DEPARTMENT OF

DAIRY SCIENCE

University of Wisconsin-Madison

Producing more milk using more high quality forages

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THE UNIVERSITY of WISCONSIN MADISON

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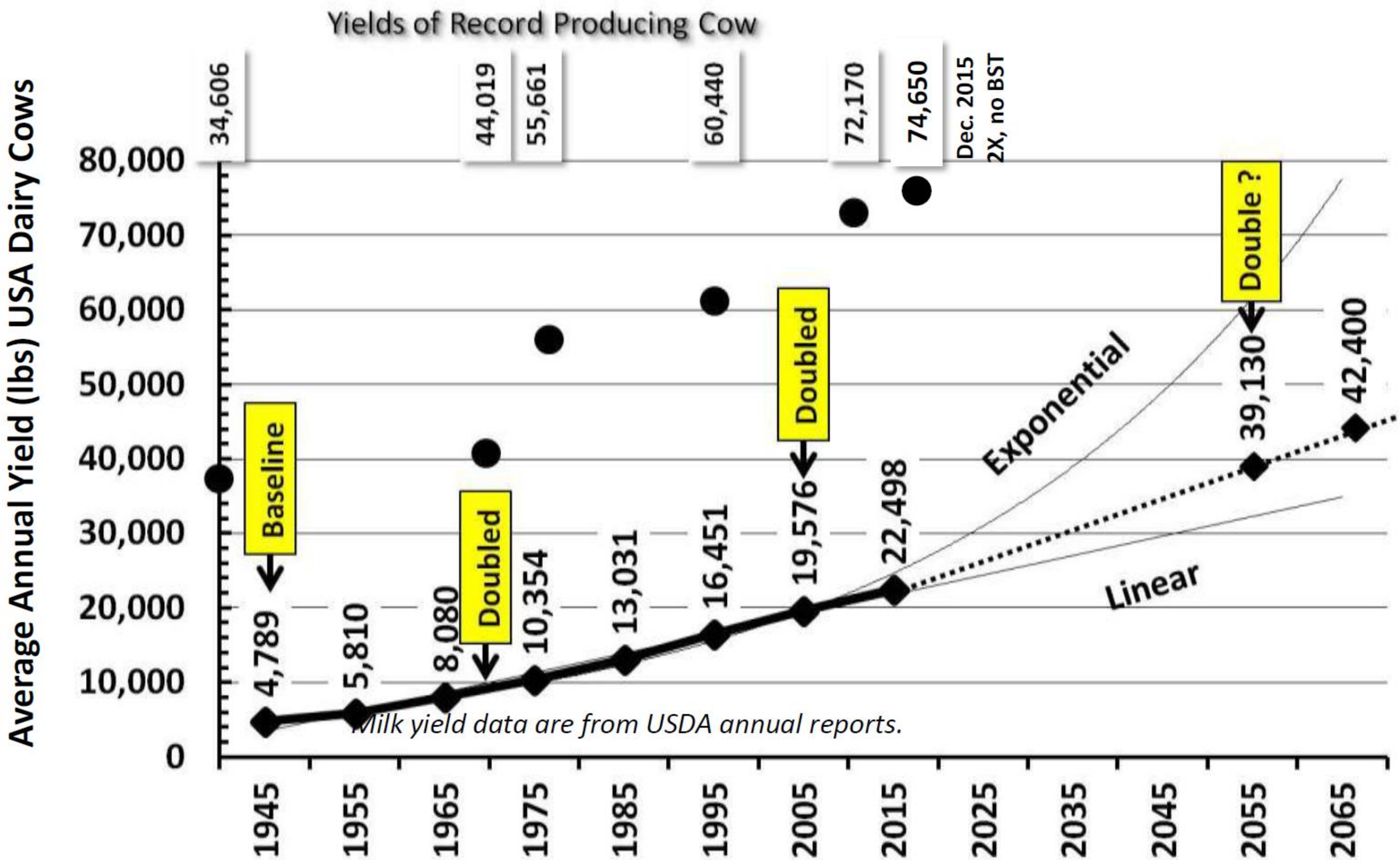
Past milk yield and Britt projections (USA)*

