40 Years of No-Till

On Farm Research Leading to Success

Jim Leverich, Emeritus
On Farm Research Coordinator
University of Wisconsin

31st Annual
NATIONAL
NO-TILLAGE
CONFERENCE
January 10-13, 2023 • St. Louis, Mo.

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GS3 QUALITY SEED
Martin-Till
aea
wearparts TILLAGE TOOLS Cultivating Solutions for Growth
HELM
Ag Leader
Precision Planting
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Keys to No-Till Success

- *Adopt Precision Farming Technologies*
- *Manage Residue and Seed Placement*
- *Optimum Row Spacing & Population*
- *Fertilizer Sources, Placement and Timing*
- *Hybrid and Variety Selection*
- *Measure to Manage* ***On Farm Research***

Precision Farming Opportunities

Ability to Measure → Measure to Manage

- *Guidance*
  - *Enhanced Seed Placement*
  - *Enhanced Nutrient Placement*
  - *Improved Field Efficiency*
  - *Reduced Compaction*
- *Measurement*
  - *Measure Yield by Pixel*
  - *Measure Soil Types and Nutrients by Pixel*
- *Variable Rate Application*
  - *Apply Nutrients and Seed by Pixel*
  - *Improve Efficiency & Profitability by Pixel*

Never a Wheel on a Row

Keep planter wheels off rows to maximize yields

BY DARRELL SMITH

Research he conducted for the University of Wisconsin (UW) and experience on his own farm convinced Jim Leverich of Sparta, Wis., that 20" corn rows pay off in yield. In a three-year Extension study, he found an 18 bu. per acre yield gain over 30" rows.

Studies conducted by Marion Calmer of Calmer Ag Research in Alpha, Ill., persuaded Leverich that keeping wheel traffic off the row was a key to reaping the yield increase.

So when Leverich decided to build a new planter, keeping wheel traffic off the row was a must. Another—and the reason he built rather than bought—was that he wanted sixteen 20" rows.

The planter that Leverich built applies pop-up fertilizer and no-tills through hefty volumes of corn residue (he sometimes harvests 200 bu. per acre), as long as the stalks are dry. FARM JOURNAL named the machine a $500 winner in the magazine's 2004 "I Built the Best" contest.

PHOTO BY THE AUTHOR

A 16-row, 20" planter built by farmer and Extension researcher Jim Leverich no-tills through heavy residue and never plants in a wheel track.

added a third bar, making a double

cause the carrying wheels are in front


400

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Relative Yield Potential When Narrowing Rows

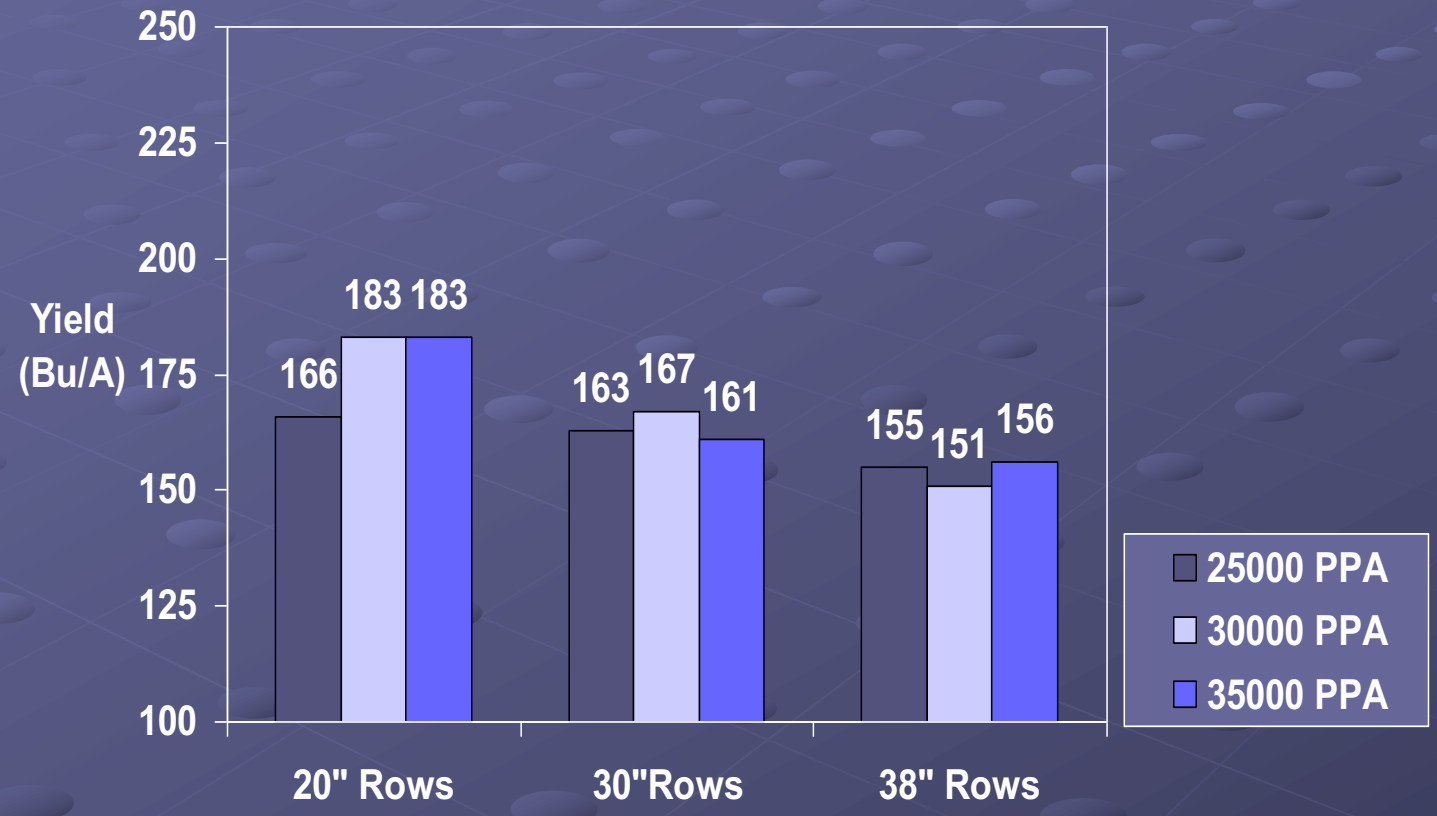
Jim Leverich, On-Farm Research Coordinator
University of Wisconsin

Row Space	38”	30”	20”	15”
Ave Pop/Acre	26000	28000	30000	30000
Yield Range (Bu)	125 to 175	135 to 190	143 to 201	146 to 205
Average Yield (Bu)	150	162	172	175
Ave % Increase		8%	6%	2%
Ave Bu Increase		12 Bu	10 Bu	3 Bu

Leverich: Summary of Midwest and Canadian Research Data
University of Minnesota, University of Illinois, Michigan State University, Ridgetown College of Agricultural Technology, University of Wisconsin, Pioneer International Research Study

