High Yielding Corn: Nitrogen and Best Management Practices

Fluid Technology Round Up

Dec 6, 2016

4R Plant Nutrition:

- **Right Source**
- **Right Rate**
- **Right Time**
- **Right Place**

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Farmers ask:

Do I need more/less fertilizer?

When do I need to apply?

Is Product A better than B?

Is Method A better than B?

Will it pay?

What would you do if you were me?

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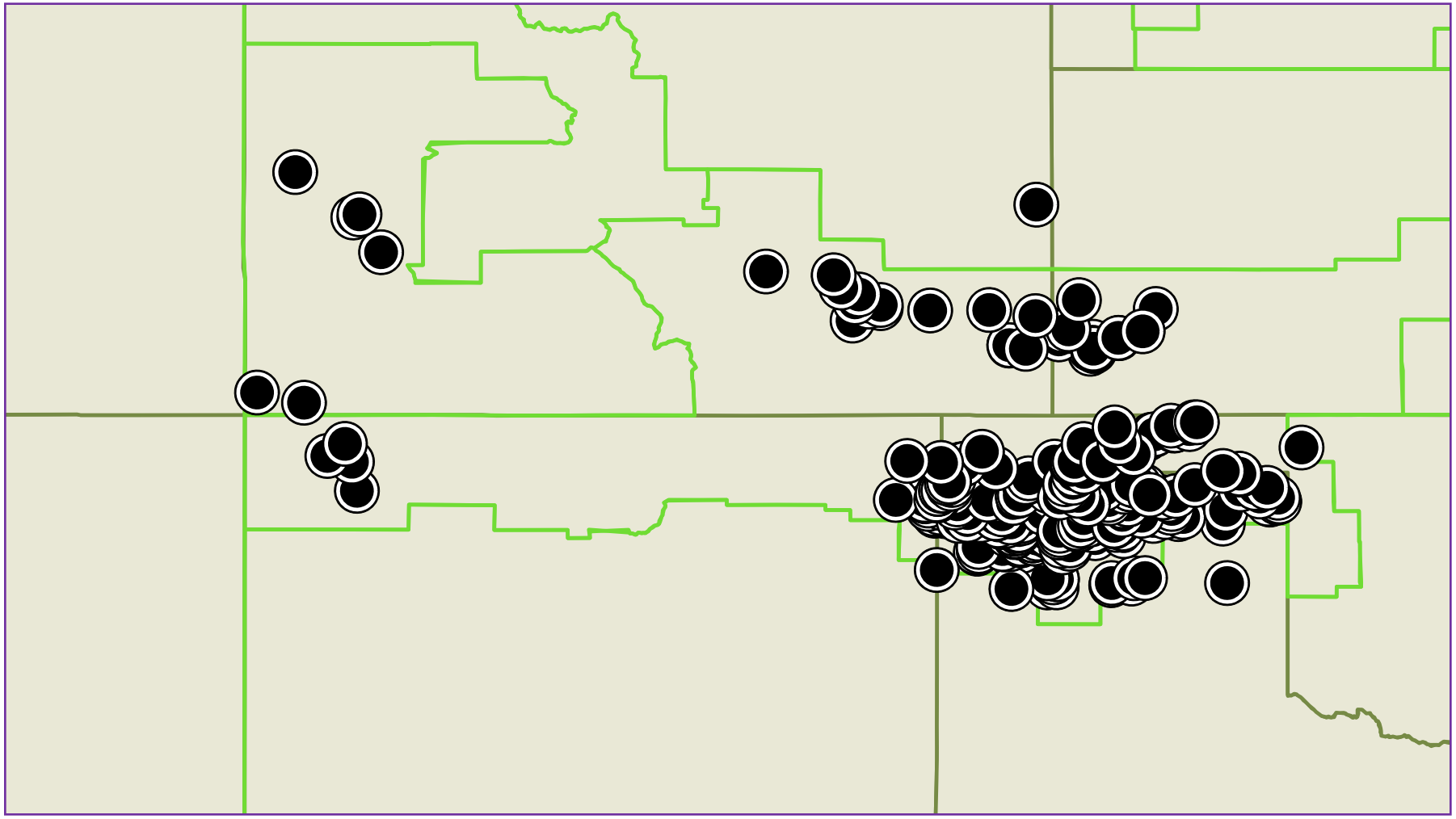
Plot Locations (2010-2013)
Spatial and Temporal Analyses



Stress at Four Critical Intervals Most Affects Grain Yield

- **(1) At or just before V7**
    - Determines number of kernel rows around the ear
- **(2) 1-2 weeks before pollination**
    - Determines number of kernel rows along the length of the ear
- **(3) During pollination**
    - Determines the maximum number of kernels that can be produced
- **(4) Latter part of grain fill**
    - Determines the weights of individual kernels

What can we control?

Irrigation Capacity Impact on Yield

Irragation Capacity GPM/A	Predicted Yield	2011 Yield	2012 Yield	2013 Yield
3.0 - 3.9	120-160	75	140	170
4.0 - 4.4	160-180	120	180	205
4.5 – 4.9	190-220	177	221	240
5.0 - 5.5	230-250	223	238	254
5.6 - 5.9	250-270	234	265	262
6.0+	270+	242	265	270

2010 Plot Averages by Nitrogen Timing

No Post Tassel Nitrogen *19 Plots*	Nitrogen Applied Brown Silk *21 plots*
Avg Yield 217 bu/acre	Avg Yield 248 bu/acre
Low yield: 170 bu/acre High yield: 269 bu/acre	Low yield: 183 bu/acre High yield: 302 bu/acre
3 plots over 240+ bu/acre	14 plots over 240+ bu/acre

