Maximizing Corn Silage Yield and Quality

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Set your own objectives for yield and quality

- Forage quality needs of livestock
- Ability to segregate silages
- Ability to produce feed on your land
- Cost and availability of other feeds

Penn State
Corn Silage Initiative- 2001

Corn silage quality variation

	CP	NDF	NDFD	Starch	Milk/Ton
Average	8.9	47.2	62.1	25.0	3372
Min	6.8	38.4	51.0	6.5	2846
Max	10.5	59.7	73.0	40.6	4066
Std dev	0.9	5.0	5.1	7.5	276
NRC	8.8	45.0	58.0	30.0	3318

Capital Region Dairy Team

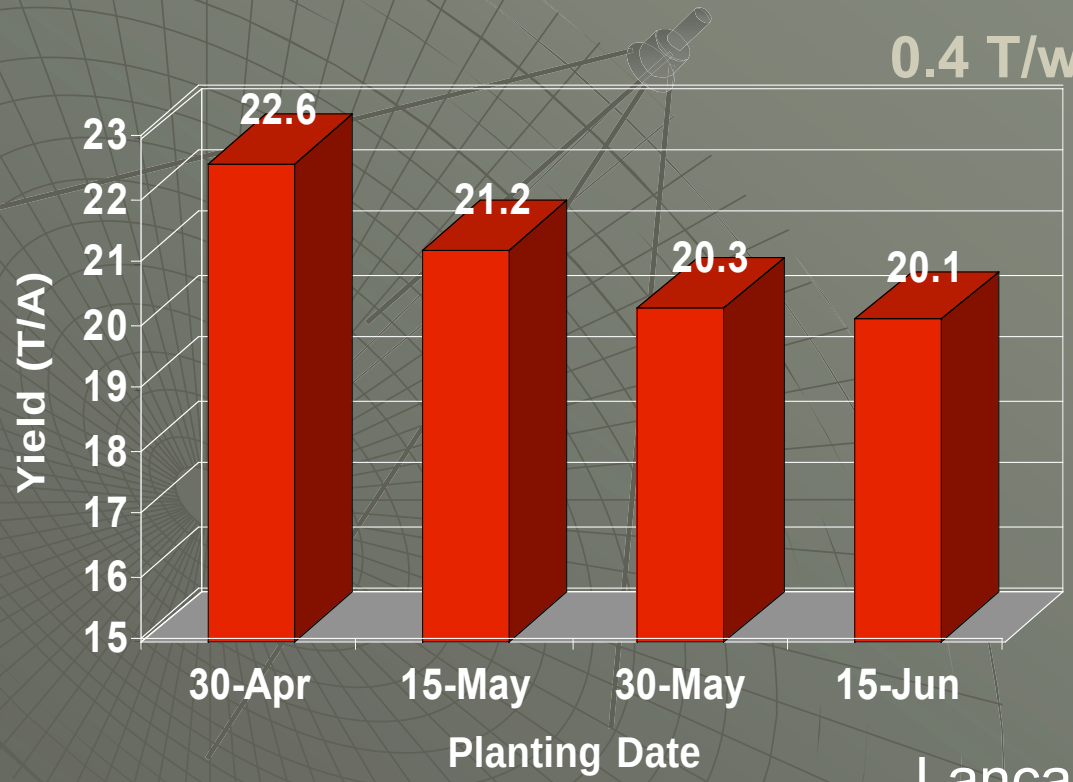
Manage the crop to meet your own objectives

Silage Yield and Quality is a function of three key components of the process:

- Production
- Harvesting
- Storage

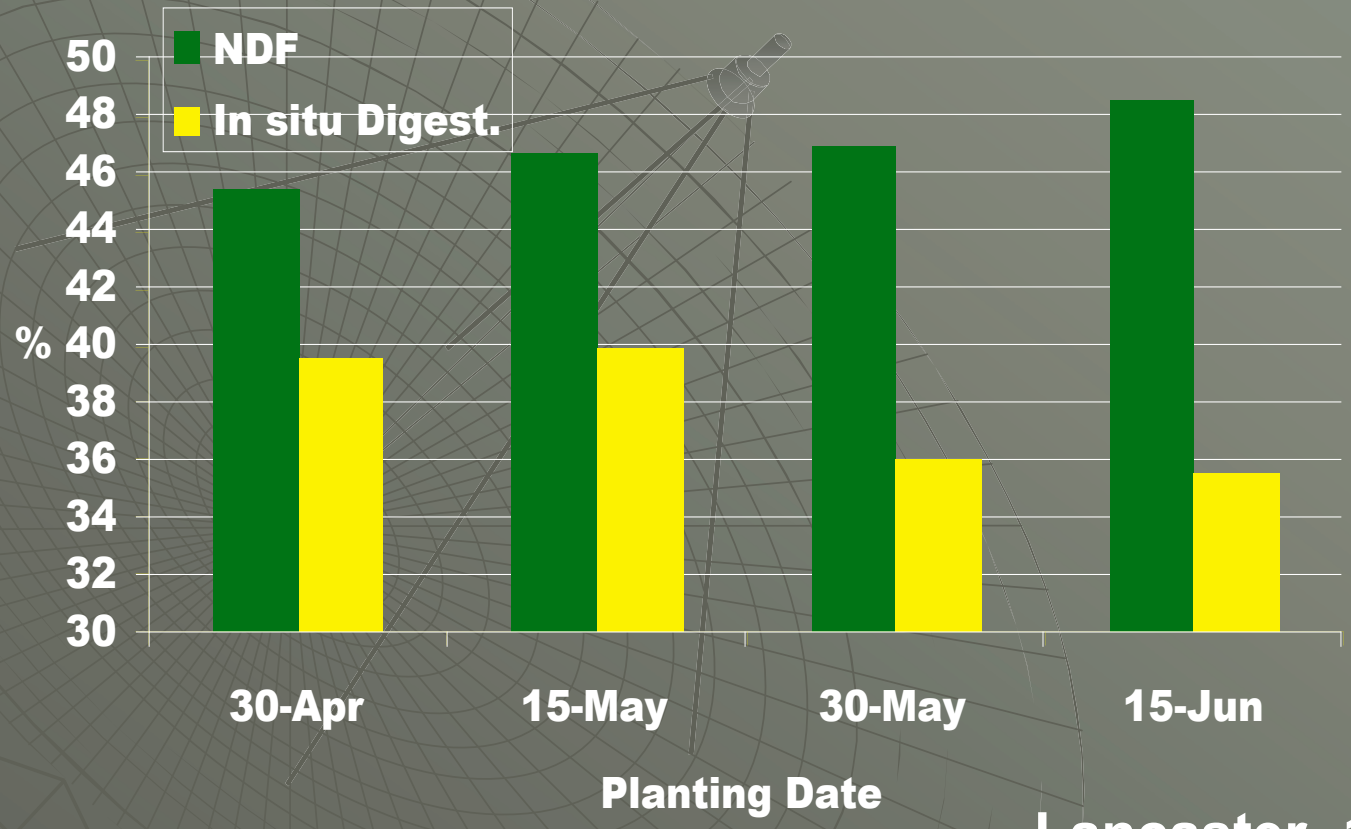
Production: Planting Practices

Planting Date Effect on Silage



Lancaster- 1997

Planting Date Effects on Quality



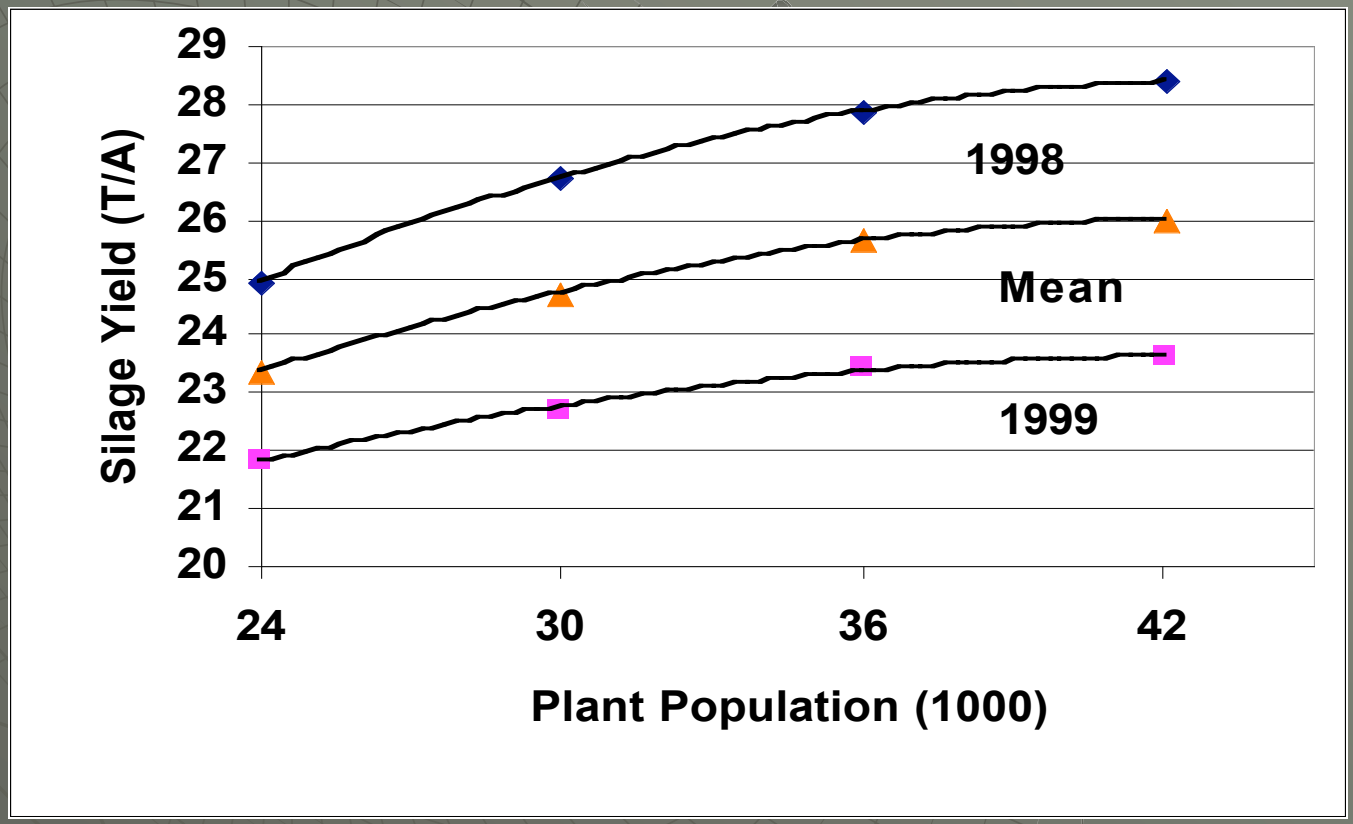
Lancaster- 1997

Optimize the plant population

On good soils the optimum plant population is 30,000+ plants/acre

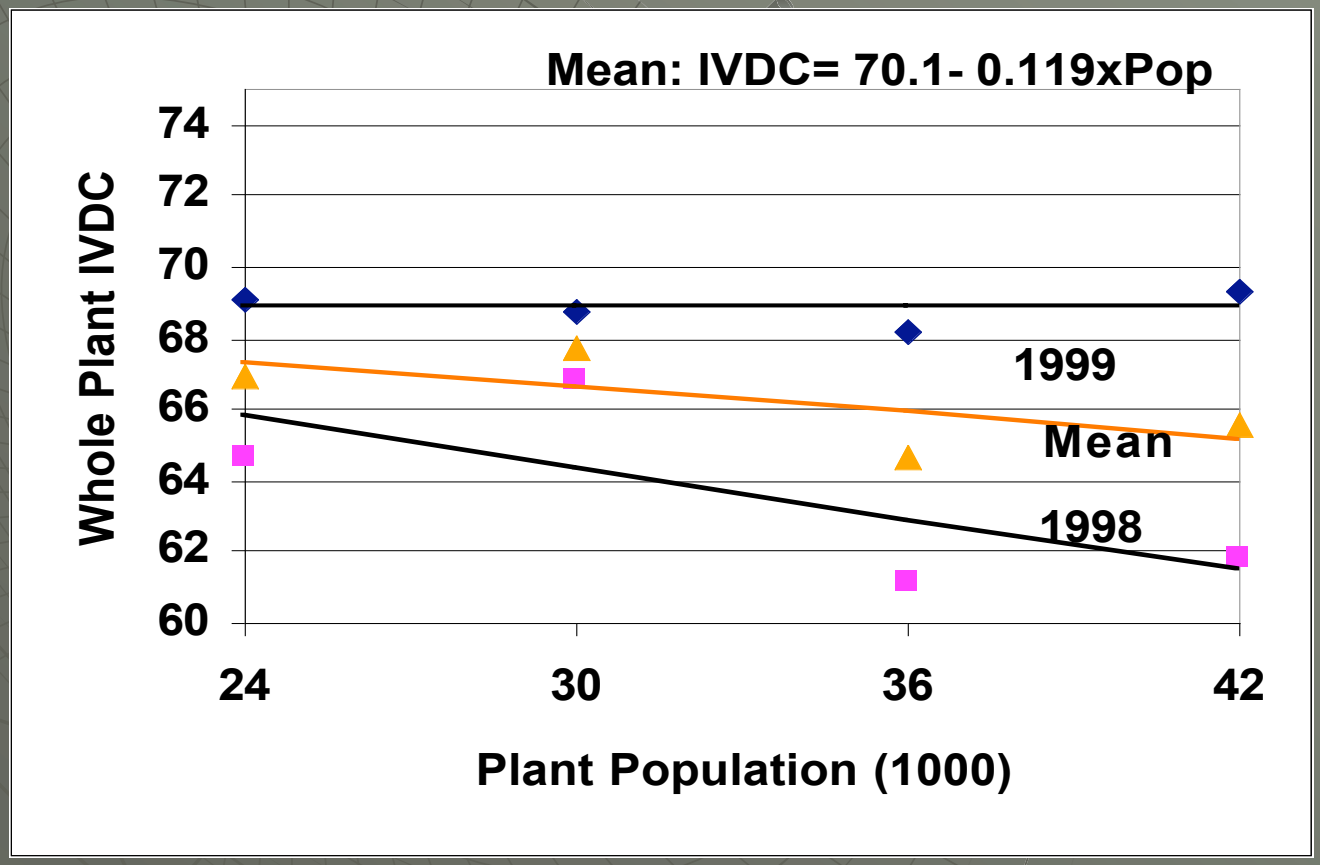
Population Effects on Yield

Centre County, PA/1999 and 2000



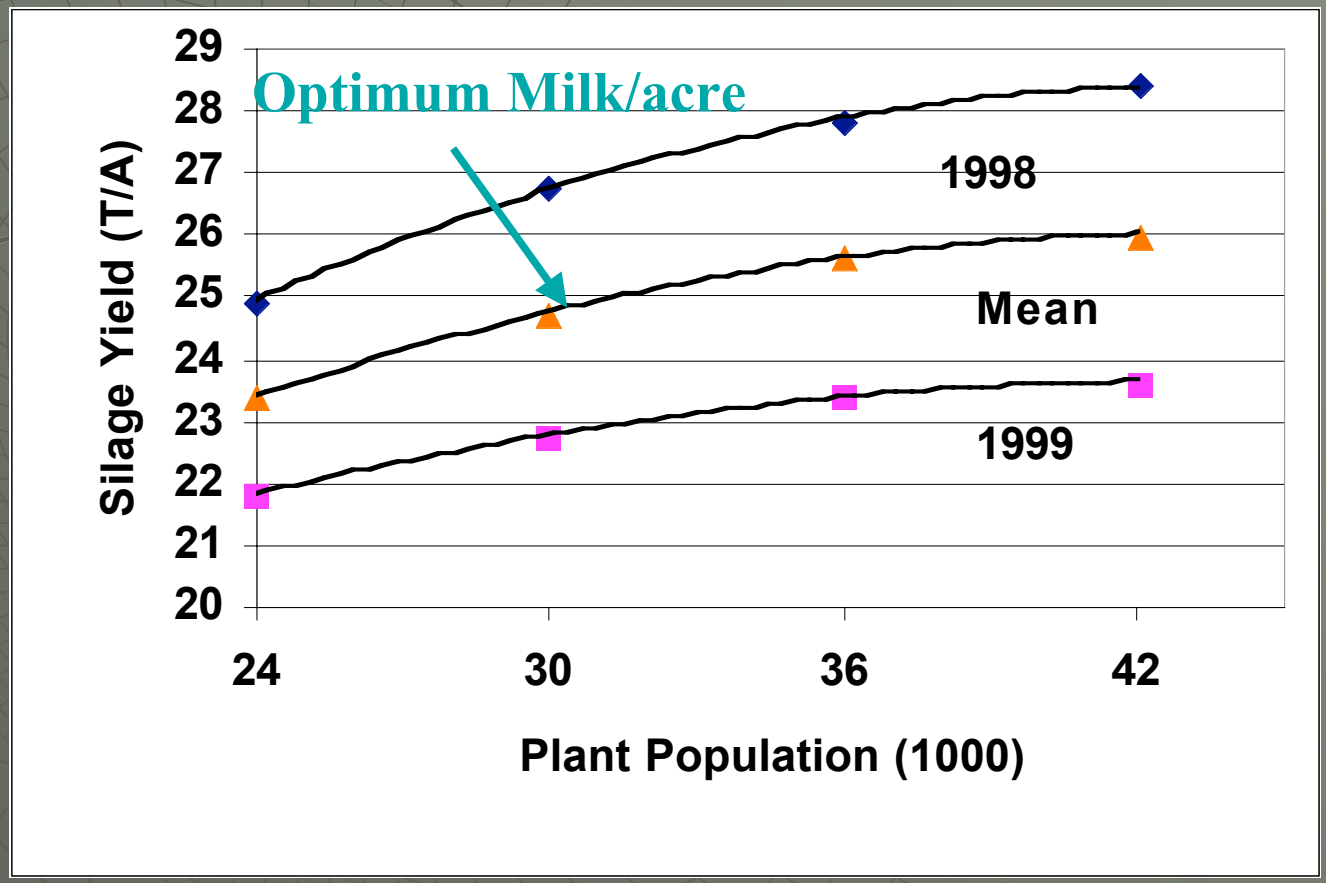