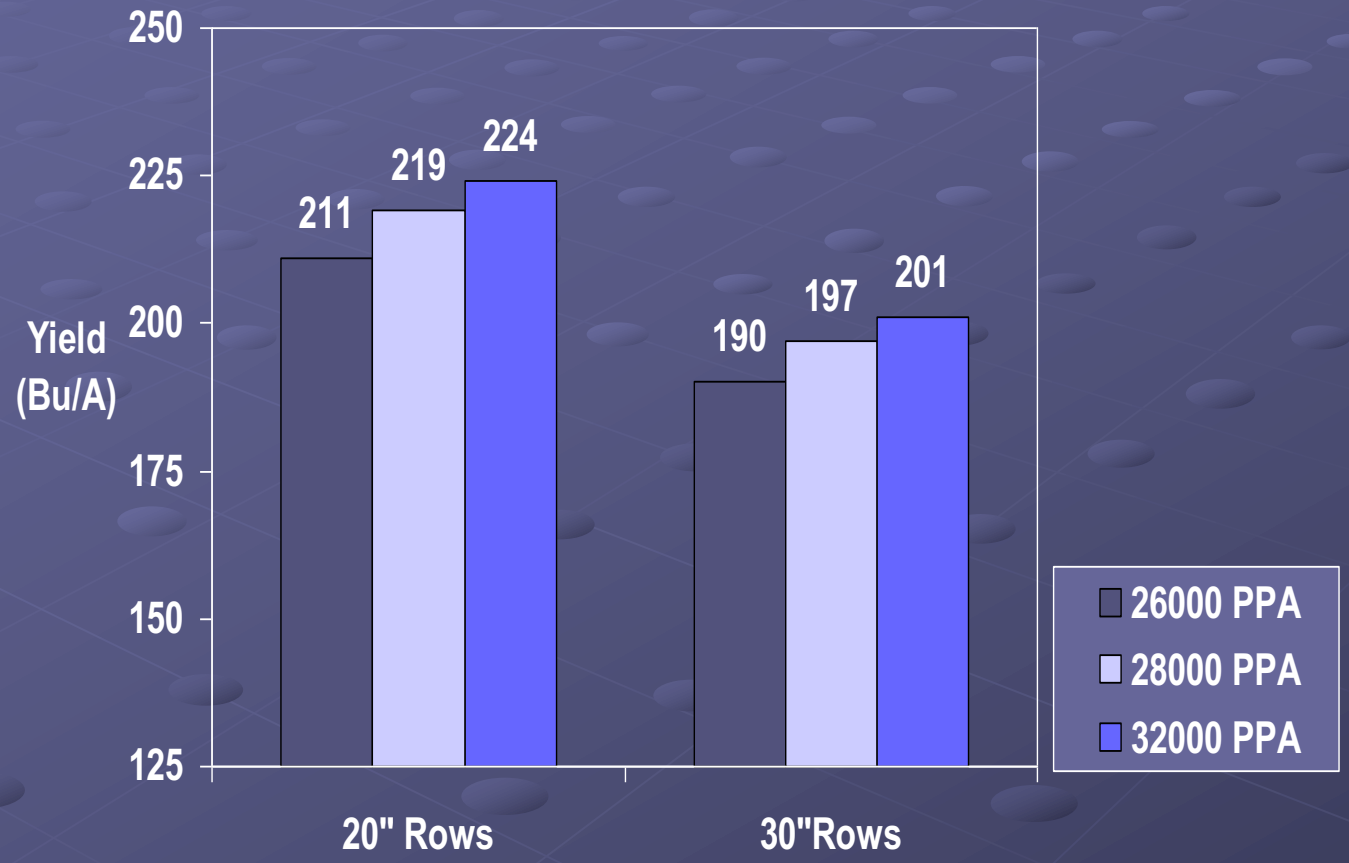
1996 -1998 Grain Row Spacing Research

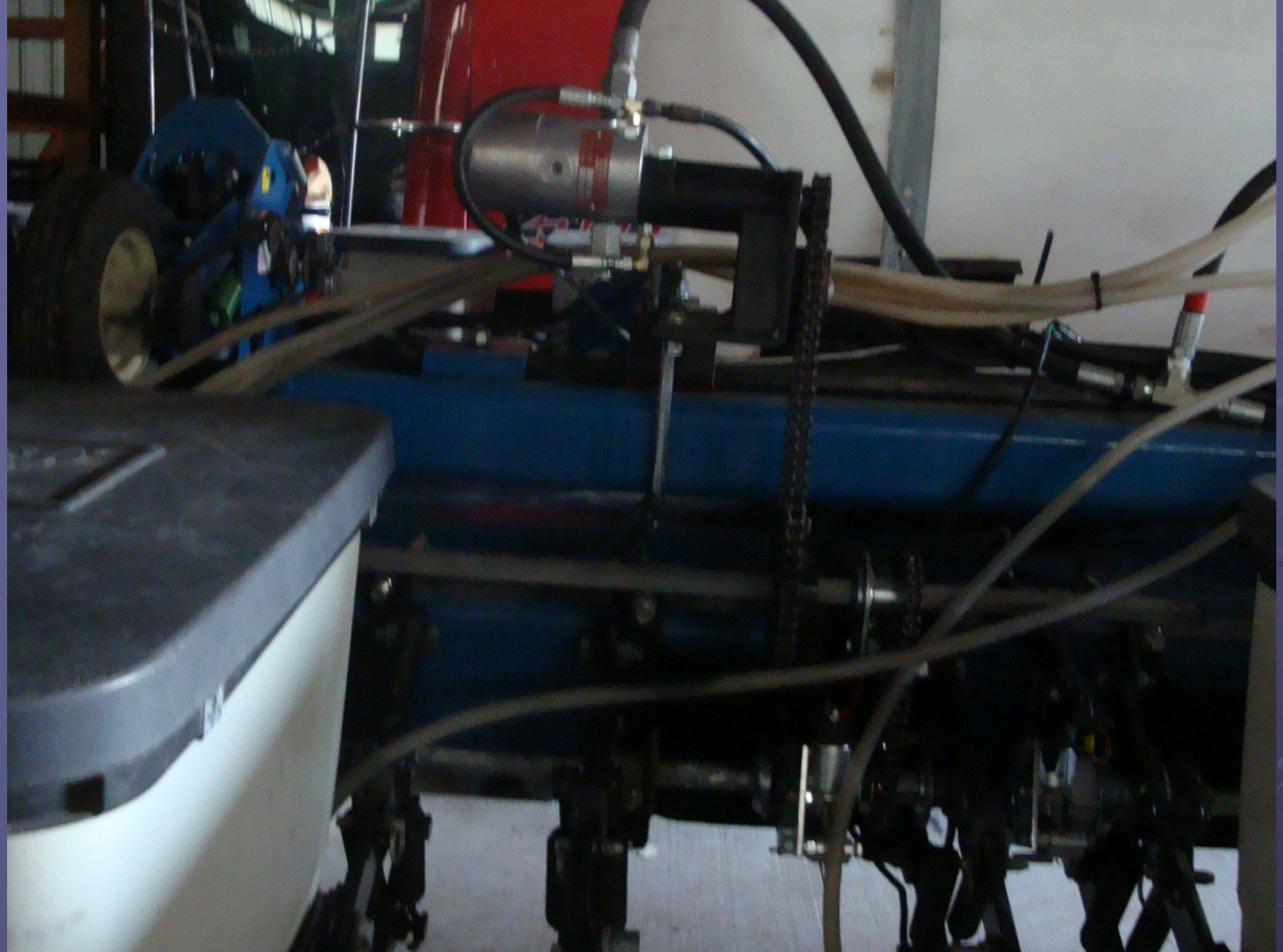
Jim Leverich, University of Wisconsin-Extension
Larry Hopkins, Farm Manager, Monroe County Farm



Corn Row Spacing Research

Jim Leverich, University of Wisconsin-Extension
Larry Hopkins, Farm Manager, Monroe County Farm





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Soil Chemical and Physical Characteristics are Foundation for Variable Rate Applications

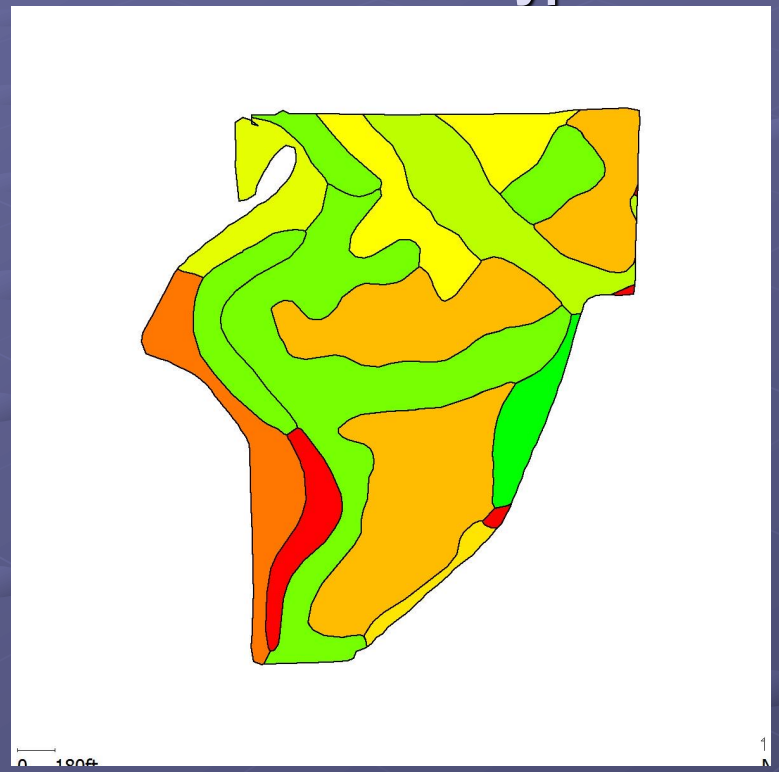
- *Chemical Properties– Soil Test Info*
- *Physical Attributes- Equally Important*
  - *Texture and Slope*
  - *Water Holding Capacity*
  - *3- Dimensional -Depth & Quality of Soil Layers*

