

# “Top” Strip-Till Practices for Corn and Soybean

Tony J. Vyn

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# RTK-guided Strip Tillage for Corn after Soybean



# Berms after Soybean Harvest and Fall Strip-Till

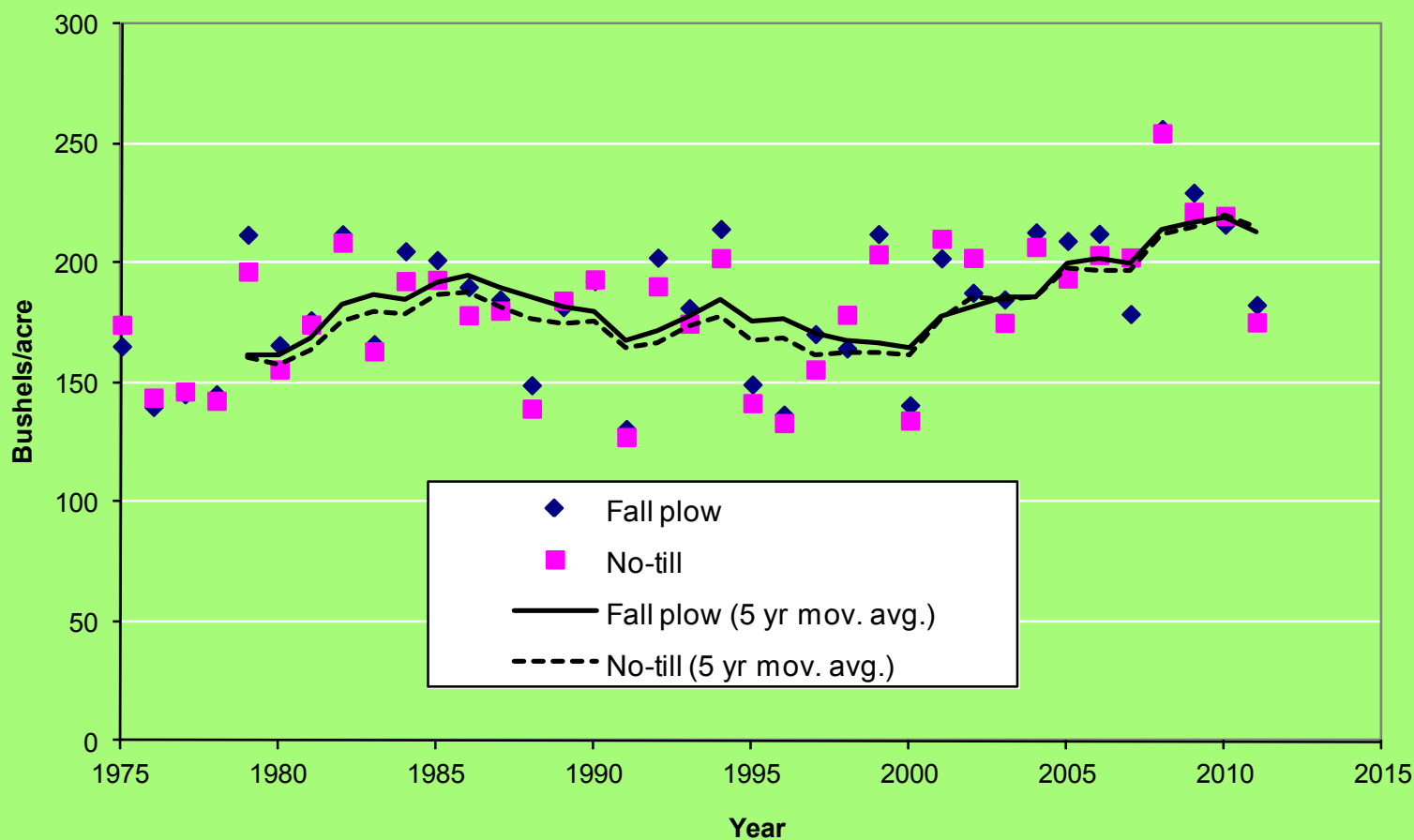


# Berm Heights in Spring after Successful Strip Tillage

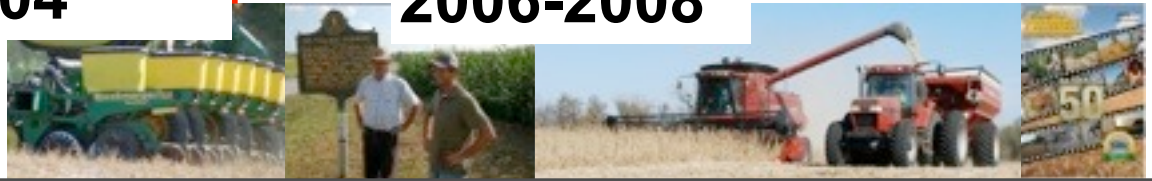
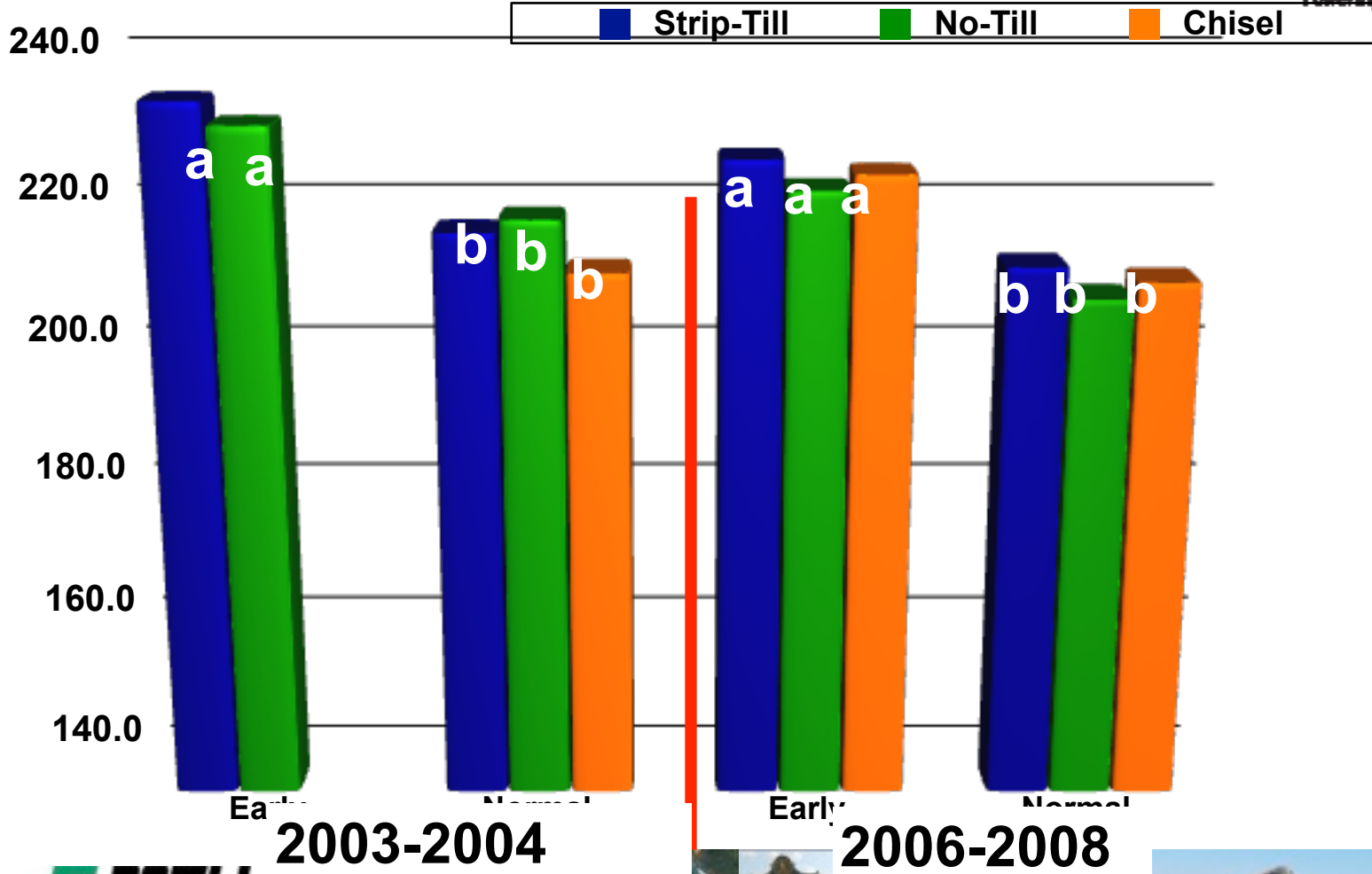


# Plow versus No-till in Corn-Soybean Rotation West Lafayette, IN (1975-2011)

Figure 3. Corn Yields After Soybeans, ACRE, 1975-2011.



# Corn Yield Response to Tillage and Planting Date after Soybean, Silty Clay Loam

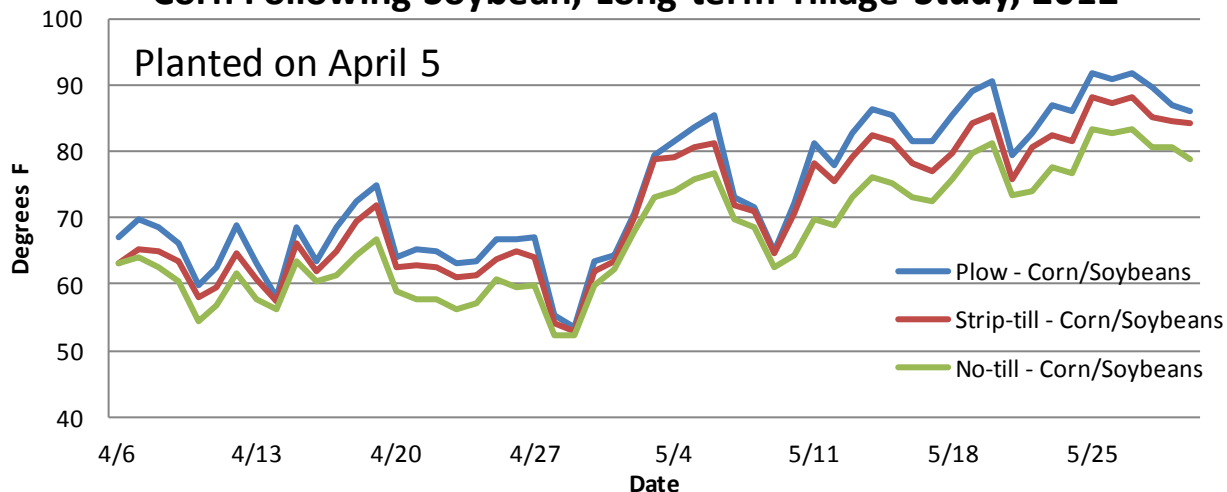


# Soil Temperature (2") with 3 Tillage Systems in 2012

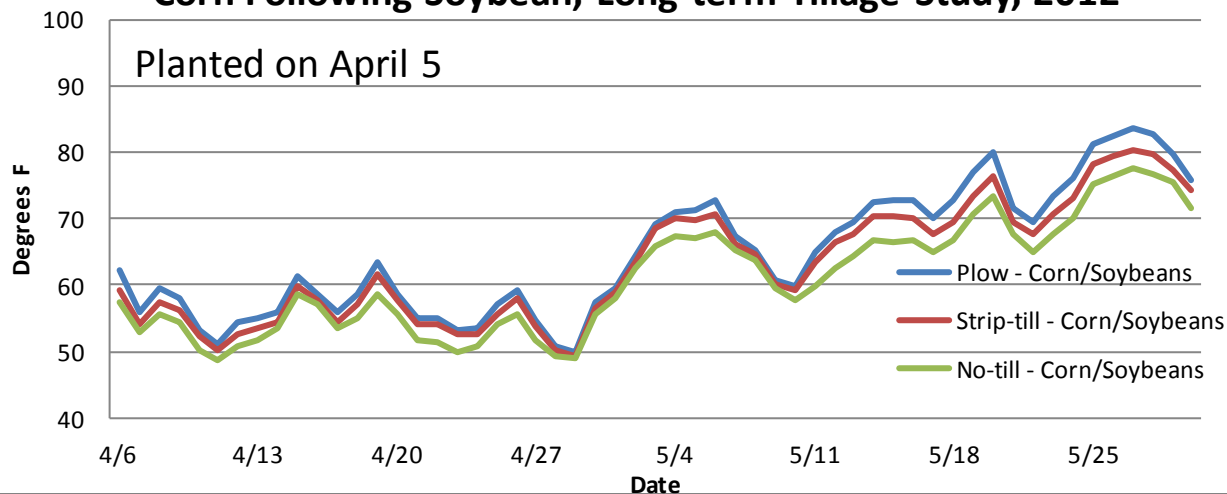
Indianapolis, Ind. • Jan. 9-12, 2013

Powering Up Your No-Till System

**Maximum Soil Temperatures,  
Corn Following Soybean, Long-term Tillage Study, 2012**



**Mean Soil Temperatures,  
Corn Following Soybean, Long-term Tillage Study, 2012**

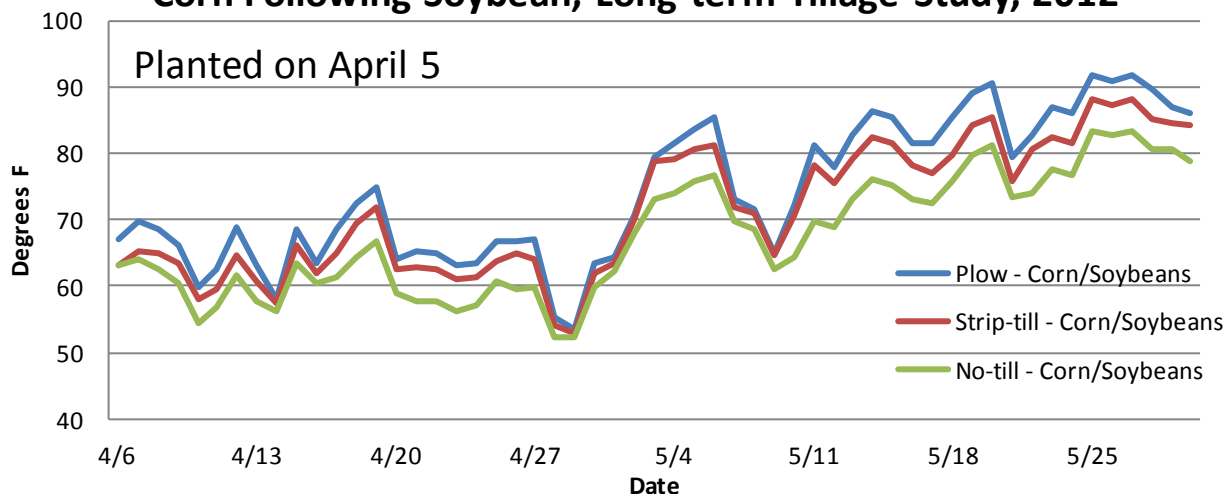


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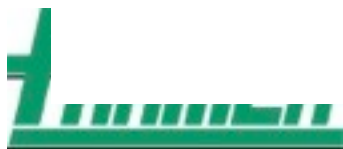
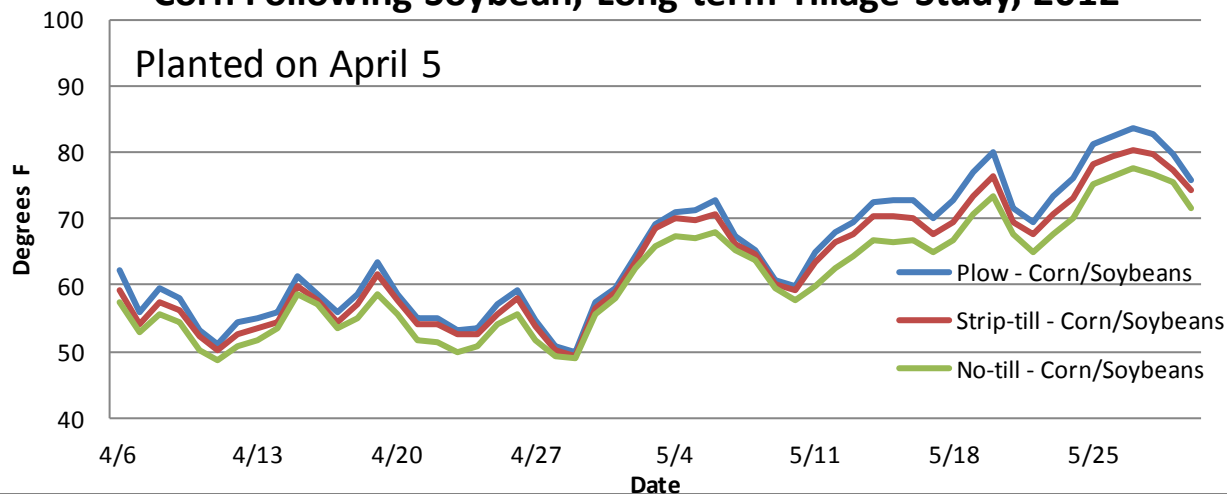
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Powering Up Your No-Till System

