



# Estimating Corn Hybrid Silage Performance Using Milk 2000



# What Do We Want in Grain versus Silage Hybrids?

Trait	Grain	Silage
Grain yield	High	Adequate
Forage yield	Adequate	High
Hybrid range	60 bu/A	8,000 lb Milk/A
Stalks	Standability	Digestibility
Leaves	Unknown	Digestibility
Kernel hardness	Hard	Soft
Plant drydown	“Stay-green”	Synchronous
Plant maturity	“Full-season”	5-10 d longer

# Corn Silage

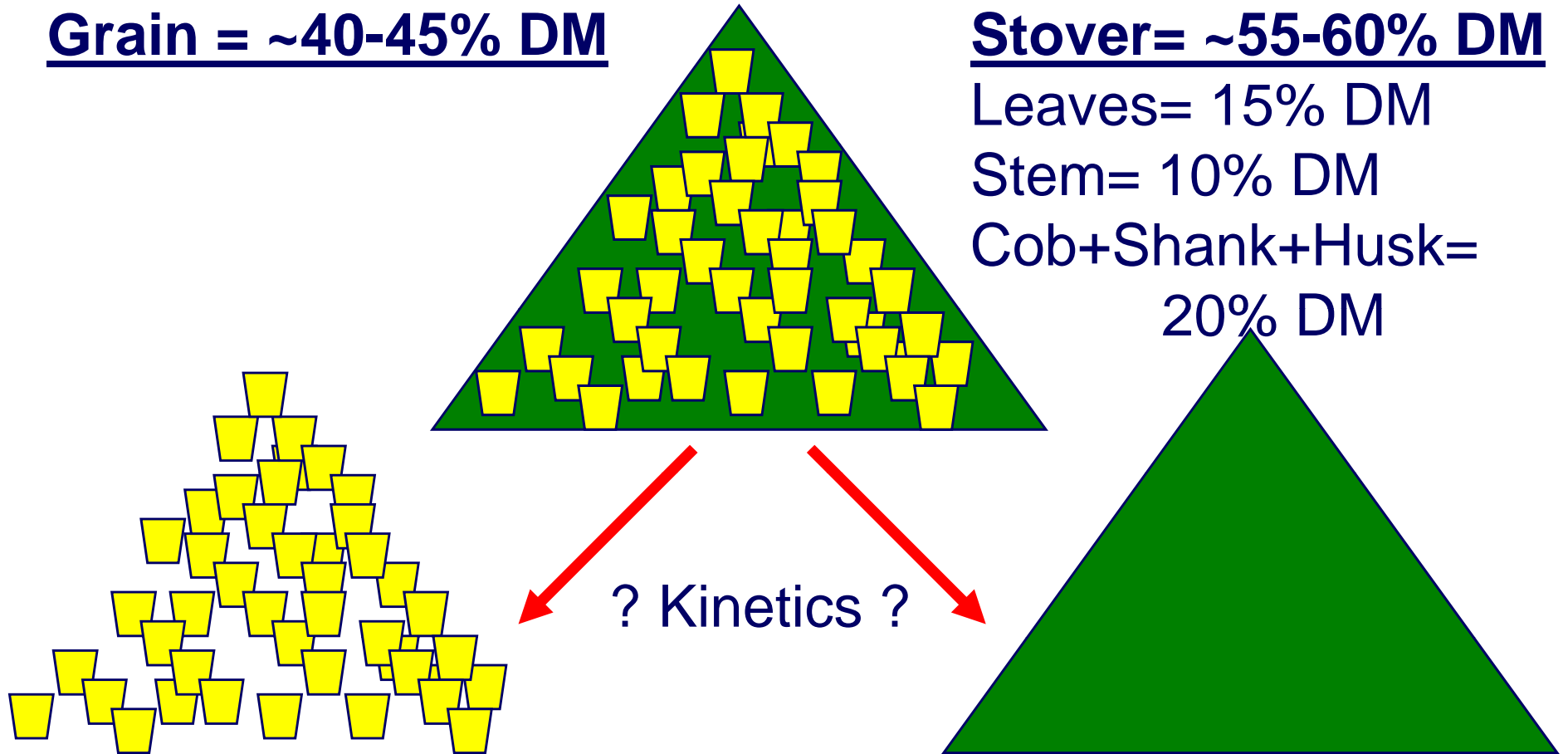
Grain = ~40-45% DM

Stover = ~55-60% DM

Leaves = 15% DM

Stem = 10% DM

Cob+Shank+Husk =  
20% DM



80 to 100% digestible

- Kernel maturity
- Starch digestibility

40 to 55% digestible

- Cell wall digestibility



# Yield and Digestibility of Corn Plant Parts

Tissue	Percent Yield	Digestibility (%)
Leaf blades	11	73
Leaf sheaths	4	63
Stalk+tassel	19	60
Cob+husk+shank	22	72
Kernels	<u>44</u>	<u>94</u>
Whole plant	100	71

*Adapted from Deinum and Struik, 1989*



# Calculating Milk per Ton

## (Milk per Acre = Yield x Milk per Ton)

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### Milk1991

- Dry matter intake estimated using NDF
- Net energy of lactation (Mcal/lb) estimated using ADF