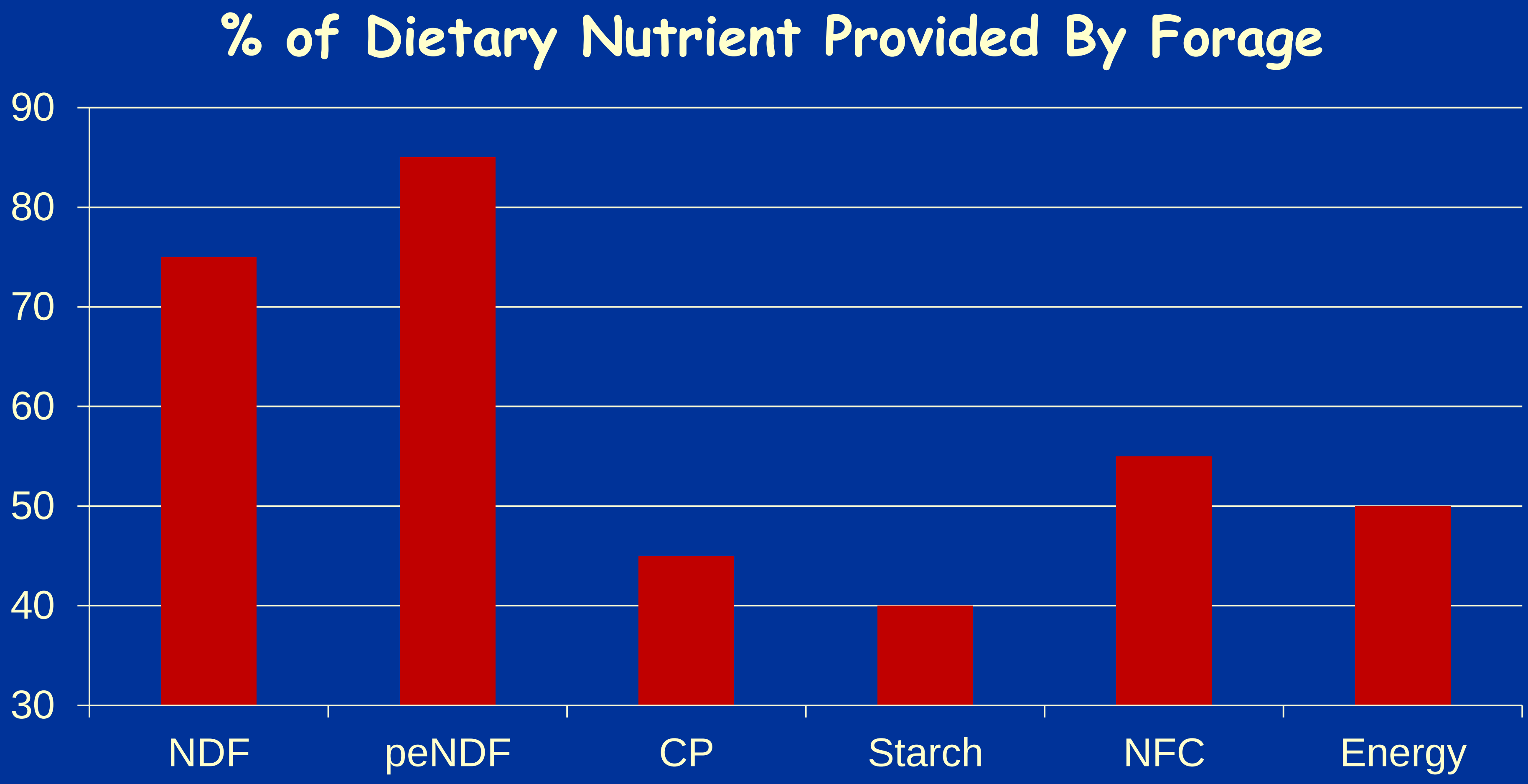


*Average annual yield data include cows of all breed types and are based on USDA annual data. Record yields are registered Holstein data. Projections are linear or exponential curves in Excel using average data. Dotted line is Britt's estimate of where we will be.

Calculated from Survey Summaries

Maintenance & BWG energy requirements apportioned to forage or concentrate according to diet F:C ratio

Calculated from Survey Summaries



What makes a better forage?