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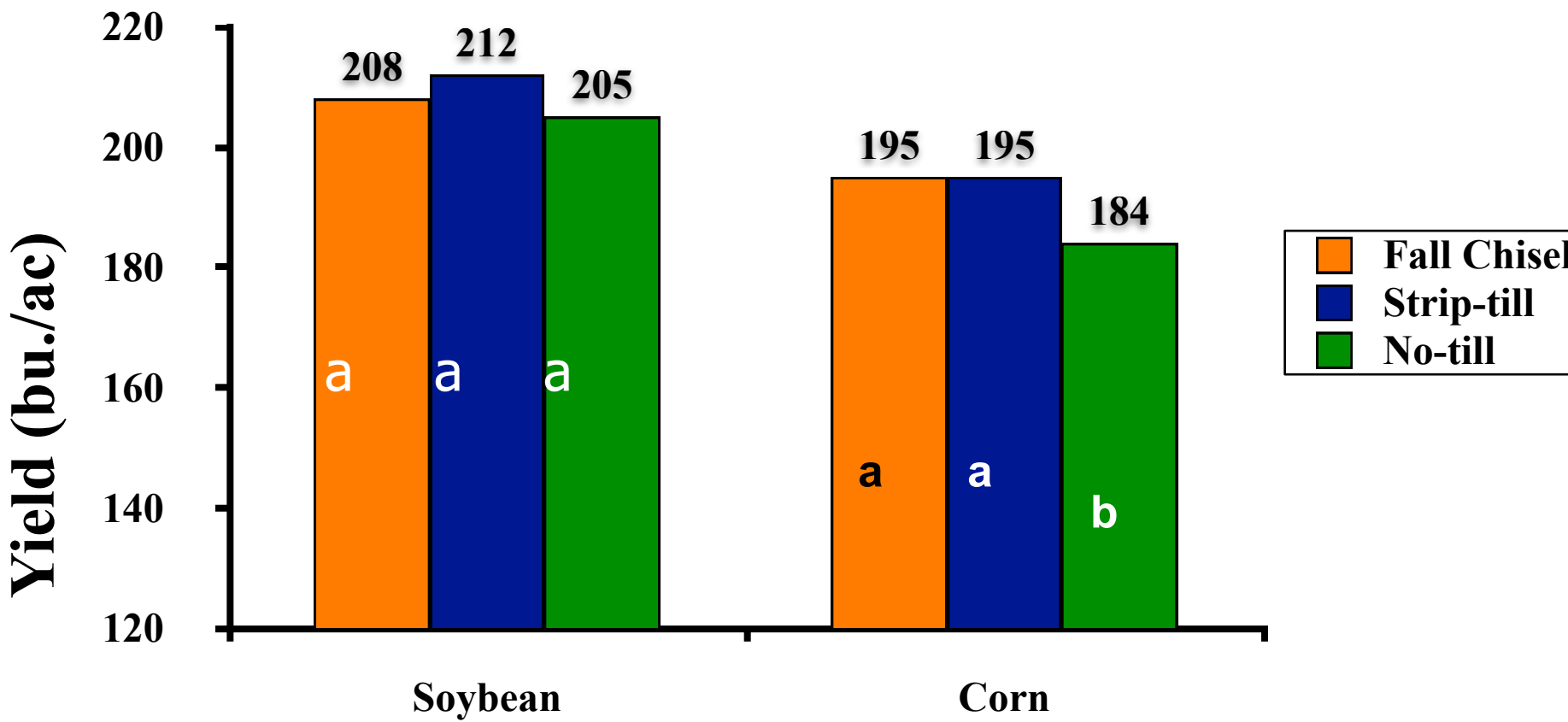


# RTK-guided Strip Tillage for Corn after Corn



# Strip Tillage for Corn after Soybean and Corn in N. Indiana, Loam Soil (2001-08)

Mississippi, June 2013  
Powering Up Your No-Till System

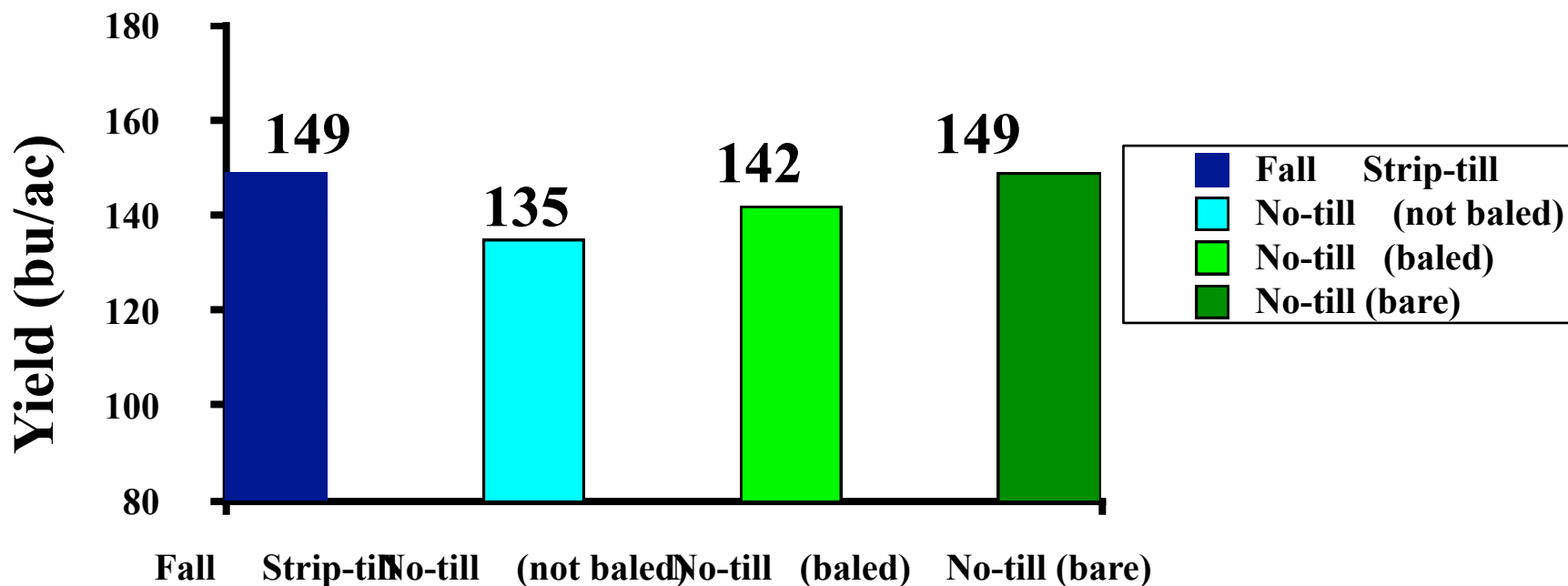


Previous Crop



# Winter Wheat Residue Effect on No-till Corn vs. Strip-till Corn

Centralia & Wyoming, Ontario (1994-96)



Opoku, Vyn & Swanton (Agron. J. 89:549)





# Spring Strip-till??





# “Spring Strip-Till” in Northern Texas (2012)

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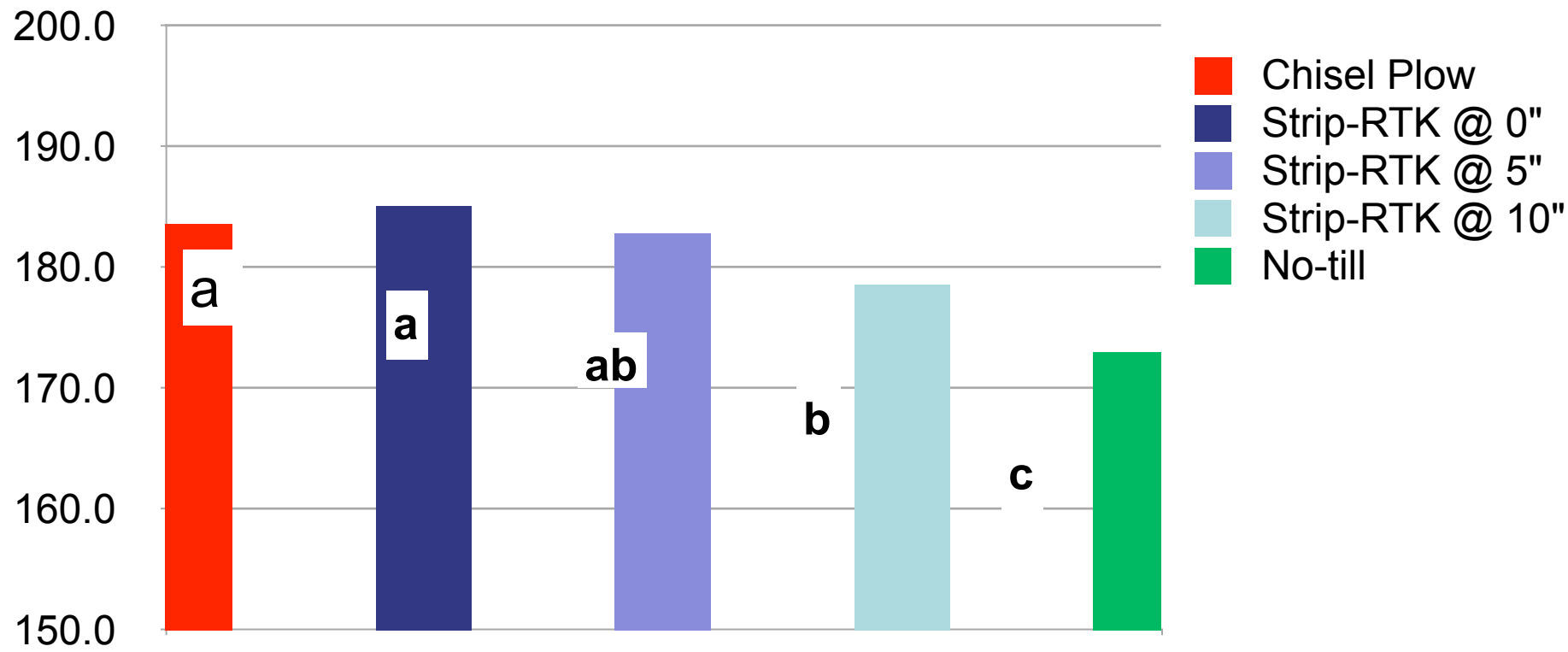


# RTK Precision Benefit in Strip-till Continuous Corn

(West Lafayette, IN, Mean of 2 planting dates, 2009-11)

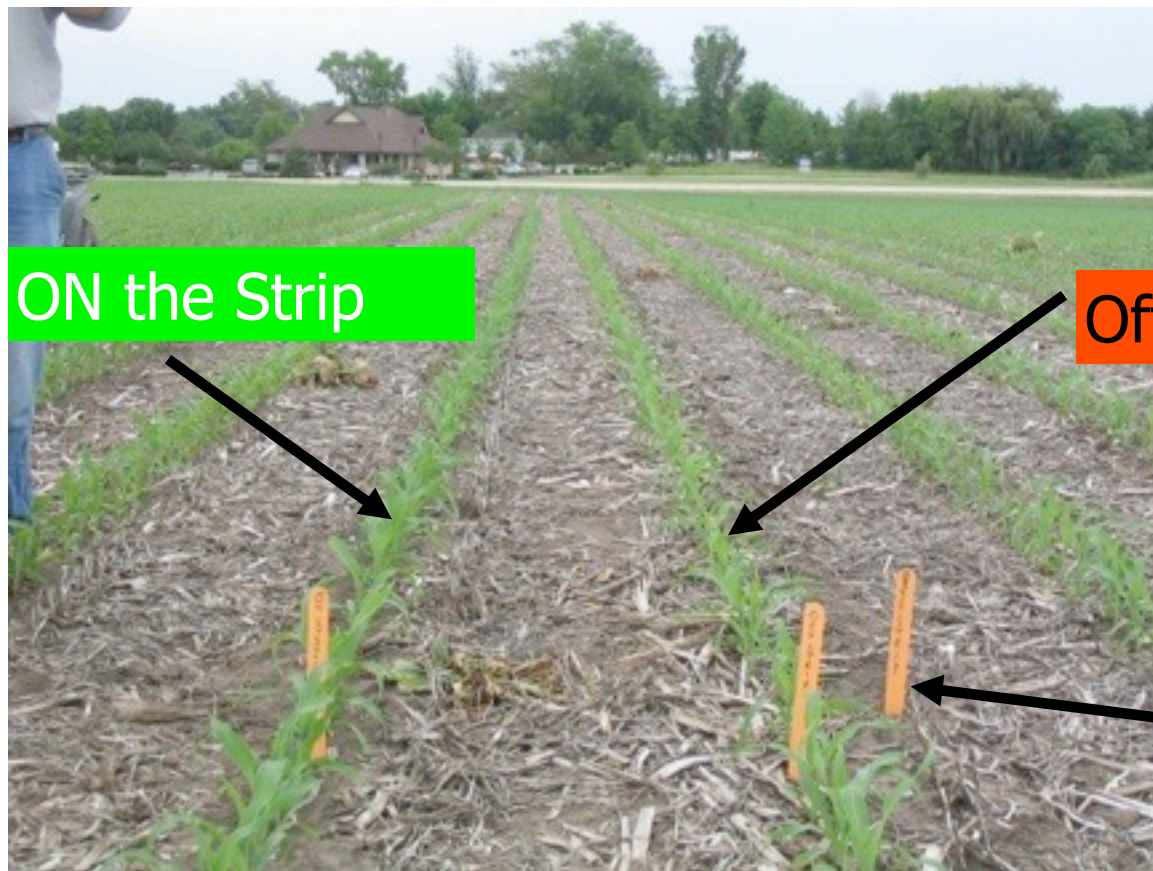


Yield (bu/acre)