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*

Measure Soil Types and Nutrients

Soil Type



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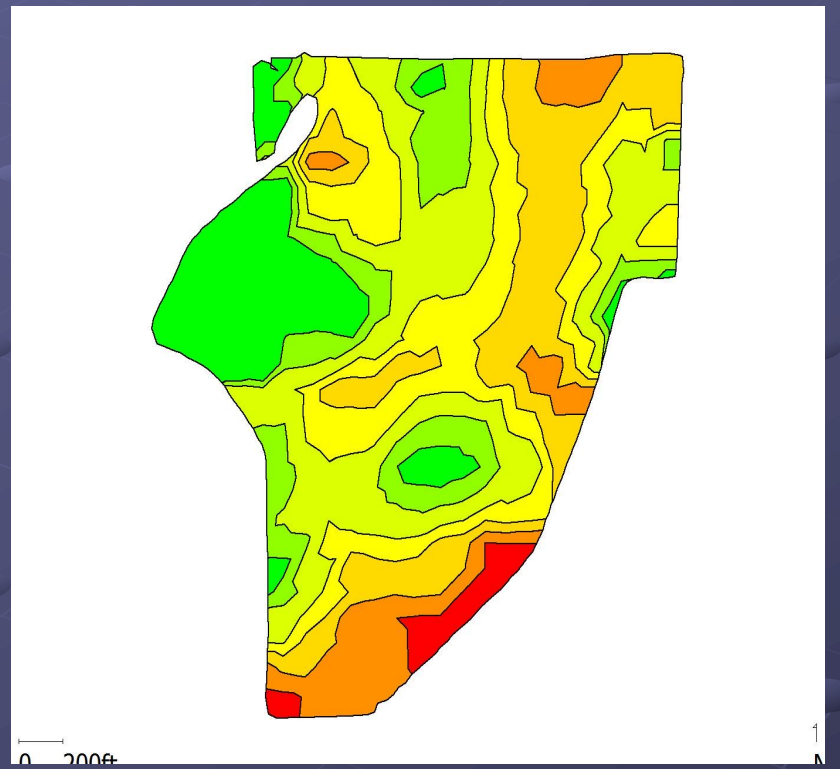
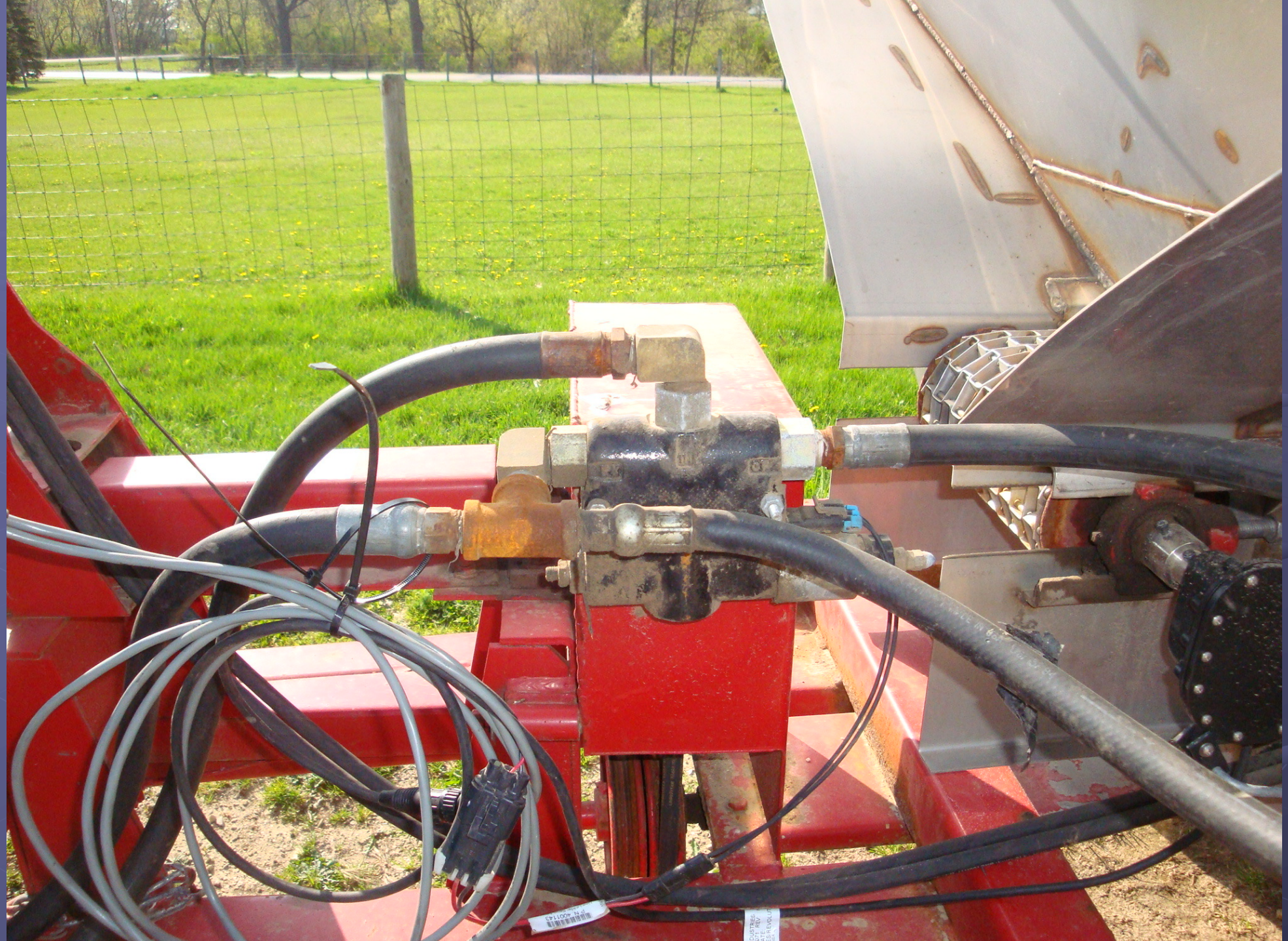
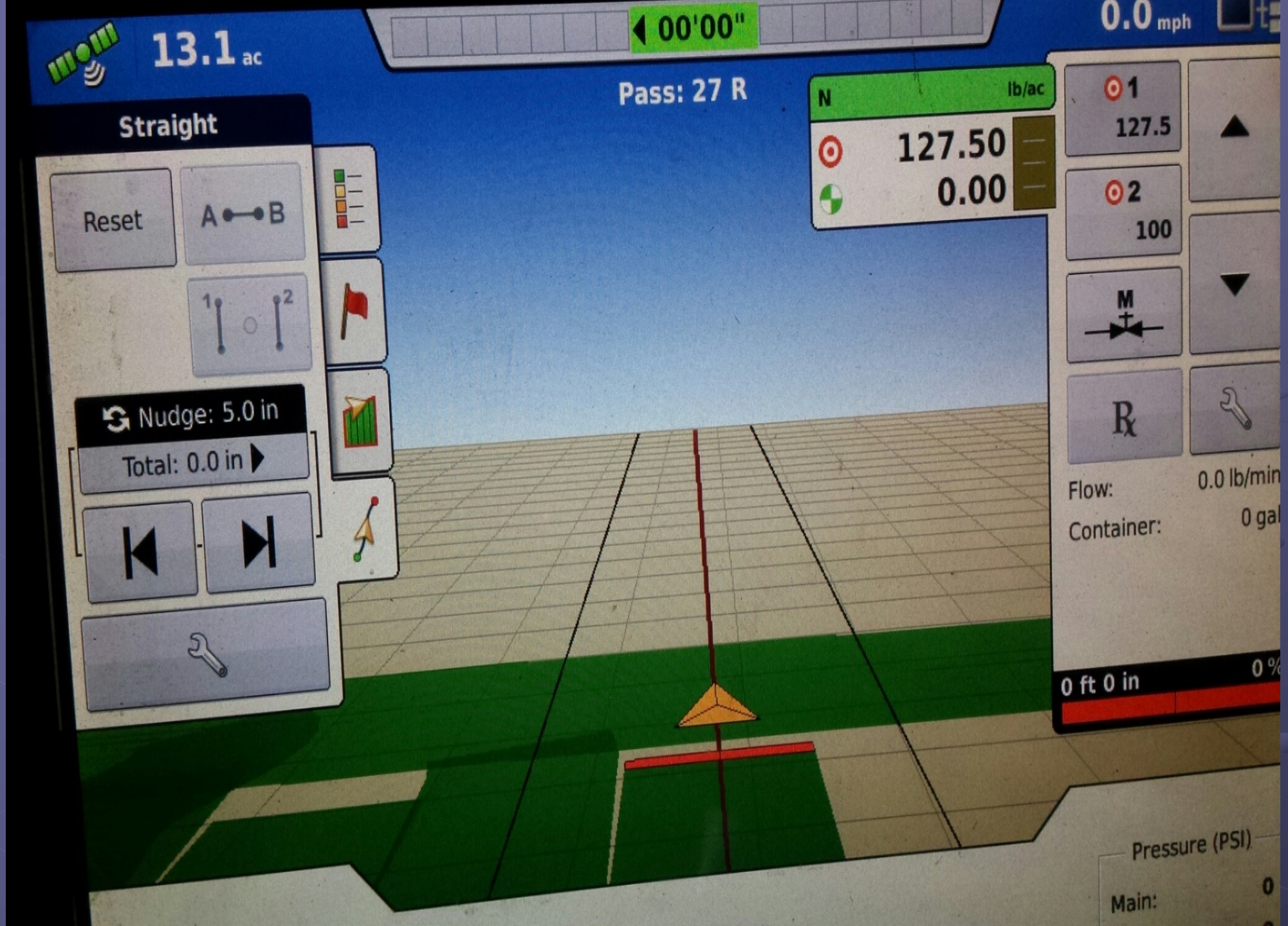


