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2006 Wisconsin Corn Conferences

Joe Lauer

University of Wisconsin

Elkhorn, Centerville, Ripon
January 10-12, 2006

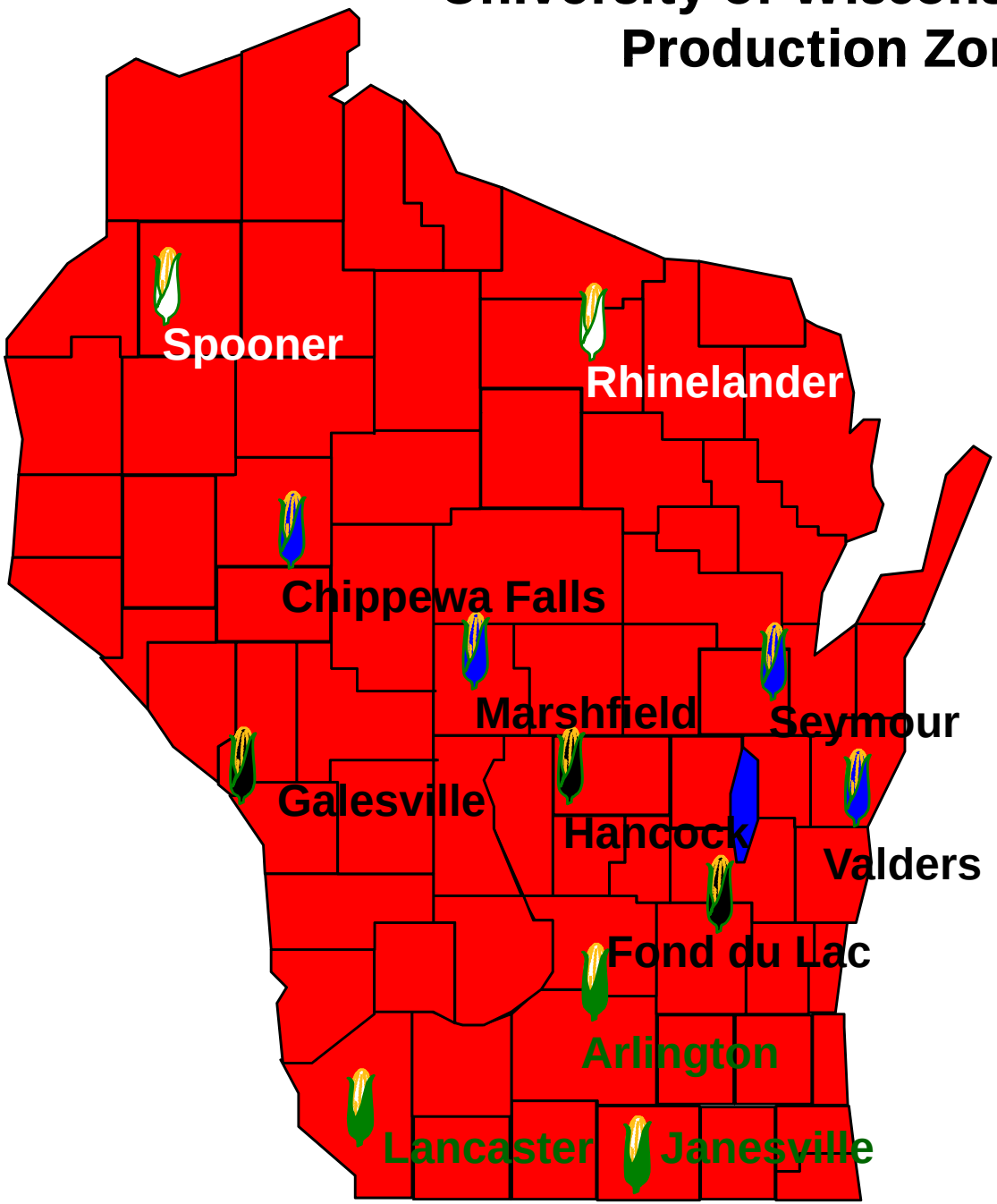
Overview

- Recap 2005
- Keys to high yields and profitability in 2006
- Planting Systems for Northern Corn Belt Soils
- Single, Paired, Triple and Quad Stacks – Making some Sense out of the Options!
- Long-term tillage effects on soil structure and properties – What does it mean for corn yield?

Corn Production during 2005

- **Record grain yields in western Wisconsin**
- **Growing season**
  - ✓ Cool, dry spring ---> Early planting
  - ✓ Drought stress, variable rains
  - ✓ Corn growth and development on target with normal GDU accumulation
  - ✓ Beautiful September and October harvest season
- **Hybrid Trials: New Grain Production Records**
  - ✓ Zone (n=9): High Cycle 7560Bt = 261 bu/A (SC)
    - ❑ Previous record: Pioneer 33A14 = 259 bu/A (S-1998)
    - ❑ Six hybrids from S and SC zone placed in Top 10 performances
  - ✓ Location (n=3): Dairyland Stealth 5204 = 288 bu/A (Hancock)
    - ❑ Previous record: Jung 2668 = 284 bu/A (Arlington-1998)
    - ❑ Six hybrids from Hancock placed in Top 10 performances

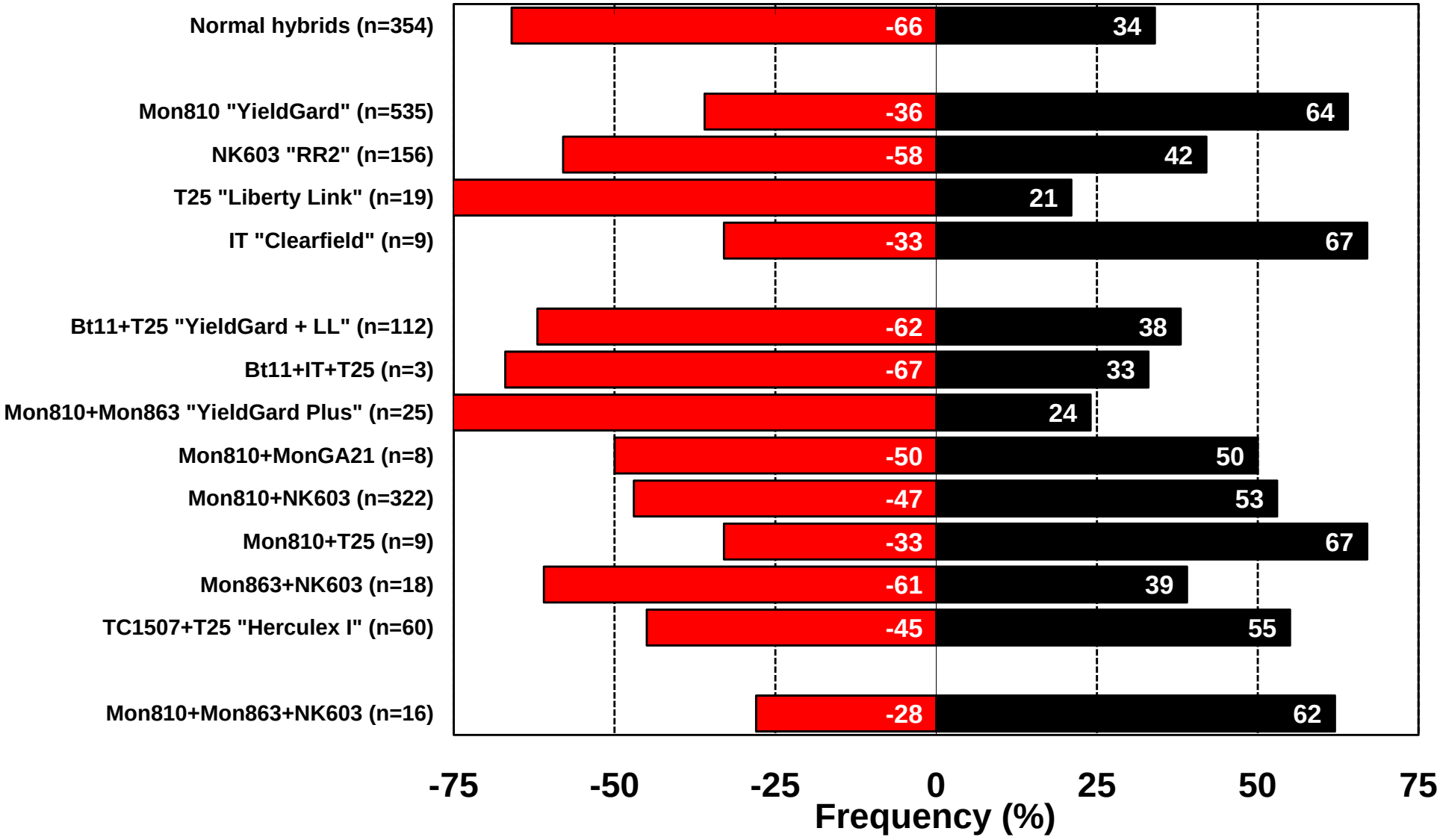
University of Wisconsin - Corn Agronomy Program
Production Zones = S, SC, NC, and N



2005 Wisconsin Corn Performance Trials
Grain Summary

Location	1995-2004 N	1995-2004 Yield	2005 N	2005 Yield	Percent change
Arlington	1838	198	167	227	15
Janesville	1837	198	167	217	10
Lancaster	1837	189	166	238	26
Fond du Lac	1637	171	149	207	21
Galesville	1634	178	149	238	34
Hancock	1633	197	149	255	29
Chippewa Falls	1528	149	142	130	-13
Marshfield	1362	158	142	180	14
Seymour	1204	161	142	169	5
Valders	1530	153	142	184	20
Spooner	1661	142	94	132	-7
White Lake/Rhinelander	511	106	47	187	76

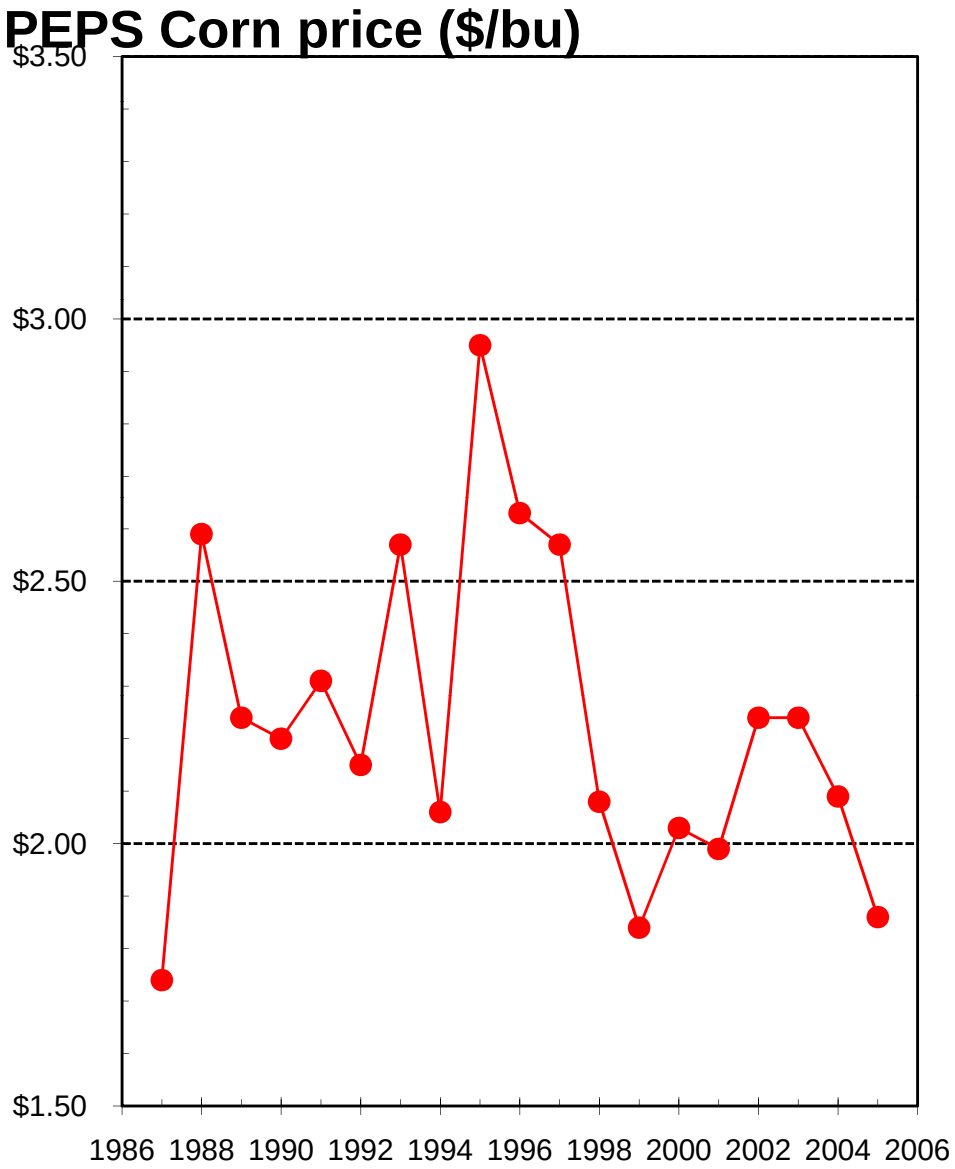
Frequency of Transgenic Hybrids Yielding Above the Trial Average in the 2005 UW Corn Trials



Recent University Trials Evaluating Twin-Row Corn
(JD = John Deere, GPPS= Great Plains Precision System)

State	Years	Tests	Planter comparison	Yield advantage for Twin-rows (bu/A)	Authors
IA	2002-2004	3	JD 7000	2.1	McGrath et al.
PA	2002	1	GPPS v JD1780	1.4	Roth et al.
ON	1995-1999	15	Unknown	5.0	Stewart
MO	2001	7	GPPS v JD7000	-9.7	Nelson & Smoot
DE, MA	2003-2004	4	GPPS v JD	-5.0	Kratochvil & Taylor
OH	2004	6	GPPS v JD	-9.0	Watters & Foster
OH	2005	1	GPPS v JD7000	-1.5	Wert
Average				**-2.4**	

Calculating Grower Return



Partial Budget Analysis

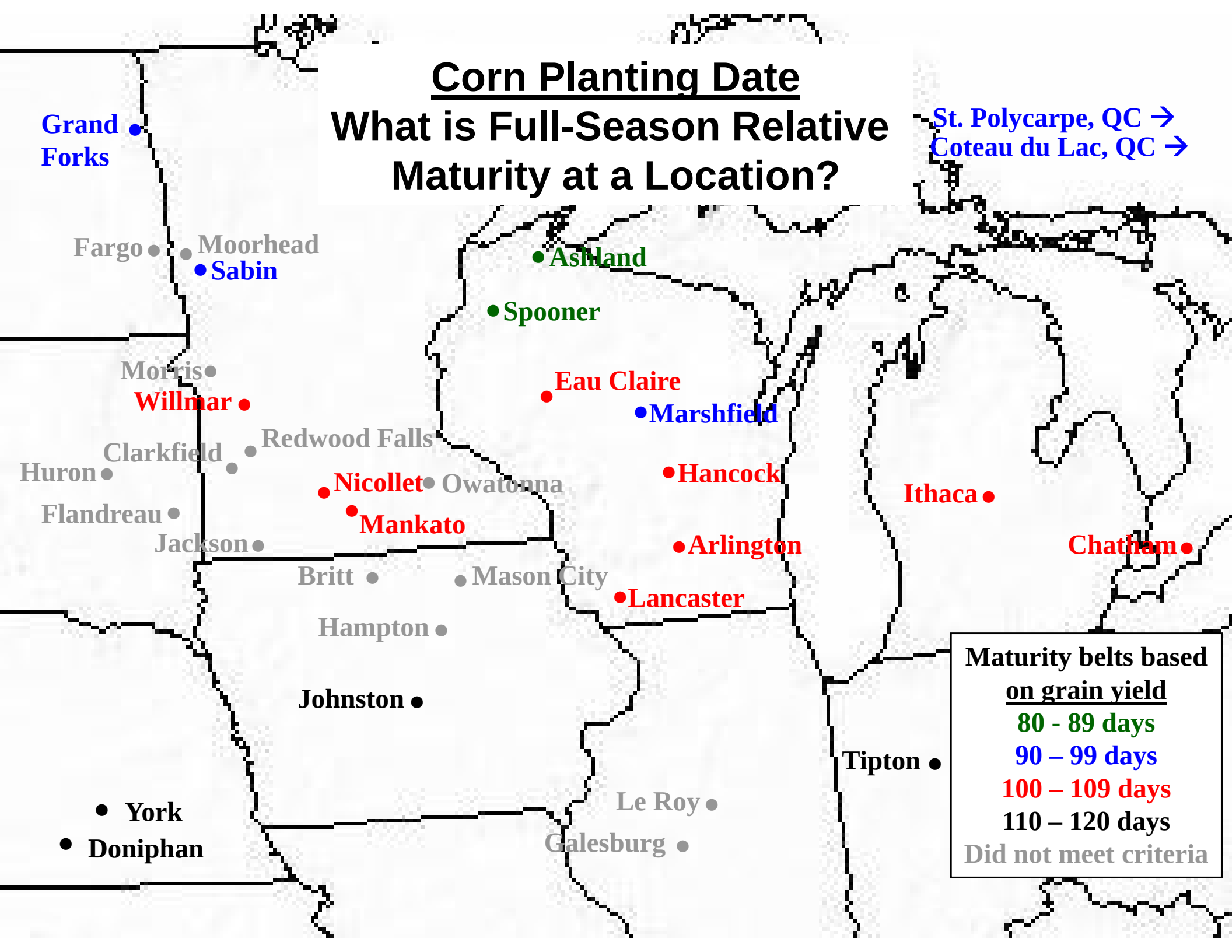
- **Grower return = (Yield x Price) - Input costs**
  - Handling ($0.02 per bushel)
  - Hauling ($0.04 per bushel)
  - Trucking (system rate)
  - Drying (system rate per bushel-point > 15.5)
  - Storage (system rate per 30 day)
  - ✓ Marketing plan: 50% sold at harvest, 25% at 4 months, and 25% at 8 months.
- **Corn Production Systems**
  - ✓ Livestock: drying=$0.00, trucking=$0.00, storage=$0.01
  - ✓ On-farm: drying=$0.02, trucking=$0.11, storage=$0.02
  - ✓ Commercial: drying=$0.04, trucking=$0.11, storage=$0.03
- **Corn Price per bushel**
  - ✓ Price matrix: $2.00, $2.50, $3.00 = gr250
  - ✓ grPEPS: Weighted Price per bushel =
    50% November Average Cash price
    + 25% March CBOT Futures ($0.15 basis)
    + 25% July CBOT Futures ($0.10 basis)
    - ❑ November Average Cash price derived from WI Ag Statistics; CBOT Futures prices derived from closing price on first business day in December.

