

Crop Rotation or Continuous Corn? Agronomic Considerations

Joe Lauer

University of Wisconsin-Madison

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Crop rotation plan for Monticello

Potatoes	Wheat	Pease	Rye			
Wheat	Turnips	Rye	Clowes	Clowes	Clowes	
Pease	Wheat	Potatoes	Rye			
Wheat	Turnips	Rye	Clowes	Clowes	Clowes	
Corn	Wheat	Potatoes	Rye			
Pease	Turnips	Rye	Clowes	Clowes	Clowes	
Wheat						

Pease coming off earlier than Potatoes, would perhaps be the best crop to precede Wheat.

The Advantage of a Crop of turnips sown on the Wheat stubble and folded off with Sheep must be very great and one that cannot be had in Europe as the harvest is too late there to put in turnips on the stubble. Turnips are known to succeed well sown on stubble without hewing. the stubble keeps the Land light & gives room for the turnips to grow

In the 3^d Scheme the Corn should be sown in drills of 7 feet wide and one foot in the Row it may be worked over 3 times before the pease are sown ^{which} should not be till June which is the best time too for planting potatoes

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- Thomas Jefferson, like other enlightened farmers, took a scientific approach to farming with the help of his son-in-law, Thomas Mann Randolph (1768-1828), who managed much of Jefferson's land after marrying Martha "Patsy" Jefferson in 1790.
- Jefferson's careful consideration of a workable method of crop rotation for Monticello -- an innovative practice at the time -- demonstrates his interest in scientific farming.

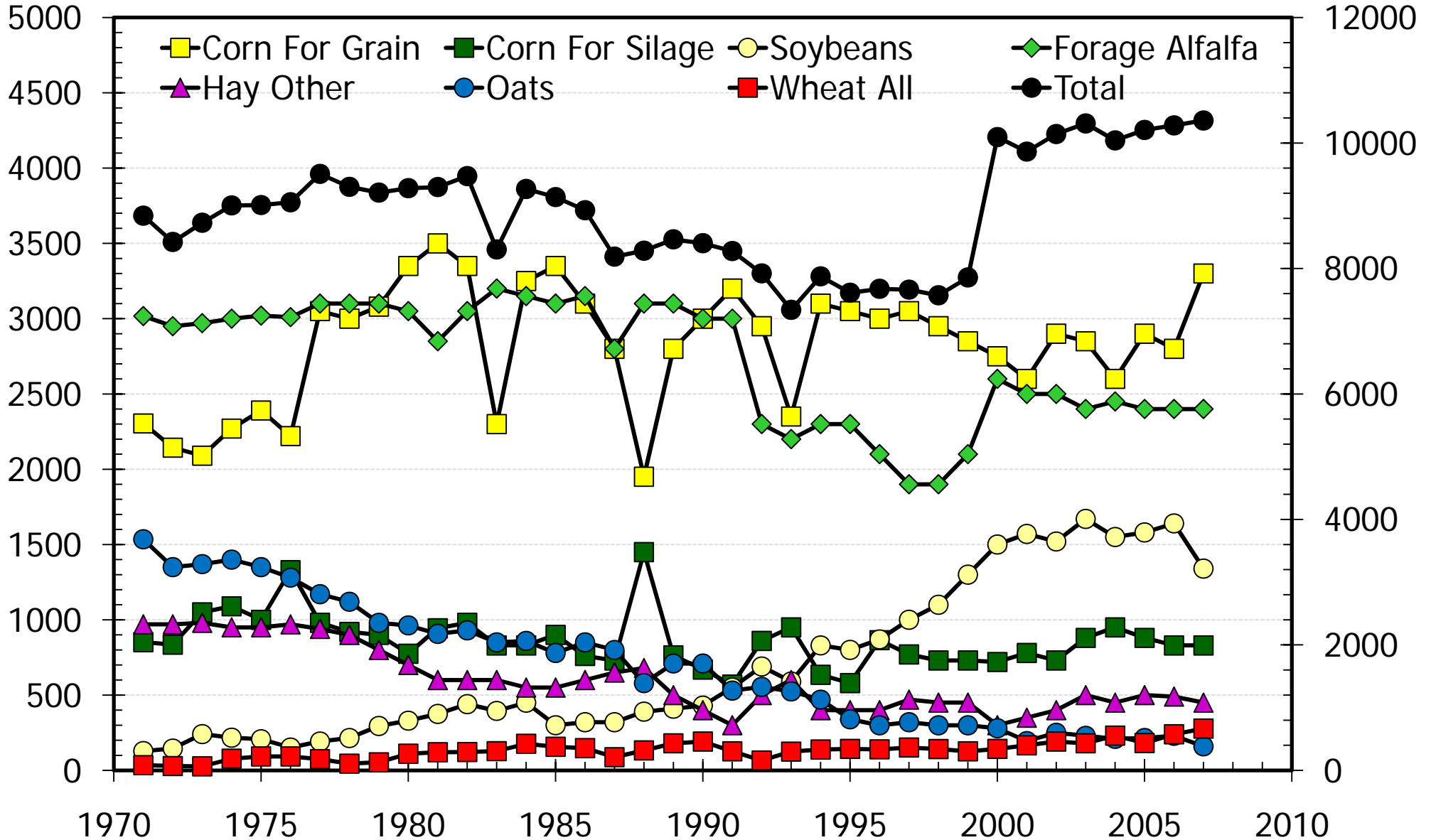
Continuous corn? Or rotate in 2008?