Population Effects on Digestibility

Centre County, PA/1999 and 2000



Optimum Population

Centre County/1999 and 2000



Fertility Management

Penn State Recommendations

Soil testing Optimum P, K

	N Lbs/A	P2O5 Lbs/A	K2O Lbs/A
Grain (125 bu/A)	130	50	30
Silage (21 T/A)	150	110	230

Hybrids

- Maturity
- Yield Potential
- Forage Quality
  - NDF
  - NDFD
  - Starch
  - Milk/ton

Silage Hybrid Evaluation

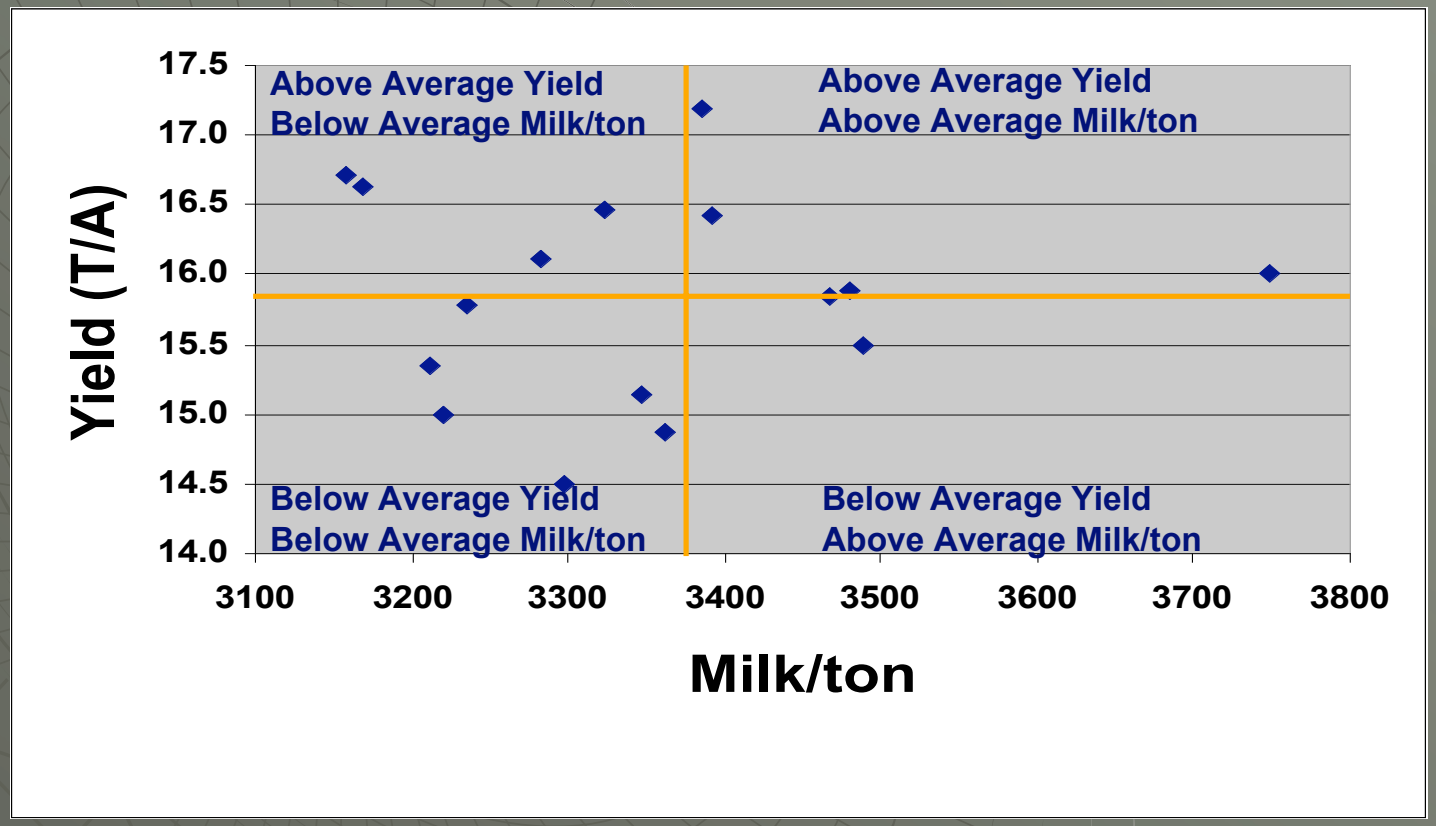
Early Hybrids 2002 average of two locations