Research Questions

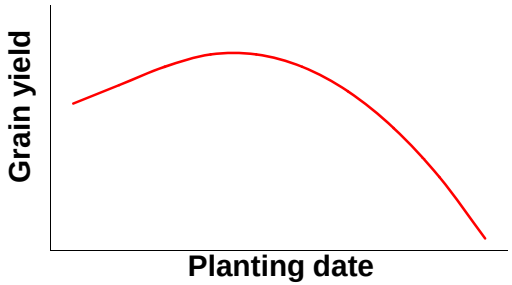
- **What is the optimum planting date and planting window?**
  - ✓ What does the relationship between grain yield and planting date look like?
  - ✓ Are optimum planting dates earlier now than a generation ago?
- **When should hybrid maturity be switched?**
- **What is the risk associated with planting dates?**

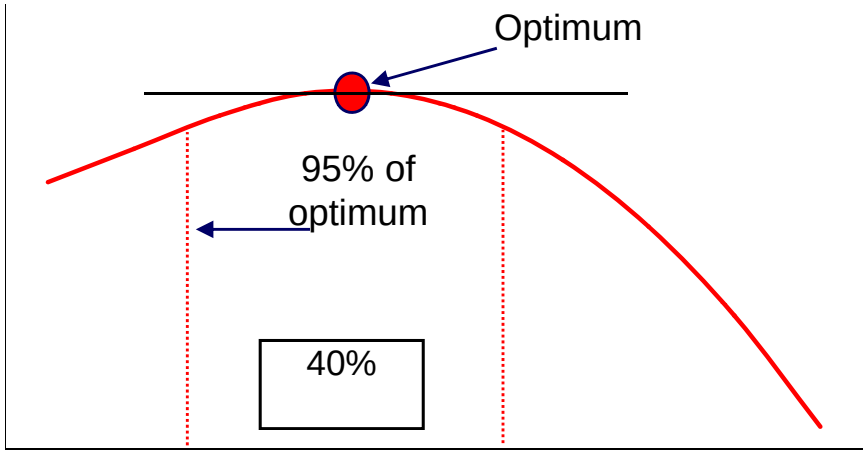
Materials and Methods

- **Total dataset = 16,772 plots from 34 locations**
- **Data criteria**
  - ✓ Each location required at least 2 years of testing
  - ✓ Each trial required at least 3 planting date treatments
  - ✓ Focus on trials with planting dates before and after 20 May (switch date)
  - ✓ Wisconsin (1974-2002): E = 56, G = 90, GxE = 196, Total = 2,644
  - ✓ Pioneer (1987-2002): E = 68, G = 139, GxE = 626, Total = 10,809
  - ✓ **Final dataset = 13,453 plots from 19 locations**
- **Location full-season maturity belt determined by the annual most frequent RM of the maximum measure (i.e. grain yield, grower return)**
- **Full-season hybrid >= location maturity belt – 5 days**
  Mid-season hybrid = location maturity belt – 5 to 15 days
  Short-season hybrid < location maturity belt – 15 days or more

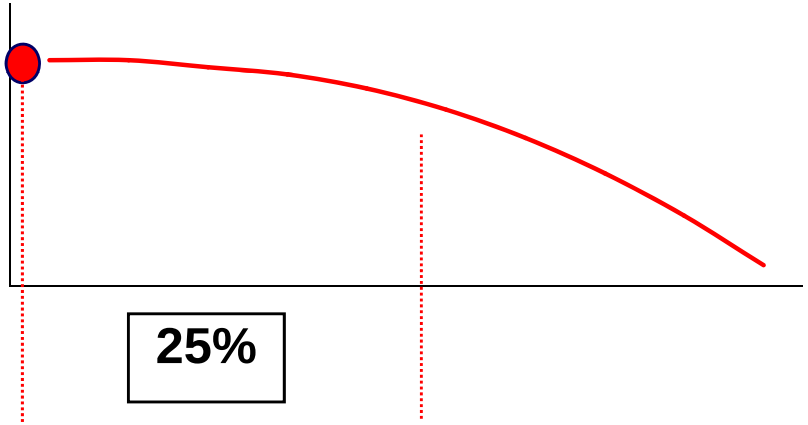

Corn Planting Date
What is Full-Season Relative Maturity at a Location?
Grand Forks
Fargo
Moorhead
Sabin
Ashland
Spooner
Eau Claire
Marshfield
Morris
Willmar
Redwood Falls
Clarkfield
Huron
Nicollet
Owatonna
Mankato
Hancock
Ithaca
Flandreau
Jackson
Arlington
Chatham
Britt
Mason City
Lancaster
Hampton
Johnston
Tipton
Le Roy
Galesburg
York
Doniphan
St. Polycarpe, QC →
Coteau du Lac, QC →
Maturity belts based on grain yield
80 - 89 days
90 – 99 days
100 – 109 days
110 – 120 days
Did not meet criteria

What Does the Relationship Between Grain Yield And Planting Date Look Like?
Total forms = 9; GxE N = 822 cases





+ Linear and - Quadratic

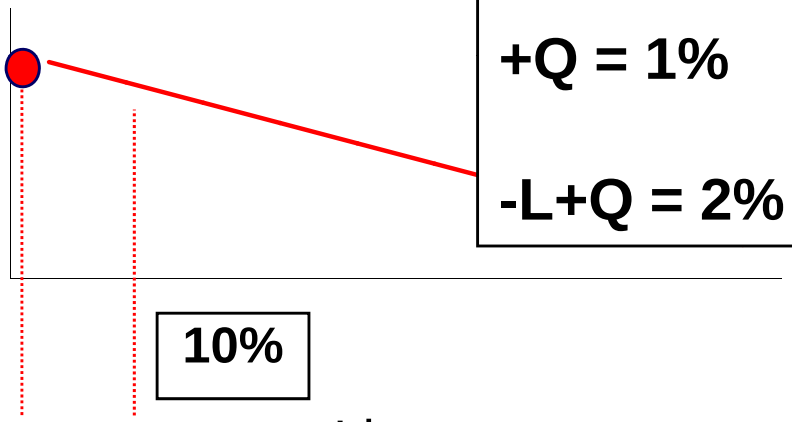


- Quadratic

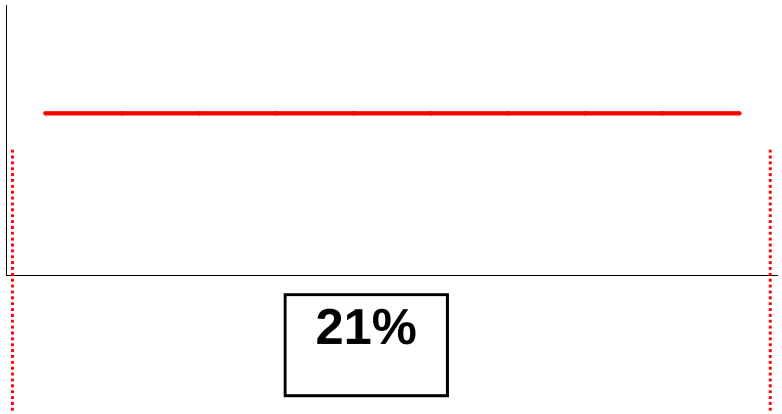
+L = 1%

+Q = 1%

-L+Q = 2%



- Linear



None

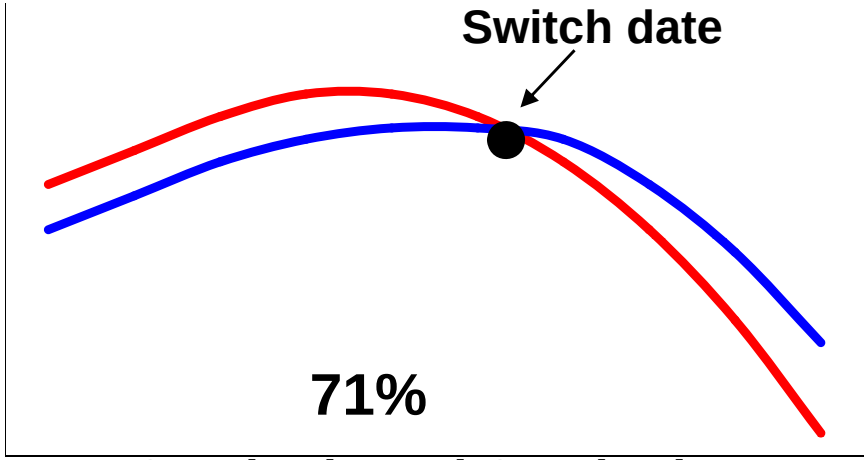
Optimum Date Of Planting, Date Of 95% Optimum And Planting Window For Full-season Hybrids

RM Belt	Wisconsin data			
		Optimum	95% of optimum	Window (Days)
80-89	Ashland	May 3	May 1	9
	Spooner	May 3	April 28	13
90-99	Marshfield	May 3	April 27	17
100-109	Hancock	April 28	April 23	22
	Arlington	May 2	April 30	16
	Lancaster	April 30	April 25	14

Optimum Planting Date, Date of 95% of Optimum and Planting Window for Full-, Mid- and Short-season Hybrids

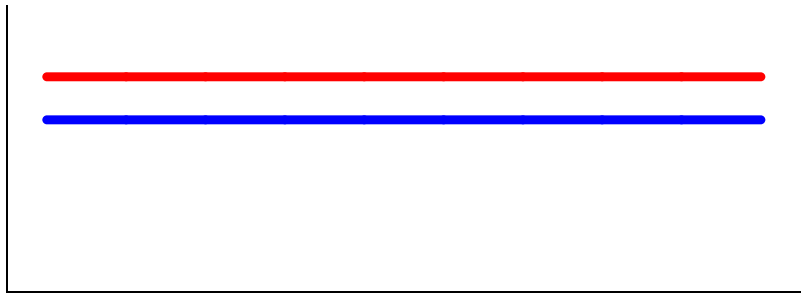
RM	Season	Grain yield (bu/A)	Optimum	Window		
				Begin	End	(Days)
85 day RM belt						
80-89	Full-	137	May 3	April 30	May 11	11
70-79	Mid-	128	May 8	May 3	May 17	14
95 day RM belt						
90-99	Full-	152	May 9	May 6	May 21	14
80-89	Mid-	142	May 12	May 8	May 25	17
70-79	Short-	122	May 11	May 8	May 24	15
105 day RM belt						
100-109	Full-	172	May 2	April 29	May 18	19
90-99	Mid-	169	May 2	April 29	May 23	24
< 90	Short-	156	May 5	April 29	May 28	29
115 day RM belt						
110-119	Full-	182	April 25	April 21	May 11	20
100-109	Mid-	167	April 27	April 22	May 16	24
< 100	Short-	146	April 29	April 24	May 19	25

Switching From Full-season To Mid-season Corn Hybrids
N = 124 cases



71%

Quadratic and Quadratic



21%

None and None

LL = 3%
LN = 2%
NL = 2%

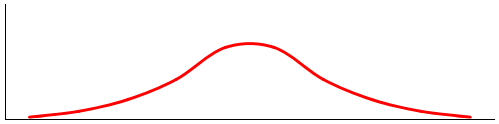
Switch Dates For Corn Hybrid Maturity Groups – Wisconsin data

RM belt	Location	Full- to Mid-	Full- to Short-	Mid- to Short-
80-89	Ashland	May 21	----	----
	Spooner	June 3	----	----
90-99	Marshfield	May 10	May 30	----
100- 109	Hancock	May 20	----	----
	Arlington	May 23	May 26	May 30
	Lancaster	May 30	----	----

Switch Dates for Full-, Mid- and Short-Season Hybrids

	Full- to Mid-	Full- to Short-	Mid- to Short-
Grain yield			
85 day RM belt	May 28	----	----
95 day RM belt	May 24	June 4	----
105 day RM belt	May 22	May 27	May 28
115 day RM belt	May 23	June 14	June 10
Corn price = $3.00 /bu			
Drying cost = $0.04/bu*pt			
85 day RM belt	June 2	----	----
95 day RM belt	May 22	May 24	June 7
105 day RM belt	May 22	May 25	May 28
115 day RM belt	May 11	June 6	June 10

Risk Distributions



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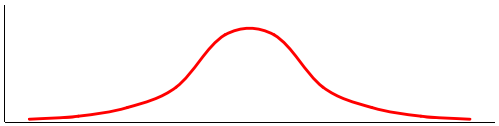
Normal



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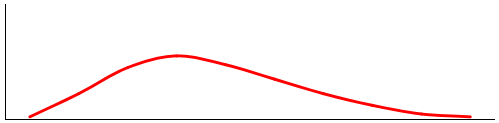
Low Standard Deviation

Low risk



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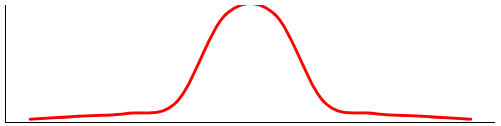
Positive Skew

High “upside” risk



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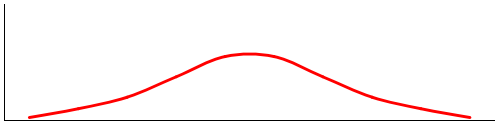
Positive Kurtosis

Infrequent extremes



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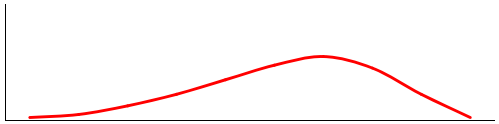
High Standard Deviation

High risk



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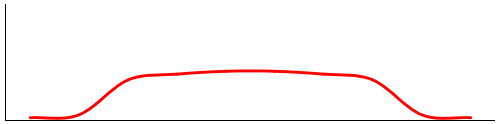
Negative Skew

High “downside” risk



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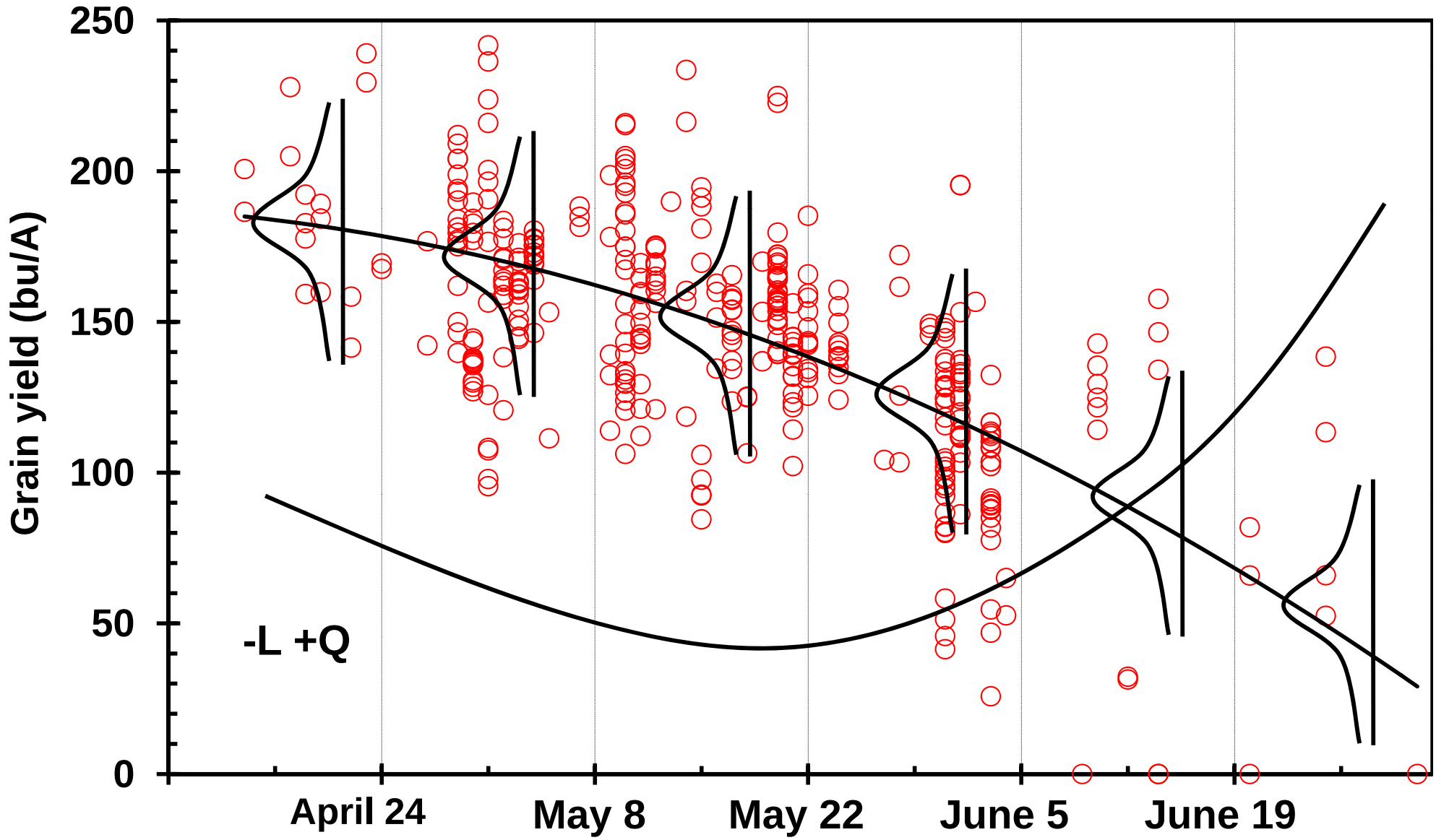
Negative Kurtosis