Wisconsin Corn Acreage

Source: USDA-NASS

Crop Acres

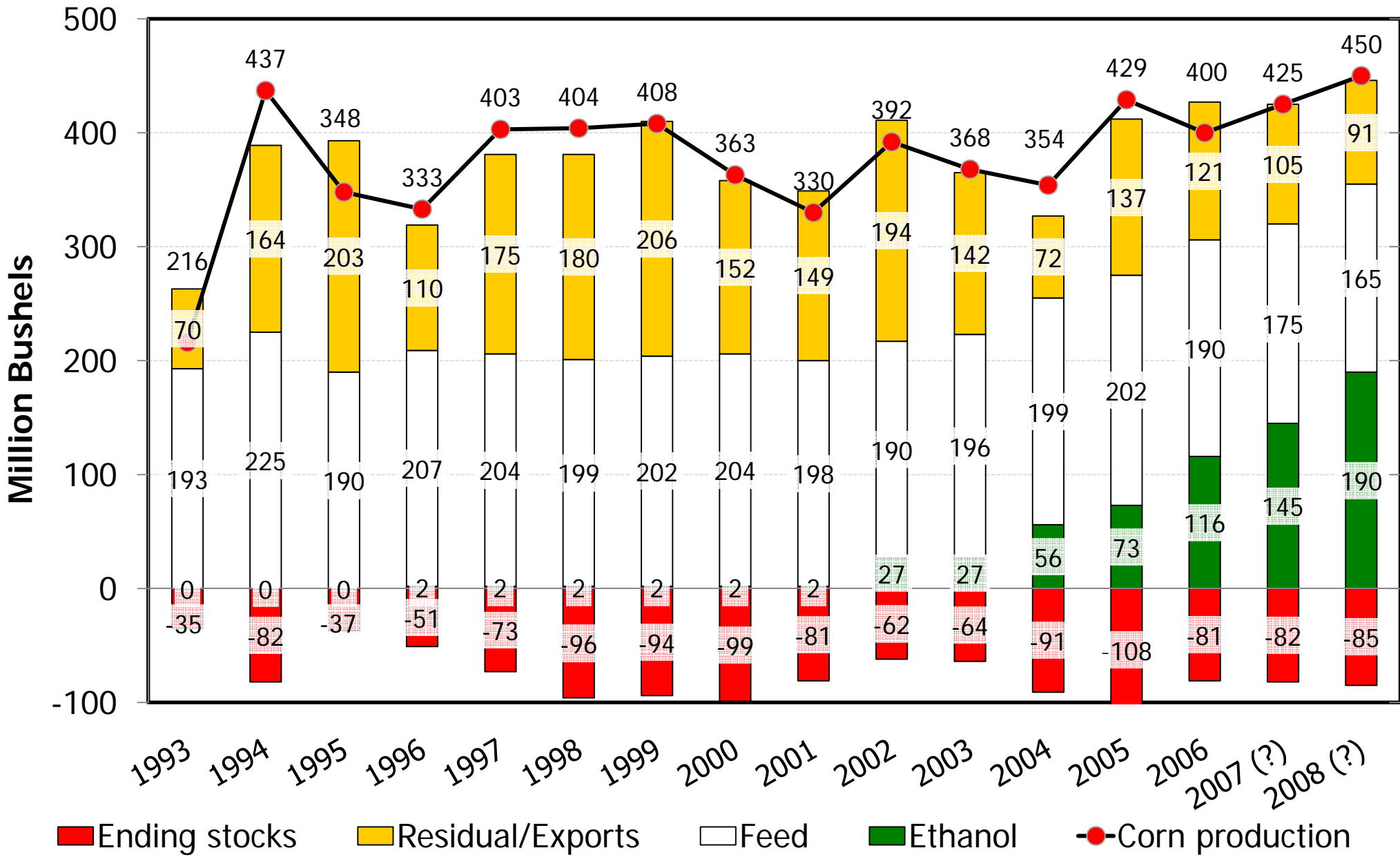
Total Acres



Continuous corn, or rotate in 2008?

Wisconsin Corn Use

Sources: USDA-NASS
NCGA: The World of Corn



Overview

- The Rotation Effect – What is it?
- Interactions to watch out for ...



The Rotation Effect – What is it?



- **Crop Rotation**

- ✓ Universal management practice
- ✓ Proven management decision that increases crop yields
- ✓ Currently, increased economic benefit for monoculture

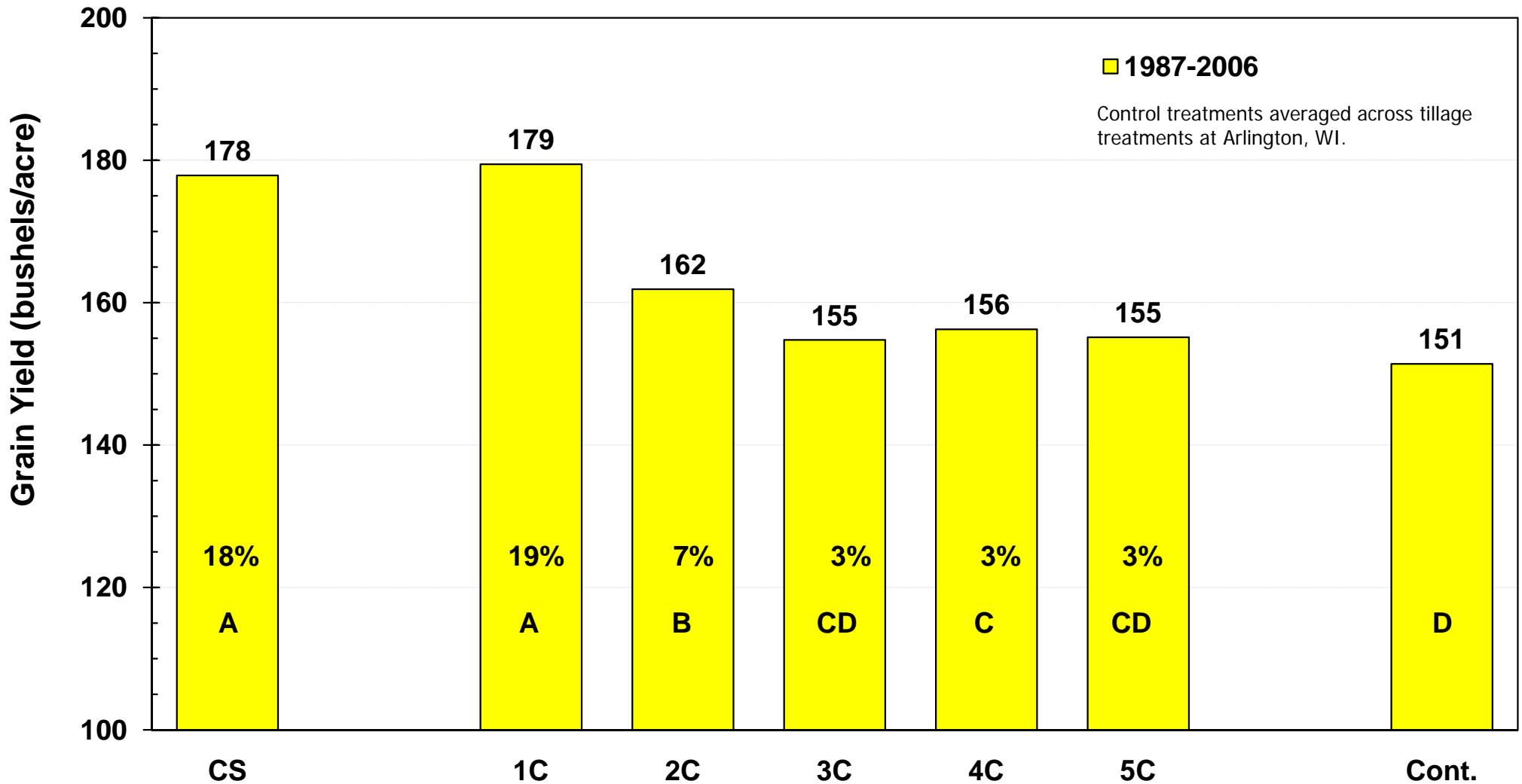
- **Rotation Effect**

- ✓ The effect of all conditions, other than N, supplied by legumes in a rotation (Baldock et al. 1981)
- ✓ Other non-legume crops can provide benefits as well (Robinson, 1966; Langer and Randall, 1981; Crookston et al., 1988)
- ✓ Additional benefits of rotating crops
 - All production inputs can be optimized
 - Typical problems associated with monoculture are not apparent.