- ✓ High digestibility
  - ✓ Fiber (-)
  - ✓ Fiber digestibility (+)
- ✓ High intake potential
  - ✓ Fiber (-)
  - ✓ Fiber digestibility (+)

BOTH NDF and NDF digestibility are needed to assess forage quality

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Corn Silage Quality Indicators for High-Producing Dairy Herds

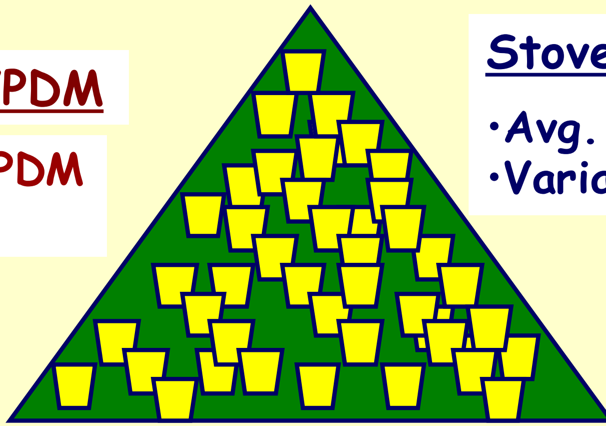
Parameter	Indicates Better Quality	Primary Reason
NDF	↓	↓ Rumen Fill Limitation of DMI Potential for production response or feeding of higher-forage diets
Lignin	↓	
$uNDF_{240}$	↓	
$NDFD_{30}$	↑	
TTNDFD	↑	
Starch	↑	↑ Energy Density Potential for production response or feeding less corn grain
Milk per ton	↑	Quality Index for Ranking

Corn Silage Quality Indicators for High-Producing Dairy Herds

Parameter	Indicates Better Quality	n	Average ± 1 STDEV
NDF (% DM)	↓	384,715	41 - 36
Lignin (% DM)	↓	344,134	3.3 - 2.6
$uNDF_{240}$ (% NDF)	↓	81,418	27 - 24
$NDFD_{30}$ (% NDF)	↑	170,634	54 - 60
TTNDFD (% NDF)	↑	27,954	41 - 46
Starch (% DM)	↑	347,759	32 - 39
Milk per ton	↑	136,056	3320 - 3683

Summary of combined multi-year, multi-lab (CVAS, DairyOne, RRL, DLL) data, except TTNDFD only from RRL

Whole-Plant Corn Silage

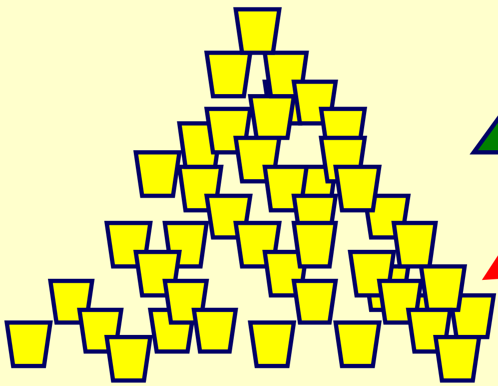


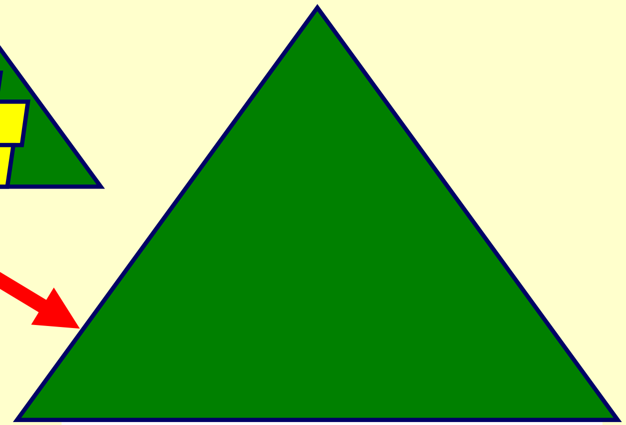
Grain ~40-45% of WPDM

- Avg. 30% starch in WPDM
- Variable grain:stover

Stover= ~55-60% of WPDM

- Avg. 42% NDF in WPDM
- Variable stover:grain





80 to 98% StarchD

- Kernel particle size
- Duration of silage fermentation
- Kernel maturity
- Endosperm properties
- Additives (exp.)