2018 -2022 Potassium Program Example

- *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*




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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Container:
0 gal
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0 %
Pressure (PSI)
Main:
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ANHYDROUS
1005
2
AMMONIA

Leopold Center Sustainable Agriculture Research Report

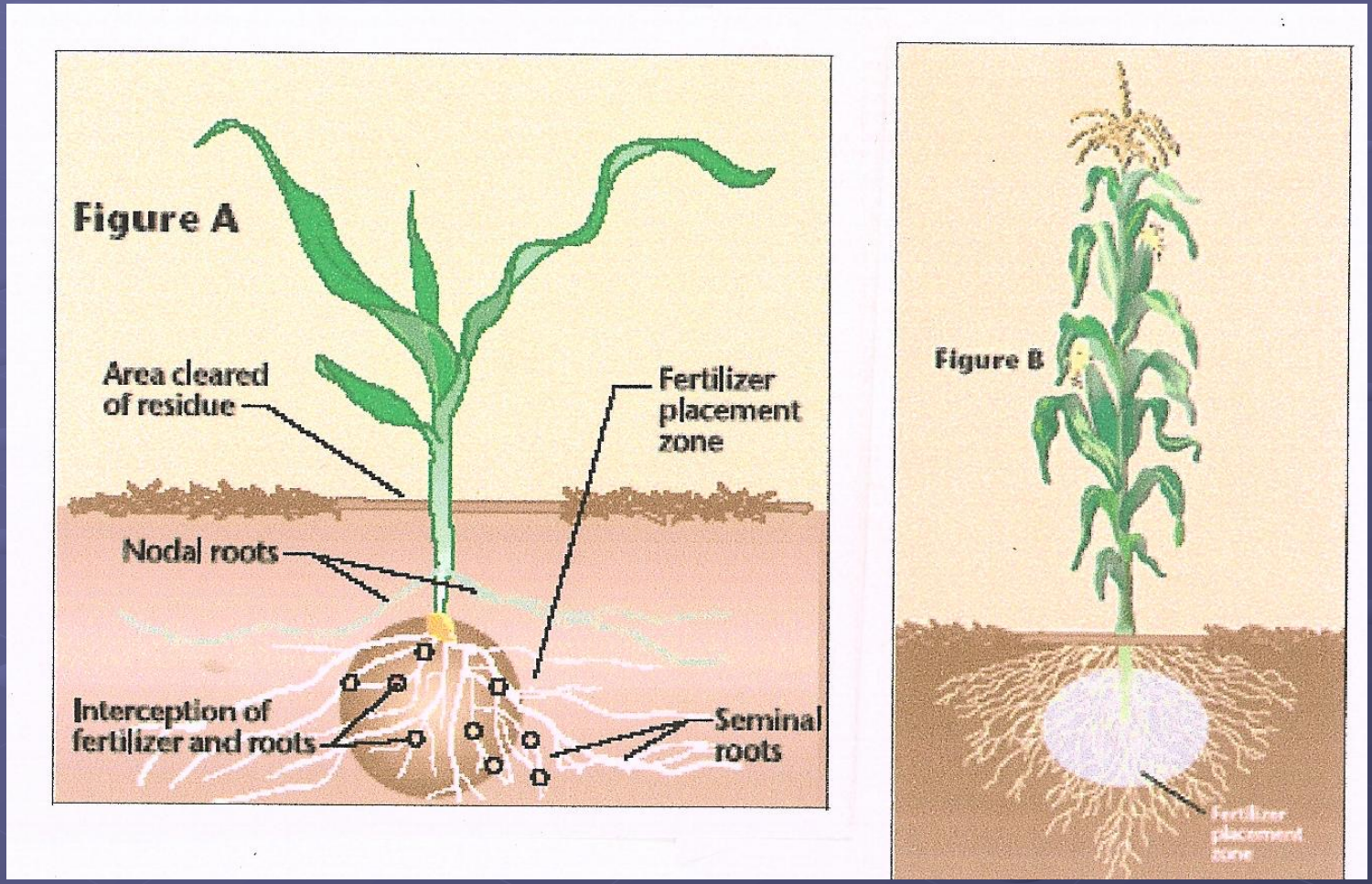
Table 1. Yield and early growth of corn as affected by four tillage systems and various fertilization strategies at the Northeast Research Farm.

	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.

Nutrient Placement and Efficiency



Starter Placement Options

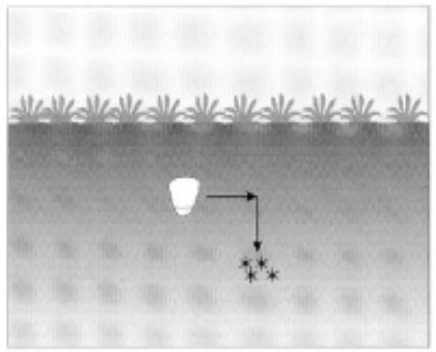


Figure 2a. Two-by-two placement.

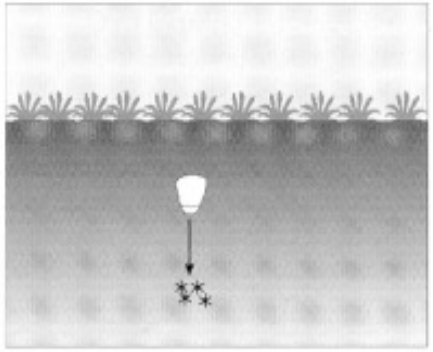


Figure 2b. Below-seed placement.