- **Mechanism for effect is unknown**

The rotation effect lasts two years increasing corn grain yield 10 to 19% for 1C and 0 to 7% for 2C ...

Corn Yield Response Following Five Years of Soybean

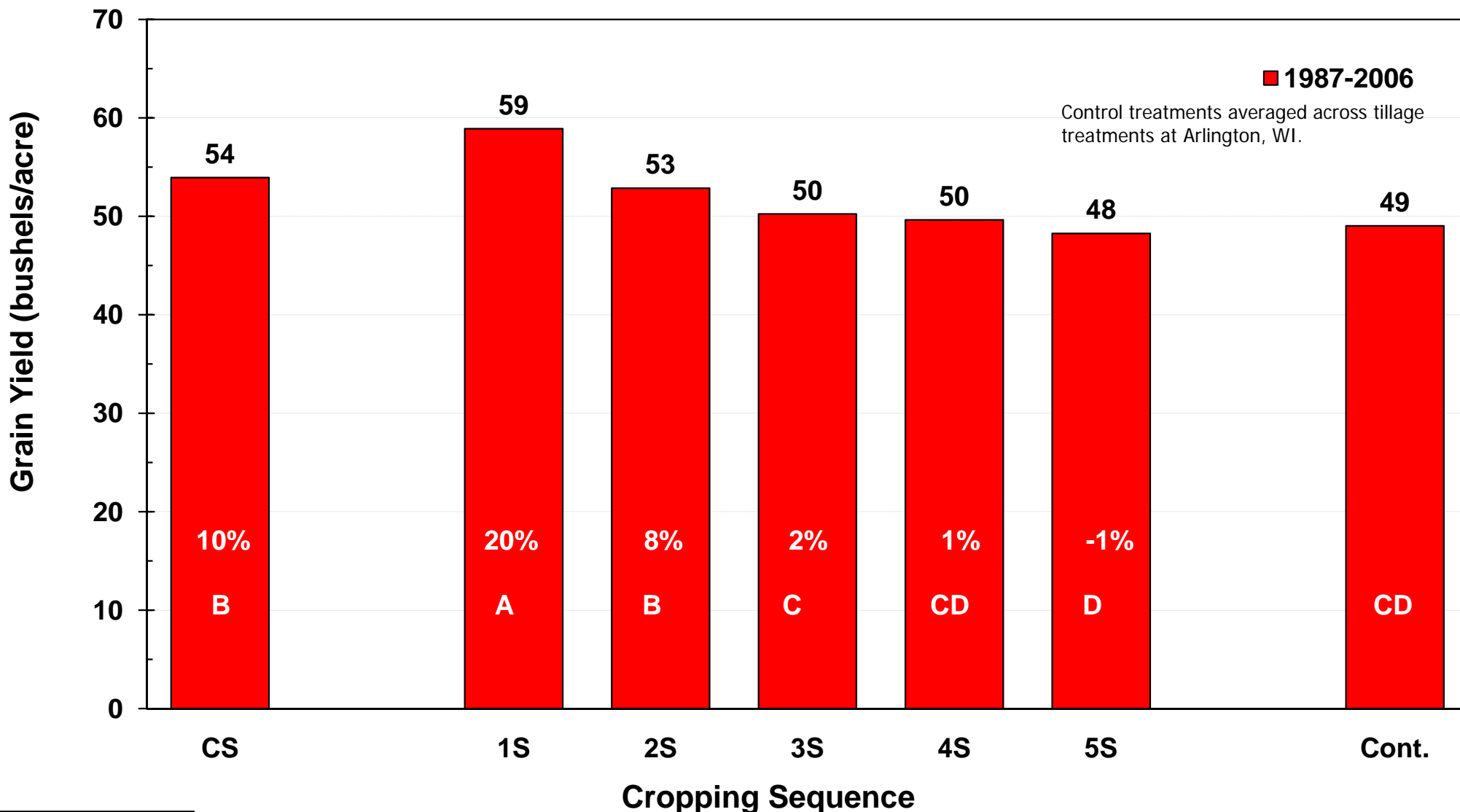


Source: Lauer

C= Corn, S= Soybean, Number = consecutive year of corn

The rotation effect lasts two years increasing soybean grain yield 10 to 20% for 1S and 8% for 2C ...