40 to 70% IVNDFD

- Lignin/NDF
  - ✓ Hybrid Type
  - ✓ Environment; G × E
  - ✓ Maturity
- Cutting height
- Additives (exp.)

Variable peNDF as per chop length

Adapted from Joe Lauer, UW Madison Agronomy Dept.

Corn Silage Harvest Practices Influence Starch Digestibility!

Harvest Guidelines

Conventional Processor

- TLOC: 13-19 mm
- 15%-25% PSU box top screen
- Roll Gap: 1-3 mm
- DM%: 34%-38%

New Processing Alternatives

- Novel intermeshing disk processors
- Processors with greater roll speed differential
- Shredlage®

Kernel Processing Score
Mertens, USDFRC

- Ro-Tap Shaker
  - 9 sieves (0.6 thru 19 mm) and pan
  - Analyze for starch on 4.75 mm & > sieves

% of starch passing 4.75 mm sieve	CSPS
>70%	Excellent
70% to 50%	Adequate
< 50%	Poor

Industry Makes Advances in Corn Silage Processing

(CVAS Data, 2006 to 2014)

Crop Year	Number	Average	Percent Excellent	Percent Poor
2006	97	52.8	8.2	43.3
2007	272	52.3	9.2	37.9
2008	250	54.6	5.2	34.8
2009	244	51.1	6.1	48.0
2010	373	51.4	5.9	43.4
2011	726	55.5	12.3	33.1
2012	871	60.8	14.8	19.9
2013	2658	64.6	36.0	12.9
2014	322	61.8	24.2	9.0

Corn Silage Processing Improves

(DLL Data, 2009 to 2014)

Corn Silage Processing Score
Summary by Crop Year (Sept 1 – Aug 31st each yr.)
10/29/2015

DAIRYLAND Laboratories, Inc.

CSPS	2009	2010	2011	2012	2013	2014
<50	31.2%	30.3%	20.8%	15.9%	17.0%	14.4%
50-70	63.3%	60.3%	61.6%	63.7%	61.6%	67.1%
>70	5.5%	9.4%	17.5%	20.4%	21.4%	18.5%
Count	483	499	958	1079	1566	1580

Corn Silage Processing Improves

(RRL Data, 2013 to 2015)

Crop Year	Count (n)	Average CSPS	Normal Range	Percent Excellent	Percent Poor
2013	725	56	44 - 68	12%	33%
2014	2155	65	54 - 76	33%	8%
2015	847	68	57 - 79	48%	6%

Focus on Forage

Wisconsin TEAM Forage

Making Sure Your Kernel Processor Is Doing Its Job

by Kevin J. Shinners and Brian J. Holmes

www.uwex.edu/ces/crops/uwforage/KernelProcessing-FOF.pdf

Figure 1. Chopped whole-plant corn placed into water.

Figure 2. Gently agitating material to help the kernels sink to the bottom of the container.