Frequent extremes

Grain Yield Response of Full-Season Corn Hybrids to Planting Date at Arlington (1976-2002)



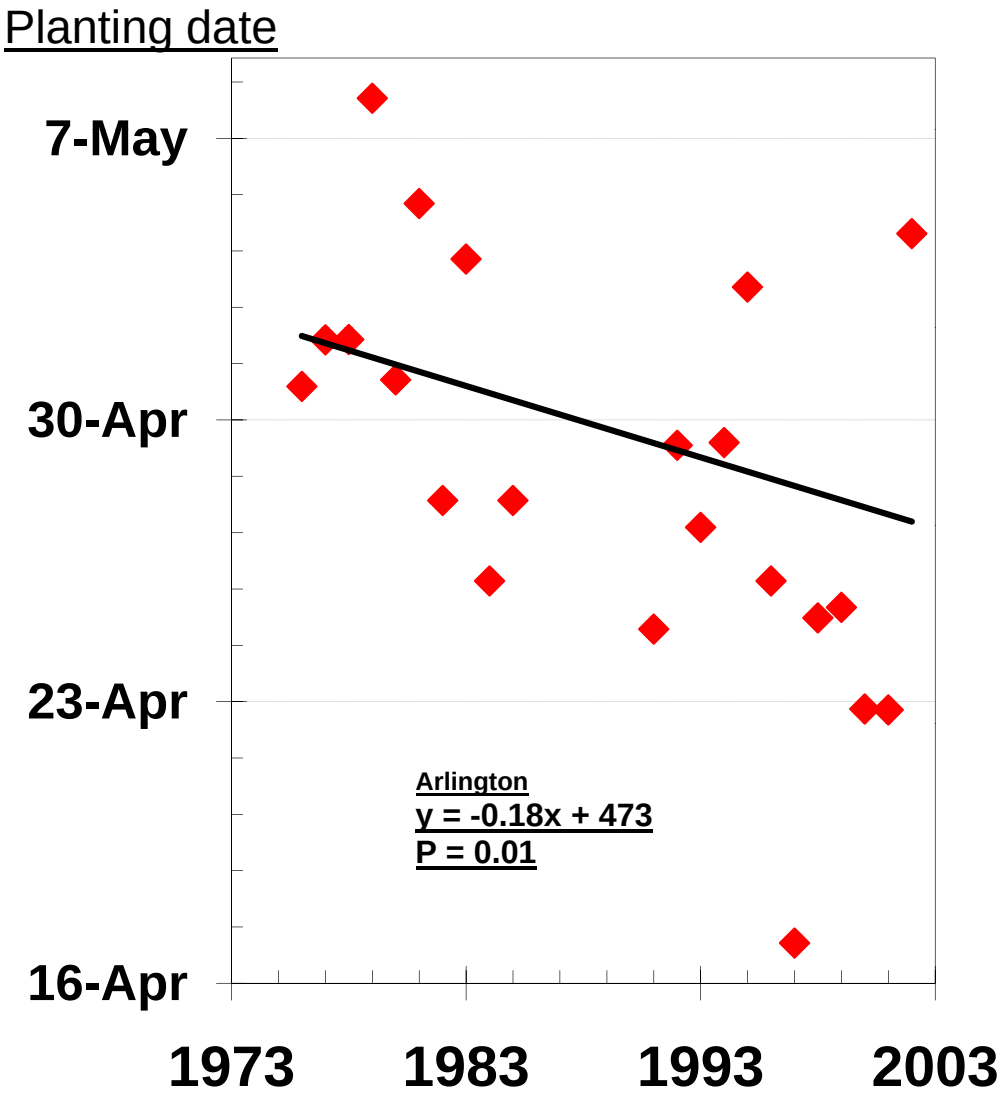
Risk Patterns for Full-Season Hybrids

	Full-	April 20	April 30	May 10
Grain yield			+ or - bu/A	
85 day RM belt	NS	23	23	23
95 day RM belt	-L +Q	28	21	15
105 day RM belt	-L +Q	26	21	18
115 day RM belt	-L +Q	22	21	20

Corn price = $3.00 /bu

Drying Cost = $0.04/ bu*point			+ or - $/A	
85 day RM belt	NS	58	58	58
95 day RM belt	-L +Q	72	53	37
105 day RM belt	-L +Q	66	54	45
115 day RM belt	-L +Q	59	56	56

Are Optimum Planting Dates Getting Earlier?



- **Yes, current optimum planting dates are 5 days earlier than 1974**
  - ✓ Criteria: 10 or more years of data at a location
    - ❑ Arlington, WI = 5 days
    - ❑ Johnston, IA = 4 days

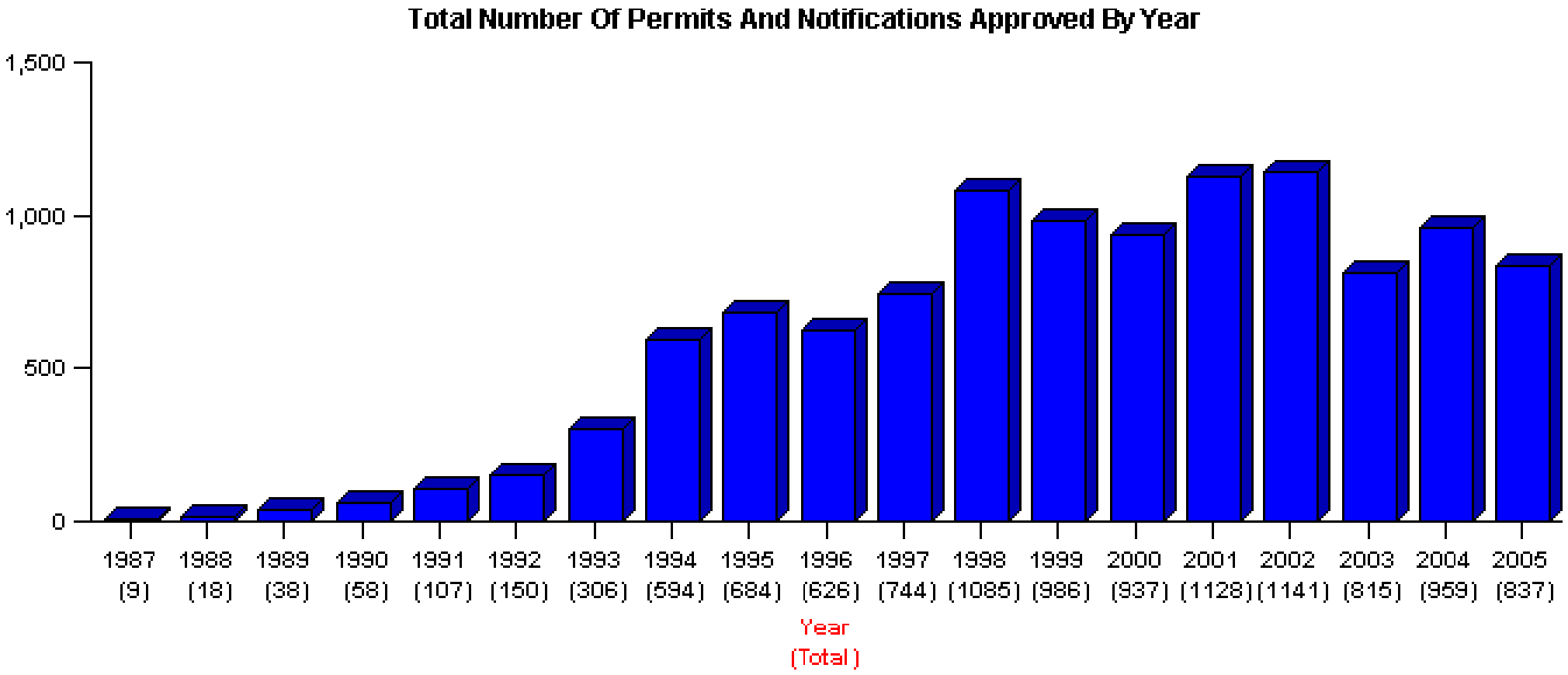
Conclusions

- **Optimum and 95% of optimum planting dates are similar among Full-, Mid-, and Short-season hybrids.**
  - ✓ Planting windows are 1 to 10 days longer with Short- v. Full-season hybrids.
- **Switch dates for Full- to Mid-season hybrids range from May 22 to May 28.**
  - ✓ Earlier switch date with higher corn price and/or drying cost.
- **Planting date risk for full-season hybrids is curvilinear between April 20 and June 15.**
  - ✓ Equal risk among all planting dates in 80-89 day maturity belts.
  - ✓ Equal risk for full-season hybrids among all planting dates when low corn price and high drying cost.

Parting Thoughts

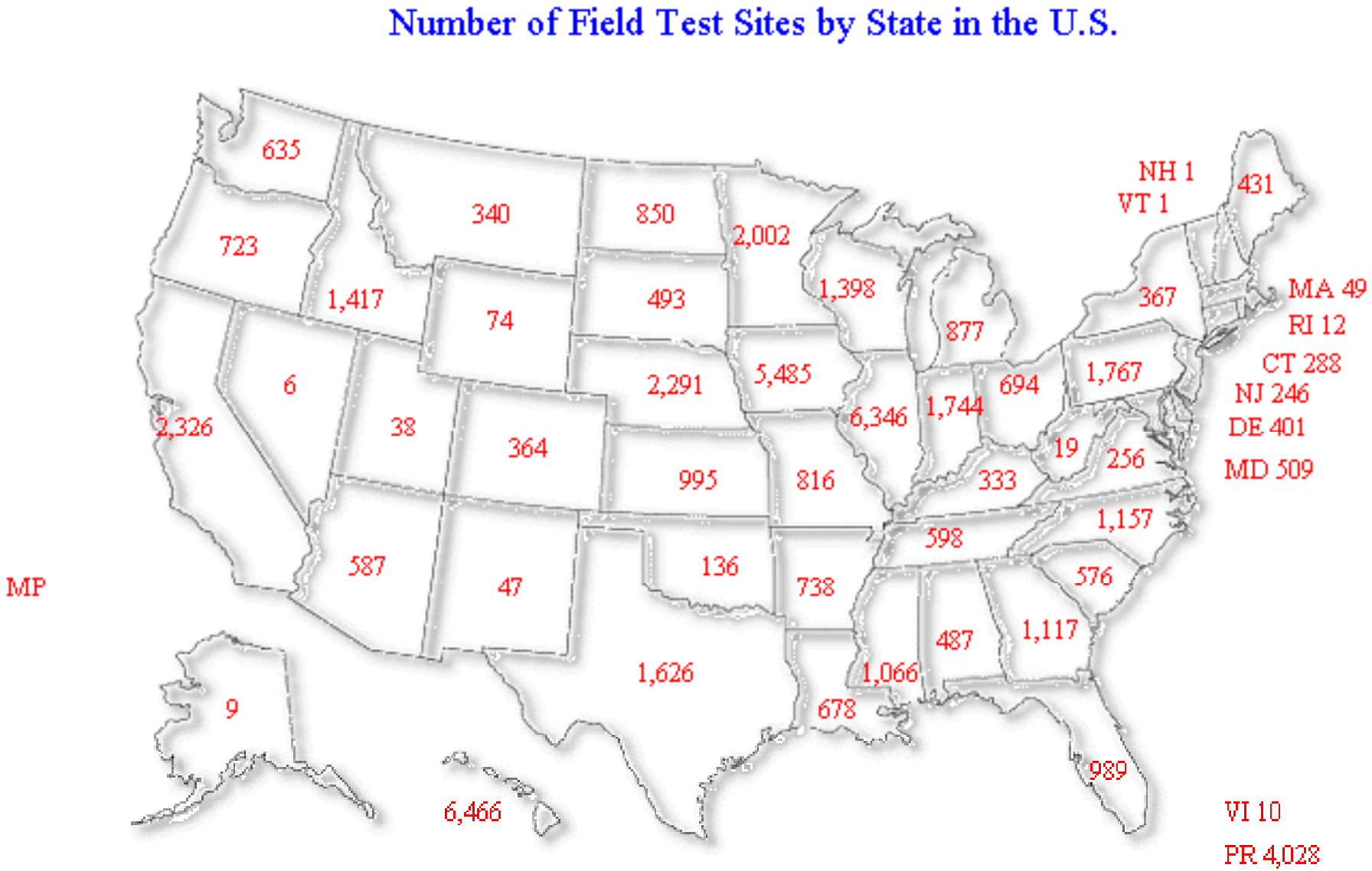
- **The biggest risk to early planting is non-uniform stands.**
  - ✓ But remember: "The yield potential of an early planted field with a poor stand is usually better than a later planted field with uniform spacing and emergence. It just doesn't look as pretty in June and July."
  - ✓ Late-planted fields have higher grain moisture, thus more drying costs.
- **Replanting is an "insurance" option, especially when seed costs are low.**
  - ✓ Crop insurance may not help with replanting costs if the field was planted before April 6. Check with your insurance agent.
- **Planting depth and early planting: Temptation is to plant shallower. Recommend planting seed 1.5 to 2.0 inches deep.**
  - ✓ Seedbed can settle, but seed doesn't move from where it was placed.
  - ✓ If enough settling occurs, the crown of the plant may be too close to the surface resulting in reduced and poor secondary root growth.
  - ✓ Adequate depth reduces effects of soil drying, bird and rodent feeding.

How much field testing of transgenics is going on? (Permits and Notifications n = 12 052)



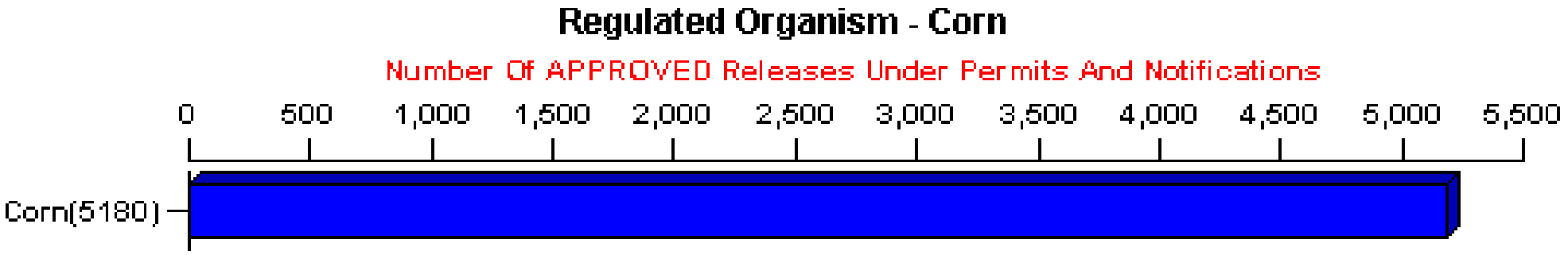
Source: Information Systems for Biotechnology (& Jan 06)
http://www.isb.vt.edu/

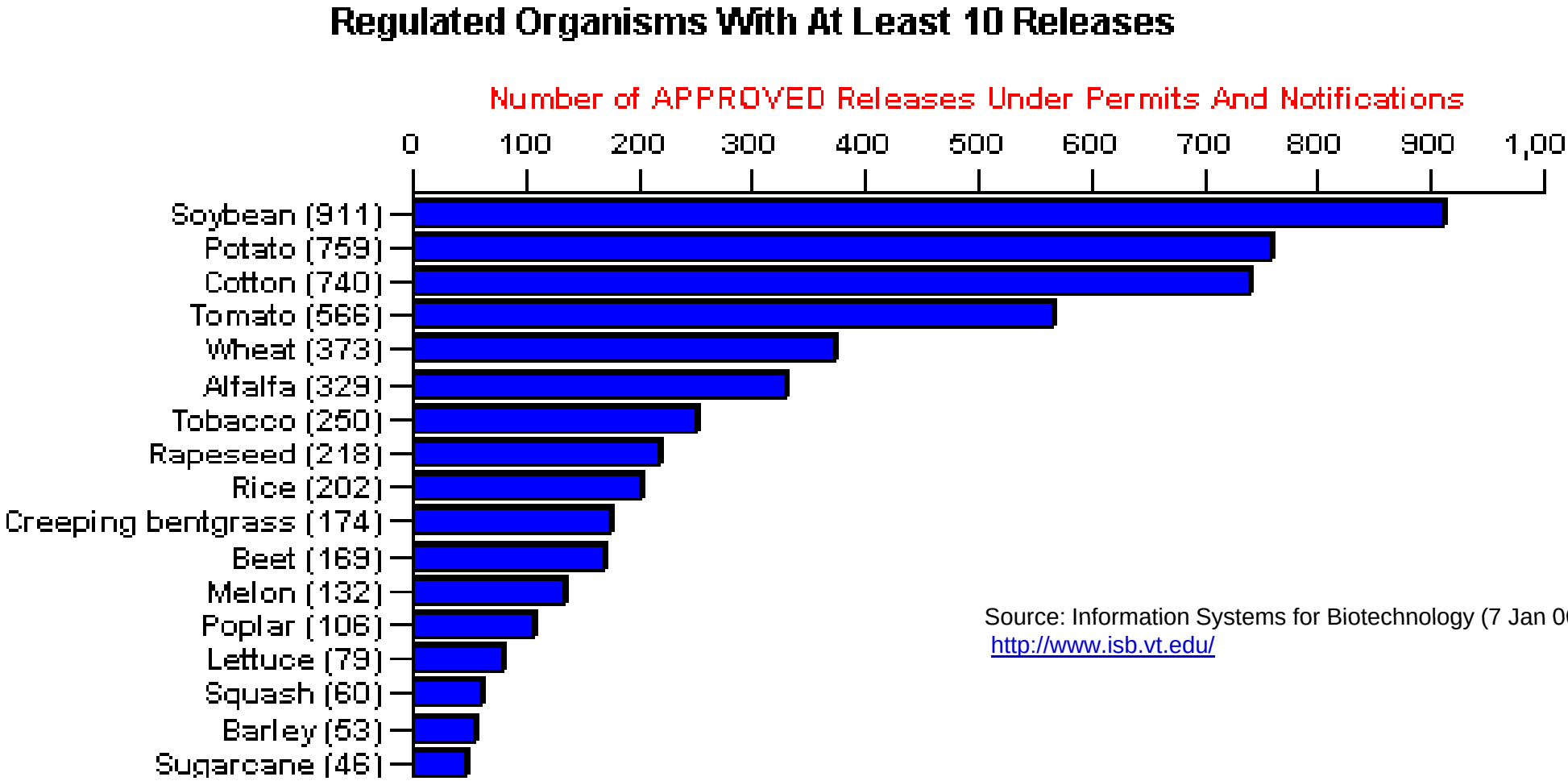
Where is field testing of transgenics occurring?