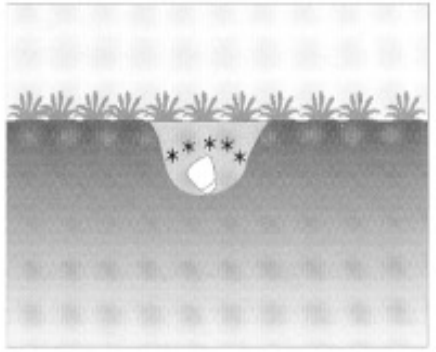


Figure 2c. In-row or "pop-up" placement.

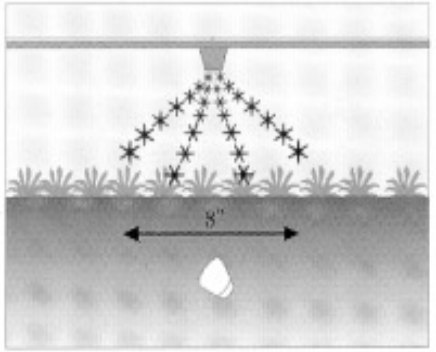


Figure 2d. Over-the-row banding.

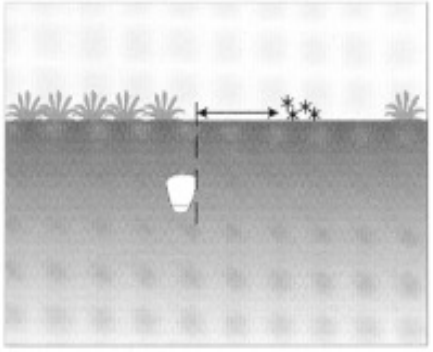


Figure 2e. Surface-dribble placement.

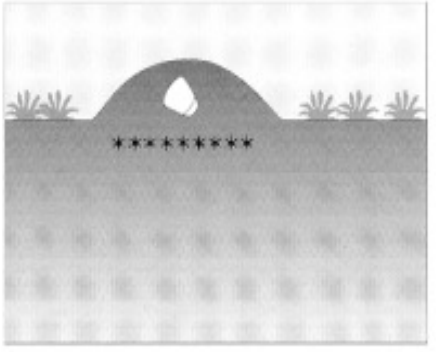


Figure 2f. Banding under the row.

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

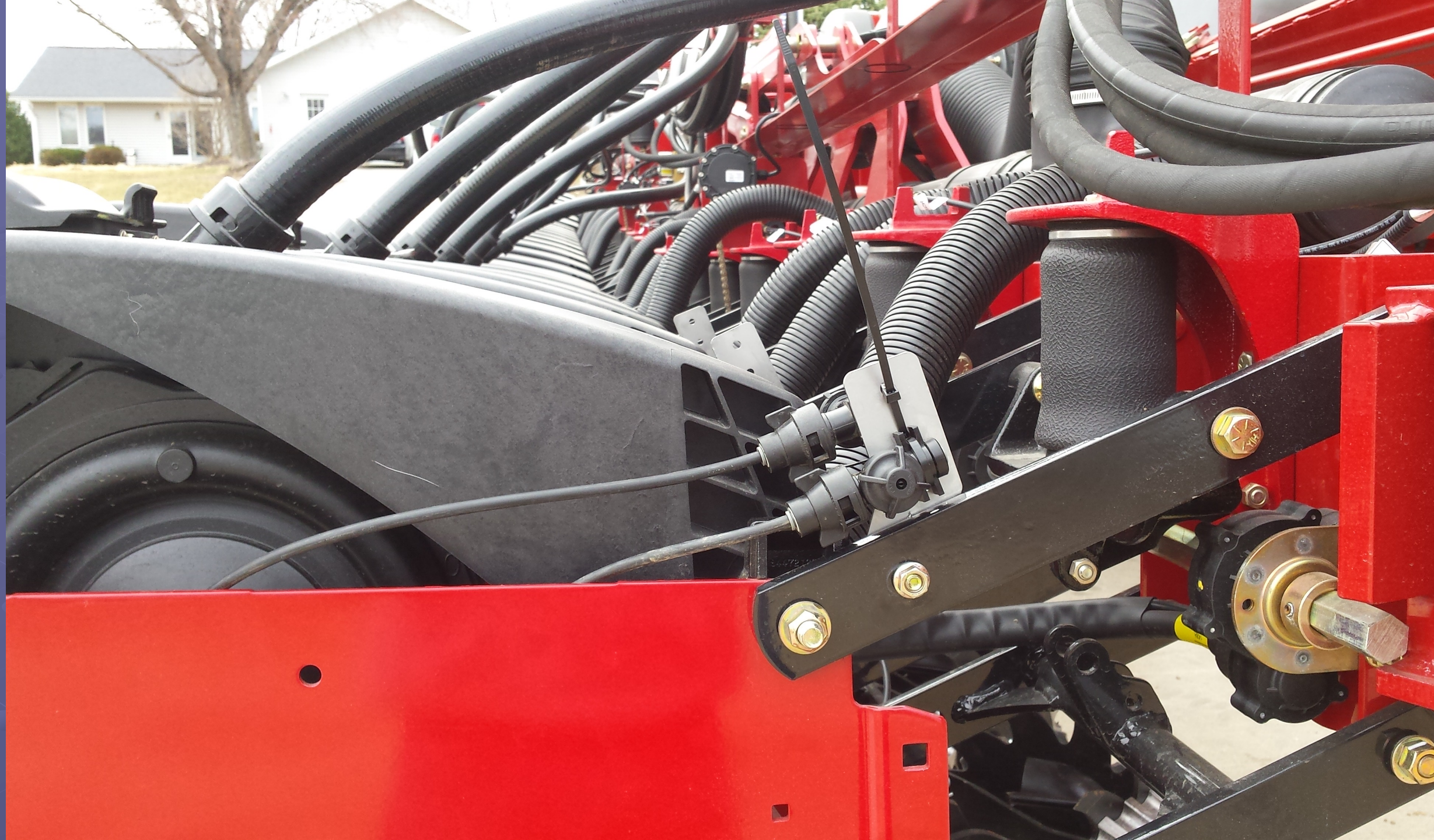
NLAE National Laboratory for Agriculture and the Environment

