

2012 Agronomy Update Meetings

Portage, Fond du Lac, Kimberly, Wausau, Eau Claire,
Sparta, Janesville and Belmont

Joe Lauer
University of Wisconsin-Madison

Cooperating with Columbia, Fond du Lac, Outagamie, Marathon,
Eau Claire, Monroe, Rock and Grant Counties

January 3 – 6, 2012



Overview

- 2011 highlights for corn production
- Do we need to do tillage following soybean? The influence of residue management and planting date responses.
- Corn silage hybrids – What's new and how are they performing?



Highlights for corn production during 2011

• Growing Season

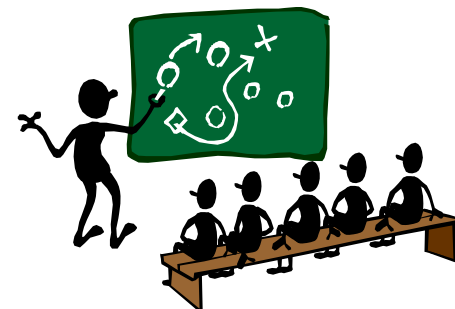
- ✓ Planting: Cool, wet conditions, delays in NE WI
- ✓ Season:
 - ❑ Wind event in early July caused lodging in southern two tiers of counties.
 - ❑ GDU accumulation was below normal in the south
- ✓ Harvest: Below normal precipitation in the south resulted in dry grain

• New in the Hybrid Trials

- ✓ Strive to improve readability
 - ❑ Traits organized as technologies in Table 2
 - ❑ Tables 3 and 4 include frequency of transgenic technologies and seed treatments
 - ❑ Only traits listed in results tables
- ✓ New: Marshfield includes both NC and N set of hybrids

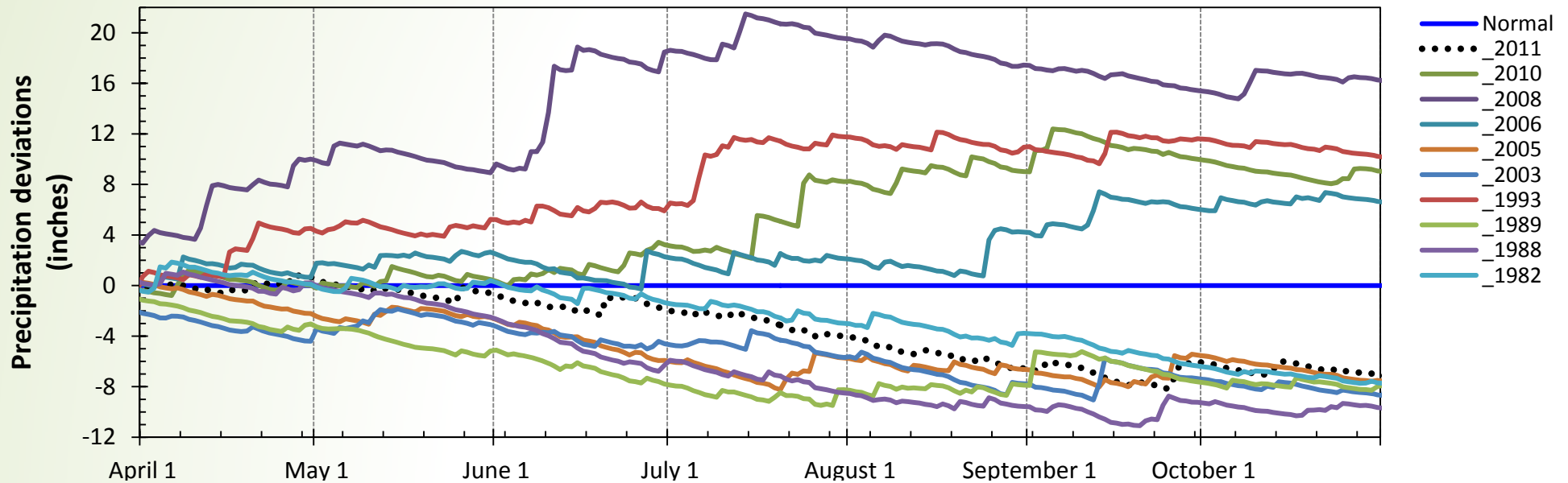
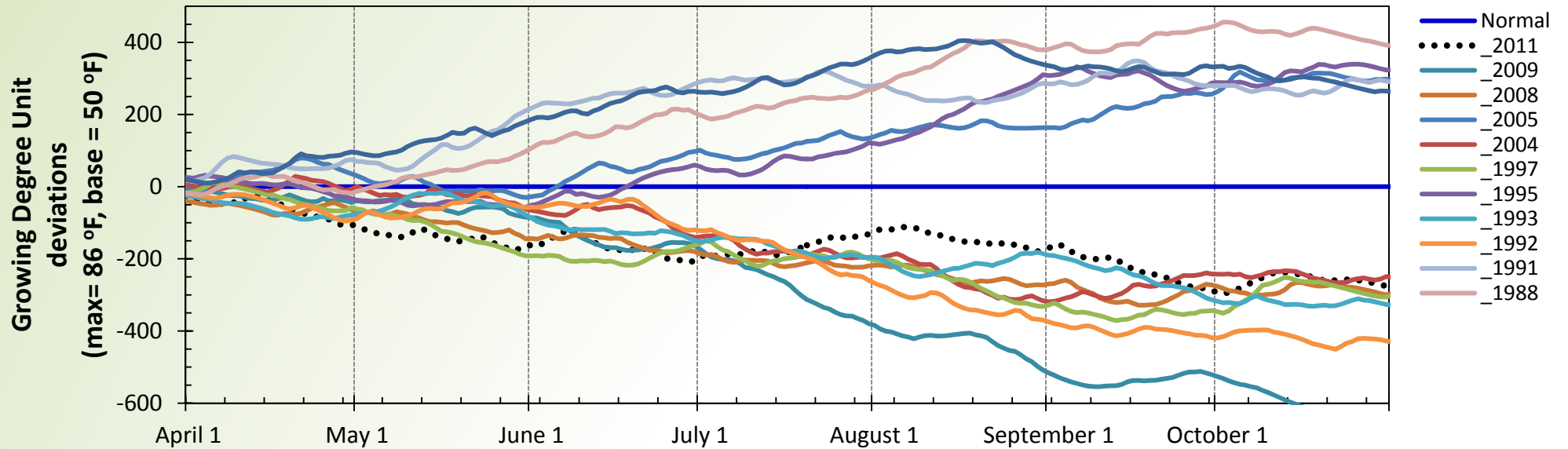
• Records

- ✓ Grain
 - ❑ No "All-time" grain yield records set in 2011
 - ❑ The top yielding hybrid was **DeKalb DKC62-09** in the Southern production zone at 246 bu/A.
- ✓ Silage
 - ❑ Five hybrids broke into the All-time Top 50 list. All were grown in the South Central production zone.
 - ❑ The top yielding hybrid was **Dairyland HiDF3110Q** in the South Central production zone at 11.5 T/A.
 - At Galesville, forage yield was 12.8 T/A (6th All-time)



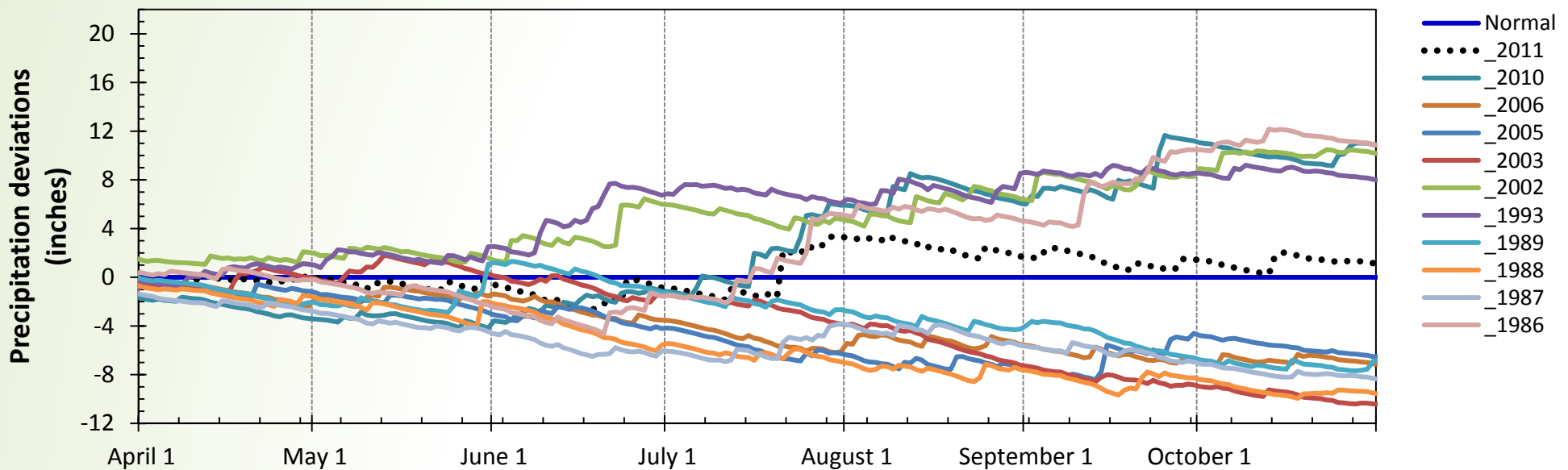
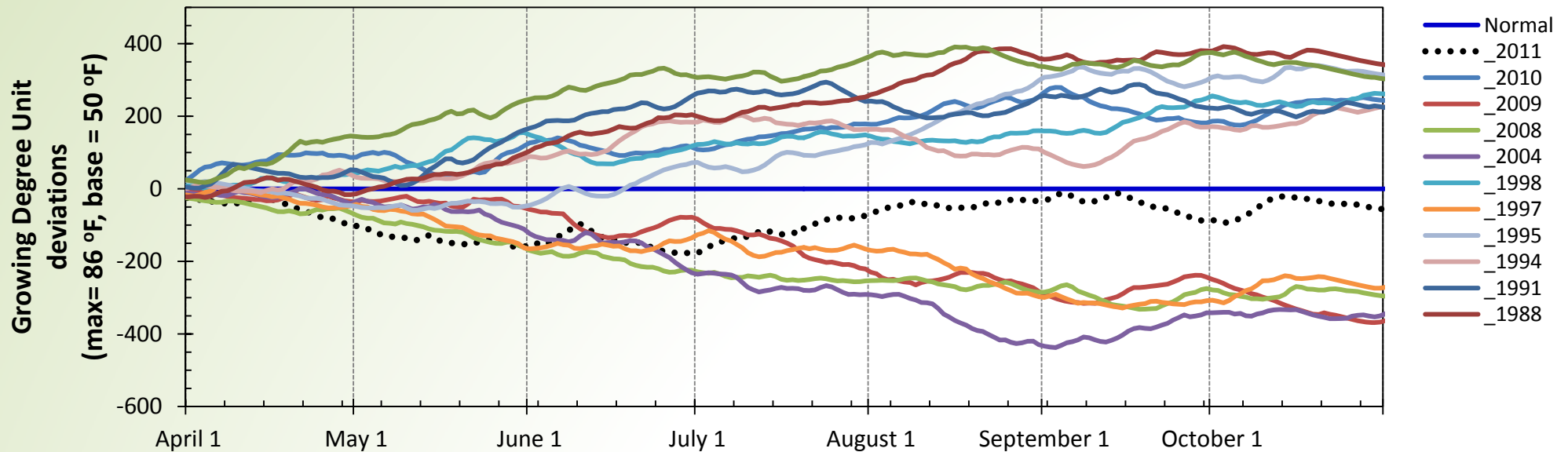
Growing degree unit accumulation and precipitation deviations during 2010 compared to the 30-yr normal