### Milk1995

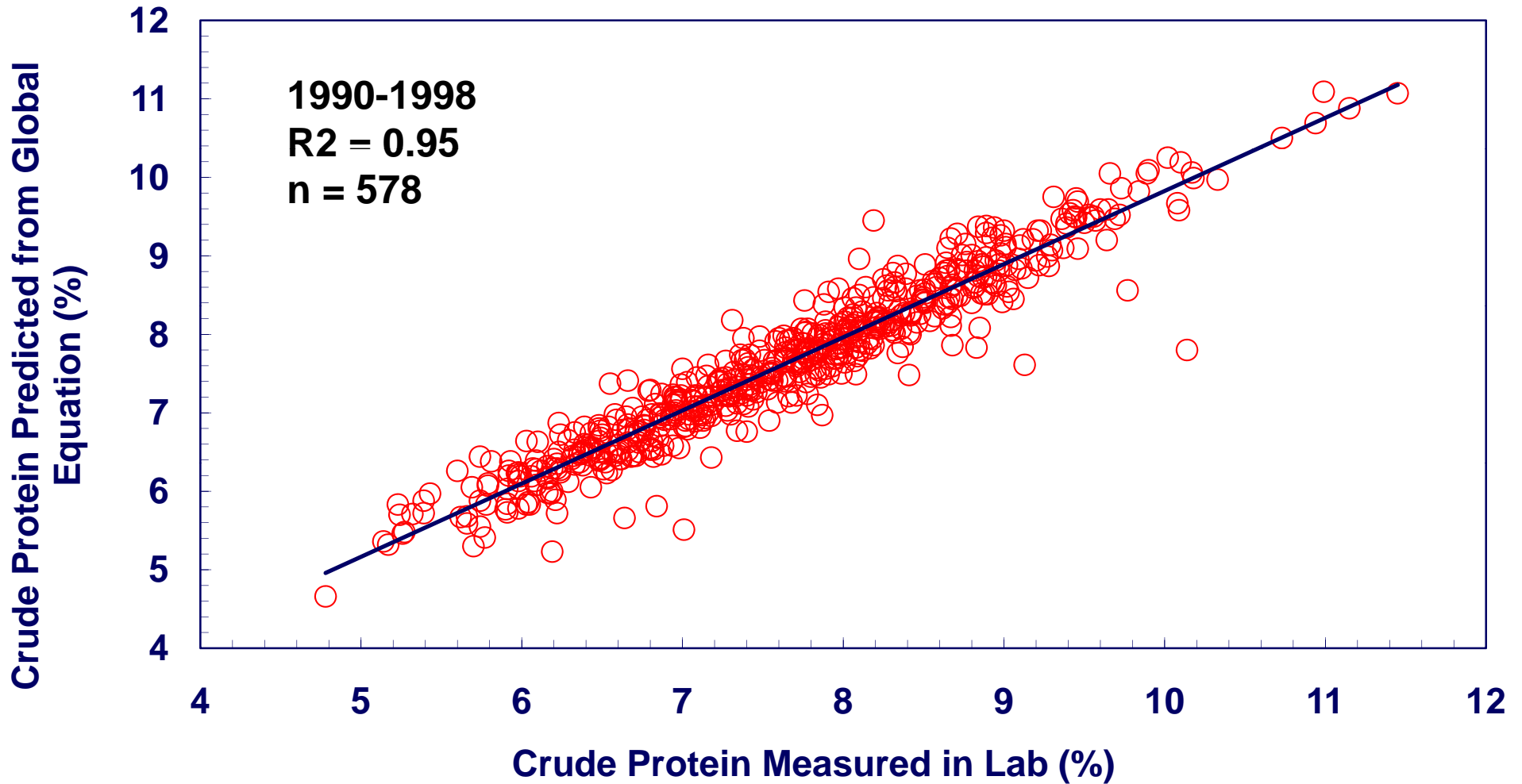
- Dry matter intake estimated using NDF
- Net energy of lactation (Mcal/lb) estimated using IVD

### Milk2000

- Dry matter intake estimated using NDF and Cell wall digestibility
  - ✓ Base dry matter intake adjusted 0.374 lb. per 1% unit change in CWD above or below the trial average CWD (Allen et al.)
- Starch digestibility is adjusted for dry matter content and kernel processing
- Net energy of lactation (Mcal/lb) estimated using multi-component summative equation approach



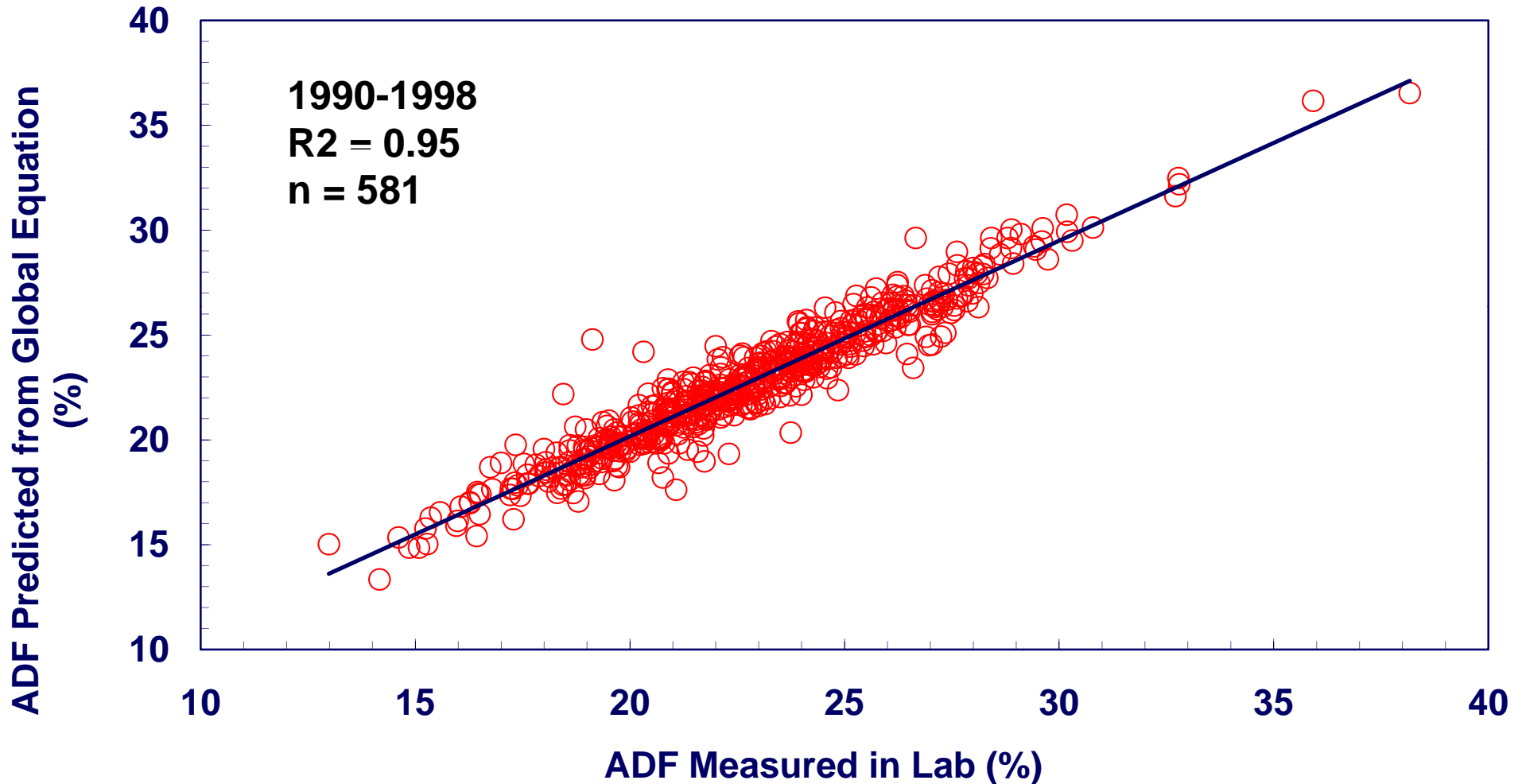
# NIRS Global Equation Calibration for Crude Protein (602 samples submitted)