Brand/Hybrid	Dry Matter	Silage Yield	CP	NDF	Starch	Sugar	NFC	Ash	Fat	Lignin	NEl	IVTD	NDFD	Milk/ton	Milk/acre
	%	Tons/acre	%	%	%	%	%	%	%	%	Mcal/lb	%	%	lbs/ton	lbs/acre
Mycogen TMF108	40.1	15.8	8.0	42.7	33.8	8.1	44.0	3.5	2.7	3.6	0.72	78.7	50.6	3235	17799
Dekalb DKC59-08	38.6	16.7	7.9	39.0	37.3	8.4	50.1	3.6	2.9	2.8	0.78	78.7	44.8	3158	18758
Dekalb DKC60-09	36.4	16.5	8.2	40.7	34.0	10.0	46.0	3.8	2.6	3.4	0.74	80.5	51.8	3324	19299
Pioneer 34M95	36.2	16.0	7.8	44.0	31.5	10.2	45.8	3.6	2.6	3.4	0.74	84.1	64.2	3747	20473
Pioneer 34M94	35.6	15.5	7.7	45.3	30.3	10.6	42.5	3.5	2.7	3.7	0.71	80.9	58.4	3490	19148
Chemgro 7253 RR	35.5	15.9	8.0	42.8	31.5	11.0	44.9	3.7	2.6	3.7	0.72	81.8	57.4	3480	19921
Pioneer 34B23	34.9	17.2	8.0	44.5	29.2	12.0	42.3	3.9	2.8	3.9	0.70	79.9	54.7	3385	19553
NK Brand N70-D5	34.7	15.8	8.1	41.0	33.1	12.0	46.1	3.7	2.5	3.5	0.73	81.5	54.6	3468	19232
Wolf River Valley 2114	34.7	16.1	8.5	45.4	28.1	12.7	39.5	3.7	2.6	4.0	0.68	79.1	54.2	3283	17945
Dekalb DKC58-78	34.5	14.9	8.0	41.0	33.9	9.0	46.5	4.2	2.6	3.1	0.74	80.5	52.4	3362	18475
Pioneer 34B24	34.3	16.6	7.9	42.2	30.7	13.4	44.7	3.8	2.7	3.8	0.72	78.4	48.5	3168	18291
Agway AG6001	34.1	16.4	8.5	42.6	31.8	10.3	44.7	4.0	2.7	3.7	0.73	80.2	53.4	3391	19472
Agway AG6191	33.6	15.0	8.2	43.9	30.3	10.7	43.0	4.1	2.6	3.7	0.71	78.4	51.5	3221	16641
Hytest HT 7706	32.9	15.1	8.0	43.0	31.6	11.0	45.2	3.8	2.6	3.6	0.73	79.5	51.7	3347	17396
Dekalb DKC61-25	32.8	15.3	8.0	43.1	29.8	12.9	43.7	3.9	2.5	3.7	0.71	78.6	50.9	3211	17247
Golden Harvest H-9233	31.2	14.5	7.8	42.8	31.7	10.7	45.4	4.1	2.5	3.5	0.73	79.0	50.2	3298	17139
MEAN	35.0	15.8	8.0	42.7	31.8	10.8	44.7	3.8	2.6	3.5	0.72	80.0	53.1	3348	18549
LSD 0.10	1.2	NS	NS	NS	NS	1.0	NS	NS	NS	NS	0.08	2.3	3.9	187	NS
HybridxLocation	Sig.	NS	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	NS	NS	NS	NS	NS
CV (%)	4.4	11.4	4.6	8.8	11.4	12.0	8.2	8.3	8.1	9.6	13.9	3.5	9.2	6.9	13.9

*Silage yields are expressed on a 35%DM basis- all other parameters are expressed on a dry matter basis.

http://cornandsoybeans.psu.edu

Yield vs. Quality: Early Hybrids



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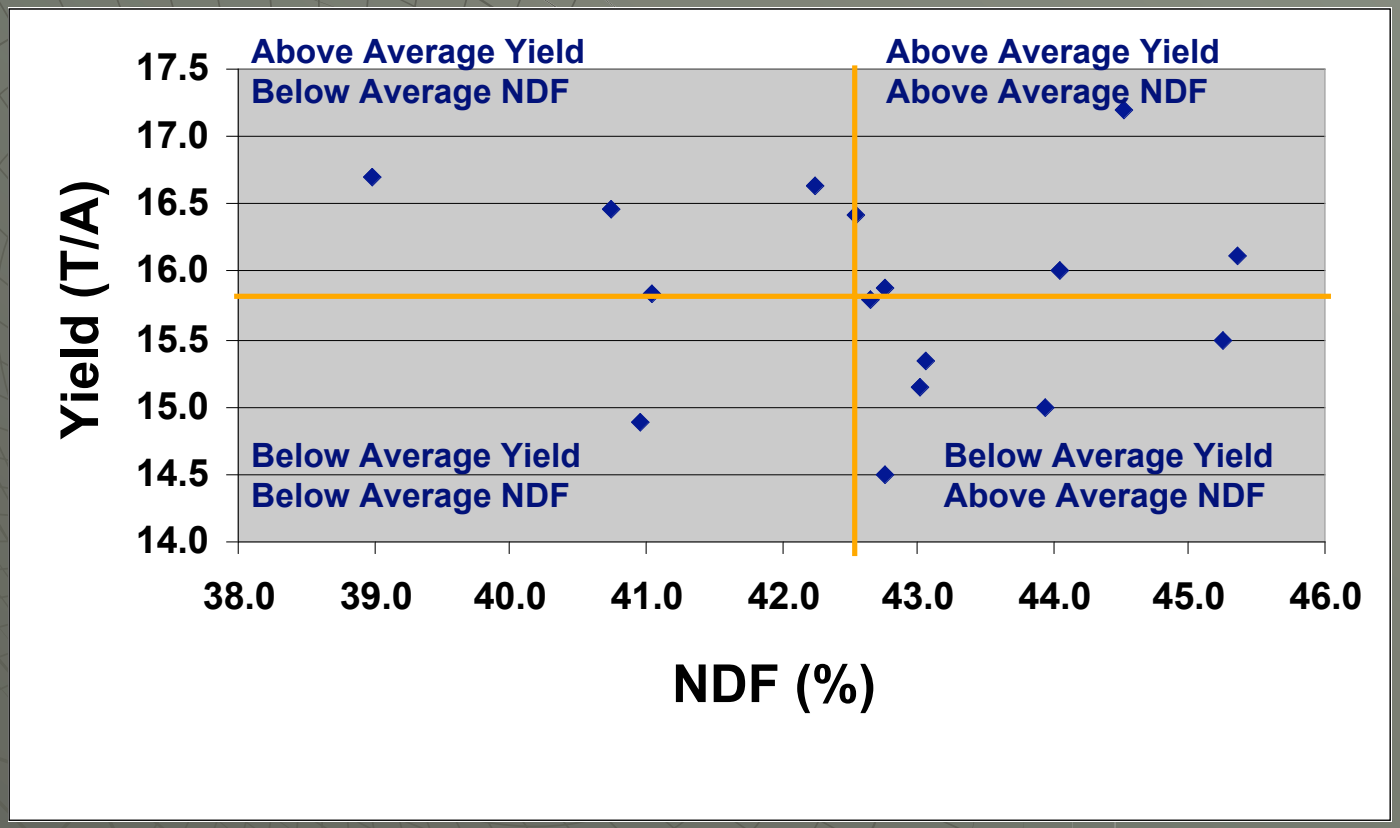