(\pm Standard Deviation of warm/cool and wet/dry seasons)



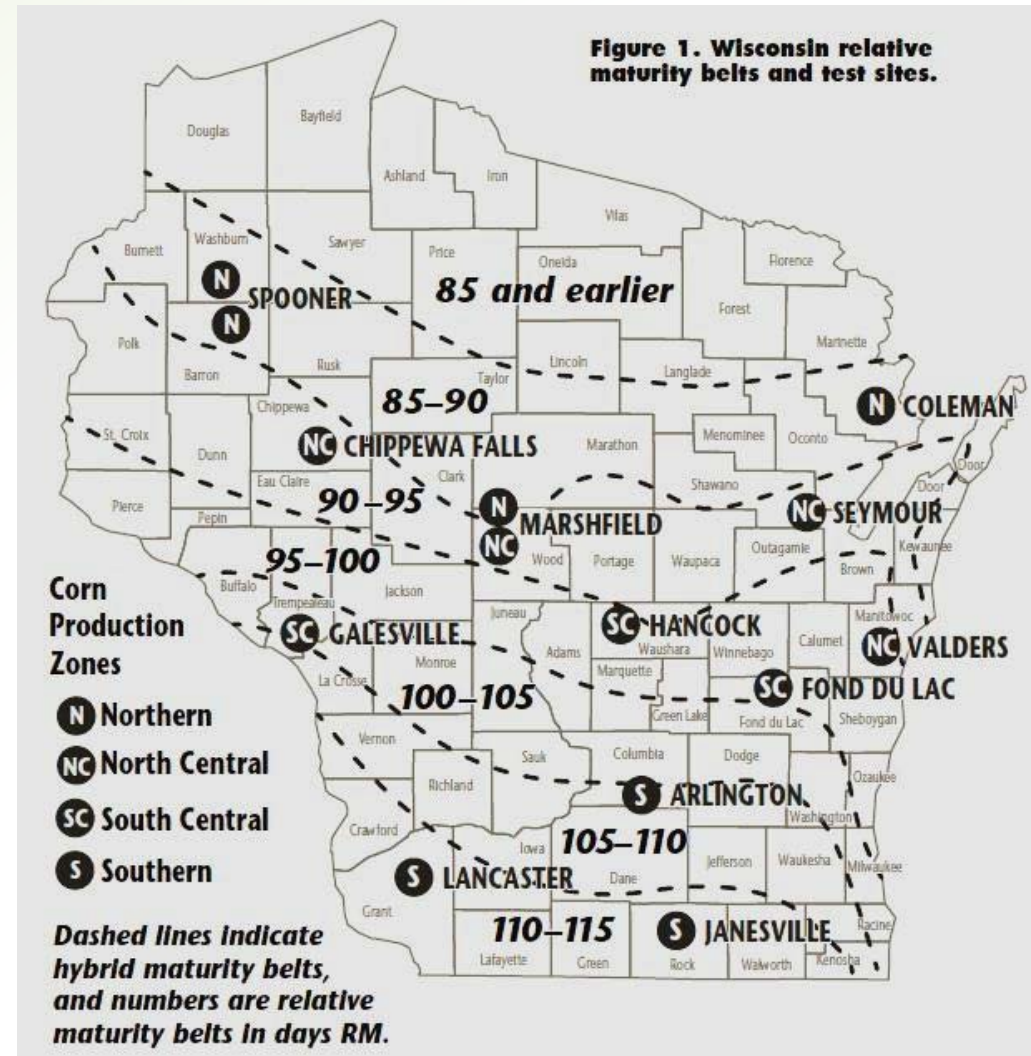
Growing degree unit accumulation and precipitation deviations during 2010 compared to the 30-yr normal

(\pm Standard Deviation of warm/cool and wet/dry seasons)



Corn Agronomy Program 2011

- Corn is grown on ~4 million acres in WI. A one bushel increase by farmers increases farm income \$8 to \$20 million dollars annually.
- Objective: To provide unbiased performance comparisons of hybrid seed corn available in Wisconsin.
 - ✓ In 2011, 492 corn hybrids were tested at 14 locations.



2011 Wisconsin Corn Performance Trials

Grain Summary

Location	<u>2001-2010</u>		<u>2011</u>		Percent change
	N	Yield	N	Yield	
Arlington	1988	216	150	194	-10
Janesville	1885	223	150	230	3
Lancaster	1753	214	150	231	8
Fond du Lac	1471	185	153	205	11
Galesville	1565	210	153	222	6
Hancock	1594	219	153	204	-7
Chippewa Falls	1180	165	144	188	14
Marshfield	1618	164	204	180	10
Seymour	1303	166	144	172	4
Valders	1536	167	144	151	-10
Coleman/Rhineland	268	176	60	181	3
Spooner	1376	139	180	162	17

2011 Wisconsin Corn Performance Trials Silage Summary

Location	2001-2010		2011		Percent change
	N	Yield	N	Yield	
Arlington	642	9.6	62	9.2	-4
Lancaster	642	9.0	62	9.7	8
Fond du Lac	664	8.1	76	9.4	16
Galesville	668	9.4	76	9.9	5
Chippewa Falls	458	7.4	81	8.2	11
Marshfield	606	7.3	107	7.6	4
Valders	587	7.3	81	7.9	8
Coleman/Rhineland	202	7.3	26	8.6	18
Spooner	440	6.8	52	7.0	3

Hybrid Selection Principles in the Transgenic Era

1. Use multi-location averages to compare hybrid performance
2. Evaluate consistency of performance
3. Pay attention to seed costs
 - ❑ <http://corn.agronomy.wisc.edu/Season/DSS.aspx>
4. Every hybrid must stand on its own for performance
5. Buy the traits you need

**“Traits do not add to yield ...
Traits protect yield.”**

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WISCONSIN CORN HYBRID PERFORMANCE TRIALS



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University of Wisconsin-Extension

Wisconsin Crop Improvement Association

UW
Extension
Cooperative Extension
2011

<http://corn.agronomy.wisc.edu/HT>

The Wisconsin Rotation Trials

Lauer, Conley and Undersander



Corn-Soybean- Oat-Alfalfa-Wheat Lancaster since 1966

CC
CSCOA
CCCOA
CCOAA
COAAA:1966-1976
CCAA:1977-1986
AA:1977-2004
CS:1987-
CA:1987-2004
CSW:2005-

Corn N rate
1966-76: 0, 75, 150, 300
1977- : 0, 50, 100, 200

Corn-Soybean since 1983

CC
SS
CS
CCCCSSSSS

Tillage=2
N rate
Cultivar
Population
Row spacing
Seed insecticide
N timing
N source

