Optimizing Tillage Systems in Modern Corn Production: Pointers

Tony J. Vyn, Graduate Students, Colleagues & Farmers

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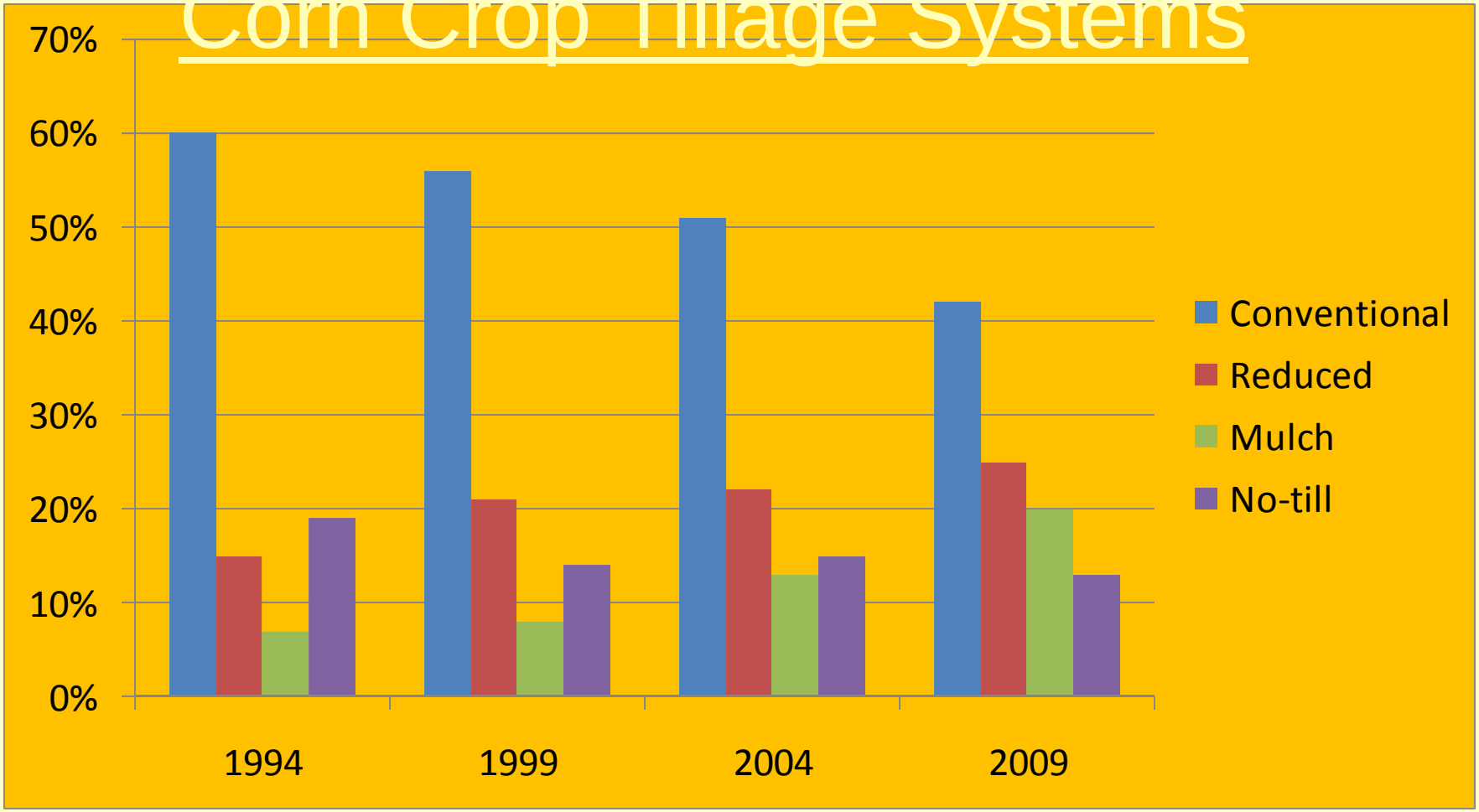
Illinois Tillage Trend Survey for Corn

Source: Joe Bybee

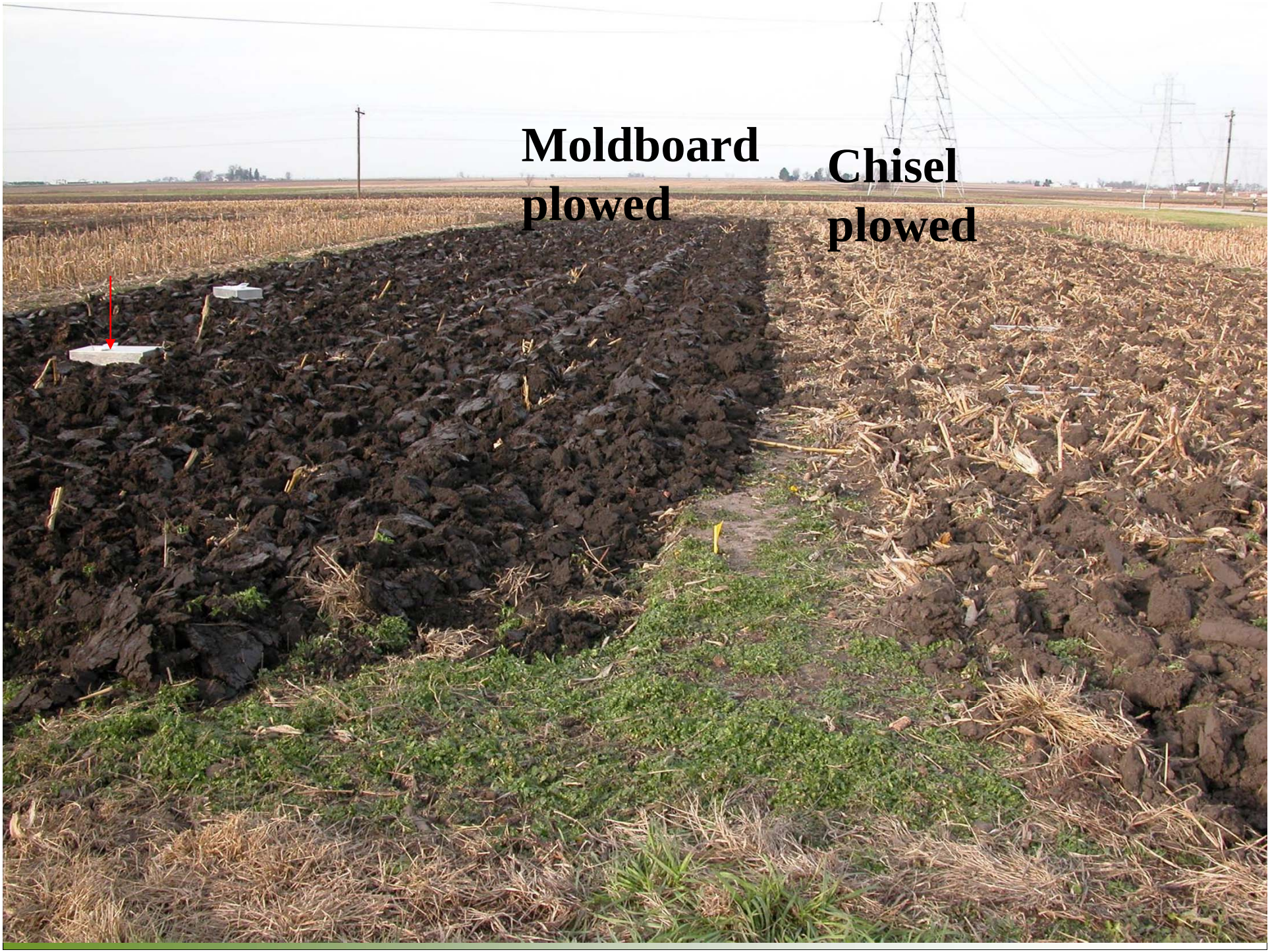


No-till (with good management) is dependable for corn after soybean with limited rutting and good drainage