Bt and RR hybrids

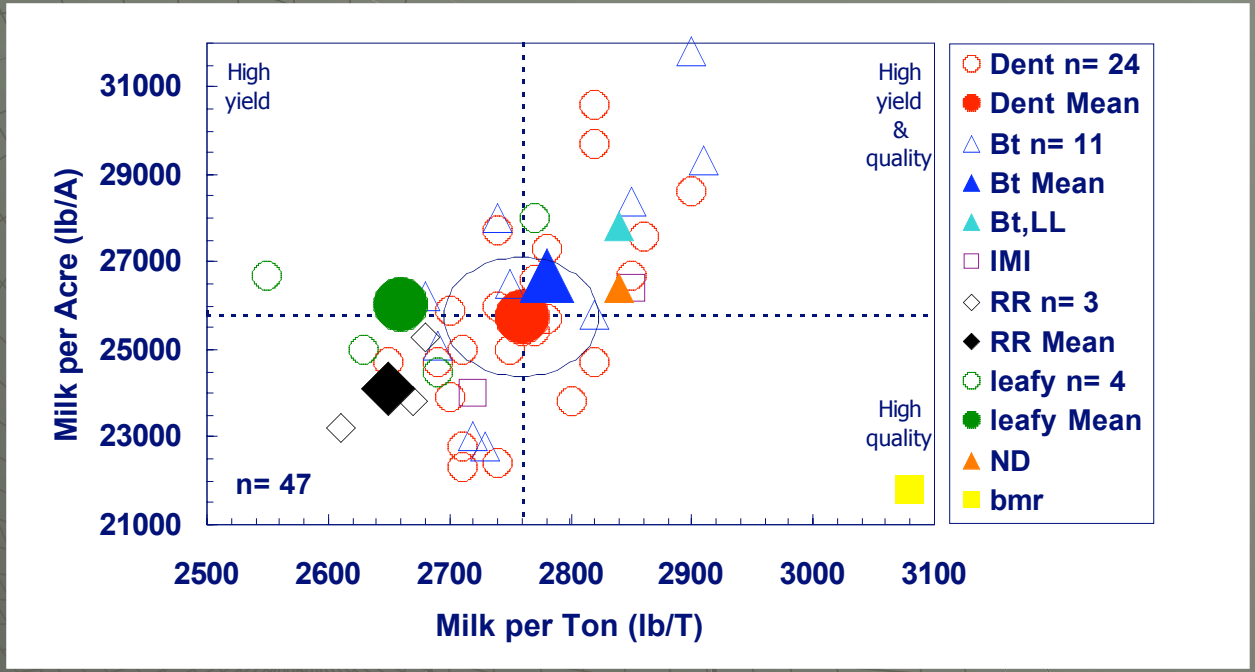
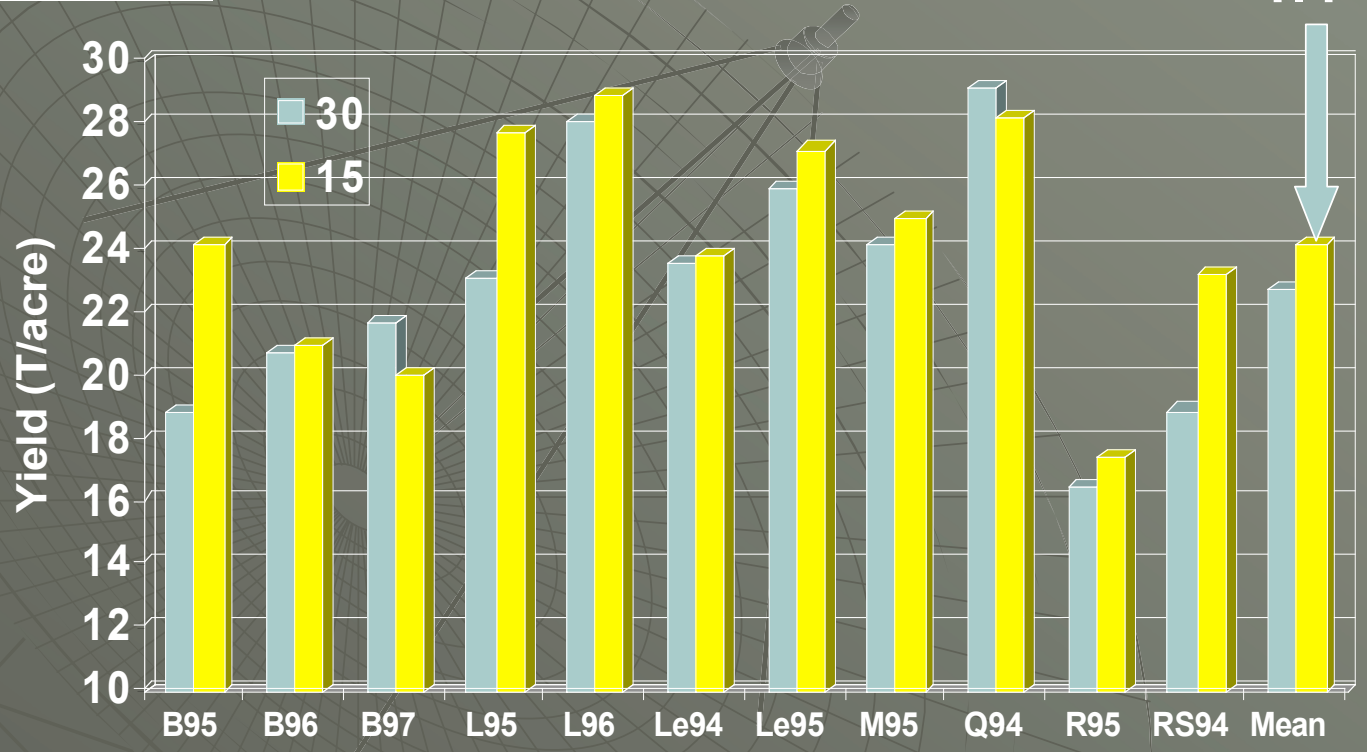