Systems Trials

Soils 1958-
Weeds 1987-
WICST 1990-
GLBRC 2009-

Tillage since 2001

CC
CS

Tillage=6
Starter
Planting date

Corn-Alfalfa

ARL and MAR since 2010

CC
CCAAA
CCAA
CCAA biomass

BioChar since 2009

CC
CS

Tillage=2
BioChar

Corn-Soybean-Wheat 1984 to 2000

CC
SS
CS
CSW:1984-1994
CCS:1995-2000
CCCS:1995-2000

Corn-Soybean-Wheat ARL & MAR since 2002

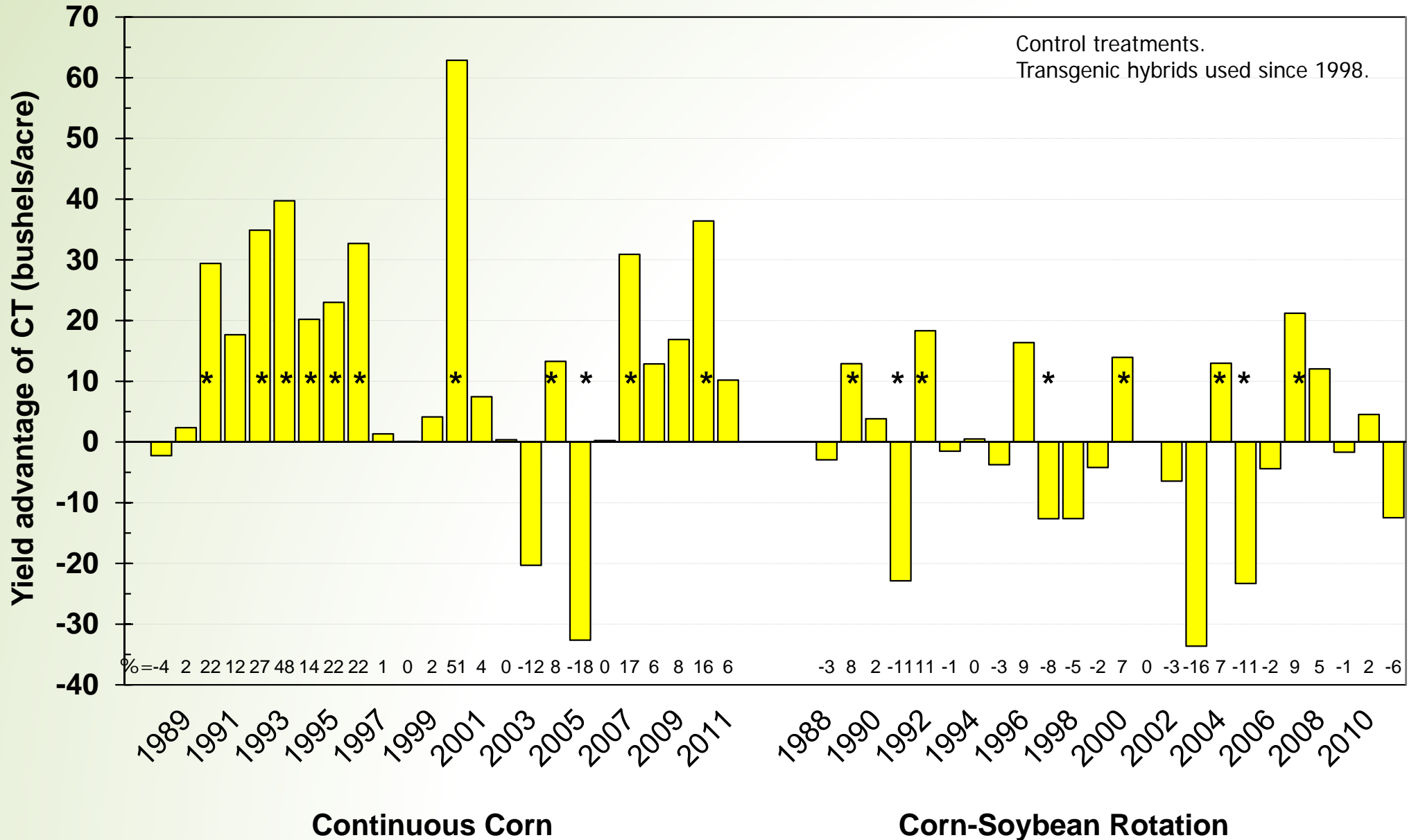
CC
SS
WW
CS
CSW
CWS
CWS biomass

Seed fungicide
Foliar fungicide
Fusarium management

Photo by Justin Hopf

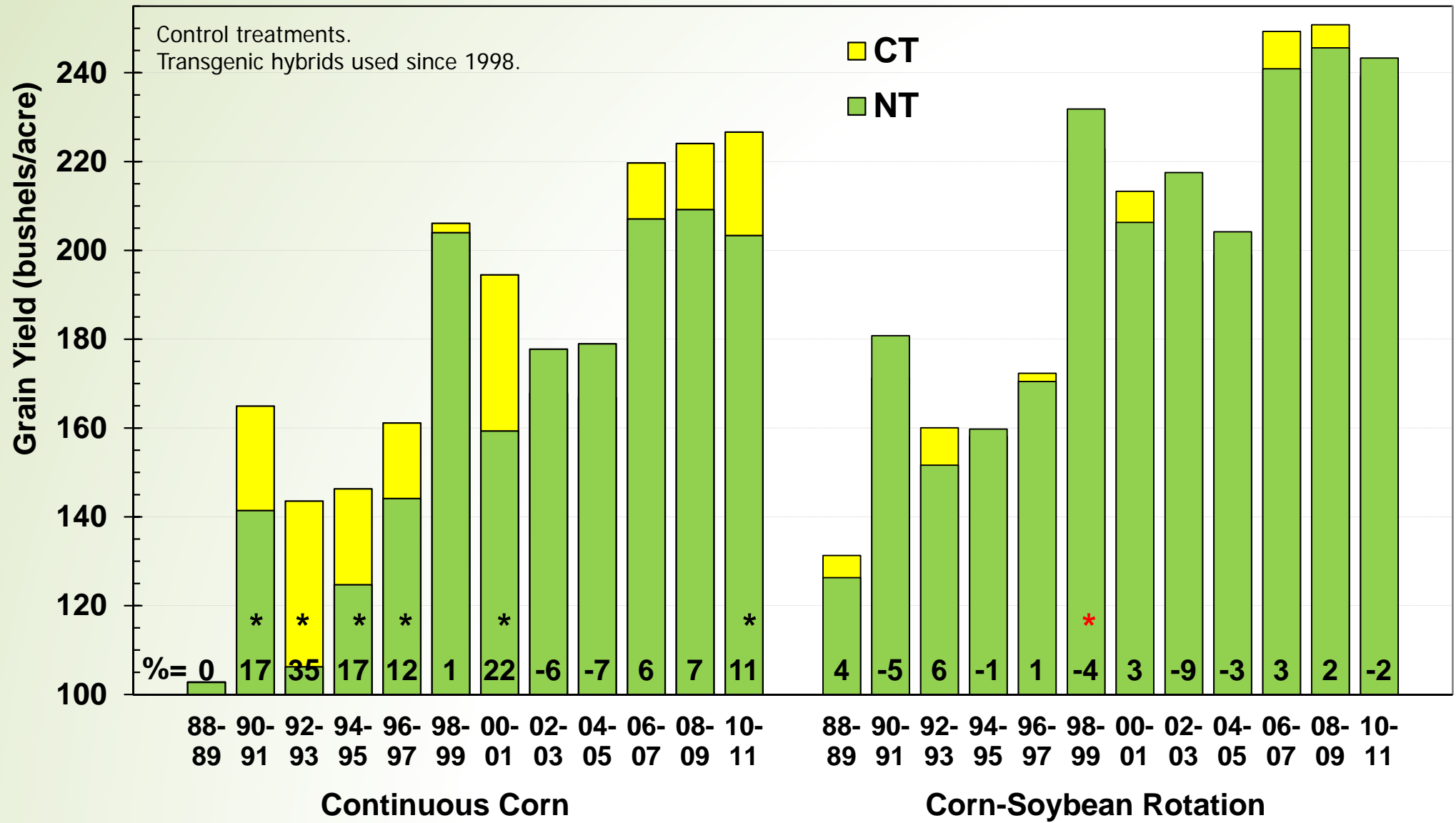
In continuous corn, CT increased corn yield 10 of 24 years, NT= 1 of 24.
 In a corn-soybean rotation, CT= 5/24, NT 3 of 24.

Corn Yield Response to Tillage in CC and CS Rotations



In continuous corn, CT increased corn yield 6 of 12 cycles (50%).
 In a corn-soybean rotation, there is no difference between CT and NT.

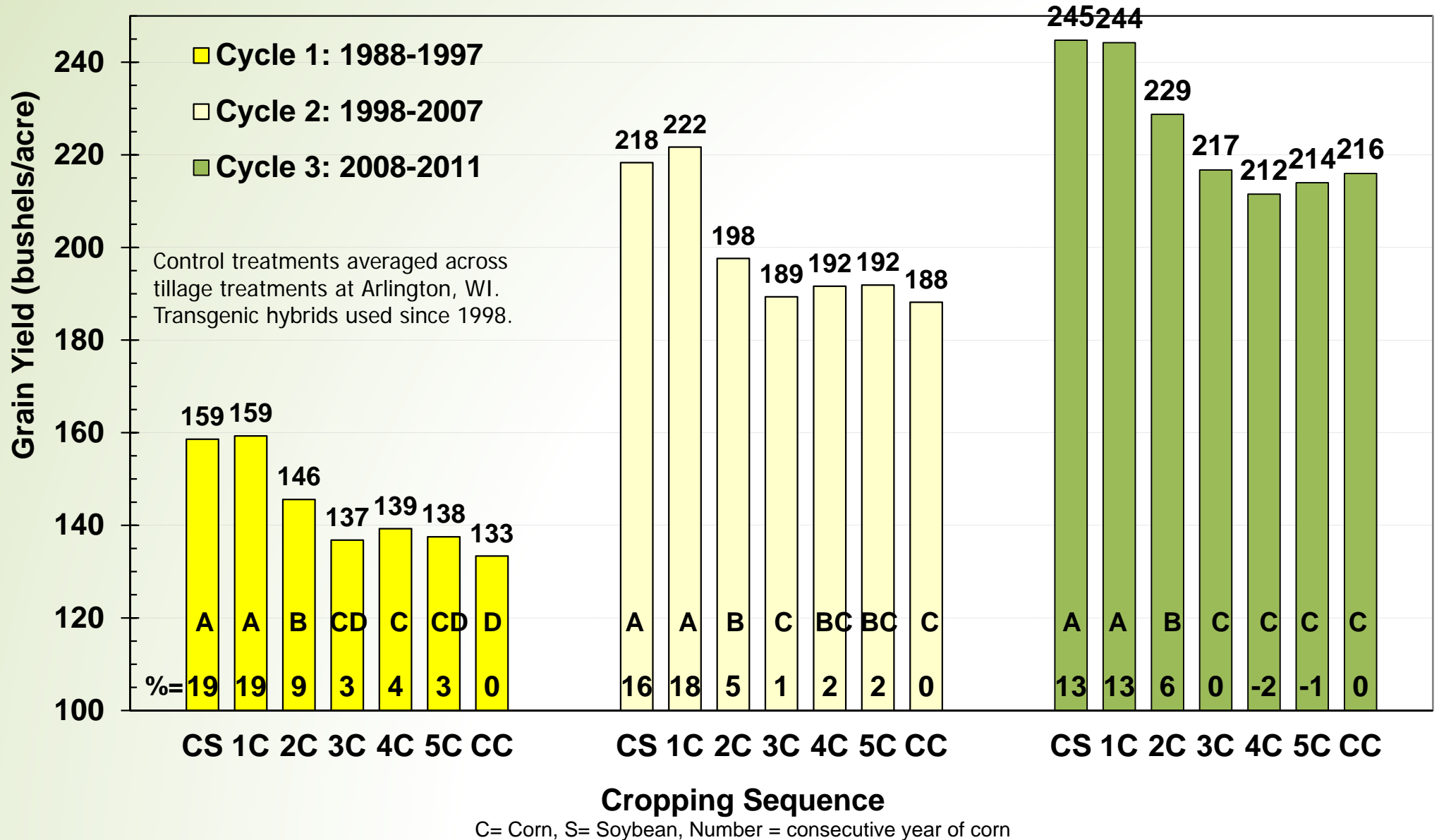
Corn Yield Response to Tillage in CC and CS Rotations