Photo source: Greg Stewart

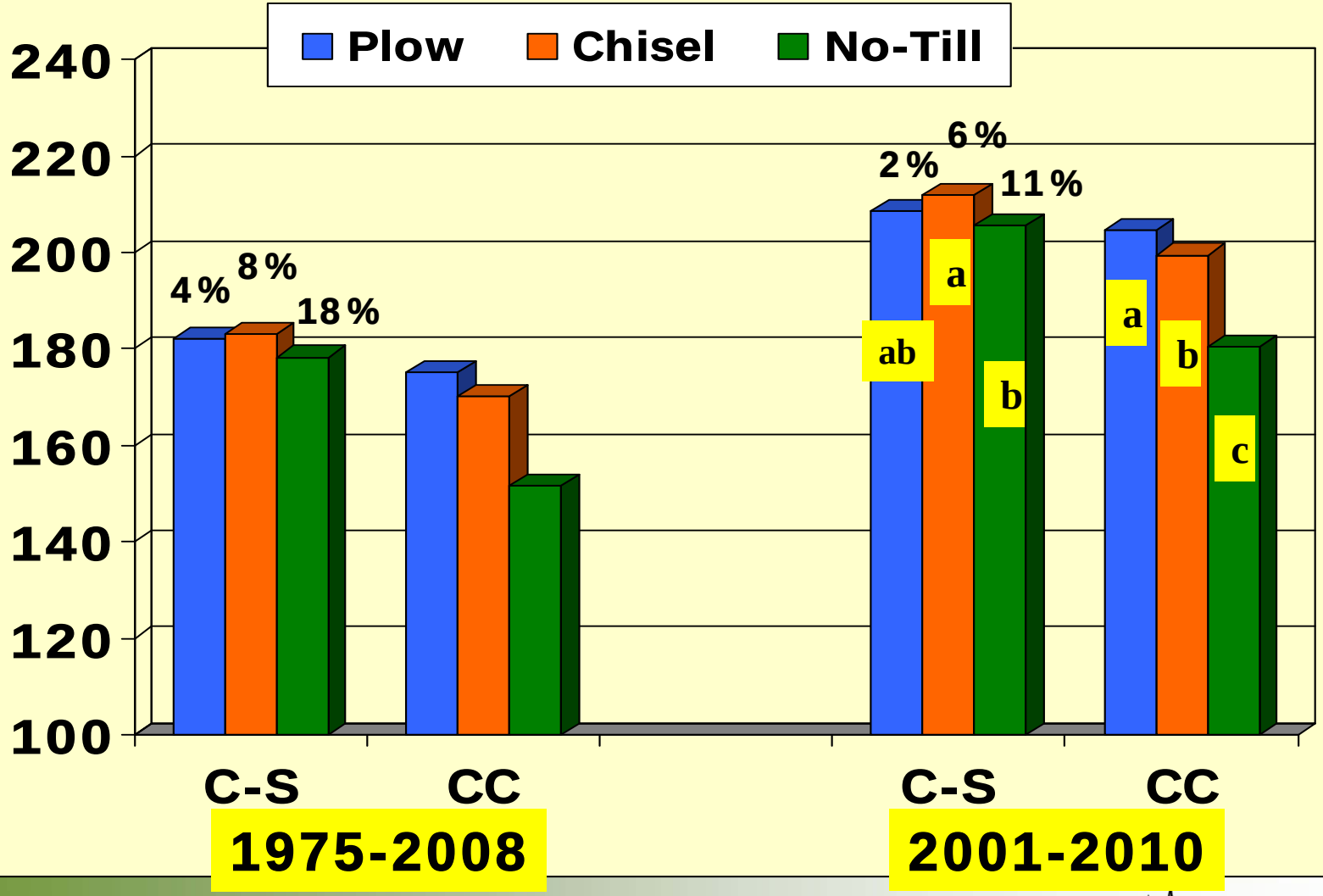
Long-term Rotation and Tillage Plots

Silty clay loam, W. Lafayette, IN 1975-2011

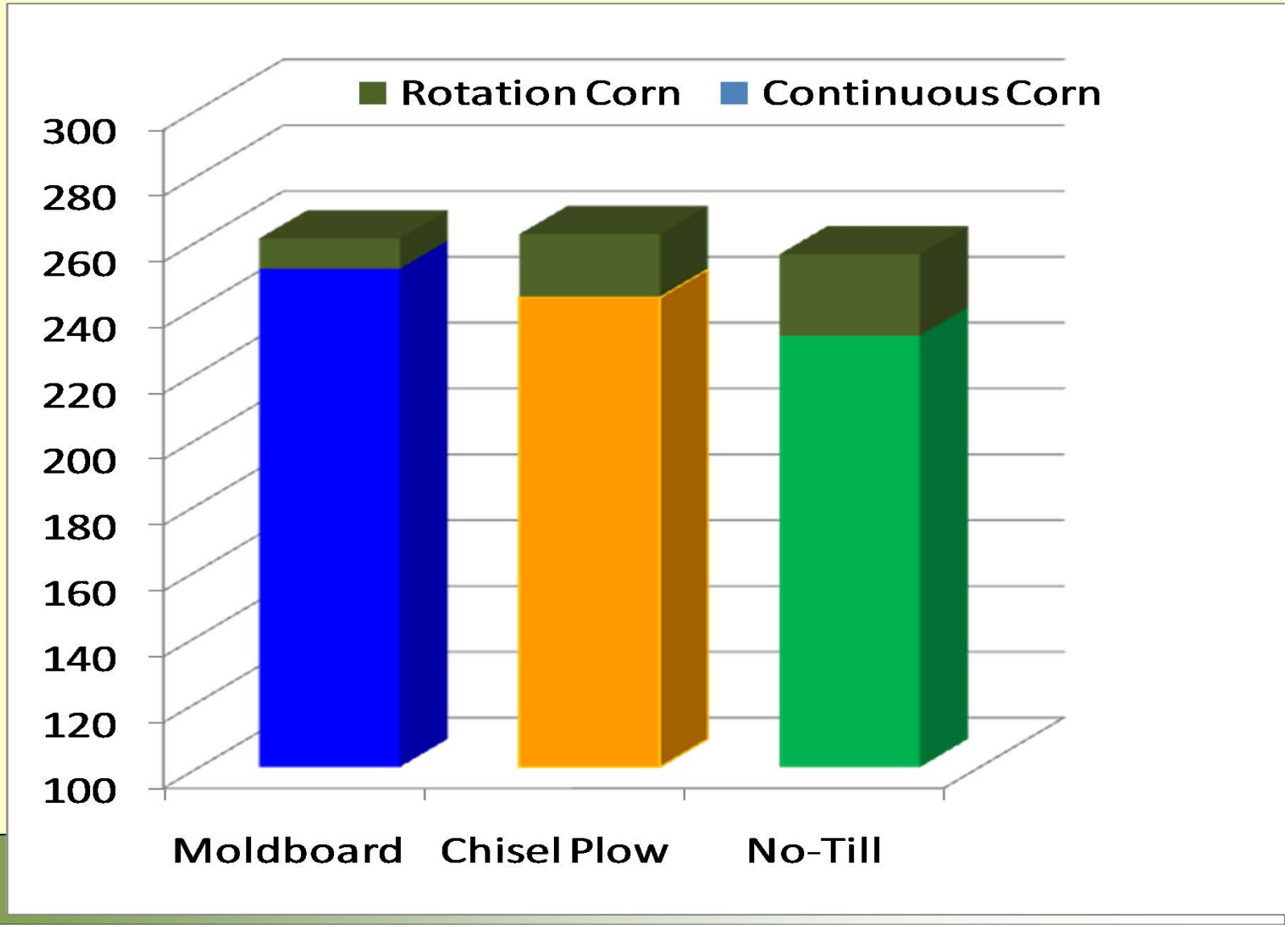

Moldboard plowed
Chisel plowed

Plant Stand in No-Till Continuous Corn

Corn Yield Response to Tillage and Rotation, Silty Clay Loam, W. Lafayette, IN, 1975-2010.