# NIRS Global Equation Calibration for ADF

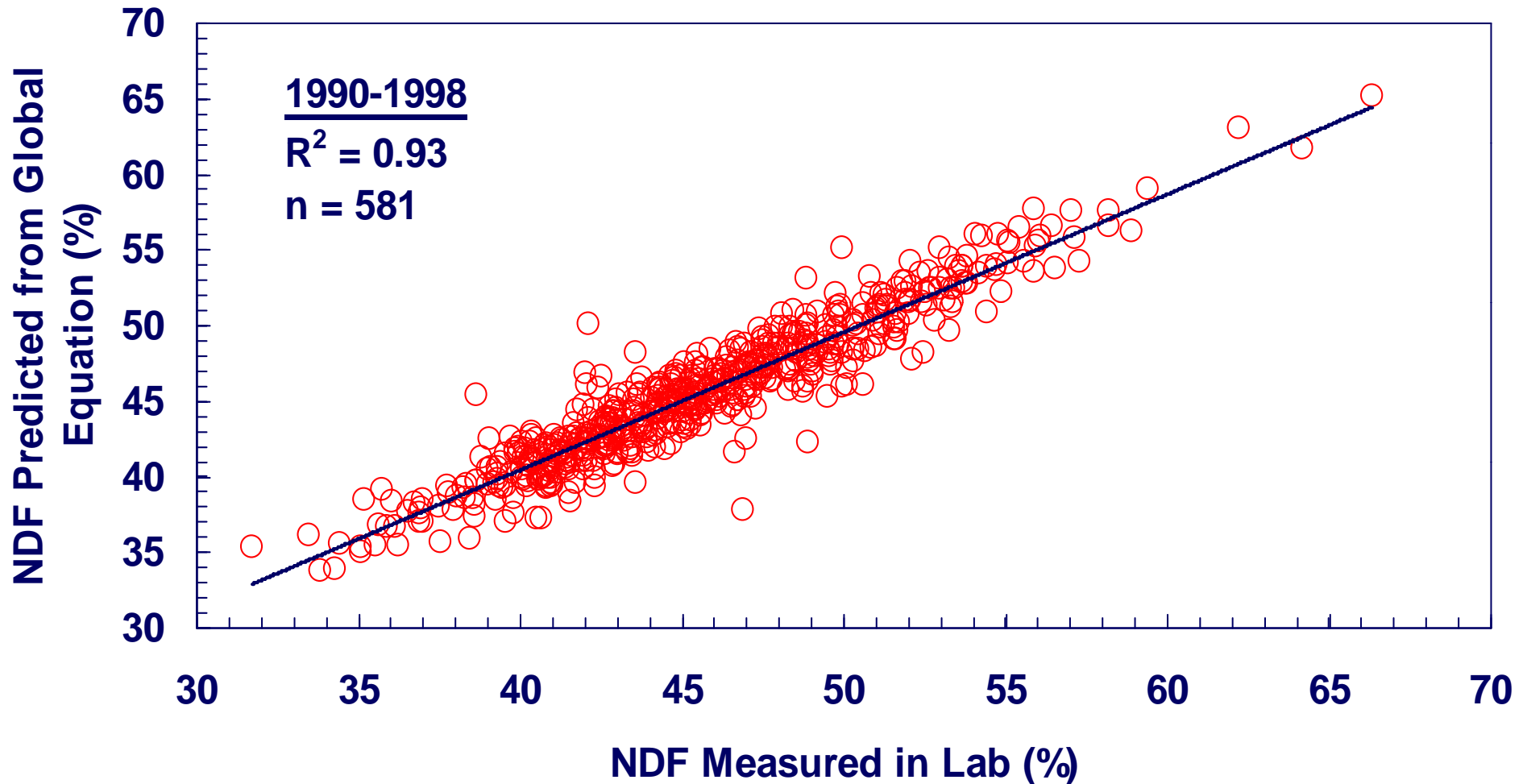
(602 samples submitted)