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


1245
CASE

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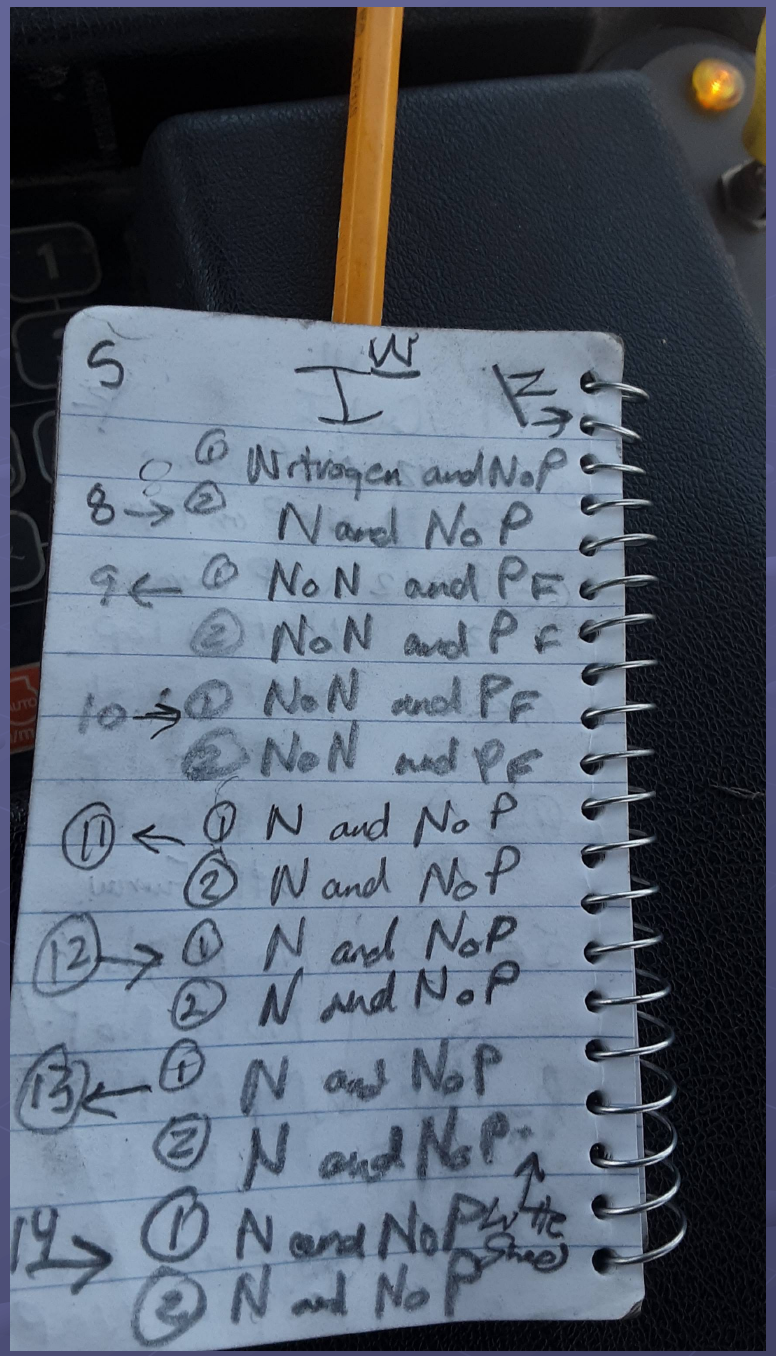
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12 → ① N and No P
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13 ← ① N and No P
② N and No P
14 → ① N and No P (4th Shed)
② N and No P

Medium-Textured Soil Starter Fertilizer Trial

Replicated 1,000-foot plots with four replications for each treatment. Planted Dairyland 4018 seed at 28,000 population per acre on May 11, 2022, in 12-row, 20-inch replications.

TRT	Fertilizer Treatment Description	Average Yield	Average Moisture
TRT 1	5 gallons of 28% N and 2.5 gallons of ammonium thiosulfate in 2-0 surface band and 5 gallons of 10-34-0 in furrow	223.4	19.7
TRT 2	5 gallons of 28% N and 2.5 gallons of ammonium thiosulfate and 5 gallons of 10-34-0 in 2-0 surface band	221.1	19.7
TRT 3	No starter fertilizer	212.1	20.1
TRT 4*	5 gallons of 28% N and 2.5 gallons of ammonium thiosulfate in 2-0 surface band	222.3	20.1
TRT 5	5 gallons of 10-34-0 in furrow	224.2	20.2
TRT 6*	5 gallons of 28% N and 2.5 gallons of ammonium thiosulfate in 2-0 surface band	222.3	20.1

Heavy Clay Soil Starter Fertilizer Trial

Replicated 1,000-foot plots with two replications for each treatment.
Planted Dairyland 4014 seed at 32,000 population per acre on
May 9, 2022, in 12-row, 20-inch replications.

TRT	Fertilizer Treatment Description	Average Yield	Average Moisture
TRT 1	5 gallons of 28% N and 2.5 gallons of ammonium thiosulfate in 2-0 surface band	234.0	20.7
TRT 2	No starter fertilizer	217.4	20.7
TRT 3	5 gallons of 28% N and 2.5 gallons of ammonium thiosulfate in 2-0 surface band and 5 gallons of 10-34-0 in furrow	229.4	20.0
TRT 4	5 gallons of 28% N and 2.5 gallons of ammonium thiosulfate in 2-0 surface band	232.6	20.9


400

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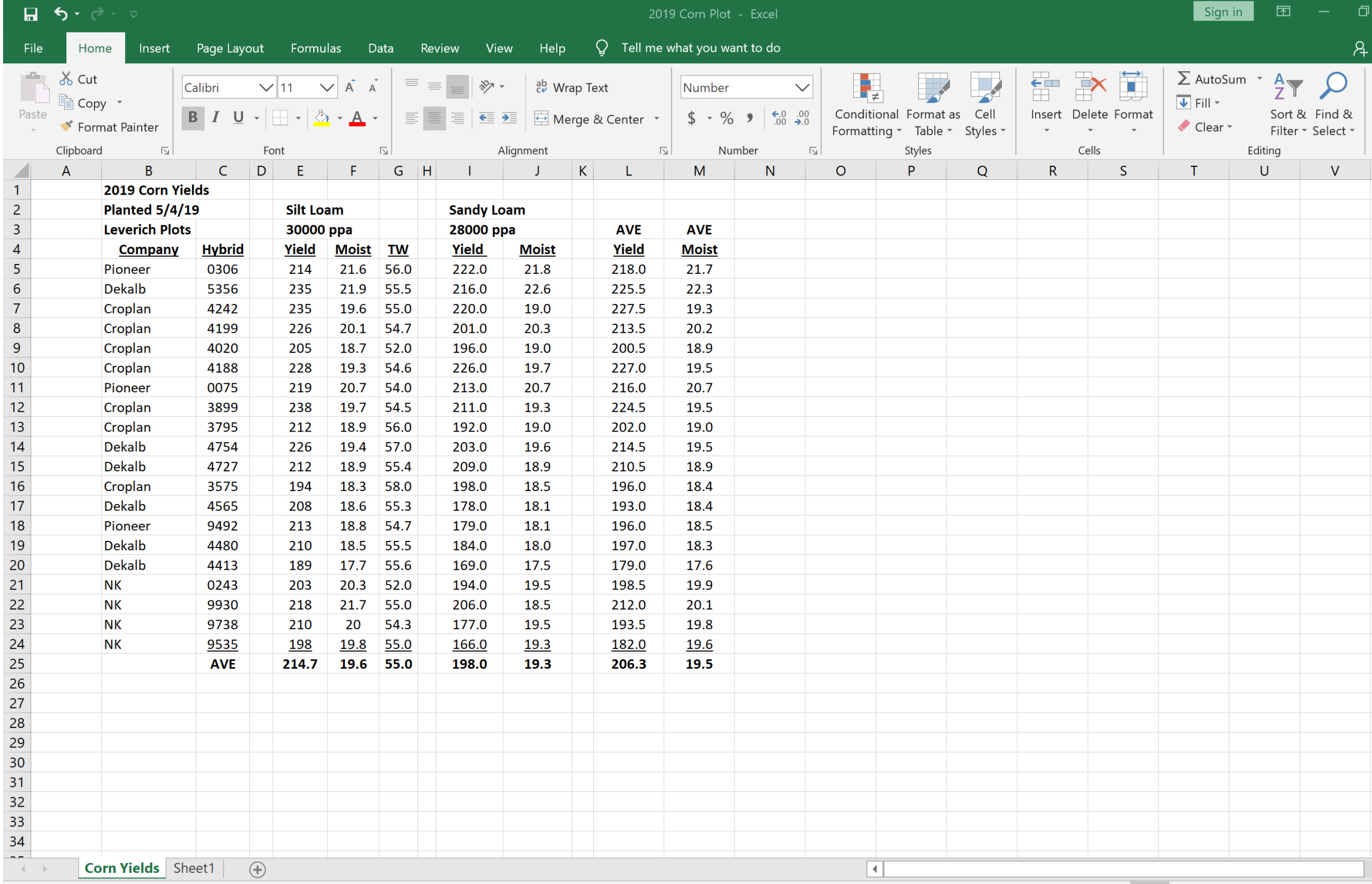

