Developing an Efficient Fertility System for High No-Till Yields and Profitability

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Management Goals to Achieve High Yields in No-Till Systems

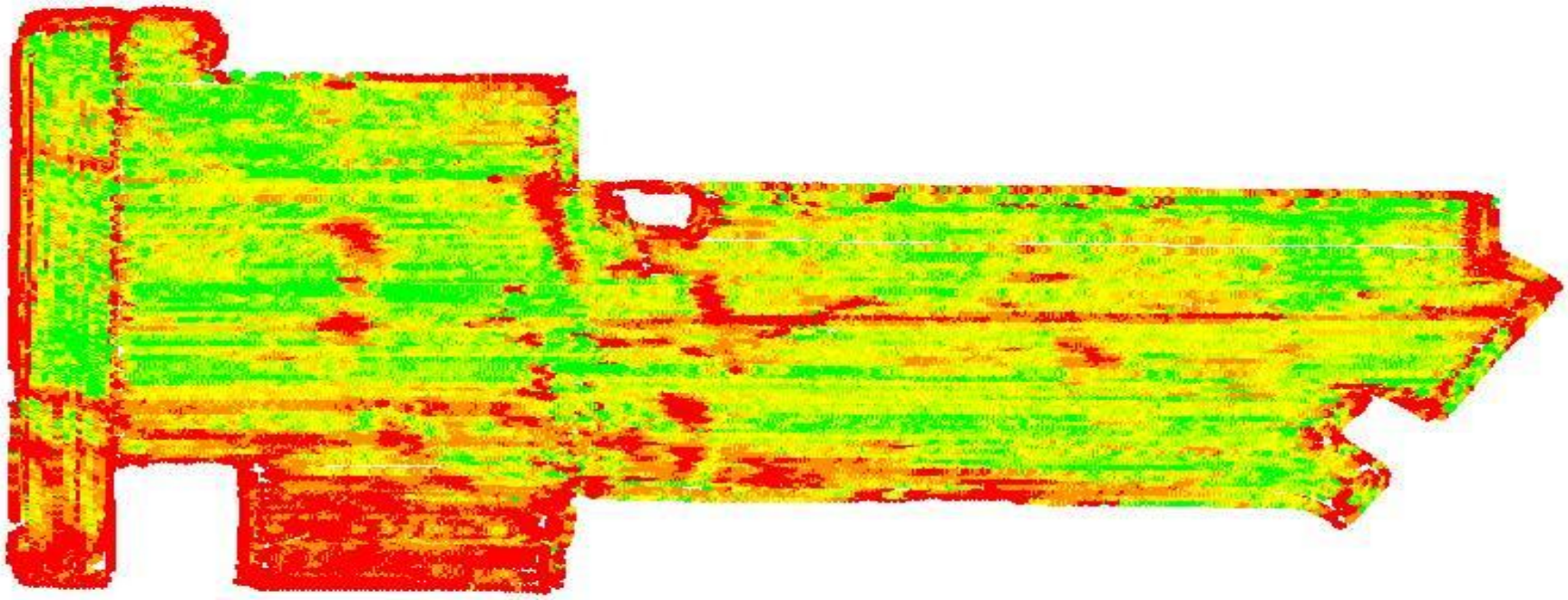
- *Residue Management*
- *Seed and Starter Placement*
- *Fertilizer Placement, Sources and Timing*
- *Hybrid and Variety Selection*
- *Optimum Row Spacing and Population*

Precision Farming Opportunities in No-Till Systems

- *Guidance*
  - *Enhanced Seed Placement*
  - *Enhanced Nutrient Placement*
  - *Improved Field Efficiency*
- *Yield Monitoring*
  - *Measure Yield by Hybrid/Variety and Pixel*
  - *Measure Soil Types and Nutrients by Pixel*
- *Variable Rate Application*
  - *Apply Nutrients and Seed by Pixel*
  - *Improve Efficiency & Profitability by Pixel*


DAWN
DAWN

Measure Yields




DGPS
Run 1
0
26.4 ft
30.0
Groundspeed
4.3 mph
Moisture, Avg
12.2 %
Grower
JBL
Farm
BUSH
Yield, Dry
72 bu/ac
Yield, Avg-Dry
59 bu/ac
Field
NORTH
Moisture
10.9 %
Bushels, Wet
2577 bu
Task
15/10/10-12:44:25
Flow, Dry
960 bu/h
Flow, Avg-Dry
787 bu/h
Crop Type
Beans-Soybean
Area
43.44 ac
Weight, Wet
154623 lb
Temperature
68 °F
Oct 10, 2015
5:21 pm
Back
Run1
Run2
Run3
Run4
Run5
Run6