Rotation Advantage Persists Even in High Yield Environments (e.g. 2008)



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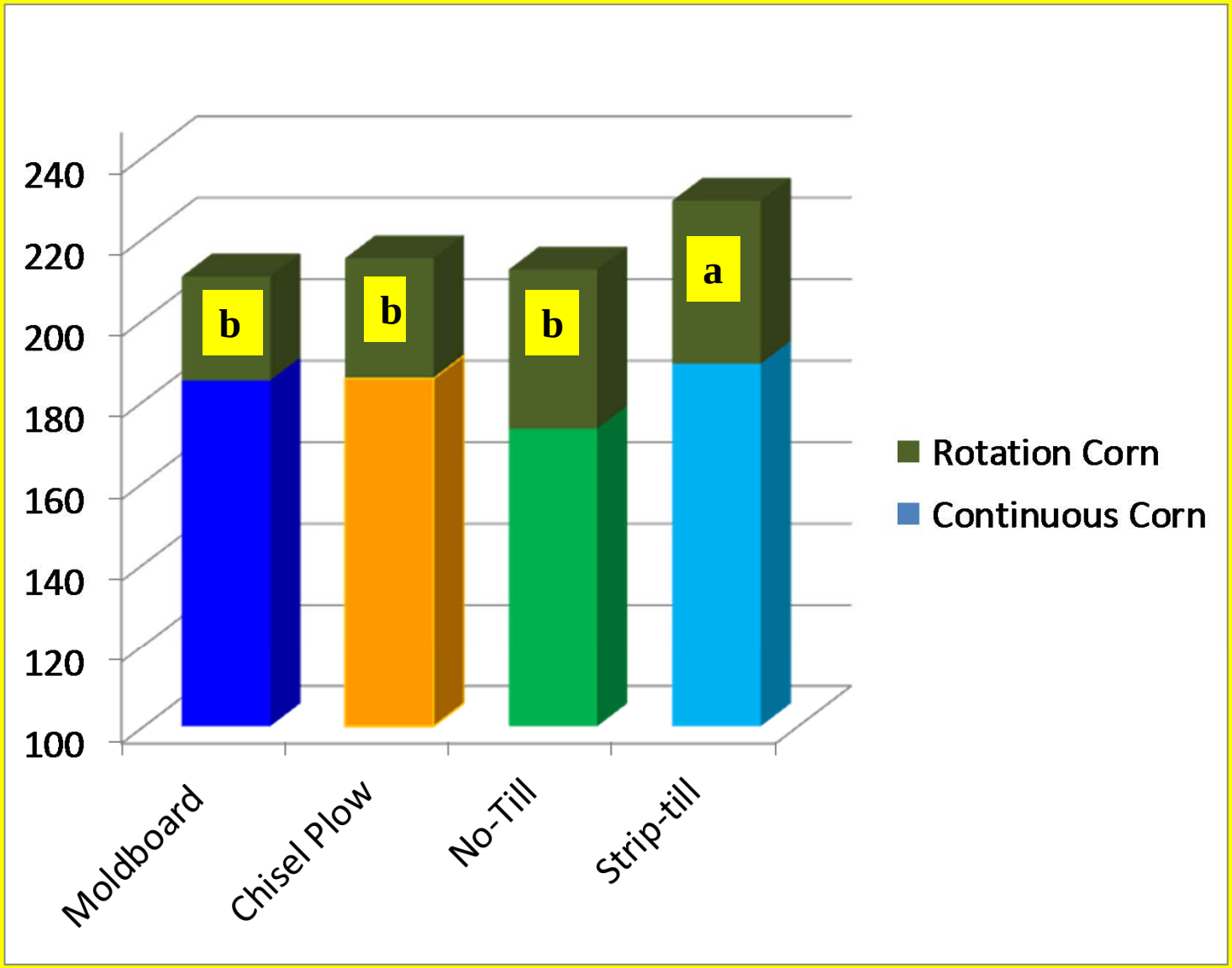
Rotation Advantage was very evident in the stress environment of 2010!