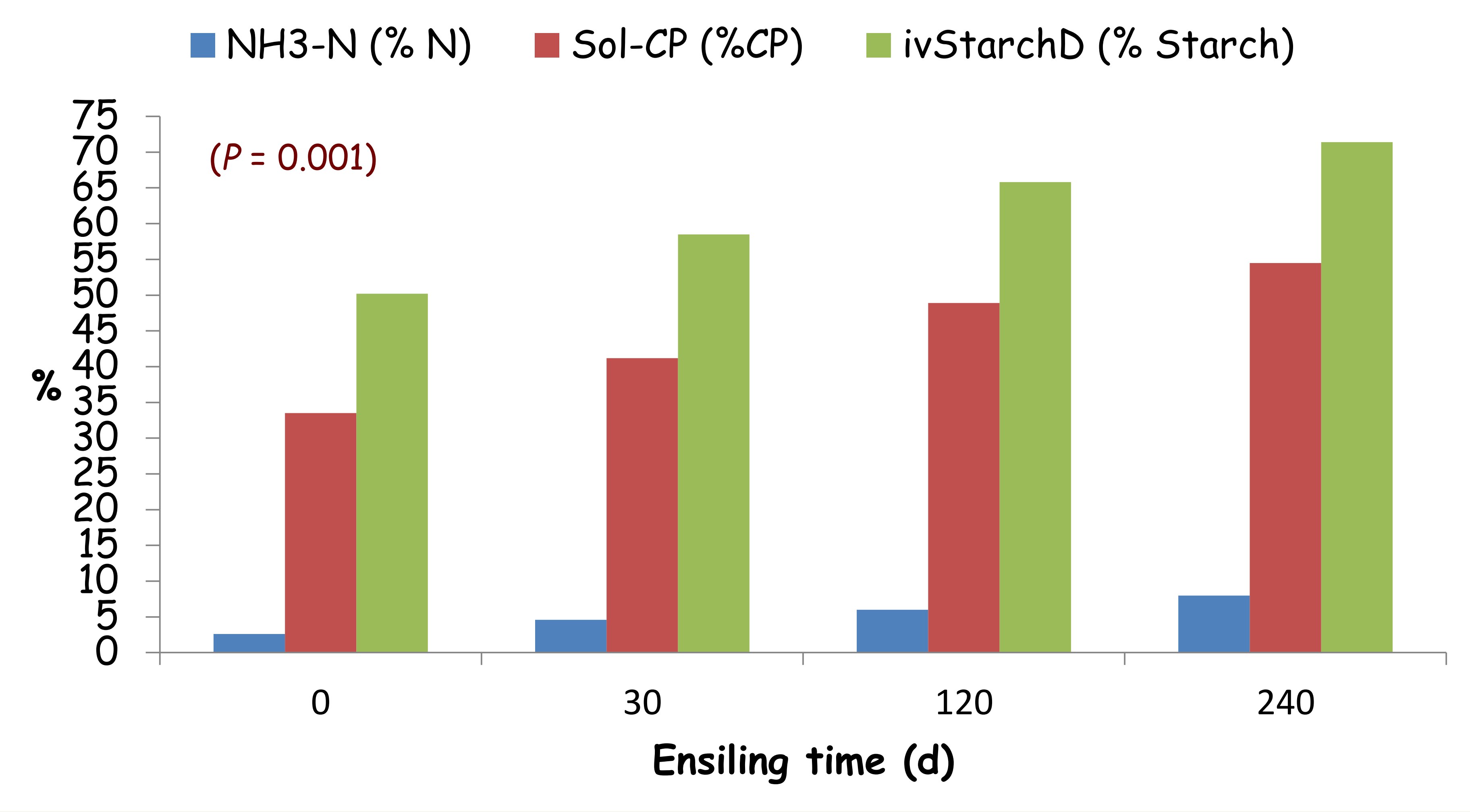
***Figure 3*.** Skimming and removing the floating stover.