2007 Corn Plot

Leverich Farms

Extremely Dry in July and Early August

				Rep 1		Rep 2		Rep 3		Average		
Brand	**Hybrid**	**Mat**		**Yield**	**Moist**	**Yield**	**Moist**	**Yield**	**Moist**	**Yield**	**Moist**	**Field Data**
Carharts	1889 RR	90		105.9	13.6	127.4	13.0	116.8	16.0	116.7	14.2	*Spread Fert April 16th*
Croplan	314 TS	92		115.5	14.4	131.3	13.3	144.3	13.5	130.3	13.7	*100 lb Potash*
Carharts	1857 RB	90		108.4	14.3	121.1	13.1	139.6	13.7	123.0	13.7	*100 lb AMS*
Carharts	1995 VT3	95		110.6	13.8	147.0	12.7	137.3	12.7	131.6	13.1	
Carharts	1956 RR	95		105.9	14.1	119.4	13.1	132.5	13.4	119.3	13.5	*Applied N on April 21st*
Croplan	364TS	96		121.5	14.4	139.3	13.6	153.1	13.7	138.0	13.9	*Anhydous Ammonia*
Croplan	3688 RB	96		125.6	14.1	166.1	13.6	164.5	13.4	152.1	13.7	*135 lb Nitrogen*
Croplan	3456 RB	96		135.8	14.6	159.3	13.6	150.3	13.7	148.4	14.0	
Midwest	69704 VT3	97		141.6	14.3	168.6	13.6	147.6	13.5	152.6	13.8	*Planted April 28th*
Pioneer	37Y13 RR	97		128.5	17.8	162.5	16.1	135.8	16.5	142.3	16.8	*Pop 31600 in 20" Rows*
Dairyland	9497 TS	97		129.5	14.6	129.1	13.8	131.9	14.0	130.2	14.1	*Popup 9 gal 10-34-0*
Dairyland	7196 RB	97		135.3	14.1	150.1	13.6	148.6	13.7	144.7	13.8	
Croplan	3824 TS	98		135.8	14.0	145.0	14.2	132.6	14.5	137.8	14.2	*Sprayed May 21st*
Midwest	69802	98		148.4	14.4	164.5	14.1	143.5	13.9	152.1	14.1	*1 qt Glyphosate*
Croplan	388 RRBT	99		153.5	12.6	177.0	14.1	168.6	13.7	166.4	13.5	*.75 qt Atrazine*
Pioneer	37F75	99		146.4	15.9	164.0	16.1	134.5	16.0	148.3	16.0	
Midwest	70103 TS	100		144.6	14.8	174.0	14.8	149.5	14.6	156.0	14.7	*Sprayed June 15th*
Carharts	1100 RB	100		151.5	14.7	173.4	14.5	142.4	14.3	155.8	14.5	*1 1/2 pt Glyphosate*
Carharts	1960 RB	100		136.4	15.2	156.3	15.1	137.1	14.6	143.3	15.0	
Dairyland	9201 TS	100		136.5	15.0	164.5	15.7	131.9	16.0	144.3	15.6	*Harvested Oct 27th*
Carharts	1100 VT3	100		148.5	14.4	156.6	14.2	140.4	14.2	148.5	14.3	
Dekalb	5139 TS	101		183.0	15.0	188.6	14.9	161.6	14.9	177.8	14.9	*Previous Crop*
Dekalb	5240 TS	102		177.0	14.5	170.1	14.3	145.8	14.4	164.3	14.4	*Soybeans on Rep1 & 3*
Dekalb	5259 VT3	102		169.4	15.2	154.0	13.8	149.6	13.9	157.7	14.3	*Corn on Rep 2*

Sheet1 / Sheet2 / Sheet3 /

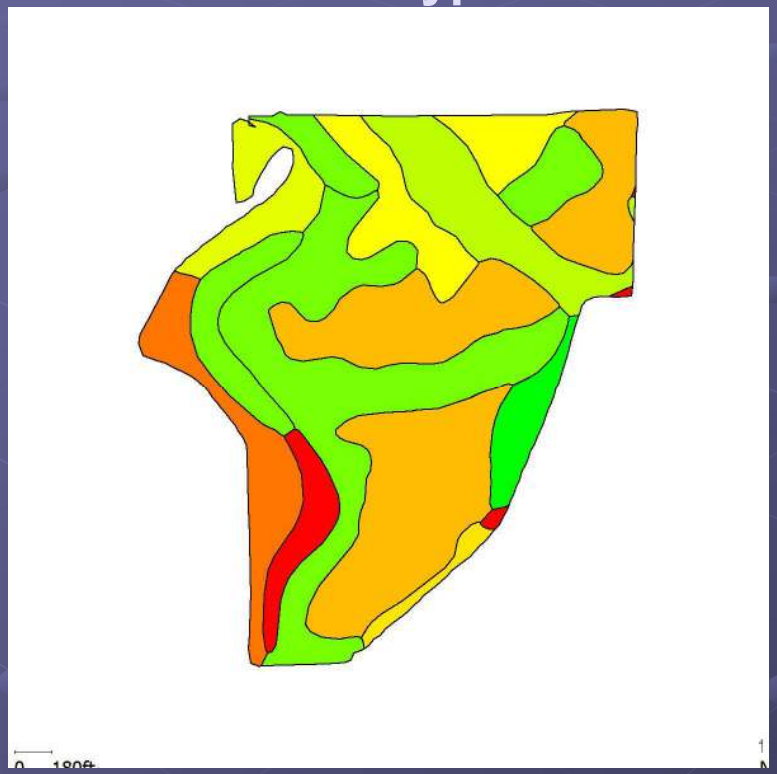
Develop Your Fertility System

- *Soil Types and Textures*
- *Soil Sampling Points and Zones*
- *Fertility Needs and Nutrient Use*
- *Timing and Placement of Nutrients*
- *Equipment and Precision Ag Tools*