Nitrogen Effectiveness by Timing

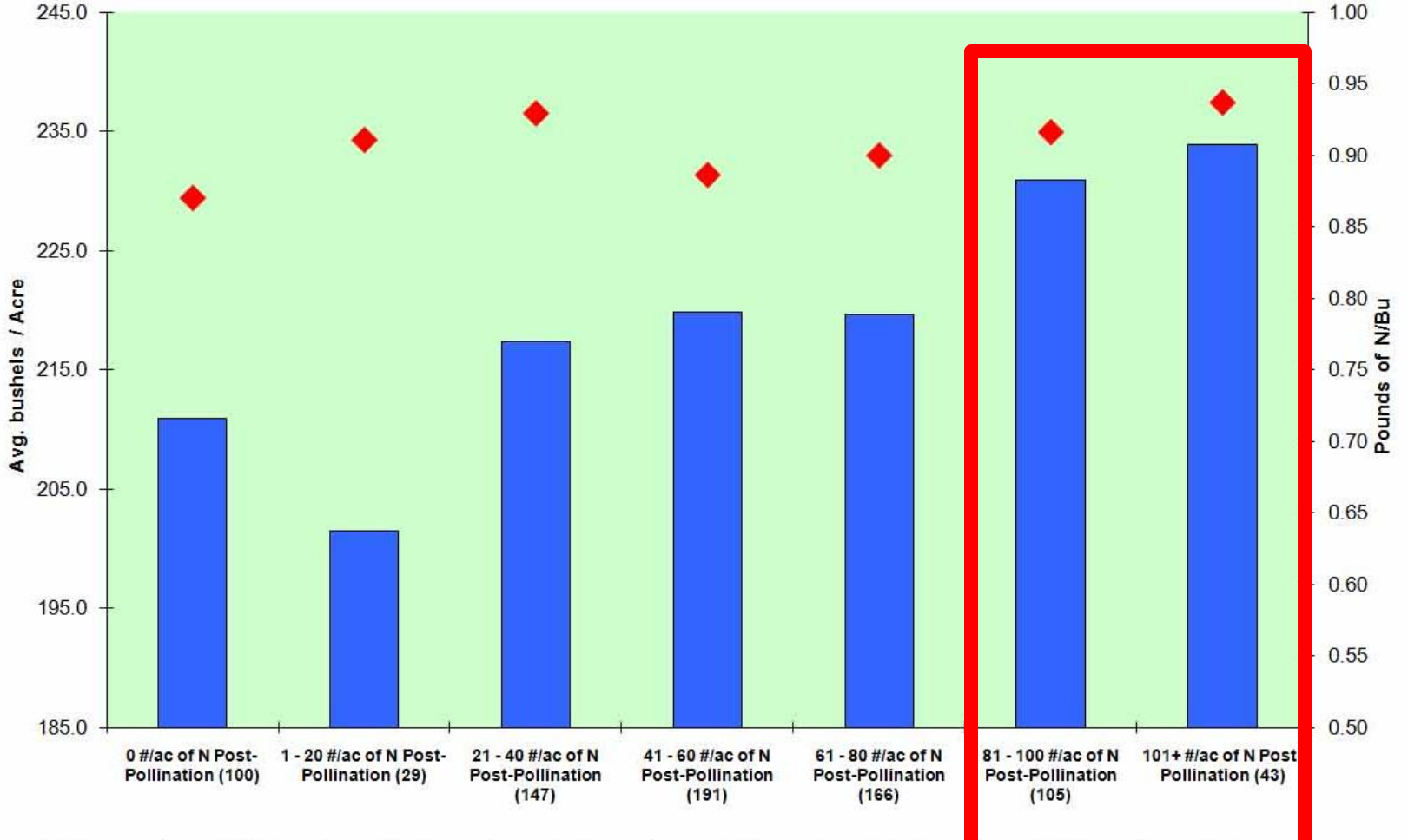
1998 – 2007 TX & OK Hi-Plains

N Application Timing	75%+ Total N as Pre-Plant	75%+ Total N as In-Season
Avg Yield	207.7	215.9
Avg #N Used/A	247	192
N Use/Bushel	1.19	0.86

In-Season N 28% more efficient than preplant

Source: Better Harvest Inc., Dumas, TX

Comparision of Yields and N Use (lbs.N/bu.) of Corn by N Application Timing (781 fields from 1998 thru 2009 in the HiPlains Area of Texas and Oklahoma)



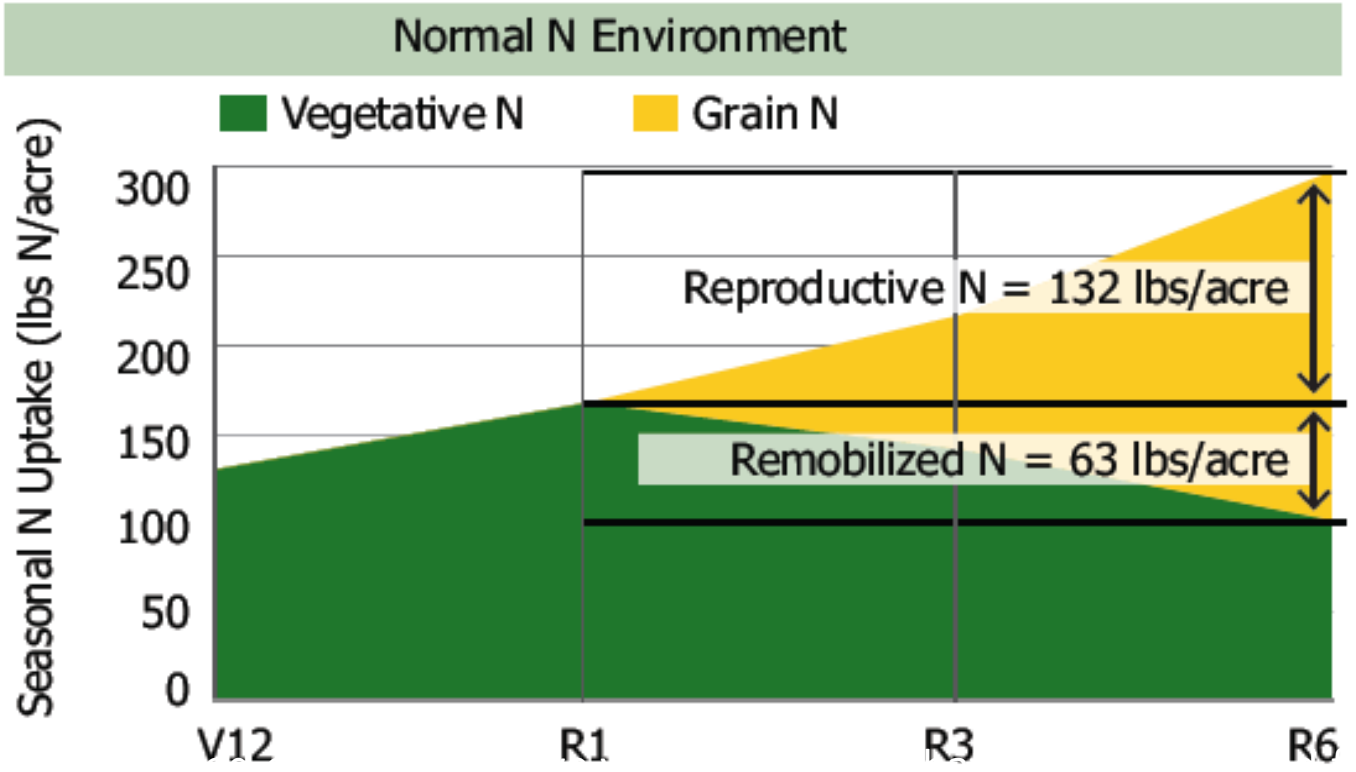
Avg. yield bu./acre	210.9	201.5	217.4	219.8	219.7	231.0	233.9
Avg. #N use / acre	184	183	202	195	198	212	219

Table 1. Nitrogen uptake timing and quantities for old and new hybrids.