# NIRS Global Equation Calibration for NDF

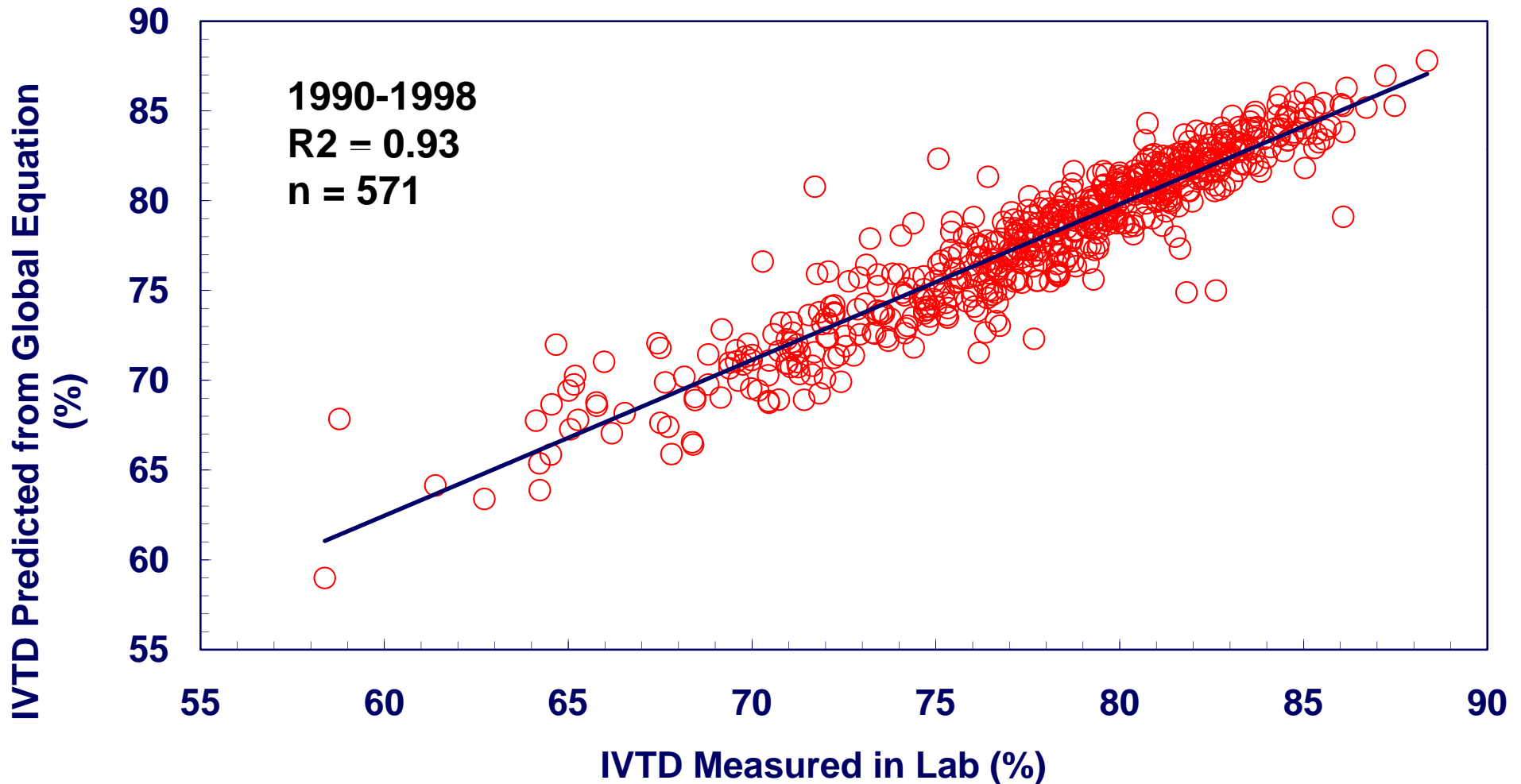
(602 samples submitted)