Source: Information Systems for Biotechnology (1 Jan 87 to 7 Jan 06)
http://www.isb.vt.edu/

How many field tests are occurring by crop? (Permits and Notifications n = 12 052)



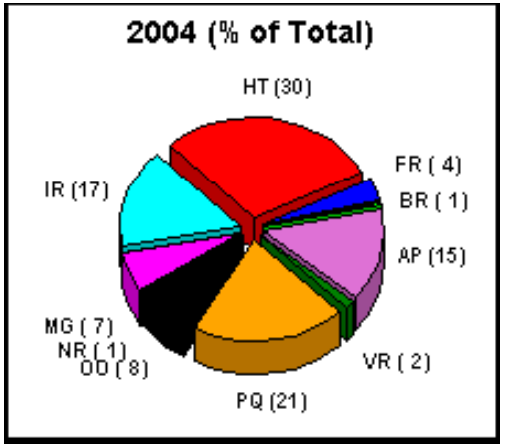


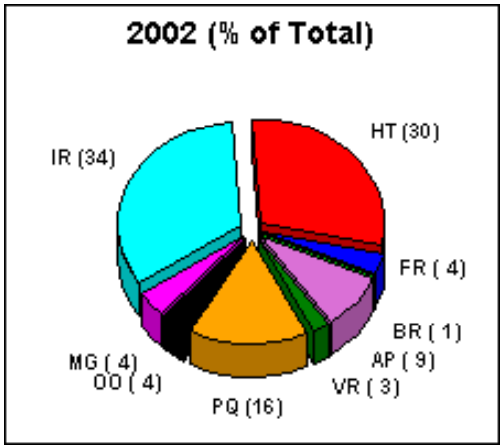
Source: Information Systems for Biotechnology (7 Jan 06)
http://www.isb.vt.edu/

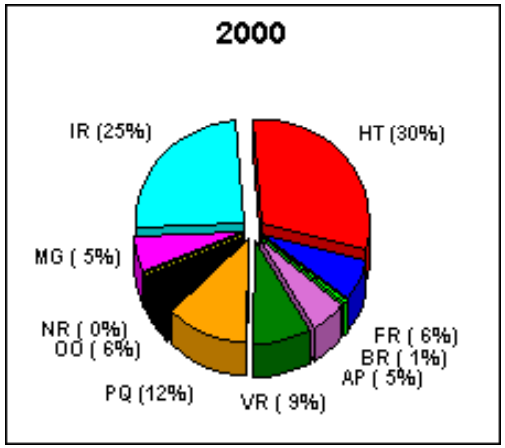
BR - Bacterial Resistance | GC - Genetic Containment | IR - Insect Resistance | MG - Marker Gene | NR - Nematode Resistance | PQ - Product Quality

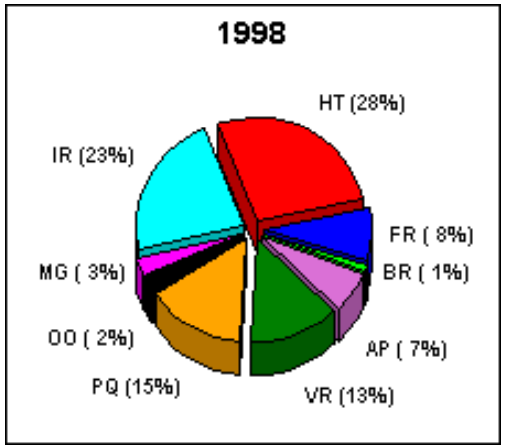
What transgenic phenotypes are being tested?

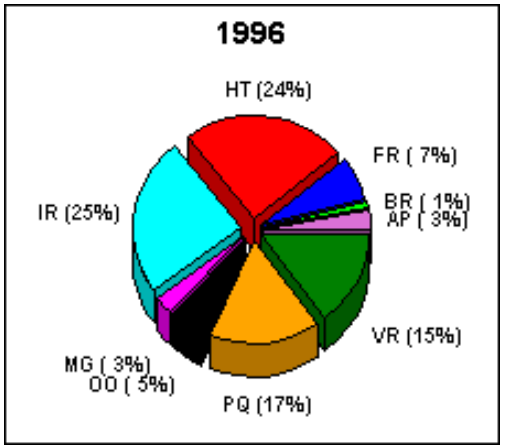
Source: Information Systems for Biotechnology (7 Jan 06)
http://www.isb.vt.edu/