# Row Position is Critical

Chattanooga, TN - Jan. 9-11, 2013  
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ON the Strip

Off the Strip

The Strip

Source: Norm Larson, Elburn Co-op, IL



# RTK + Pre-plant UAN Application 2006-2008

ge  
ice

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# RTK Planting after Pre-plant UAN

(West Lafayette, 2006)



4.11.2006



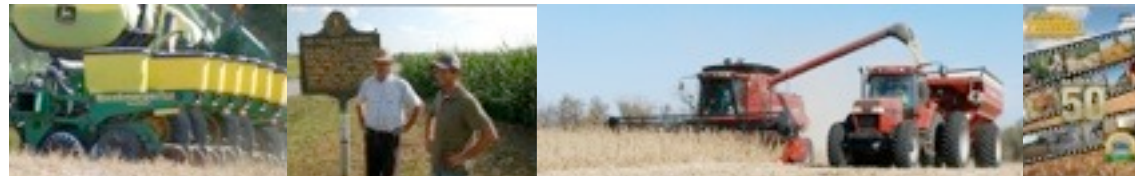


# Treatment Description for RTK Guided Row Positions Relative to Pre-plant UAN



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- UAN rates (0, 50, 100, 200 N per acre)



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- Two locations in 2006-2008: 1. Wanatah (loam), and 2. West Lafayette (silty clay loam)



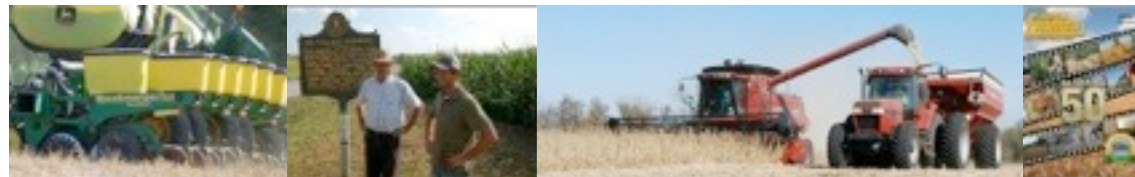
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- Starter at Wanatah: 19-17-0 at 125 pounds/acre



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- UAN rates (0, 50, 100, 200 N per acre)
- Positions (0", 5", and 10" from UAN band)
- Two locations in 2006-2008: 1. Wanatah (loam), and 2. West Lafayette (silty clay loam)
- Starter at Wanatah: 19-17-0 at 125 pounds/acre
- All treatments received a total of 200 pounds of N as UAN (whether pre-plant and/or early sidedress)





# RTK and Pre-plant UAN at Wanatah, IN

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**50 N at 0" versus 200 N at 0"**



**100 N at 0" versus 100 N at 10"**



# RTK and Pre-plant UAN at Wanatah, IN, 2006

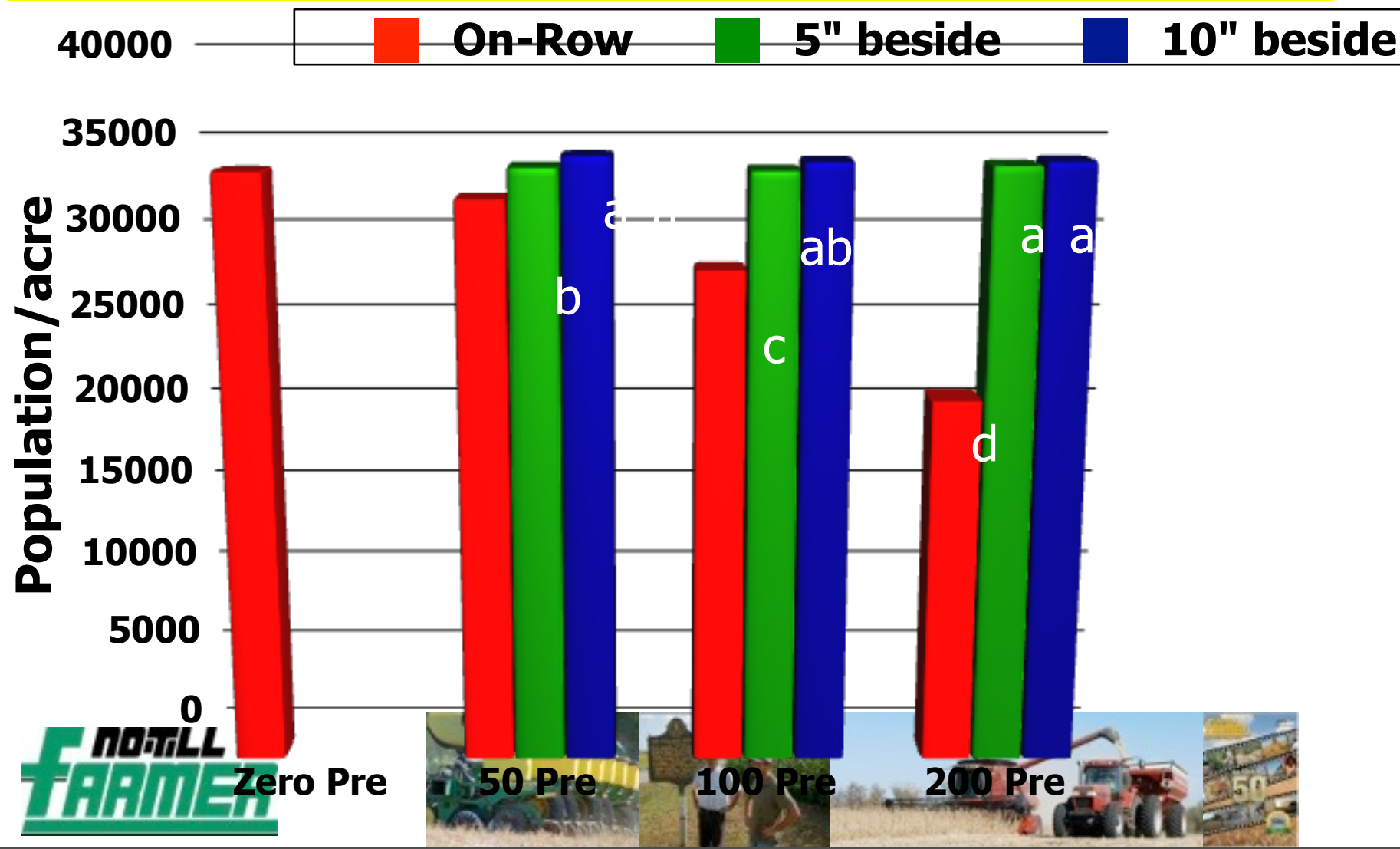


**200 N at 5" versus 200 N at 0"**

**200 N at 5" (background) vs.  
200 N at 0" (foreground)**

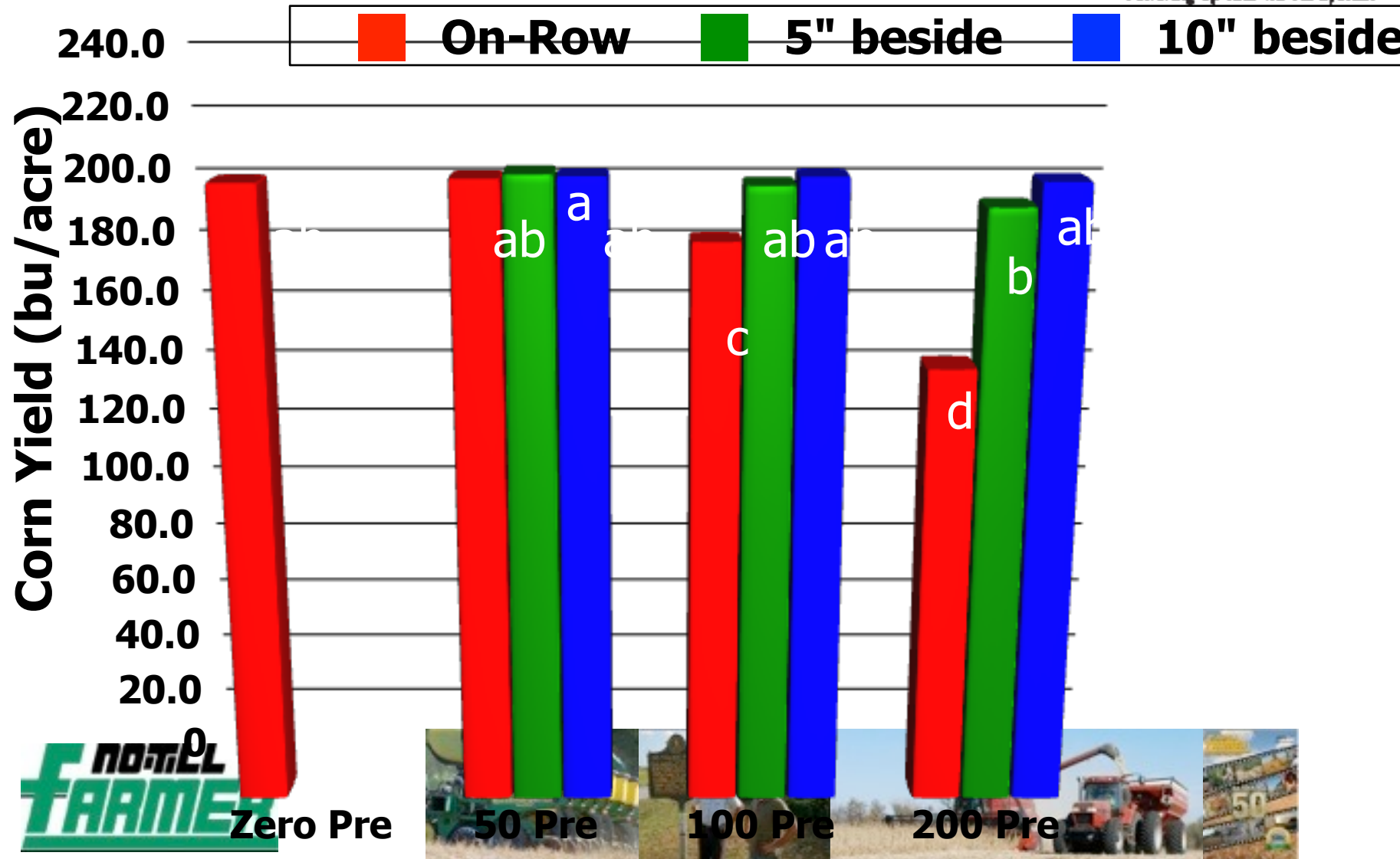


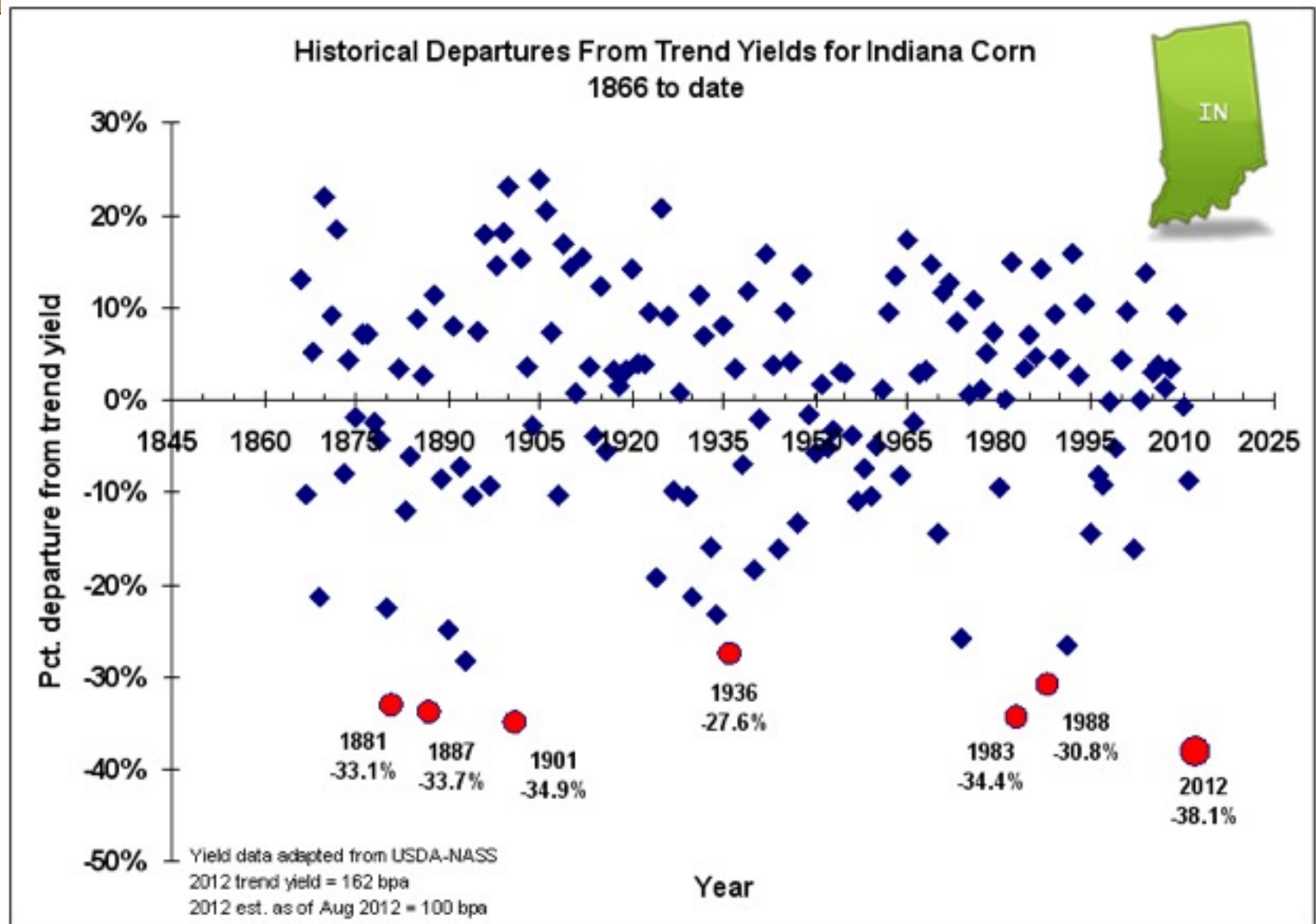
# RTK Row Position Effects on Plant Population Response to Pre-Plant UAN Rates Wanatah, IN, 2006-2008