Era of hybrid release	N at R1	N at R6	Post-flowering N uptake	Increase in post-flowering N uptake
	- - - - lbs N / acre - - - -			%
Old (1940 to 1990)†	102	145	43	28%
New (1991 - 2011)	97	152	55	
Old (1970)‡	125	162	37	40%
New (2000)	125	177	52	

† Ciampitti and Vyn , 2012 ‡ Haegele et al., 2013

Nitrogen Uptake During Grain Fill



Newer hybrids take up additional N post-flowering compared to older hybrids

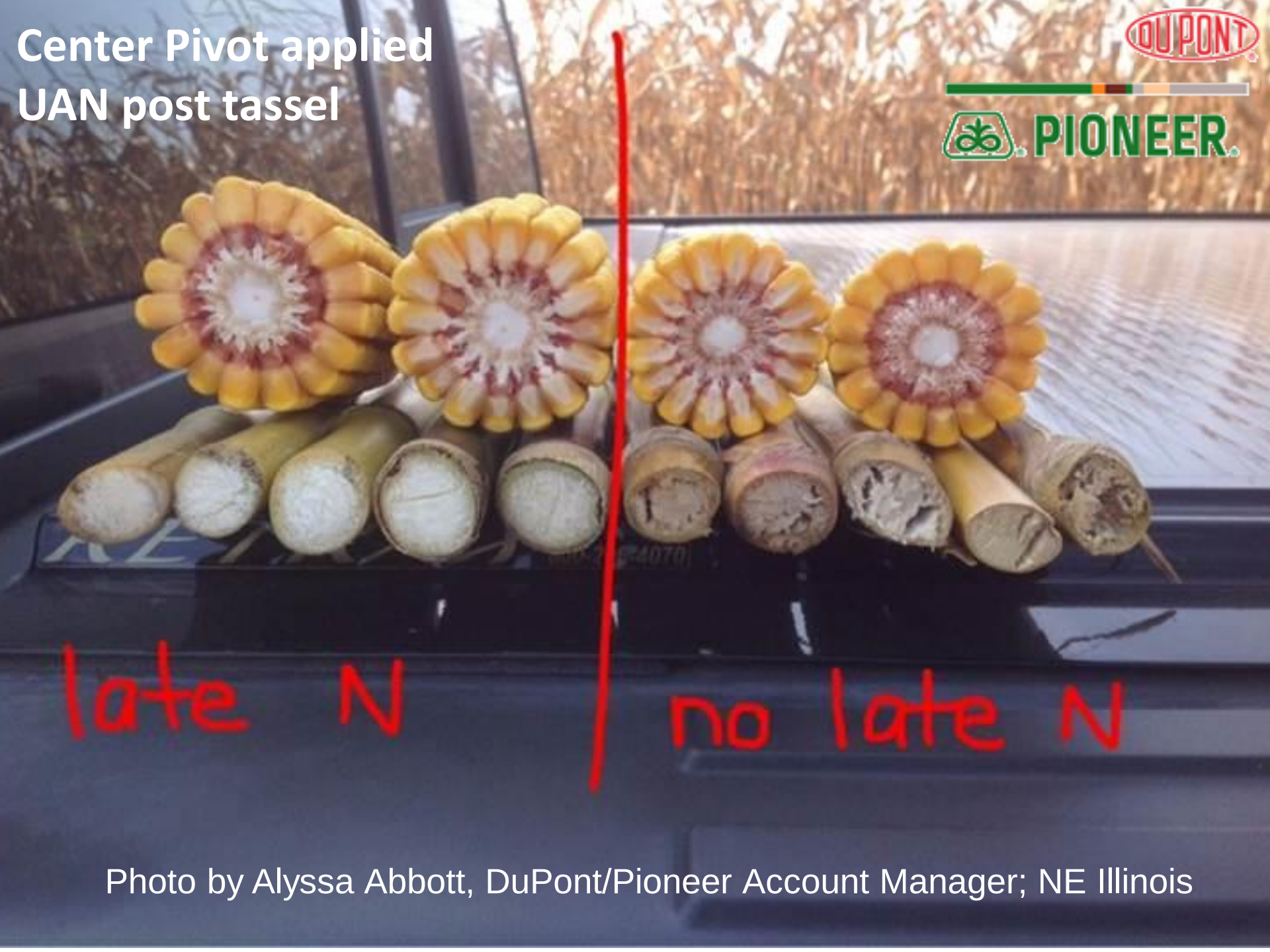
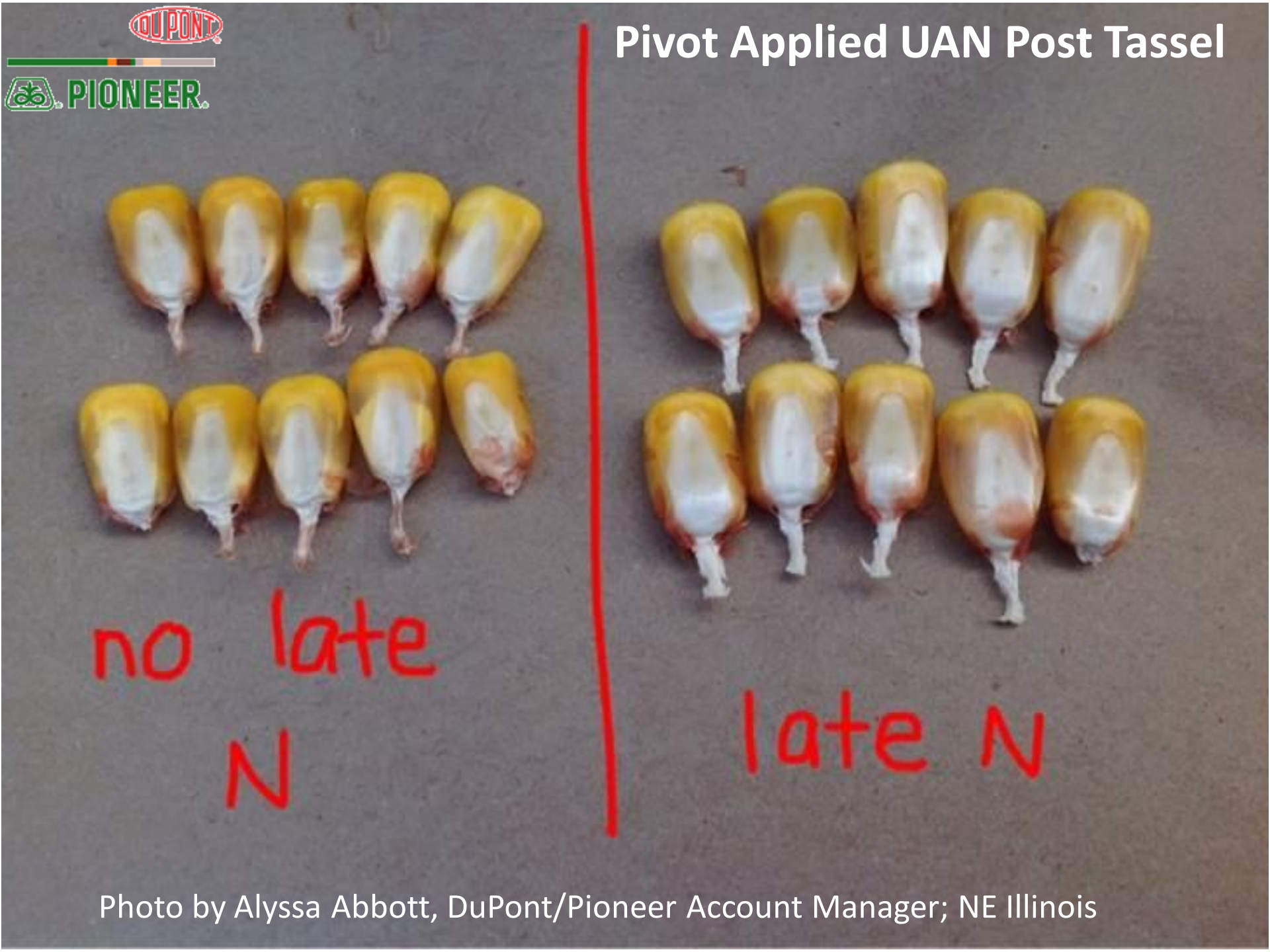