No star = NS, Black star favors CT, Red star favors NT

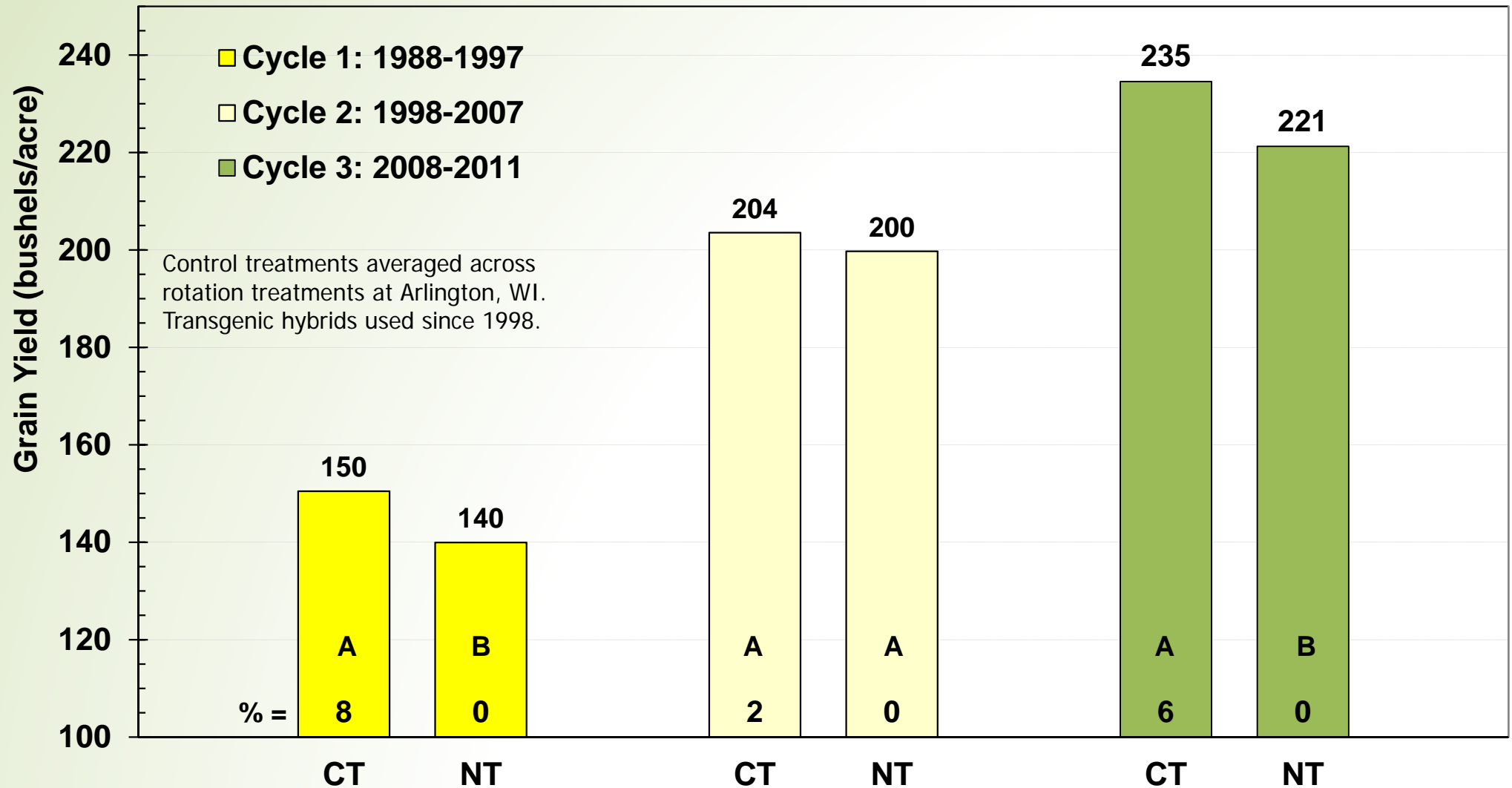
Modern corn hybrids and management practices have the same rotation response as older hybrids and practices ...

Corn Yield Response Following Five Years of Soybean



Conventional tillage increases grain yield 2-8% compared to no tillage ... but there is an interaction ...

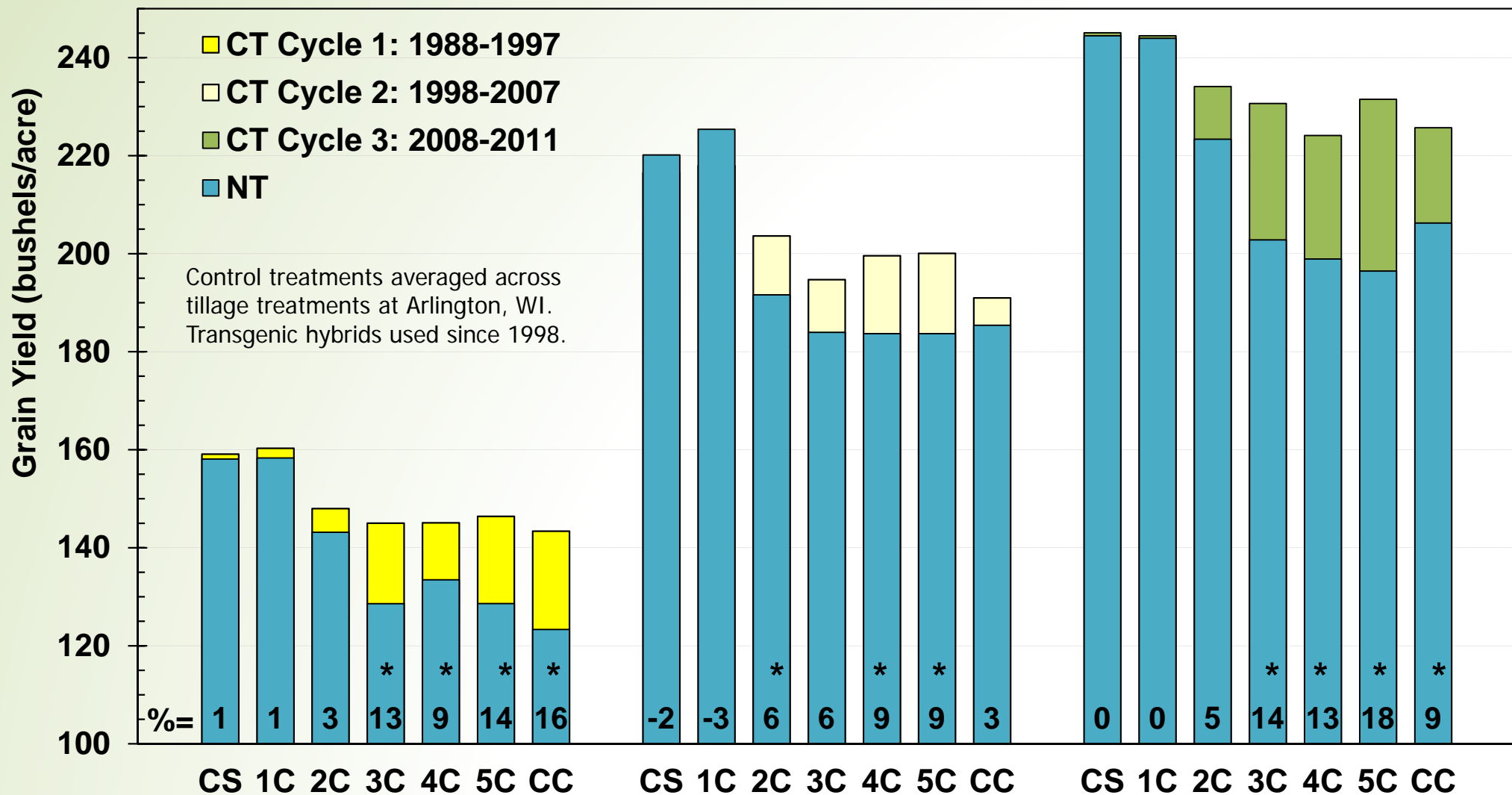
Corn Yield Response to Tillage



Cropping Sequence
CT= Conventional tillage, NT= No tillage

Tillage does not affect corn yield the first year following soybean, but improves yield 3-6% in the second year, and 6-14% in the third year