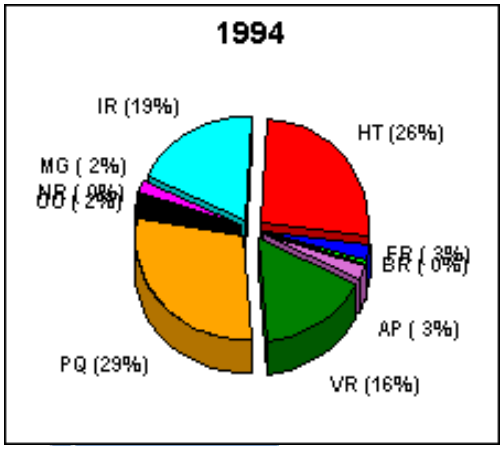


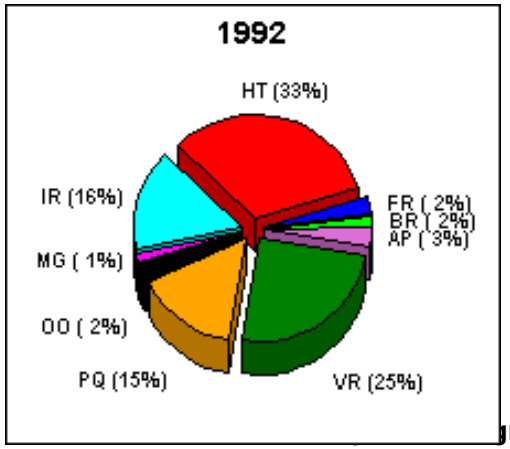


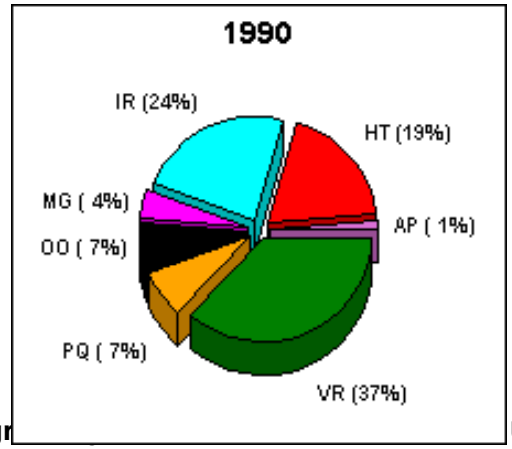


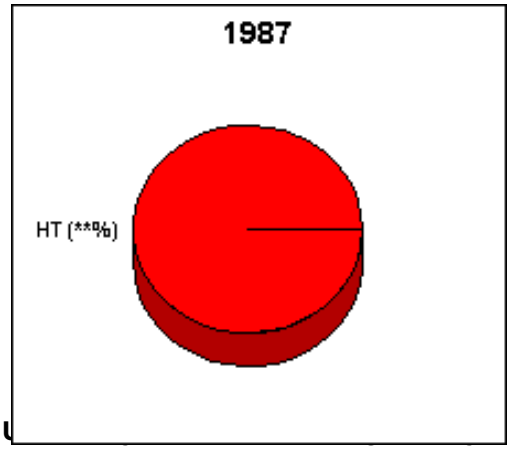




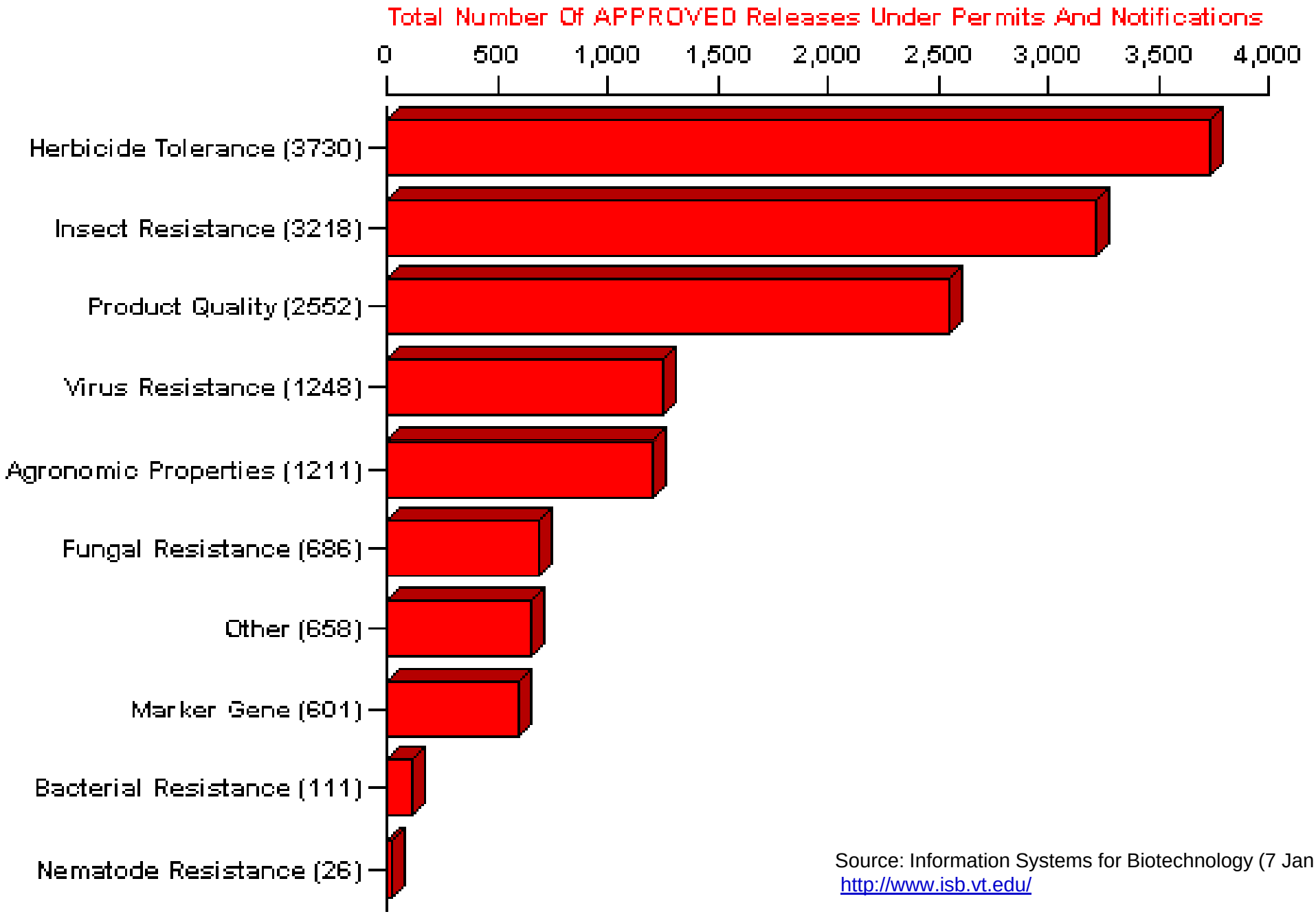






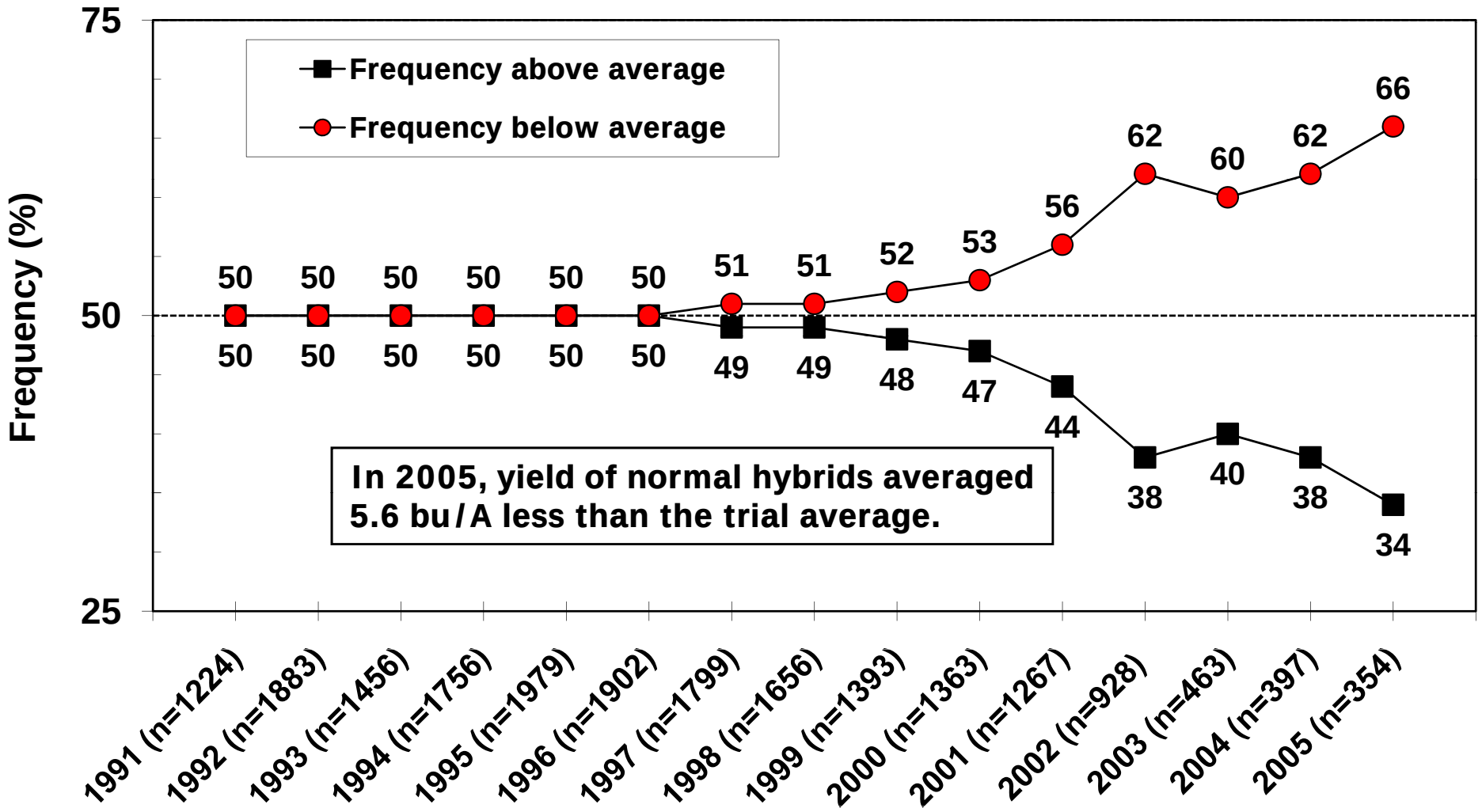


APPROVED Releases By Phenotype Category

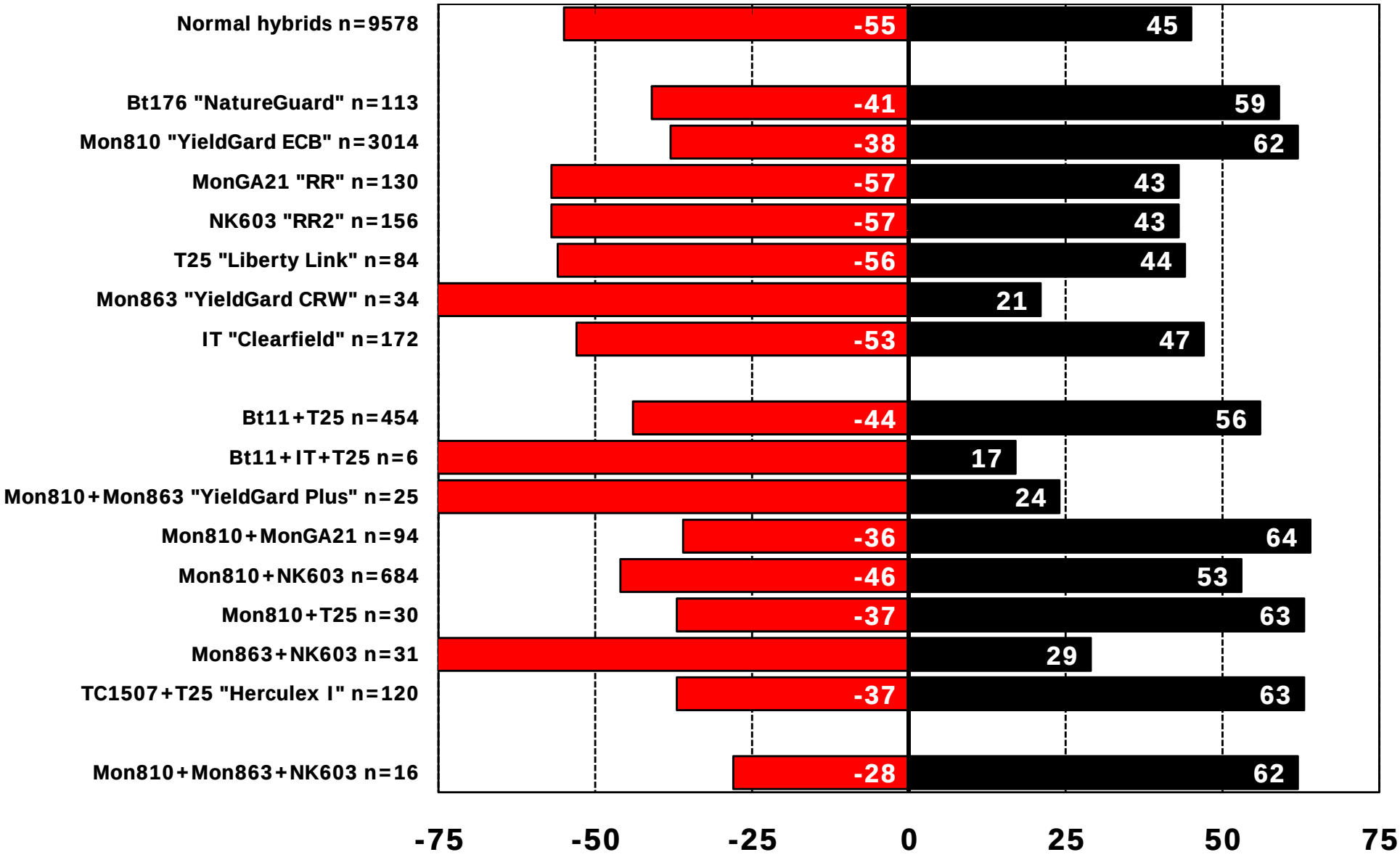


Source: Information Systems for Biotechnology (7 Jan 06)
http://www.isb.vt.edu/

Frequency of 'Normal' Corn Hybrids Yielding Above and Below the Trial Average in the UW Corn Trials



Frequency (%) of Transgenic Hybrids Yielding Above (+) and Below (-) the Trial Average (UW Corn Trials, 1997 to 2005)



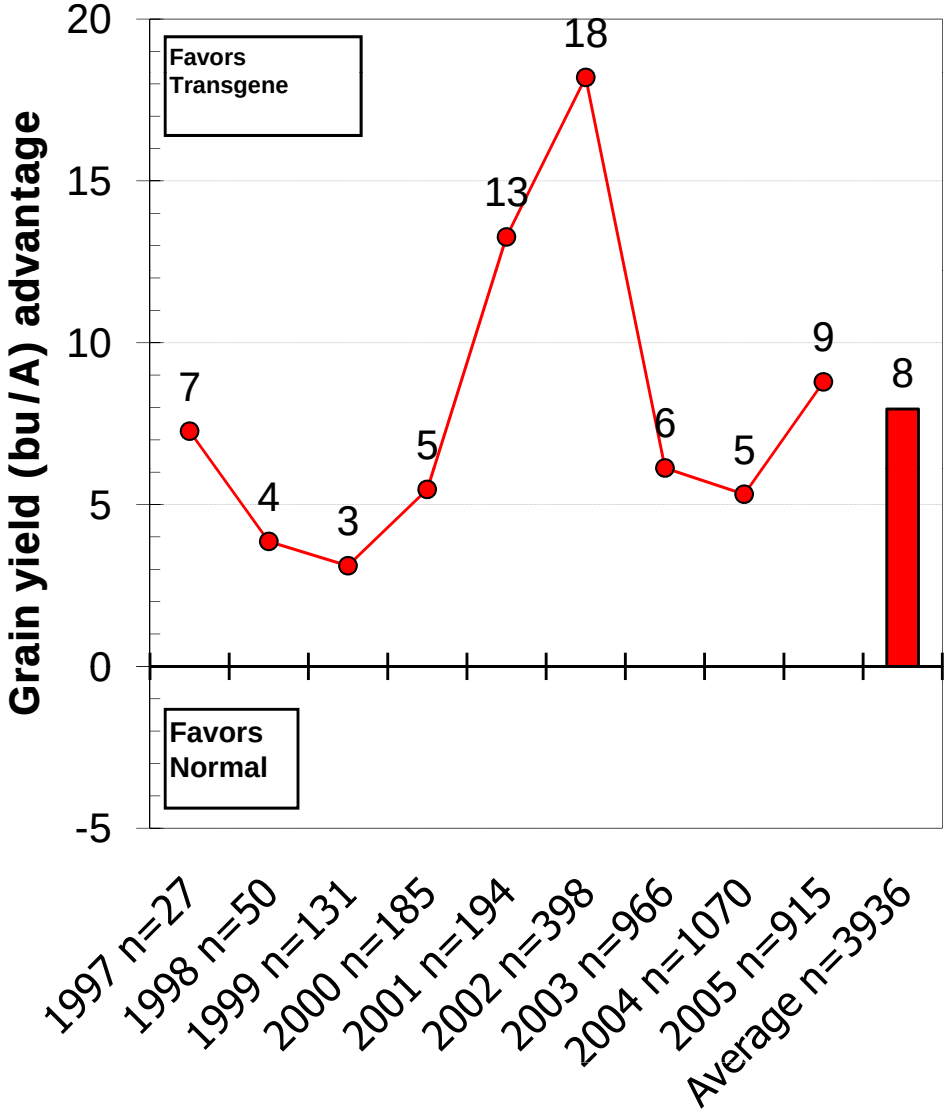
How much does it cost for corn seed technologies? Where is the breakeven point?

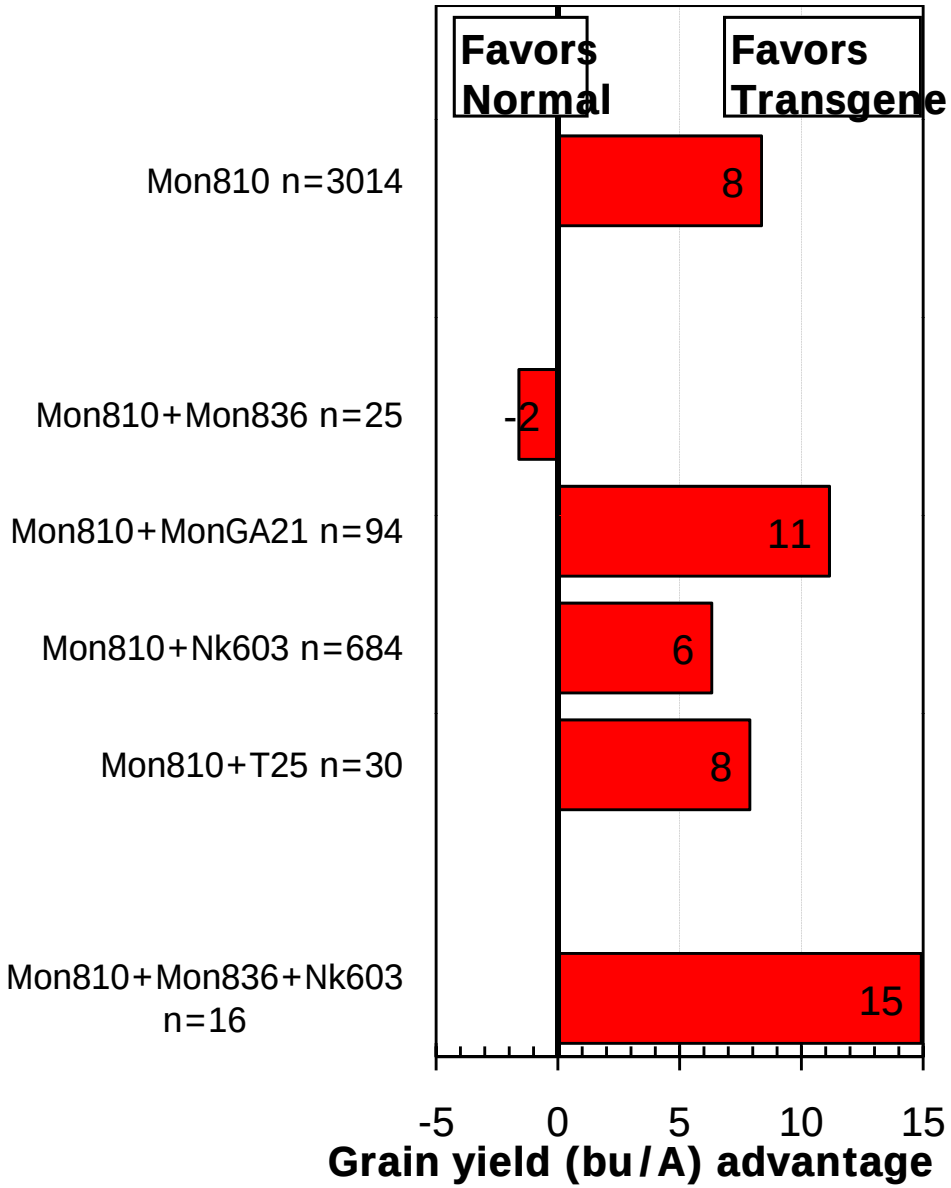
Cost ($/A) matrix of corn seed sold at a premium (i.e. technology fee)

Yield Increase (bu/A)	$20 Bag difference			$40 Bag difference			$60 Bag difference		
	Corn Price			Corn Price			Corn Price		
	$2.00	$2.50	$3.00	$2.00	$2.50	$3.00	$2.00	$2.50	$3.00
0	$-8	$-8	$-8	$-17	$-17	$-17	$-25	$-25	$-25
2	$-4	$-3	$-2	$-13	$-12	$-11	$-21	$-20	$-19
4	$-0	$2	$4	$-9	$-7	$-5	$-17	$-15	$-13
6	$4	$7	$10	$-5	$-2	$1	$-13	$-10	$-7
8	$8	$12	$16	$-1	$3	$7	$-9	$-5	$-1
10	$12	$17	$22	$3	$8	$13	$-5	$0	$5
12	$16	$22	$28	$7	$13	$19	$-1	$5	$11

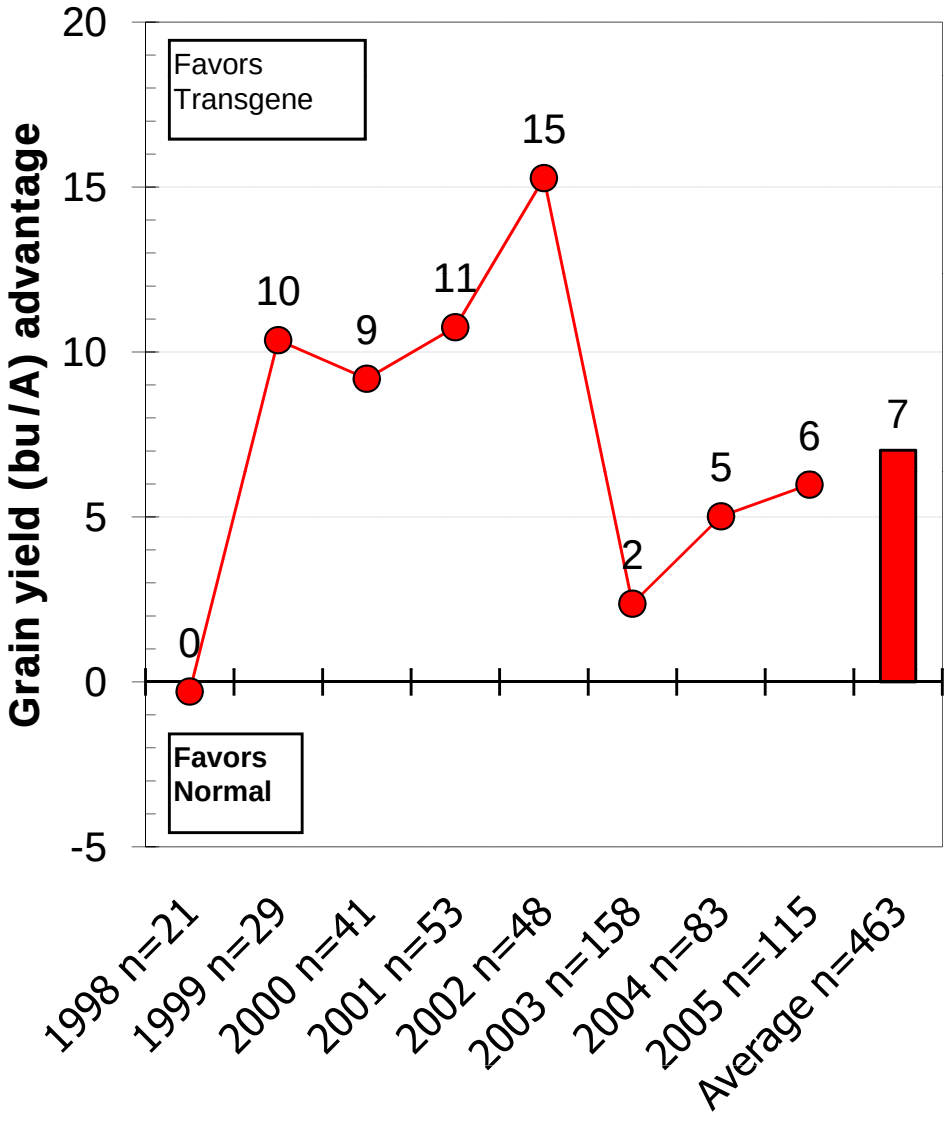
Assume: 80,000 seeds/bag planted at 33,000 seeds/A for final population of 30,000 plants/A

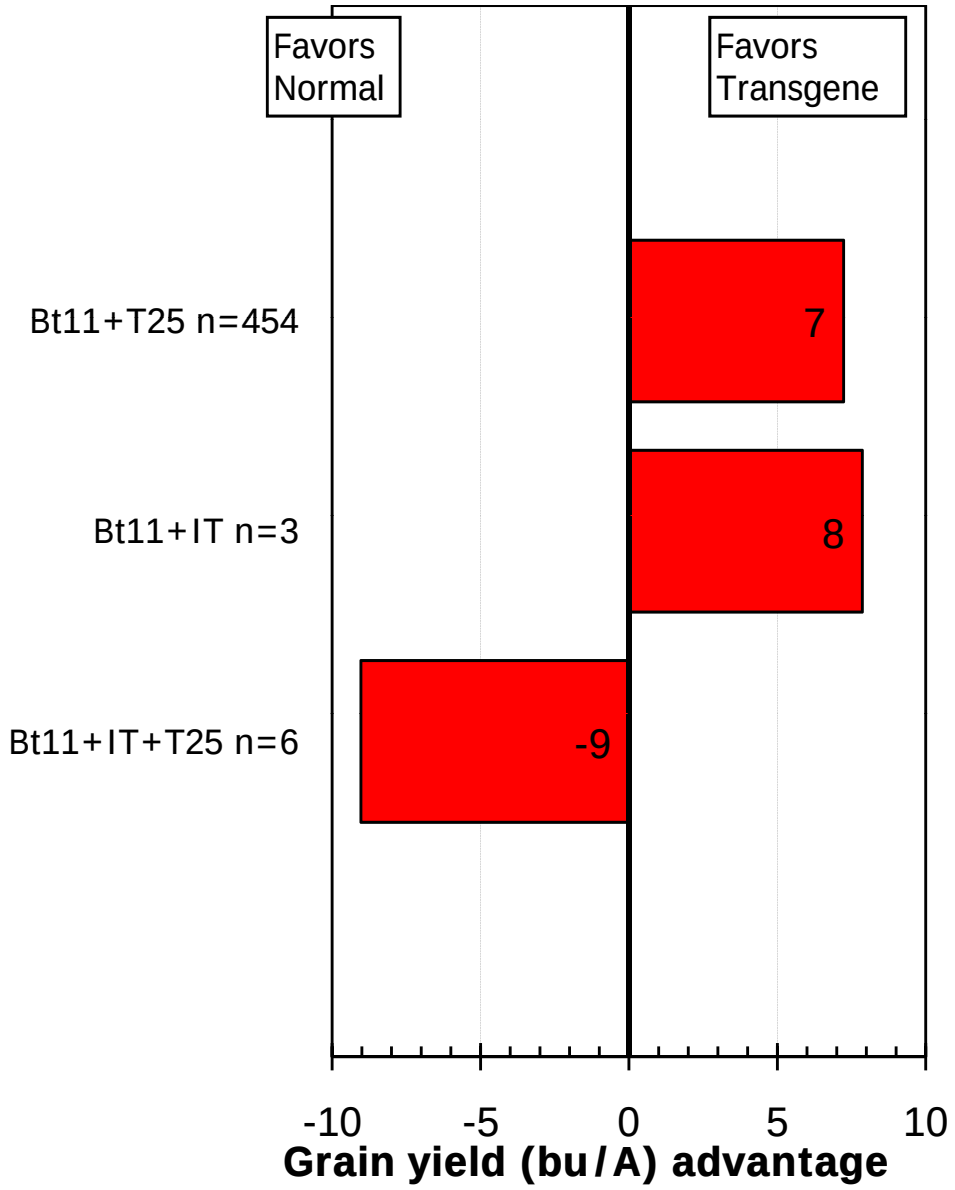
Hybrids with "YieldGard ECB" (Mon810) Compared to the Average of Normal Corn Hybrids (UW Trials, 1997 to 2005)