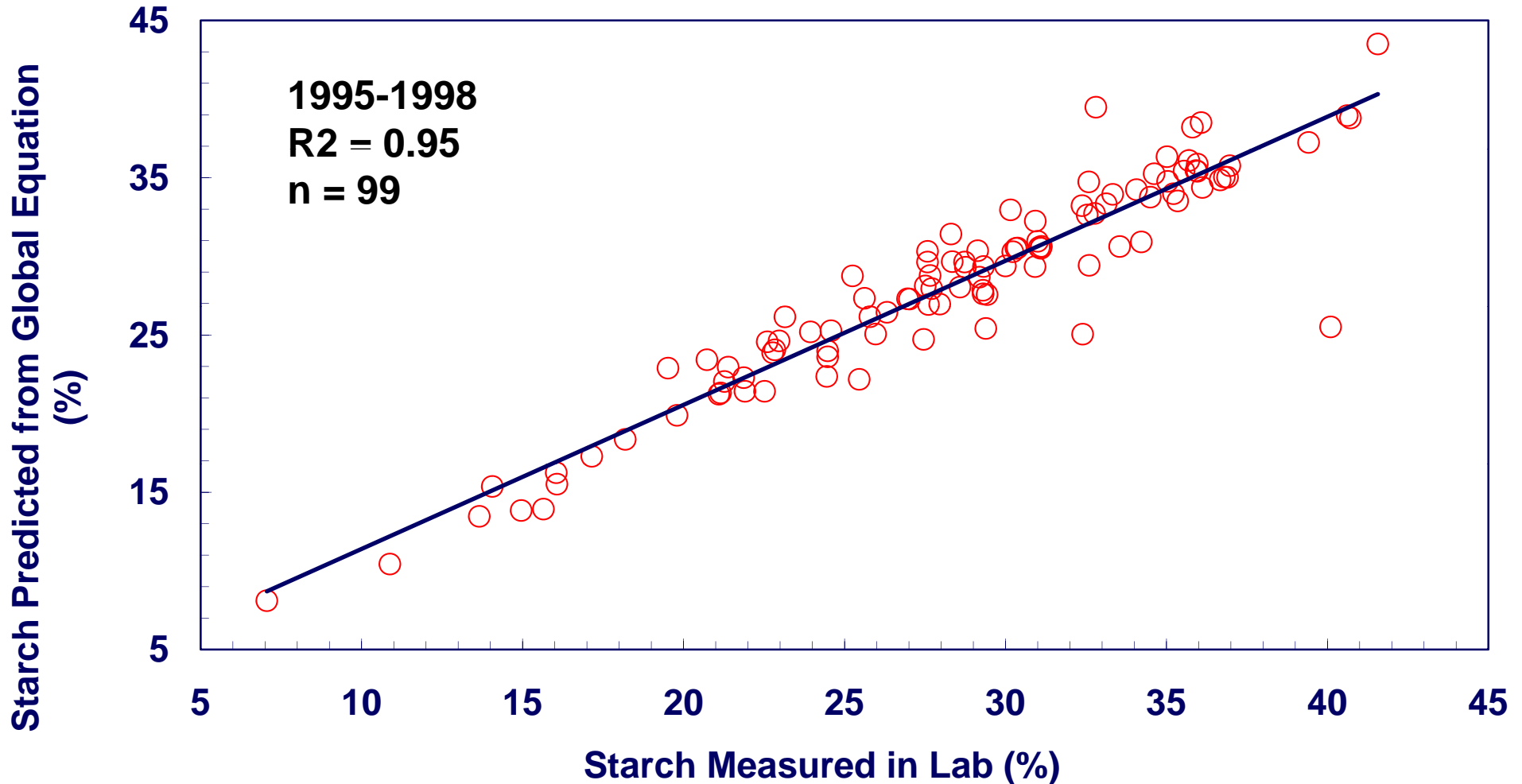


# NIRS Global Equation Calibration for *in vitro* True Digestibility (602 samples submitted)





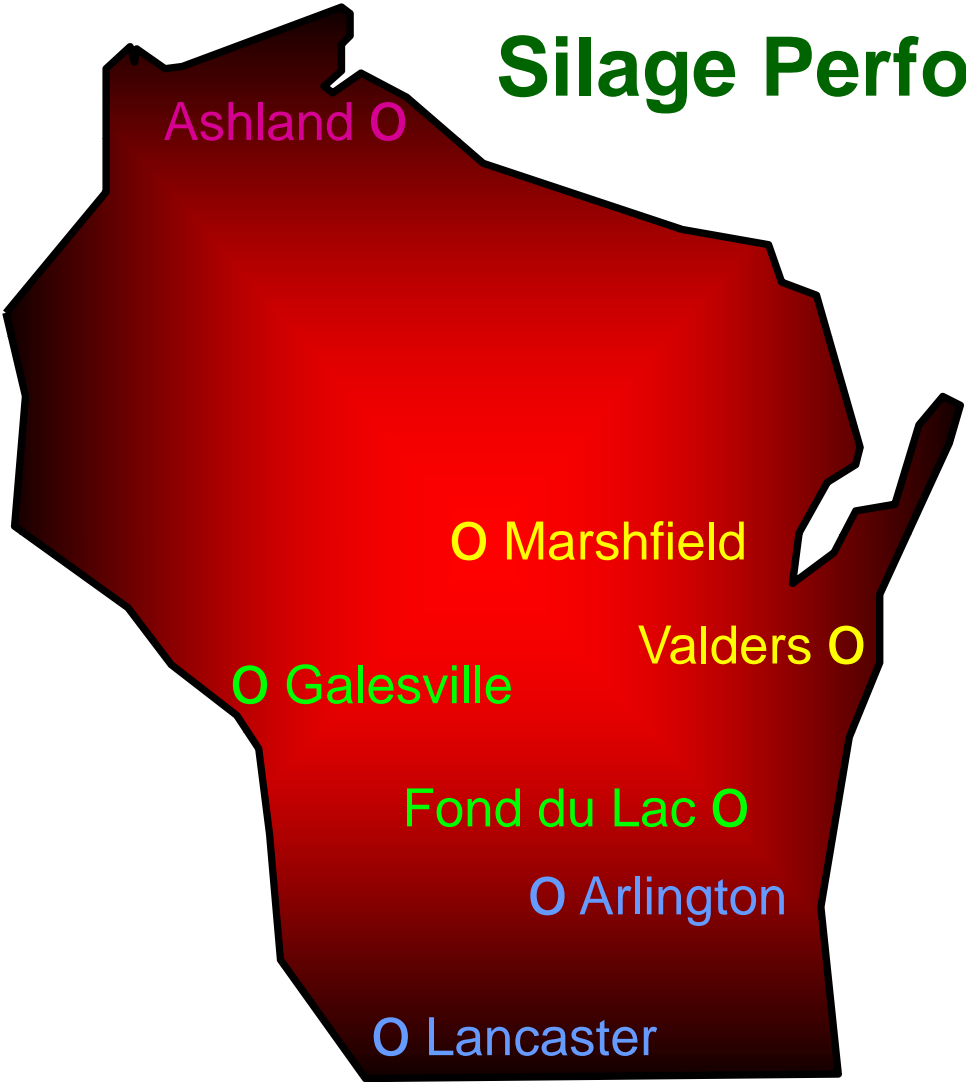
# NIRS Global Equation Calibration for Starch Content (104 samples submitted)



# University of Wisconsin Corn Hybrid Silage Performance Trials



# Wisconsin Corn Hybrid Silage Performance Trials





# 2000 Wisconsin Corn Performance Trials - Silage Summary

Location	1990-1999		2000		Percent Change
	N	Yield	N	Yield	
		T/A		T/A	
Arlington	388	9.3	66	9.1	- 2
Lancaster	311	7.7	66	7.8	+ 1
Fond du Lac	284	8.7	77	7.6	- 13
Galesville	284	8.0	77	8.0	+ 0
Marshfield	401	6.8	55	7.9	+ 16
Valders	328	7.1	55	7.6	+7
Ashland	109	6.7	16	5.5	- 18



# Wisconsin Corn Hybrid Silage Performance Trial Measurements

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- Agronomic

- ✓ Yield: Tons Dry matter / A
- ✓ Moisture: %
- ✓ Kernel milk stage: %

- Quality (NIR)

- ✓ Crude protein : %
- ✓ Acid detergent fiber: %
- ✓ Neutral detergent fiber: %
- ✓ *In vitro* true digestibility: %
- ✓ Cell wall digestibility: %
- ✓ Starch content: %

- Performance index

- ✓ Milk per ton: The amount of milk production from one ton of silage using the quality measures.

(Estimate is based on a standard cow body weight of 1350 pounds and milk production level of 90 pounds milk per day at 3.8 percent fat.)

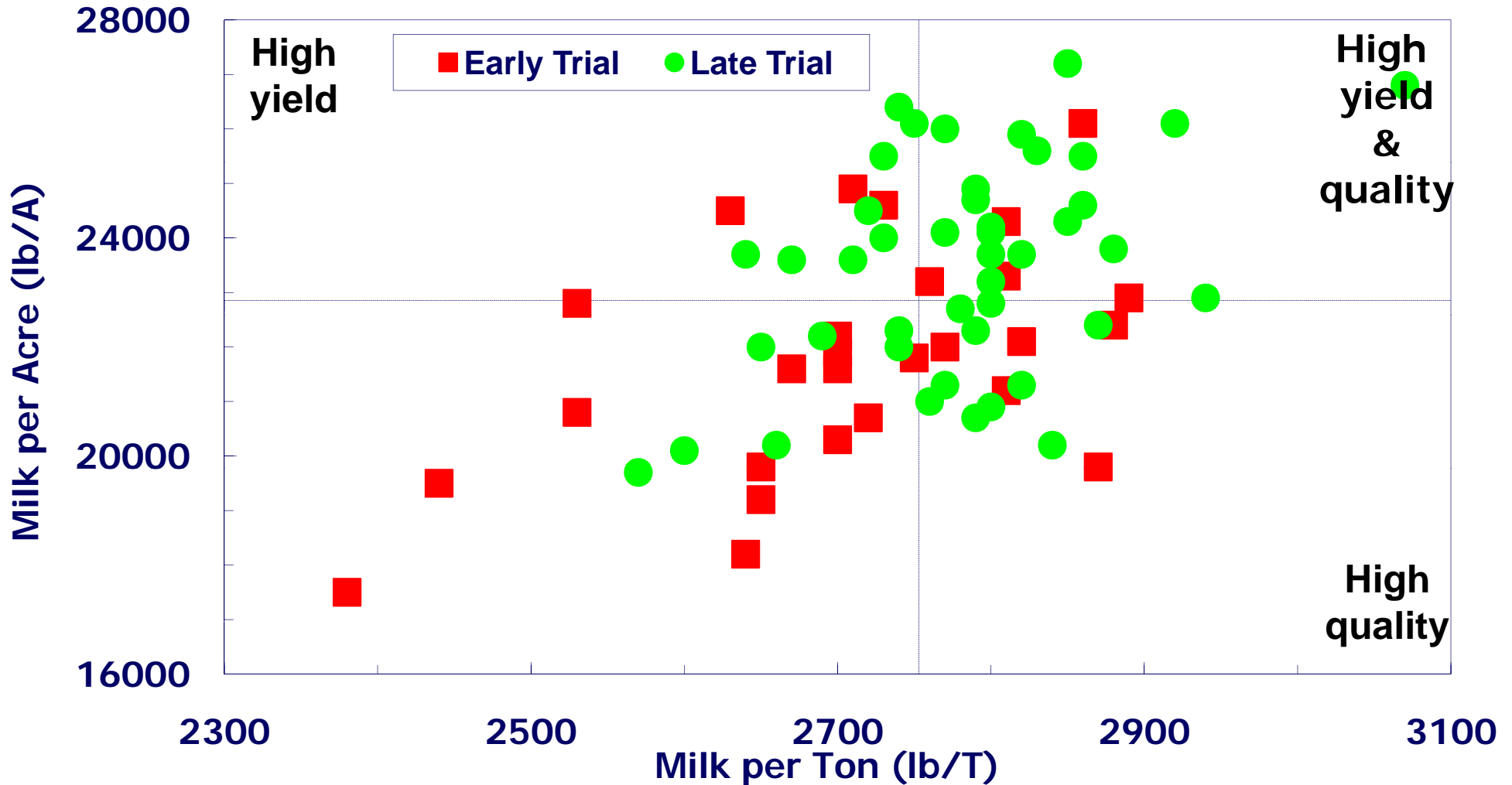
- ✓ Milk per acre = Milk per ton X Dry matter yield per acre