Corn Yield Response Following Five Years of Soybean

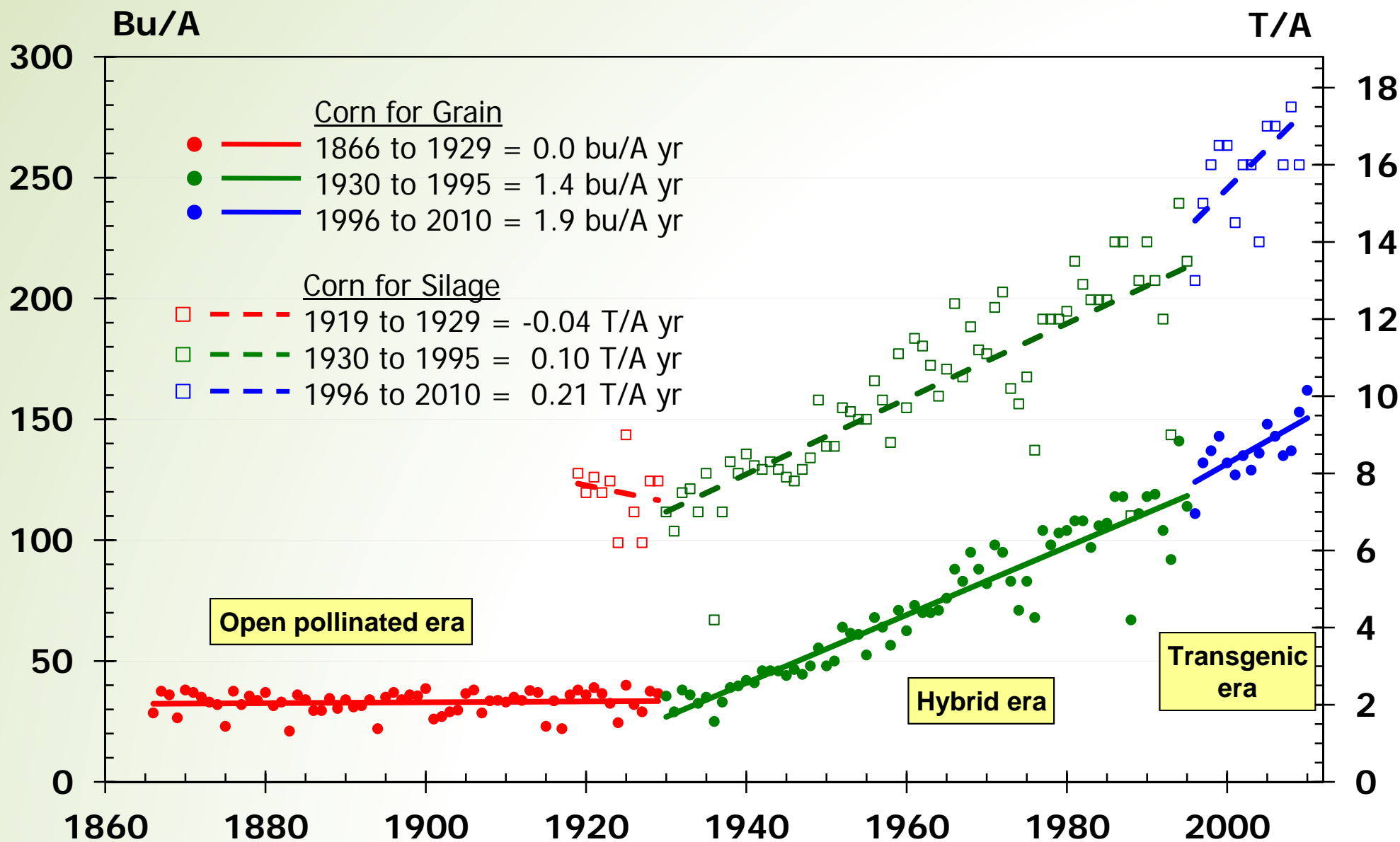


Cropping Sequence

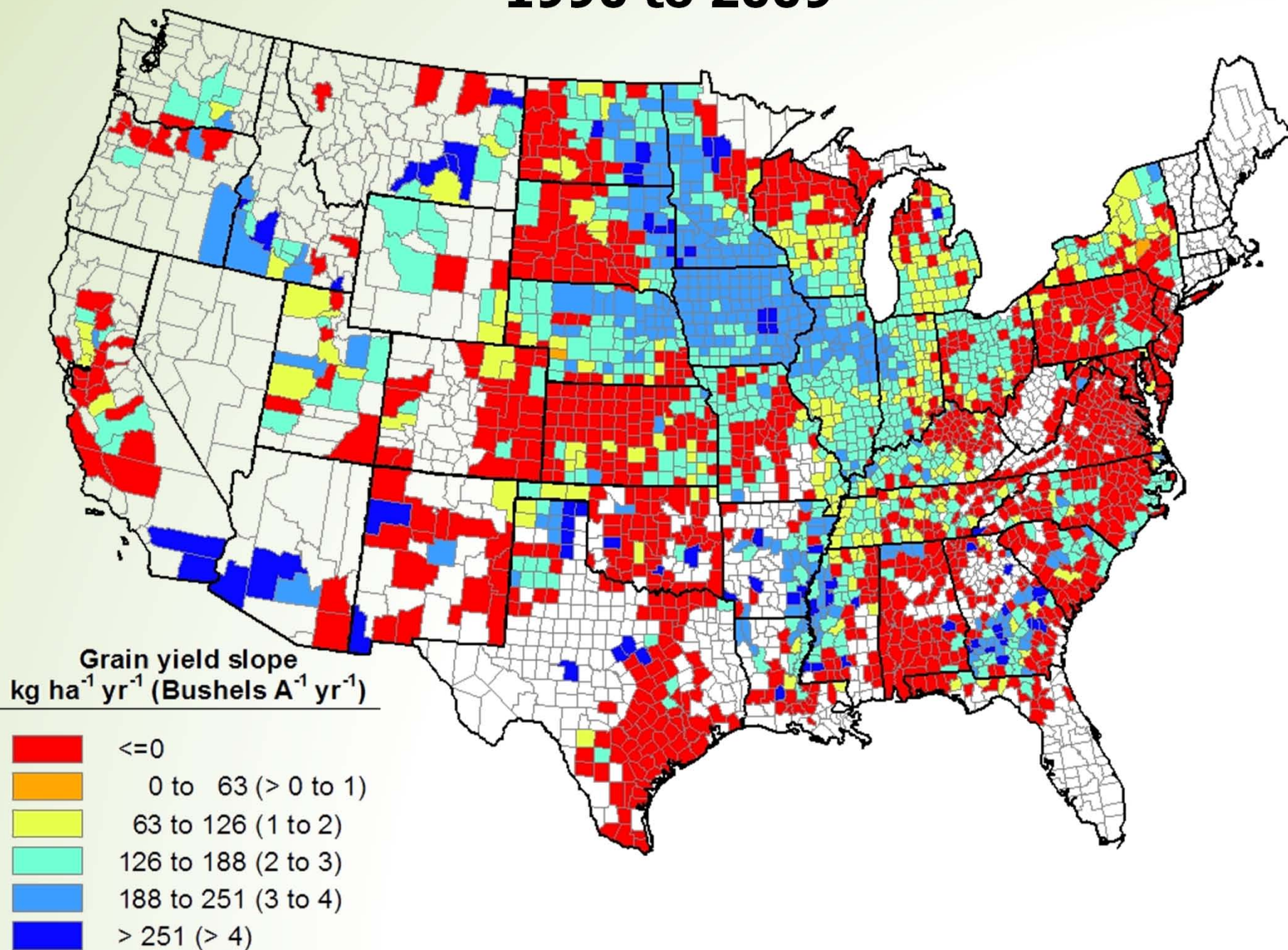
C= Corn, S= Soybean, Number = consecutive year of corn

Corn grain and silage yield in Wisconsin since 1866

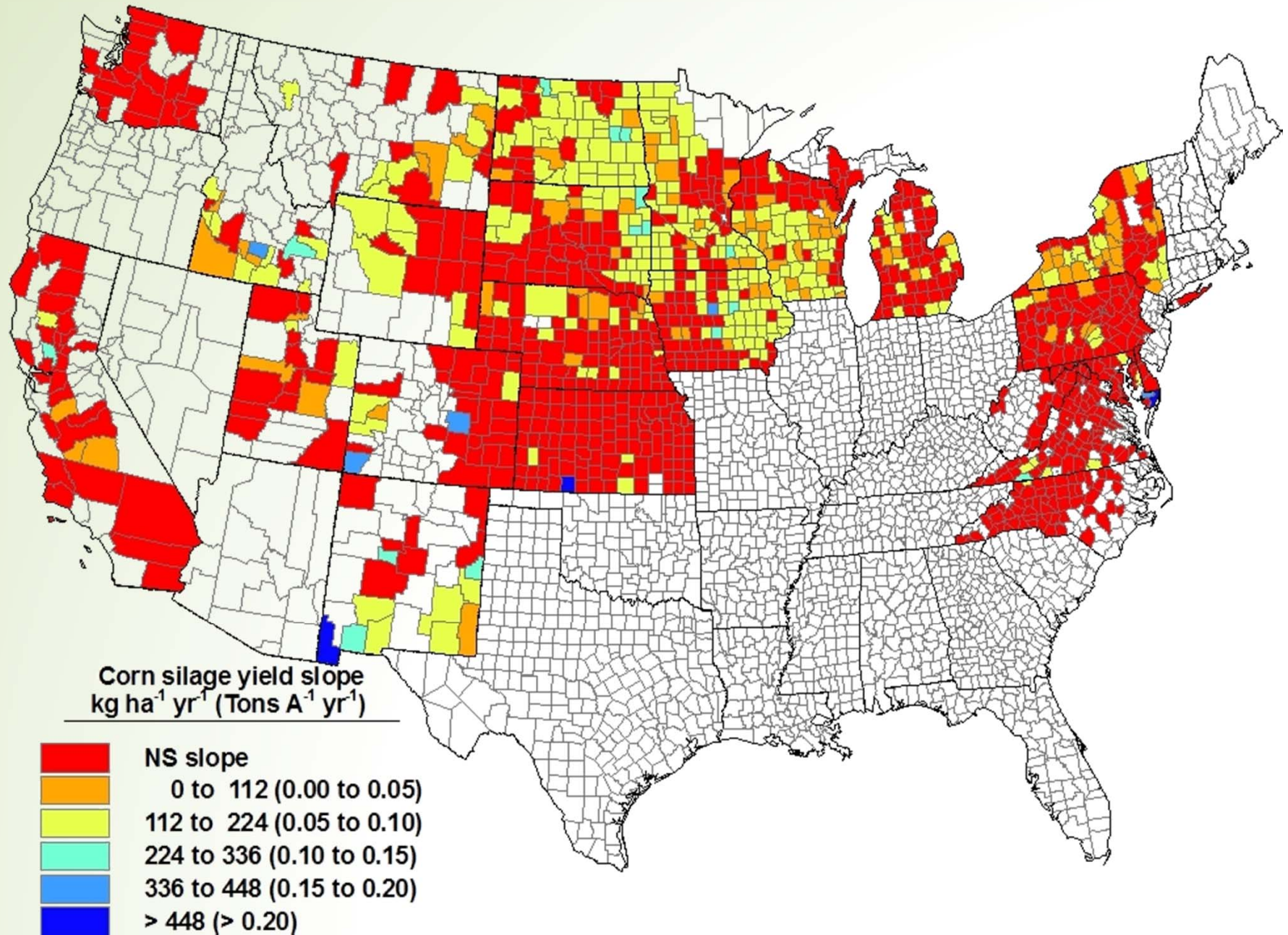
The yield march continues ...