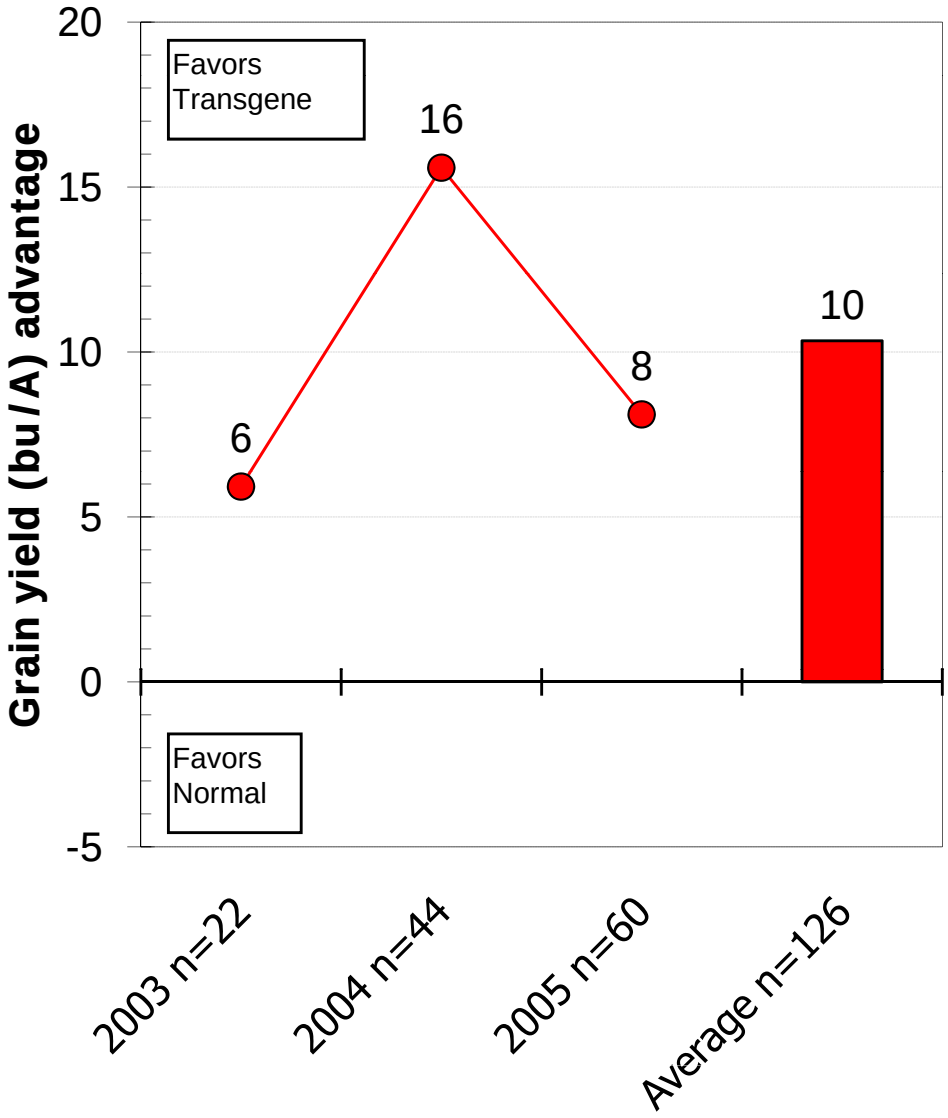


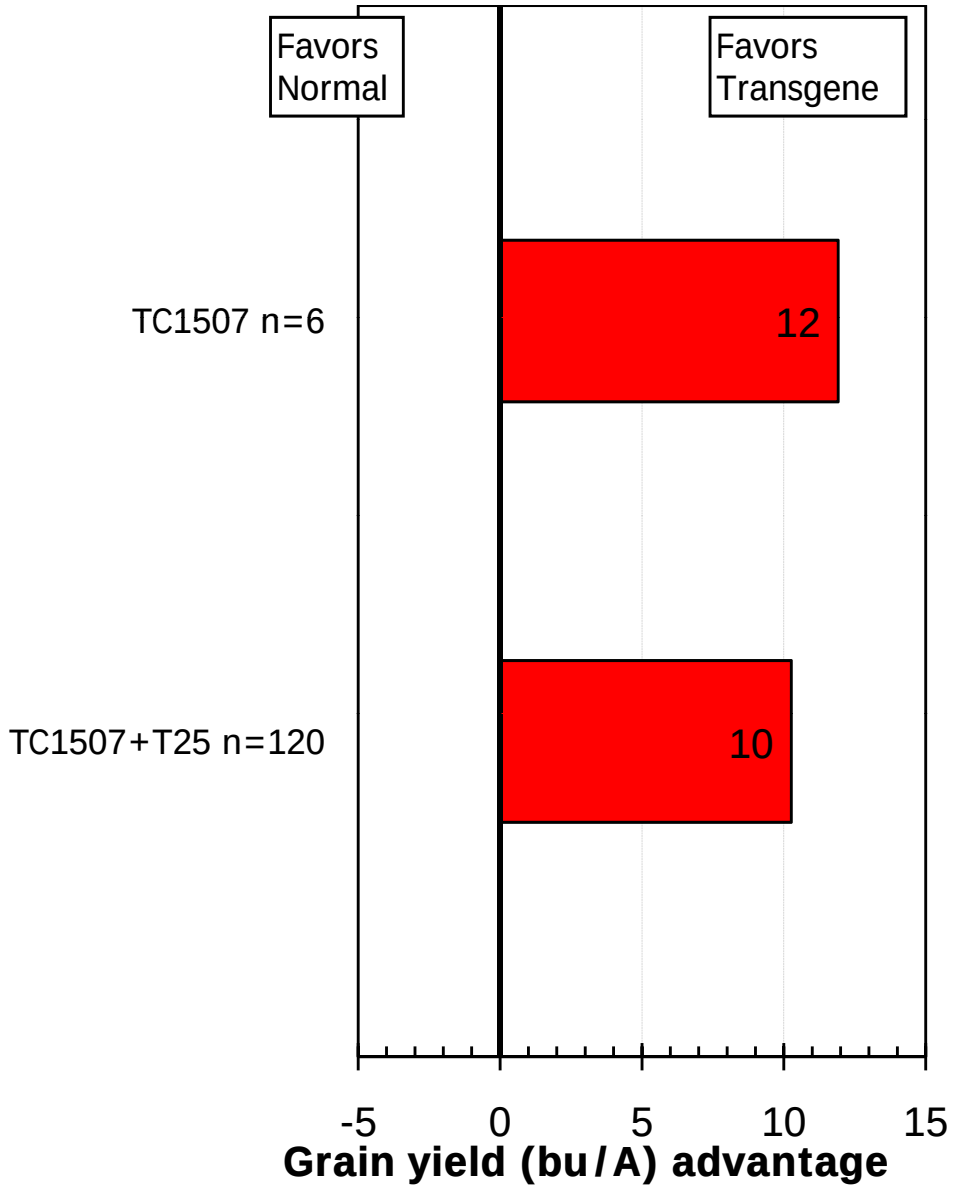
Hybrids with "YieldGard ECB" (Bt11) Compared to the Average of Normal Corn Hybrids (UW Trials, 1997 to 2005)



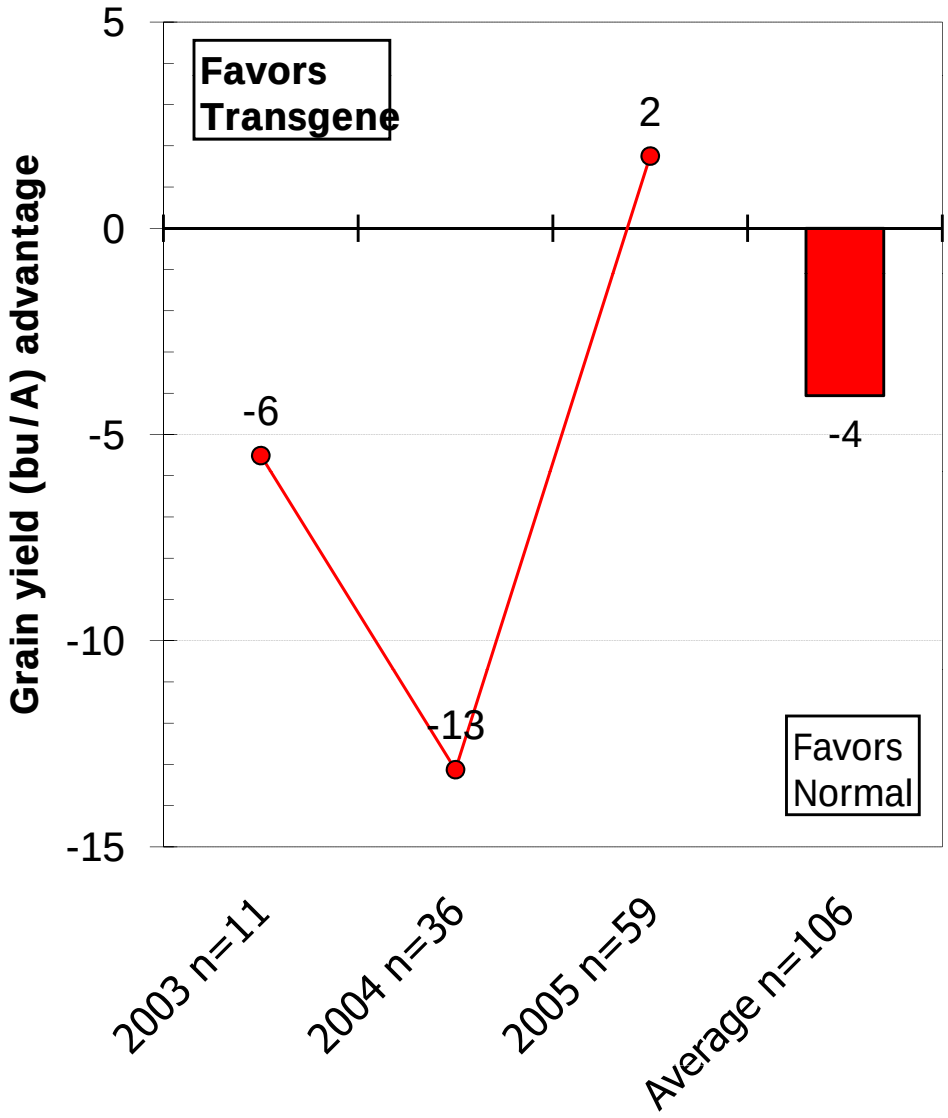


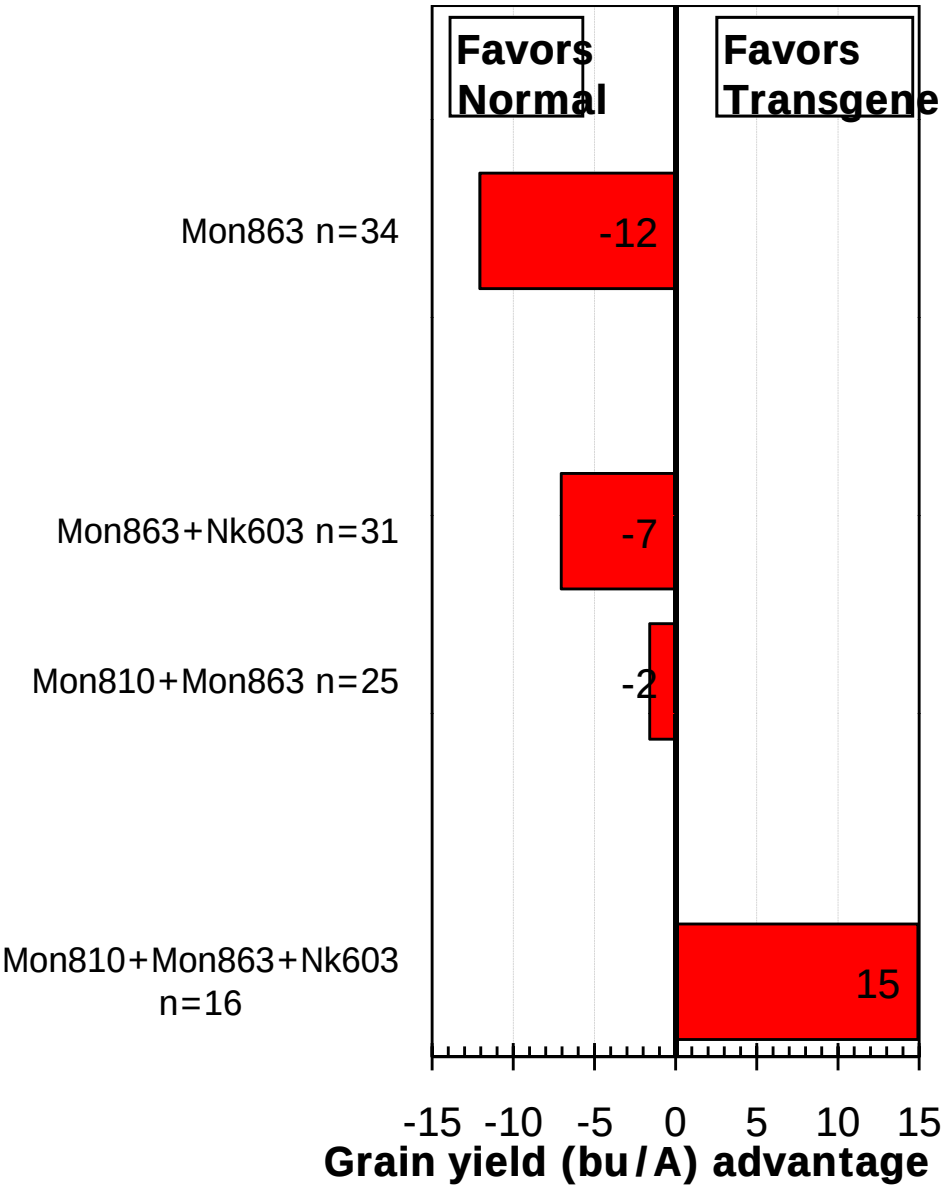
Hybrids with "Herculex I" (TC1507) Compared to the Average of Normal Corn Hybrids (UW Trials, 1997 to 2005)