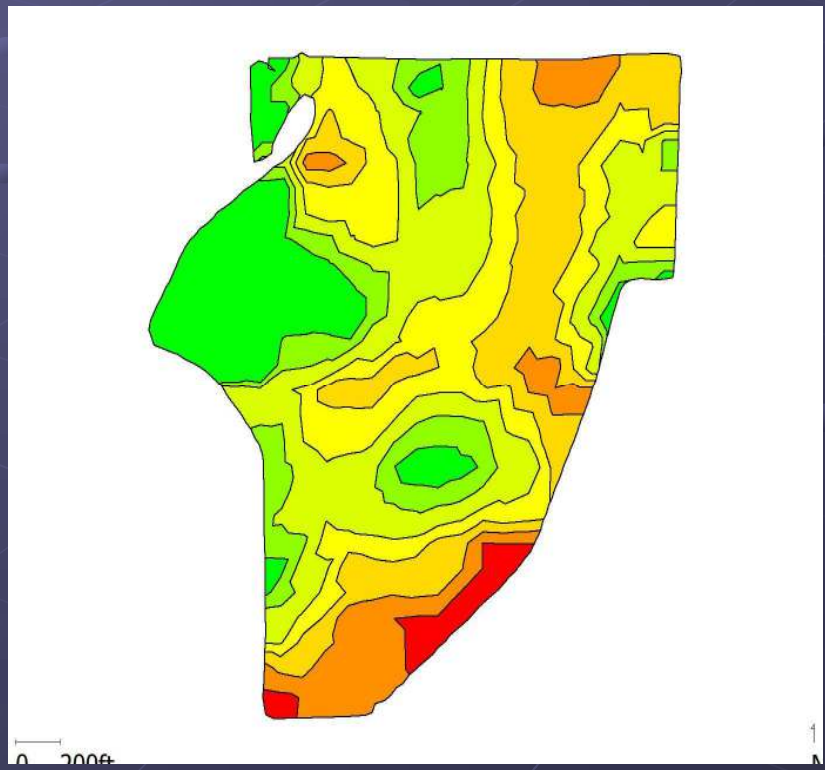

2005
MODEL
FOR MIXOR
MINIMUM
1245

Measure Soil Types and Nutrients

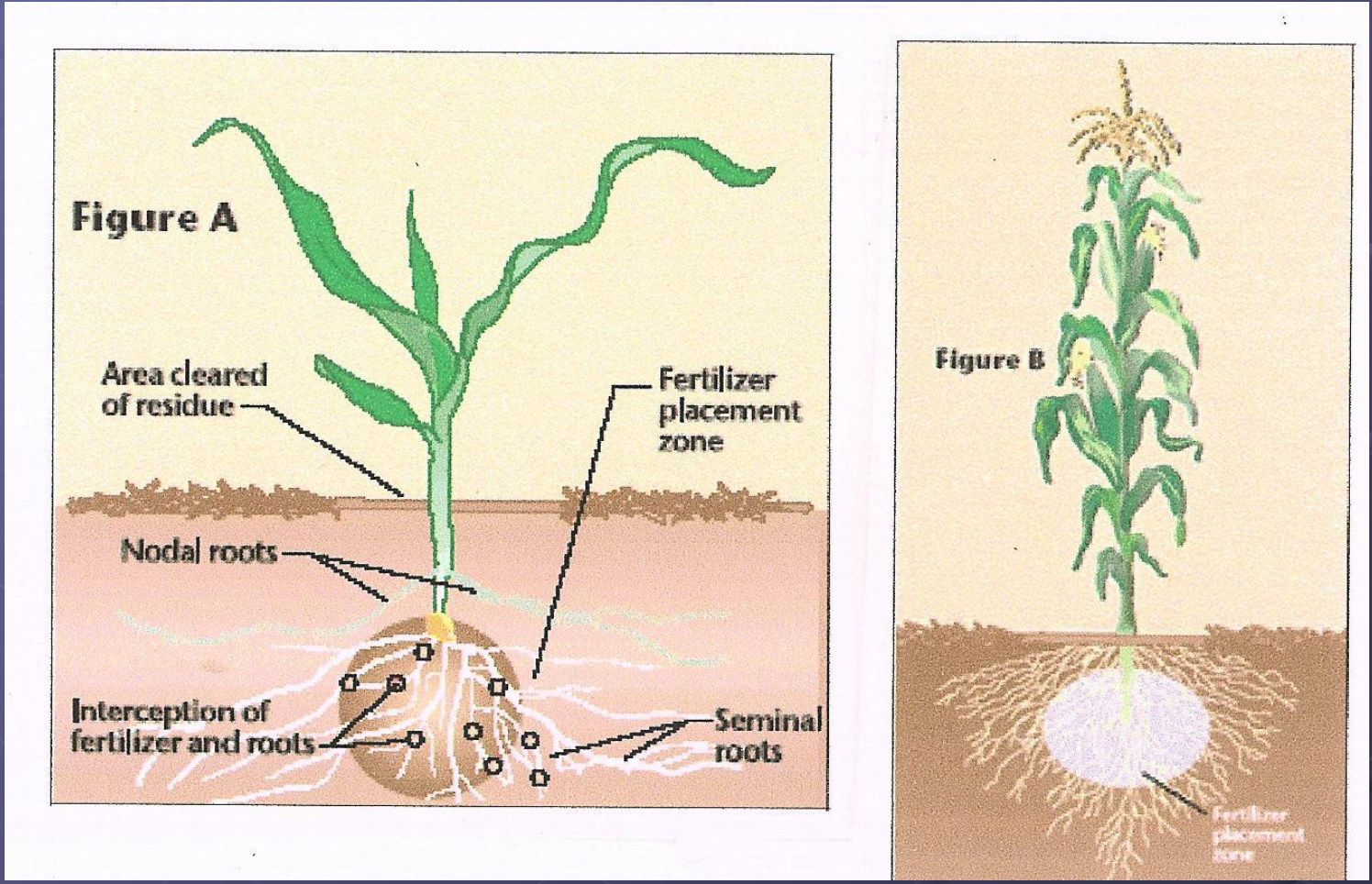
Soil Type



Soil Potassium



Nutrient Placement and Efficiency



Leopold Center Sustainable Agriculture Research Report

Table 1. Yield and early growth of corn as affected by four tillage systems and various fertilization strategies at the Northeast Research Farm.