Photo by Alyssa Abbott, DuPont/Pioneer Account Manager; NE Illinois

Pivot Applied UAN Post Tassel



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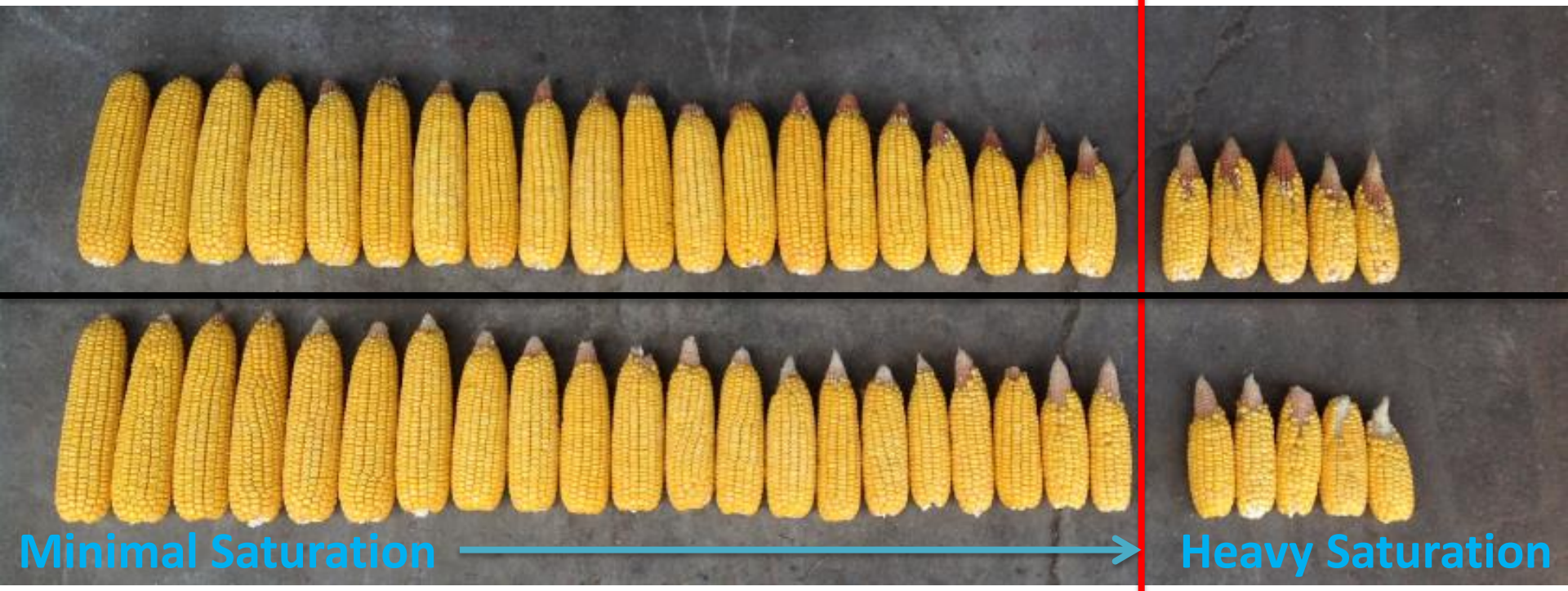
Power of Proactive N Management
Momence 2015