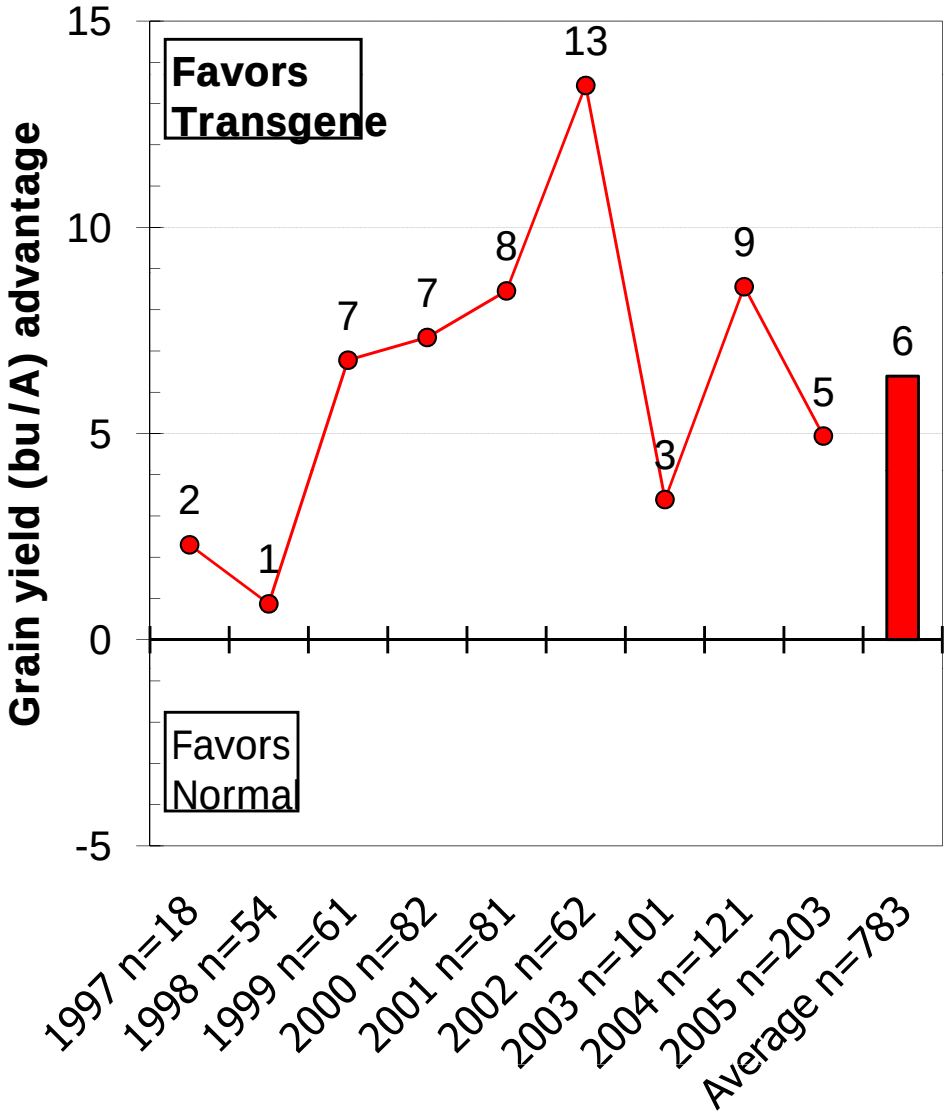


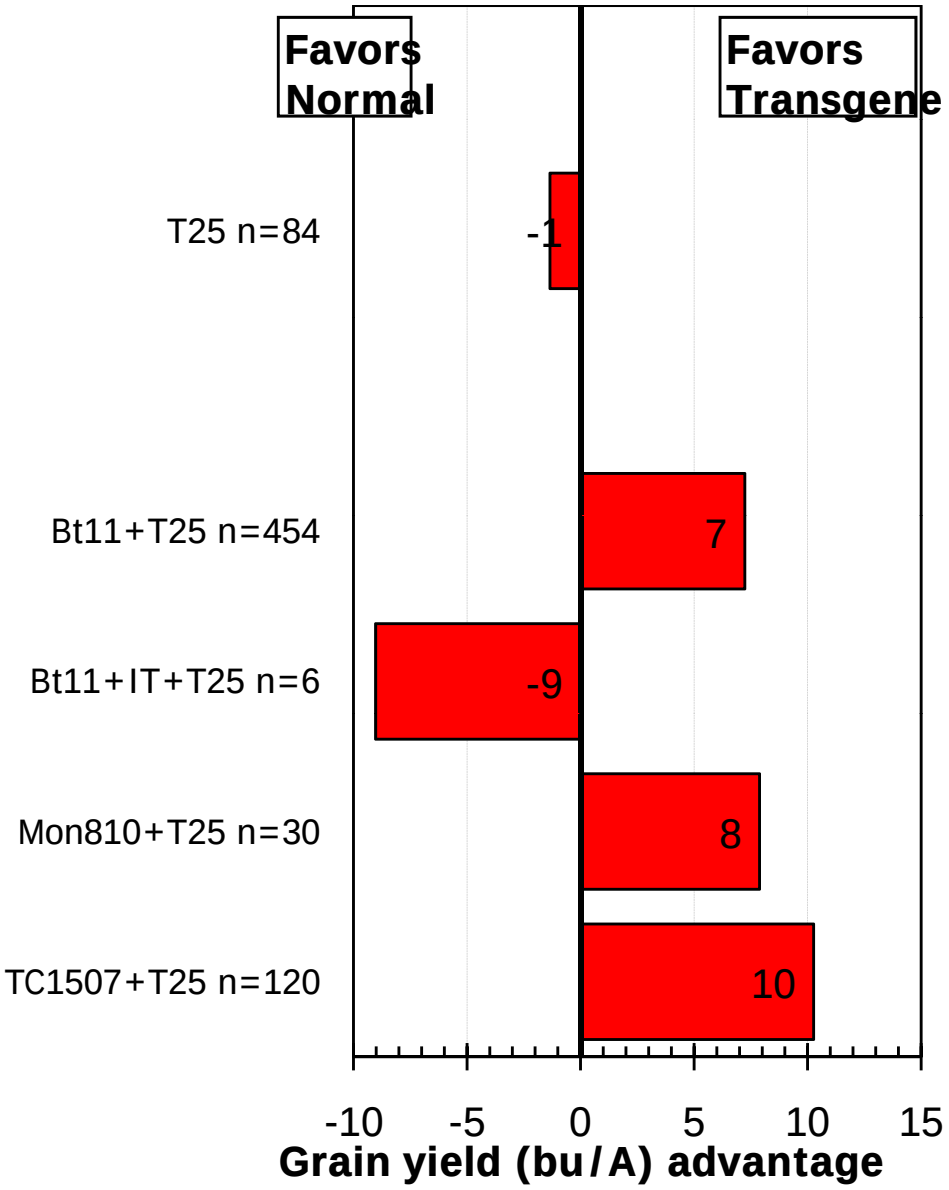
Hybrids with "YieldGard CRW" (Mon863) Compared to the Average of Normal Corn Hybrids (UW Trials, 1997 to 2005)



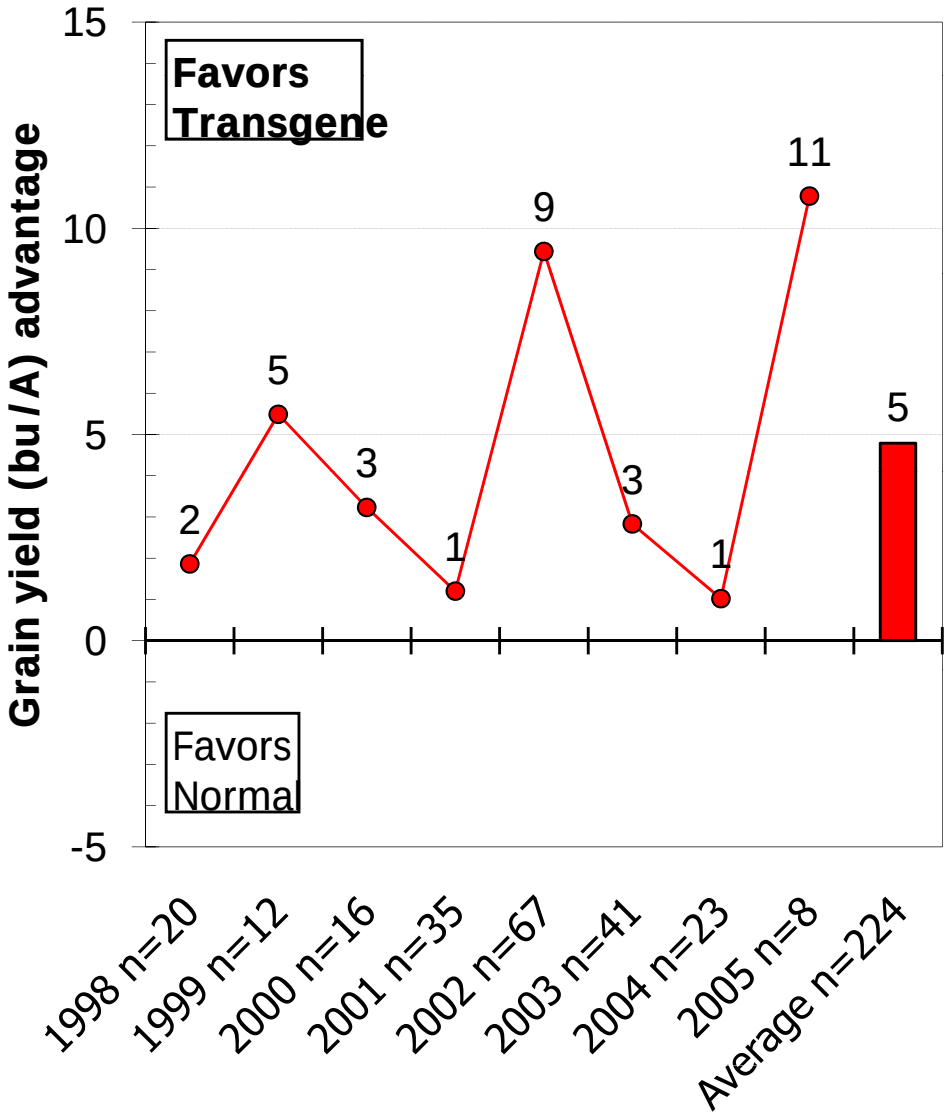


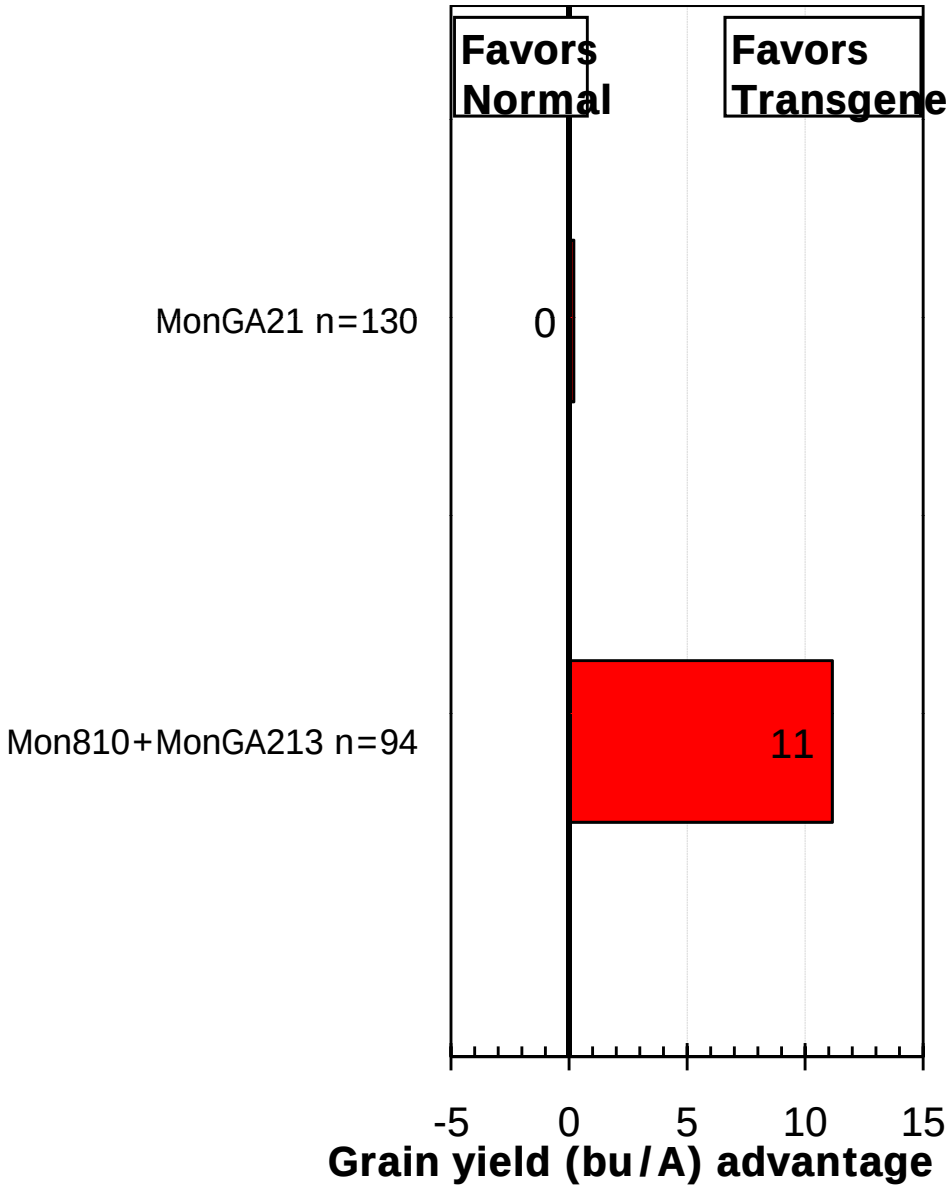
Hybrids with “Liberty Link” (T25) Compared to the Average of Normal Corn Hybrids (UW Trials, 1997 to 2005)



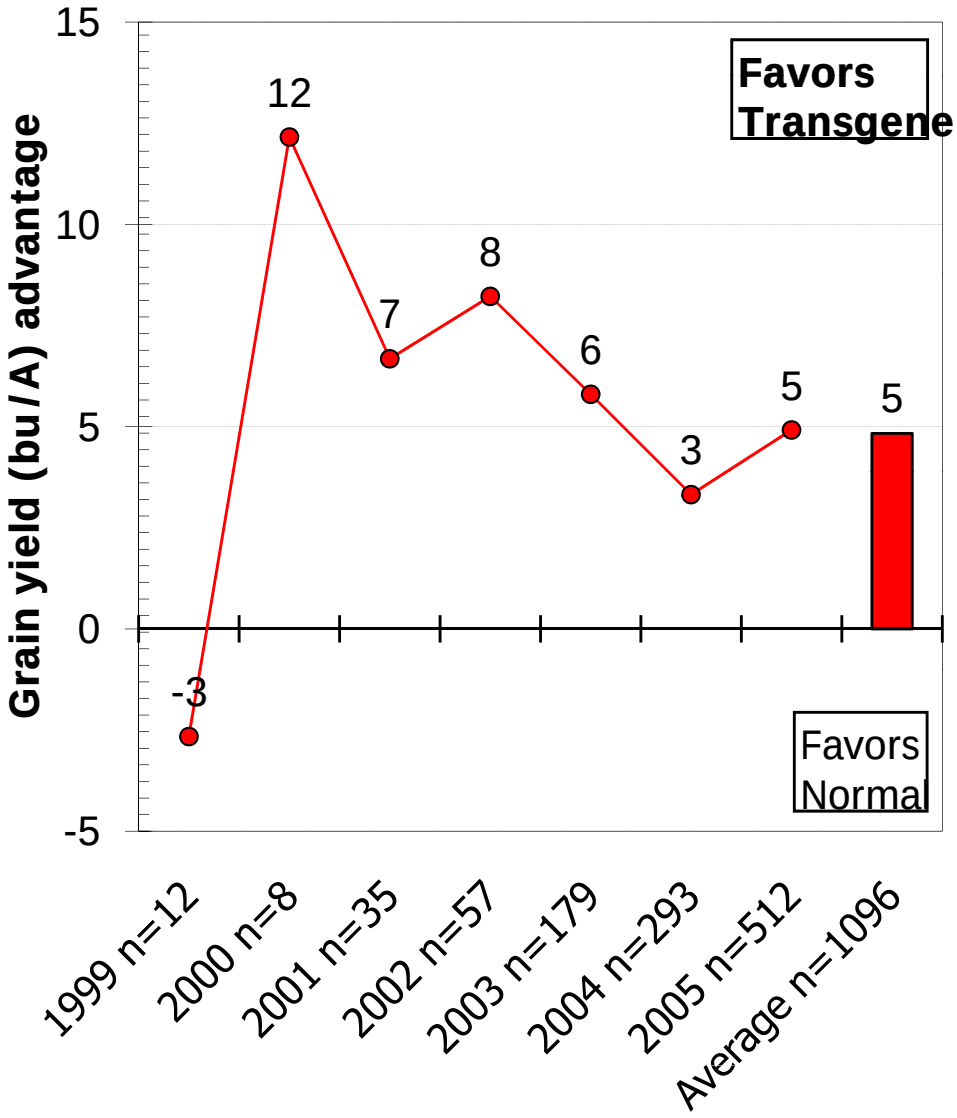


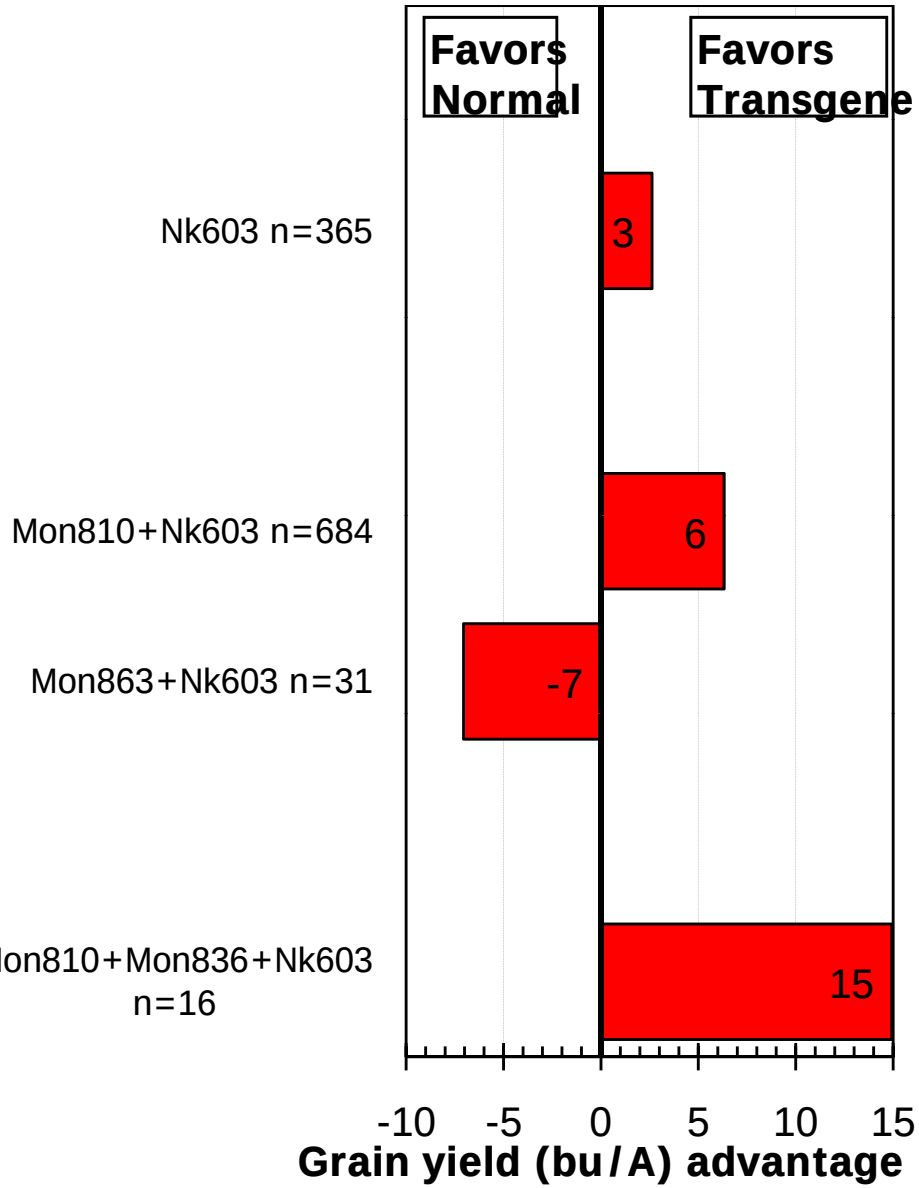
Hybrids with "Roundup Ready 1" (MonGA21) Compared to the Average of Normal Corn Hybrids (UW Trials, 1997 to 2005)