Yield Bu/acre

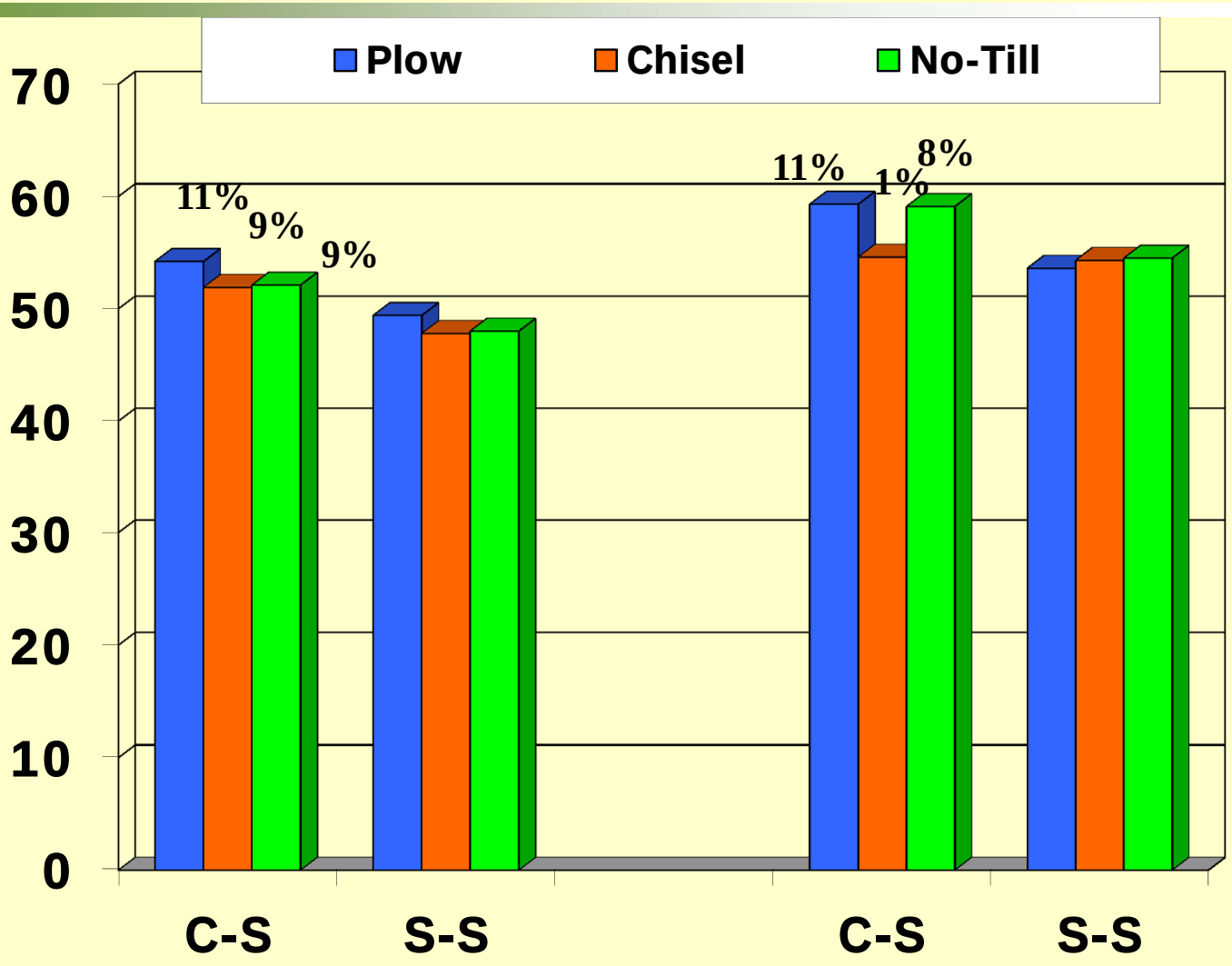


Uniformity More Difficult to Achieve in Corn after Corn

Chisel Plow

No-Till

Soybean Yield Response to Tillage and Rotation, Silty Clay Loam, W. Lafayette, IN, 1975-2010.



1975-2010

2001-2010

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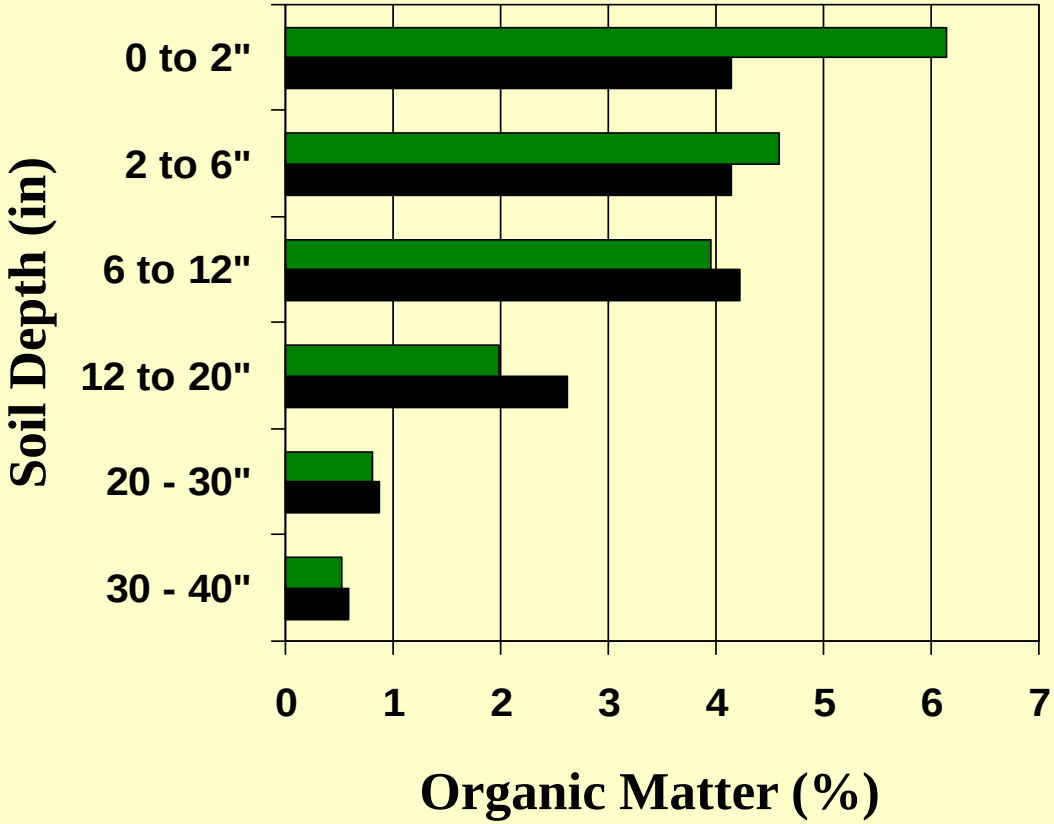
Soybean Disease Complexes:

Soybean Cyst Nematode (SCN); Sudden Death Syndrome (SDS)

Long-term Tillage Effects on Soil Organic Matter (1975-2003, West Lafayette, IN)



Source: Gál, Vyn et al., 2007, Soil Tillage Research

Factors affecting N Losses

- **Rainfall Amounts and Soil Moisture**
- **Soil Temperature**
- **N Rate, Timing and Mineralization (NO_3 +NH_4)**
- **Tillage (No-till = 57% reduced N_2O gas losses)**
- **Soil pH and Ca concentration**
- **Rate of plant N uptake or decomposition**



Diagonal versus Parallel Pre-plant NH_3 Placement (2010)

