2008 Wisconsin Corn Conference Sponsors

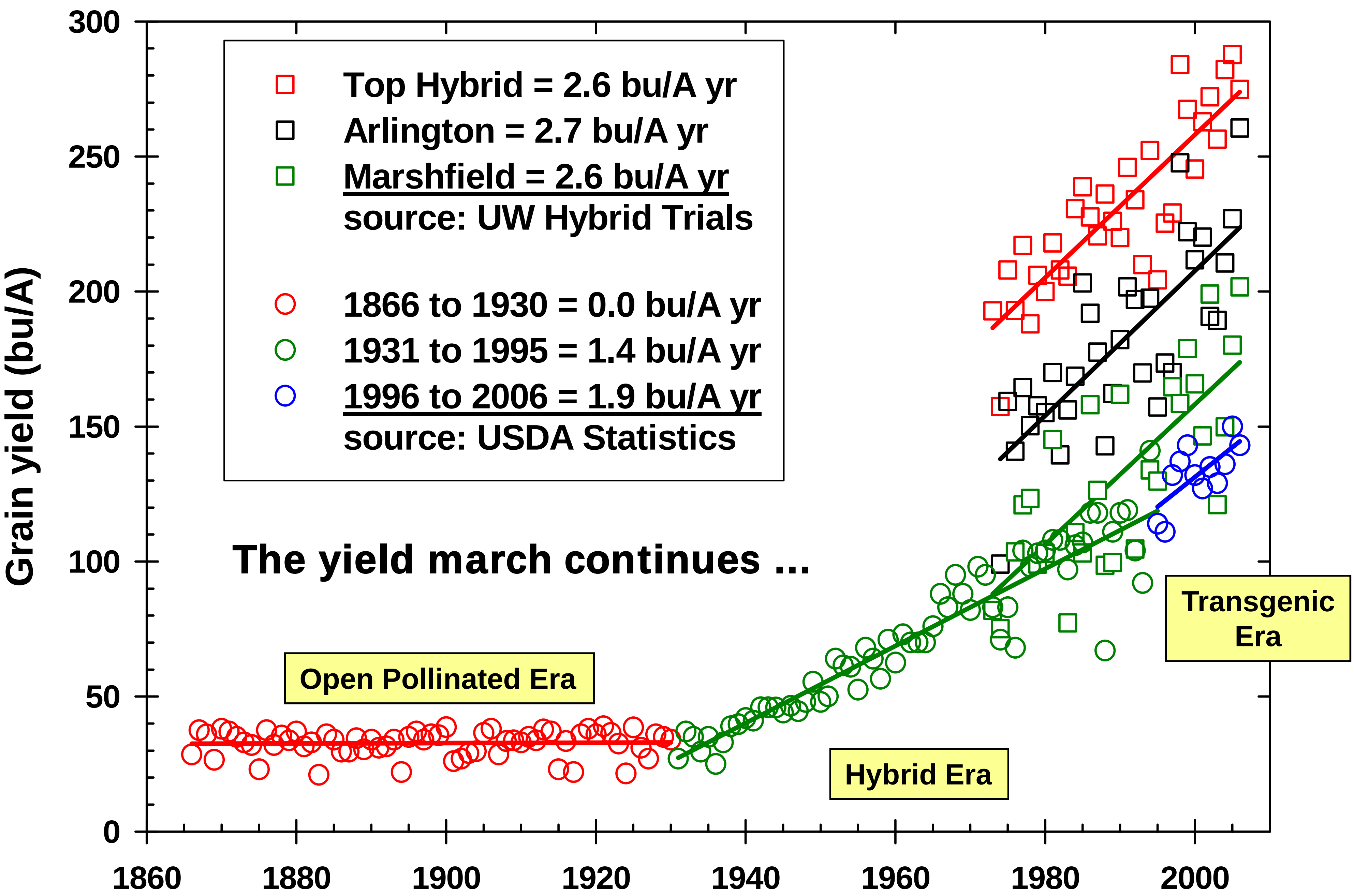
Dairyland Seed Company
First Capital Ag
Kaltenberg Seeds
Monsanto Company
Mycogen Seeds
NK Brand Syngenta Seeds
Pioneer Hi-Bred, International
Legacy Seeds
Syngenta Crop Protection
Trelay Seed Company
UAP Distribution
Rural Mutual Insurance Company
Contree Sprayer and Equipment Company
Wisconsin Corn Promotion Board
Wisconsin Corn Growers Association
University of Wisconsin Agronomy Department
University of Wisconsin Cooperative Extension
UWEX Cooperating Counties – Barron, Richland, and Dodge

Key Management Practices for Profitable Corn Production in the Northern Corn Belt

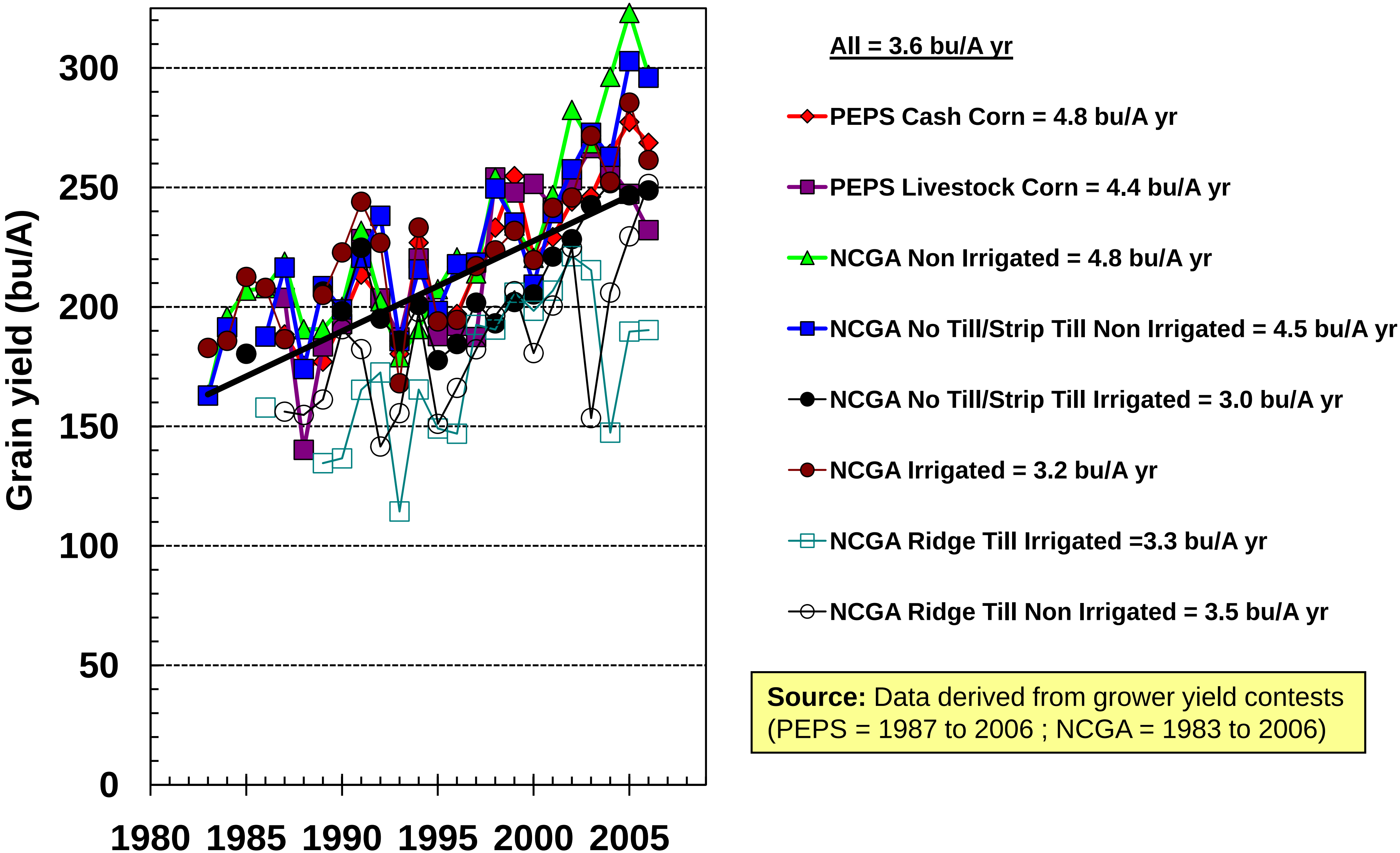
Joe Lauer
University of Wisconsin

2008 Wisconsin Corn Conferences
Rice Lake, Johnson Creek, and Richland Center
January 10, 21 and 22

Corn yield in Wisconsin since 1866

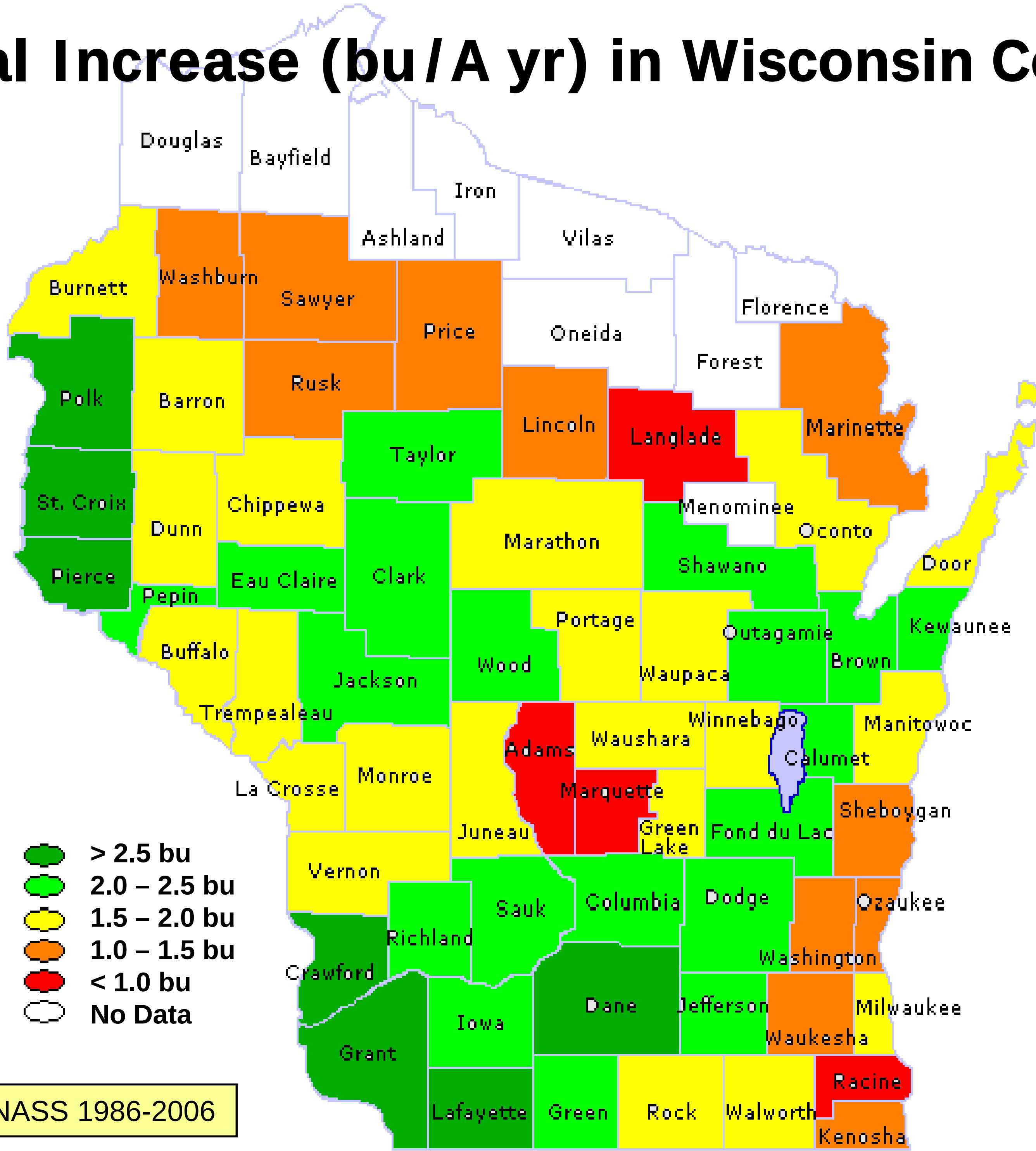


Corn Yield Progress in Wisconsin (Top Producer in Category)



Source: Data derived from grower yield contests (PEPS = 1987 to 2006 ; NCGA = 1983 to 2006)

Annual Increase (bu/A yr) in Wisconsin Counties



Source: Mitchell, NASS 1986-2006

Get a Grip on Production Costs

- **How much does it cost to grow an acre of corn?**
- **How do you compare to other corn producers?**
- **If inputs are changed, how do they affect other input decisions?**
- **Account for overhead**
- **Most fields have similar costs of production.**
  - ✓ Grower returns differ by doing the right thing in the right place at the right time.

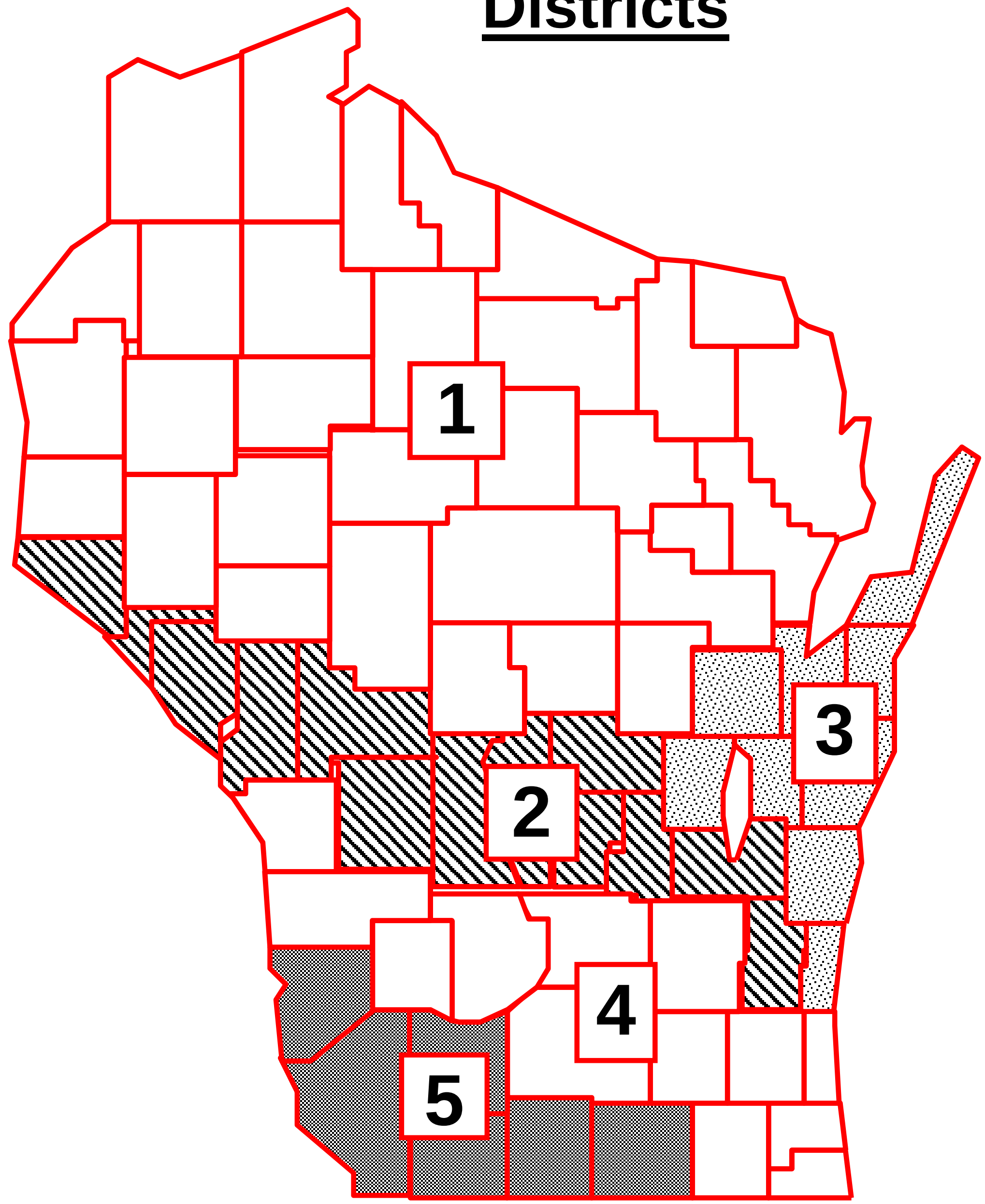
PEPS

Profits through Efficient Production Systems

- **Objectives**
  - ✓ Cost analysis of grain enterprises
  - ✓ Emphasize soil and water conservation, efficiency, profitability, and competitiveness vs. productivity alone
  - ✓ Recognize the way efficient growers integrate practices into a system