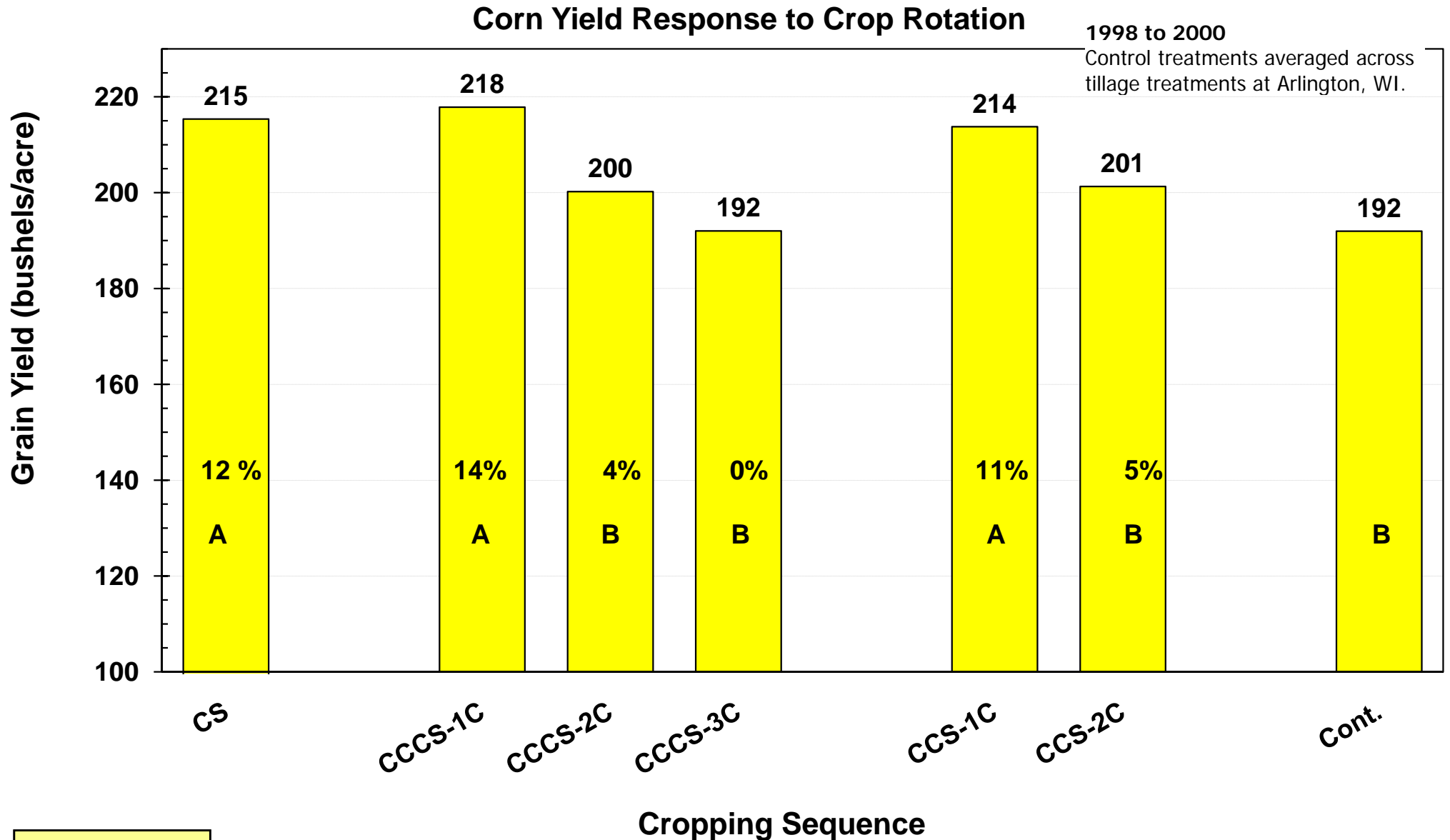
Soybean Yield Response Following Five Years of Corn



Source: Lauer

C= Corn, S= Soybean, Number = consecutive year of soybean

A one year break using soybean reduces the rotation effect in the second phase (NS to CC) ...

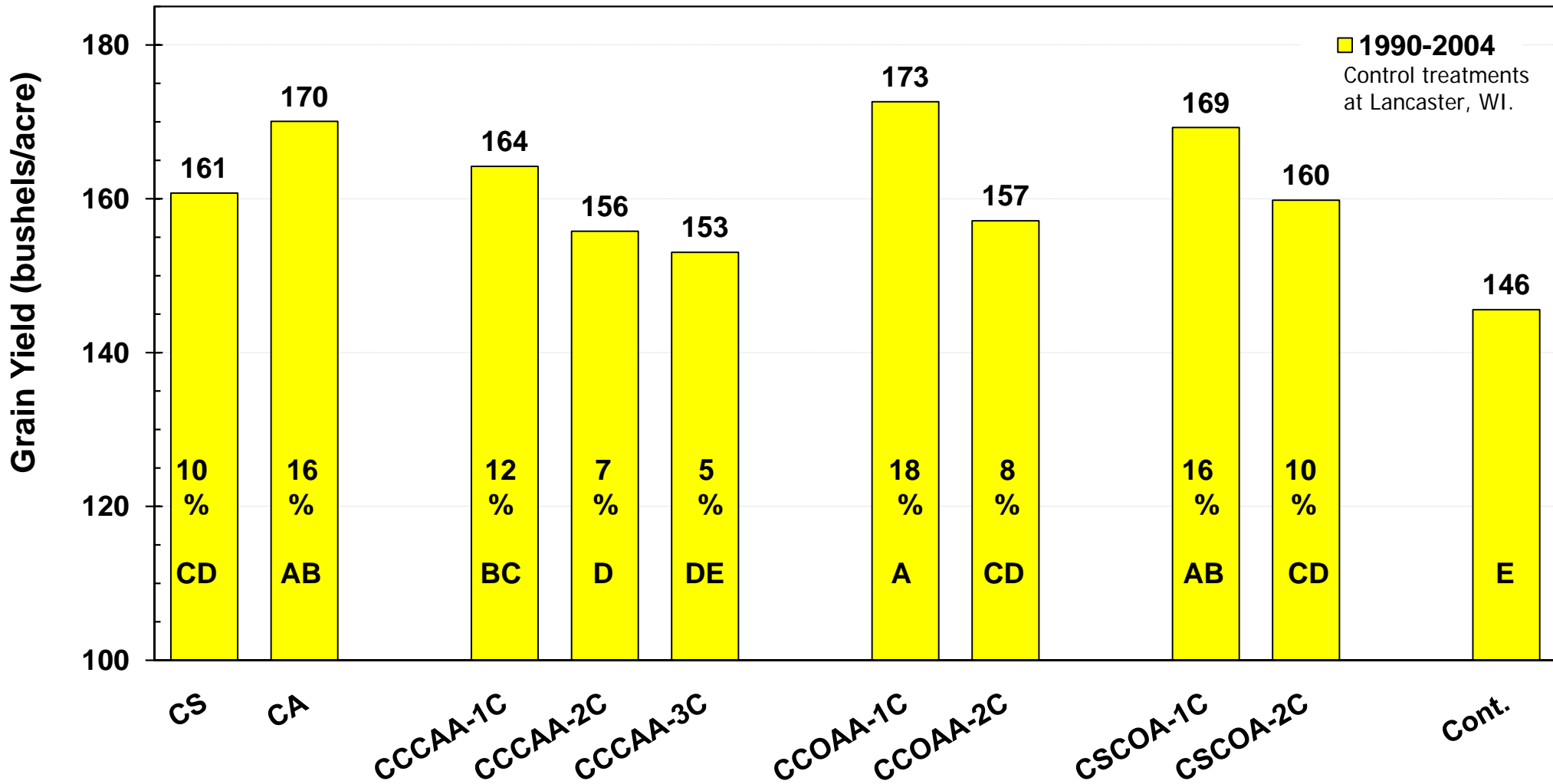


C= Corn, S= Soybean, Number = consecutive year of corn

Source: Lauer

At least two break years are needed to measure a response in the second crop phase ...