# Table 15. North Central Zone - Early Maturity Silage Trial 2000

BRAND	HYBRID	Kernel											MAR	VAL
		Yield	Moist	Milk	CP	ADF	NDF	IVD	CWD	Starch	MILK PER		Yield	Yield
		T/A	%	%	%	%	%	%	%	%	TON	ACRE	T/A	T/A
Trelay	2008	8.3 *	55.3	30	7.0	25	52	72	46	28	2670	22300 *	8.3 *	8.3 *
Carhart's Blue Top	CX8500A	7.4	58.7	50	7.3	24	49	73	46	29	2770 *	20700	7.9 *	7.0
NK Brand	N27-M3	7.0	59.2	30	7.1	24	48	74	45	31	2810 *	19800	7.4	6.7
Pioneer	39D81	5.2	59.6	10	7.1	26	53	71	45	26	2620	13600	5.7	4.6
Renk	RK394	7.8 *	59.6	30	7.0	28	55	70	46	24	2580	20200	8.3 *	7.3
Dairyland	Stealth 1280	7.7 *	59.9	30	7.1	25	52	72	45	28	2690	20800	8.3 *	7.1
85-DAY HYBRID TRIAL AVERAGE##			60.3											
LG Seeds	LG2367	7.3	60.4	30	6.9	26	53	72	47	27	2700	19800	8.3 *	6.3
Carhart's Blue Top	CX290A	7.4	60.6	40	7.2	22	46	75	45	34	2900 *	21300	7.2	7.5 *
Dairyland	Stealth 1289	7.0	60.7	20	8.1	28	55	70	46	24	2570	18100	7.3	6.7
Brown	2080	6.8	61.3	40	7.0	23	48	74	45	31	2830 *	19200	6.5	7.1
Carhart's Blue Top	CX1187A	6.9	61.4	30	7.2	25	51	73	46	29	2780 *	19200	6.8	7.0
90-DAY HYBRID TRIAL AVERAGE##			62.9											
Dekalb	DKC39-45	7.1	63.8	40	6.8	23	47	74	45	31	2920 *	20600	6.7	7.4 *
NK Brand	N2555BT	7.1	64.2	40	7.4	26	51	72	45	27	2760 *	19800	7.7 *	6.6
Ramy Seed	PG1455	8.6 *	64.6	60	7.3	25	50	73	46	28	2850 *	24500 *	8.7 *	8.4 *
Golden Harvest	H6675	8.2 *	66.4	40	7.7	25	50	72	44	26	2780 *	22900 *	8.4 *	8.1 *
MEAN		7.3	61.1	40	7.2	25	51	72	46	28	2750	20200	7.6	7.1
LSD(0.10)**		0.9	3.9	10	0.5	3	4	3	1	4	200	3100	1.1	1.1



# Corn Hybrid Silage Performance in the South Central Production Zone - 2000





A close-up photograph comparing two corn plants. The plant on the left is labeled 'bmr' and has a stem with a distinct yellowish-orange hue. The plant on the right is labeled 'Normal' and has a stem that is a vibrant yellow. Both plants have large, green, serrated leaves. The background is blurred, showing other plants and a fence.

**bmr**

**Normal**



# Relative Performance of Corn Hybrids Tested in Six Environments (Coors, 2000)

Hybrid	RM	YLD	MST	CP	ADF	NDF	IVD	CWD	Starch
		T/A	%	%	%	%	%	%	%
Short-season (D1297)	98	6.4	52.8	7	24	49	73	45	30
Mid-season (P35R58)	105	8.2	63.9	7	27	53	70	44	25
Leafy (NK48V8/4687)	105	8.1	64.7	7	27	53	70	44	22
Bmr (CF657)	110	5.7	67.5	7	25	50	75	50	27
Full-season (P33A14A)	113	8.1	68.6	7	29	55	69	43	20



# Relative Performance of Corn Hybrids Tested in Six Environments (Coors, 2000)

Milk per Acre (lb/A)