- **Divisions**
  - ✓ Corn, Cash Crop
  - ✓ Corn, Livestock
  - ✓ Corn, Silage
  - ✓ Soybean

Districts



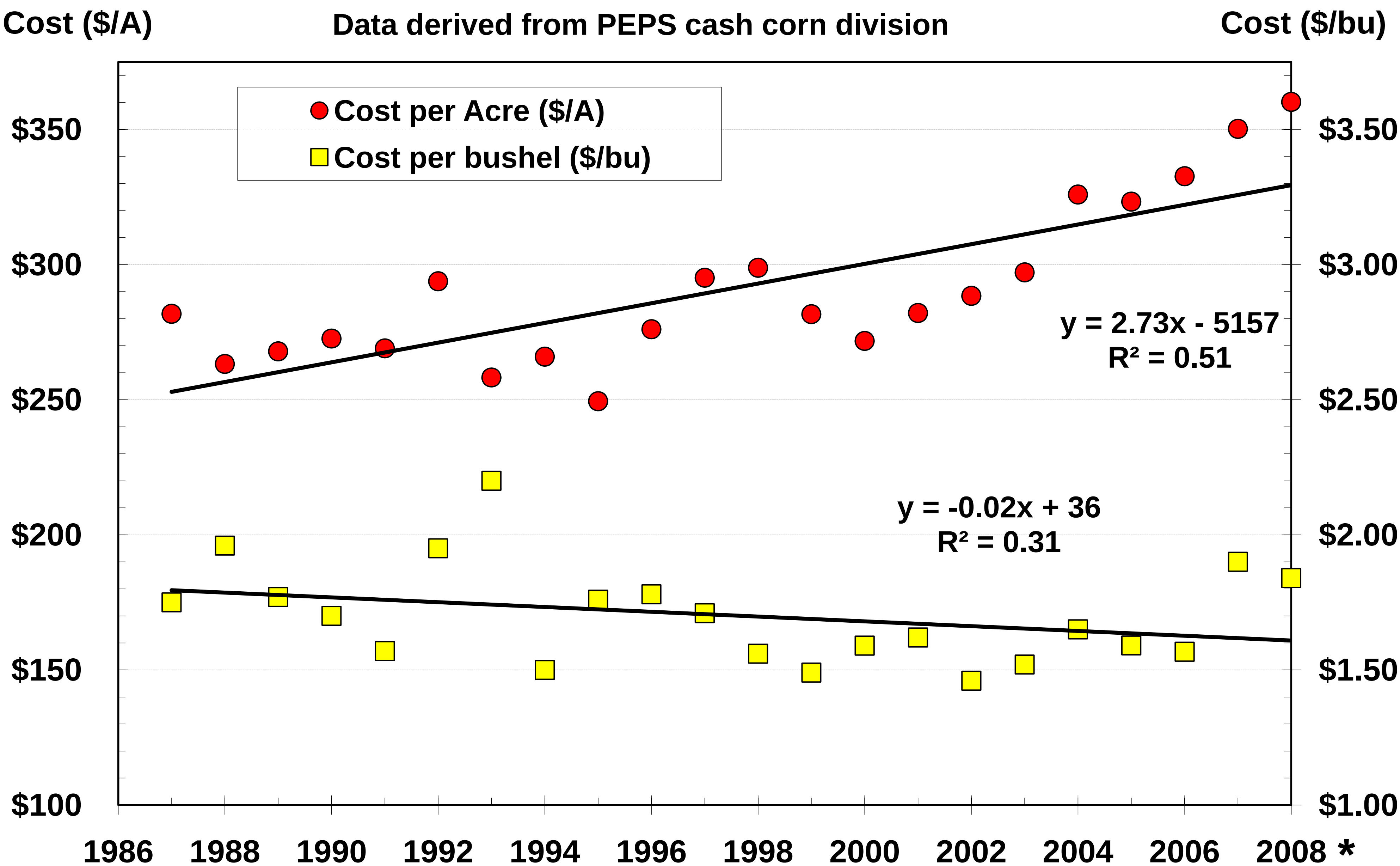
Differences between the High (20%) and Low (20%) profit groups

	Cash Corn (n=108)		Livestock Corn (n=77)		Soybean (n=96)	
	High 20%	Low 20%	High 20%	Low 20%	High 20%	Low 20%
Grain yield (bu/A)	221	172	222	165	63	46
Grain moisture (%)	18.7	20.6	18.1	22.5	12.2	12.2
Acre Cost ($/A)	$315	$313	$242	$296	$194	$195
Bushel cost ($/bu)	$1.43	$1.83	$1.09	$1.84	$3.09	$4.32
Grower return ($/A)	$204	$74	$230	$92	$220	$124

Source: Lauer (2003-2007)

How much does it cost to produce corn in WI?

(* =projected from previous five years)

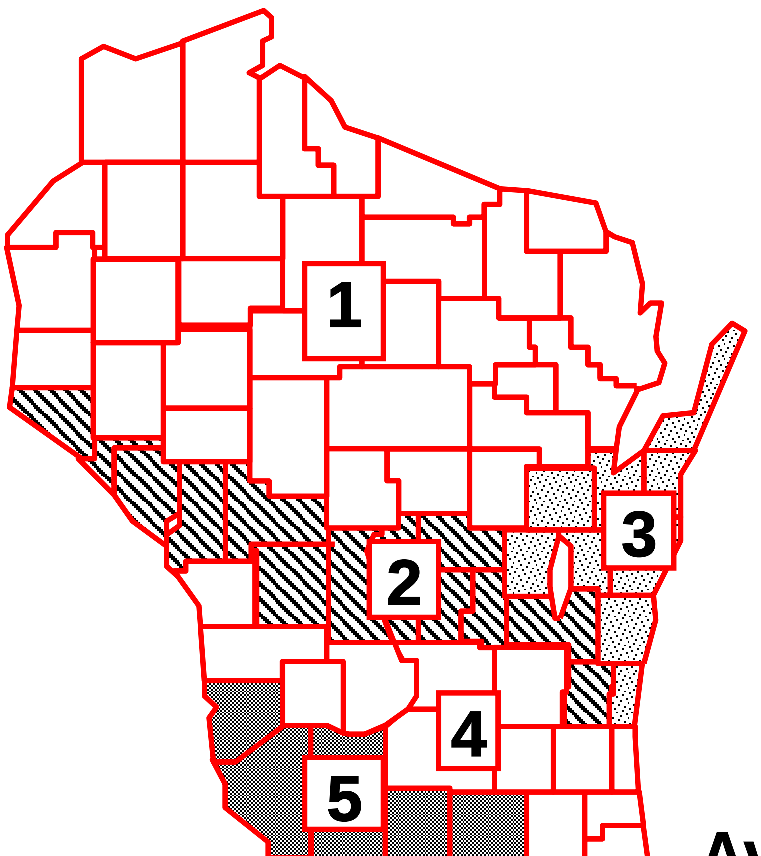


Source: Lauer

http://corn.agronomy.wisc.edu

Corn and Soybean Cost of Production ($/A)

PEPS

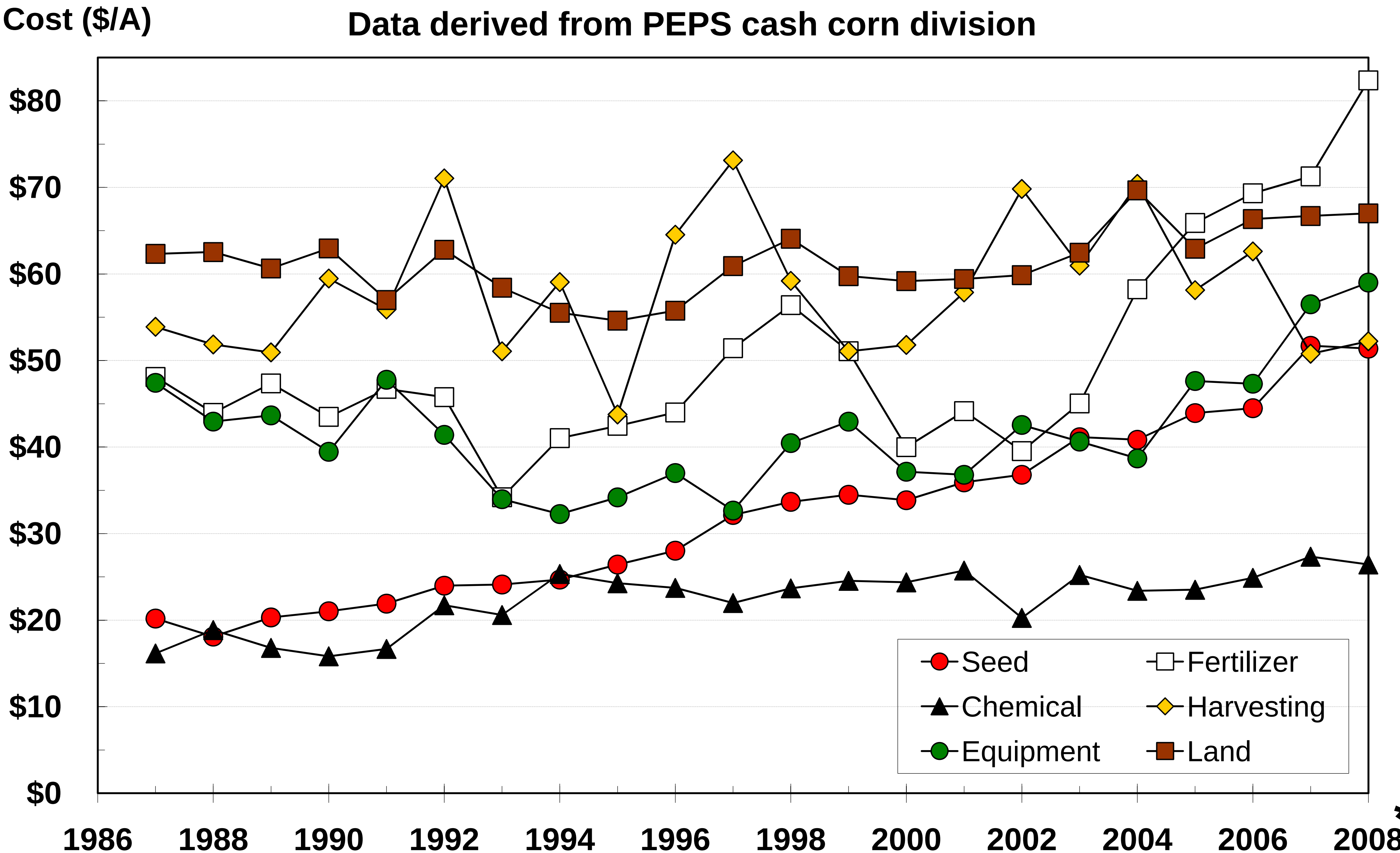


District	Cash corn	Livestock corn	Soybean
	(n=108)	(n=77)	(n=96)
1	$318	$250	$182
2	$311	$274	$183
3	$310	$258	$197
4	$327	$309	$210
5	$378	$353	$249
Average	$321	$276	$196

Source: Lauer (2003-2007)

Average corn production costs for major inputs

(*=projected from previous five years)

