23	28
7.5	9	17	26	34	43
10	11	23	34	45	57
12.5	14	28	43	57	71
15	17	34	51	68	85
20	23	45	68	91	114

Using the dry erase marker, add the Irrigation Water N Credit amount to the Field Info Card.

Then, discuss amongst your group and place the Irrigation Water N Credit card on the map if you feel comfortable taking this nitrogen credit.

-----Credits Worksheet – Manure Credit-----

For this example, we're going to assume that we're using manure from a small cow/calf operation that uses bedding occasionally. The manure analysis report for that manure is in the Field History sheet. However, to simplify this activity, the needed values have been filled in or highlighted on your worksheet already. We will be applying manure before planting at a rate of 15 tons/acre and not incorporating the manure.

Step 7. Determine the Ammonium N Available THIS YEAR from the manure by using the below formula and Table 1.

$$\text{Ammonium N Available} = \text{Availability factor} \times \text{As Is Basis Ammonium N in sample (lbs/ton)}$$

$$\frac{\text{_____}}{\text{(Highlighted in Table 1)}} \times 0.10 \text{ (lbs/ton)} = \frac{\text{_____}}{\text{Ammonium N Available}} \text{ (lbs/ton)}$$

Table 1. Fraction of ammonium nitrogen available this year.

<i>Sidedress Application</i>			
Injected			0.95
Sprinkler Irrigated			0.80 (if > 0.4" applied) or 0.40 (if ≤ 0.4" applied)
<i>Preplant Application and Not Incorporated</i>			
Surface - spring or fall			0.00
<i>Preplant Application and Incorporated</i>			
	<i>Solid</i>	<i>Liquid Applied When Air Temp > 50°F</i>	<i>Liquid Applied When Air Temp ≤ 50°F</i>
Immediately	0.95	0.95	0.95
One day later	0.50	0.70	0.70
Two days later	0.25	0.45	0.55
Three days later	0.15	0.25	0.45
Seven or more days later	0.00	0.00	0.40

Step 8. Determine the Organic N Available THIS YEAR from the manure by using the below formula and Table 2 on the next page.

$$\text{Organic N Available} = \text{Availability factor} \times \text{As Is Basis Organic N in sample (lbs/ton)}$$

$$\frac{\text{_____}}{\text{(Highlighted in Table 2)}} \times 13.7 \text{ (lbs/ton)} = \frac{\text{_____}}{\text{Organic N Available}} \text{ (lbs/ton)}$$

Step 9. Add the Ammonium N Available and the Organic N Available to get Total N Available THIS YEAR.

$$\text{Total N Available this year} = \text{Ammonium N Available} + \text{Organic N available}$$

$$\frac{\text{_____}}{\text{Ammonium N Available
(from Step 7 above)}} \text{ (lbs/ton)} + \frac{\text{_____}}{\text{Organic N Available
(from Step 8 above)}} \text{ (lbs/ton)} = \frac{\text{_____}}{\text{Total N Available THIS YEAR}} \text{ (lbs/ton)}$$

Step 10. Multiply the Total N Available THIS YEAR by the application rate to get a Manure N Credit for this year.

$$\text{Manure N Credit (lbs/acre)} = \text{Total N Available} \times \text{Application Rate}$$

$$= \frac{\text{_____}}{\text{Total N Available THIS YEAR
(from Step 9 above)}} \text{ lbs/ton} \times 15 \text{ tons/ac} = \frac{\text{_____}}{\text{Manure N Credit}} \text{ (lbs/acre)}$$

Table 2. Fraction of organic nitrogen available this year.

<i>Beef/Dairy Manure</i>	
Solid or stored liquid	0.40
Composted feedlot	0.15
<i>Poultry Manure</i>	
Layers with no bedding	0.45
All other poultry	0.40
<i>Swine Manure</i>	0.40

Using the dry erase marker, add the Manure N Credit amount to the Field Info Card.

Discuss amongst your group and place the manure credit card on the map if you feel comfortable taking this nitrogen credit.

To Download an Excel Spreadsheet copy of the
UNL N Calculator, go to:

<https://go.unl.edu/2021ncalc>