Corn grain yield change over time for U.S. counties 1990 to 2009



Corn silage yield change over time for U.S. counties 1990 to 2009



What has happened to corn silage hybrids over time?

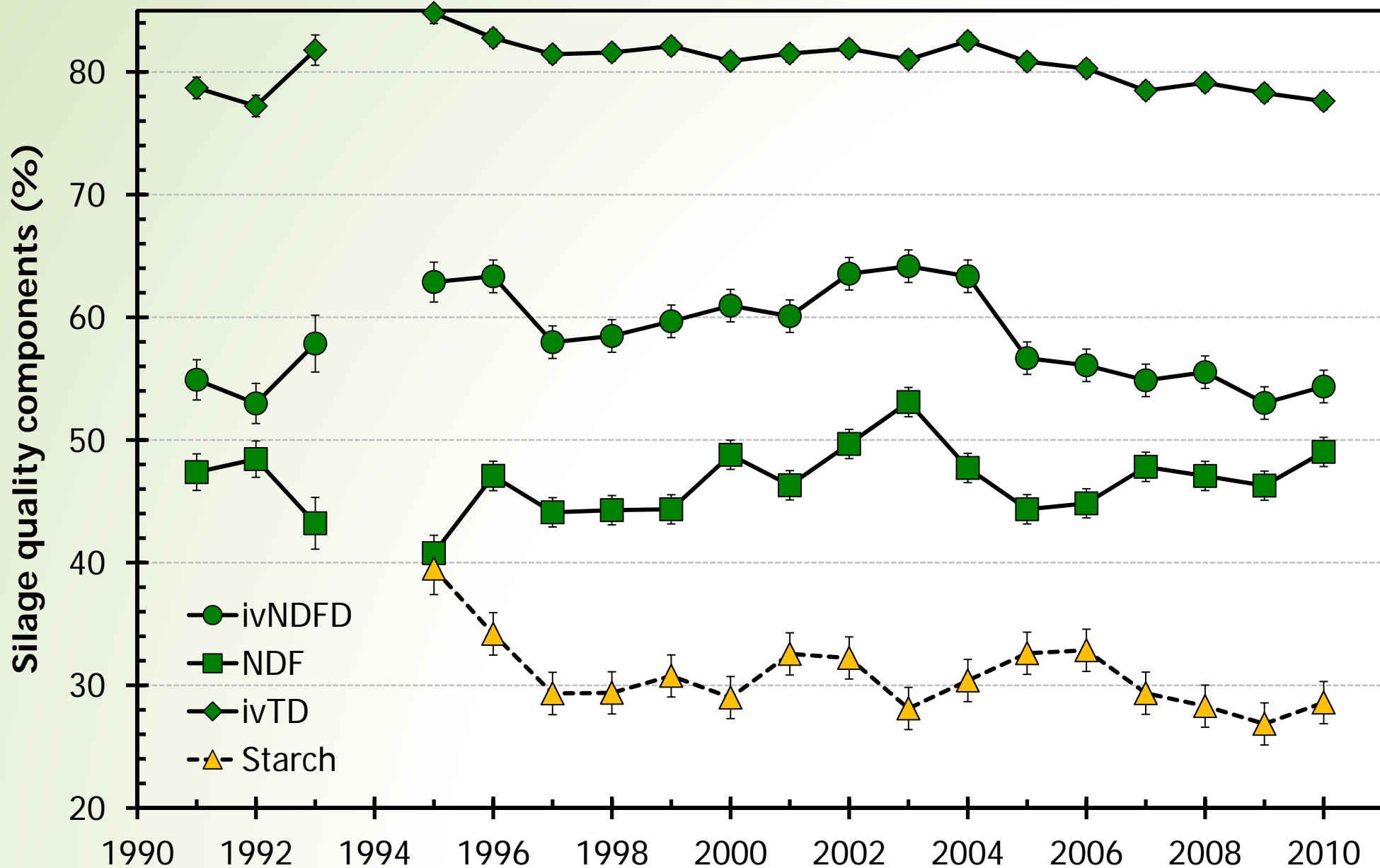
Materials and Methods

- **Objective:** To describe corn yield and quality changes of representative cultivars used by farmers in the northern Corn Belt.
- **Total of 36 cultivars**
 - ✓ Six open-pollinated cultivars used prior to 1930
 - ✓ 24 cultivars representing four 15-yr eras between 1931 and 1989
 - ✓ Six modern cultivars
 - ✓ Cultivars were divided into early- and late-maturity trials
 - ✓ Arlington, Fond du Lac, Marshfield
 - ✓ 1997 and 1998
- **M&M of 1995 to 2009 era**



Average corn silage quality components of hybrids tested in the UW silage consortium and performance trials

(Error bar= standard error of the mean)



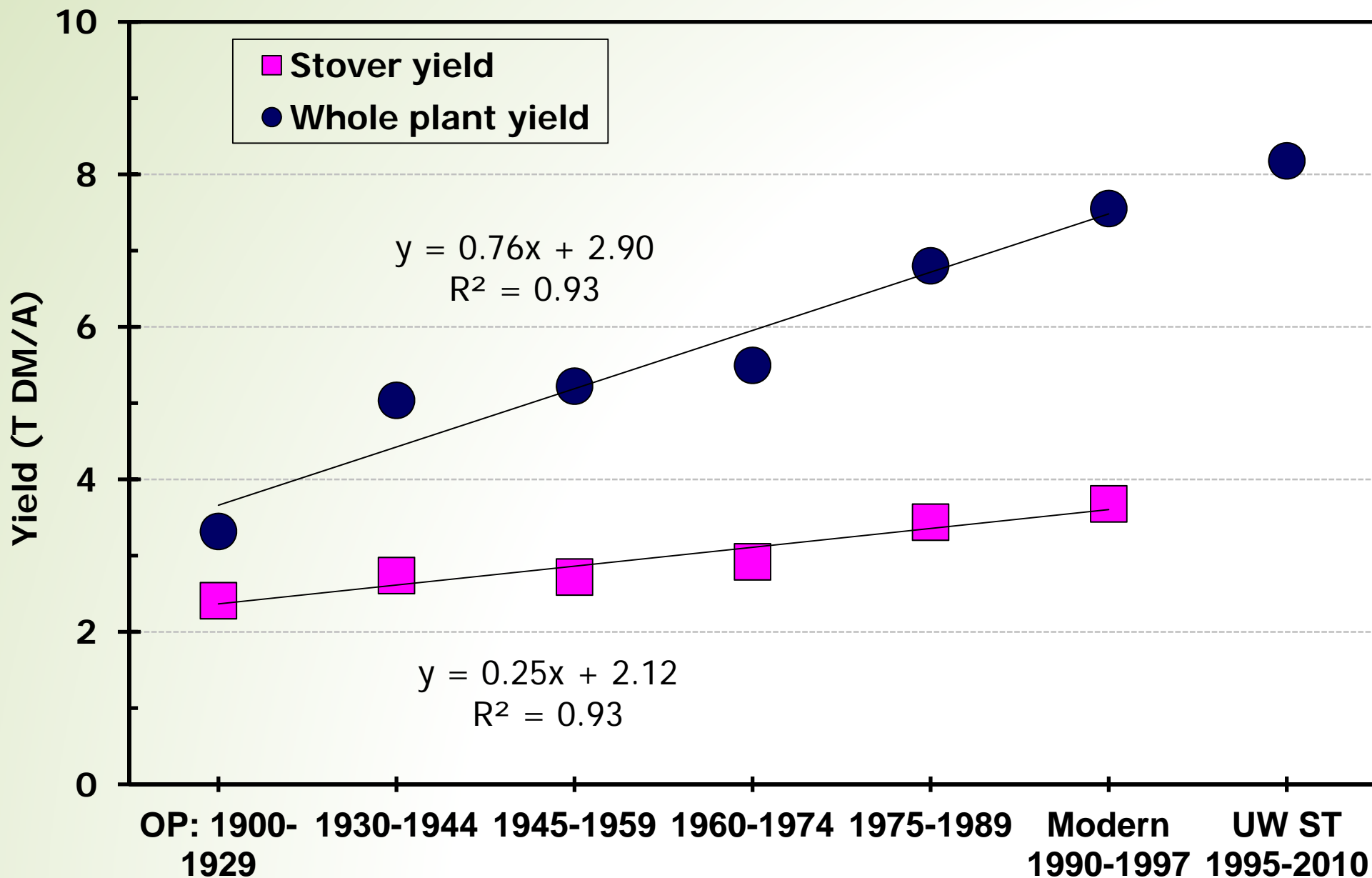
What is an Average Corn Silage Hybrid?