P1417AMX | 268# Total N
Fertigation: 60# @ V6 | 60# @ V12 | 40# @ R1

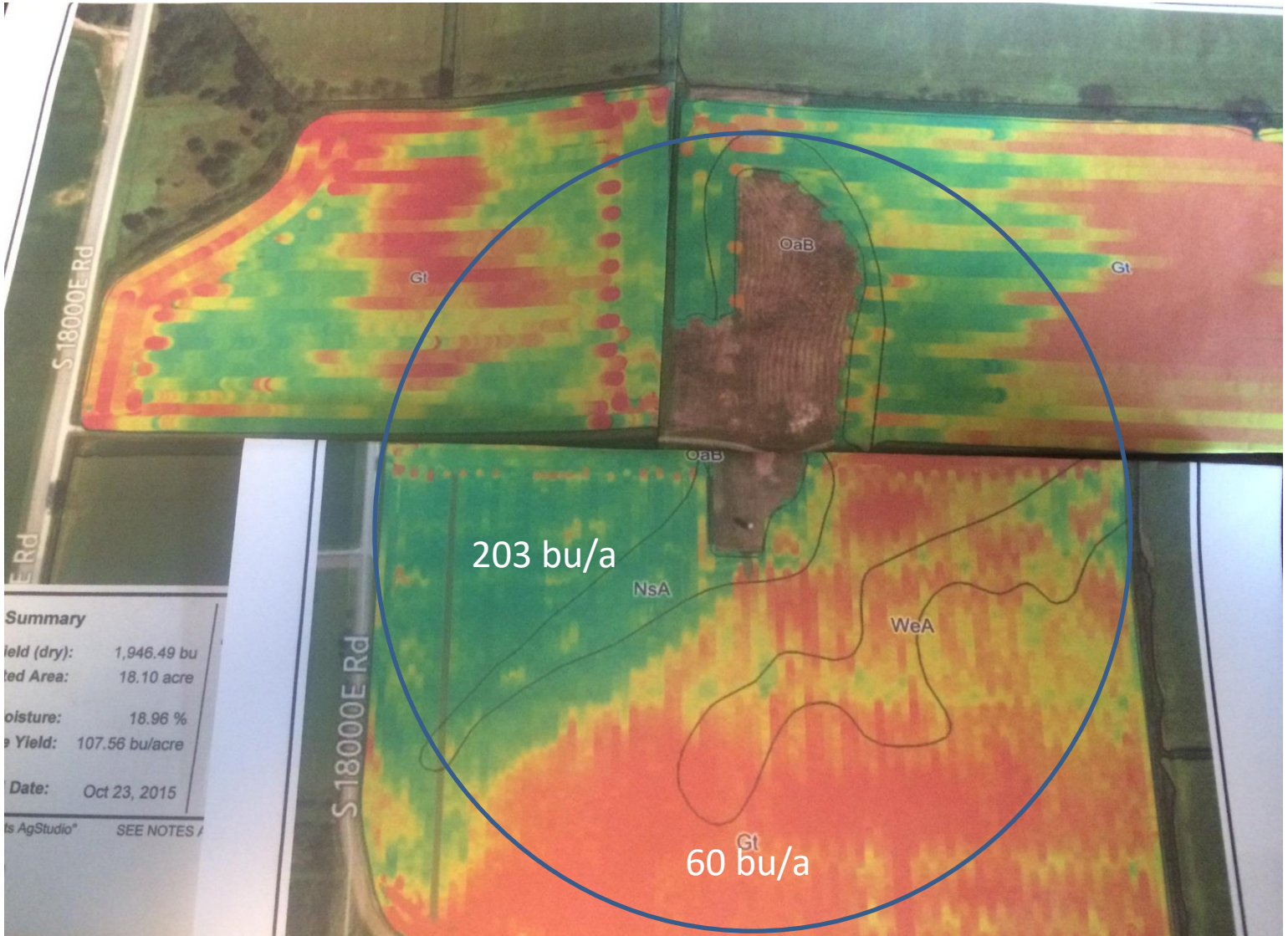
P1417AMX | 168# N
Fertigation: 60# @ V6



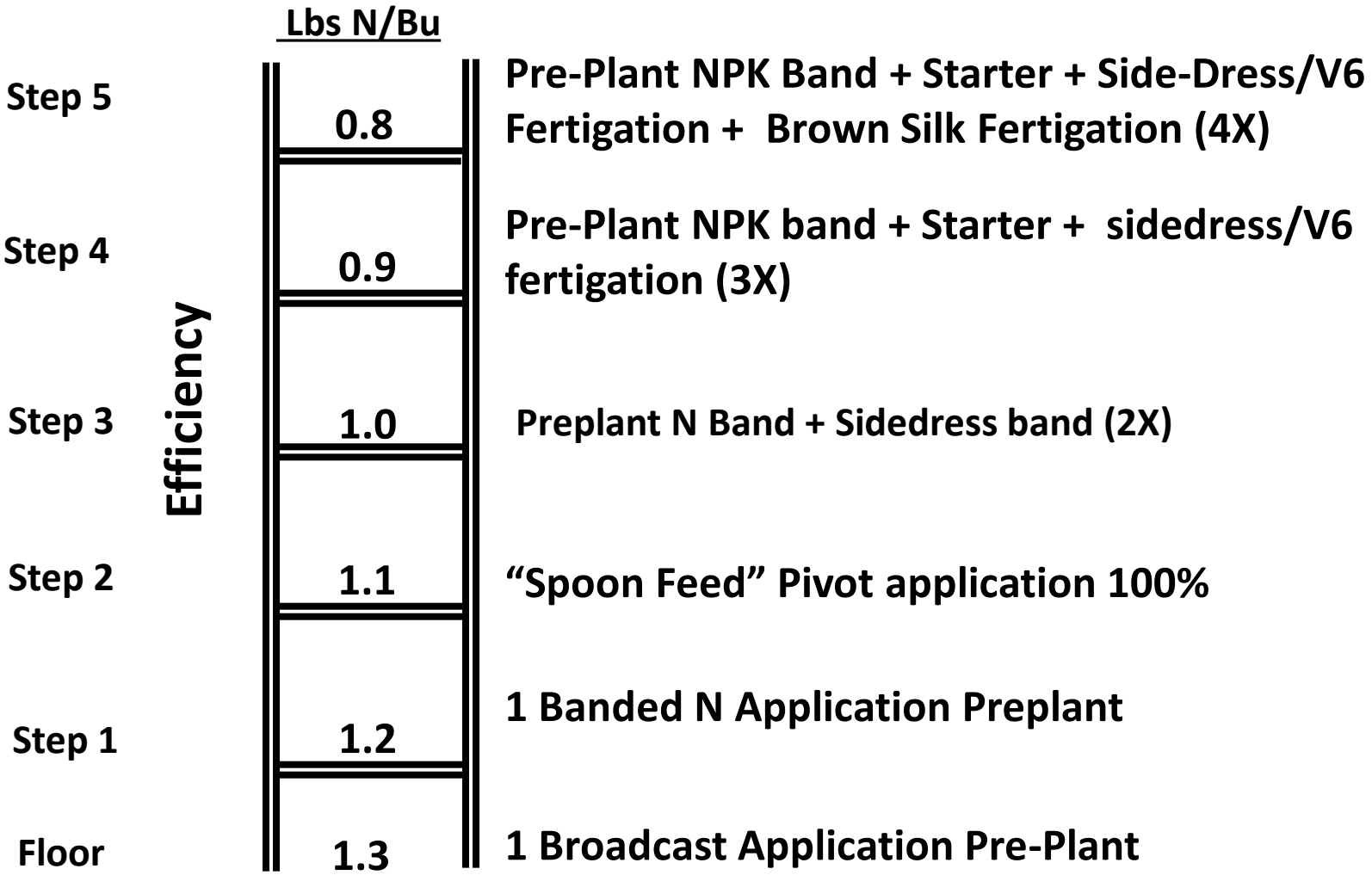
P1197AM | 268# Total N
Fertigation: 60# @ V6 | 60# @ V12 | 40# @ R1
Photo by Alyssa Abbott; DuPont Pioneer Account Manager

P1197AM | 168# N
Fertigation: 60# @ V6

2015 Pivot Trial
Momence, IL



Corn Nitrogen Management Ladder



Pumps at each Pivot

18,000 Gal Tank

12 row coulter rig for side dressing 32-0-0 UAN in strip-till

Sidedress UAN with coulter rig in heavy residue with wet soil. No pre herbicide movement, no fertilizer burn.

Sidedress anhy burn due to wet soil. Pre herbicide barrier disturbed by shank.

2013 Top 10 Highest Average Plots
Texas & Oklahoma Panhandles

Location	Avg Yield	Plant Date	GPM/acre	Tillage	Starter	Miticide Pre-Tassel	Post Tassel Nitrogen
Sherman Co	285.2	5-17-13	5.5	ST	Y	Y	Y
Hansford Co	284.5	5-4-13	6.0	ST	Y	Y	Y
Hansford Co	282.2	5-10-13	5.3	ST	Y	Y	Y
Moore Co	281.4	4-30-13	6.0	ST	Y	N	N
Texas Co	280.9	5-17-13	5.6	ST	Y	Y	Y
Ochiltree Co	275.0	5-17-13	6.0	ST	Y	Y	Y
Sherman Co	267.2	5-13-13	5.4	ST	N	Y	Y
Moore Co	265.4	4-29-13	5.0	ST	Y	Y	Y
Texas Co	263.4	5-13-13	6.0	NT	Y	Y	Y
Hansford Co	262.7	5-22-13	4.5	ST	Y	Y	Y

Strip-Tilled & Fertilized


JOHN DEERE
8320

Fertilizer placement

APPLICATION RATE: 100 lb. N, 40 lb. P_2O_5

Broadcast and disked

6 in. deep

111 ppm N

19 ppm P

3" incorporation depth

Injected

15 inch centers,

6200 ppm N

1200 ppm P

4" deep band

Banding allows a 25-33% reduction in a broadcast rate for immobile nutrients

- **Nutrient deficiency caused by heavy residue and cool, wet soil.**
- **Corn root growth decreases 5-fold when 70º F to 58º F and P uptake decreased 4-fold**
- **Early June before ST and CT soil temps are equal**