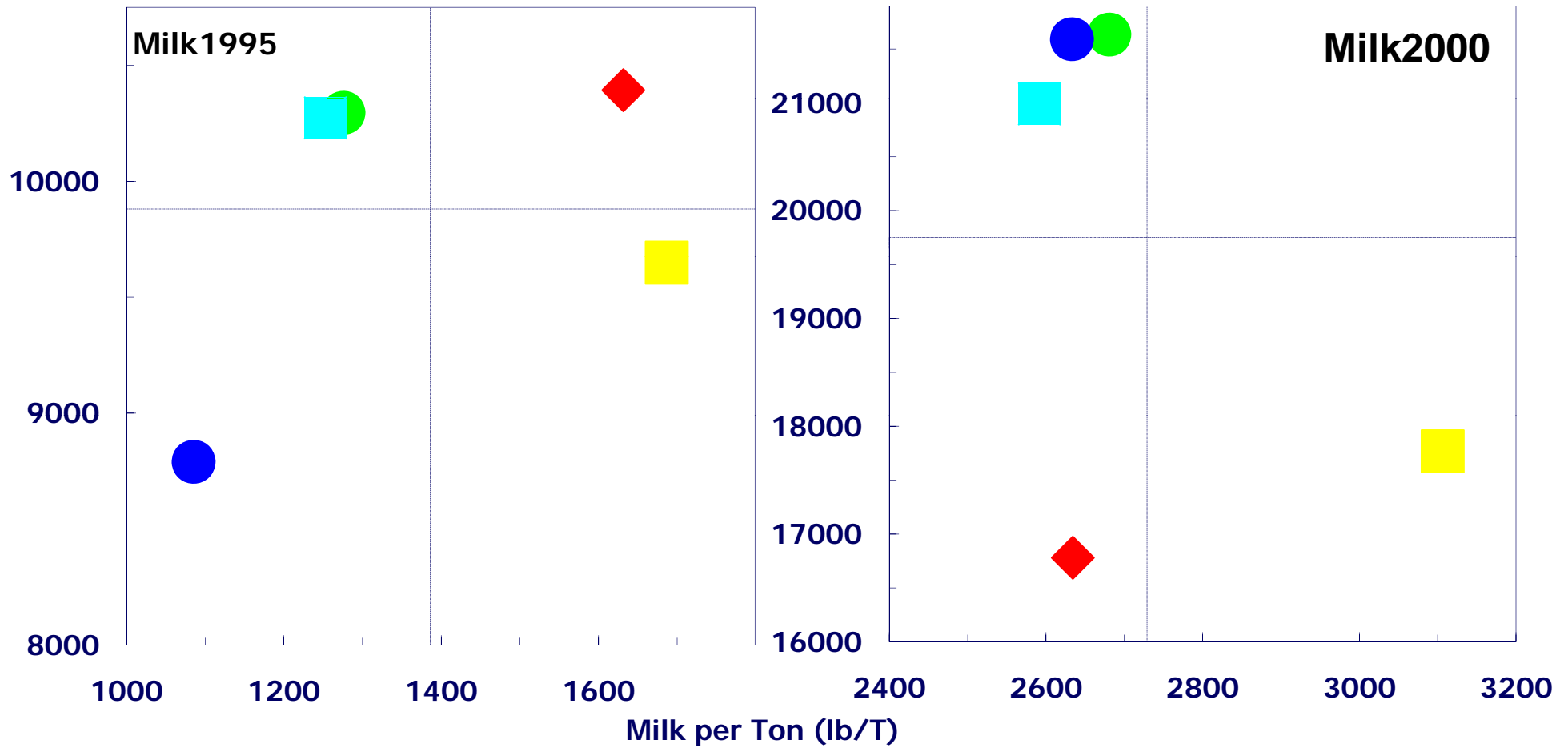
■ Bmr

● Leafy

◆ Short

■ Mid

● Full





# Relative Performance of Corn Hybrid Types Tested in the UW Silage Trials (1999-2000)

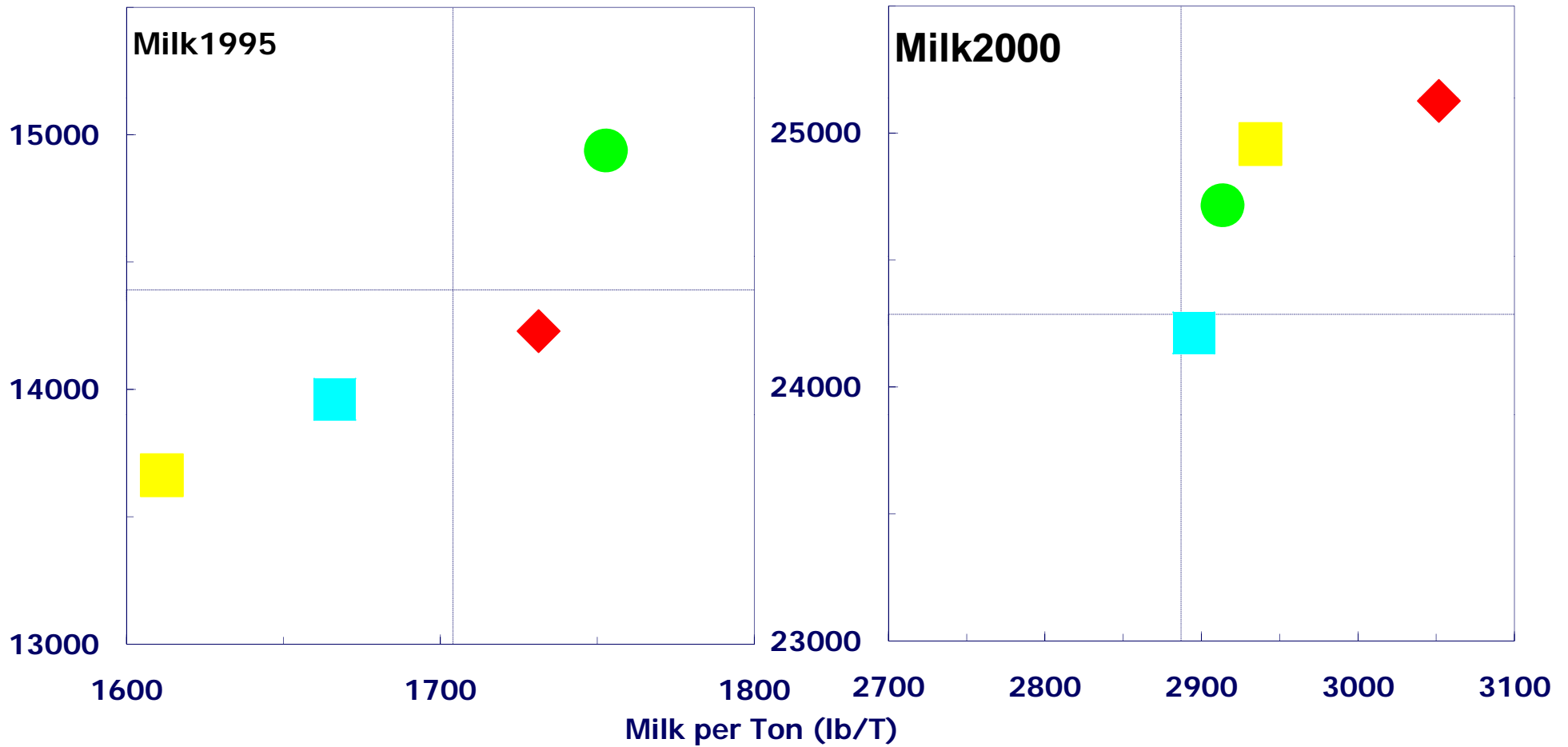
Hybrid	YLD	MST	CP	ADF	NDF	IVD	CWD	Starch
	T/A	%	%	%	%	%	%	%
silage	8.5	66.6	7	25	50	74	47	27
Bt	8.5	62.2	7	24	47	74	46	31
HOC	8.2	66.8	8	24	48	75	48	30
leafy	8.4	63.0	7	24	48	74	46	29
average hybrid	8.4	62.5	7	24	48	74	46	31