	Fertilization treatments †					
Tillage	Check	Planter band	Broadcast	B+S	Deep band	D+S
	bu/acre					
Plow	177	174	181	180	173	177
Chisel	185	190	190	190	187	190
Ridge-Till *	169	169	164	174	175	180
No-Till *	177	183	178	189	187	188
Means	177	179	178	183	181	184
	g/plant					
Chisel *	3.47	4.12	4.33	4.38	4.13	4.51
Ridge-Till *	2.82	2.78	3.00	3.18	2.98	3.55
No-Till *	2.43	3.05	2.80	3.26	2.80	3.42
Means	2.91	3.32	3.38	3.61	3.30	3.83

† B+S = broadcast plus planter band, D+S = deep-band plus planter band. Early growth was not measured for the moldboard-plow tillage.

* Statistically significant differences.

Soil Chemical and Physical Characteristics are Foundation for Variable Rate Applications

- *Chemical Properties– Soil Test Info*
- *Physical Attributes- Equally Important*
  - *Texture and Slope*
  - *Water Holding Capacity*
  - *3- Dimensional -Depth & Quality of Soil Layers*

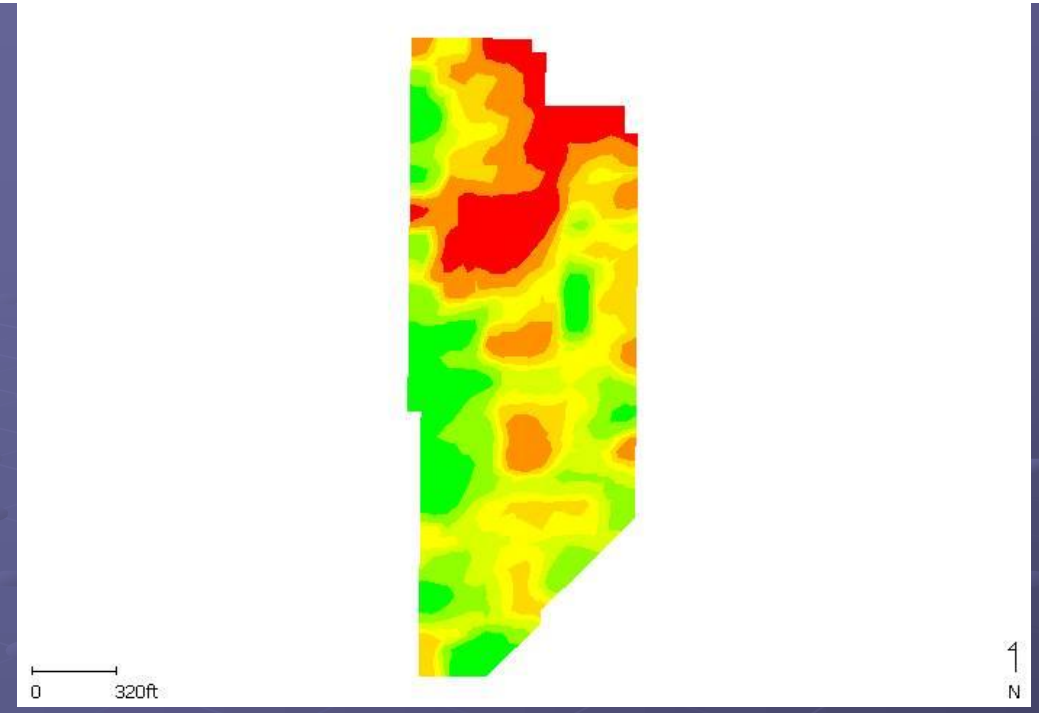
Soil Productivity Information

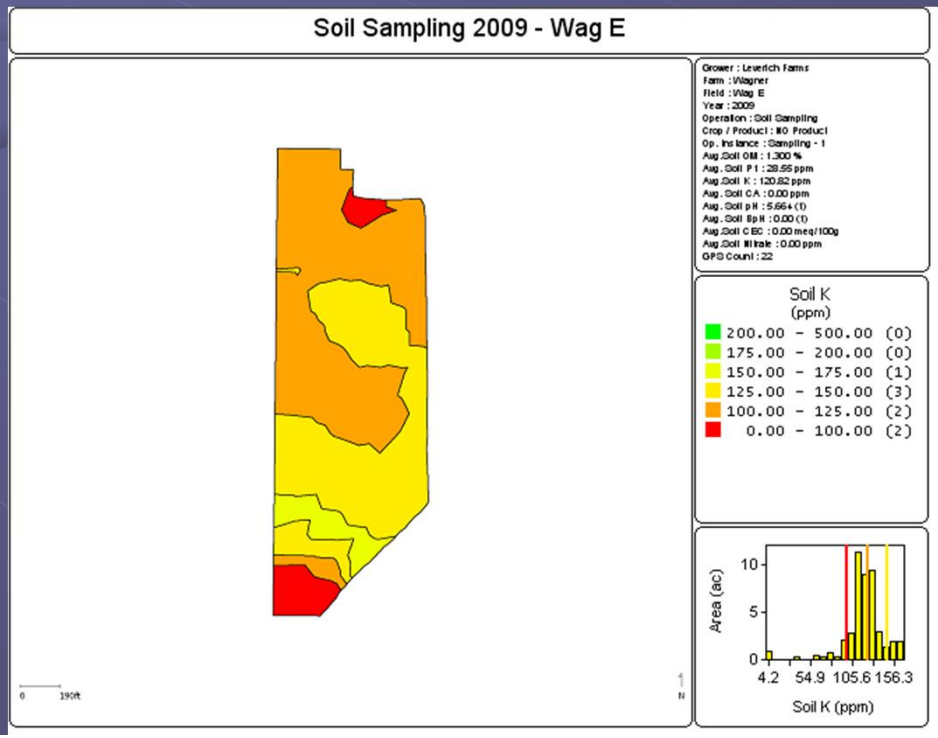
- *Grid or Zone Soil Sampling*
  - *2or 3 Dimensional*
- *Sampling Layer Information*
  - *Soil Type, Topography, and Slope Maps*
    - *NRCS*
    - *Conductivity (veris) or Sonar*
- *Yield Maps*
- *Infra-red Imaging*
    - *Sattelite or drones*
- *Water Holding Capacity*