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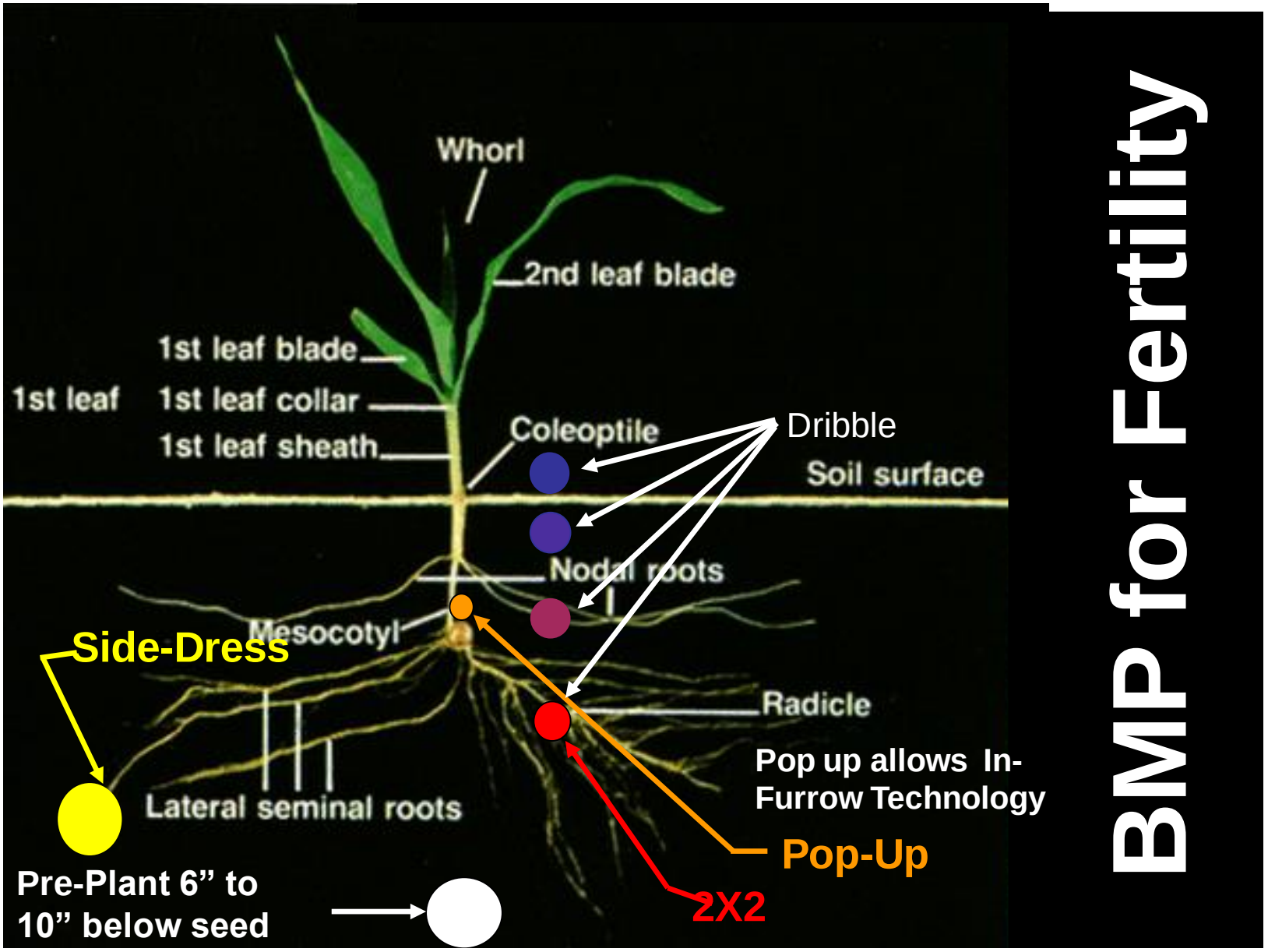
Starter Effects on Corn Yield (bu/a) 3-Year Average

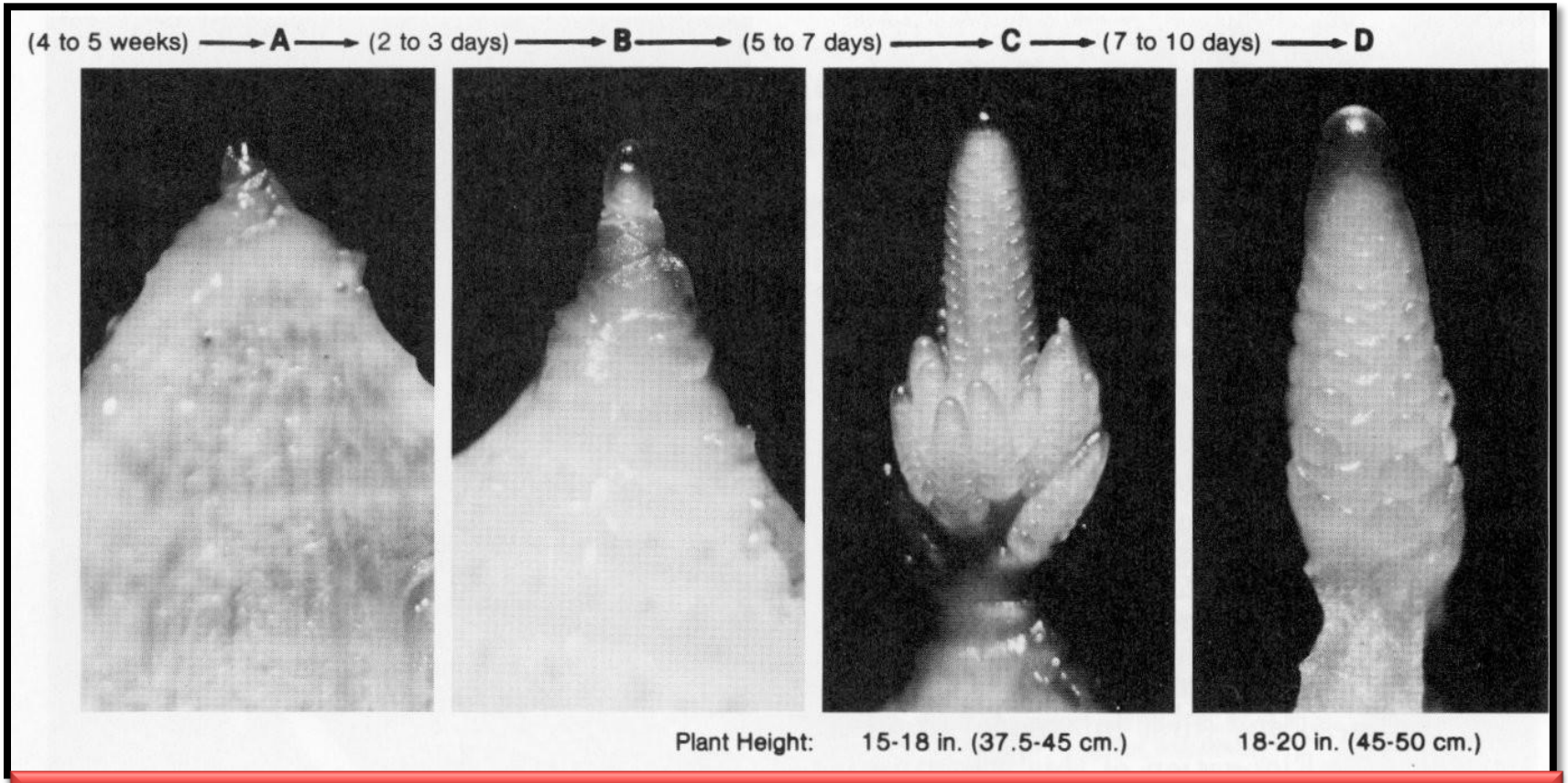
Starter	In-furrow	Surface Band 2x2	Surface Band 2X0	Row Band Broadcast
5-15-5	172	194	190	179
15-15-5	177	197	198	180
30-15-5	174	216	212	192
45-15-5	171	215	213	195
60-15-5	163	214	213	201
Average	171	207	205	189