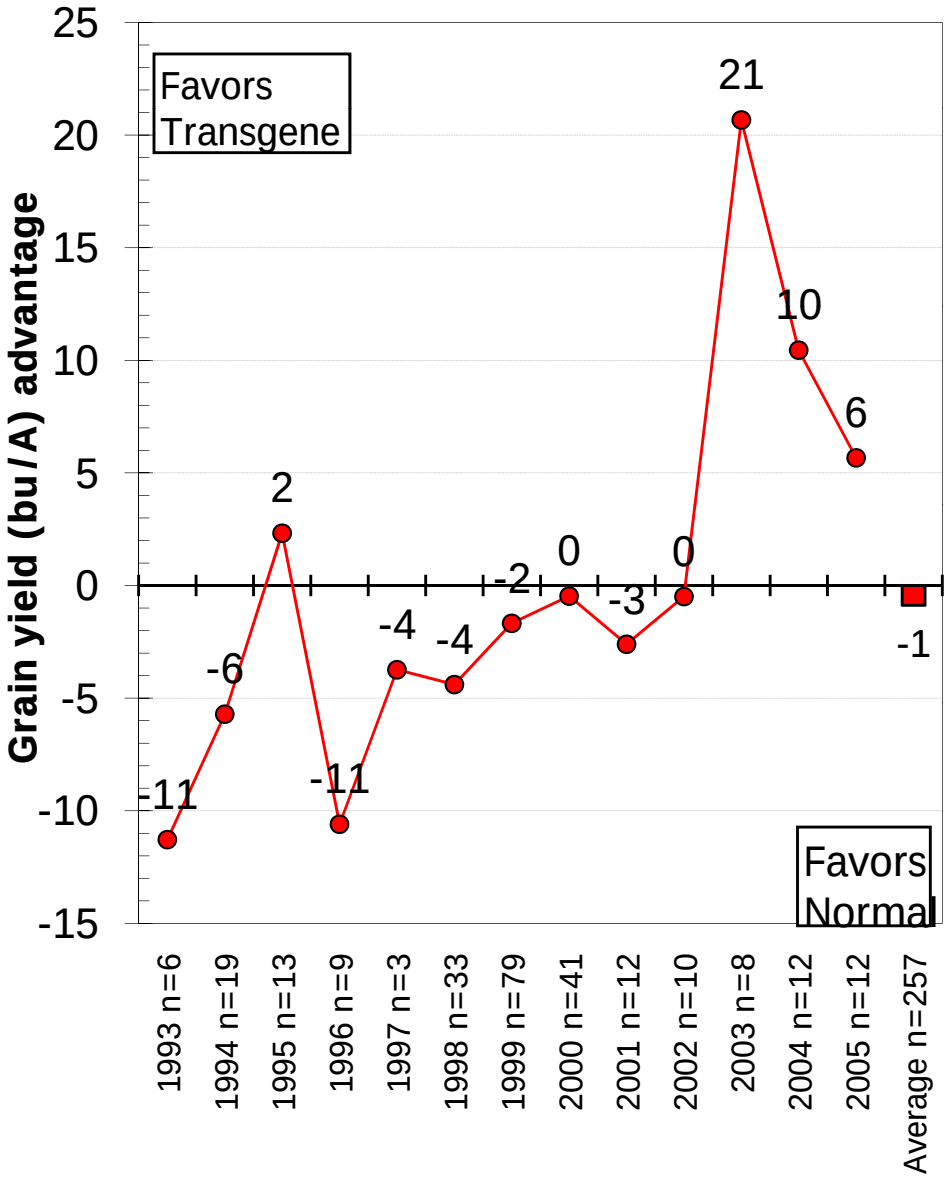


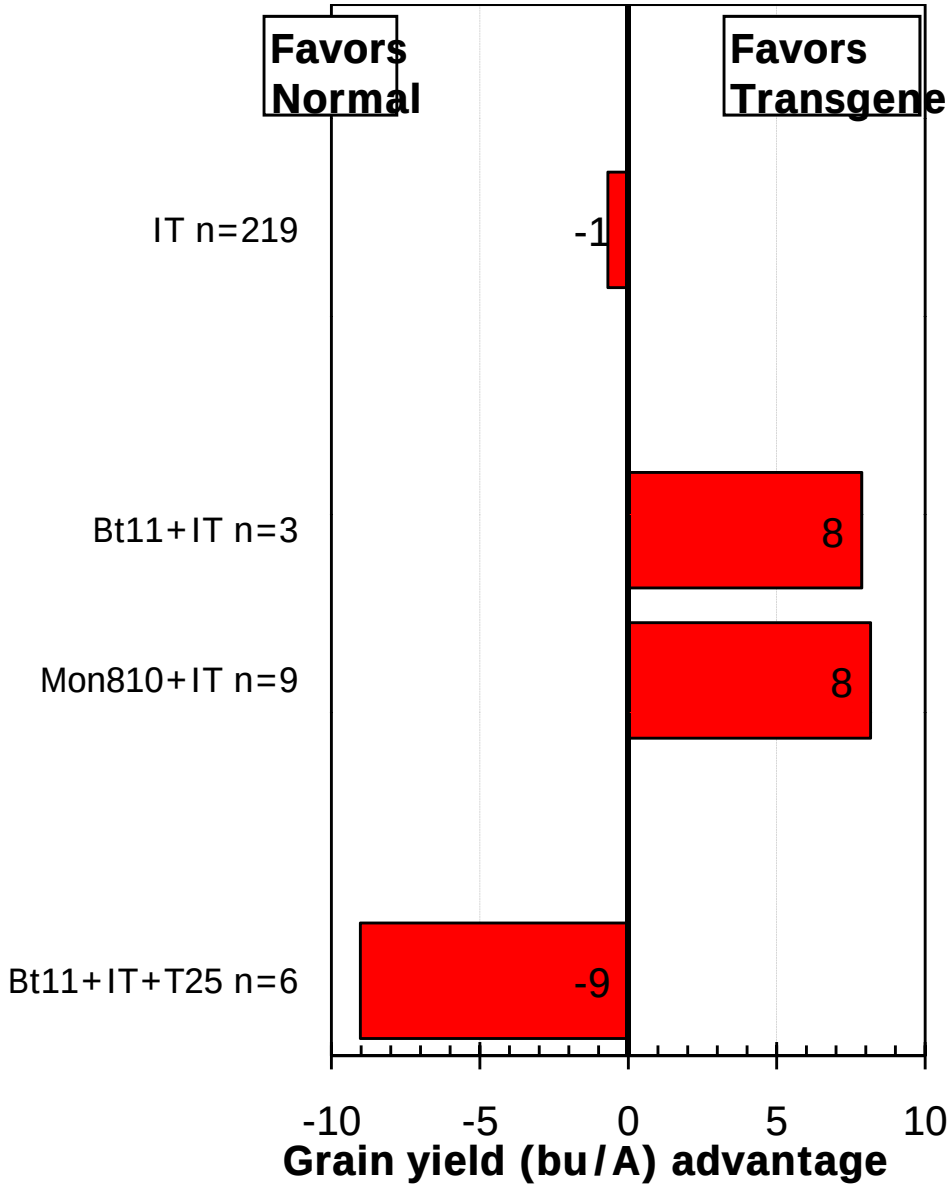
Hybrids with "Roundup Ready 2" (Nk603) Compared to the Average of Normal Corn Hybrids (UW Trials, 1997 to 2005)





Hybrids with “Clearfield” (IT) Compared to the Average of Normal Corn Hybrids (UW Trials, 1993 to 2005)





Relative Performance of Transgenic Hybrids Compared to Normal Corn (1997 to 2005)

Brand	Transgene	N	Grain yield	Grain moisture	Lodging	GR $2.50	GR PEPS
			Bu/A	%	%	$/A	$/A
		Insect Resistant Hybrids					
Nature Guard	Bt176	113	5	1	-1	8	5
YieldGard ECB	Mon810	3014	8	0	0	16	13
YieldGard CRW	Mon863	34	-12	-1	0	-23	-19
		Herbicide Tolerant Hybrids					
Liberty Link	T25	84	-1	1	0	-6	-5
Roundup Ready	MonGA21	130	0	-1	-1	3	2
RR2	Nk603	365	3	0	0	6	5
Clearfield	IT	172	-1	0	0	0	0
		Double-Stack Hybrids					
	Mon810+MonGA21	94	11	0	-1	22	19
	Mon810+Nk603	684	6	0	0	13	9
YieldGard ECB	Bt11+T25	454	7	0	0	14	11
	Mon810+T25	30	8	0	-1	14	11
Herculex I	TC1507+T25	120	10	1	-1	18	13
YieldGard Plus	Mon810+Mon863	25	-2	0	-1	-2	-1
	Mon863+Nk603	31	-7	-1	-1	-11	-8
		Triple-Stack Hybrids					
	Mon810+Mon863+Nk603	16	15	0	2	30	21

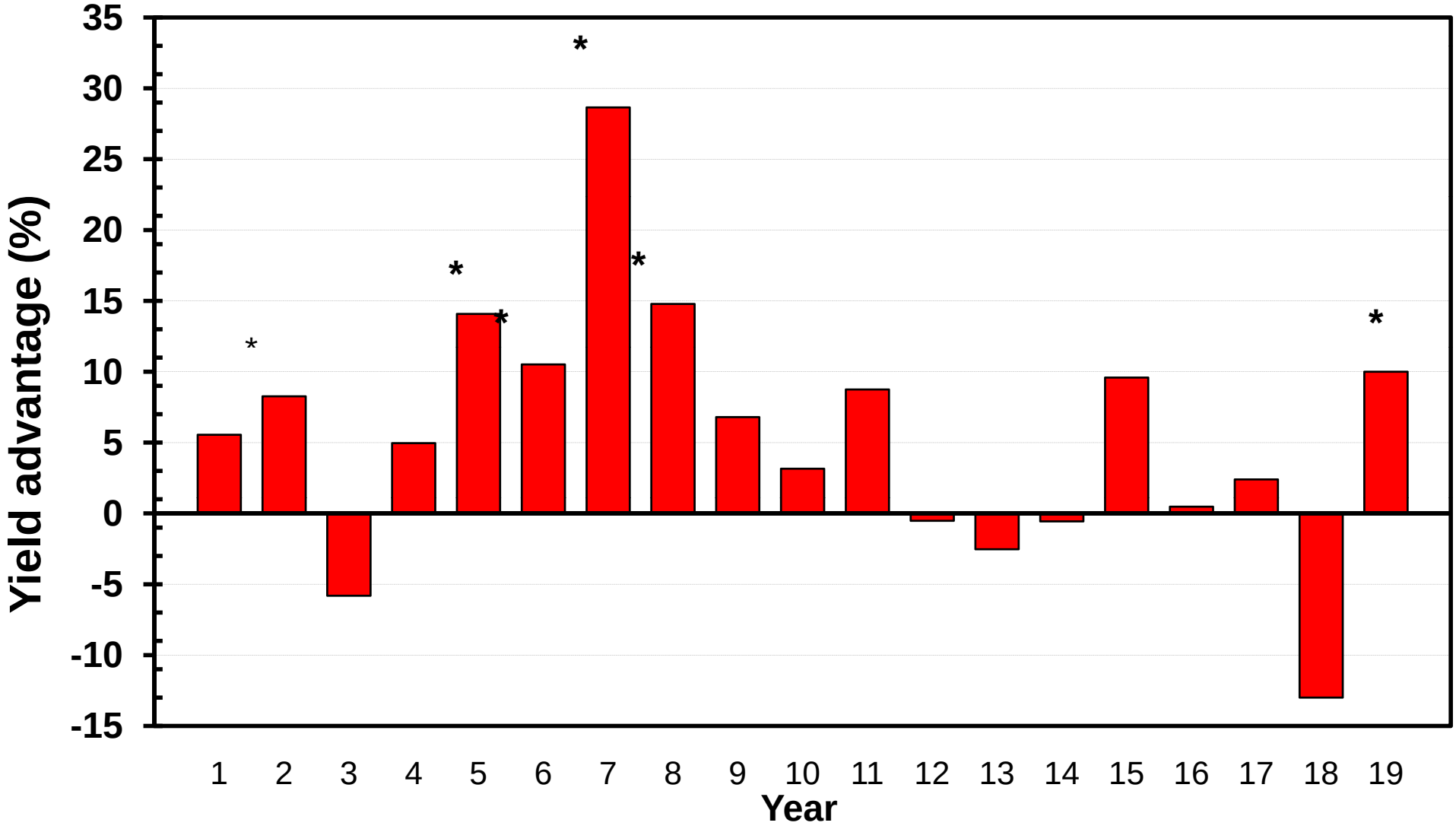
Summary

- **Care must be taken in selecting normal hybrids.**
- **Grain yield and grower return of Bt11, Mon810 and TC1507 corn hybrids is better than the trial average and normal hybrid average.**
  - ✓ Bt11, Mon810 and TC1507 stacked with T25, MonGA21 or Nk603 perform well.
- **At this time the single transgenes T25, MonGA21, and Nk603 (as well as IMI) do not add to yield or grower return.**
  - ✓ Recommended for problem fields or difficult management situations.
  - ✓ Bt(CRW) = Yield lag or drag
- **Pick hybrids based upon individual performance. DO NOT assume that performance is equivalent across a hybrid family or a hybrid's 'base' genetics.**
- **"Variation for grain yield exists among commercial transgenic hybrids sold in Wisconsin."**

Long-term tillage effects on soil structure and properties – What does it mean for corn yield?

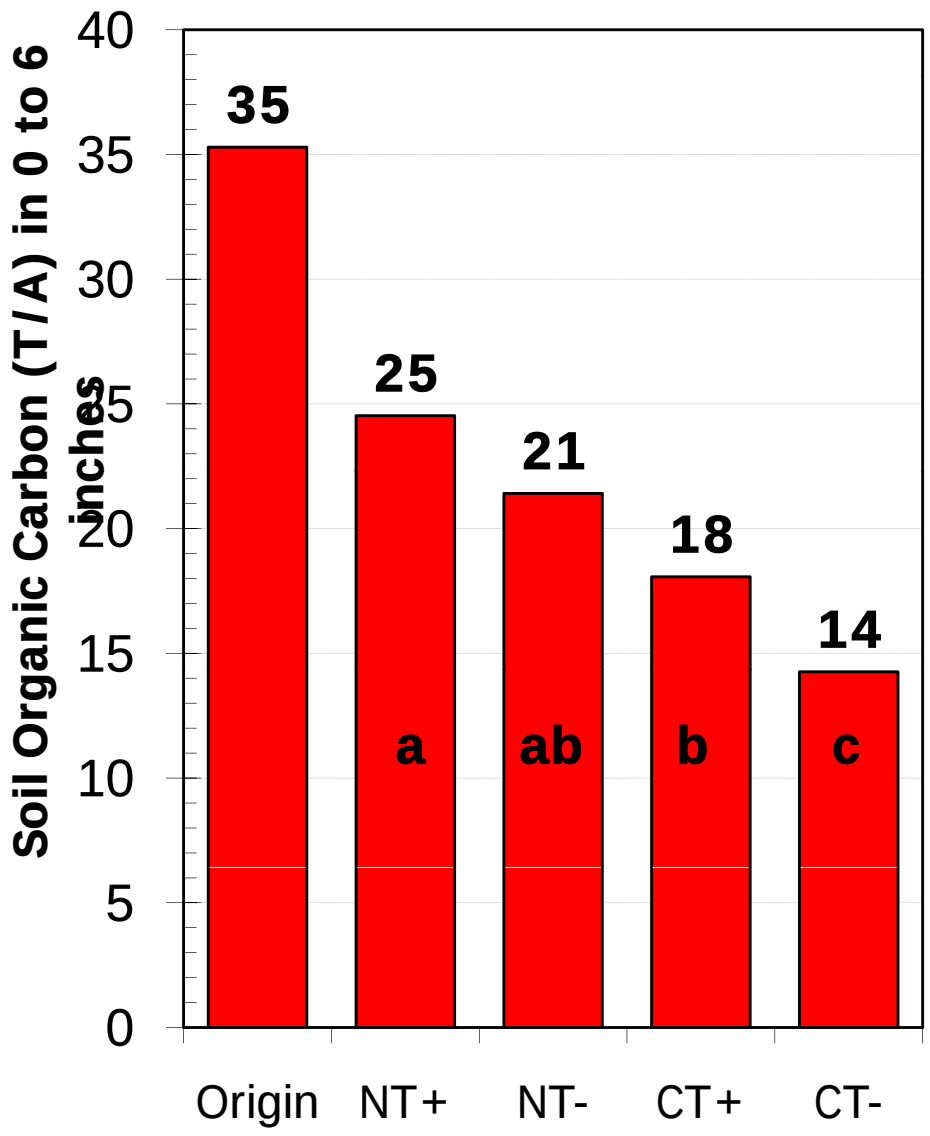
- **Soil properties affected by tillage**
  - ✓ Crop residue cover
  - ✓ Soil test measurements
  - ✓ Nutrient availability
  - ✓ Structure and aggregate stability
  - ✓ Water relationships
  - ✓ Temperature
  - ✓ Strength
- **Recent Trends**
  - ✓ Conversion from CT to NT
  - ✓ Corn residue removal

Yield advantage of chisel plow tillage over no-till 1986-2004 ("Long" Rotation trial, n= 7448 plots)



Long-Term Effects of Tillage and Corn Residue Removal
(Hooker et al., 2005 in *Soil Science Society of America Journal* 69:188)

- **28 yr experiment conducted in Connecticut**
- **Origin: adjacent forest soil**
- **Tillage treatments**
  - ✓ Conventional tillage (CT)
  - ✓ No till (NT)
- **Residue treatments**
  - ✓ Removed (-): Silage
  - ✓ Returned (+): Grain
- **Conclusions:**
  - ✓ SOC decreased in CT with residue removed.
  - ✓ SOC not decreased in NT with residue removal



Thanks for your attention!
Questions?

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