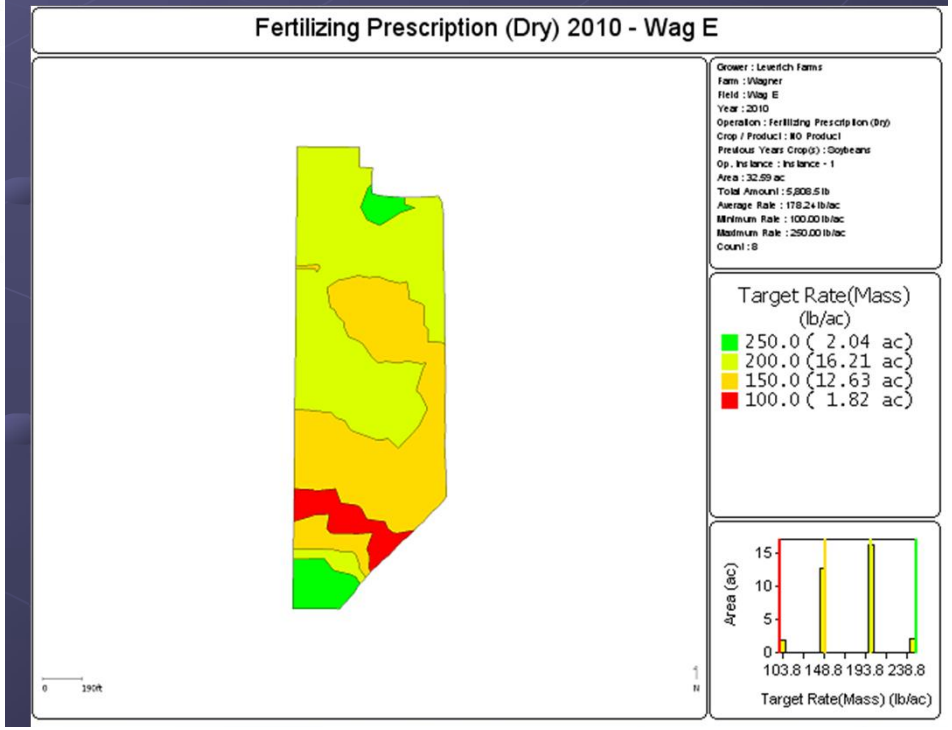
Potassium (K) Soil Test Results with Standard Vs. Grid Sampling on 54-Acre Example Field

Sampling Type	Total	Acres/ Samp	Ave. K Sample	Standard Deviation	Coefficient of Variation	Field K2O lb
Grid	27	2	157	28	57.7	6,000
Standard	7	7.7	157	17	32	5,940

	K2O/Acre	Standard (7 Samples)			Grid (27 Samples)	
Soil Test	K Range	Fert Rec	Samples	%	Samples	%
0-99	V. Low	250	0	0	0	0
100-124	Low	200	0	0	2	7.5%
125-149	Optimum	150	2	28.5%	12	44.3%
150-174	High	100	4	57.1%	7	26.0%
175-199	Very High	50	1	14.3%	3	11.1%
200+	Ext High	0	0	0		11.1%