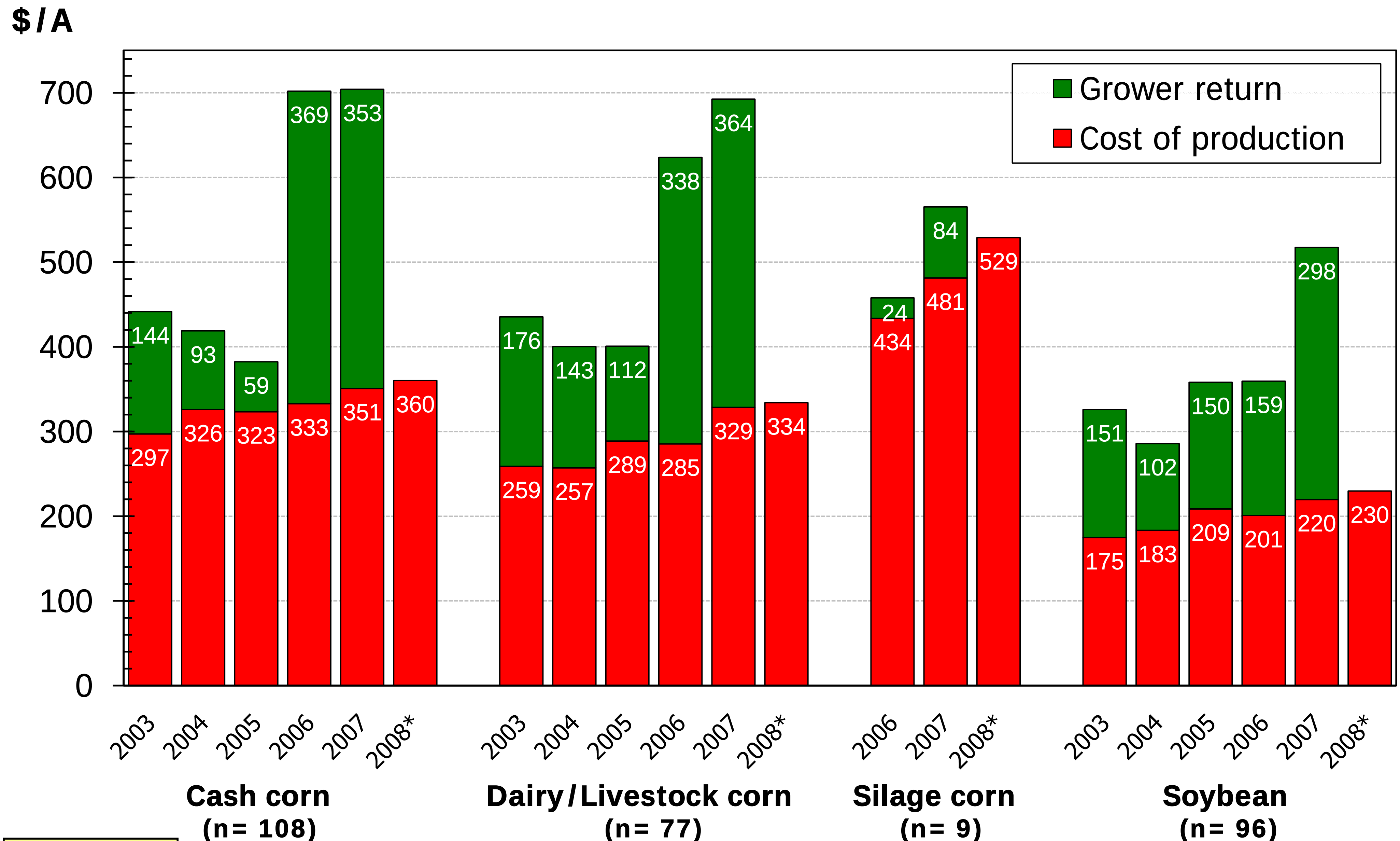


Source: Lauer

http://corn.agronomy.wisc.edu

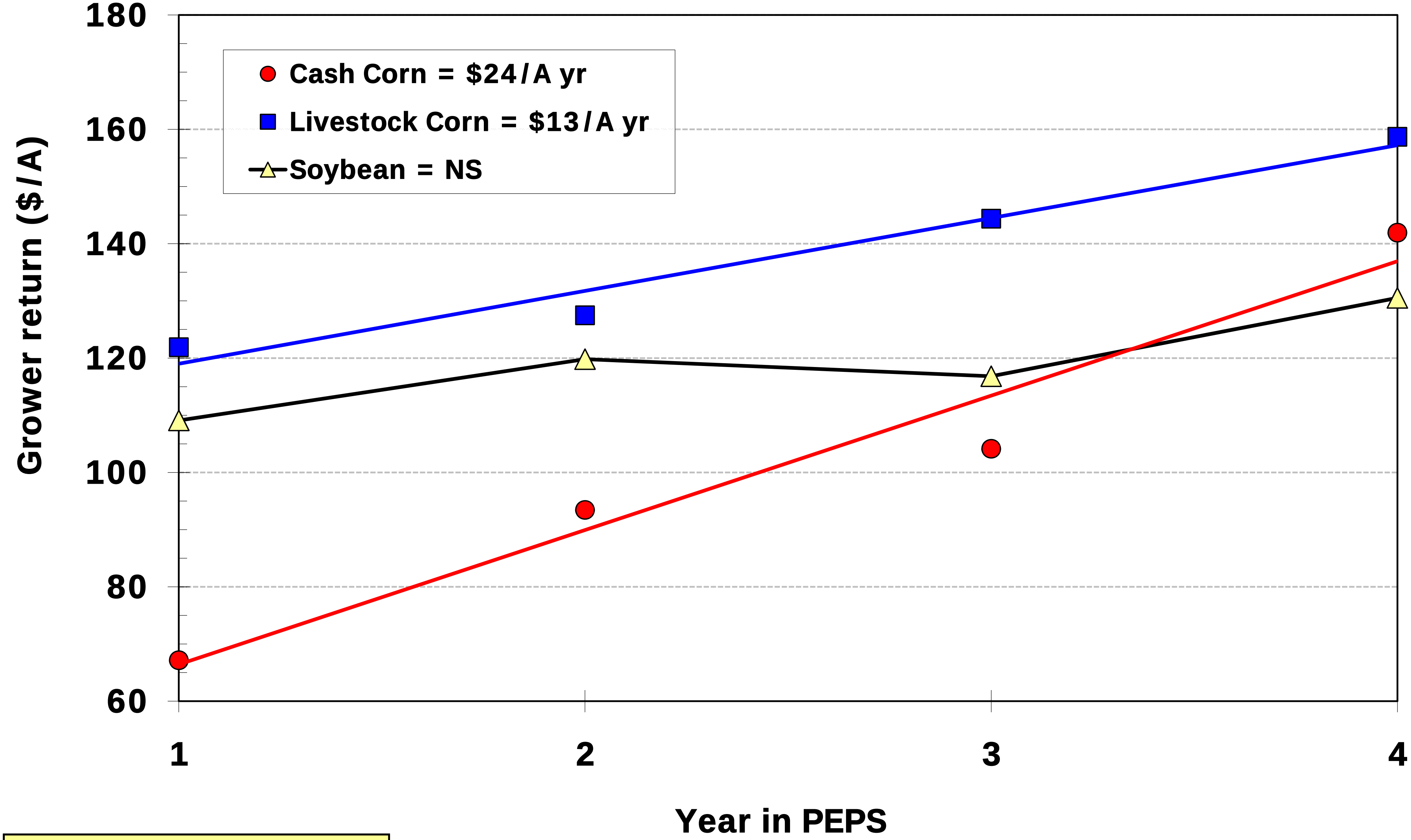
Corn and Soybean Cost of Production and Grower Return

(*=projected from previous five years)



Source: Lauer

Know Your Production Costs – PEPS Participation Increases Grower Return

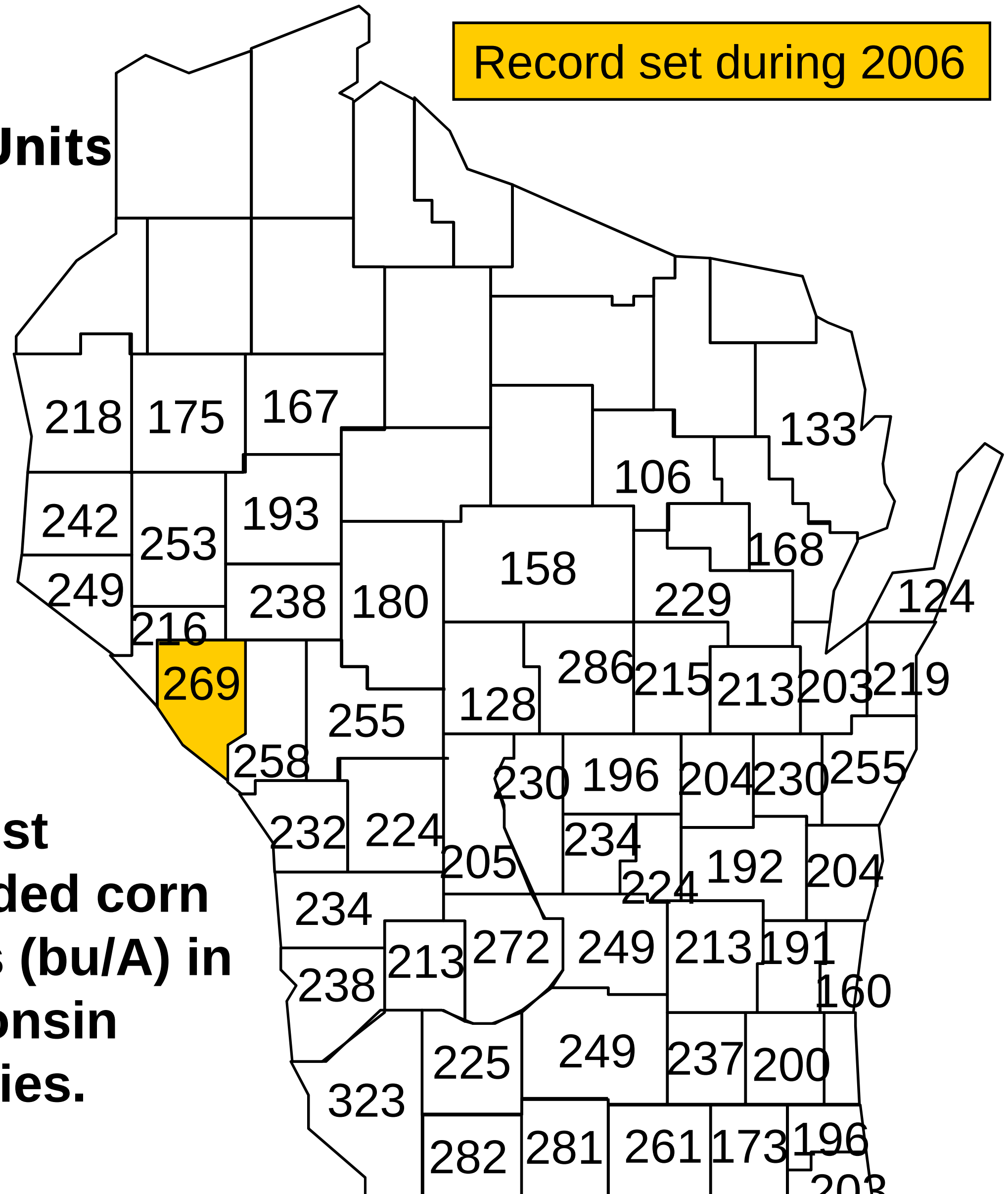


Source: Lauer (1987-2003, n= 128)

What is Your Yield Potential?

<u>Establish Realistic Yield Goals</u>

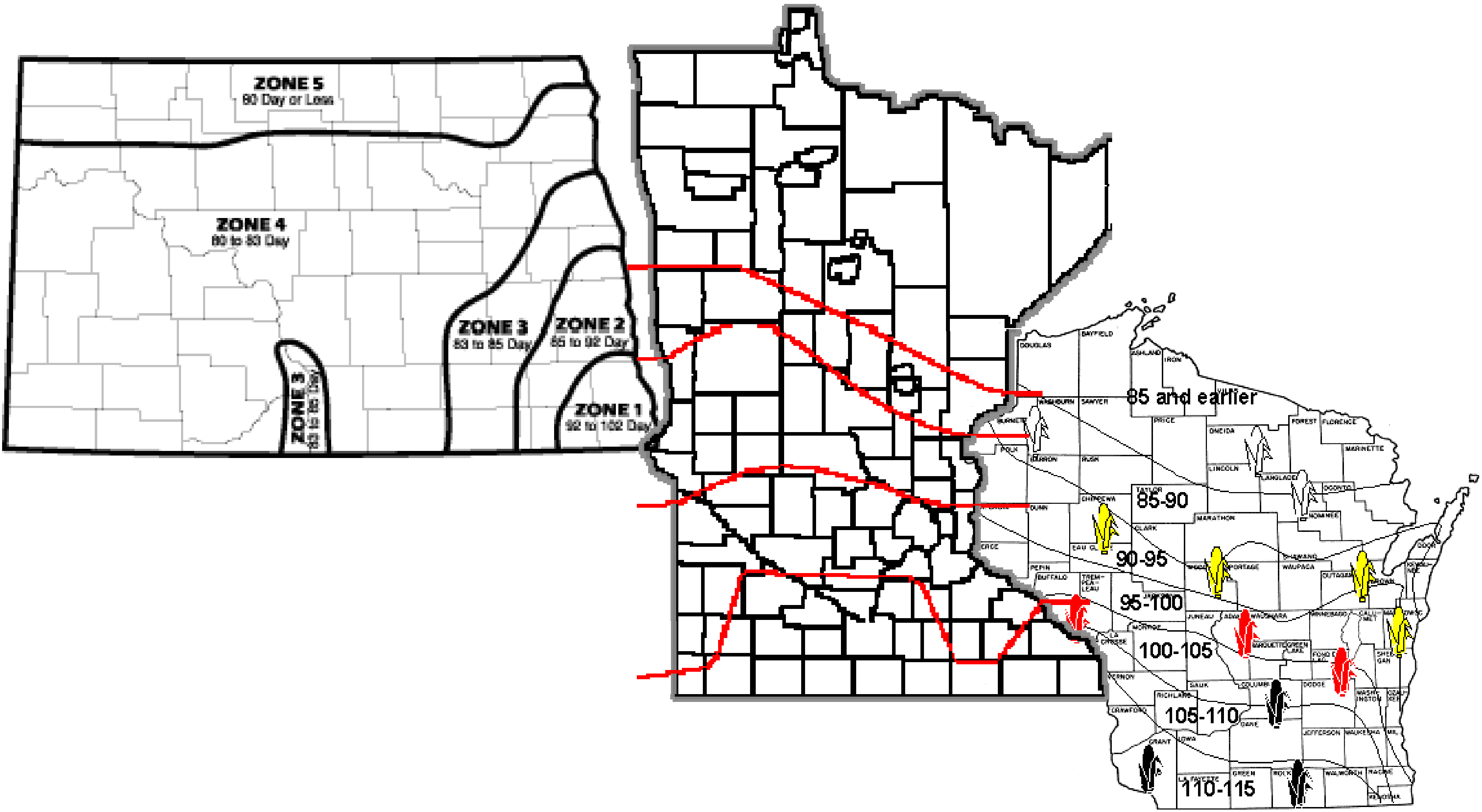
- **Yield Potential of Soil**
- **Growing Season - Growing Degree Units**
- **Sub-soil Moisture**
- **Management Ability and Philosophy**
- **Attitude Toward Risk**
- **Willingness to Be Timely**



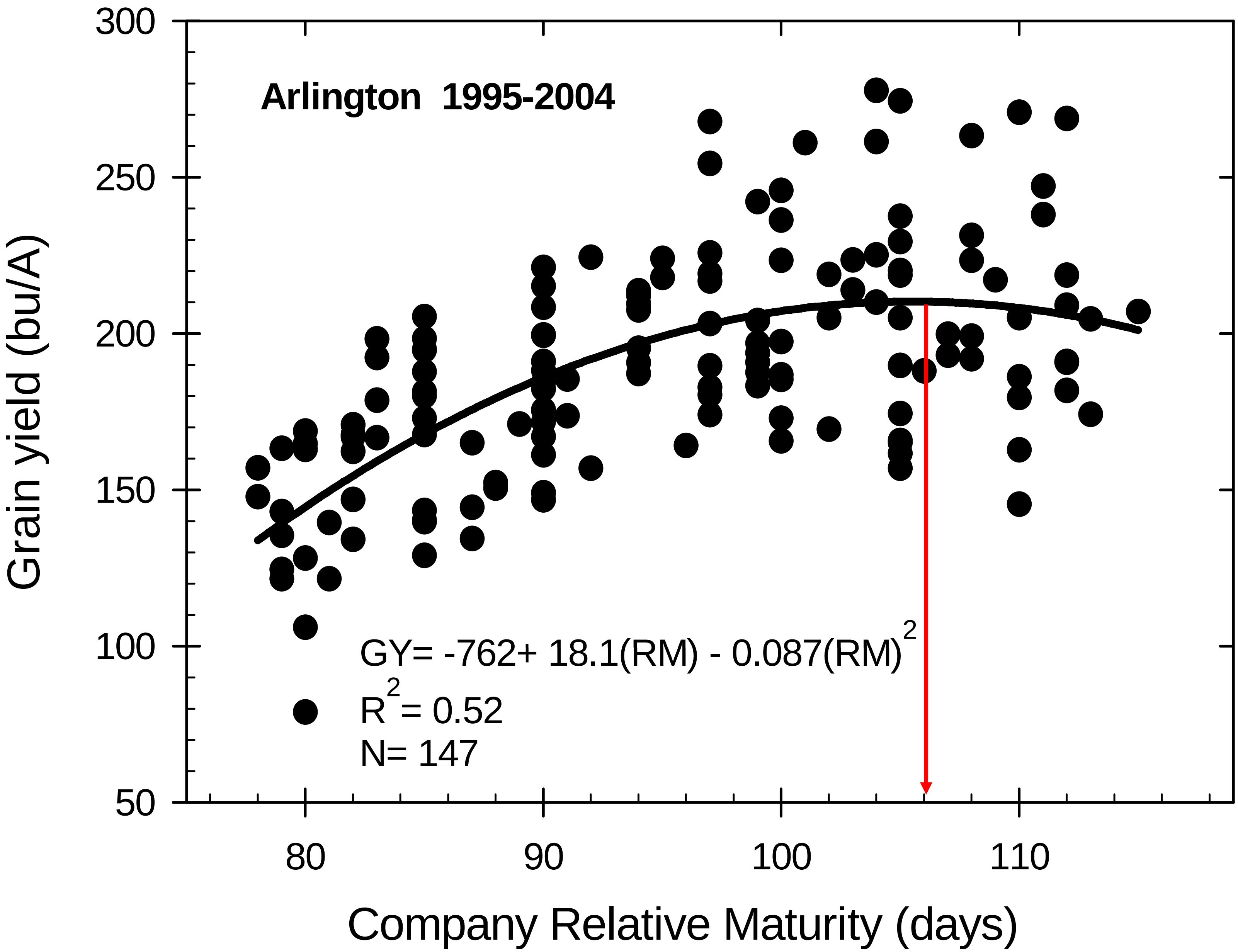
Highest recorded corn yields (bu/A) in Wisconsin counties.