Figure 1. Wisconsin Corn Hybrid Performance Trial Results from the Southern Zone, Late Maturity Trial at Arlington and Lancaster - 2001

Narrow Rows

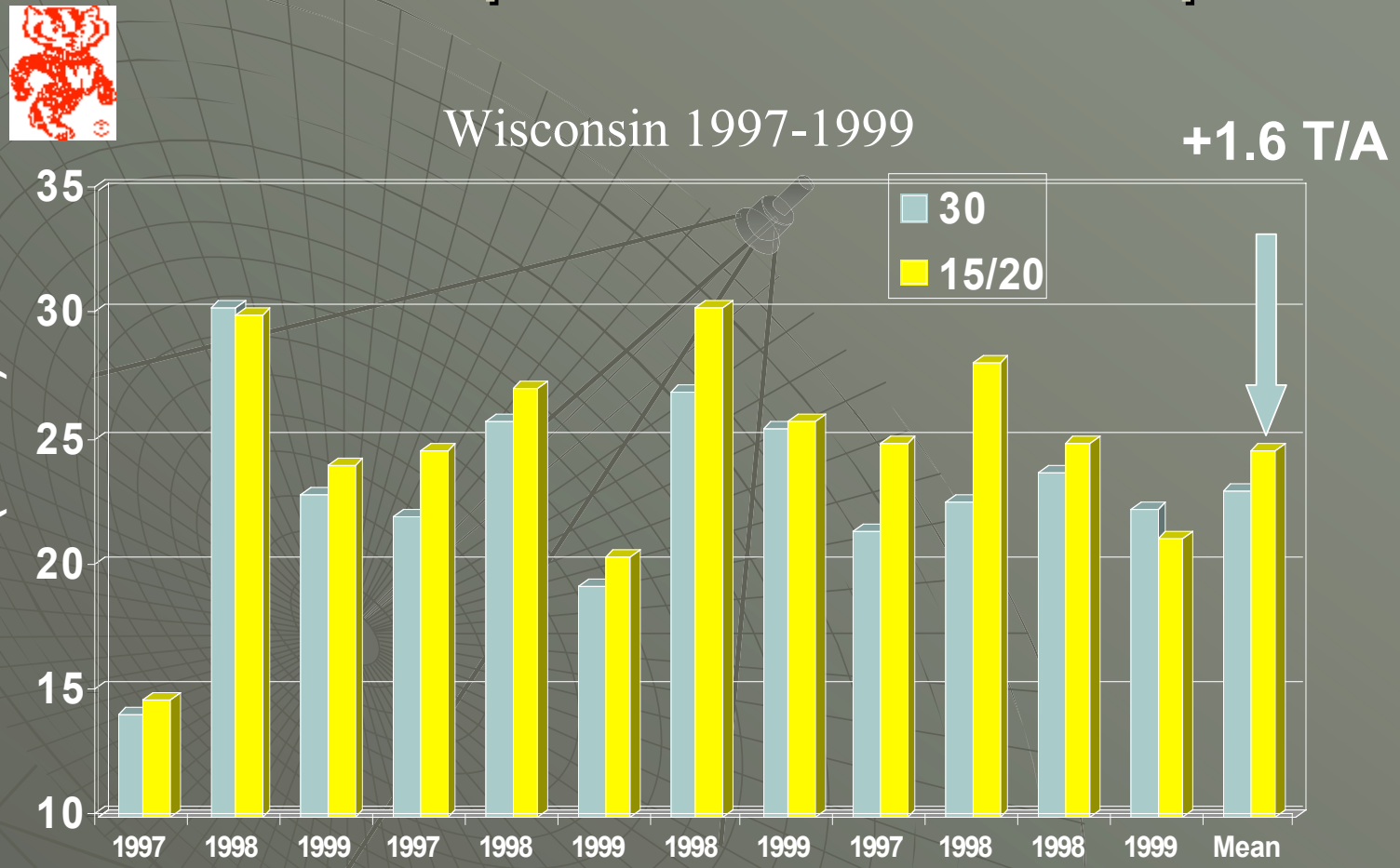
Yield Response to Row Spacing

Pennsylvania 1994-1996

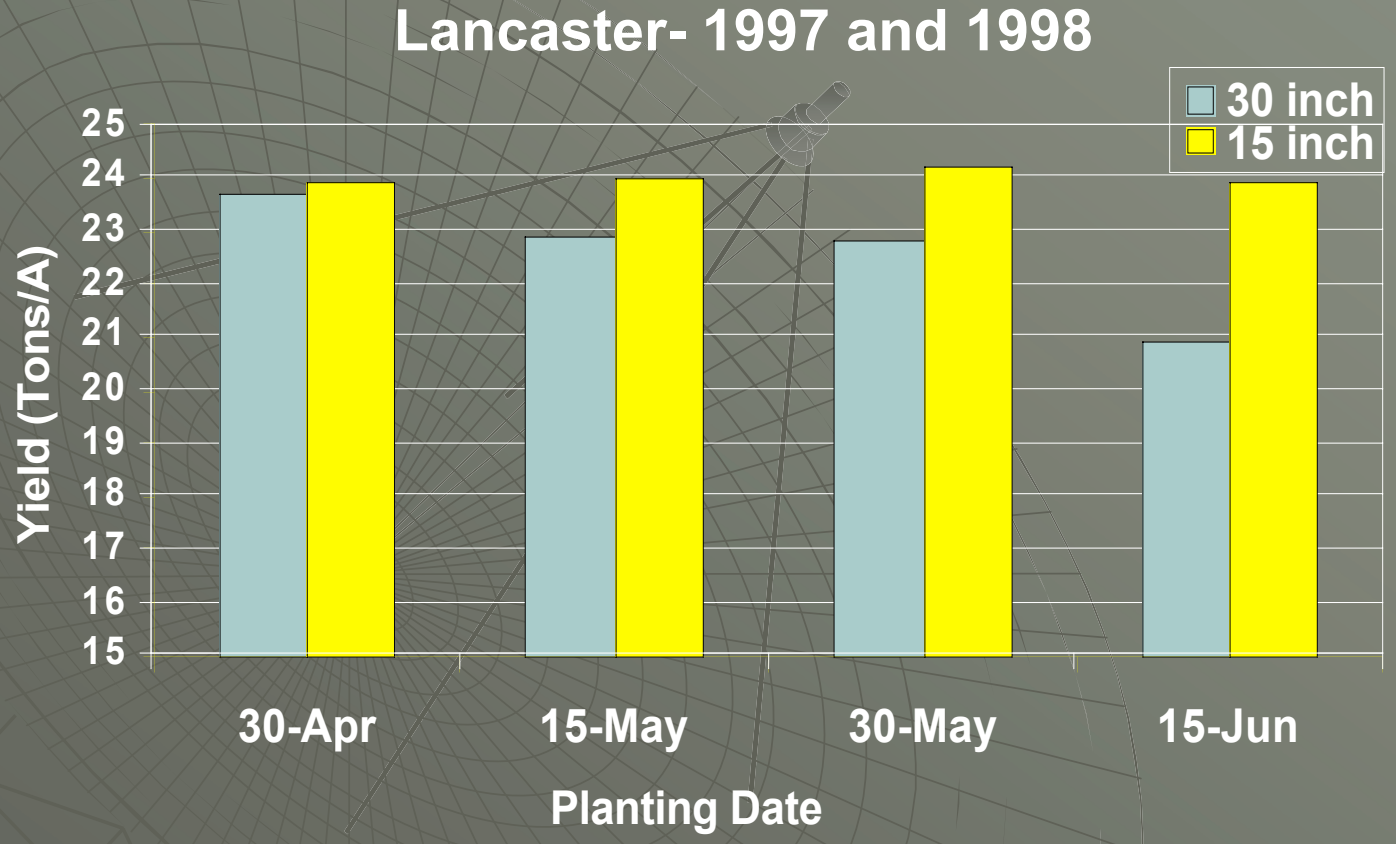


Narrow rows: No impact on forage quality traits.