# Relative Performance of Corn Hybrid Types Tested in the UW Silage Trials (1999-2000)

Milk per Acre (lb/A)

■ silage    ● Bt    ◆ HOC    ■ leafy





# Desirable Forage Characteristics

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- What makes a good forage?
  - ✓ High yield
  - ✓ High energy (high digestibility)
  - ✓ High intake potential (low fiber)
  - ✓ High protein
  - ✓ Proper moisture at harvest for storage
- Ultimate test is animal performance. Milk2000 is our best estimate for predicting performance.
- Future direction



## Criteria for Selecting Silage Hybrids

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- Grain yield: allows flexibility (dual purpose)
- Whole plant silage yield
- Relative maturity: 5-10 days later than grain hybrids
- Standability: allows flexibility
- Pest resistance
- Silage quality

***“Variation for silage yield and quality exists among commercial hybrids in Wisconsin.”***



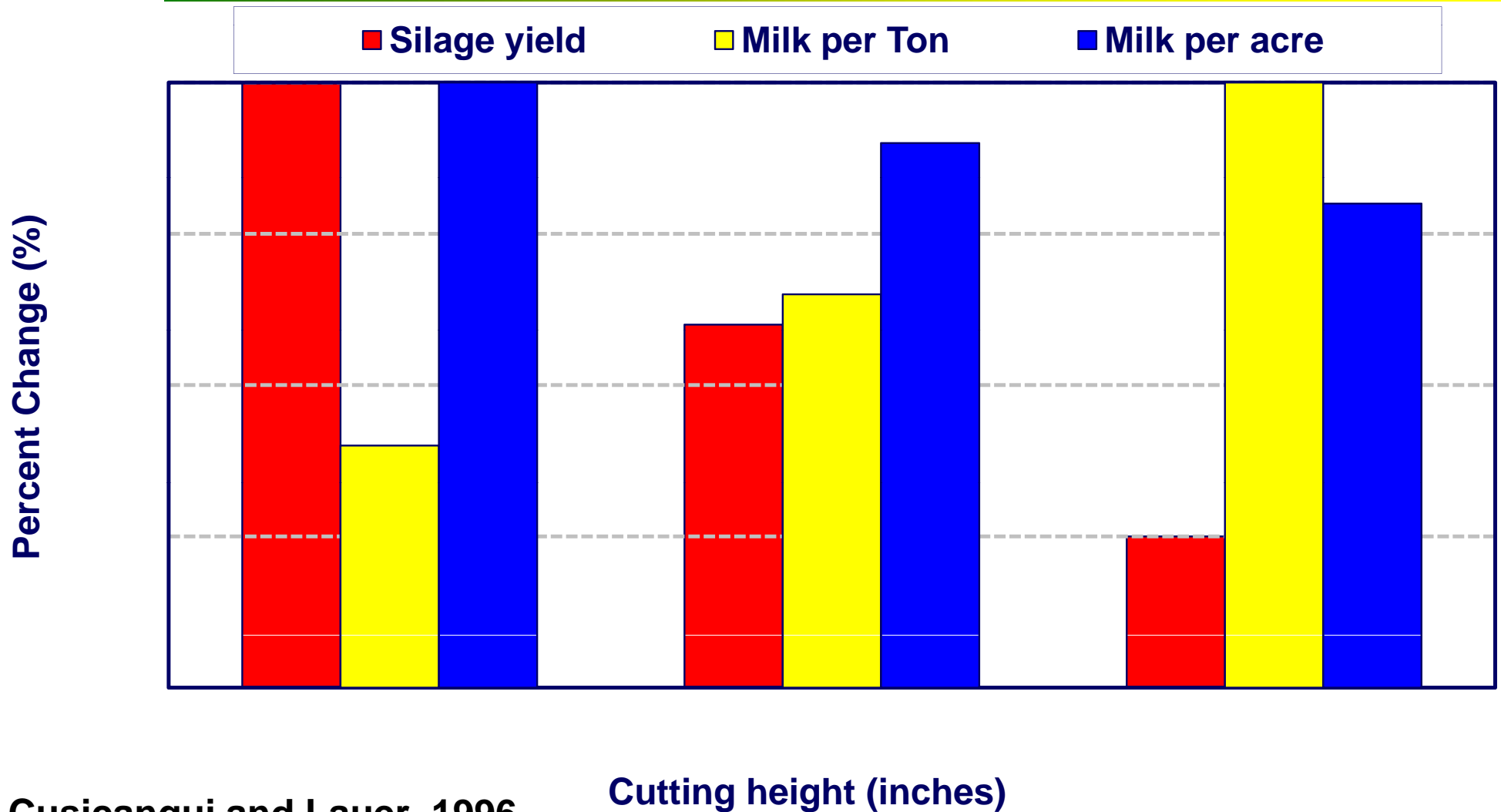
# How Should We Manage Grain v Silage Hybrid Types?

Trait	Grain	Silage
Plant population	26,000 - 30,000	2,000 - 3,000 more
Planting date	Early	Early to 7 d later
Row spacing	3-5% w/ narrow	7-9% w/ narrow
Soil fertility	Adequate	Greater
Pest resistance	Important	More important
Cutting height	Ear	Yield v Quality
Harvest timing	Drying cost	Sour v Moldy





# Relative change in silage yield & quality at different cutting heights during 1996



Cusicanqui and Lauer, 1996