0
320ft
N

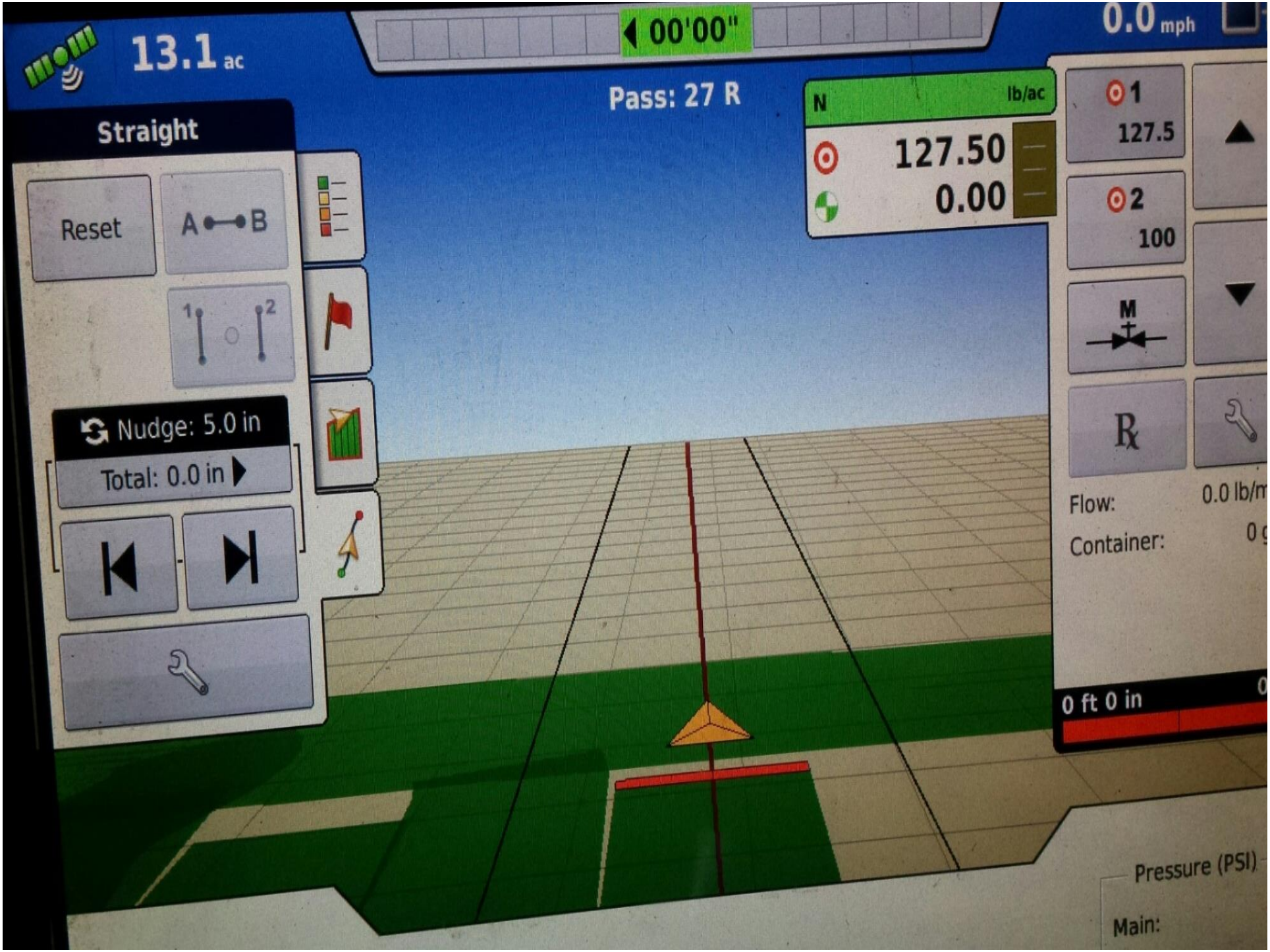

Soil Sampling 2009 - Wag E
Grower : Leverich Farms
Farm : Wagner
Field : Wag E
Year : 2009
Operation : Soil Sampling
Crop / Product : NO Product
Op. Instance : Sampling - 1
Avg.Soil OM : 1.300 %
Avg. Soil P1 : 28.55 ppm
Avg.Soil K : 120.82 ppm
Avg. Soil CA : 0.00 ppm
Avg. Soil pH : 5.664 (1)
Avg. Soil Sp H : 0.00 (1)
Avg.Soil CEC : 0.00 meq/100g
Avg.Soil Nitrate : 0.00 ppm
GPS Count : 22
Soil K
(ppm)
200.00 - 500.00 (0)
175.00 - 200.00 (0)
150.00 - 175.00 (1)
125.00 - 150.00 (3)
100.00 - 125.00 (2)
0.00 - 100.00 (2)
Area (ac)
10
5
0
4.2
54.9
105.6
156.3
Soil K (ppm)
0
190ft
N


Fertilizing Prescription (Dry) 2010 - Wag E
Grower : Leverich Farms
Farm : Wagner
Field : Wag E
Year : 2010
Operation : Fertilizing Prescription (Dry)
Crop / Product : NO Product
Previous Years Crop(s) : Soybeans
Op. Instance : Instance - 1
Area : 32.59 ac
Total Amount : 5,808.5 lb
Average Rate : 178.24 lb/ac
Minimum Rate : 100.00 lb/ac
Maximum Rate : 250.00 lb/ac
Count : 8
Target Rate(Mass)
(lb/ac)
250.0 (2.04 ac)
200.0 (16.21 ac)
150.0 (12.63 ac)
100.0 (1.82 ac)
Area (ac)
15
10
5
0
103.8
148.8
193.8
238.8
Target Rate(Mass) (lb/ac)
0
190ft
N