***Figure 4*.** Carefully draining the water so only the kernels remain in the container.

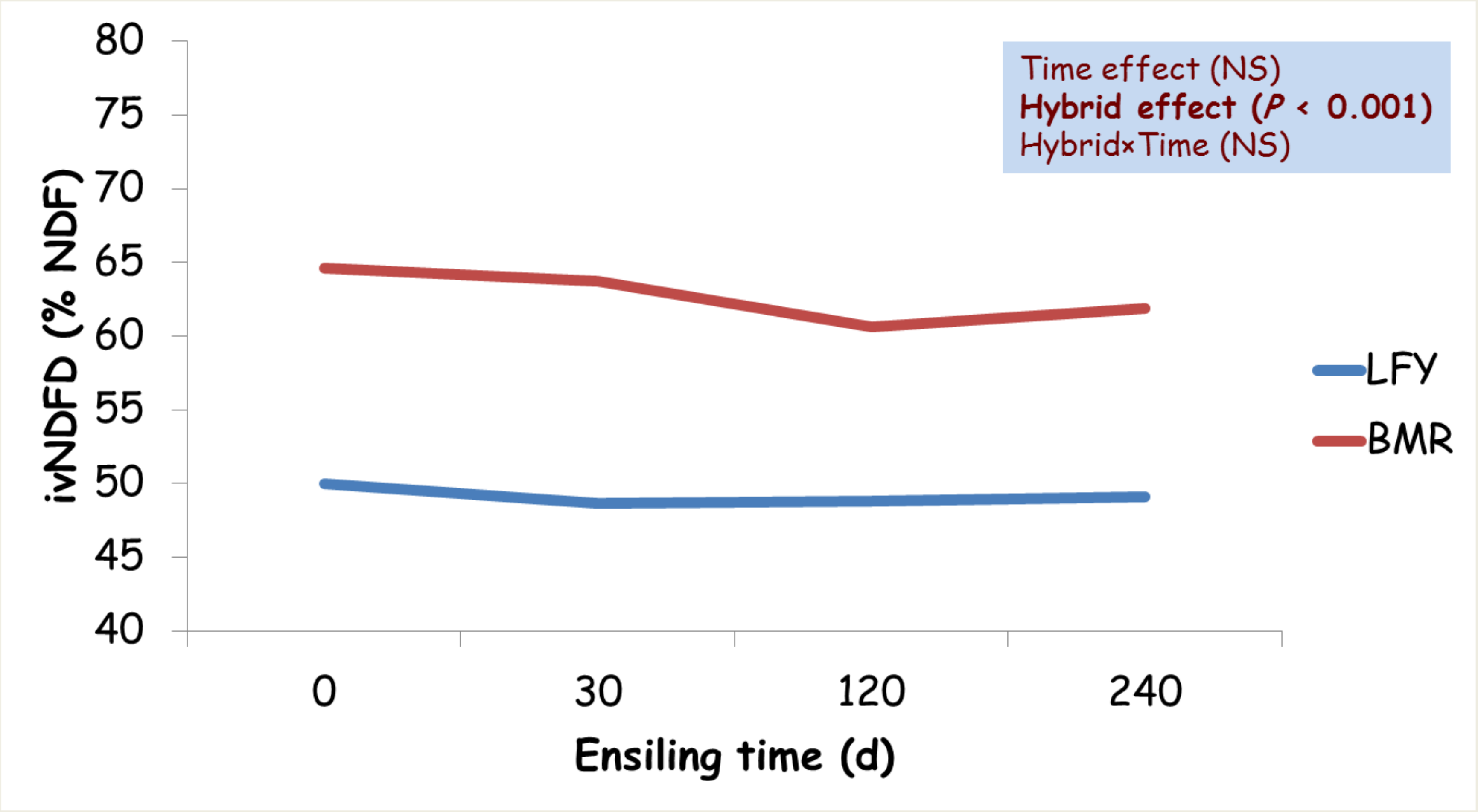
Figure 6. Separated kernels showing three levels of kernel processing. Only the material on the right could be considered adequately processed.

Corn Silage Fermentation Increases Starch Digestibility!

Ensiling time effect



Hybrid type × ensiling time



Established Components of Corn Silage Hybrid Selection Index

- Grain Yield, Starch %, NDF %
- ivNDFD
- Yield
- Milk per ton; Milk per acre
  - No revision of MILK2006 until after new update of Dairy NRC released

User-Defined Weighting




What makes a better forage?

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BOTH NDF and NDF digestibility are needed to assess forage quality

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Haycrop Silage Quality Indicators for High-Producing Dairy Herds

Parameter	Indicates Better Quality	Primary Reason
NDF	↓	↓ Rumen Fill Limitation of DMI Potential for production response or feeding of higher-forage diets
Lignin	↓	
$uNDF_{240}$	↓	
$NDFD_{30}$	↑	
TTNDFD	↑	
NFC (includes soluble fiber)	↑	↑ Energy Density Potential for production response or feeding less corn grain
CP	↑	↓ Supplemental Protein
Ash	Minimal Soil Contamination	↑ Energy Density
RFV; RFQ	↑	Quality Index for Ranking

Legume Silage Quality Indicators for High-Producing Dairy Herds

Parameter	Indicates Better Quality	n	Average ± 1 STDEV
NDF (% DM)	↓	111,310	42 - 37
Lignin (% DM)	↓	100,029	7 - 5
$uNDF_{240}$ (% NDF)	↓	25,541	45 - 36
$NDFD_{30}$ (% NDF)	↑	61,568	46 - 57
TTNDFD (% NDF)	↑	24,498	44 - 51
NFC (% DM)	↑	94,337	26 - 30
CP (% DM)	↑	112,423	21 - 24
Ash (% DM)	Minimal Soil	100,888	<13
RFV	↑	100,831	141 - 167
RFQ	↑	51,453	155 - 179