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Editing

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1		**2019 Corn Yields**																				
2		**Planted 5/4/19**			**Silt Loam**				**Sandy Loam**													
3		**Leverich Plots**			**30000 ppa**				**28000 ppa**			**AVE**	**AVE**									
4		**Company**	**Hybrid**		**Yield**	**Moist**	**TW**		**Yield**	**Moist**		**Yield**	**Moist**									
5		Pioneer	0306		214	21.6	56.0		222.0	21.8		218.0	21.7									
6		Dekalb	5356		235	21.9	55.5		216.0	22.6		225.5	22.3									
7		Croplan	4242		235	19.6	55.0		220.0	19.0		227.5	19.3									
8		Croplan	4199		226	20.1	54.7		201.0	20.3		213.5	20.2									
9		Croplan	4020		205	18.7	52.0		196.0	19.0		200.5	18.9									
10		Croplan	4188		228	19.3	54.6		226.0	19.7		227.0	19.5									
11		Pioneer	0075		219	20.7	54.0		213.0	20.7		216.0	20.7									
12		Croplan	3899		238	19.7	54.5		211.0	19.3		224.5	19.5									
13		Croplan	3795		212	18.9	56.0		192.0	19.0		202.0	19.0									
14		Dekalb	4754		226	19.4	57.0		203.0	19.6		214.5	19.5									
15		Dekalb	4727		212	18.9	55.4		209.0	18.9		210.5	18.9									
16		Croplan	3575		194	18.3	58.0		198.0	18.5		196.0	18.4									
17		Dekalb	4565		208	18.6	55.3		178.0	18.1		193.0	18.4									
18		Pioneer	9492		213	18.8	54.7		179.0	18.1		196.0	18.5									
19		Dekalb	4480		210	18.5	55.5		184.0	18.0		197.0	18.3									
20		Dekalb	4413		189	17.7	55.6		169.0	17.5		179.0	17.6									
21		NK	0243		203	20.3	52.0		194.0	19.5		198.5	19.9									
22		NK	9930		218	21.7	55.0		206.0	18.5		212.0	20.1									
23		NK	9738		210	20	54.3		177.0	19.5		193.5	19.8									
24		NK	9535		198	19.8	55.0		166.0	19.3		182.0	19.6									
25			**AVE**		**214.7**	**19.6**	**55.0**		**198.0**	**19.3**		**206.3**	**19.5**									
26																						
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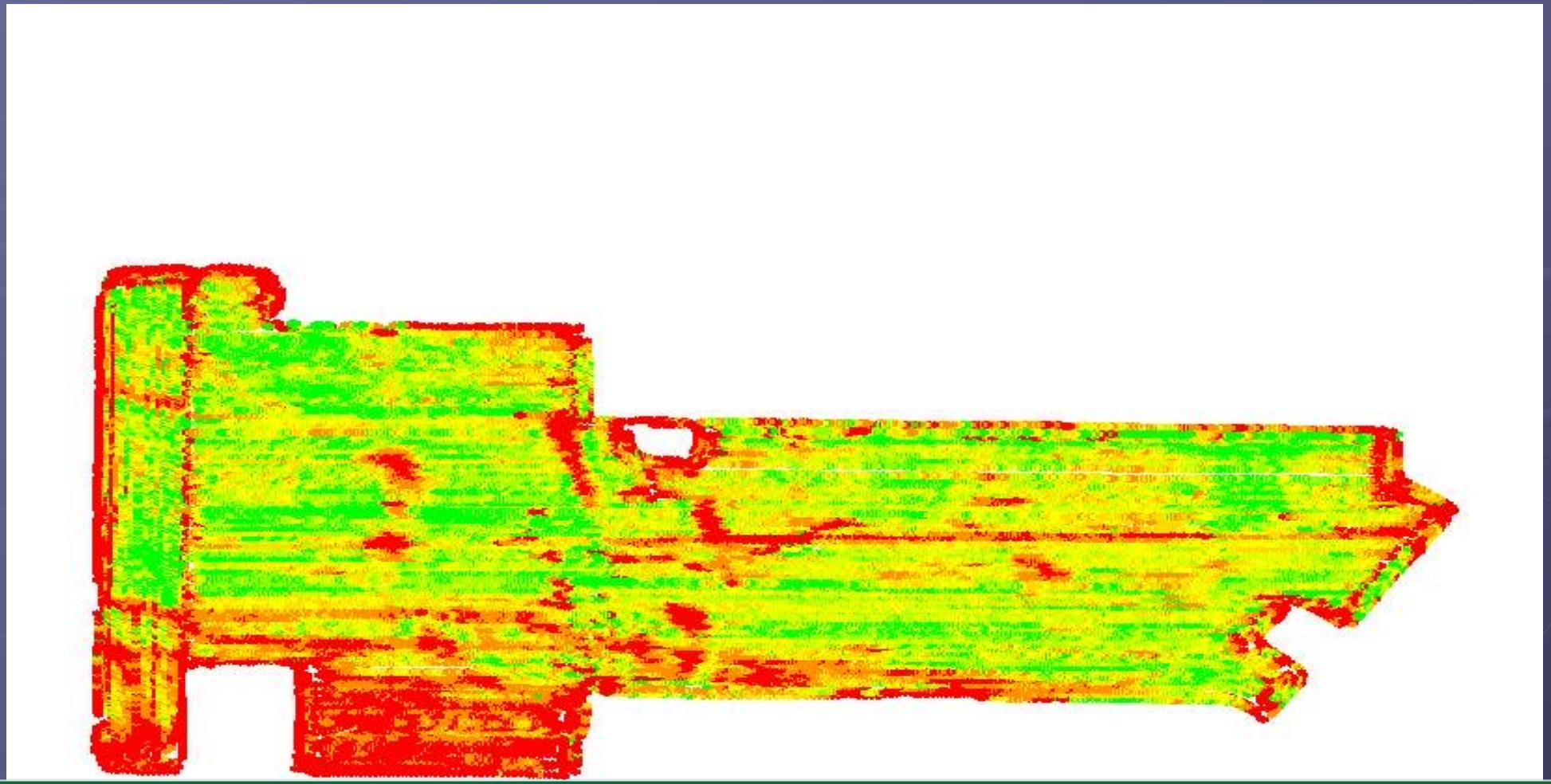
Corn Yields Sheet1