# RTK Row Position Effects on Corn Yield Response to Pre-Plant UAN Rates

Wanatah, IN, 2006-2008

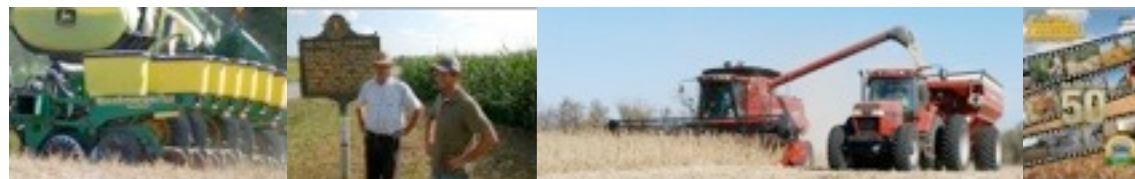
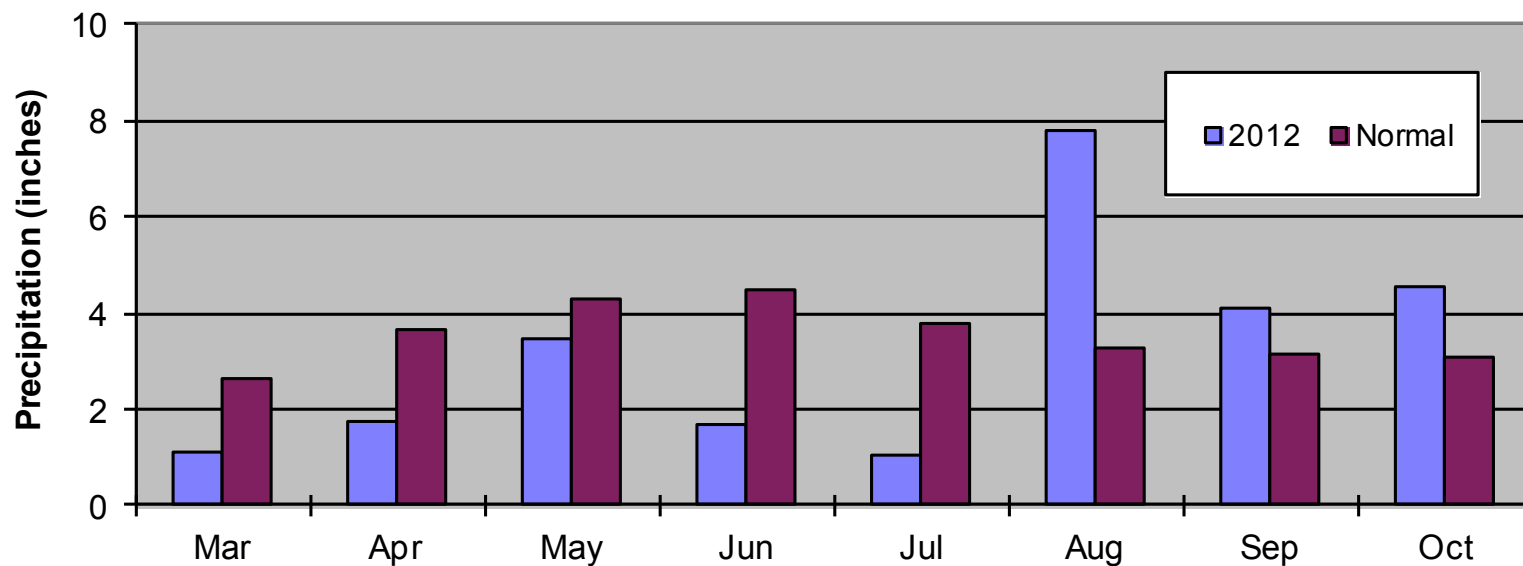




**USDA data compiled by Bob Nielsen (August, 2012)**

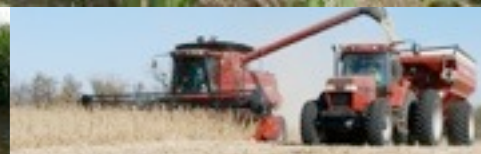
# Rainfall Timing is Critical to Tillage or Rotation Impacts

Figure 1. Monthly precipitation for March through October, 2012 compared to normal, ACRE.



# Height Reduction in No-till (2012)

12, 2013  
Systems



# No-till vs. Strip-till in Continuous Corn





# No-till vs. Chisel Plow in Continuous Corn



## Possible Contributing Factors:

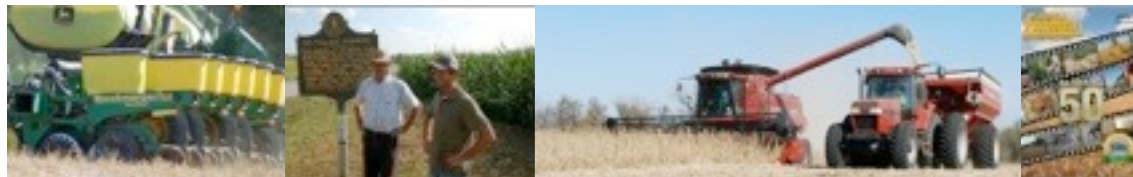
1. Hybrid "Root Strength" Score = 4/9
2. Hybrid "Drought Tolerance" Score = 7/9



# Corn Growth Responses to Tillage for Corn-Soy and Continuous Corn in 2012 (West Lafayette, IN)

## Corn-Soy

Tillage Treatments	Plant Heights on May 2 (in)	Plant Heights on June 6 (in)	Corn Yield (bu/acre)
Fall Plow	8.6 ab	43 a	171 ab
Fall Chisel	9.3 a	43 a	178 a
Strip-till	7.6 b	37 b	176 a
No-till	7.9 b	32 c	159 b



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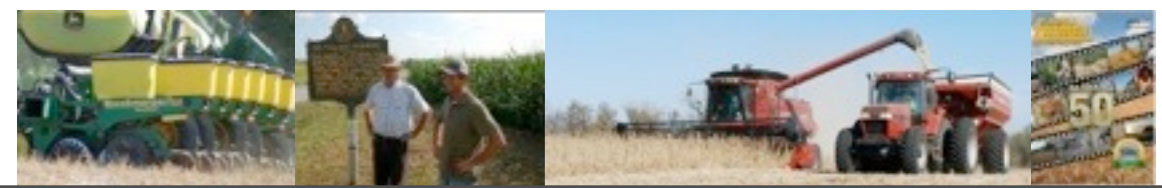
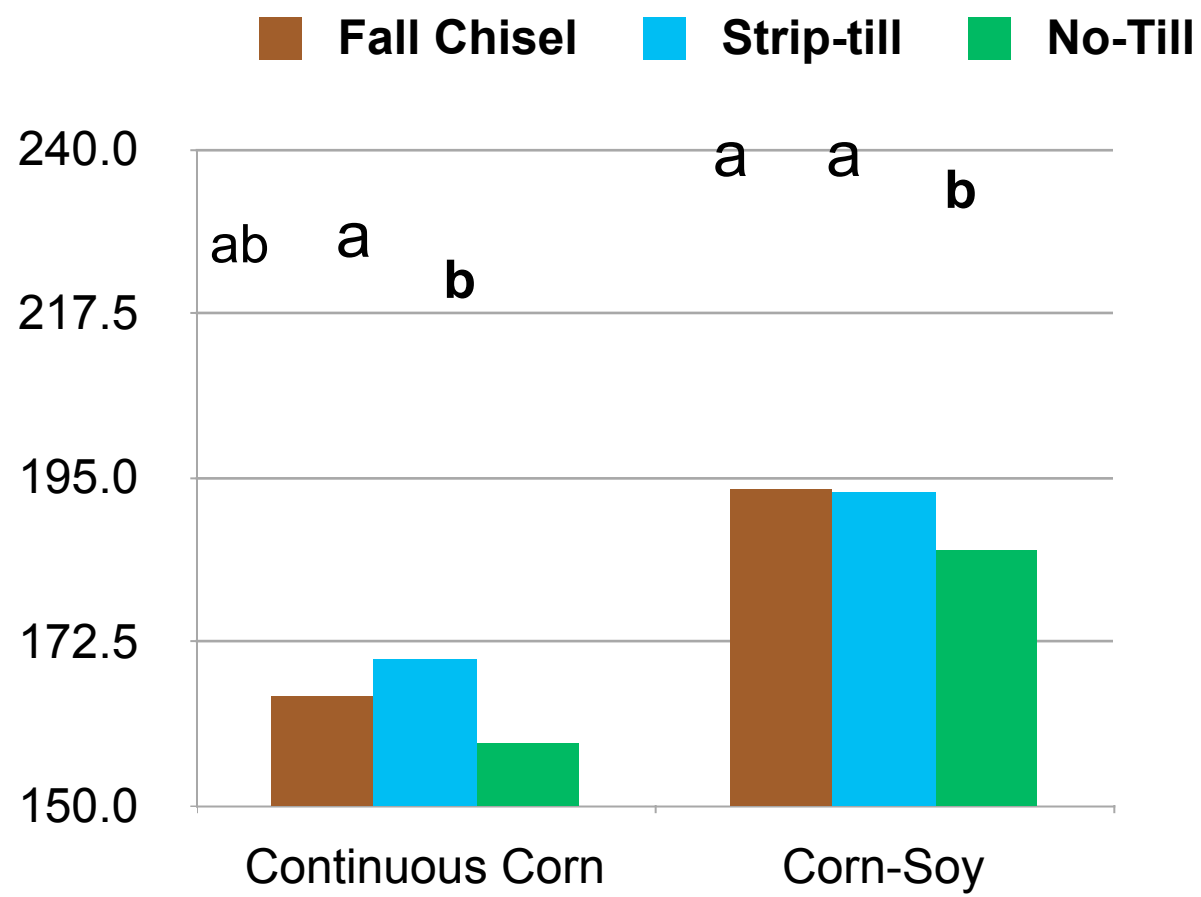
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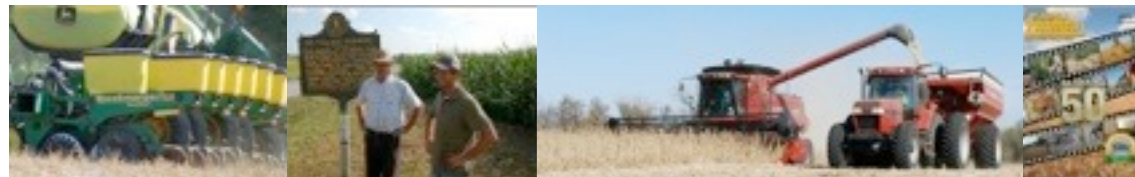


# Average Strip-Till Corn Yield Performance (West Lafayette, IN, 2010-2012)





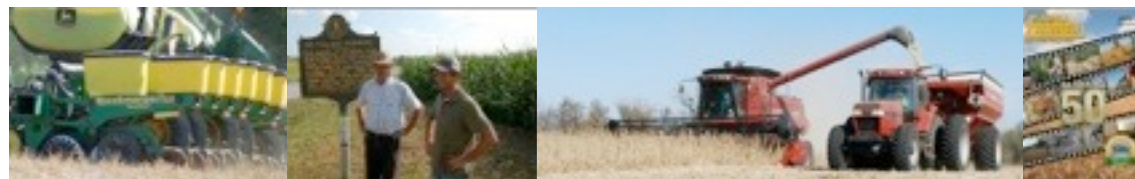
# Soybean Growth Responses to Tillage for Corn-Soy Rotation in 2012 (West Lafayette, IN)





## Soybean Growth Responses to Tillage for Corn-Soy Rotation in 2012 (West Lafayette, IN)

Tillage Treatments	Plant Heights on May 30 (in)	Plant Heights on June 19 (in)	Soybean Yield (bu/acre)
<b>Fall Plow</b>	<b>6.3 a</b>	<b>23 a</b>	<b>63 a</b>
<b>Fall Chisel</b>	<b>5.7 b</b>	<b>21 b</b>	<b>61 a</b>
<b>Strip-till</b>	<b>5.5 bc</b>	<b>18 c</b>	<b>61 a</b>
<b>No-till</b>	<b>5.1 c</b>	<b>17 d</b>	<b>61 a</b>

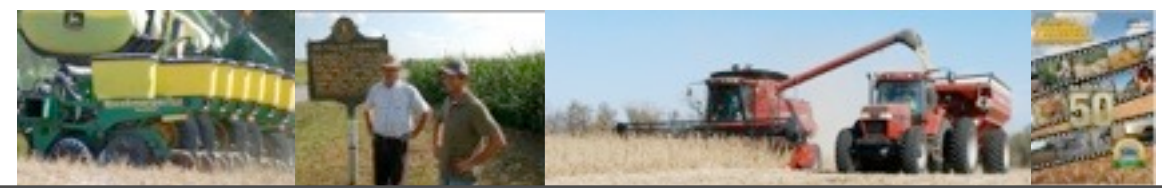
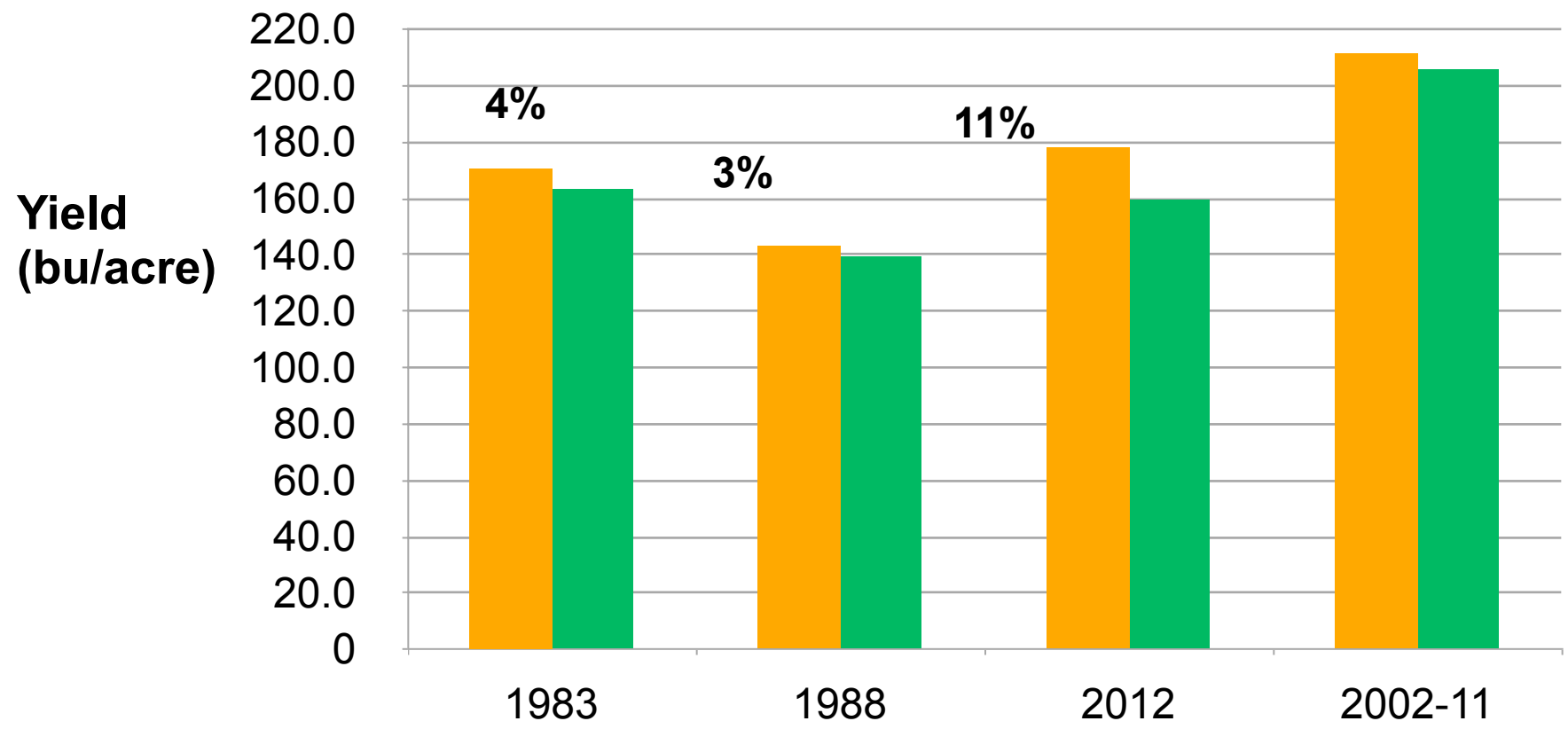