Summary of combined multi-year, multi-lab (CVAS, DairyOne, RRL, DLL) data, except for TTNDFD from RRL

New Alfalfa Varieties

- Reduced lignin for greater NDFD or delayed harvest
- Reduced protein degradability for greater RUP

Grass/MMG Silage Quality Indicators for High-Producing Dairy Herds

Parameter	Indicates Better Quality	n	Average ± 1 STDEV
NDF (% DM)	↓	85,213	55 - 48
Lignin (% DM)	↓	76,222	6 - 4
$uNDF_{240}$ (% NDF)	↓	15,972	33 - 24
$NDFD_{30}$ (% NDF)	↑	34,833	54 - 62
TTNDFD (% NDF)	↑	9,000	47 - 56
NFC (% DM)	↑	80,008	20 - 25
CP (% DM)	↑	85,889	15 - 18
Ash (% DM)	Minimal Soil	76,530	<10
RFV	↑	79,702	112 - 136
RFQ	↑	24,541	135 - 167

Summary of combined multi-year, multi-lab (CVAS, DairyOne, RRL, DLL) data, except for TTNDFD from RRL

New Grass Varieties

- Reduced NDF
- Delayed maturity
- Closer timing of maturity to alfalfa maturity




Forage Use on 4000-Cow Dairy

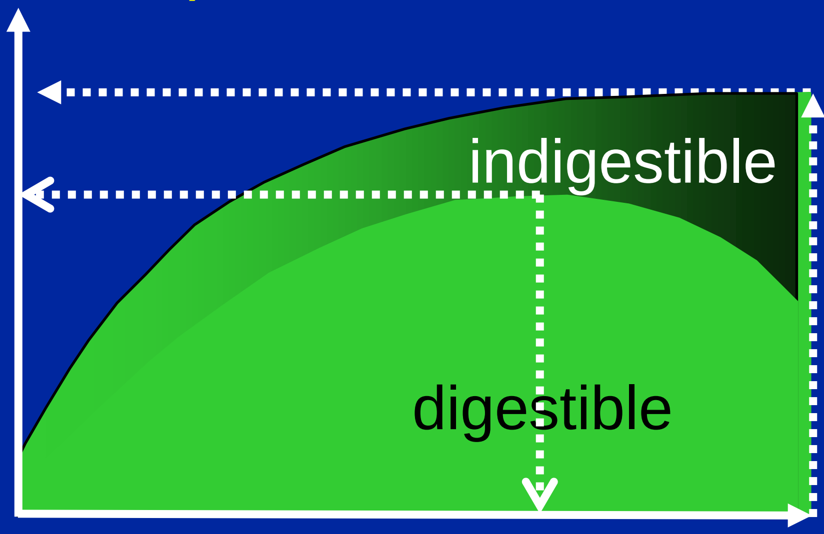
	Forage Needs @ 15% Shrink Tons DM	Acres Needed @ 6 ton DM avg. yield
Daily	51	9
Weekly	411	69
Monthly	1,763	294
Annually	21,444	3,574

Forage Use on 4000-Cow Dairy

	Acres Needed
10% Yield Drag	+397
10%-units more forage in LC Diet DM	+576
Both	+1,038

Forage yield - quality vs. quantity

Dry matter yield
(tons/acre)



Maximum yield of DM

Maximum yield of digestible DM

Vegetative growth

Optimal stage

Flower or Head or Black Layer

Stage of maturity

Dry Matter Loss for Forage Harvest and Ensiling

	Dry Matter Loss	
	Range (%)	Normal (%)
Mowing/Conditioning Haylage	1-4	2
Respiration Haylage	1-7	4
Rain (Haylage only)	0-50	varies
Raking Haylage	1-20	5
Merging Haylage	1-3	1
Chopping Haylage	1-8	3
Chopping Whole Plant Corn	0-1	0.5
Storage Filling	2-6	---
Ensiling, Storage & Feedout (bunker)	10-16	12
Haylage Total	17-64	
Whole Plant Corn Total	12-23	

Slide courtesy of Brian Holmes, UW Madison

Wisconsin TEAM Forage

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Questions?

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Visit UW Extension
Dairy Cattle Nutrition Website

http://www.shaverlab.dysci.wisc.edu/