Planting No-till Corn after Diagonal NH_3 Placement in Spring, 2010

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Crop Sciences, U. of Illinois
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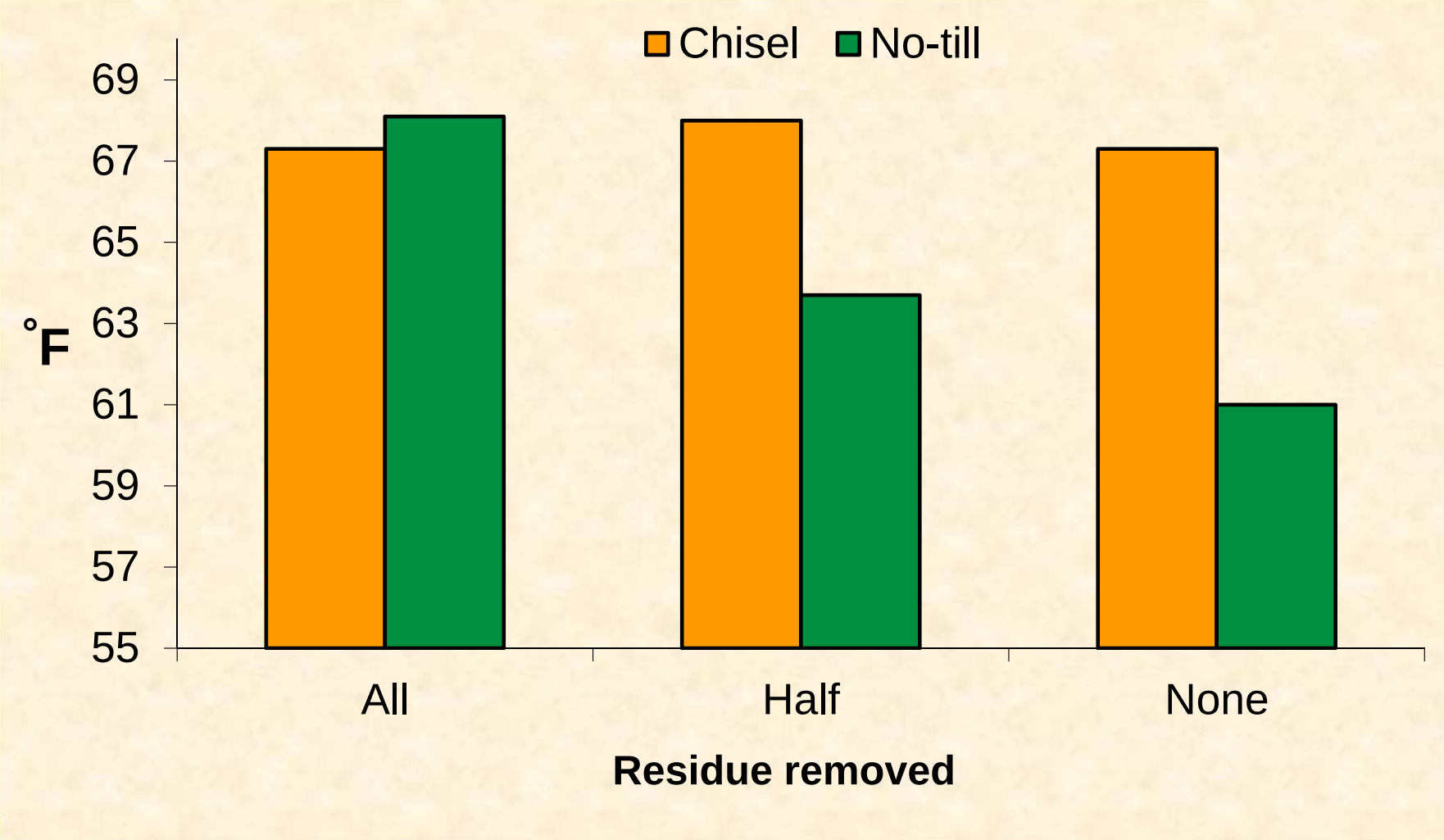
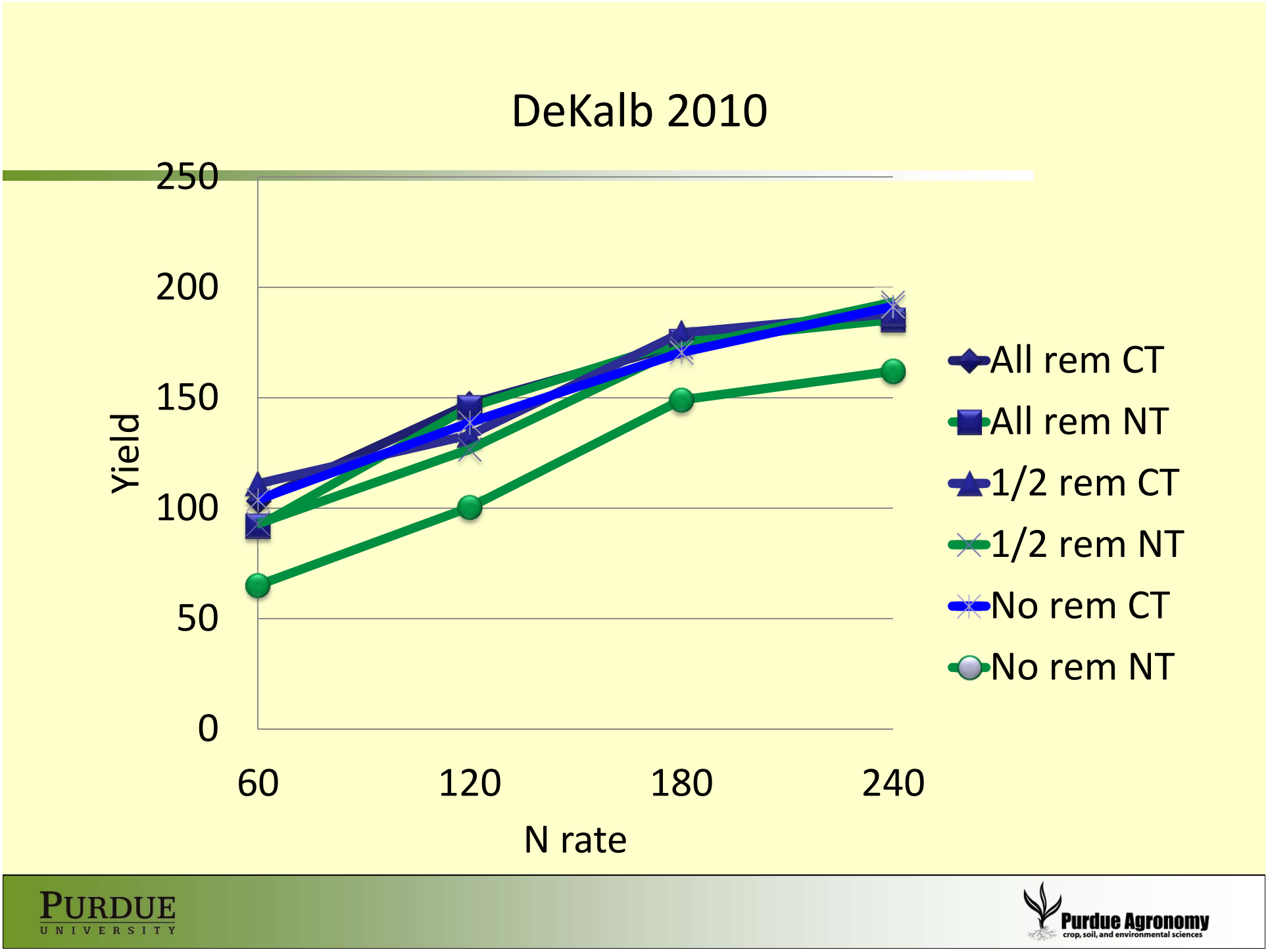
Materials and Methods

- Tillage system (split plot)
  - Chisel plow: chisel plow in fall, field cultivate in spring
  - No-till: rows planted to the side or between old rows
- N fertilization (split-split plot)
  - 60, 120, 180, 240 lb N/acre
  - Sidedressed as UAN at the V3 stage
- Plot size: 8 rows (20 ft) wide x 40 ft long