# No-till Corn Yields in "Drought" Years versus Recent 10-year Period for Corn after Soybean

Chisel Plow No-till 3%

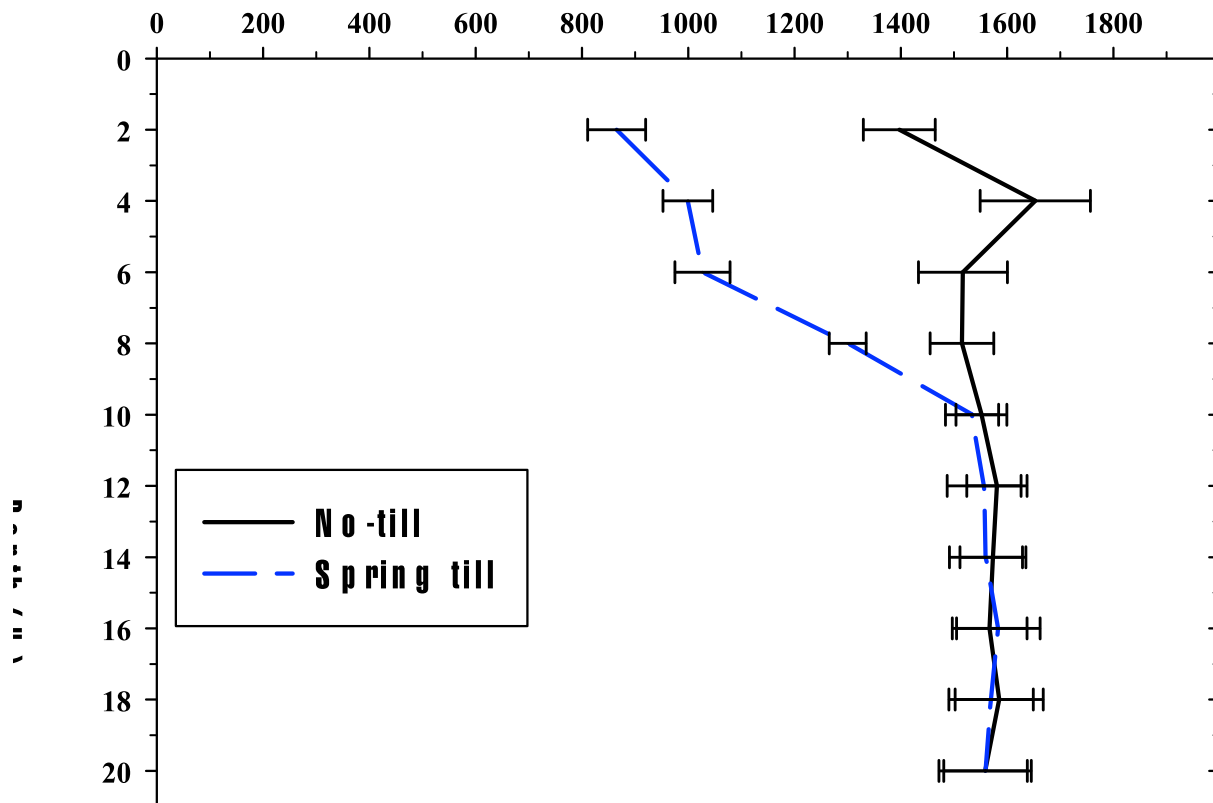
Powering Up Your No-Till System



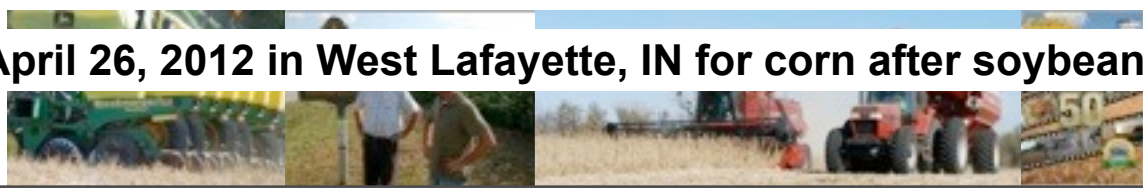
# One Tillage Factor in Root Access to Soil Water is Resistance to Root Growth

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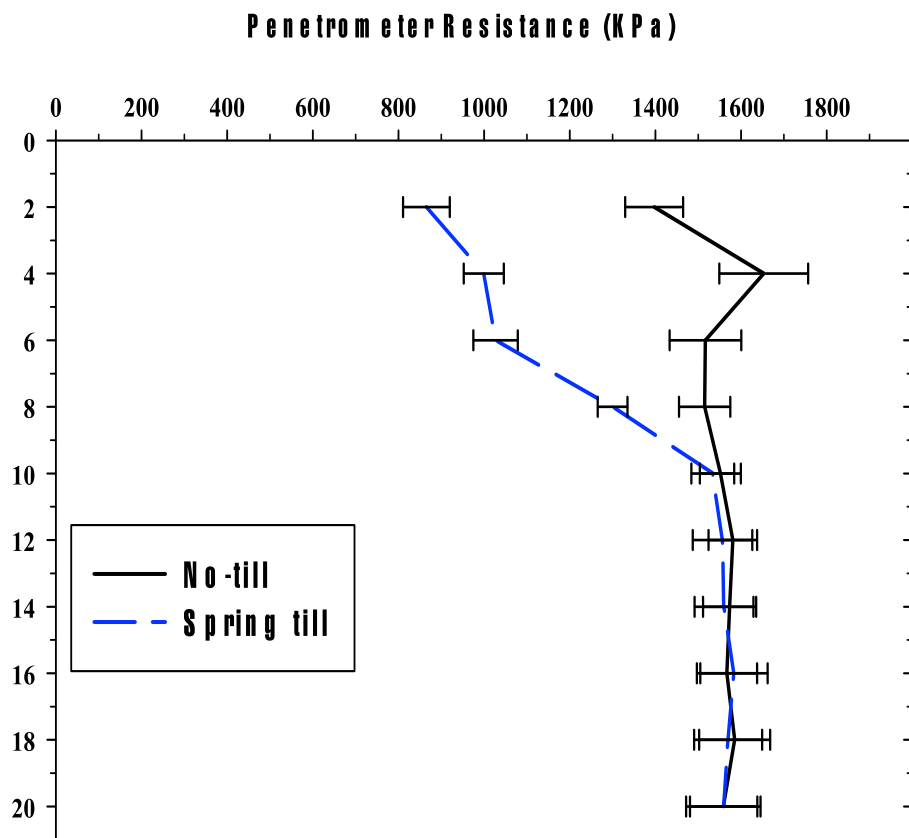
Penetrometer Resistance (KPa)



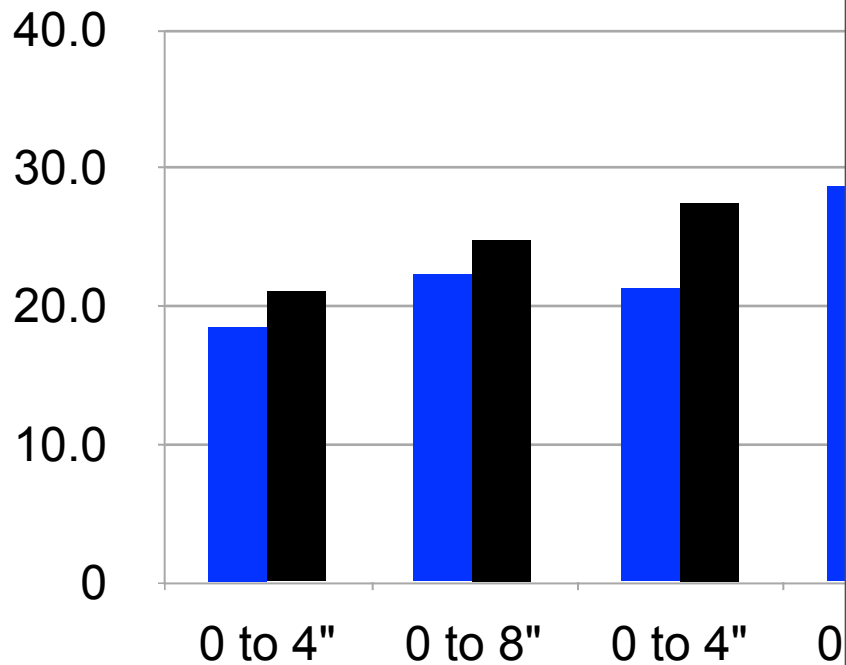
Kovacs and Vyn, 2012. April 26, 2012 in West Lafayette, IN for corn after soybean



# Soil Penetration Resistance vs. Soil Moisture %



■ Chisel plow  
 ■ No-till



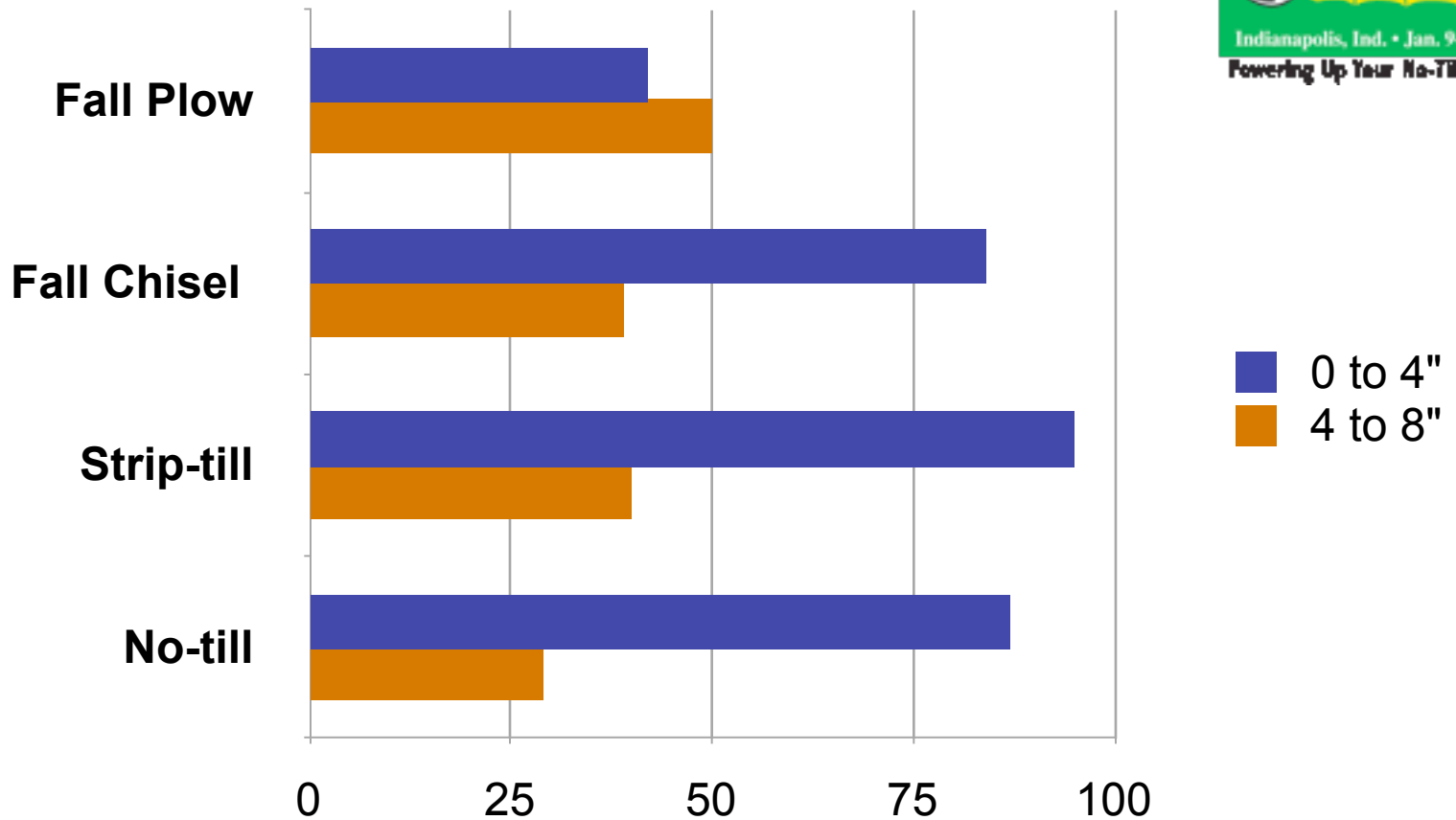
**April 27 May 15**

Kovacs and Vyn, 2012. April 26, 2012 in West Lafayette, IN for corn after soybean



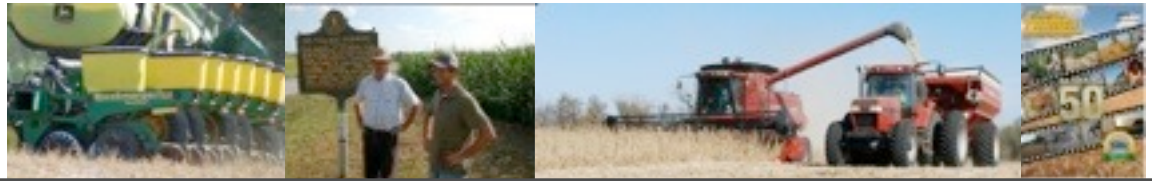
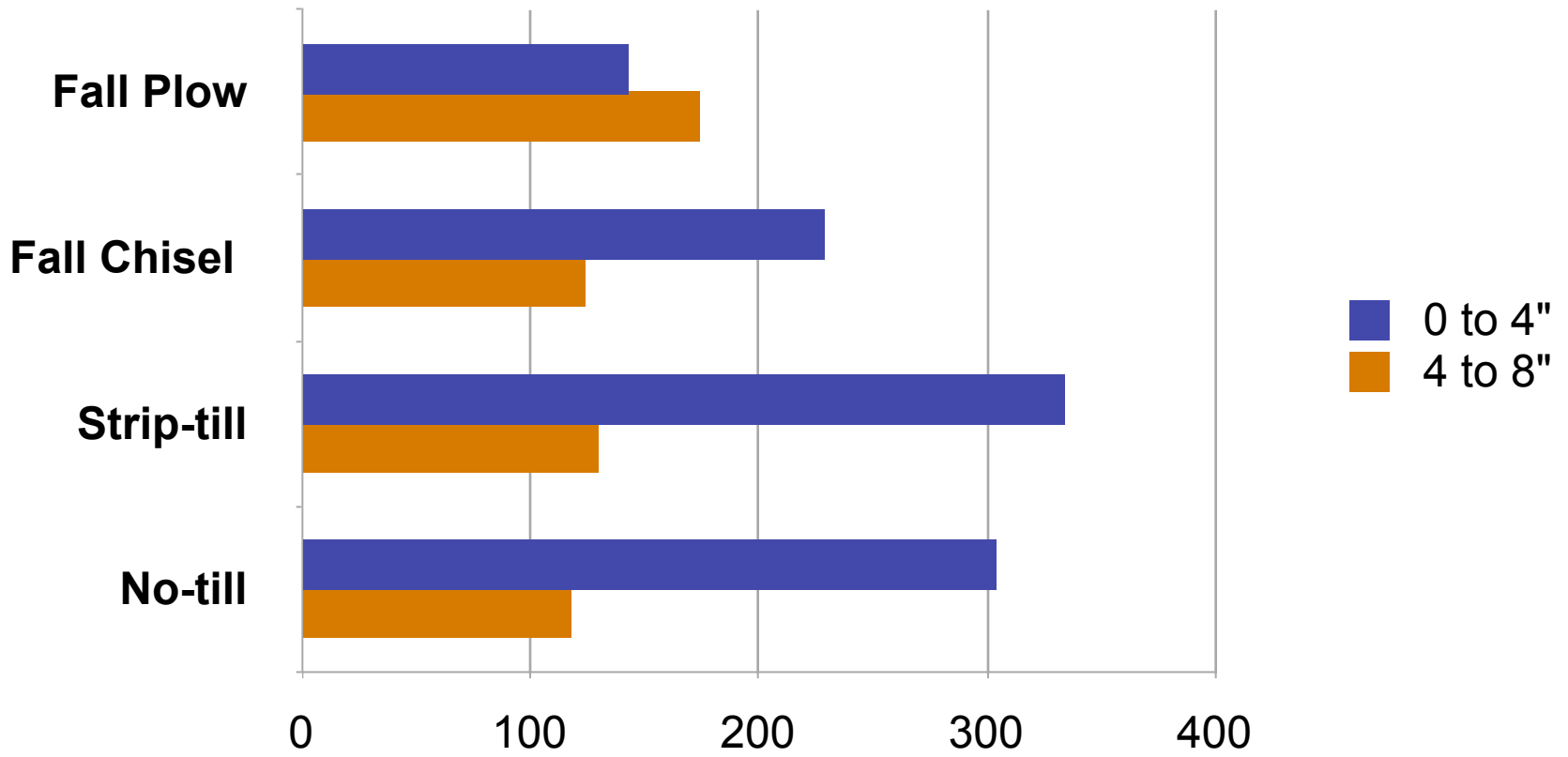
# Tillage Influence on Soil-test P (ppm)

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# Tillage Influence on Soil-test K (ppm)

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# P-K Banding vs. Broadcast Questions

Powering Up Your No-Till System

- Should farmers band 100% of requirements?
- Does the banding depth matter?
- Does the banding position matter in successive years on the same field?
- How should soil sampling proceed once deep banding is used routinely?
- Does deep banding mean lower rates can be used without yield loss?