Trait(s)	GxE	Forage yield	NDF	NDFD	Starch	Milk2006	
						N	T DM/A
Normal →	3398	7.8	47	59	30	3100	25000
Bmr	126	6.4	48	67	26	3300	21000
Leafy	240	8.1	48	59	27	3100	25000
CB	736	8.1	46	59	31	3100	26000
RR	339	7.8	47	58	30	3100	24000
CB,LL	331	8.2	47	59	30	3100	26000
CB,RR	395	8.0	46	59	32	3100	25000
CB,RW,RR	891	7.9	46	58	32	3100	25000
LSD(0.05)		0.6	2	1	4	100	2000
Average	7403	8.0	47	58	30	3100	25000

Relationship between era of release and whole-plant or stover yield

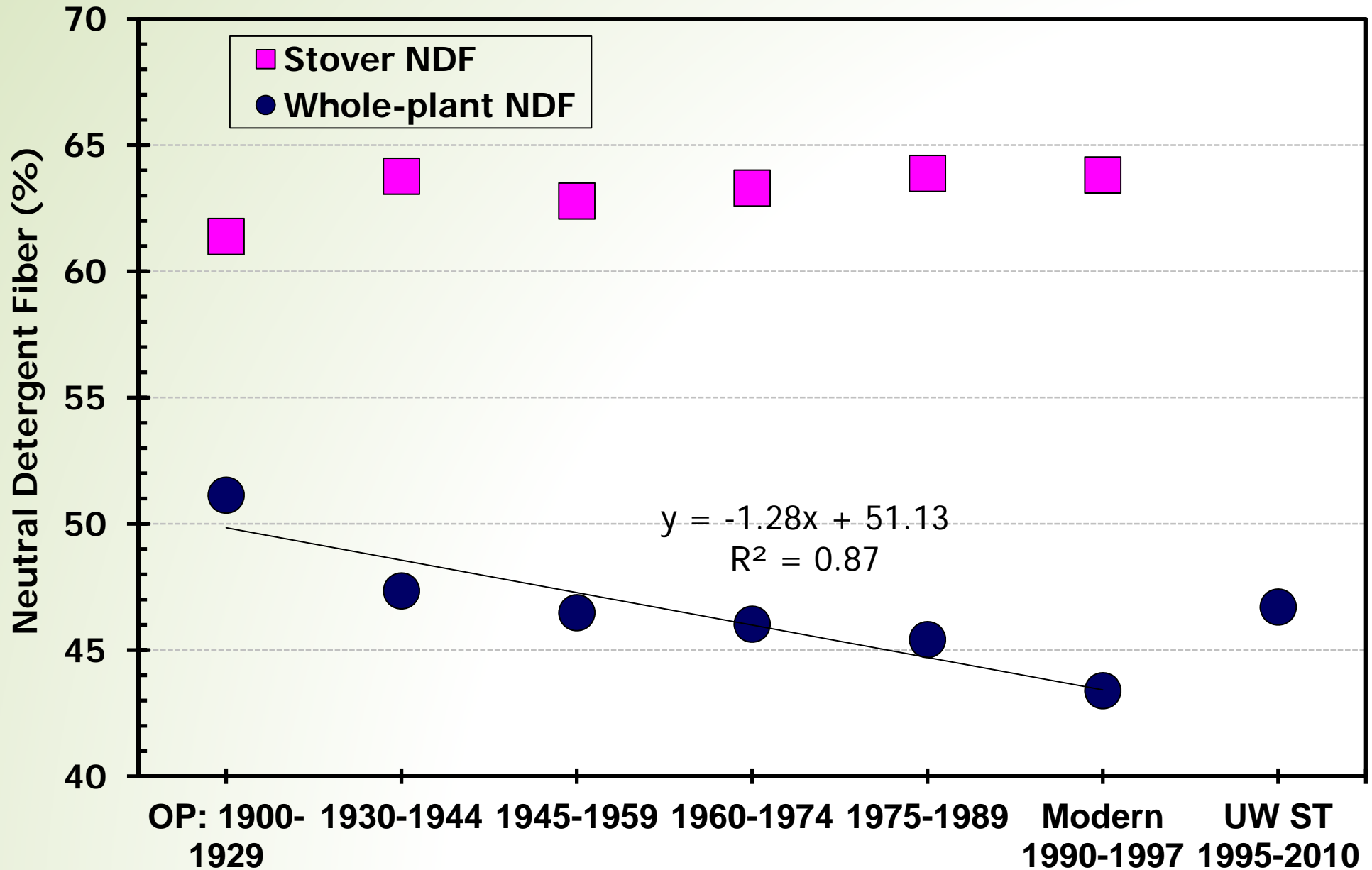
1) Whole plant yield has increased 0.76 T DM/A yr

2) Stover yield has increased 0.25 T DM/ A yr



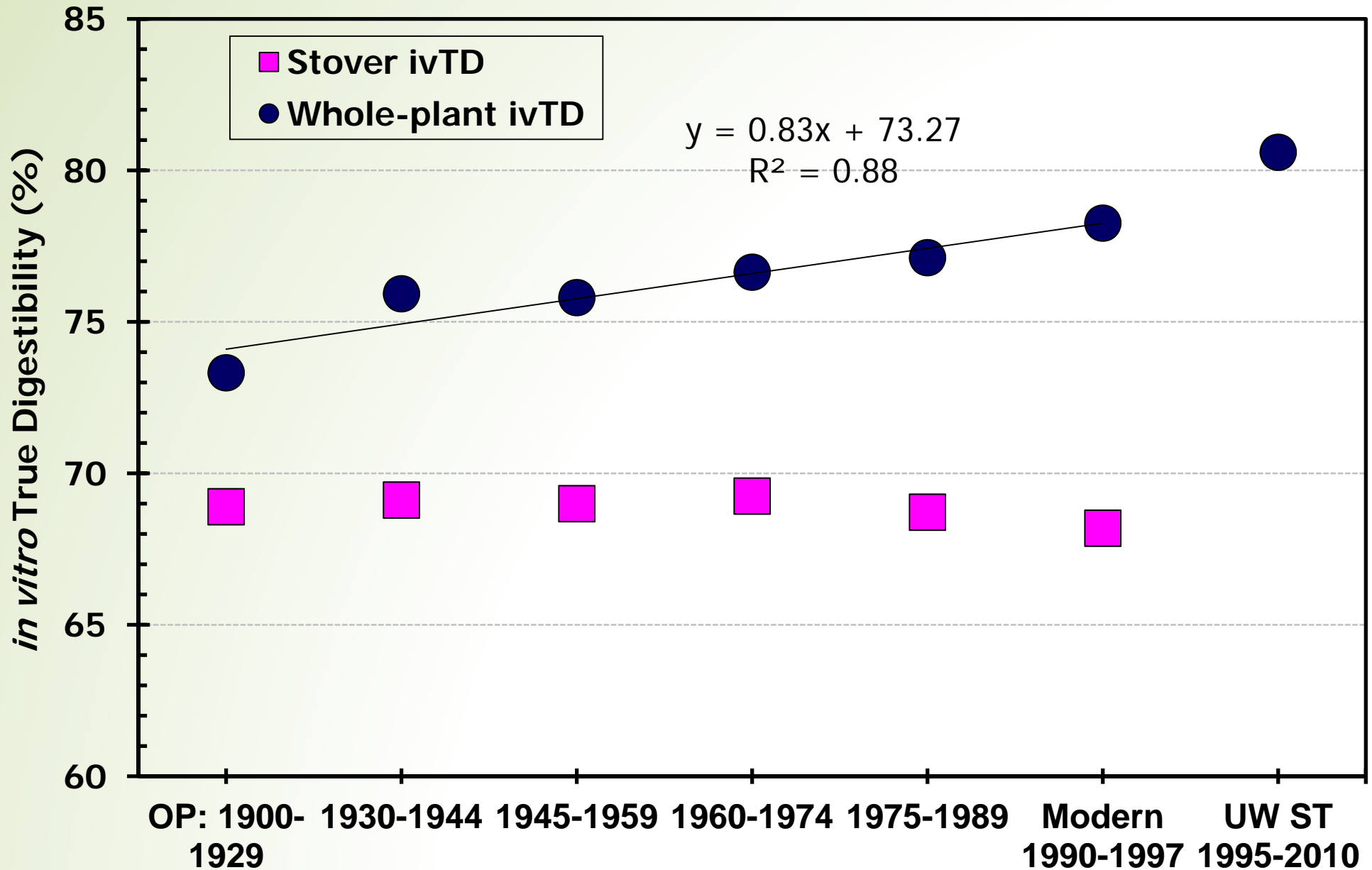
The relationship between neutral detergent fiber (NDF) and era of release.