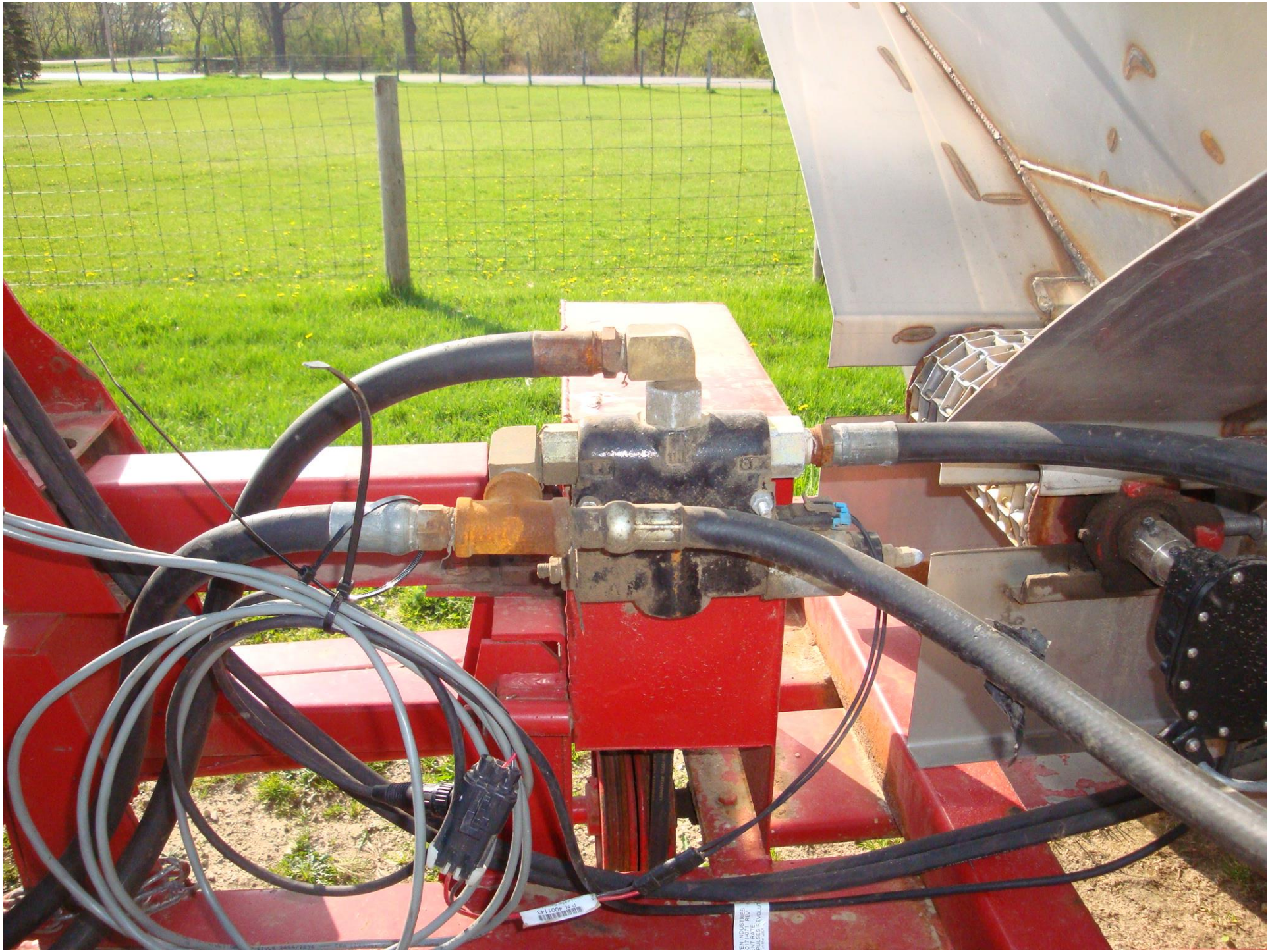
2011-2016 Potassium Program Example

- *Corn Beans Use 120 lb K in 2 years*
  - *Use 100 lb of K in Corn Broadcast*
  - *Variable Rate K in Bean Year to Match tests*
- *Bean Prescription Maps*
  - *0-100 K* — *210 lb K2O*
  - *100-125 K* — *180 lb K2O*
  - *125-150 K* — *150 lb K2O*
  - *150-175 K* — *120 lb K2O*
  - *175-200 K* — *90 lb K2O*
  - *200 -225 K* — *60 lb K2O*
  - *225+ K* — *0 lb K2O*