Measure Yields



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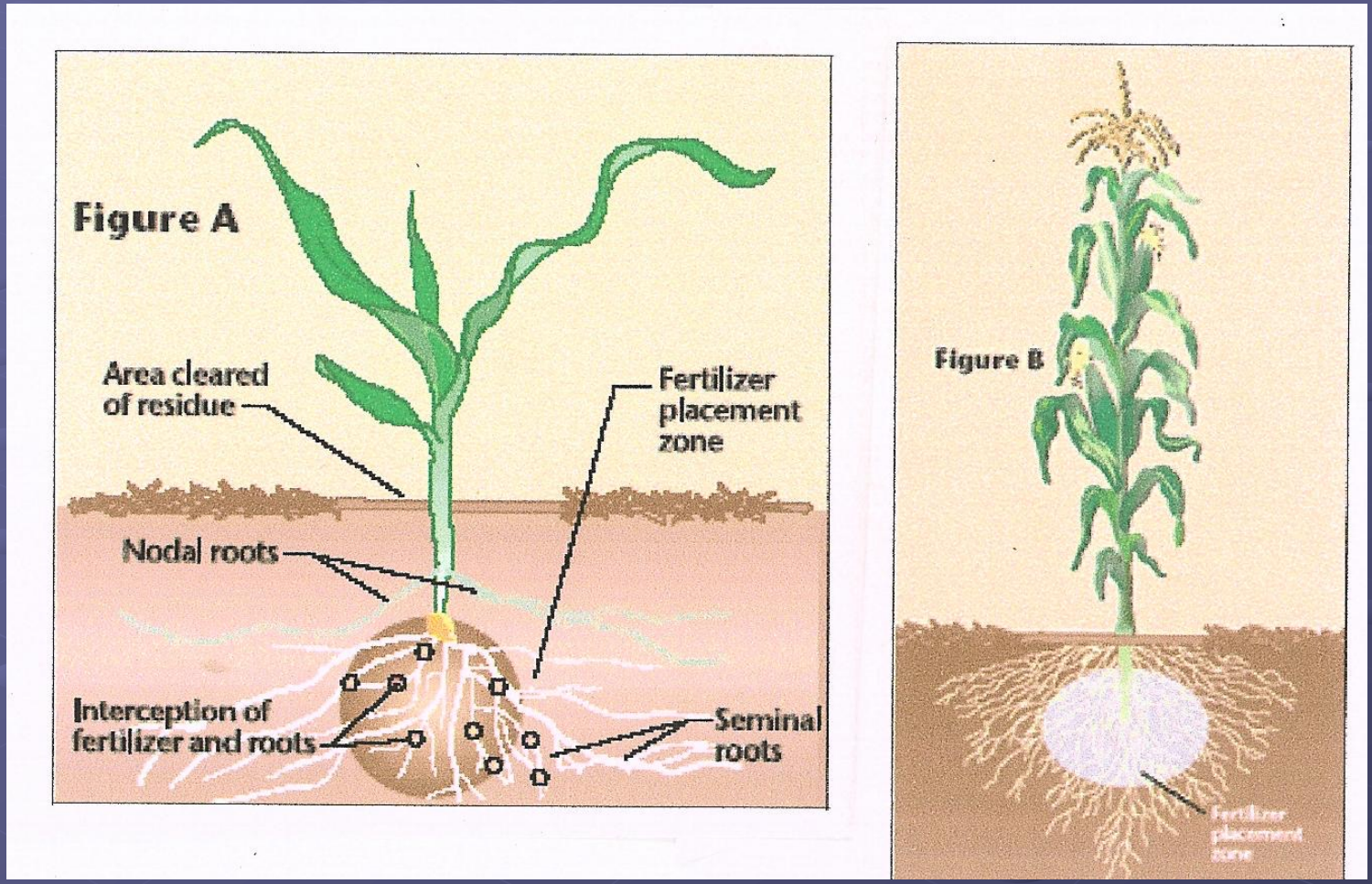
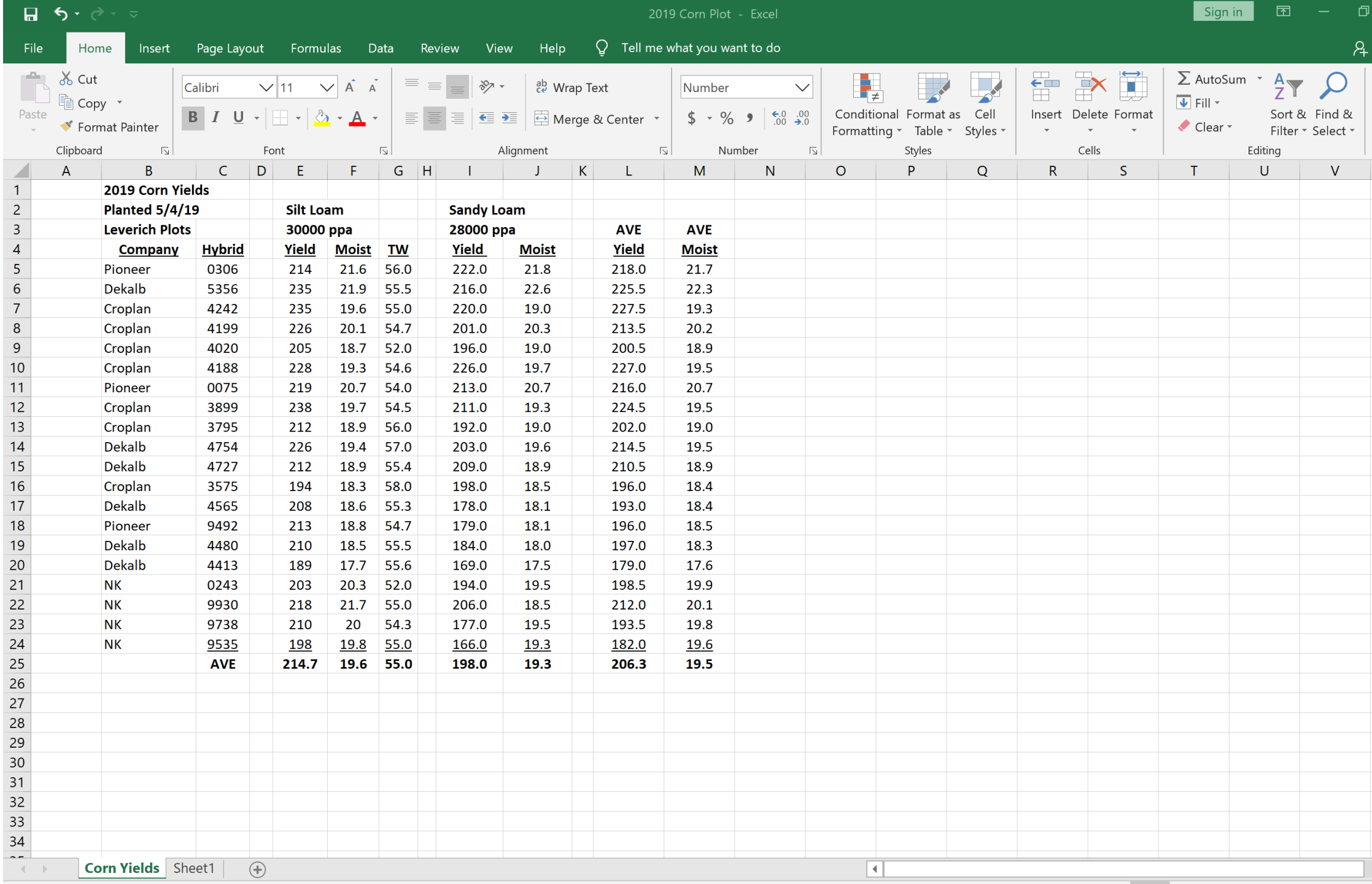
Nutrient Placement and Efficiency





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1		**2019 Corn Yields**																				
2		**Planted 5/4/19**			**Silt Loam**				**Sandy Loam**													
3		**Leverich Plots**			**30000 ppa**				**28000 ppa**			**AVE**	**AVE**									
4		**Company**	**Hybrid**		**Yield**	**Moist**	**TW**		**Yield**	**Moist**		**Yield**	**Moist**									
5		Pioneer	0306		214	21.6	56.0		222.0	21.8		218.0	21.7									
6		Dekalb	5356		235	21.9	55.5		216.0	22.6		225.5	22.3									
7		Croplan	4242		235	19.6	55.0		220.0	19.0		227.5	19.3									
8		Croplan	4199		226	20.1	54.7		201.0	20.3		213.5	20.2									
9		Croplan	4020		205	18.7	52.0		196.0	19.0		200.5	18.9									
10		Croplan	4188		228	19.3	54.6		226.0	19.7		227.0	19.5									
11		Pioneer	0075		219	20.7	54.0		213.0	20.7		216.0	20.7									
12		Croplan	3899		238	19.7	54.5		211.0	19.3		224.5	19.5									
13		Croplan	3795		212	18.9	56.0		192.0	19.0		202.0	19.0									
14		Dekalb	4754		226	19.4	57.0		203.0	19.6		214.5	19.5									
15		Dekalb	4727		212	18.9	55.4		209.0	18.9		210.5	18.9									
16		Croplan	3575		194	18.3	58.0		198.0	18.5		196.0	18.4									
17		Dekalb	4565		208	18.6	55.3		178.0	18.1		193.0	18.4									
18		Pioneer	9492		213	18.8	54.7		179.0	18.1		196.0	18.5									
19		Dekalb	4480		210	18.5	55.5		184.0	18.0		197.0	18.3									
20		Dekalb	4413		189	17.7	55.6		169.0	17.5		179.0	17.6									
21		NK	0243		203	20.3	52.0		194.0	19.5		198.5	19.9									
22		NK	9930		218	21.7	55.0		206.0	18.5		212.0	20.1									
23		NK	9738		210	20	54.3		177.0	19.5		193.5	19.8									
24		NK	9535		198	19.8	55.0		166.0	19.3		182.0	19.6									
25			**AVE**		**214.7**	**19.6**	**55.0**		**198.0**	**19.3**		**206.3**	**19.5**									
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Corn Yields Sheet1

40 Years of No-Till

On Farm Research Leading to Success

Jim Leverich, Emeritus
On Farm Research Coordinator
University of Wisconsin