Dr. Barney Gordon, Kansas State University

Positional Availability



Corn Ear Development



Girth (rows around) is determined by 8-leaf stage so ear girth can be affected by early moisture stress & nutrient deficiency

Starter Fertilizer @ V6

BANDED

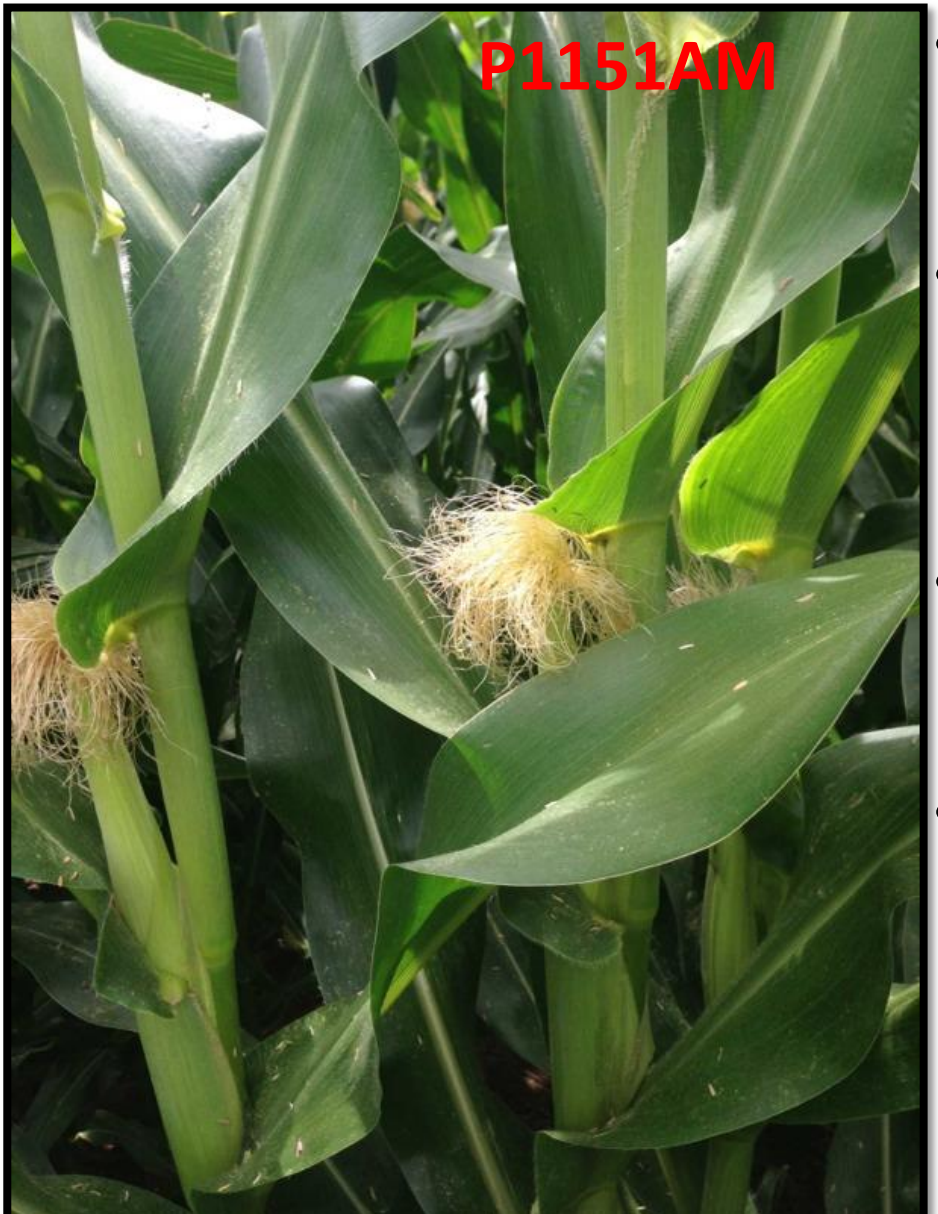
BROADCAST

Dual Starter Placement
Utilize best of In-Furrow Technology

Dual Starter Placement
Utilize best of In-Furrow Technology

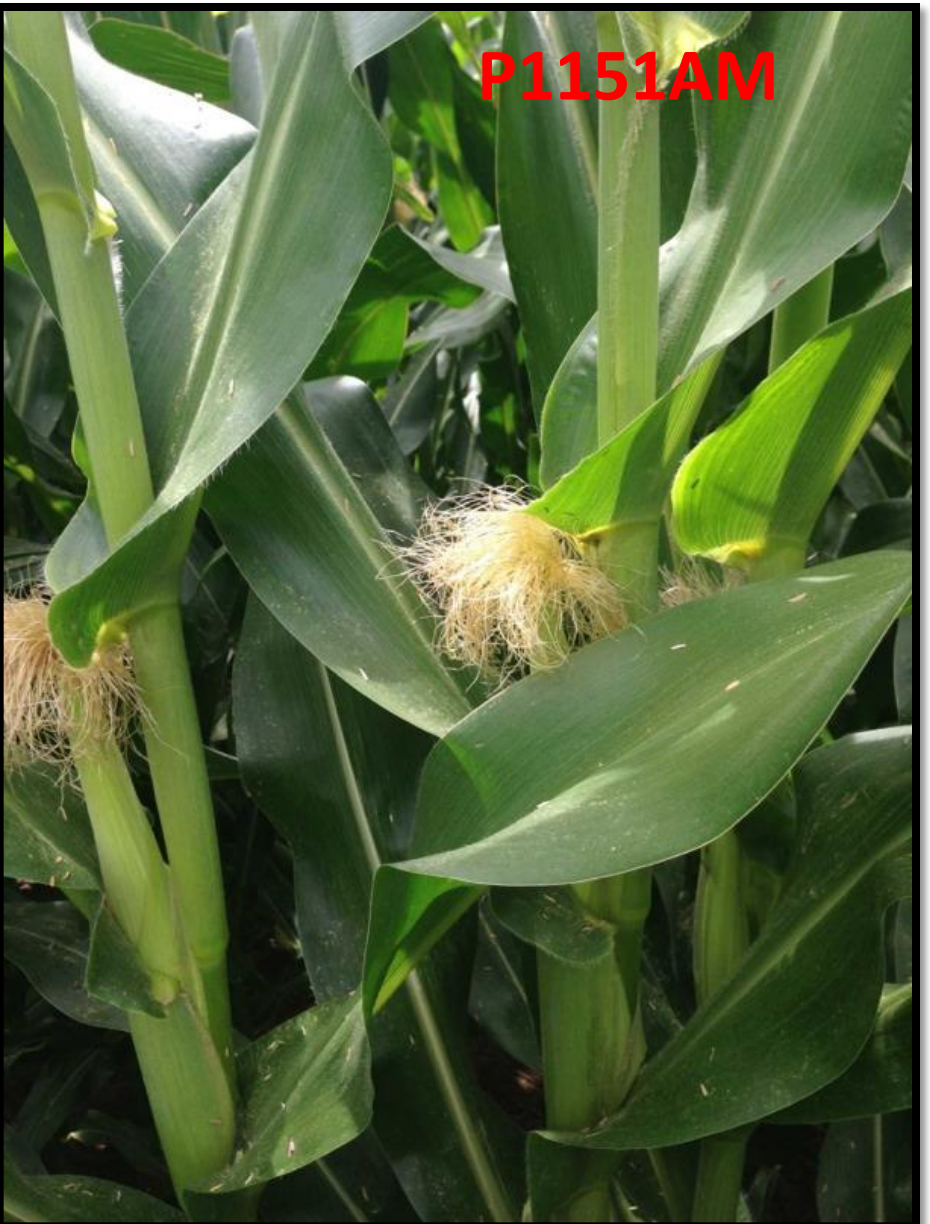
2x0 Surface Band

Adjusting N Rate in Season

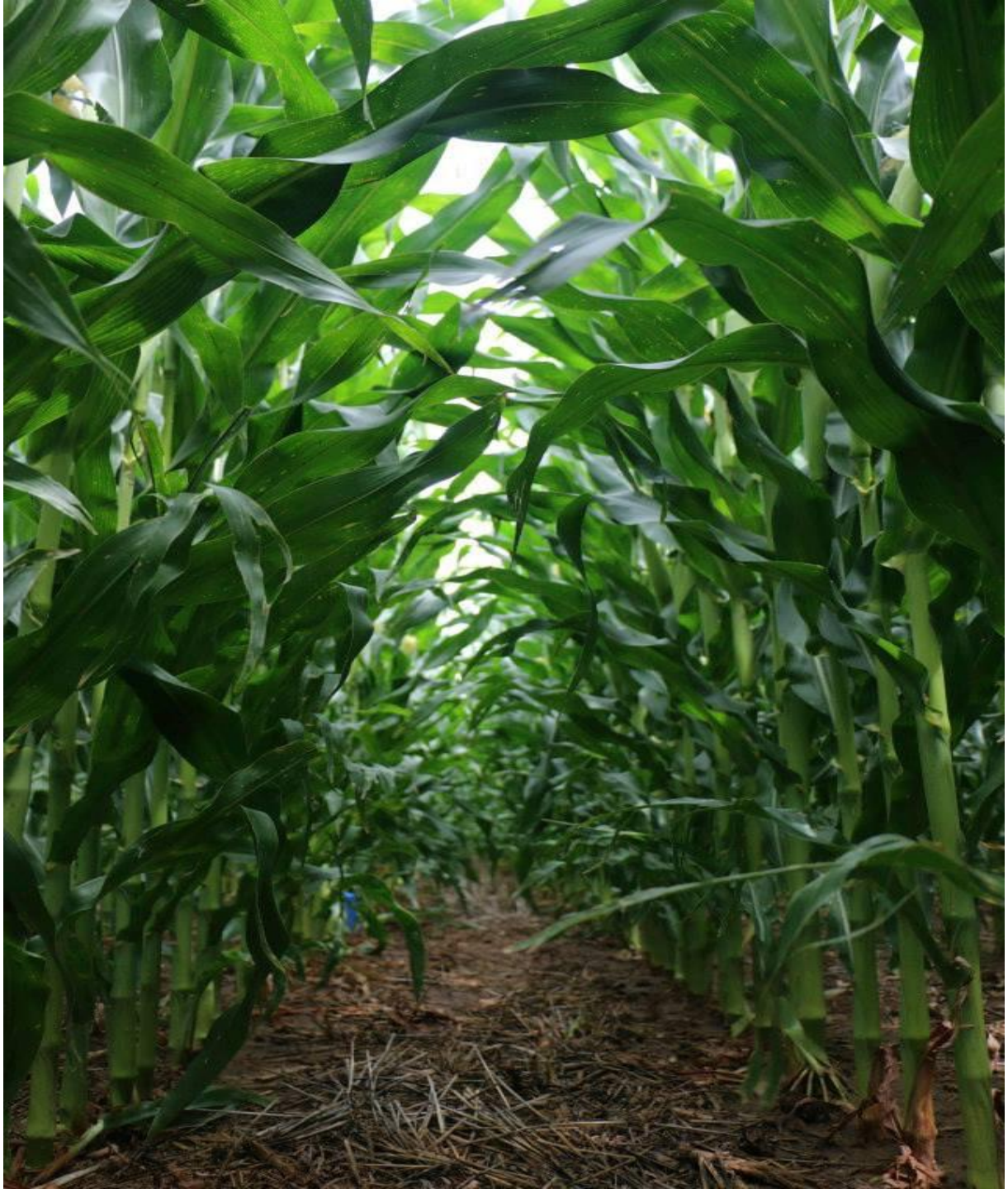


- Ear size estimate @ R1
  Plant Pop in 1/1000 acre
- Use Factor to Estimate Yield
  (girth x length x pop) x Specific Hybrid Factor
- Evaluate Plant Health, Subsoil Moisture, Extended Forecast
- + or – N amount post tassel based on new goal

Adjusting N Rate in Season



- Ear size estimate 2014
- (17x40x36) x.0118=288
- Potential yield was 285 to 290. 150 lbs on 7-25
- Post-tassel N application increased from 50 to 90 units of N/acre



2014

- Final ear size was 17-by-40 average
- 288 estimate
- 285 bu/a was final yield 2014
- .84 lbs applied N/bu

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P1197AM
2015

150# N + 0# P
preplant band
Soil test 96 ppm
on P_2O_5 (manure)

10 gal starter
per acre 2x0
(APP + 28-0-0-5)

3) 50# N 32-0-0 at V6

4) 100# N 32-0-0
beginning R2

3 pints Comite
per acre by air
at V14

6.8 oz Aproach
Prima at R3

July Yield Estimate
(19x40x34K) (.0118)
= 305 bu/acre

2015 yield: 300 bu


16x41x38K= 294 bu/a est
8-3-16
+50N recommended and applied.
100N total post tassel, 300N total
P1151AM
38000population
R2
2016


16.5x37x40=288 bu/a set
9-12-16
Final yield: 285 bu/a
P1151AM
R6
2016
16.5x37x40k

A Special “Thank You” to my Colleague

Alyssa Abbott - *DuPont Pioneer*

Thank you!!!!!

Questions????