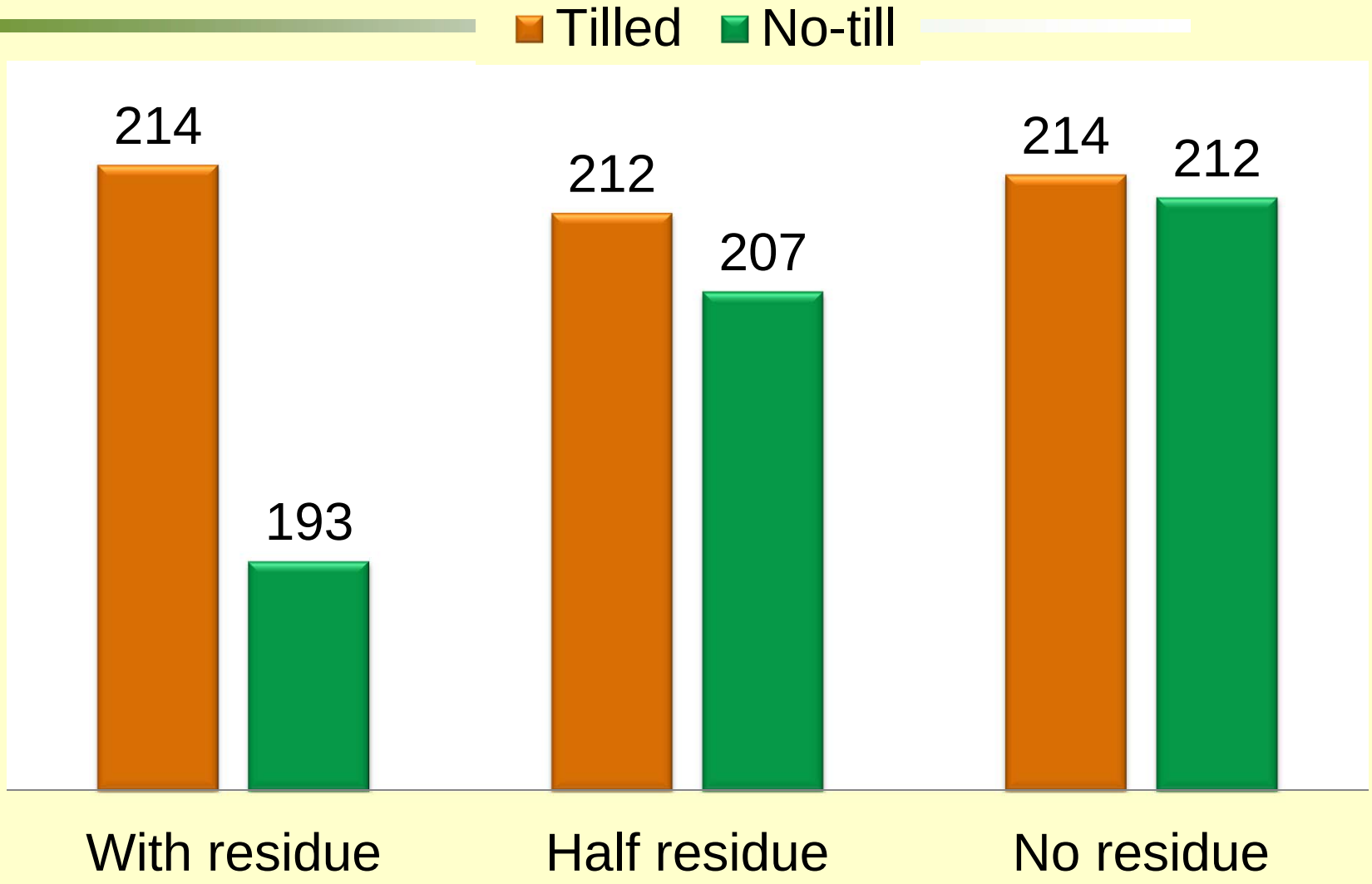
No residue removed

Soil temperature at 2 inches over the first 3 weeks after planting at DeKalb, IL in 2007




DeKalb 2010
250
200
150
100
50
0
Yield
60
120
180
240
N rate
All rem CT
All rem NT
1/2 rem CT
1/2 rem NT
No rem CT
No rem NT

Continuous corn yield, 12 Illinois sites



Spring Strip Tillage Pointers

Vertical Tillage for Corn after Soybeans

Fall Strip-Till vs. Turbo-Till® or FC

North-East Purdue Ag Center, Columbia City, IN

(2005-2006) Corn following Soybeans

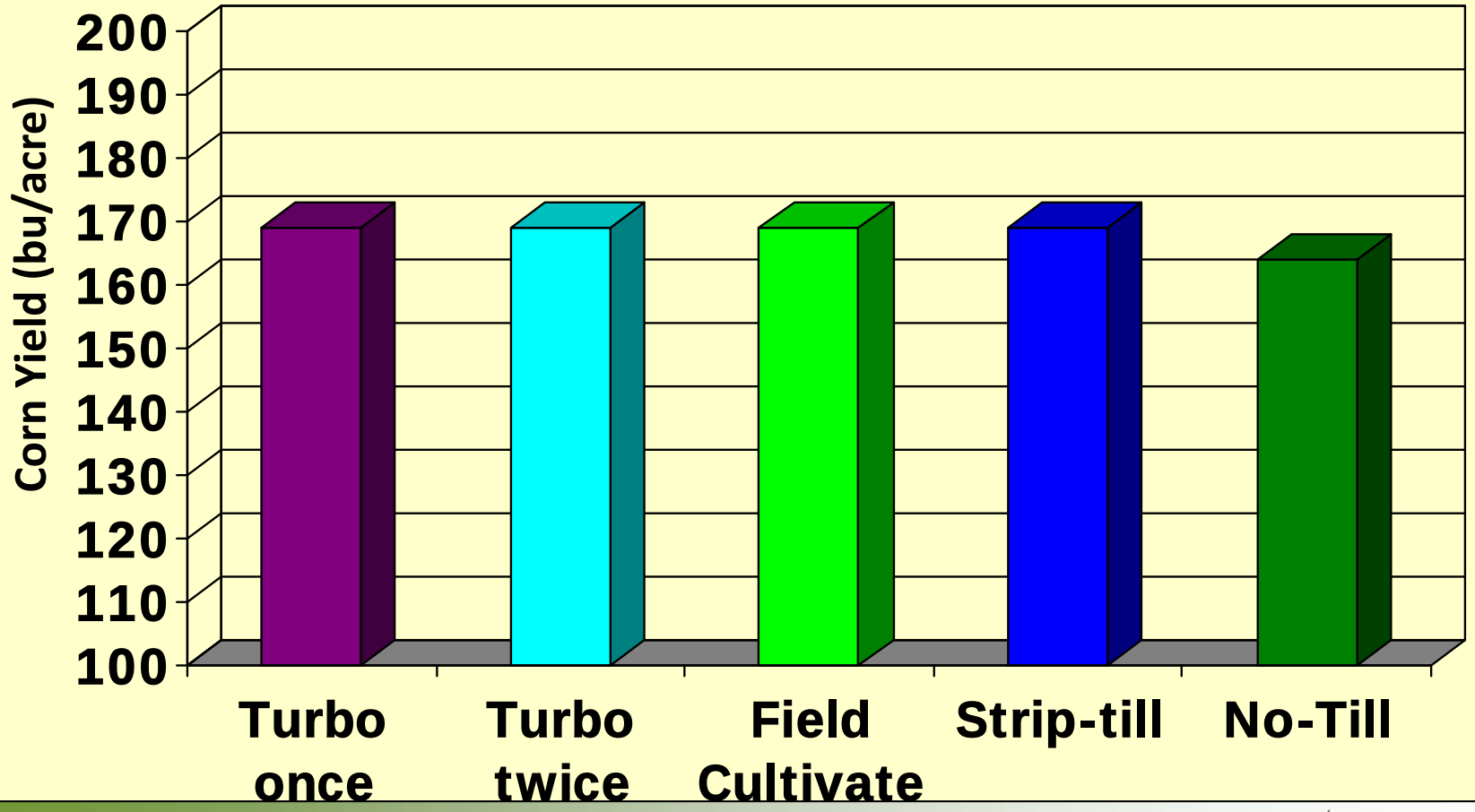



Photo Source: Greg Stewart

Spring versus Fall Vertical Tillage


Deep Ripping

Vertical tillage and Soil Moisture in 2009

Tillage Treatment	Moisture % May 26	Moisture % Post-plant
No-till	38 a	44 a
Fall strip-till	28 bc	37 bcd
Fall Salford RTS + Spring Salford RTS	33 b	36 bcd
Spring Salford RTS	-----	41 ab
Fall Deep-Rip	30 bc	37 bcd
Fall Chisel + Spring Disk	27 c	32 d

Vertical Tillage will:

…. Help the Transition to No-till?