- 1) Whole-plant NDF is decreasing at 1.3% per era
- 2) No relationship between stover NDF and era



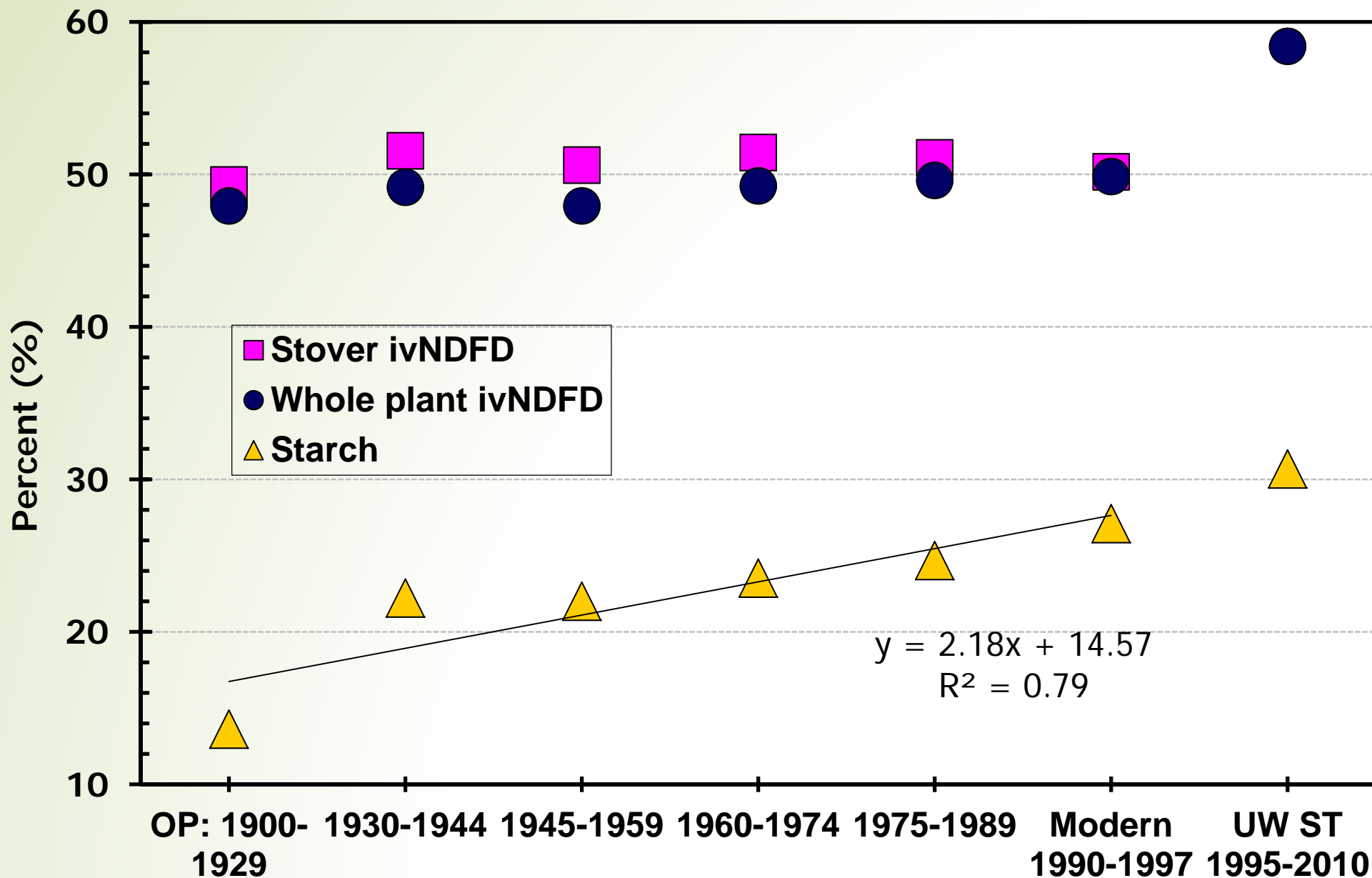
The relationship between *in vitro* true digestibility and era of release.

- 1) Whole-plant digestibility has increased 0.83% per era
- 2) No relationship for stover



Relationship between era of release and ivNDFD and starch content

- 1) No relationship for whole-plant and stover
- 2) Starch content has increased 2.18% per era



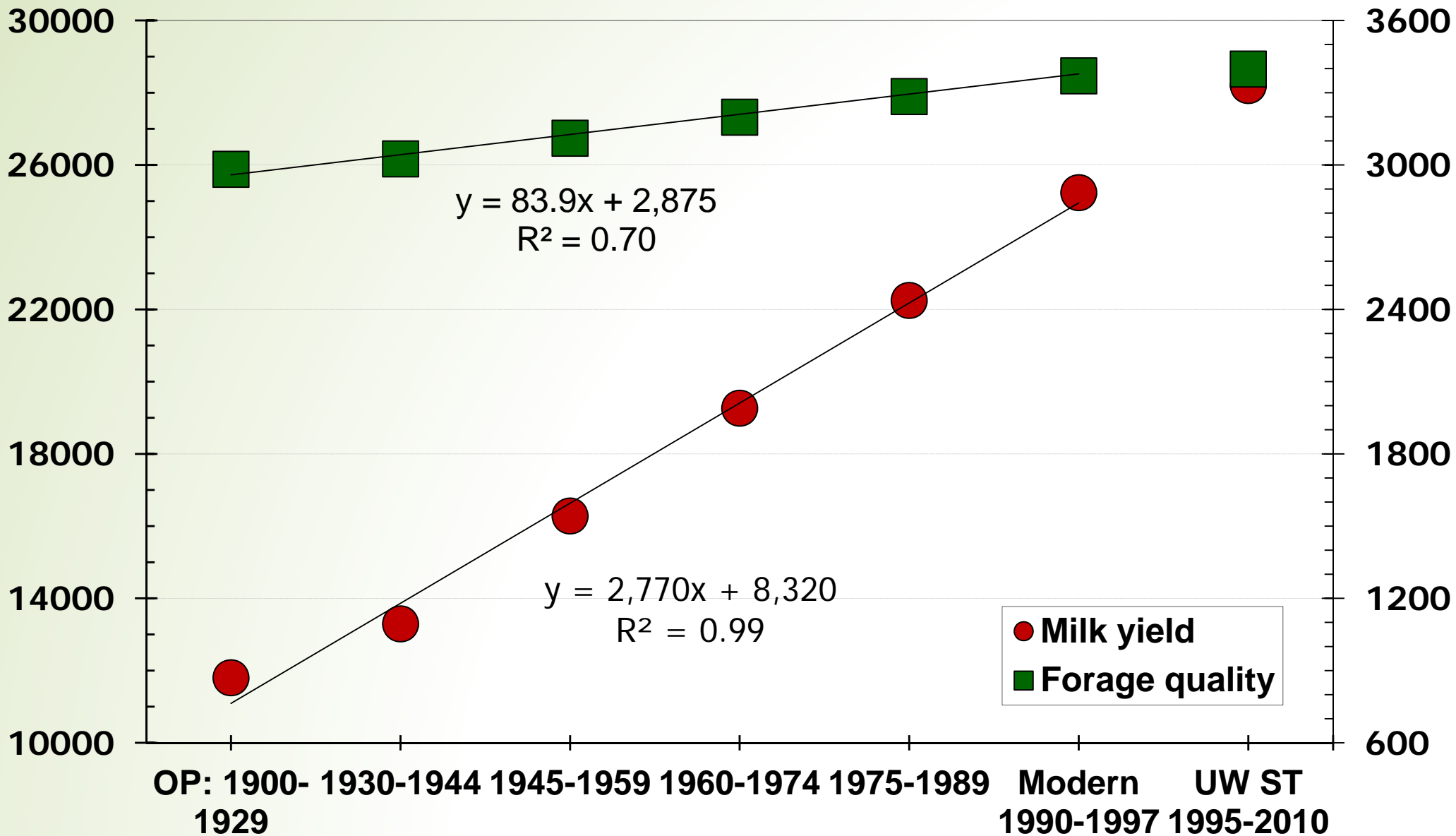
The relationship between performance index (Milk2000) and era of release

1) Milk yield has increased 2770 lb milk/A per era

2) Forage quality has increased 83.9 lb milk/T per era

Milk yield (lb milk / A)

Forage quality (lb milk / A)



Breeding/Managing an ideal corn plant for silage

- **Good agronomics**

- ✓ High yield (Biomass)
- ✓ Pest resistance in high density
 - ❑ Transgenic traits for pest control is important
- ✓ Lower economic threshold for pest control
- ✓ Adequate lodging resistance
- ✓ Prolific

- **Proper ensiling moisture at harvest**

- ✓ Harvest drydown synchrony between stover and ear
- ✓ Soft kernel texture

- **Environment**

- ✓ Soil organic matter: High root mass, cutting height
- ✓ Manure: Low-phytate for less P
- ✓ N: Rotations with alfalfa lowers N fertilizer requirement
- ✓ Stress tolerance: drought



- **Forage quality**

- ✓ High starch content
- ✓ High NDFD
- ✓ Low NDF
- ✓ Nutrient dense
 - ❑ Waxy endosperm: 100% amylopectin = 100% digestible
 - ❑ Oil: Lower linoleic to oleic ratio
 - ❑ Increase protein content
 - Optimize amino acid profile
 - ❑ Produces as much protein and oil per acre as soybean
- ✓ Transgenic traits
 - ❑ Modify other lignin pathway ("Bmr like") traits

- **"Dual" purpose?**

Conclusions

- Don't throw away your chisel plow...
- Modern corn hybrids and management practices have the same rotation response as older hybrids and practices.
- Conventional tillage increases grain yield 2-8% compared to no tillage, but there is an interaction ...
 - ✓ Tillage does not affect corn yield the first year following soybean, but improves yield 3-6% in the second year, and 6-14% in the third year
 - ✓ In continuous corn, CT increased corn yield 40-50% of the time.
 - ✓ In a corn-soybean rotation, there is no difference between CT and NT.
- Corn silage yield gain continues ...
- Much progress yet to be gained, especially for quality traits.
 - ✓ Forage quality changes have not occurred, although specific hybrids have had dramatic changes (i.e. bmr)
 - ✓ More progress might be gained if breeding efforts targeted quality rather than yield.
- Environmental "traits" may become just as important as forage quality traits.
 - ✓ Manure management
 - ✓ Stress management (i.e. drought)
- "First lesson....don't try and make corn the perfect, all inclusive crop. Only 8-10% of corn acres are used for silage." (Bill Mahanna, 2011)



Thanks for your attention! Questions?



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