# Strip Tillage with Nutrient Banding in Small-plot Research (West Lafayette, IN)



2013  
systems

Note:  $P_2O_5$  rate = 88 pounds/acre, and  $K_2O$  rate = 115 pounds/acre

All plots received a uniform 2 x 2" starter of 14 – 28 – 14 (N,P,K), plus a total N rate of 250 pounds/acre.



## Sponsor: PPI-FAR 2001-2003

# High Yield Corn Response to Placement

**Hybrids:**           1. Pioneer 34B24  
                          2. Pioneer 34M95

**Population/ Acre:**    1. 32,000  
                                  2. 42,000

### P&K Fertilizer

**Placements:** 1. Control  
                      2. Broadcast  
                      3. Shallow Band (6")  
                      4. Deep Band (12")  
                      5. Shallow + Deep (6" and 12")

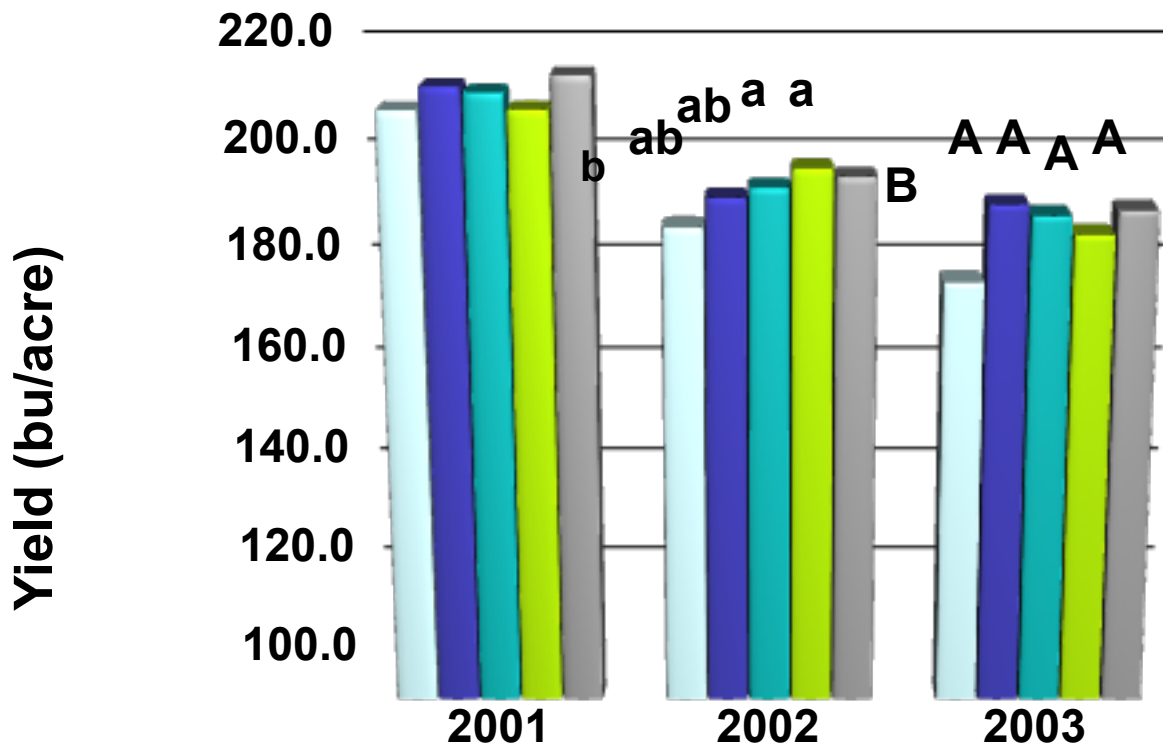


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# Corn Yield Response to Fertility Placement, West Lafayette, IN, (2001-2003).

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- Control
- Broadcast
- Band 6"
- Band 12"
- Band 6" and 12"

## “CONTROL”

Soil-test P (0-4"):	15	25	30
(4-8"):	15	15	21
Soil-test K (0-4"):	94	143	161
(4-8"):	107	101	110



# Importance of fertilizer management to uniformity in ear size at high plant populations



Control

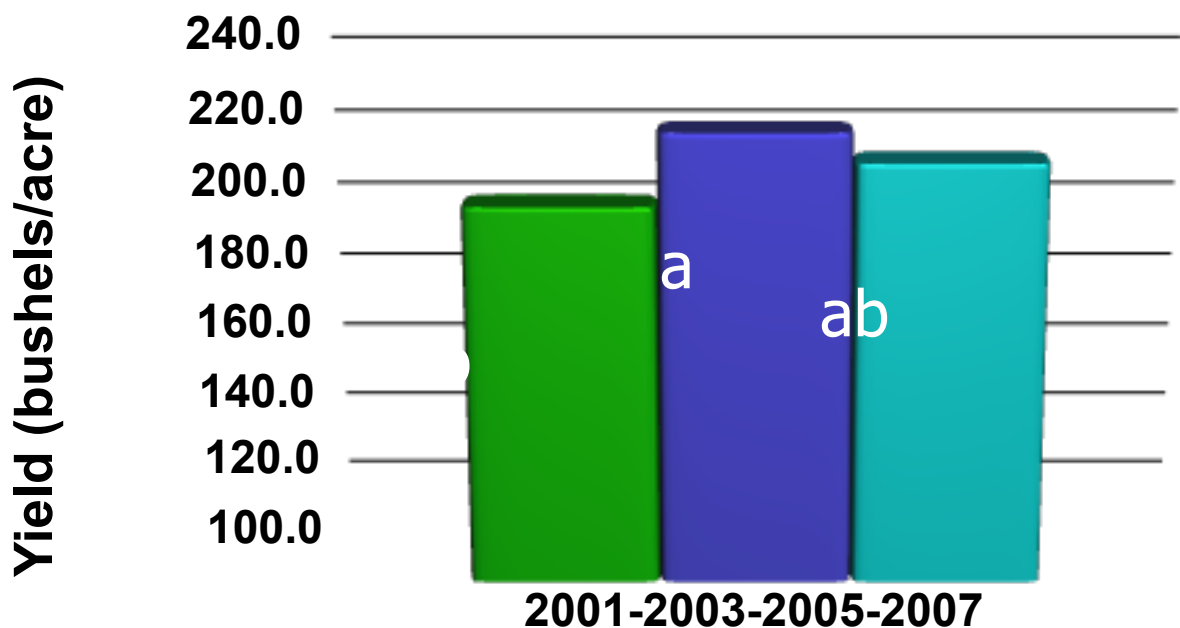


Deep Band at 6 + 12"





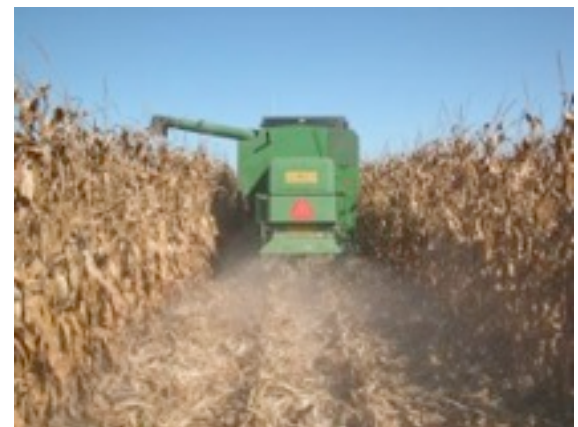
# Six inch Band P and K Placement Effects on Strip-till Corn Yield (mean of 2 hybrids, 2001-2007)



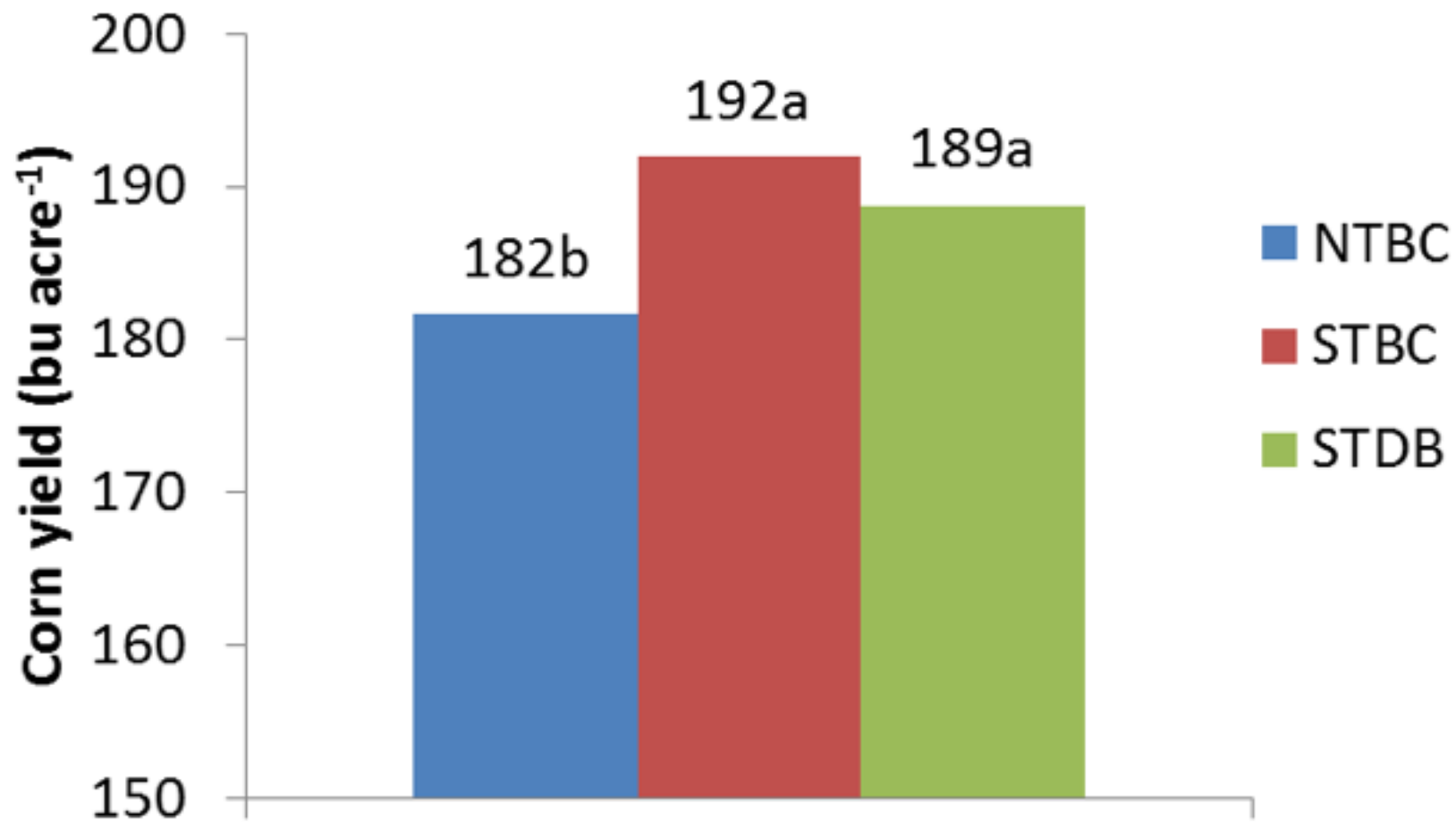
■ Control  
■ Broadcast P & K  
■ Deep-Band P & K

**Soil-test P (0-4"):** 22  
                   (4-8"):

**Soil-test K (0-4"):** 186  
                   (4-8"):



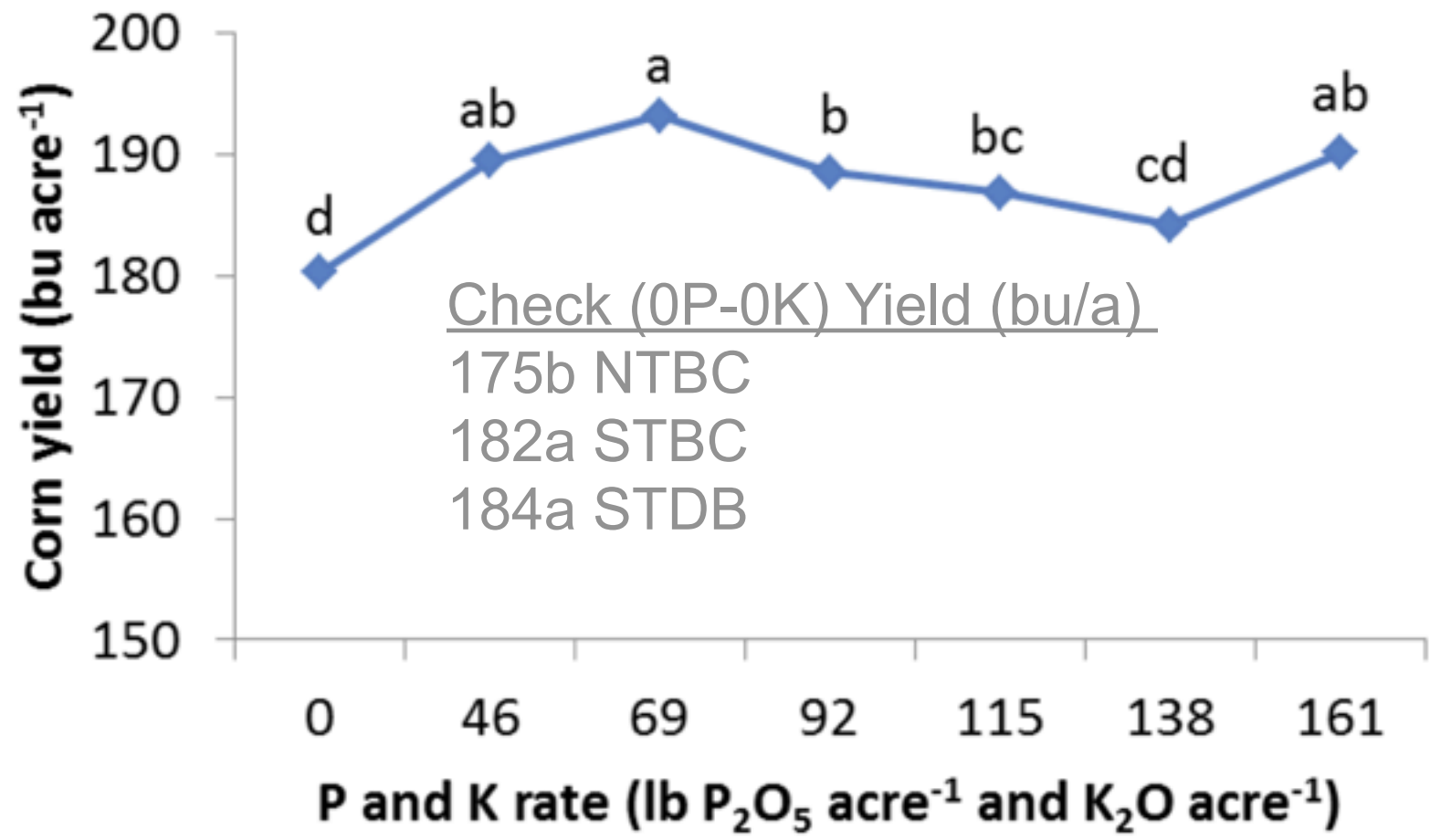
# Corn yield response to deep banded vs. broadcast P and K (2-yr mean)



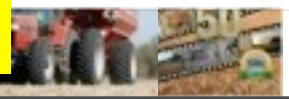
Source: Fernandez. Univ. of IL.