Source: Lauer, 2006
NCGA (1983-2006), PEPS (1987-2006)

Northern Corn Maturity Belts



The influence of maturity on yield … longer season = greater yield



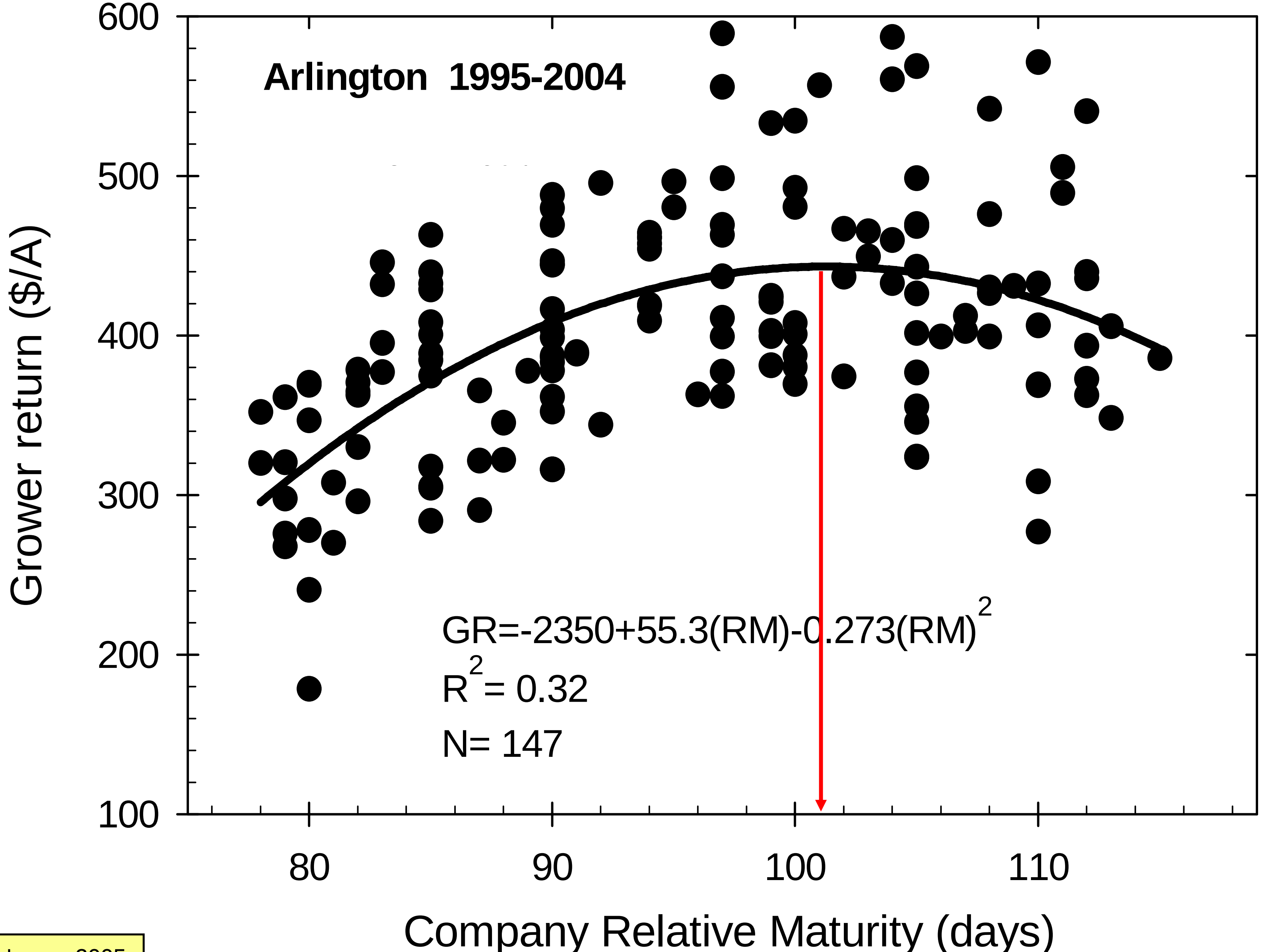
Source: Lauer, 2005

Optimum relative maturity (days RM) for grain yield at various locations in Wisconsin.

Location	Years tested	Optimum RM
Arlington	1995-2004	106
Janesville	1996-1997	107
Lancaster	1996-1997	112
Fond du Lac	1996-1997	103
Hancock	1995-2004	104
Chippewa Falls	1999-2001	104
Marshfield	1999-2004	---
Seymour	1999-2001	102
Valders	1999-2001	---

Source: Lauer, 2005

It all boils down to economics (drying cost) ...



Source: Lauer, 2005

Optimum relative maturity (days RM) for three corn production systems at Arlington (1995-2004).

System:Drying Cost ($ / point bu)	Grain price ($/bu)			
	$2.00	$2.50	$3.00	PEPS
Commercial:$0.04	--	98	99	98
On-Farm:$0.02	100	101	102	101
Livestock:$0.00	106	106	106	107

Source: Lauer, 2005

Hybrid Selection Decisions ...

- **Select hybrids using multi-location performance data**
- **Evaluate consistency**

- **"Buy the traits you need"**
- **"Every hybrid must stand on it's own for performance"**
  - ✓ DO NOT buy based upon "family" performance, base genetics, etc.

YieldGard VT Triple

HERCULEX I Insect Protection HX

HERCULEX XTRA HX

Roundup Ready CORN

Roundup Ready CORN 2

YieldGard Corn Borer — Corn Borer Protection

Liberty Link Herbicide Resistance

YieldGard Rootworm — Rootworm Protection

YieldGard Plus — Corn Borer | Rootworm

Agrisure

ExSeed Enhanced™

PRODIGENE — The world's leader in transgenic plants

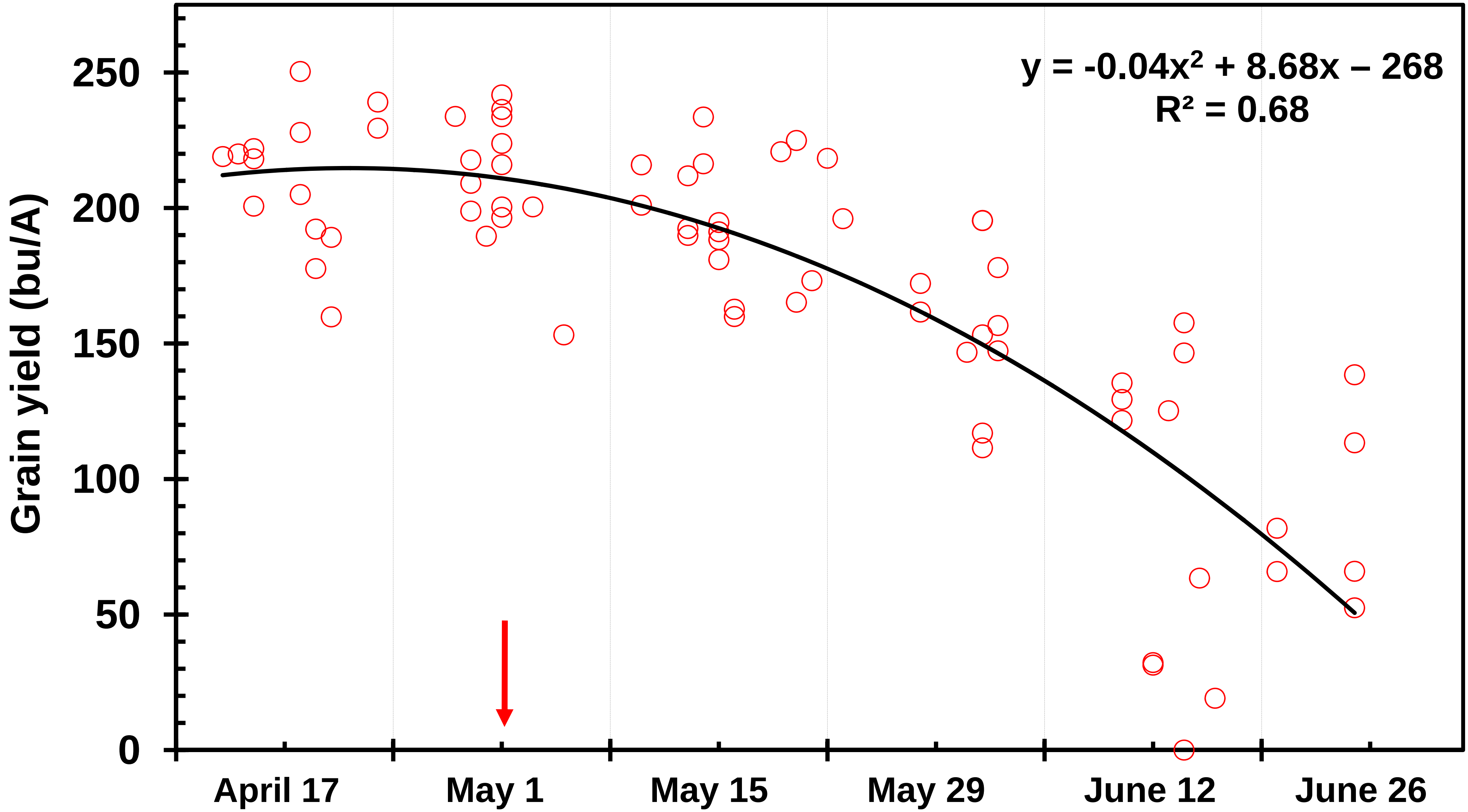
Cost ($/A) matrix of corn seed sold at a premium

(i.e. technology fee)

Yield Increase (bu/A)	$25 Bag difference				$50 Bag difference				$75 Bag difference			
	Corn Price				Corn Price				Corn Price			
	$2	$3	$4	$5	$2	$3	$4	$5	$2	$3	$4	$5
0	-$10	-$10	-$10	-$10	-$21	-$21	-$21	-$21	-$31	-$31	-$31	-$31
2	-$6	-$4	-$2	$0	-$17	-$15	-$13	-$11	-$27	-$25	-$23	-$21
4	-$2	$2	$6	$10	-$13	-$9	-$5	-$1	-$23	-$19	-$15	-$11
6	$2	$8	$14	$20	-$9	-$3	$3	$9	-$19	-$13	-$7	-$1
8	$6	$14	$22	$30	-$5	$3	$11	$19	-$15	-$7	$1	$9
10	$10	$20	$30	$40	-$1	$9	$19	$29	-$11	-$1	$9	$19
12	$14	$26	$38	$50	$3	$15	$27	$39	-$7	$5	$17	$29
14	$18	$32	$46	$60	$7	$21	$35	$49	-$3	$11	$25	$39
16	$22	$38	$54	$70	$11	$27	$43	$59	$1	$17	$33	$49

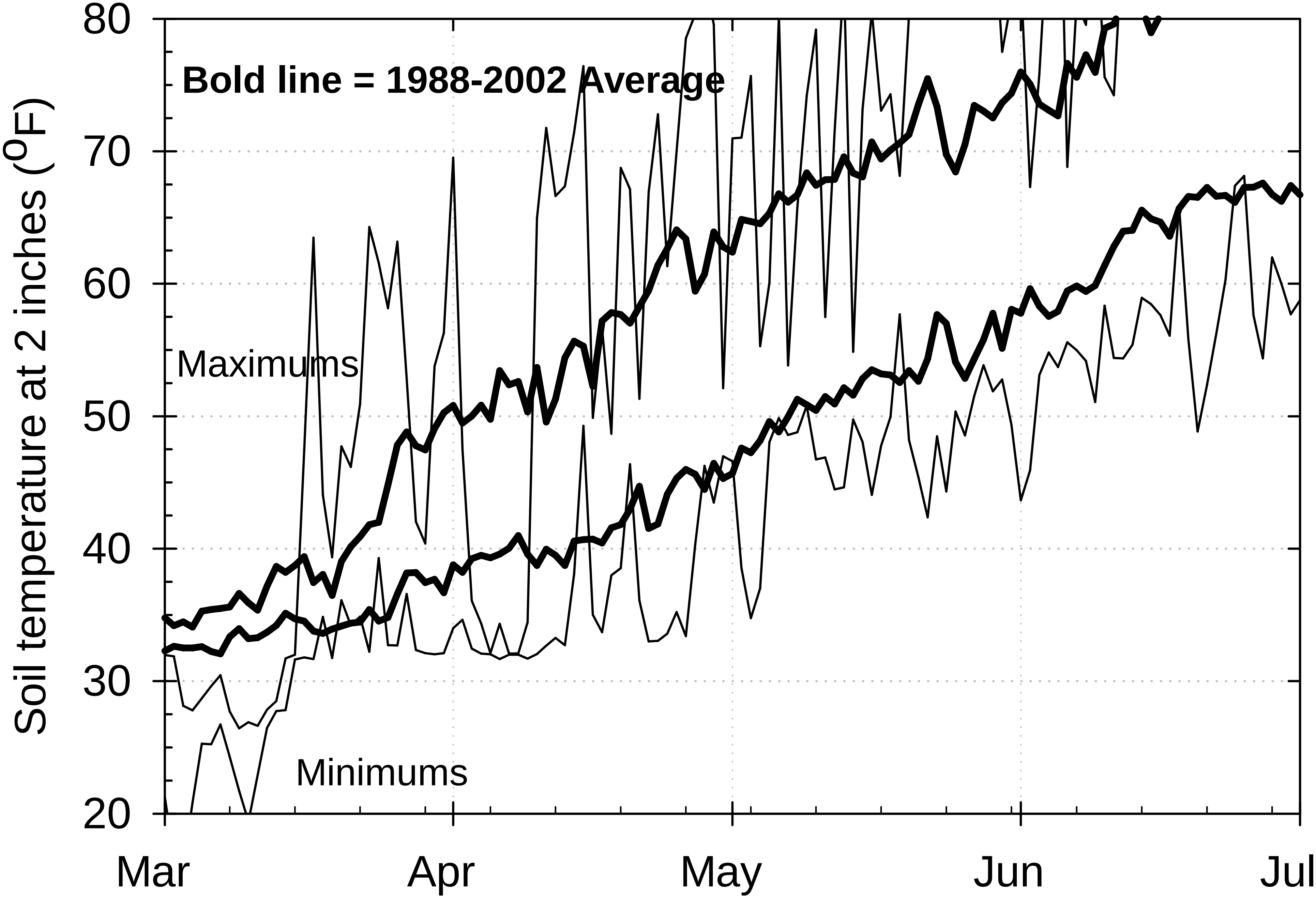
Assume: 80,000 seeds/bag planted at 33,000 seeds/A for final population of 30,000 plants/A

Grain yield is decreasing 0.5 bu/A per day on May 15 and accelerates to 2.5 bu/A per day on June 1 ...



Source: Lauer (Full-season hybrid at Arlington 1997-2006)

Soil temperatures at Arlington during 2003



Source: NWS, 2003

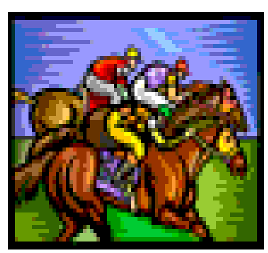
“Today there are more chances than ever for disease development from soil pathogens.”