Corn Yield Response to Crop Rotation



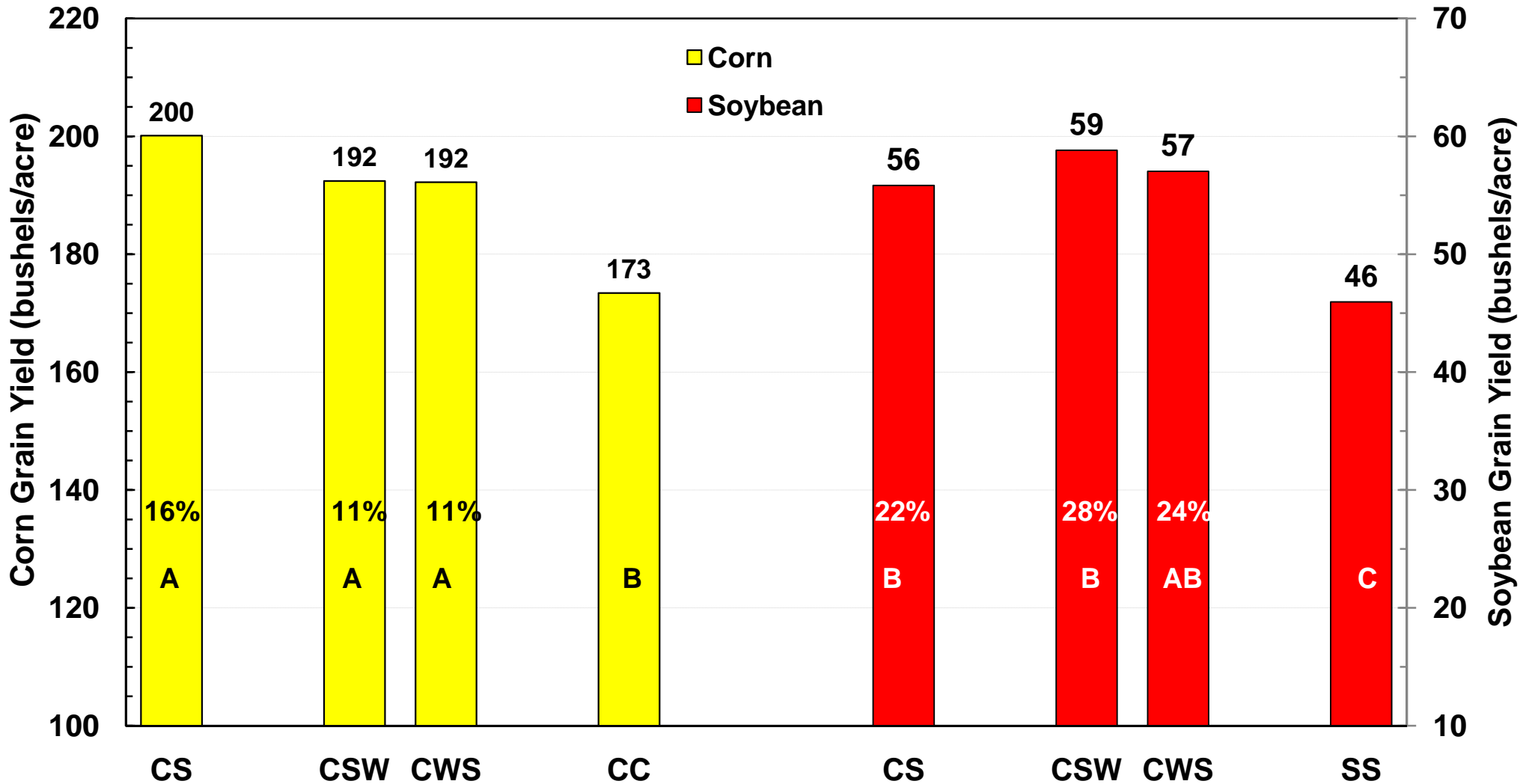
Cropping Sequence

A= Alfalfa, C= Corn, O= Oat, S= Soybean, W=Wheat

Source: Stanger and Lauer, 2008

Adding a third crop does not increase corn grain yield, but does improve soybean grain yield ...

Corn and Soybean Yield Response to Crop Rotation



Source: Lauer

Cropping Sequence
C= Corn, S= Soybean, W=Wheat

2004-2006: Values averaged across seed fungicide treatments at Arlington, WI.

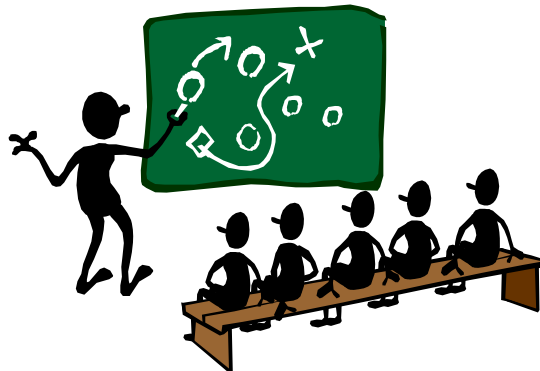
Management Decision Interactions with Rotation

Significant

- Tillage
- N rate
- CR Insecticide
 - ✓ CR Variant = NS (need all the time)
- Environment