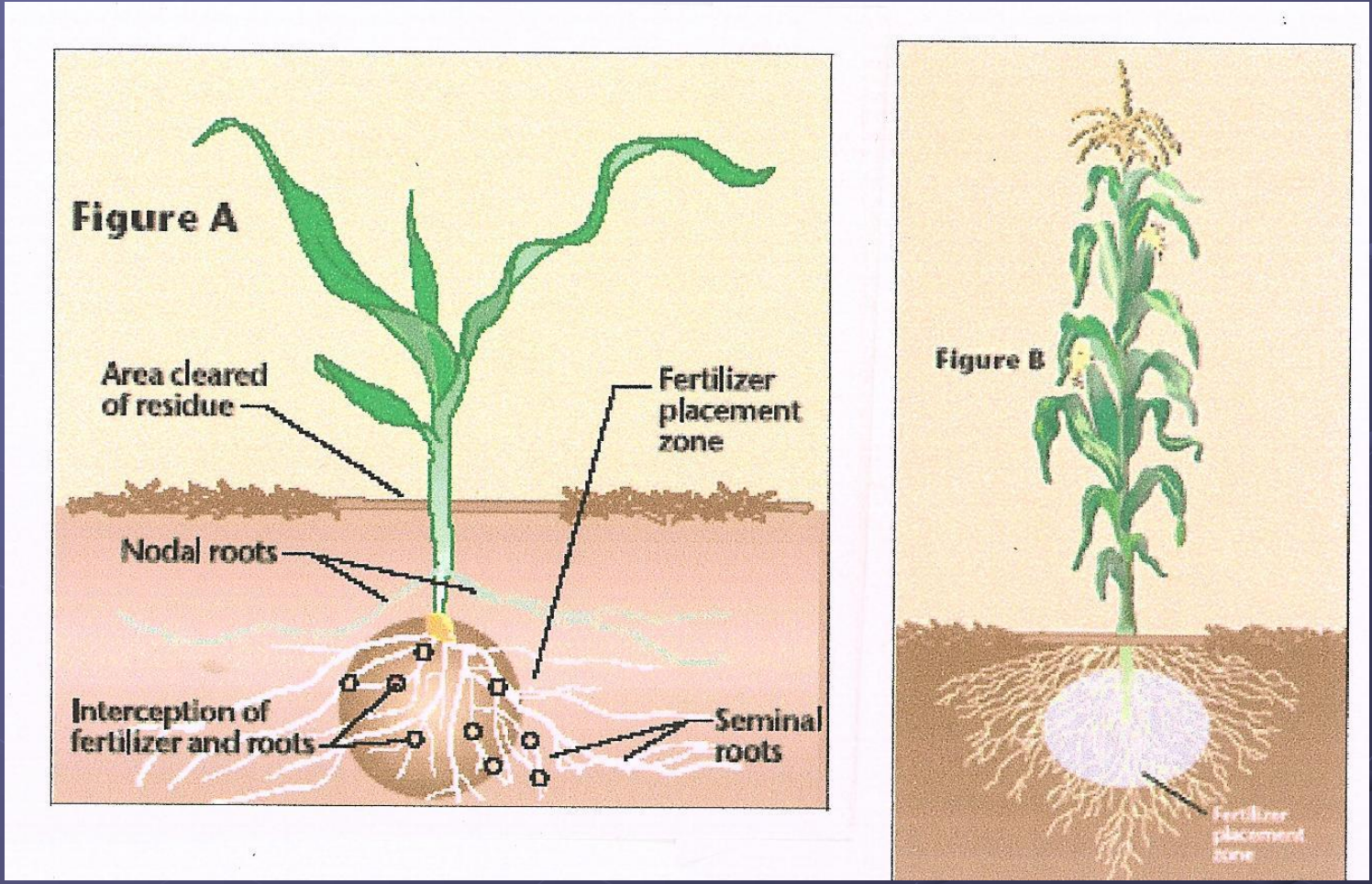

AG-800


13.1 ac
00'00"
0.0 mph
Pass: 27 R
Straight
Reset
A B
Nudge: 5.0 in
Total: 0.0 in
N
lb/ac
127.50
0.00
1
127.5
2
100
M
R
Flow:
0.0 lb/m
Container:
0 ft 0 in
Pressure (PSI)
Main:


CAUTION
BEFORE MOVING UNIT, LUG NUTS MUST BE TIGHTENED SECURELY USING A 15" LUG WRENCH.
RETIGHTEN AFTER TOWING UNIT NO MORE THAN TWO MILES LOADED. RETIGHTEN EVERY 25-50 MILES THEREAFTER DURING THE FIRST WEEK OF OPERATION. CHECK WEEKLY THEREAFTER.
PART NO. 30481 B



Nutrient Placement and Efficiency



Develop Your Fertility System

- *Soil Types and Textures*
- *Soil Sampling Points and Zones*
- *Fertility Needs and Nutrient Use*
- *Timing and Placement of Nutrients*
- *Equipment and Precision Ag Tools*

Starter Placement Options

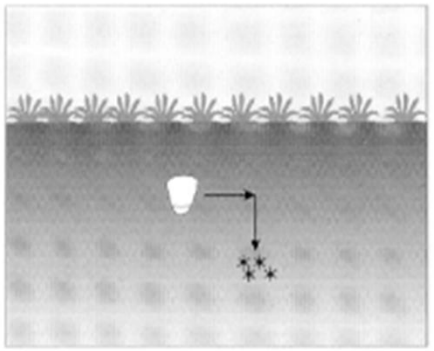


Figure 2a. Two-by-two placement.

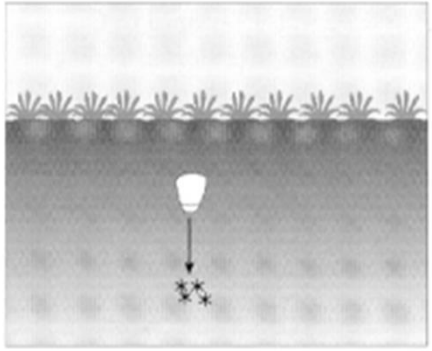


Figure 2b. Below-seed placement.

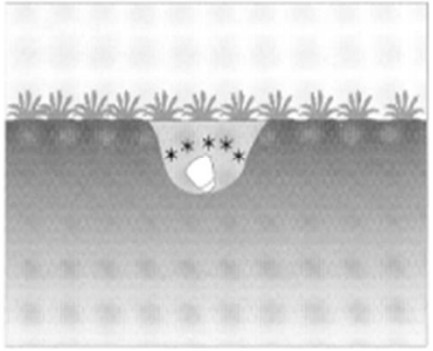


Figure 2c. In-row or "pop-up" placement.

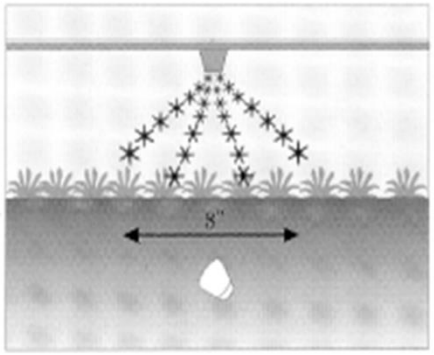


Figure 2d. Over-the-row banding.

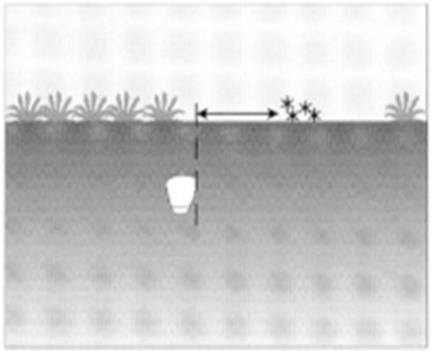


Figure 2e. Surface-dribble placement.

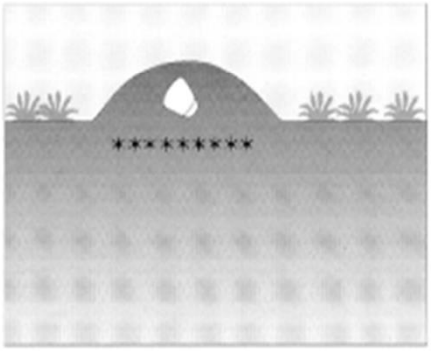


Figure 2f. Banding under the row.

http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-29/

NLAE National Laboratory for Agriculture and the Environment

Corn Grain Yield Response to Starter Placement and Composition (MN)

Trmt	$N+P_2O_5+K_2O+S$	Placement	Source	Yield
	lbs/Acre			bu/A
1	0+0+0+0	None	None	209
2	6+20+0+0	in-furrow	APP	215
4	20+20+6+4	2x0	APP+UAN+KTS	233
5	20+20+6+4	2x2	APP+UAN+KTS	221
10	20+20+10+10	2x0	APP+UAN+KTS+ATS	231
11	20+20+10+10	2x2	APP+UAN+KTS+ATS	224

Randall, 2008

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