…..Mitigate the Transition away from No-till?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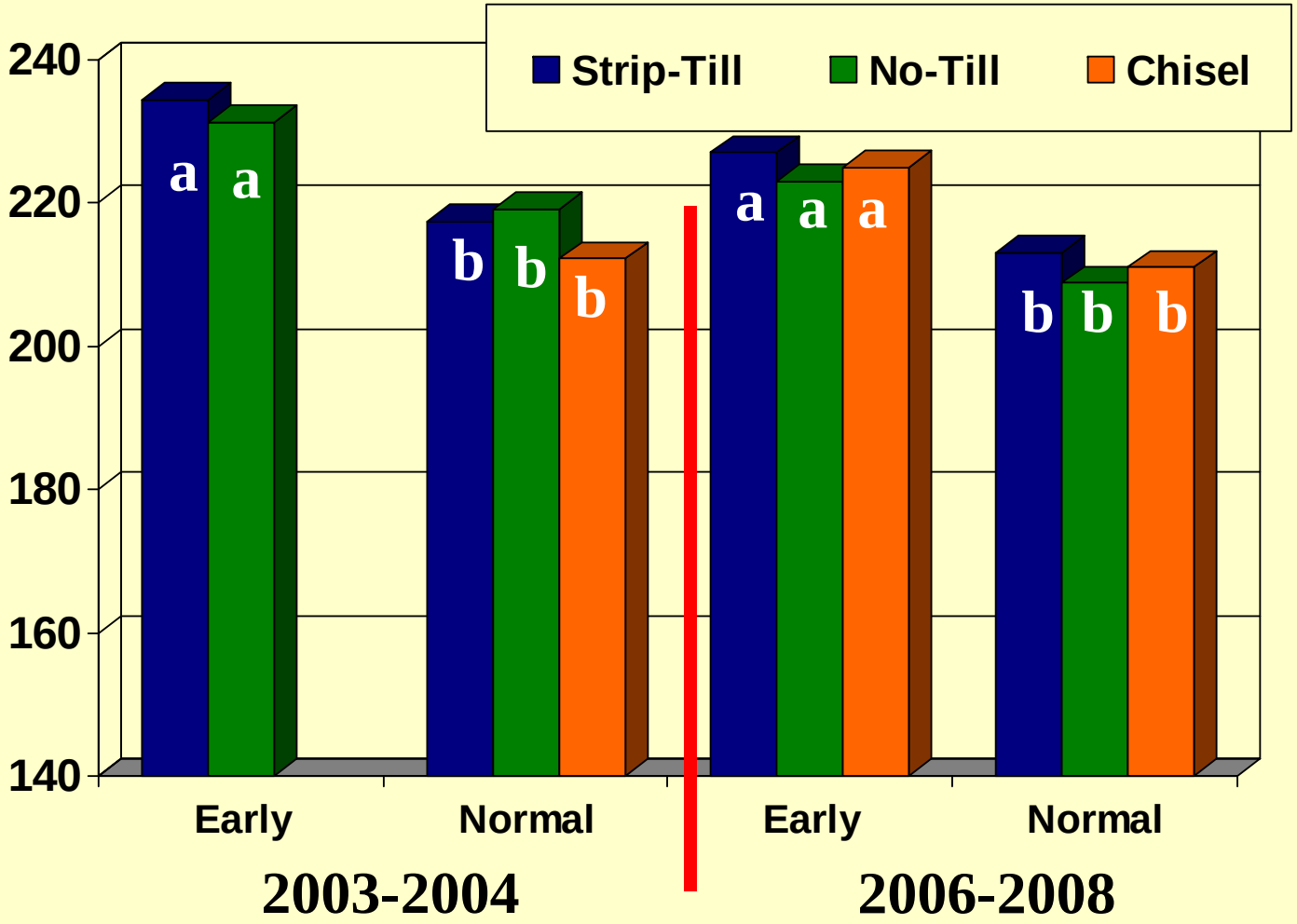
Strip-till and RTK

No Guarantee that Strip-till > No-till

No-till vs. Strip-till Following Soybean on loam soil, Wanatah, IN, 2008

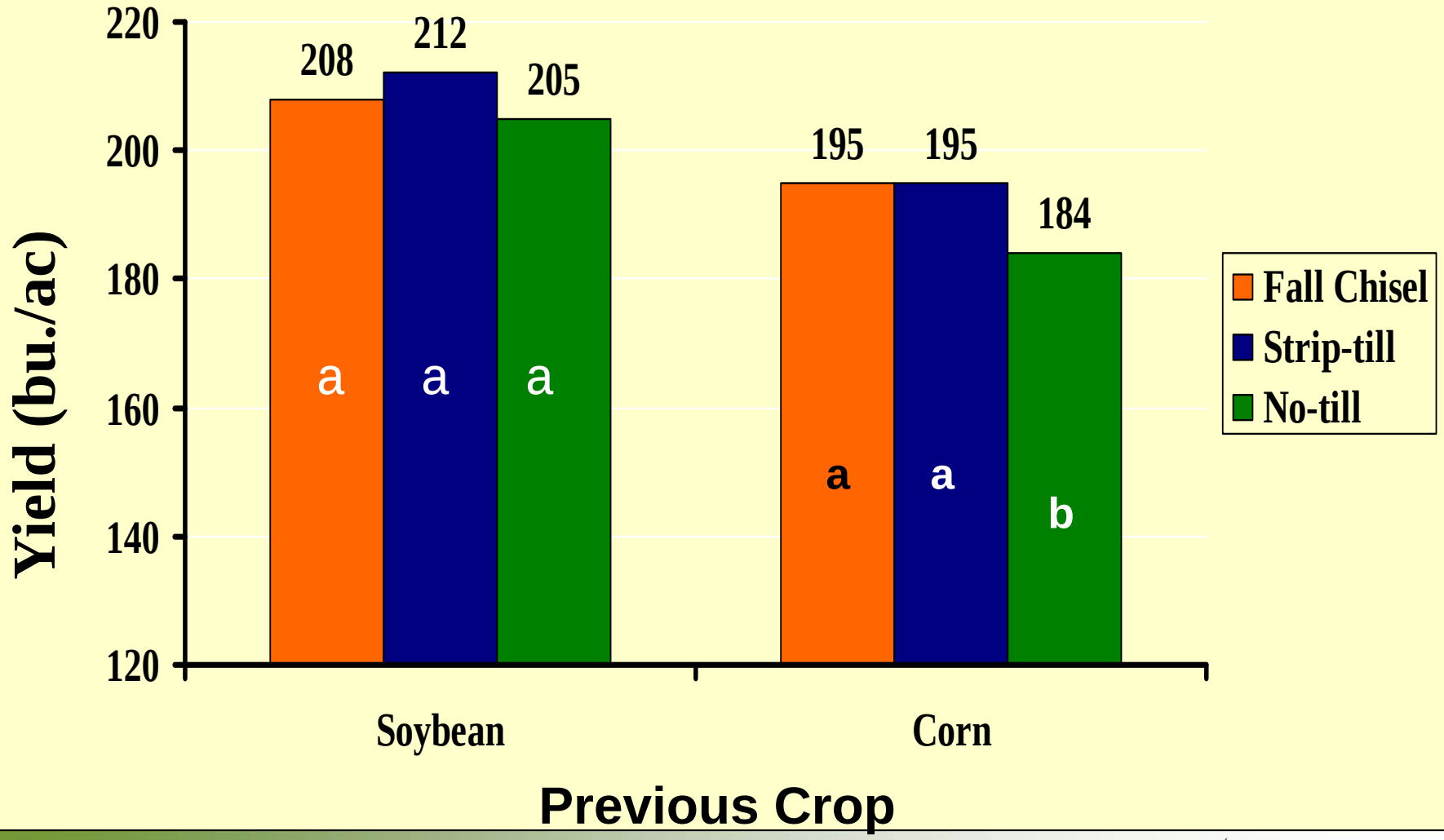
Corn Yield Response to Tillage and Planting Date after Soybean, Silty Clay Loam