The Problem

- **Historically seedling emergence is a problem in WI**
- **Changing farmer practices**
  - ✓ Earlier planting dates
  - ✓ Increased acreage where corn is planted into reduced tillage seedbeds.
  - ✓ Seed environment is often cool and wet
  - ✓ “Slow-growth” syndrome in reduced tillage systems causes delayed emergence, poor seedling growth, and difficult stand establishment
- **The Solution: For nearly 50 years, Captan was the “workhorse” for protecting corn seed.**

Race - Pathogen v. Corn

- **Environments which favor seedling blight have high enough temperatures to start corn germination followed by a period of low temperatures**
  - ✓ (Dickson, 1929; referring to the 1921 season).
- **"... that other factors being constant, the relative growth rates of the host and pathogen determine to a considerable degree the severity of pre-emergence and seedling infection at different temperatures."**
  - ✓ (Leach, 1947)



Efficacy of Corn Seed Treatments

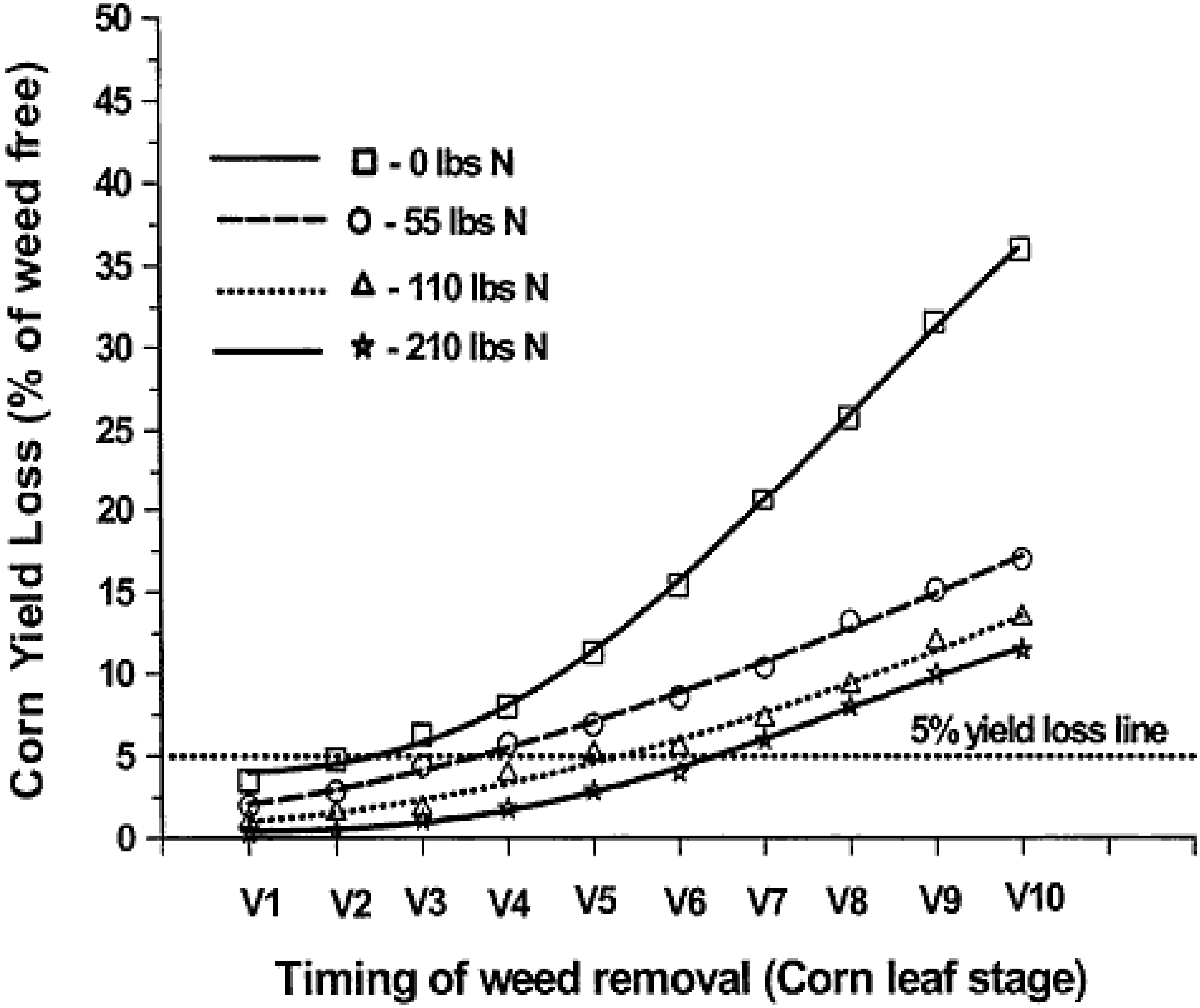
Disease	Favorable Environment	Captan	Maxim	Apron
Rhizoctonia	Rainfall followed by cool and then warm weather	Good	Good	Poor
Fusarium	??	Good	Excellent	Poor
Pythium	Likes cold and wet	Poor	Poor	Excellent
Helminthosporium	??	Good	Good	Poor
Penicillium	??	Good	Good	Poor
Aspergillus	??	Good	Good	Poor

derived from Pedersen, U. of Illinois

Take home message ... The number of days from planting to emergence is a key factor in establishing the amount of seedling disease that will be infecting the crop.

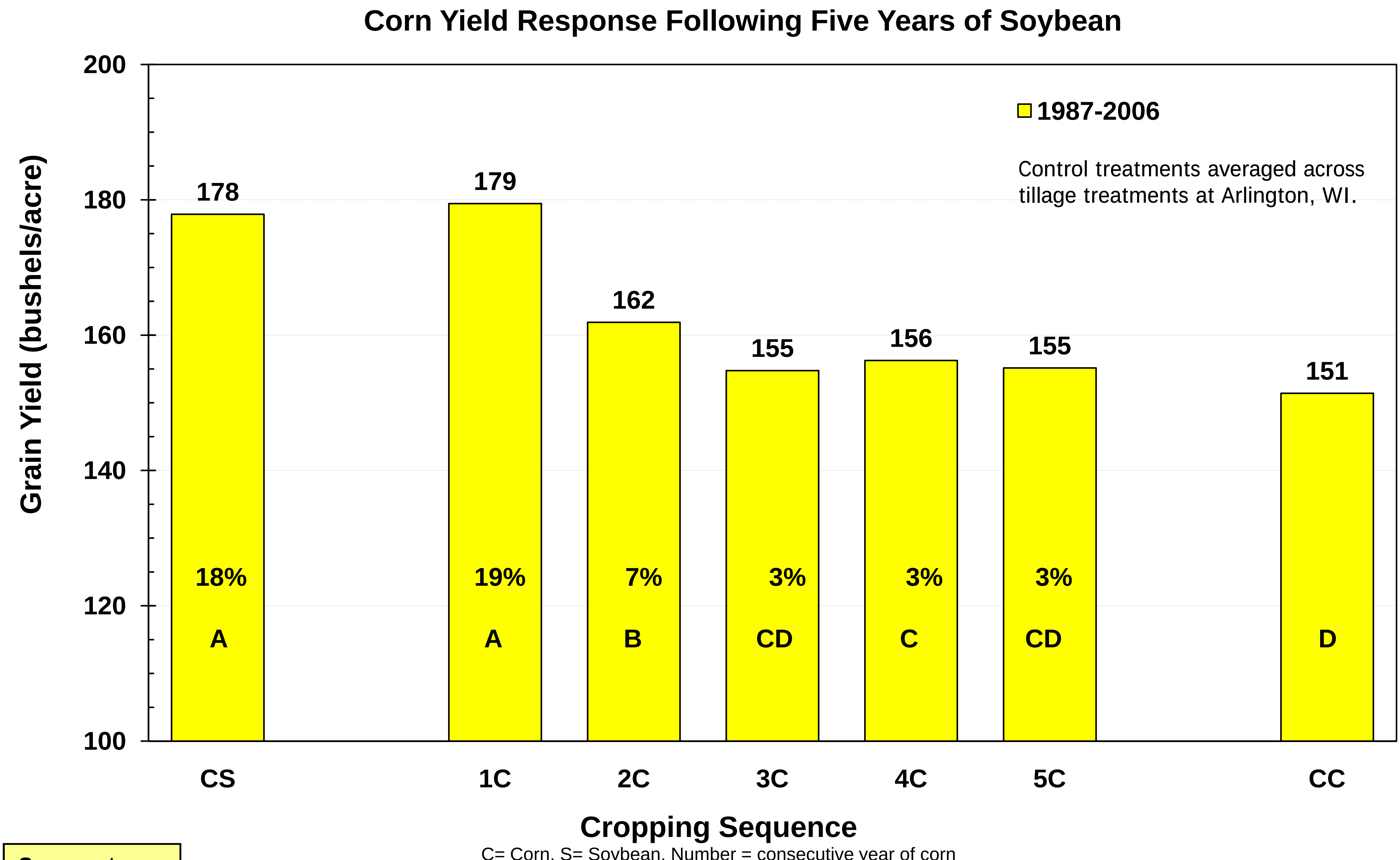
- **Growers must do ALL of the right things to minimize early season STRESS**
- **It is hard to make money raising “runts”**
- **Rain a growers best friend or worst enemy**
  - ✓ Rainfall - soon after planting that results in saturated or nearly saturated soils - is a bigger factor on yield than is date of planting or tillage type
  - ✓ Grower’s today plant large numbers of acres of corn each day-increasing the at risk acres when a major weather front comes through
- **There is no second chance to do things right the first time**

Yield Cost of Delaying Weed Control



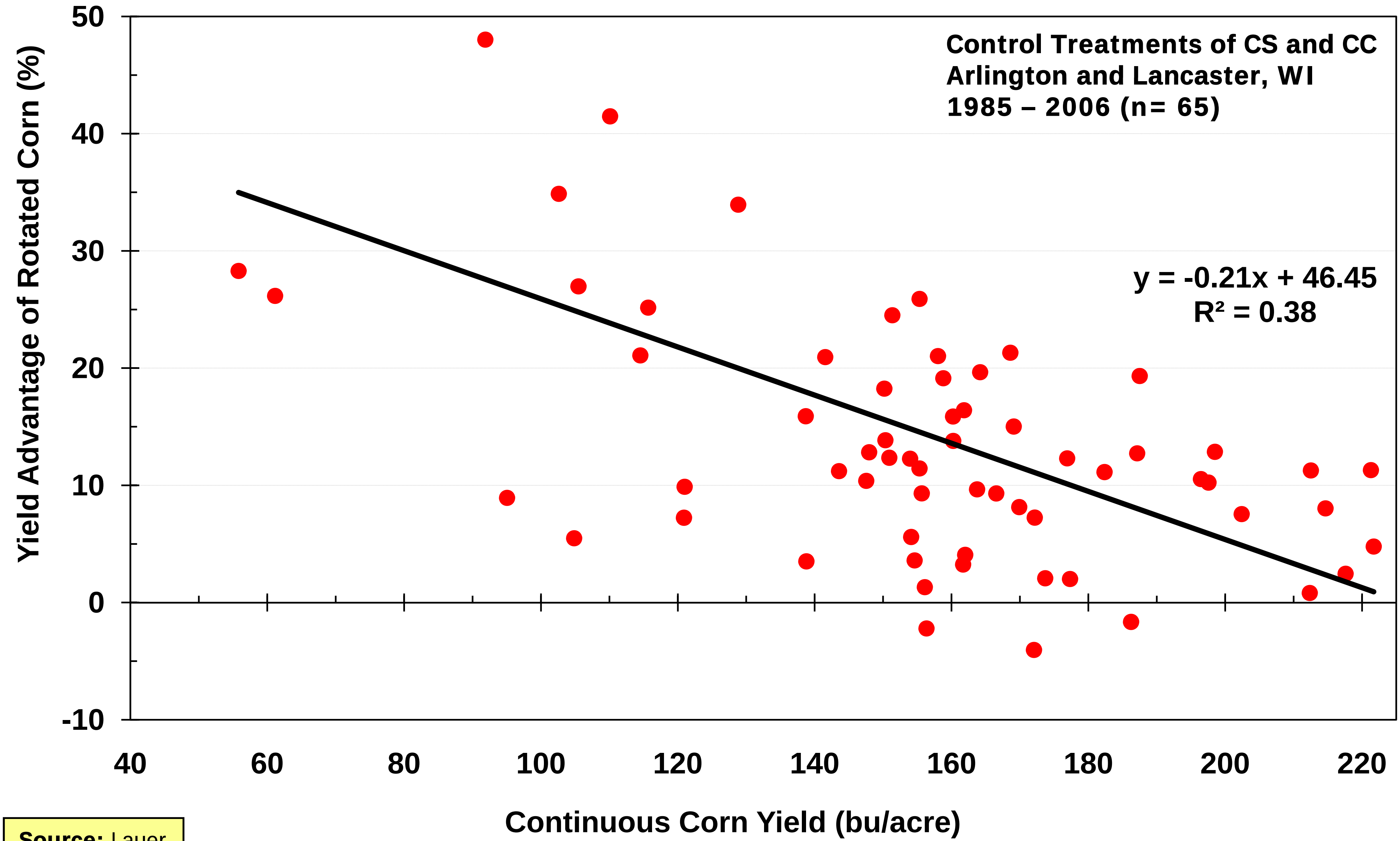
Source: Knezevic et al. (2003)

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



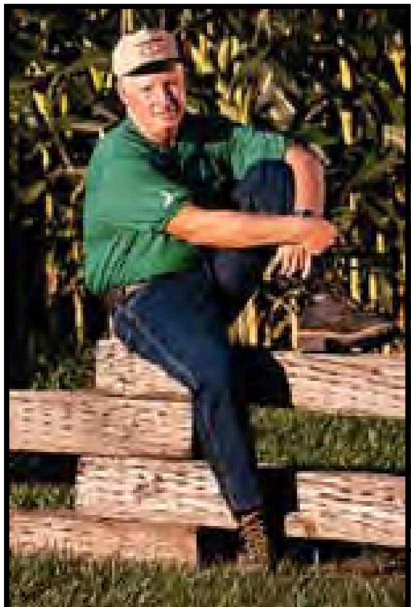
Source: Lauer

Rotation is more important in stress environments ...



Source: Lauer

Yield Contest Winners – DO NOT use Crop rotation, but DO use High Plant Densities



Ken Beaver, Sterling, NE

- 2001: 319 bu/A
- 39,000 plants/A

Herman Warsaw, Saybrook, IL

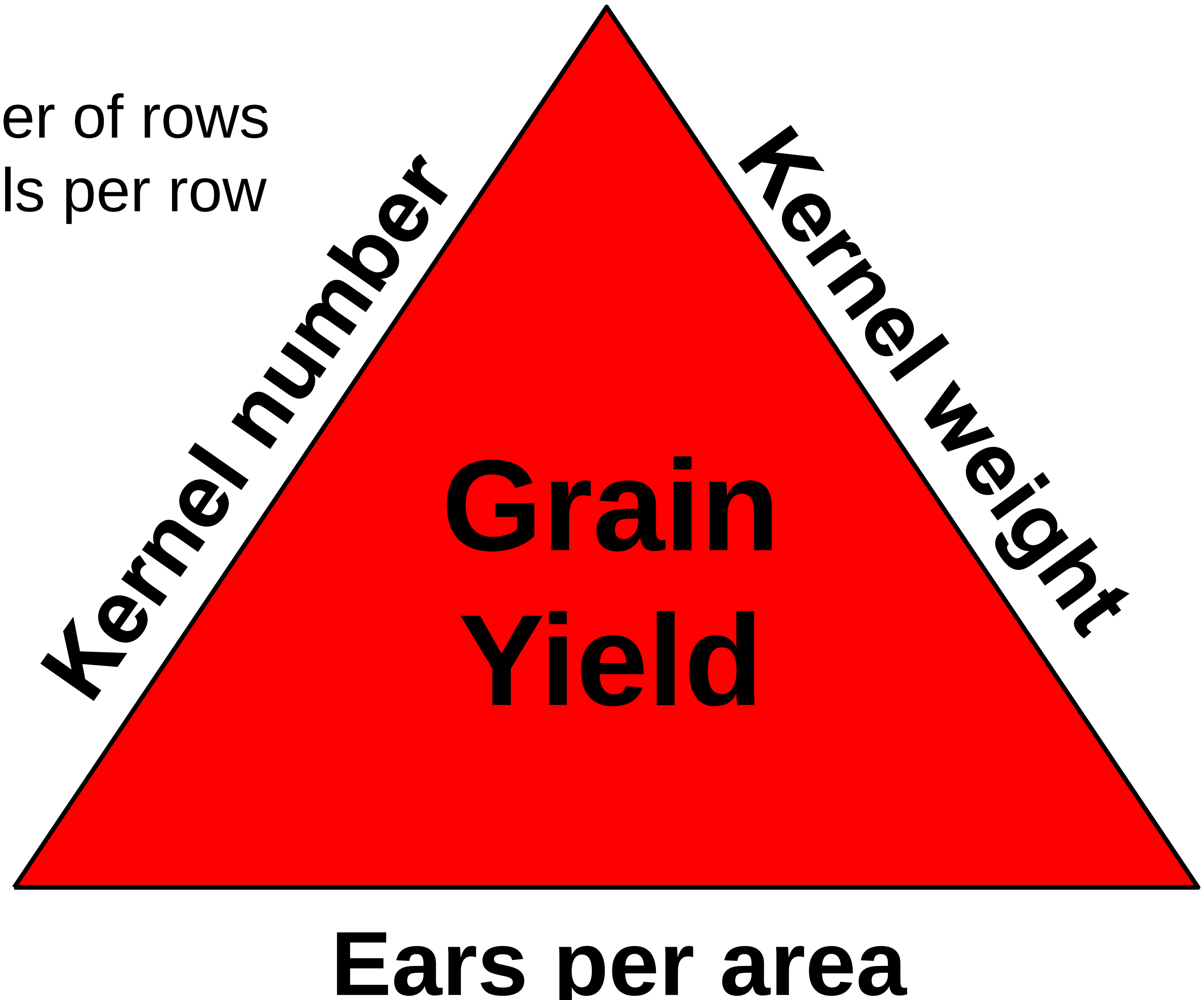
- 1985: 370 bu/A
- 20+ years continuous corn
- 36,000 plants/A