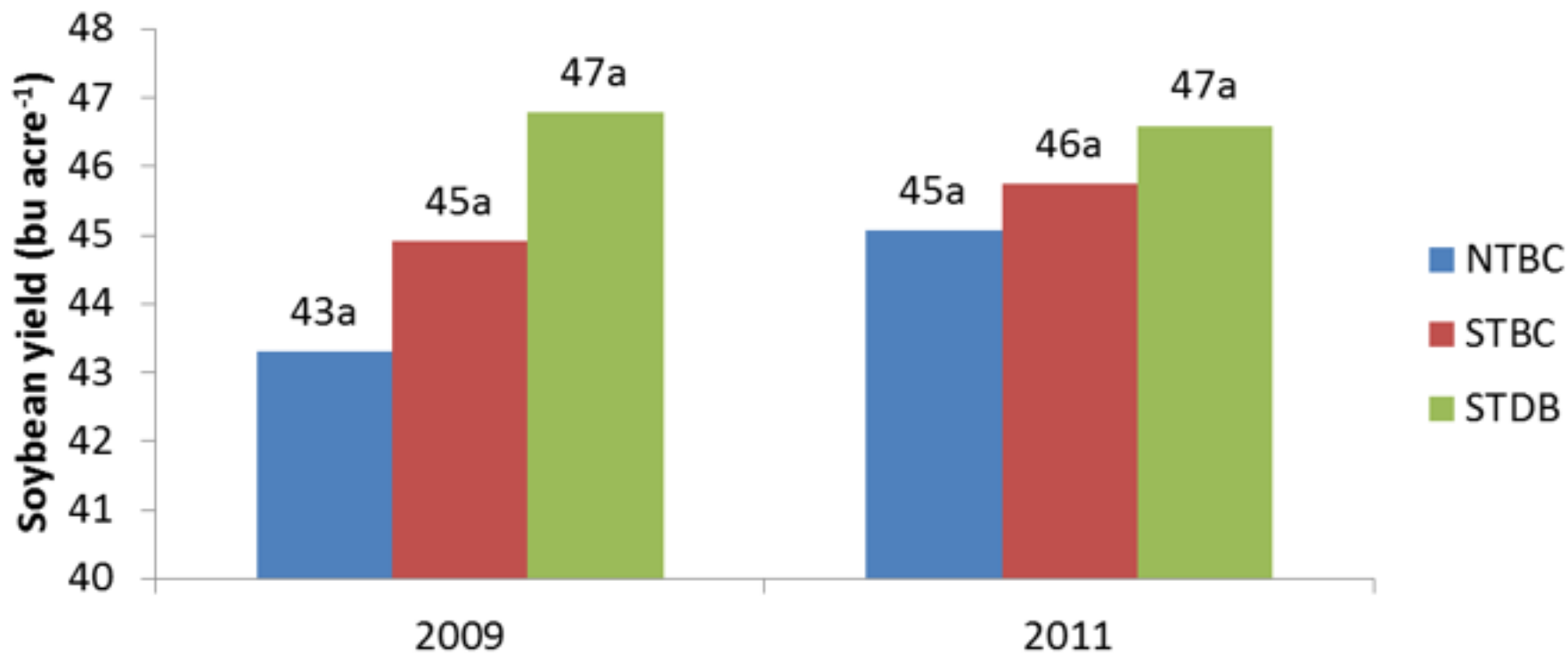
# Illinois Corn Response to P&K



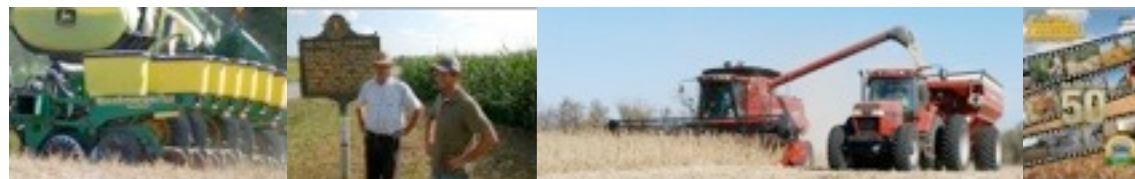
Source: Fernandez, Univ. of IL



# Soybean yield in Illinois in Response to Broadcast versus Deep Band



Source: Fabian Fernandez, Univ. of IL



# Micro-Essentials Banding Project for 2013-2015



# Micro-Essentials Banding Project for 2013-2015







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# RTK Guidance & Nutrient Placement Conclusions

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# RTK Guidance & Nutrient Placement Conclusions

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- 1. P and K fertilizer placement: No evidence of advantage for deep banding at full crop removal rates.**
- 2. UAN and NH<sub>3</sub> fertilizer: Rate, timing, and proximity to corn row are important considerations in avoiding injury while promoting even and optimum N availability to all plants.**



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# Acknowledgments

## Funding:

**John Deere**

**Fluid Fertilizer Foundation**

**IPNI**

**USDA-NIFA**



## Equipment:

**John Deere Cropping Systems Unit**

**Remlinger (Kalida, OH)**

**Environmental Tillage Systems**

## Seed:

**Pioneer Hi-Bred, Int.**





# Thanks!



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# Corn Response to Deep Banding at 6" Depth



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# Residual Effects of Fertilizer P and K Placement in Corn on Subsequent No-till Soybean (2002-2006)

Planting 5/10/04



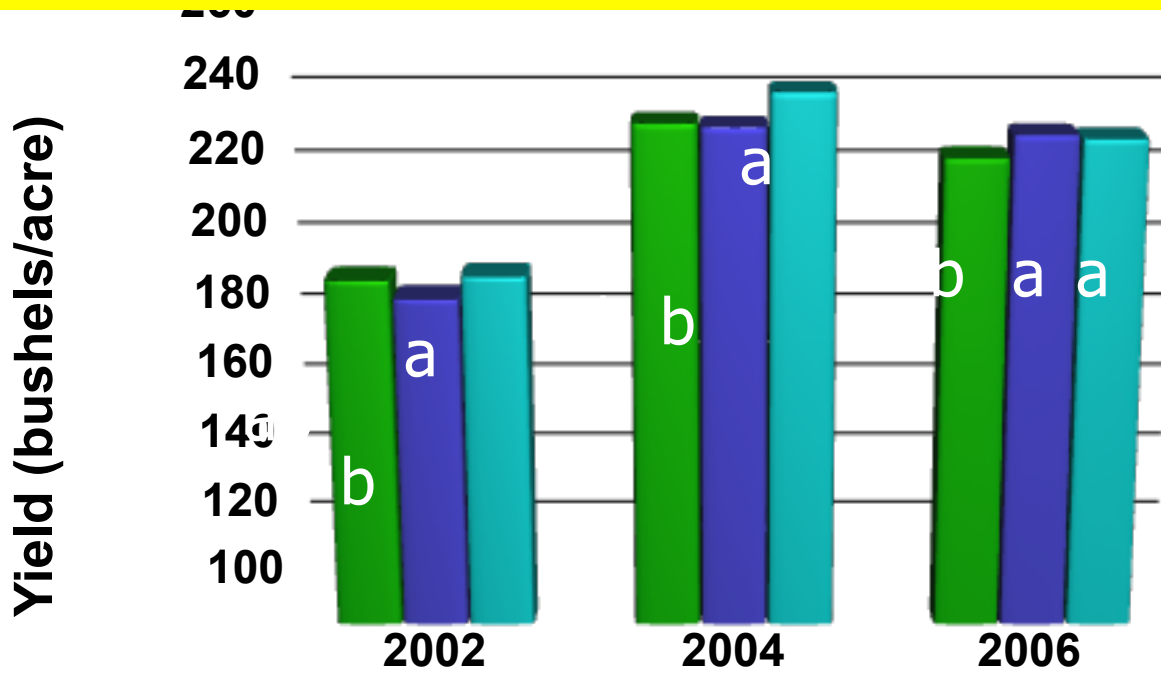
Soil sampling (June/04)



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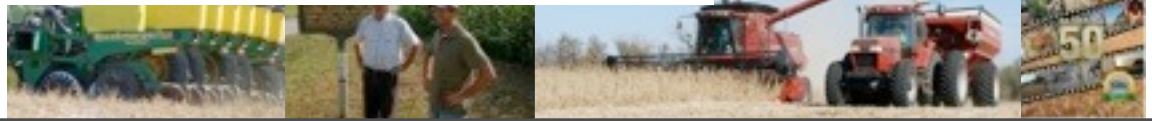
# Six inch Band P and K Placement Effects on Strip-till Corn Yield (mean of 2 hybrids, 2002-2004-2006)



Powering Up Your No-Till System

- Control
- Broadcast P & K
- Deep-Band P & K

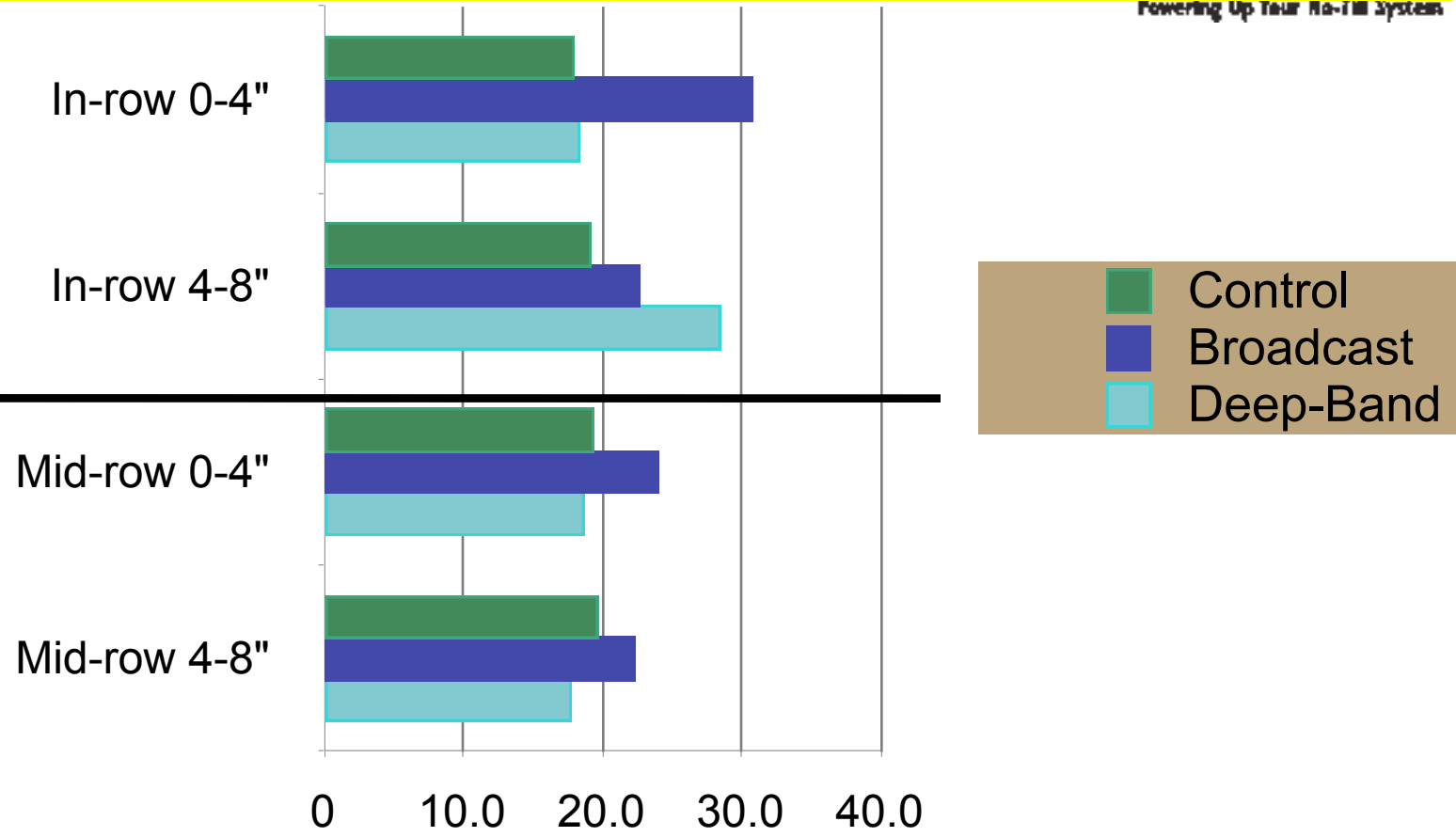
Soil-test P (0-4"): 104  
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 Soil-test K (0-4"): 164  
 (4-8"): 125