Yield Response to Row Spacing



Narrow Rows and Later Planting



Crop Rotations

Soil Management for Silage

- Manage and monitor compaction during harvest and manure spreading
- Cover crops essential for long term productivity
- Consider no-till
- Consider tillage or deep tillage if compaction is present

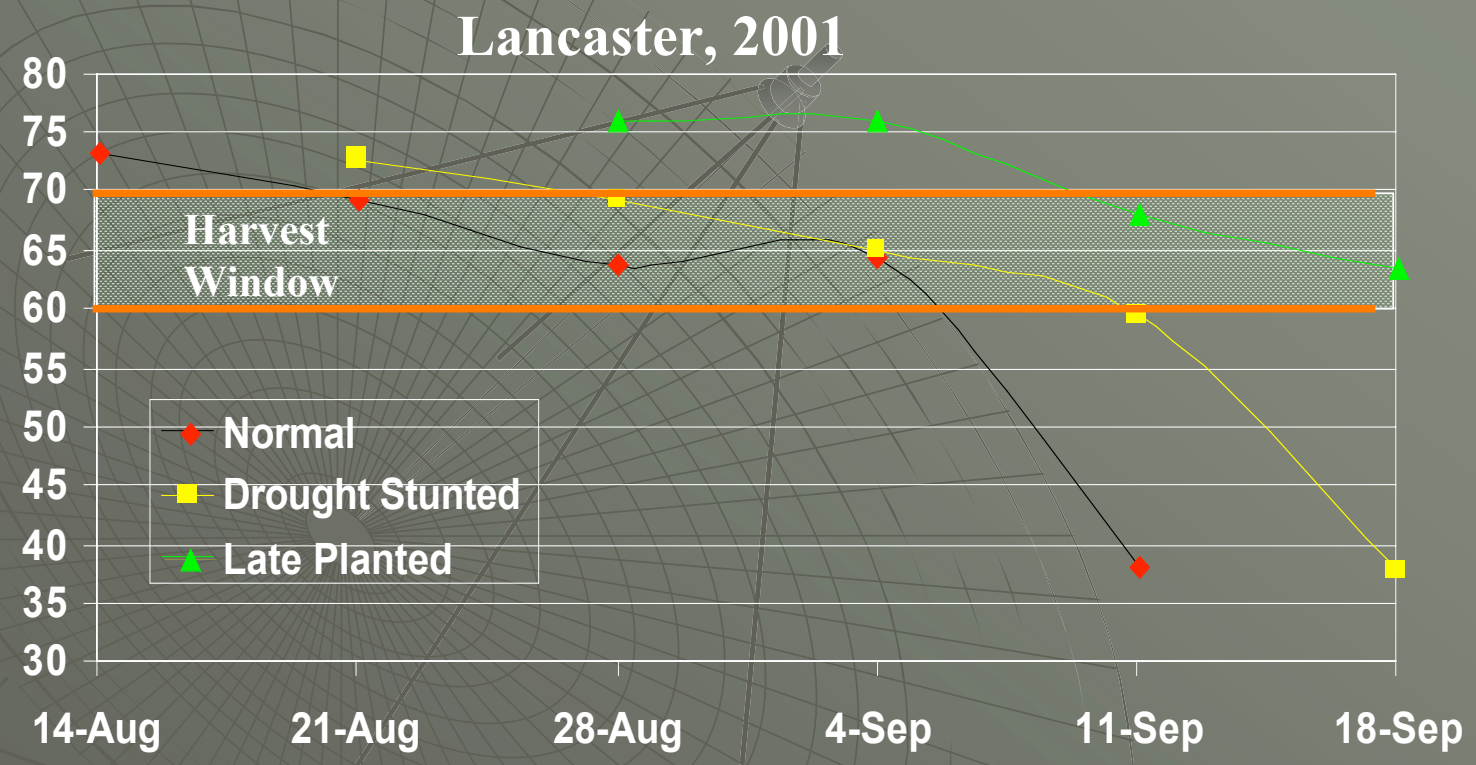
Maximizing Corn Silage Production

- Early planting and adequate populations
- Soil fertility
- Row spacing
- Hybrids
- Crop rotations
- Soil management
- Weed and Insect management

Harvesting

Dry Matter Measurements at Harvest are Essential

Rate of Moisture Decline

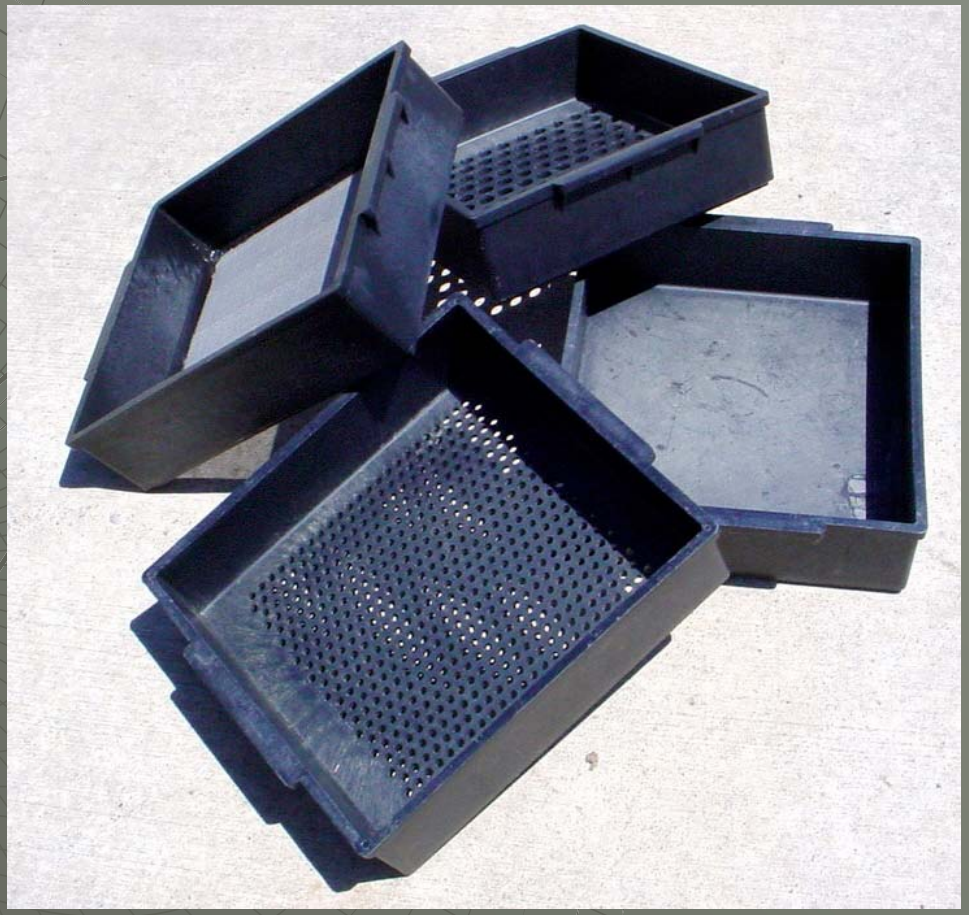


Predicting Harvest

- Chop representative sample at early dent
- Measure DM
- Estimate harvest date using 0.6%/day drydown rate
- Re-evaluate prior to harvest