Francis Childs, Manchester, IA

- 2002 World Record = 442 bu/A
- 30+ years continuous corn
- 45,000 plants/A

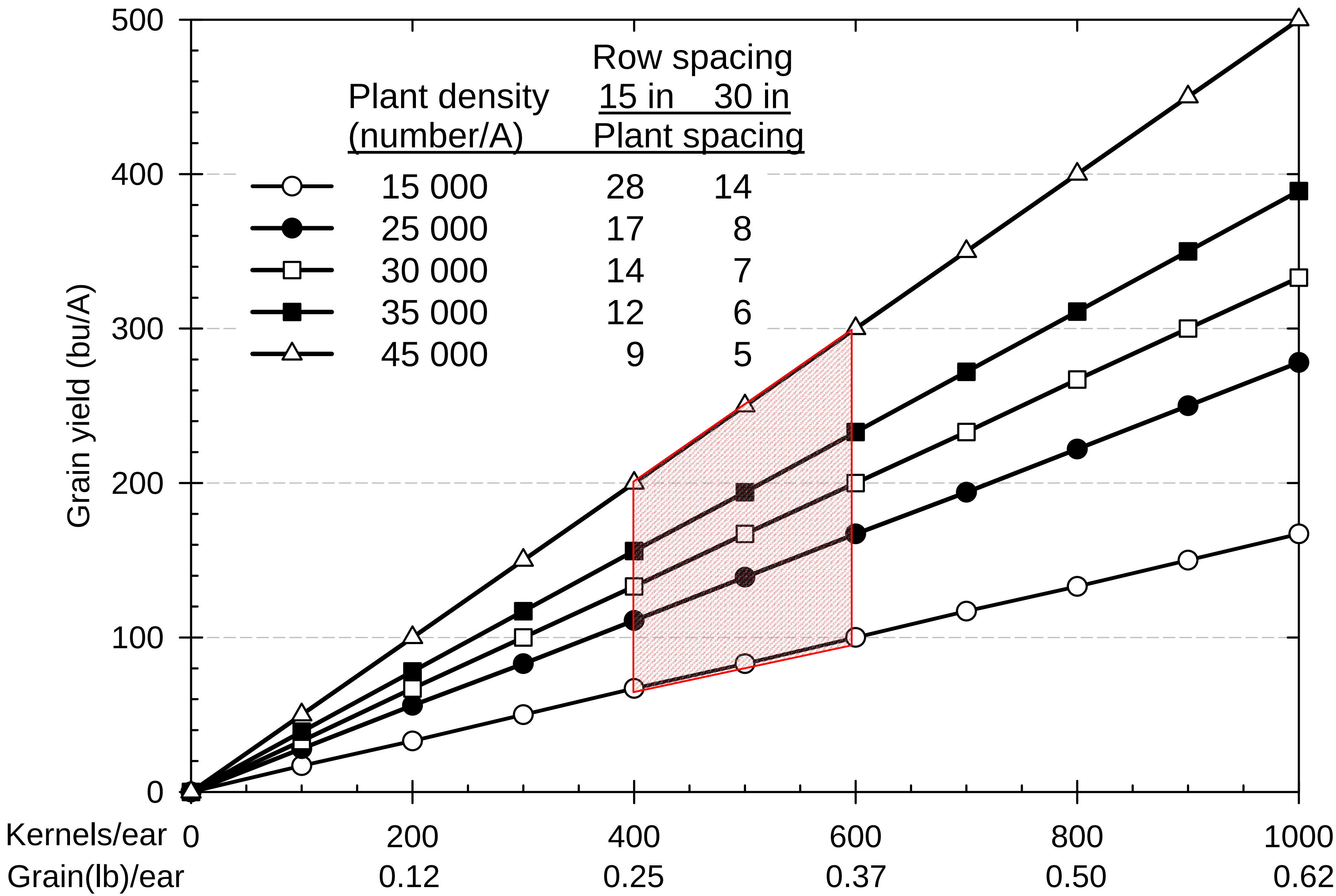
Yield Components of Corn

Number of rows
Kernels per row

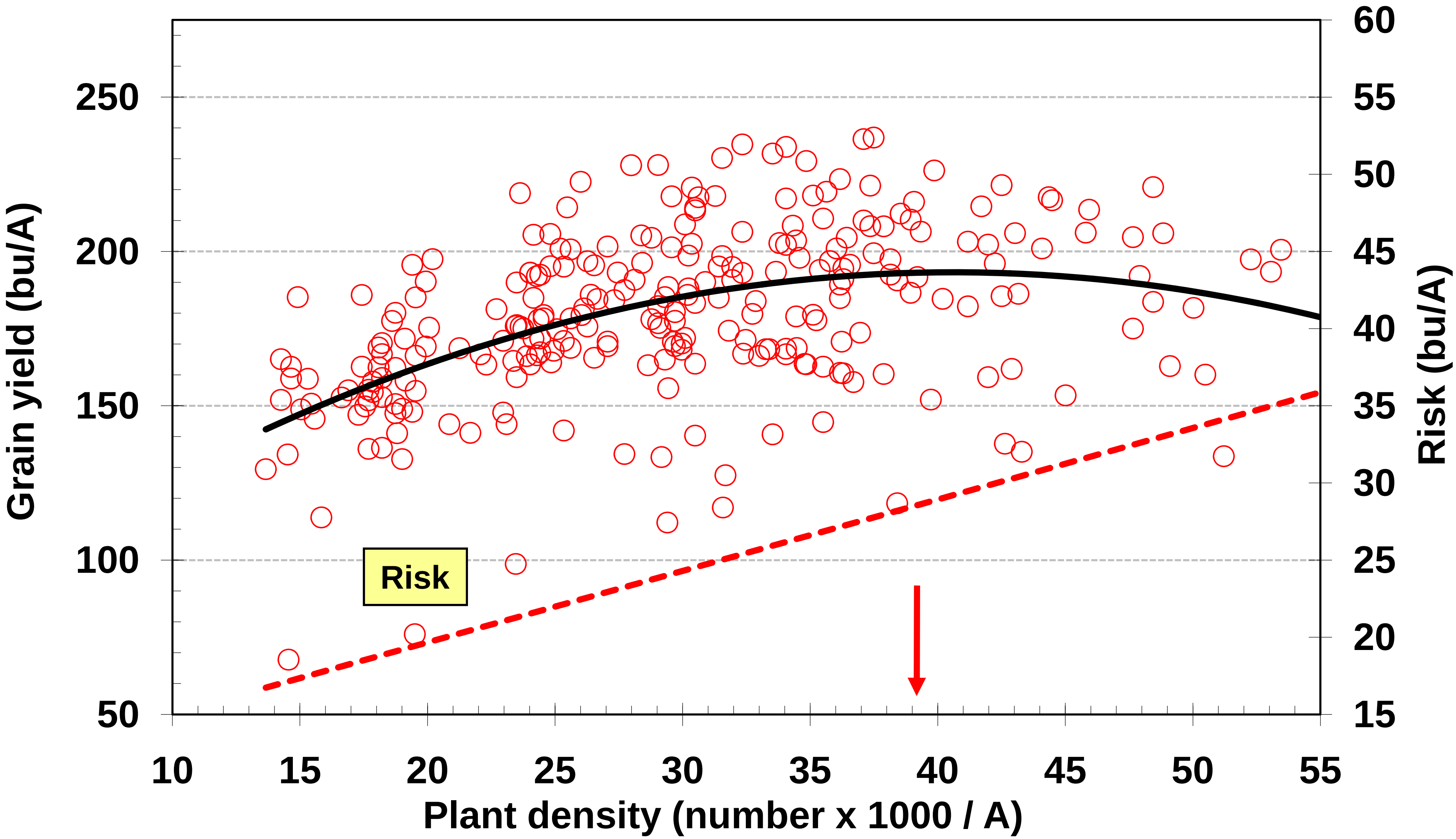


Potential Grain Yield Using Calculated Components

Assume 90,000 kernels/bu and 56 lb/bu; kernel mass = 282 mg



Increasing plant density increases grain yield … but there is a risk



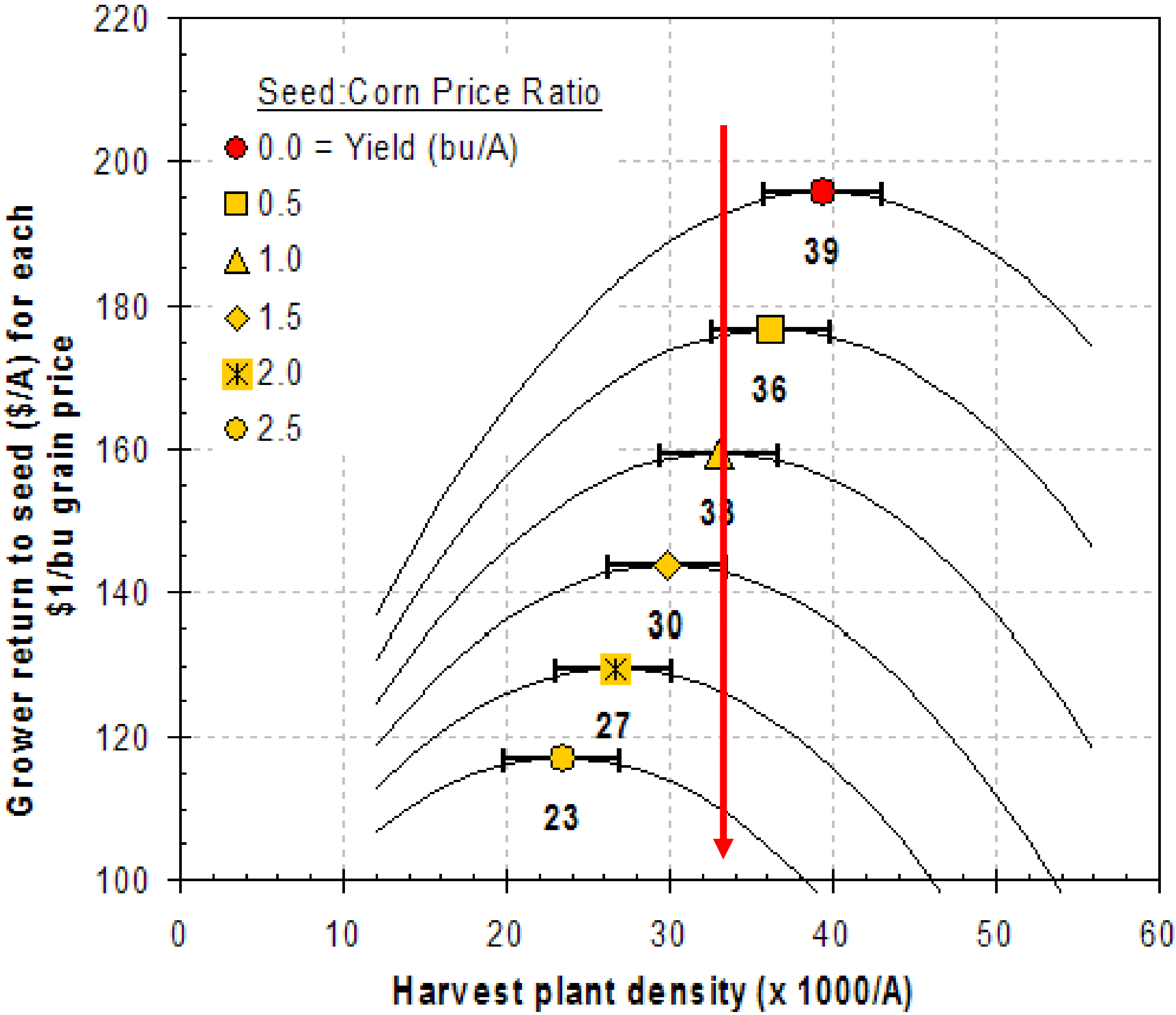
Source: Lauer, 2006
(Arlington, WI (1987 to 2005, n= 867 plots)

Price Ratio of Seed:Corn
(i.e. $/1000 seeds ÷ $/bu corn)

Price of seed		Price of corn ($/bu)				
$/80 K bag	$/1000 seeds	$1.00	$2.00	$3.00	$4.00	$5.00
$40	$0.50	0.50	0.25	0.17	0.13	0.10
$60	$0.75	0.75	0.38	0.25	0.19	0.15
$80	$1.00	1.00	0.50	0.33	0.25	0.20
$100	$1.25	1.25	0.63	0.42	0.31	0.25
$120	$1.50	1.50	0.75	0.50	0.38	0.30
$140	$1.75	1.75	0.88	0.58	0.44	0.35
$160	$2.00	2.00	1.00	0.67	0.50	0.40
$180	$2.25	2.25	1.13	0.75	0.56	0.45
$200	$2.50	2.50	1.25	0.83	0.63	0.50
$220	$2.75	2.75	1.38	0.92	0.69	0.55
$240	$3.00	3.00	1.50	1.00	0.75	0.60

Source: Lauer, 2006

As Seed:Corn price ratios increase, economic optimum plant density decreases …



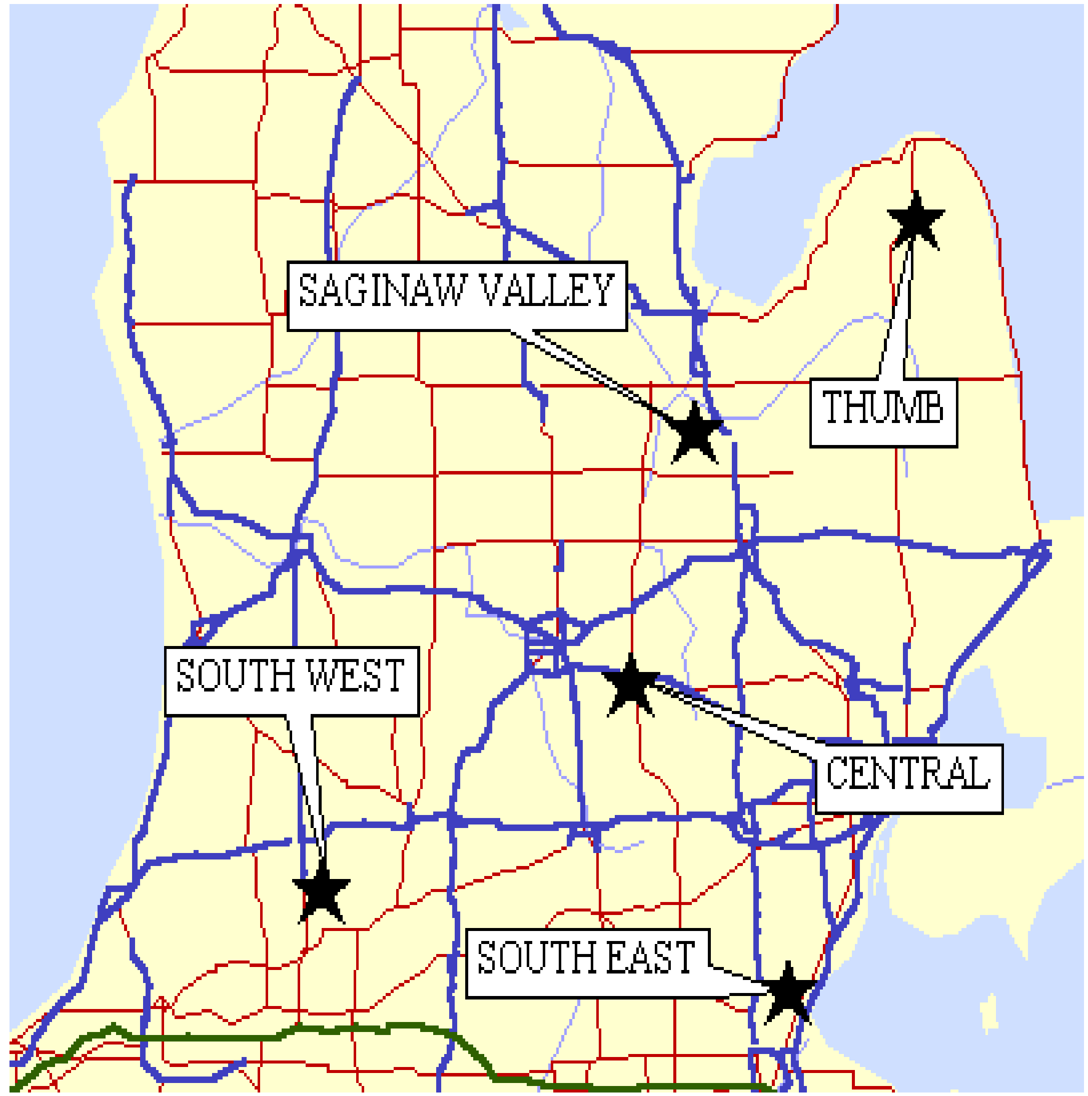
- Symbols represent the economic optimum return to plant density (EOPD).
- Error bars are the low and high ends of the range of profitability (within $1/A of EOPD) at each seed:corn price ratio.