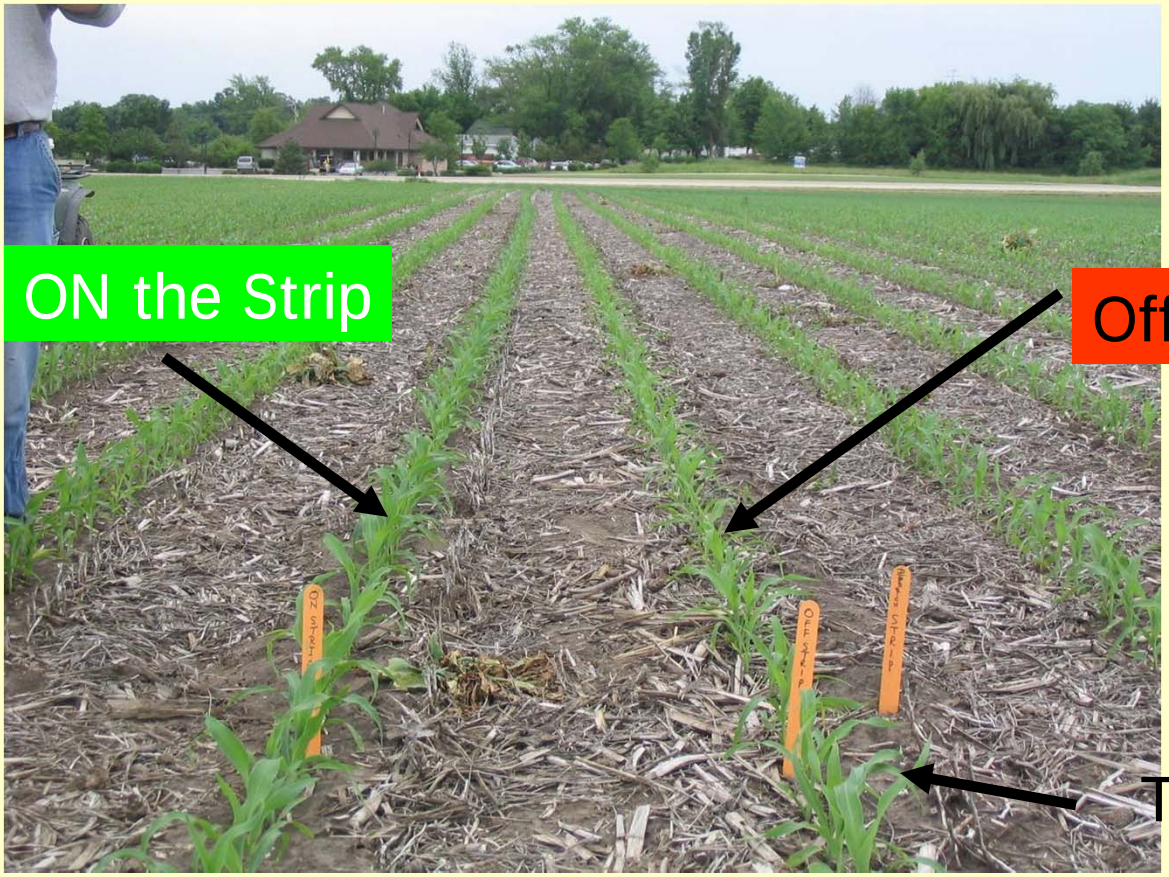
Strip Tillage for Corn after Corn?

No-Till vs. Strip-till following Corn
(Loam soil, Wanatah, IN, 2008)

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



Row Position is Critical



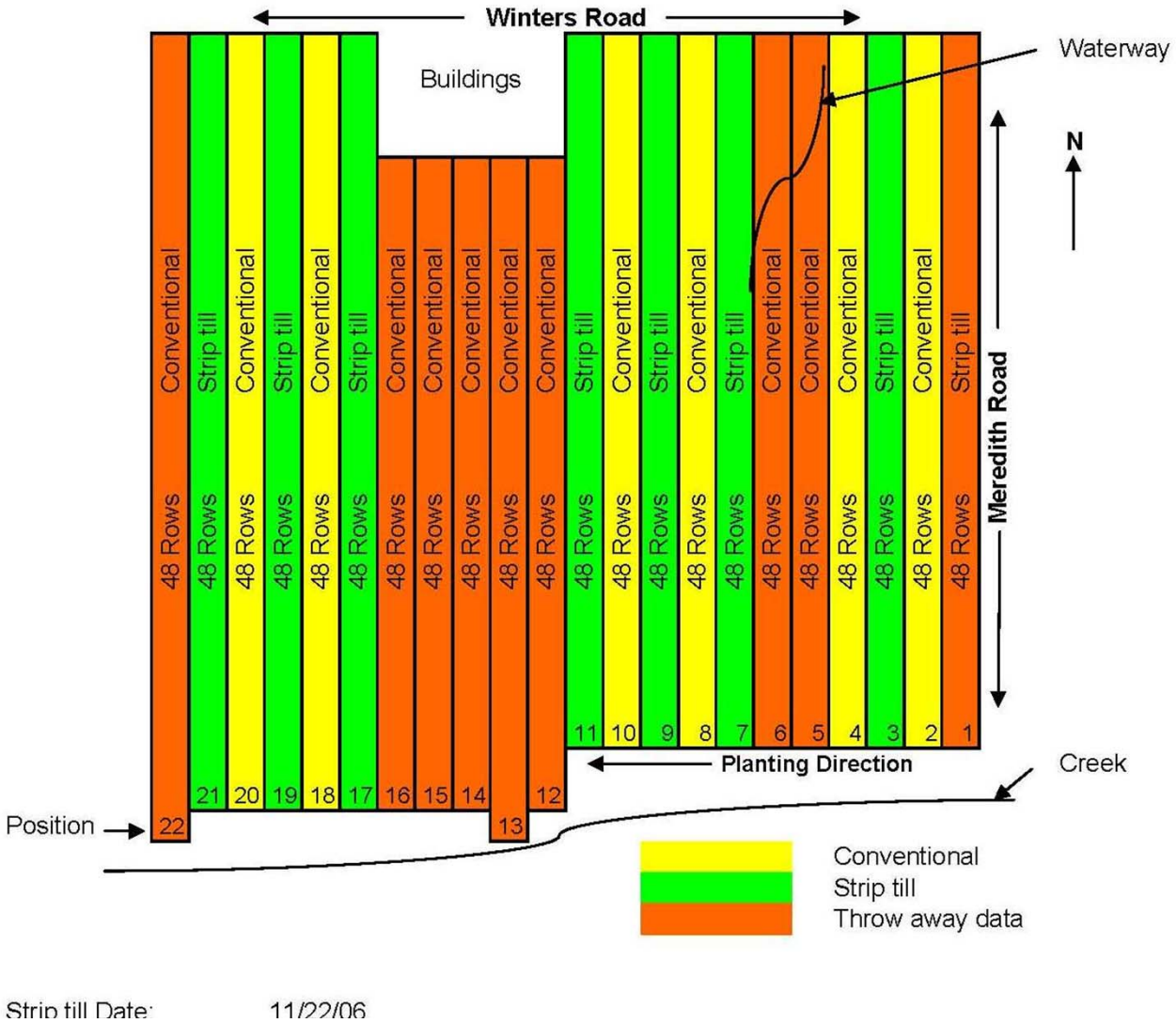
Source: Norm Larson, Elburn Co-op, IL

RTK Automatic Guidance

Pointers about Residue and Tillage Management in Modern Corn Production?

1. New tillage options and technology advances in residue management and automatic guidance expand the options available to growers.
2. Avoid excessive fall tillage and premature ("rushed"), deep, or intensive tillage in spring.
3. No-till and strip tillage options can be successful for corn (even in first-time fields), but crop rotation and fertility management matters!

4. Adoption of tillage should be guided by research instead of testimonials and marketing.



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John Deere & Co.

Equipment:

John Deere Cropping Systems Unit
Case-DMI (Goodfield, IL)
Remlinger (Kalida, OH)

Seed:

Pioneer Hi-Bred, Int.
Beck's Hybrids

Thanks!

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