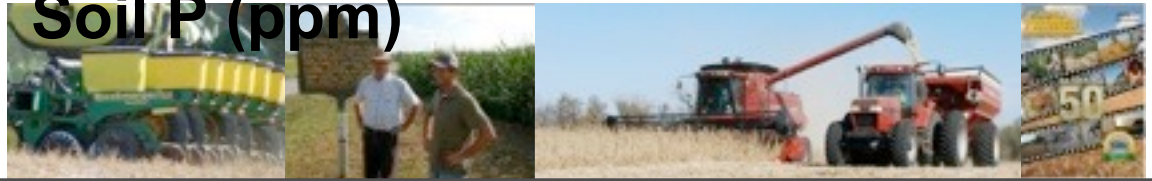


# Soil P concentrations in spring 2008 following third strip-till corn cycle for a corn-soybean rotation

Powering Up Your No-Till System

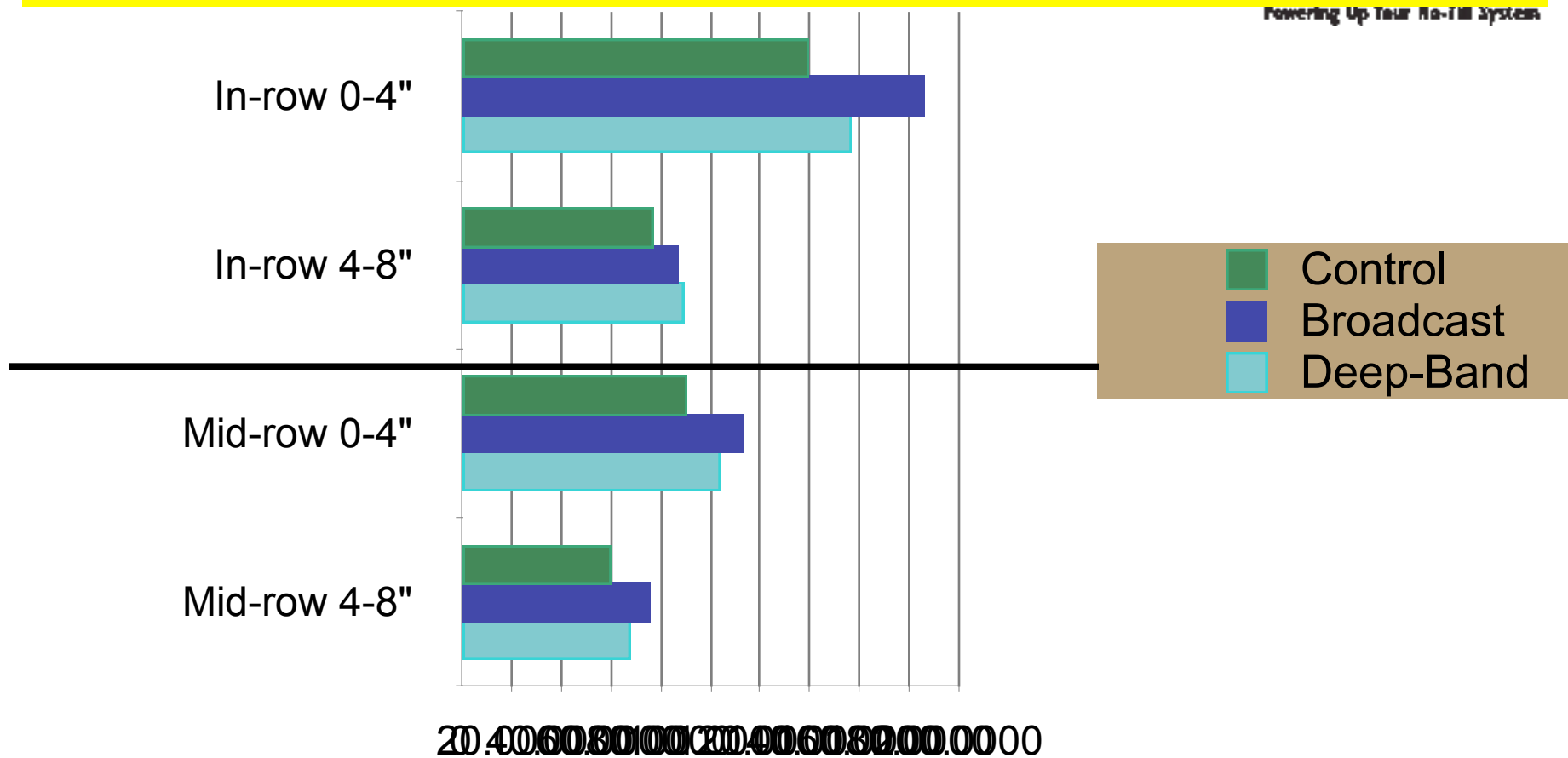


Soil P (ppm)

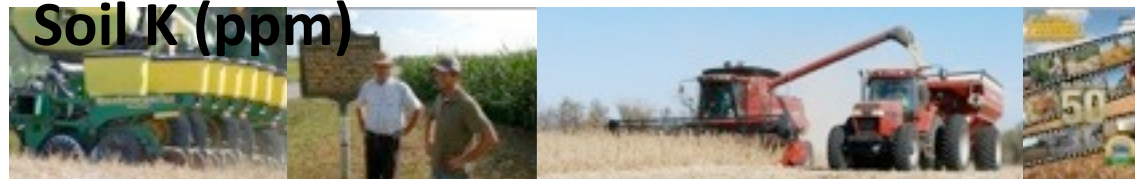


# Soil K concentrations in spring 2008 following third strip-till corn cycle for a corn-soybean rotation

Powering Up Your No-Till System

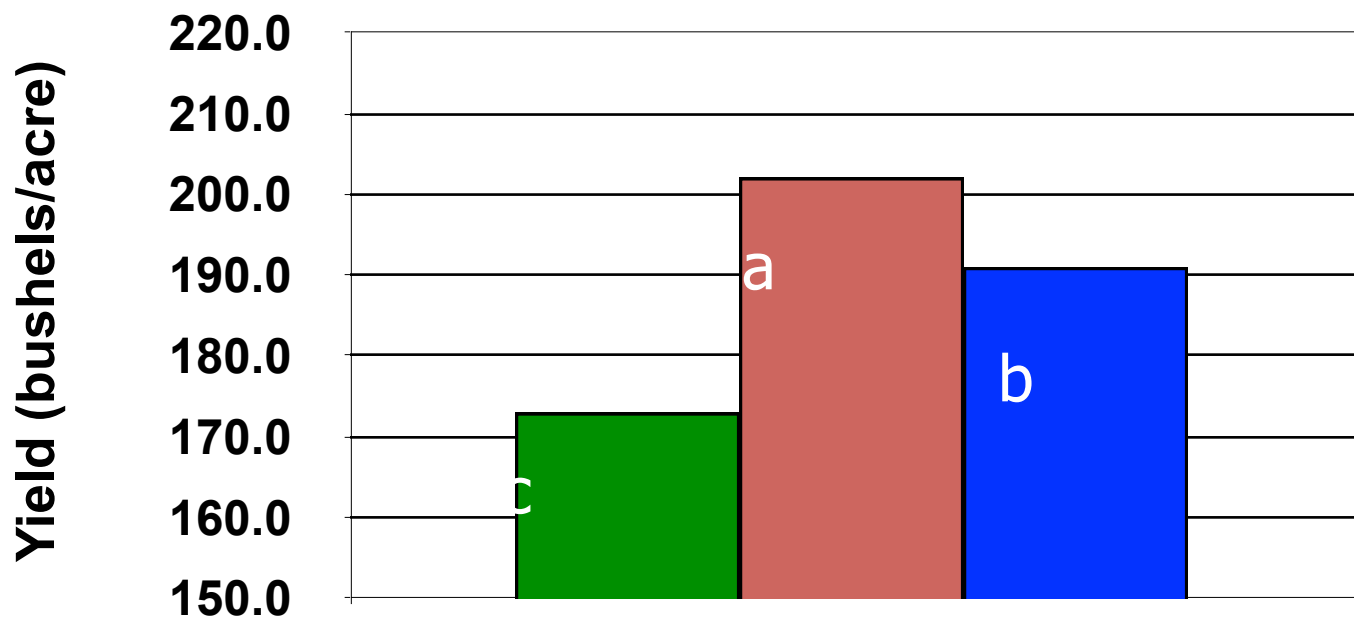


Soil K (ppm)





# Historic Broadcast versus Deep-Band Fertilizer Effects on No-Till Corn Yield (2009)



- Control
- Broadcast P & K
- Deep-Band P & K

Soil-test P (0-4"): 22  
(4-8"): 21  
Soil-test K (0-4"): 186  
(4-8"): 94



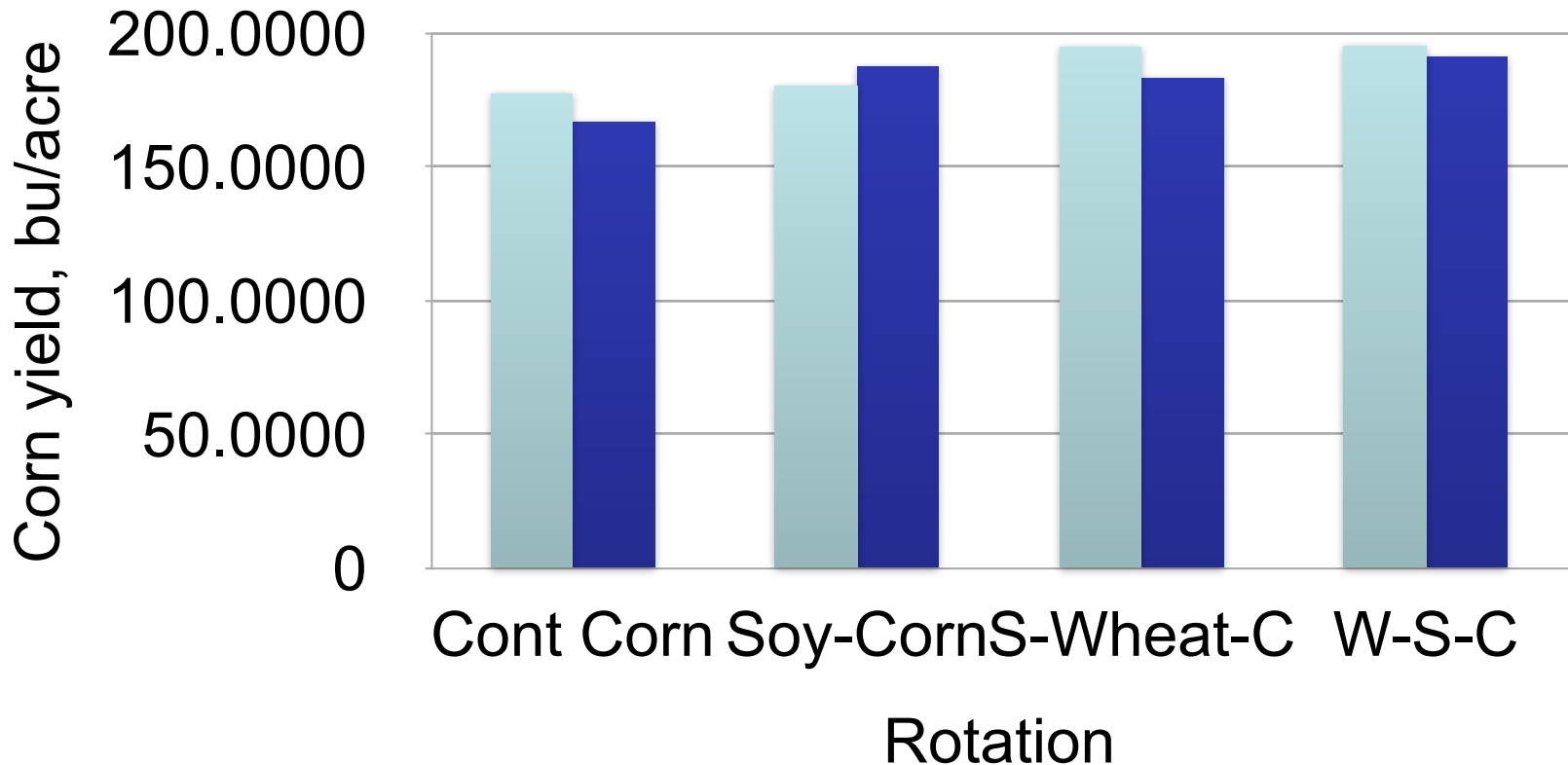
# Corn Yield Response to Tillage and Rotation on Drought-prone Soil

I

Tilled No-till

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Perry, 2008-2011



**NO-TILL  
FARMER**  
Source: E. Nafziger



# Corn Yield Response to Tillage and Rotation on Drought-prone Soil

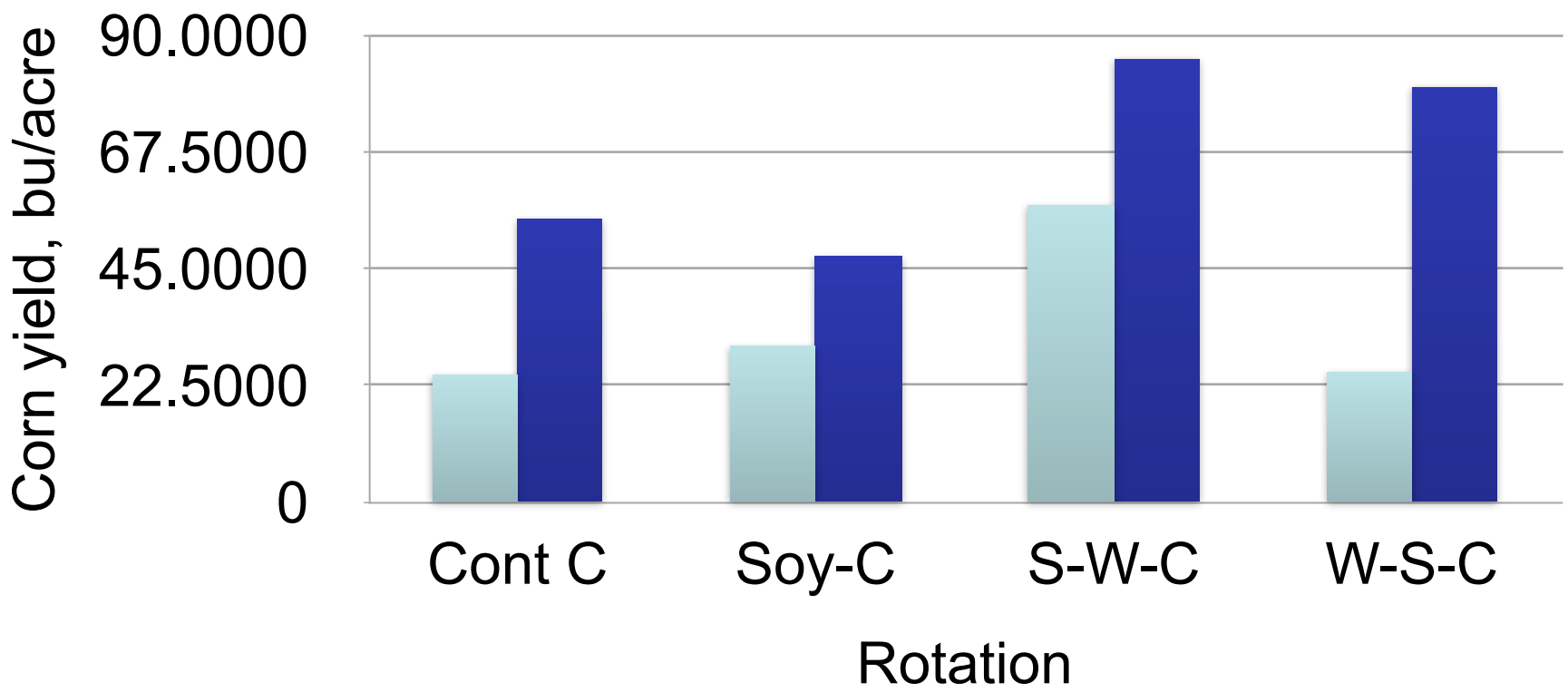


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Tilled No-till

## Perry 2012



Source: **NO-TILL FARMER** Nafziger