Source: Lauer, 2006

Michigan Row Spacing study

Methods

- 15 total site-years (5 Sites x 3 Years)
- 4 hybrids per Site
- 5 populations per site (23000, 26400, 29800, 33200, 36500 plants/A)
- 3 row widths (15, 22, 30 in)
- 2640 total plots



Source: Widdicombe and Thelen, 2002 (AJ 94:1020)

15” row
configuration

30” row
configuration

Corn response to row width in Michigan 1998-1999. Each value is the mean of 880 plots.

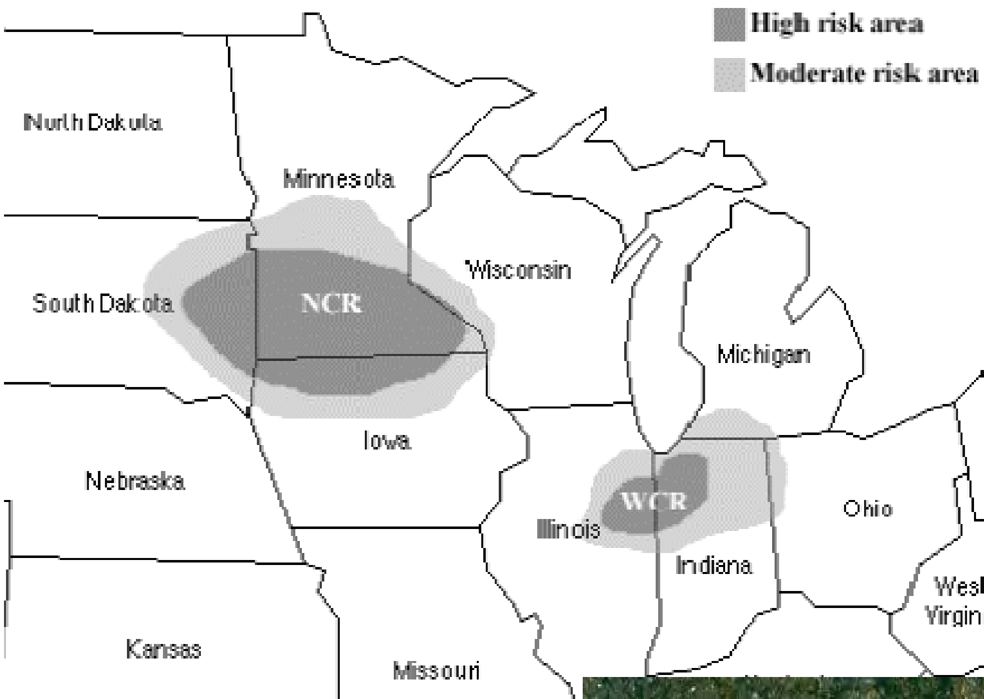
Row width	Yield	Moisture	Stalk Lodging
(in)	(bu/A)	(%)	(%)
30	177 c	19.6 a	1.60 b
22	181 b	19.2 b	1.92 a
15	184 a	19.2 b	1.65 b

Source: Widdicombe and Thelen, 2002 (AJ 94:1020)

#7 Insect Management

- Its all about scouting and timing!
- Insects are adapting

Corn rootworm
(*Diabrotica sp.)*



Photos: Rice

What about Bt corn and European Corn Borer dynamics?

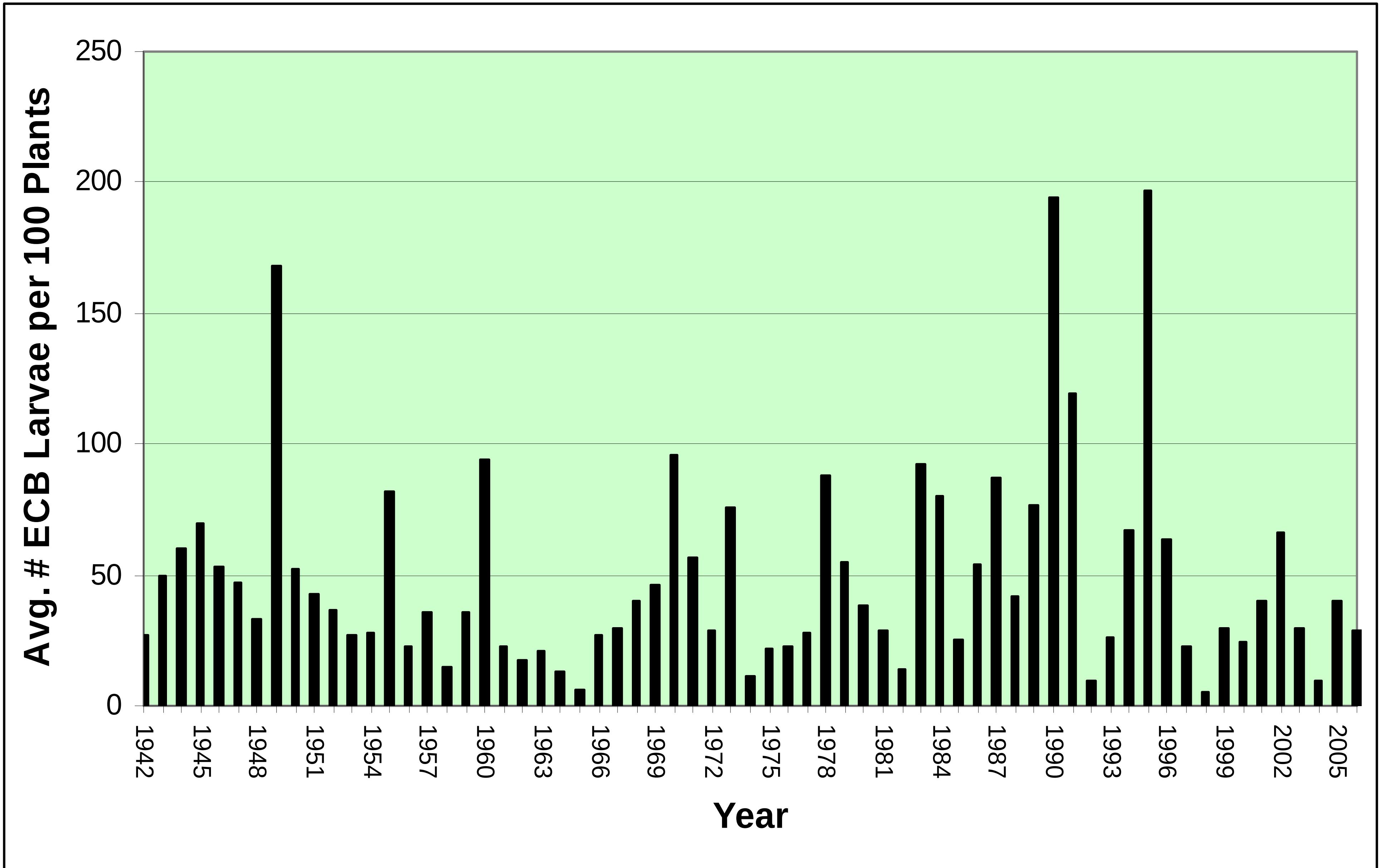
Factors affecting ECB

- **Natural enemies**
  - ✓ Diseases
    - ❑ Fungus: *Beauveria bassiana*
    - ❑ Protozoan: *Nosema pyrausta*
  - ✓ Parasitoids
  - ✓ Predators
- **Tillage**
- **Weather (overwintering, mating, egg laying, and larval establishment)**
- **Planting date**
- **Corn hybrid resistance**

European Corn Borer (*Ostrinia nubilalis*)

Photos: Rice

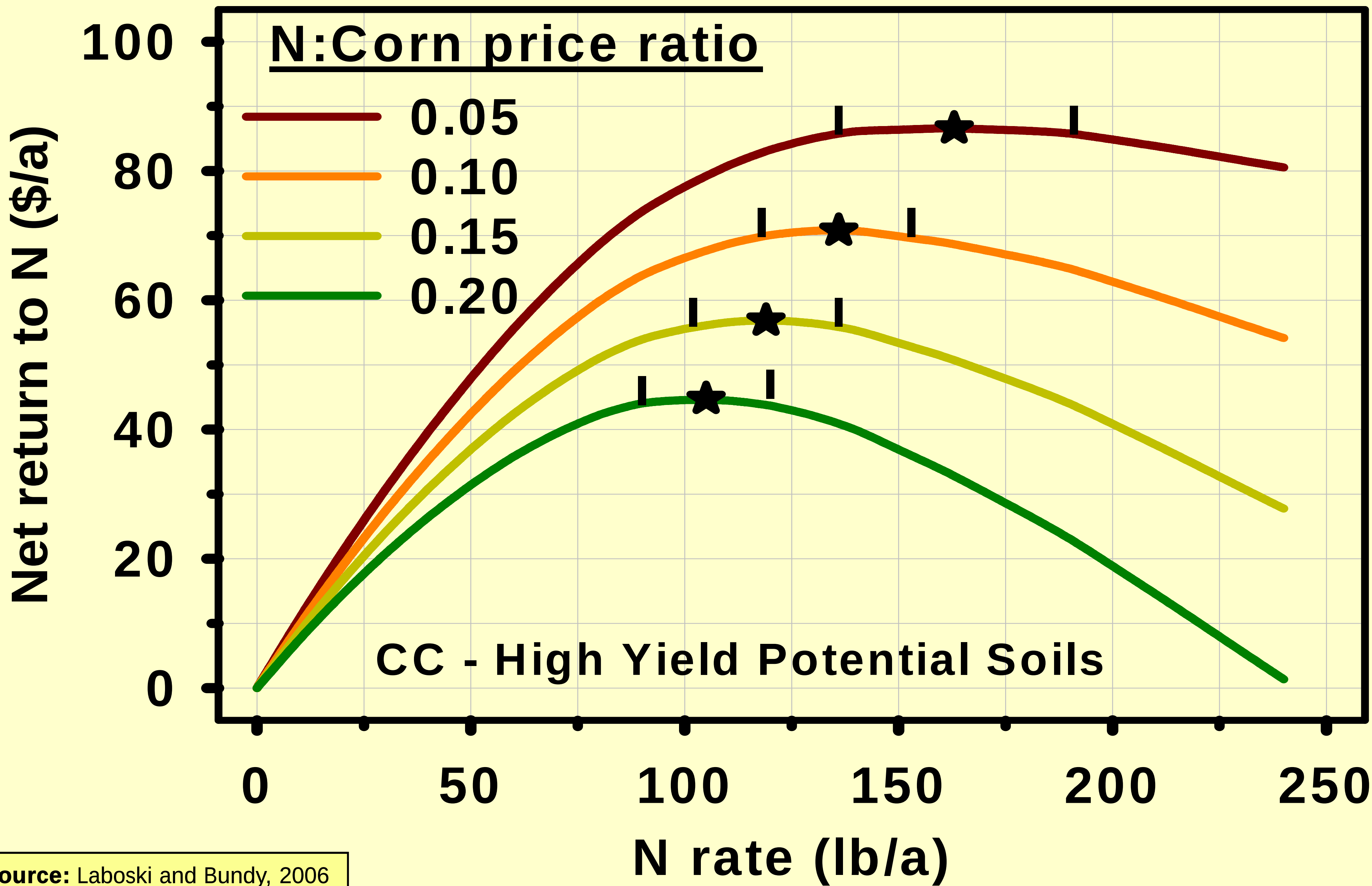
ECB Fall Population Trends for Wisconsin



Source: WDATCP (2006)

Price of N $/lb N	Price of Corn ($/bu corn) 1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20
0.20	0.11	0.10	0.09	0.08	0.08	0.07	0.07	0.06
0.22	0.12	0.11	0.10	0.09	0.08	0.08	0.07	0.07
0.24	0.13	0.12	0.11	0.10	0.09	0.09	0.08	0.08
0.26	0.14	0.13	0.12	0.11	0.10	0.09	0.09	0.08
0.28	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.09
0.30	0.17	0.15	0.14	0.13	0.12	0.11	0.10	0.09
0.32	0.18	0.16	0.15	0.13	0.12	0.11	0.11	0.10
0.34	0.19	0.17	0.15	0.14	0.13	0.12	0.11	0.11
0.36	0.20	0.18	0.16	0.15	0.14	0.13	0.12	0.11
0.38	0.21	0.19	0.17	0.16	0.15	0.14	0.13	0.12
0.40	0.22	0.20	0.18	0.17	0.15	0.14	0.13	0.13
0.42	0.23	0.21	0.19	0.18	0.16	0.15	0.14	0.13
0.44	0.24	0.22	0.20	0.18	0.17	0.16	0.15	0.14
0.46	0.26	0.23	0.21	0.19	0.18	0.16	0.15	0.14

Profitable N Rates - MRTN



Source: Laboski and Bundy, 2006

University of Wisconsin – Agronomy

Soil and Previous Crop	N:Corn Price Ratio ($/lb N:$/bu)			
	0.05	0.10	0.15	0.20
	lb N/a (Total to Apply)			
High/ V.High Yield Potential Soils				
Corn, Forage legumes, Vegetable legumes, green manures	**165 (135-190)**	**135 (120-155)**	**120 (100-135)**	**105 (90-120)**
Soybean, Small grains	**140 (110-160)**	**115 (100-130)**	**100 (85-115)**	**90 (70-100)**
Medium/Low Yield Potential Soils				
Corn, Forage legumes, Vegetable legumes, green manures	**120 (100-140)**	**105 (90-120)**	**95 (85-110)**	**90 (80-100)**
Soybean, Small grains	**90 (75-110)**	**60 (45-70)**	**50 (40-60)**	**45 (35-55)**
Irrigated Sands & Loamy Sands				
All crops	**215 (200-230)**	**205 (190-220)**	**195 (180-210)**	**190 (175-200)**
Non-Irrigated Sands & Loamy Sands				
All crops	**120 (100-140)**	**105 (90-120)**	**95 (85-110)**	**90 (80-100)**

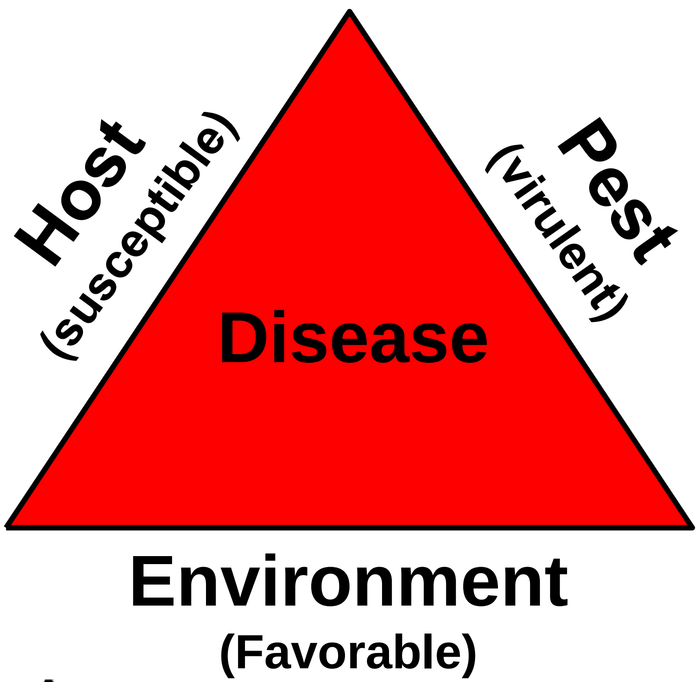
Corn and Fungicide in Wisconsin

Year	Previous Crop	Tillage	No Fungicide	With Fungicide	Fungicide Increase	Did it pay?
			------- bushels per acre -------			
2007	Corn	No-till	216	222	6	?
	Soybean	No-till	203	230	27*	Yes
	Wheat	No-till	205	210	5	No
	Soybean	No-till	206	208	2	No
2006	Soybean	Chisel	226	229	3	No
	Corn	Chisel	214	217	3	No
	Corn	Chisel	227	227	0	No
2005	Corn	Chisel	181	186	5	No
	Soybean	Chisel	199	211	12	?
	Soybean	Chisel	212	213	1	No
2004	Soybean	Chisel	200	211	11*	Yes