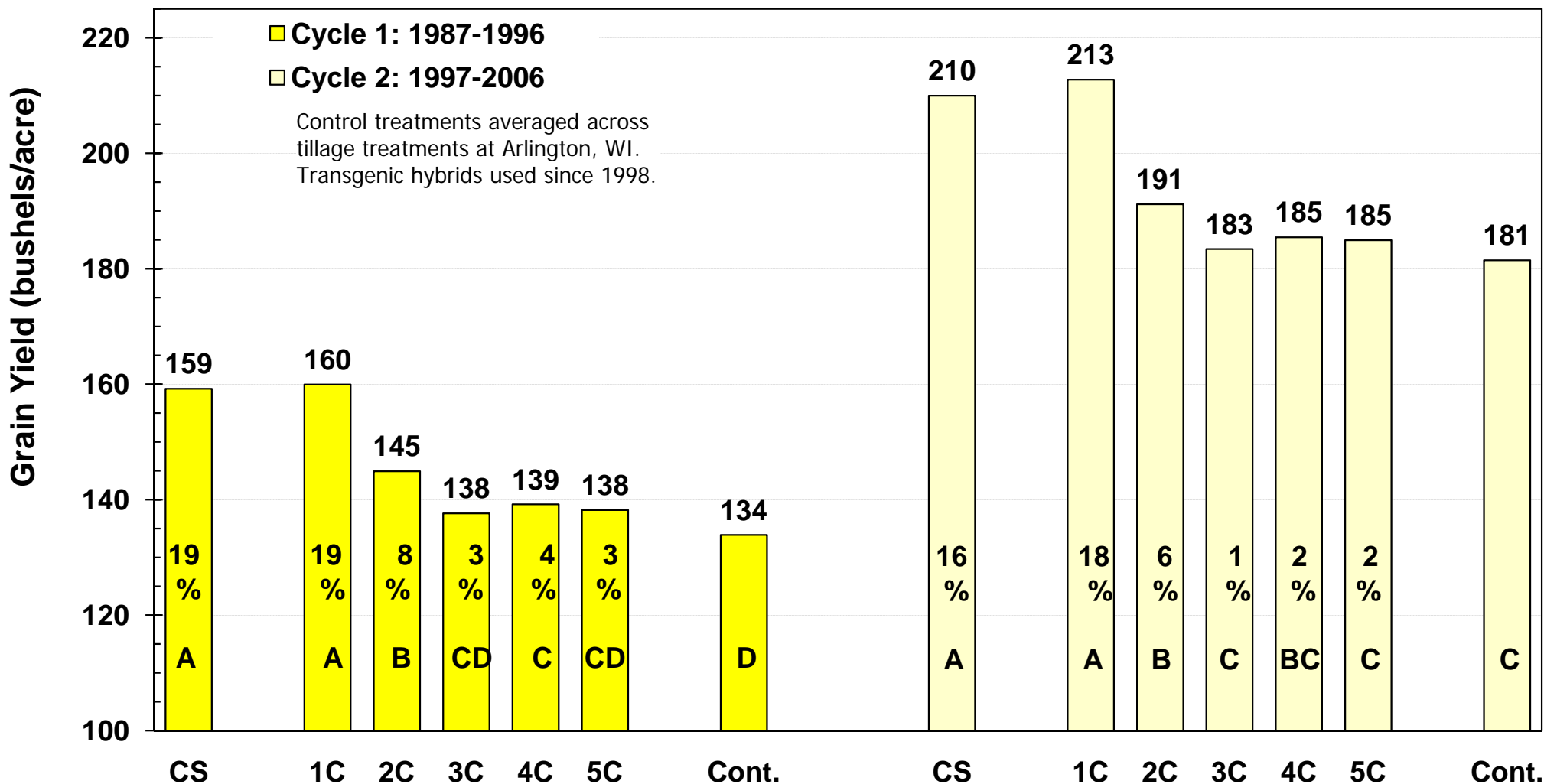
Non-significant

- Plant density
- Row spacing
- Modern hybrids versus old hybrids
 - ✓ Modern hybrids can “handle” continuous corn



Modern corn hybrids and management practices have the same rotation response as older hybrids and practices ...

Corn Yield Response Following Five Years of Soybean



Cropping Sequence

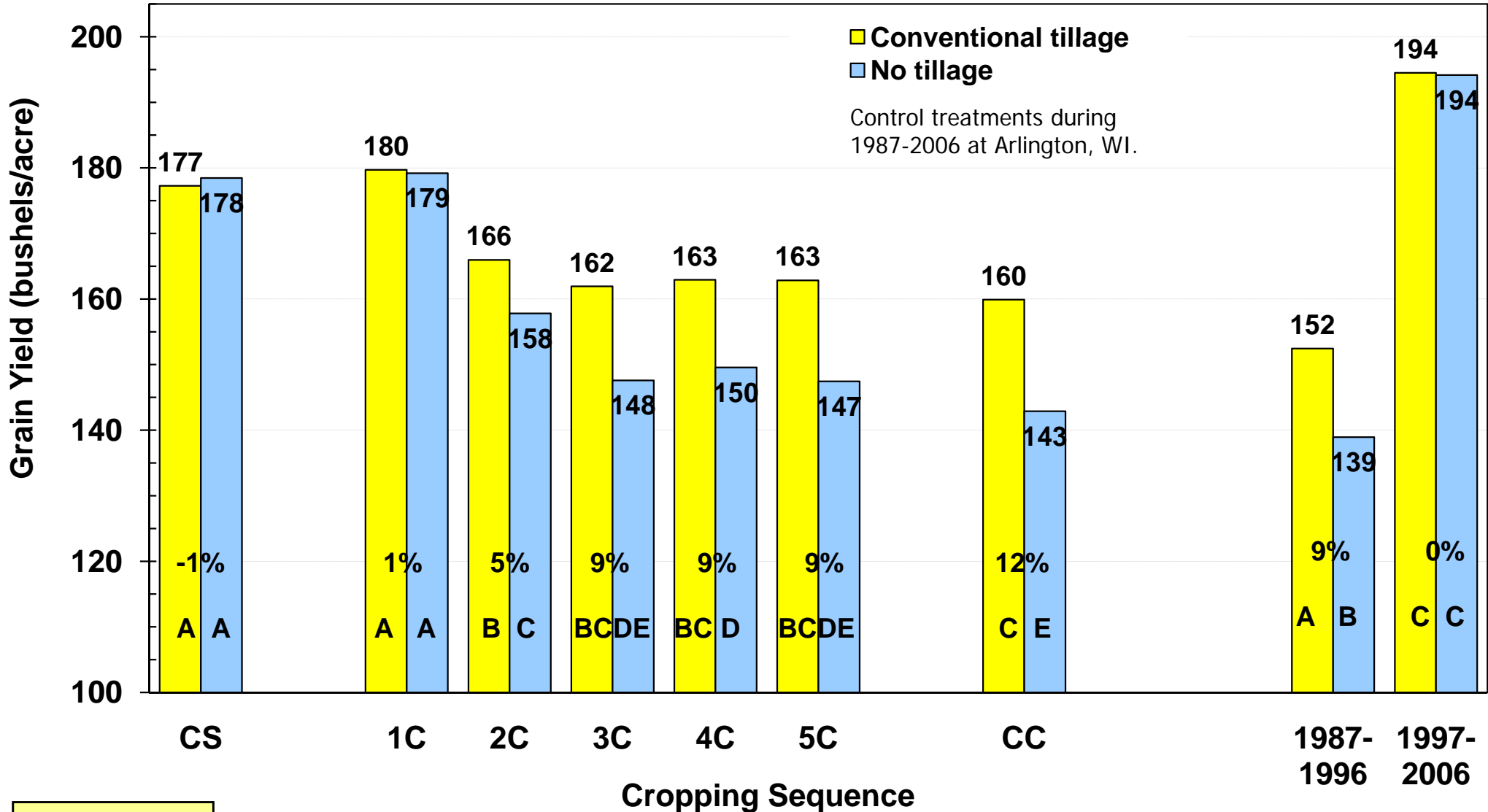
C = Corn, S = Soybean, Number = consecutive year of corn

Source: Lauer

Tillage does not affect corn yield the first year following soybean, but improves yield 5% in the second year, and 9% in the third year ...

No tillage response is observed in the second cycle ...