Forage Particle Separator Guidelines

Upper Sieve: 3-8%
Middle Sieve: 45-65%
Lower Sieve: 30 to 40%
Bottom Pan: < 5%



Heinrichs and Konoff, 2002

Processing silage

Feeding Trials with Processed Silage

Trial	Control	Processed	Difference
UW- Marshfield	52.3	52.4	+0.1
UW- Marshfield	48.6	49.7	+1.1
UW- DFRC 1998	79.0	81.9	+2.9
WSU	79.2	81.0	+1.8
WSU	65.4	68.4	+3.0
WSU	73.1	74.3	+1.2
WSU	75.5	77.3	+1.8
UW- Madison 1999	98.6	101.2	+2.6
UW-DFRC 2000	91.3	88.7	- 2.6
UW- DFRC 2000	81.0	79.4	- 1.6
OSU-2000	58.9	61.2	+2.3
OSU-2000	62.9	61.8	- 1.1

- Processing increases
  - Starch digestibility
  - Ability to pack silage
  - Milk production (in some trials)
  - Potential to harvest longer particle size
- Processing reduces
  - Sorting of cobs

Crop Processing

- _ inch TLC
- 1 to 3 mm recommended roll clearance- Varies with WP and kernel moisture
- > 95% Kernel breakage, and no cobs > 1/8th ring

Cut height effects on silage yield and quality
(summarized from 7 studies)

Item	Low Cut (7.1 ± 3.2")	High Cut (20.0 ± 3.4")	Change (%)
DM,%	37.2	40.2	8.1
NDF, %	41.6	38.0	-8.7
Starch, %	31.4	33.5	6.7
CP %	6.9	7.1	2.3
IVNDFD, %	49.9	52.1	3.9
NEL	0.71	0.74	2.7
Ton/ac, DM	8.0	7.3	-8.3
Milk, lb/ton	3294	3430	4.1
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Hi Chop Corn Profitability

- Animal requirements
- Ability to segregate
- Land base
- Forage storage capacity

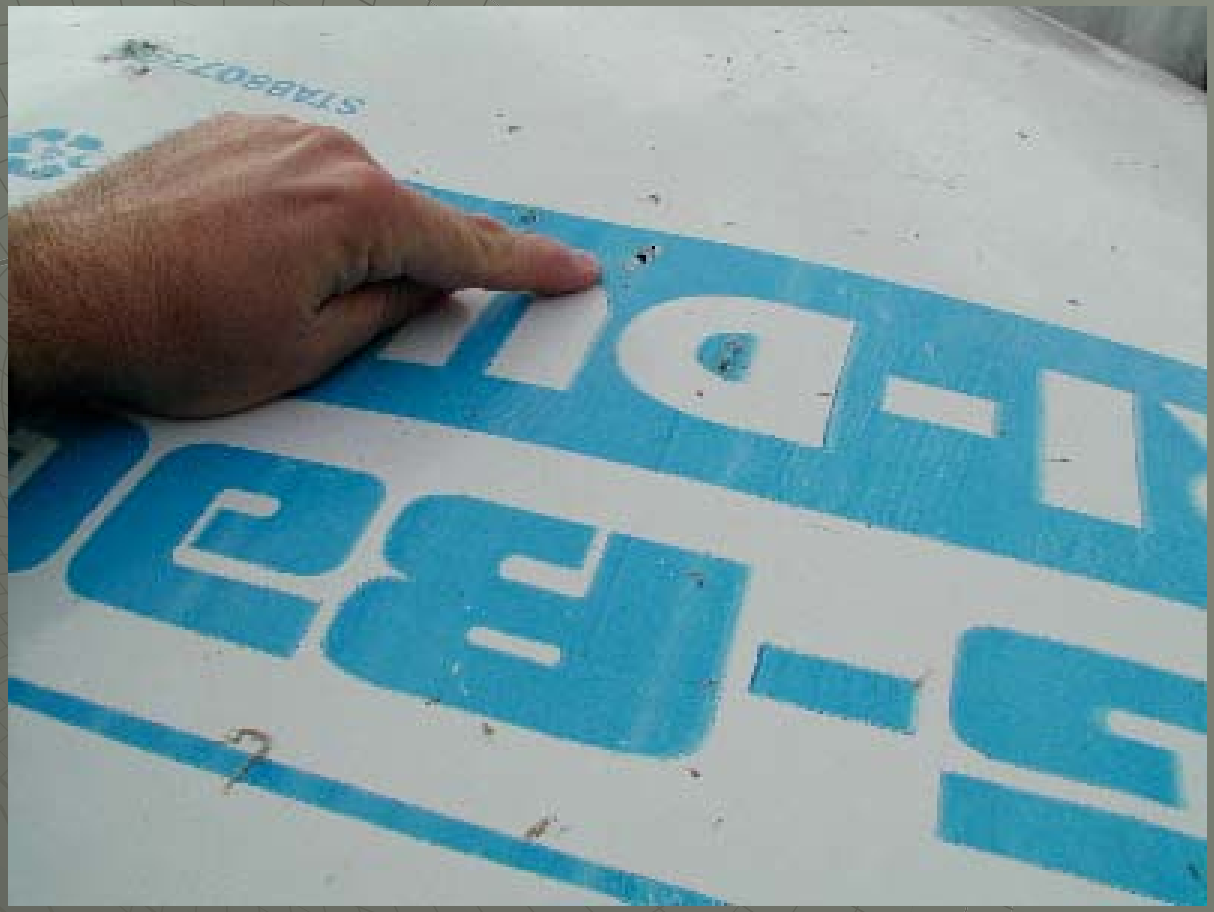
Harvesting Guidelines

- Measure the moisture
- Monitor particle size
- Consider processing
- Consider high chop
- Adapt to farm conditions

Storage Systems

Bunker Silos

Watch for Holes!



Small Holes Can be Devastating

Poor quality silage, when mixed into a TMR.....

- Creates a poor quality TMR
- The cow's rumen microbes will not be fooled

Storage Summary

- Get the dry matter right
- Consider preservatives
- Pack pack pack
- Cover- absolutely necessary
- Sort spoiled silage
- Feed out to keep fresh

Maximizing Yield and Quality

- Decide on a strategy that fits
- Plan your production accordingly
- Produce and harvest your crop according to the plan
- Preserve your crop with good storage management practices
- Continually evaluate and fine tune your program with yield checks and forage testing