Source: Lauer
Headline @ VT - Arlington

Guidelines for Using a Fungicide on Hybrid Corn

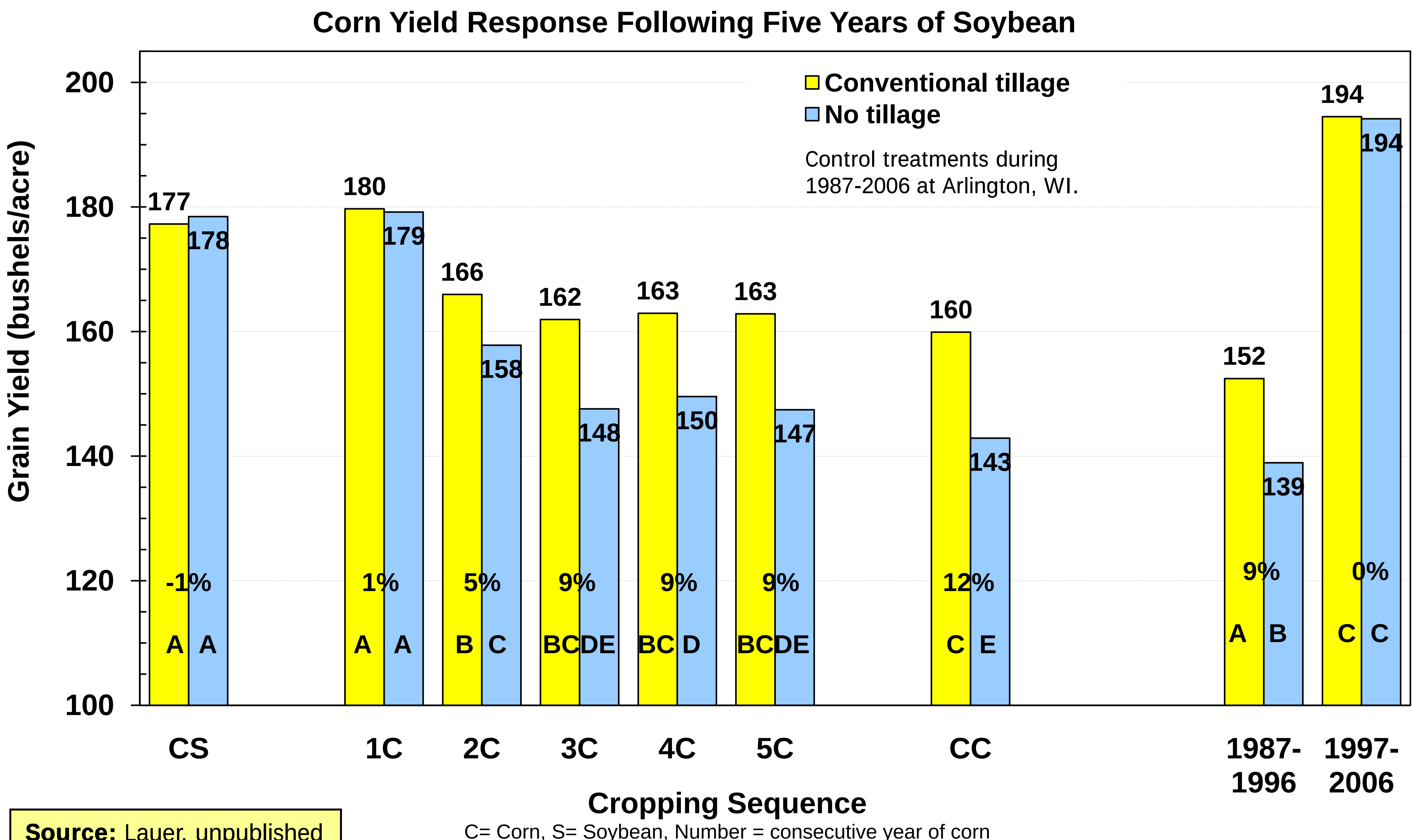
- **Spraying in 2008? Consider:**
  - ✓ hybrid susceptibility,
  - ✓ disease pressure at VT,
  - ✓ weather conditions at VT,
  - ✓ previous crop,
  - ✓ the amount of crop residue present ,
  - ✓ fungicide and application cost ,
  - ✓ grain price, and
  - ✓ directions & restrictions on label



- **In general, a fungicide application is not recommended on <u>resistant</u> hybrids.**
- **On <u>susceptible</u> hybrids, a fungicide application may be warranted if disease is present on the third leaf below the ear leaf or higher on 50 percent of the plants at tasseling.**
- **With <u>intermediate</u> hybrids, a fungicide need only be applied if conditions are favorable for disease development**
  - ✓ Spray if disease is present on the third leaf below the ear leaf or higher on 50 percent of the plants at tasseling, **and**
  - ✓ the weather is warm and humid, **and**
  - ✓ the field has a history of Gray Leaf Spot and/or Anthracnose, **and**
  - ✓ >35 percent corn residue is present.

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 ...

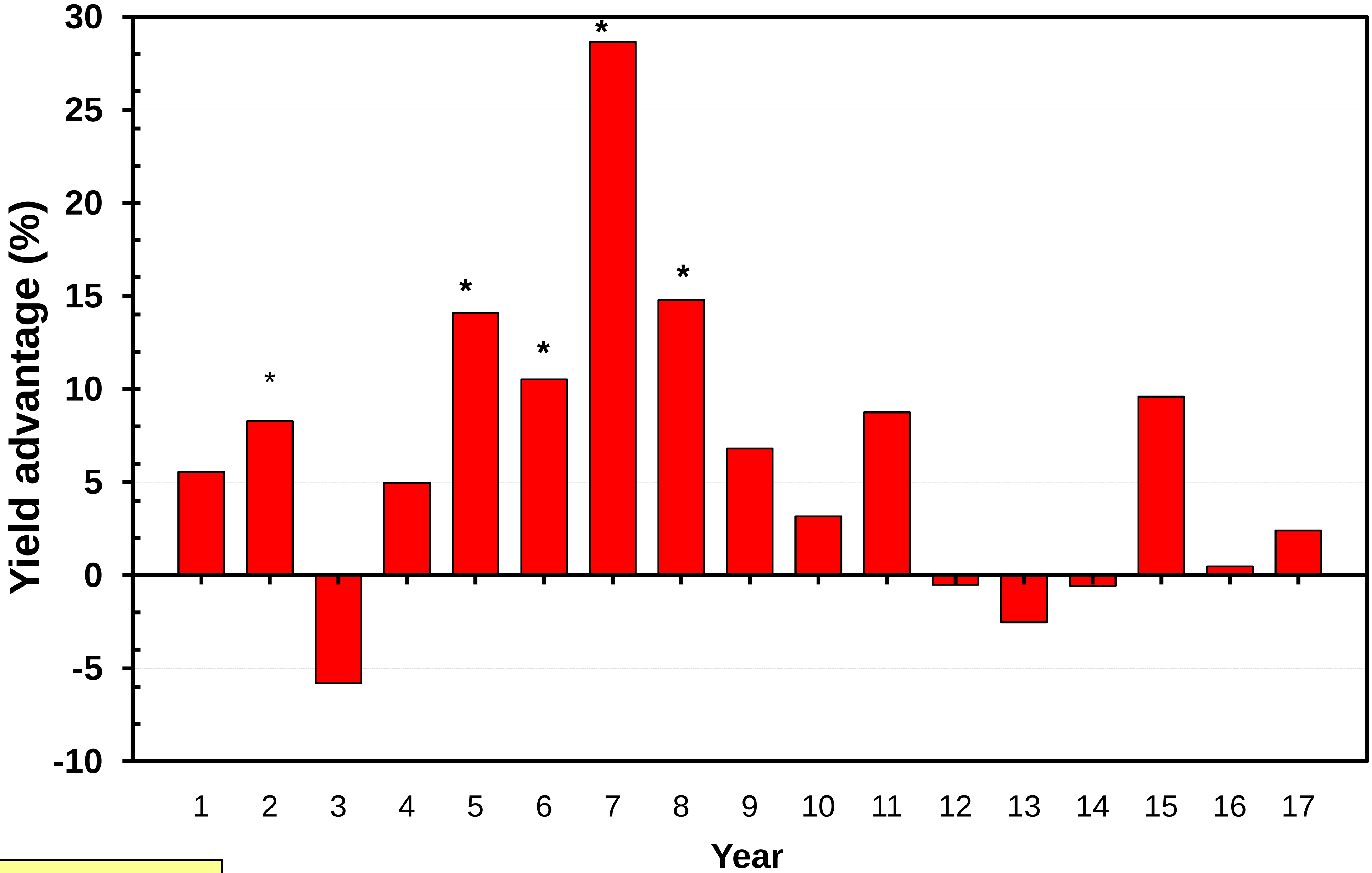
No tillage response is observed in the second cycle ...



Source: Lauer, unpublished

UW Extension

Yield advantage of chisel plow tillage over no-till 1986-2002
(“Long” Rotation trial, n= 6608 plots)



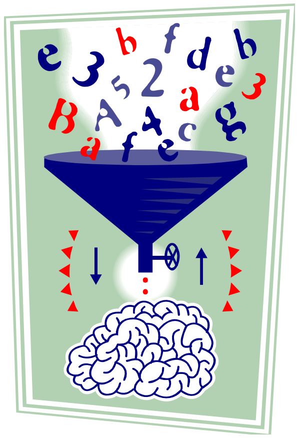
Source: Lauer (2003)

Agronomic and economic consequences of corn management decisions in WI

1. **Weather**
2. **Hybrid**
   - ✓ Top to bottom ranking = 0 to 30% change
   - ✓ Presence or absence of genetic traits = 0 to 100% change
3. **Date of Planting**
   - ✓ May 1 to June 1 = 0 to 30% change
   - ✓ Also need to add moisture penalty
4. **Pest Control**
   - ✓ Timeliness
   - ✓ Weeds > Insects > Diseases
   - ✓ Good v. Bad = 0 to 100% change
5. **Plant Density**
   - ✓ 32,000 to 15,000 plants/A = 0 to 22% change
6. **Rotation**
   - ✓ Continuous v. Rotation = 0 to 30% change
   - ✓ Greater consequence in 'stress' environments
7. **Soil Fertility**
   - ✓ 160 v. 0 lb N/A = 20 to 50% change
8. **Harvest Timing**
   - ✓ Oct. 15 to Dec. 1 = 0 to 20% change
9. **Tillage**
   - ✓ Chisel v. No-till = -5 to 10% change
   - ✓ No-till = energy savings
   - ✓ Cultivation: Yes v. No = 0 to 10% change
10. **Row Spacing**
    - ✓ 30-inches to 15-inches = 0 to 5% change

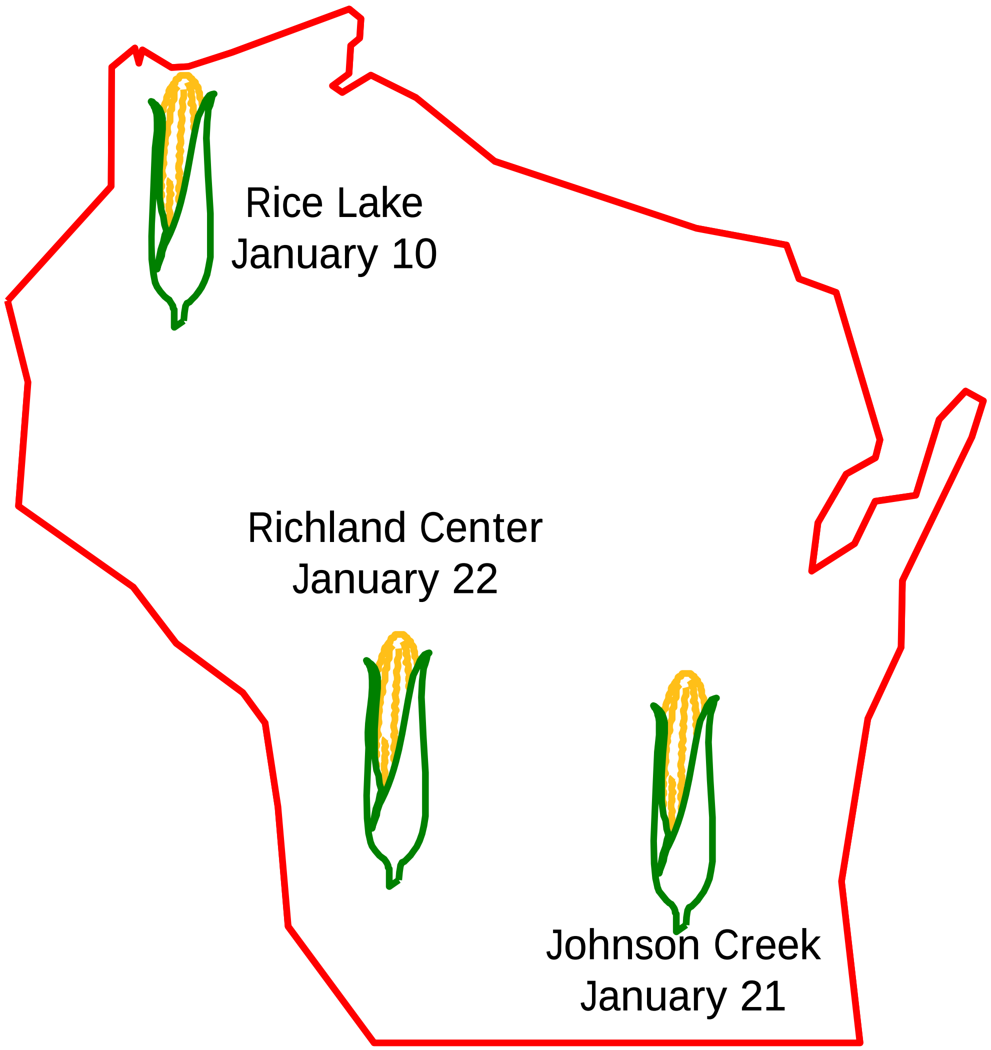
Ways To Increase Grower Return

- **Substitute information for more expensive purchased inputs:**
  - ✓Hybrid performance data
  - ✓Soil tests
  - ✓Manure analysis
  - ✓Pest scouting
  - ✓Crop consultant
  - ✓On-farm trials??



Thanks for your attention!
Questions?

2008 Corn Conferences



WISCONSIN Corn/Soy EXPO

PEPS

January 24-25, 2008
Kalahari Resort
Wisconsin Dells, WI

2008 Wisconsin Corn Conference Sponsors

Dairyland Seed Company
First Capital Ag
Kaltenberg Seeds
Monsanto Company
Mycogen Seeds
NK Brand Syngenta Seeds
Pioneer Hi-Bred, International
Legacy Seeds
Syngenta Crop Protection
Trelay Seed Company
UAP Distribution
Rural Mutual Insurance Company
Contree Sprayer and Equipment Company
Wisconsin Corn Promotion Board
Wisconsin Corn Growers Association
University of Wisconsin Agronomy Department
University of Wisconsin Cooperative Extension
UWEX Cooperating Counties – Barron, Richland, and Dodge