Corn Yield Response Following Five Years of Soybean

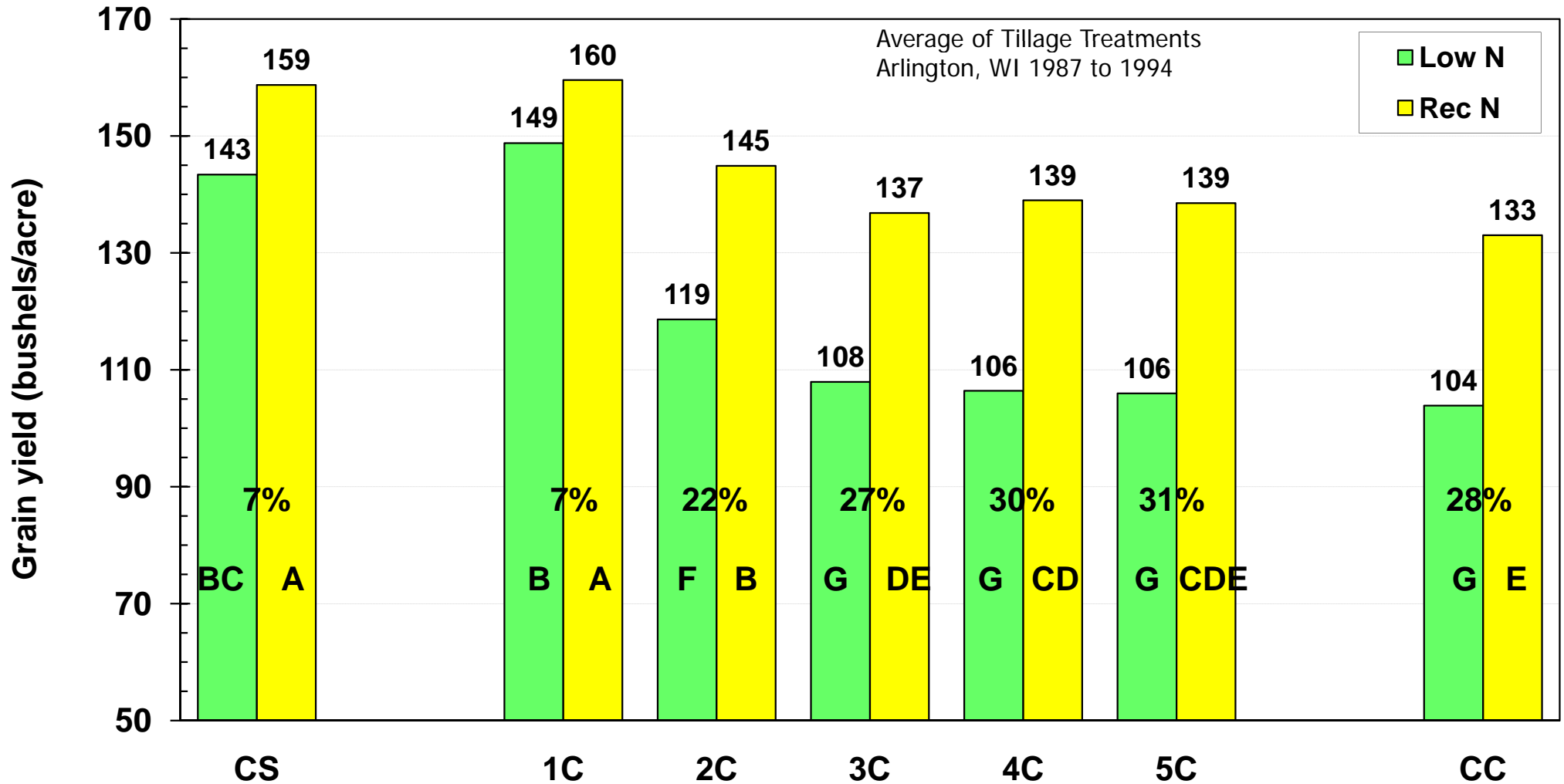


Source: Lauer

C= Corn, S= Soybean, Number = consecutive year of corn

N fertilization response increases in 2C and 3C of the rotation, so err on the high side of the recommended N application range ...

Corn Yield Response to N Following Five Years of Soybean



Average of Tillage Treatments
Arlington, WI 1987 to 1994

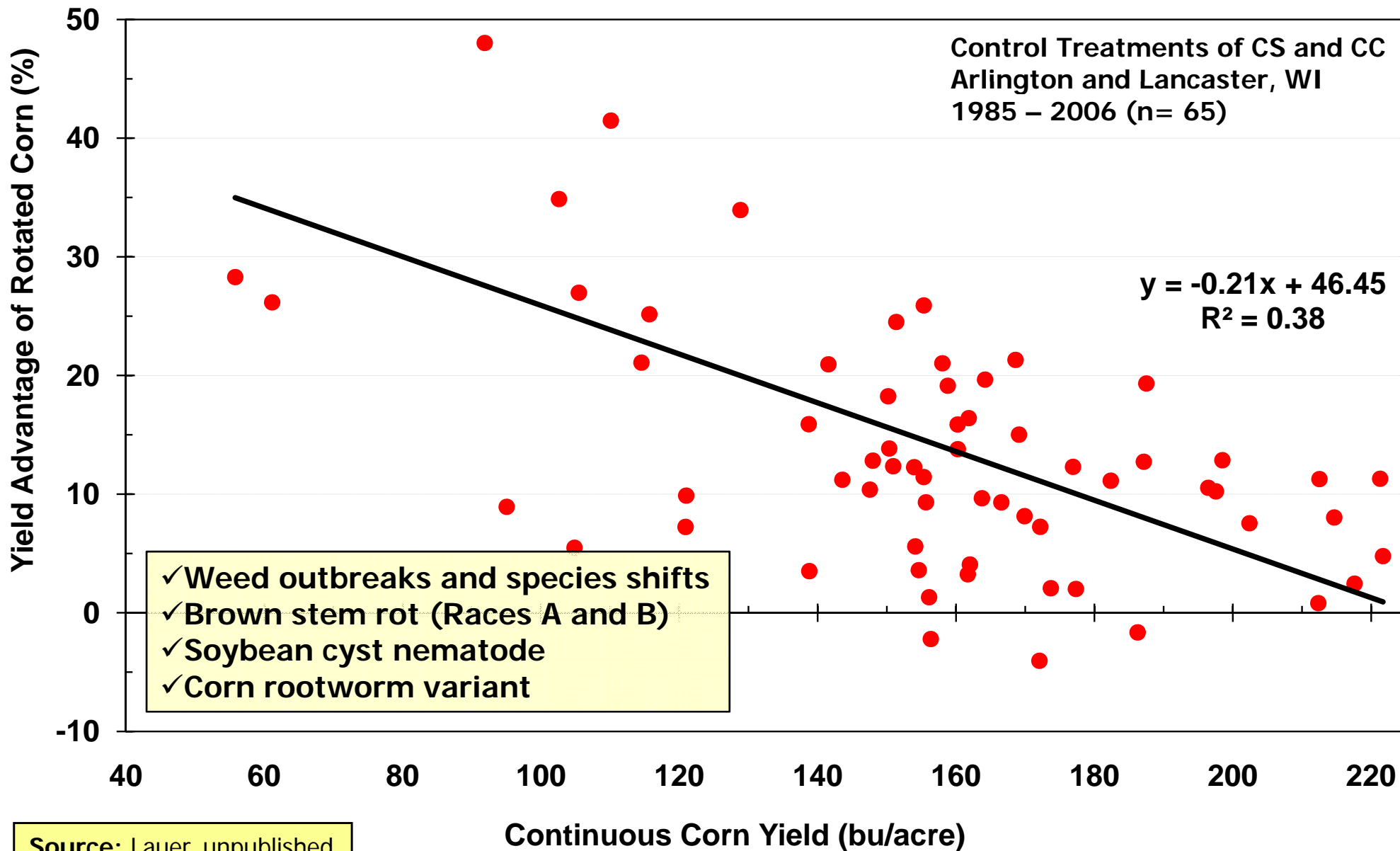
Low N
Rec N

Cropping Sequence

C= Corn, S= Soybean, Number = consecutive year of corn

Source: Lauer

Rotation is more important in stress environments ...



Source: Lauer, unpublished

Conclusions



- **Mechanism for rotation effect is unknown**
 - ✓ Hypothesis #1: One factor causes effect.
 - ✓ Hypothesis #2: Multiple factors cause effect and risk of expression depends upon the environment.
- **The rotation effect lasts at most two years increasing grain yield 10 to 19% for 1C and 0 to 7% for 2C.**
- **At least two break years are needed to measure a response in the second continuous cropping year.**
 - ✓ A one year break using soybean reduces the rotation effect in the second continuous year.
- **Adding a third crop does not improve corn yield, but does improve soybean yield.**
- **Tillage does not affect yield the first year following soybean, but improves yield 5% in the second year, and 9% in the third year.**
- **N fertilization response increases in 2C and 3C of the rotation, so err on the high side of the N application range.**
- **Modern corn hybrids and management practices have the same rotation response as older hybrids and practices.**
- **Crop rotation is even more important in stress environments.**
 - ✓ Continuous- versus rotated-corn results in yield advantages of 5 to 30% for rotated-corn.



Jorge Cusicanqui
Heather Darby
Palle Pedersen
Trenton Stanger
Zhe Yan
Justin Hopf

Kent Kohn
Thierno Diallo
Keith Hudelson
John Gaska
Tim Wood
Dwight Mueller
Darwin Frye

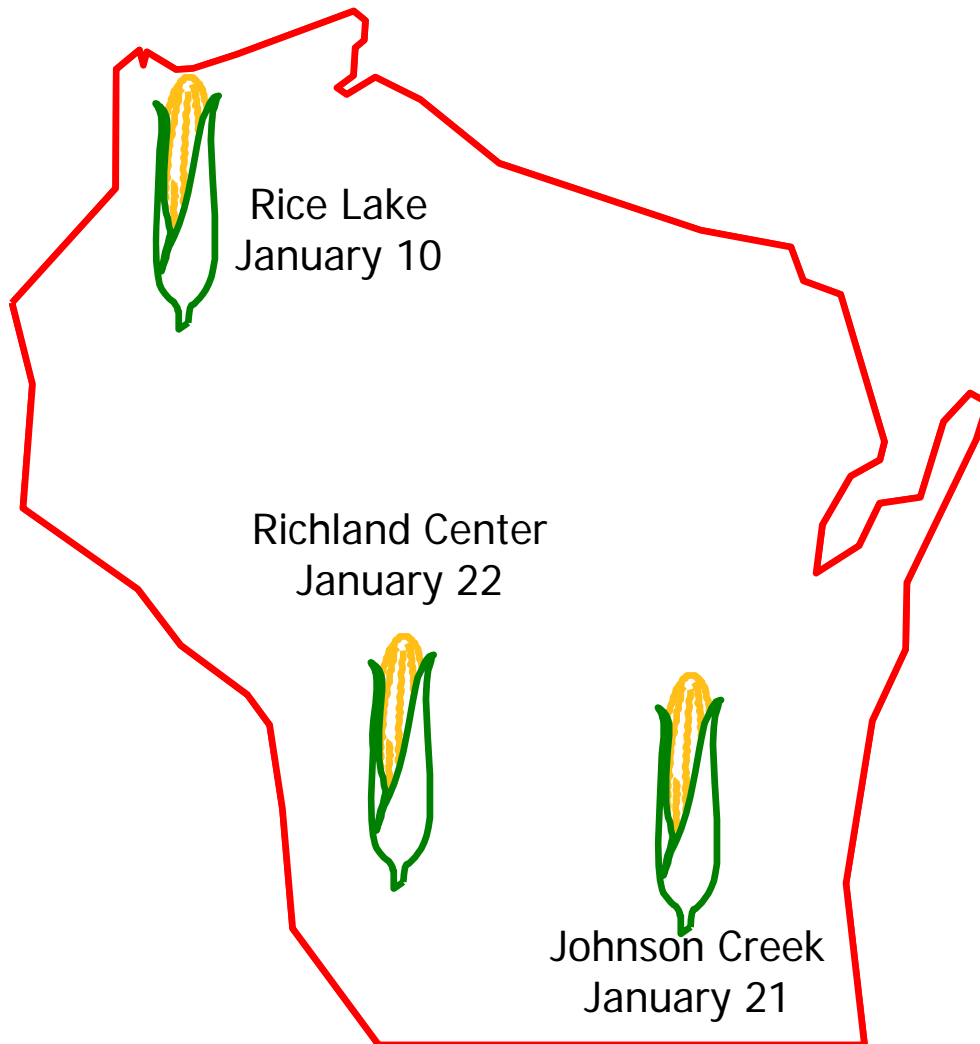
Johnny Pendleton
Ed Oplinger
Paul Carter
Roger Higgs
Larry Bundy

Funding Sources: Wisconsin Corn Promotion Board, Wisconsin Corn Growers Association, Wisconsin Soybean Association, Wisconsin Soybean Marketing Board, Seed Companies, USDA-Hatch

Thanks for your attention!

Questions?

2008 Corn Conferences



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Corn/Soy
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January 24-25, 2008
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