Opportunities to Improve Starch Digestibility on Dairy Farms

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UW Extension
Cooperative Extension

Feed: All About Timing!

Starch Digestibility

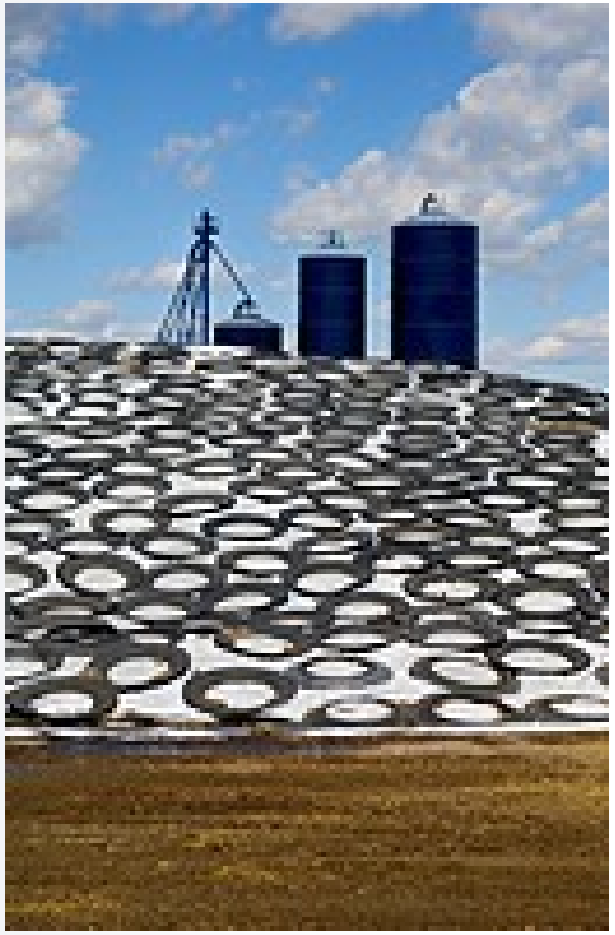
- Fecal Starch Content < 5%
- Every percentage unit increase over 5% is an estimated milk yield loss of one pound per cow per day

(Dr. James Ferguson, 2003)

Starch Digestibility

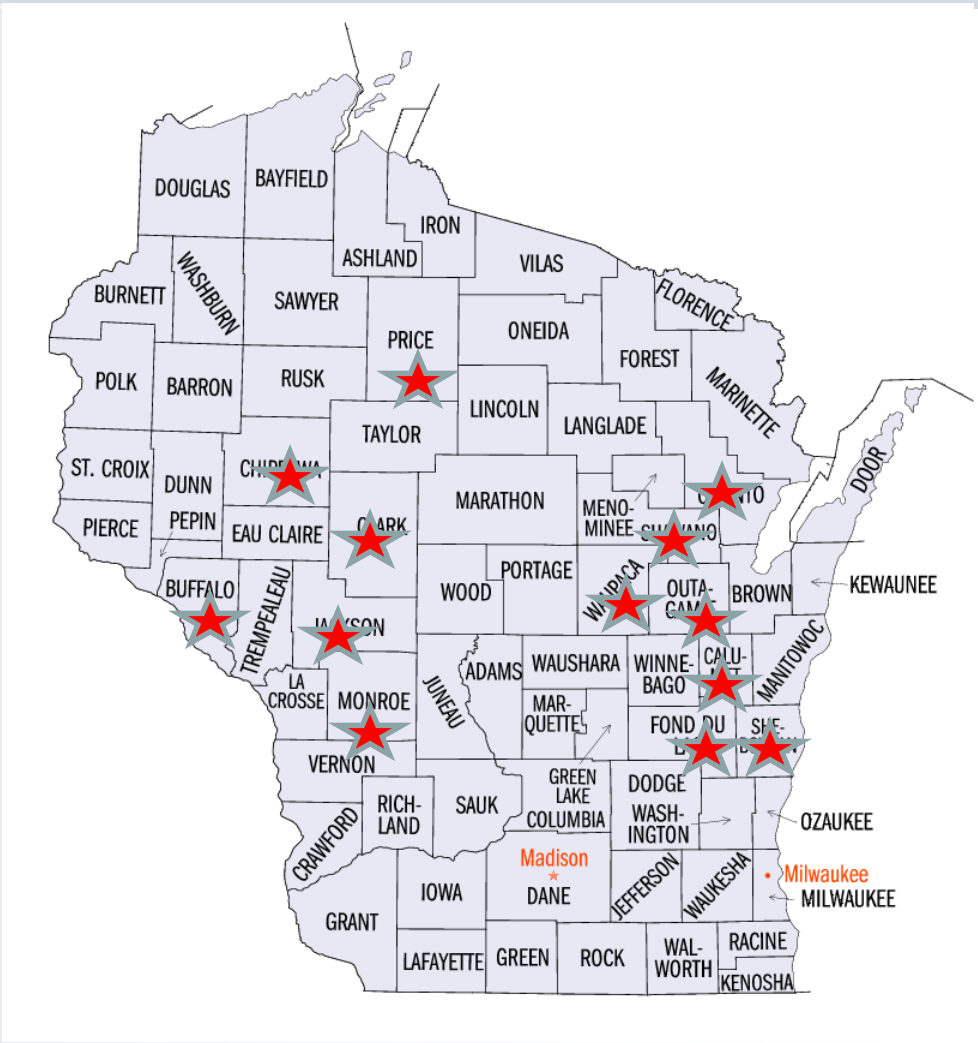
The Manure Starch Analysis Project

- Goal: To learn if starch digestibility improves with extended time in storage
- Funding
  - UW-Extension Dairy Team
  - UW-Extension Eastern District Dairy Team
  - Dr. Randy Shaver



The Project

- Looking for farms of any size
- Needed to be feeding new corn silage in fall 2011 and still in spring 2012
- 30 farms in Wisconsin
- 13 different counties



Herd Summary

- Farms
  - Average Herd Size= 223 cows
  - Range= 38 to 1,000 cows
  - Average Milk per Cow= 72.2 lbs/day
  - Range= 45 to 93 lbs/cow/day

Image Source Page: http://www.stackyard.com/news/2006/10/veterinary/03_herd_planner.html

The Process

- Sample Collection
  - Feed Samples
    - Corn Silage
    - High Moisture Corn
    - Dry Corn
  - Manure
    - The manure from ten cows in the herd 45 to 120 days fresh was comingled into one sample
  - Farm/Herd Data

Image Source: http://teawithfriends.blogspot.com/2010/07/visit-to-dairy-farm.html

Laboratory Analysis

- Rock River Laboratory, Inc
  - Watertown, Wisconsin

- Courtney Heuer
  - Graduate Student
  - UW-Madison

    Department of Dairy Science

Feed Sampling

- Corn Silage
  - Dry Matter Percent
  - Corn Silage Processing Score
  - Starch Percent
  - 7-Hour Starch Digestibility

Feed Sampling

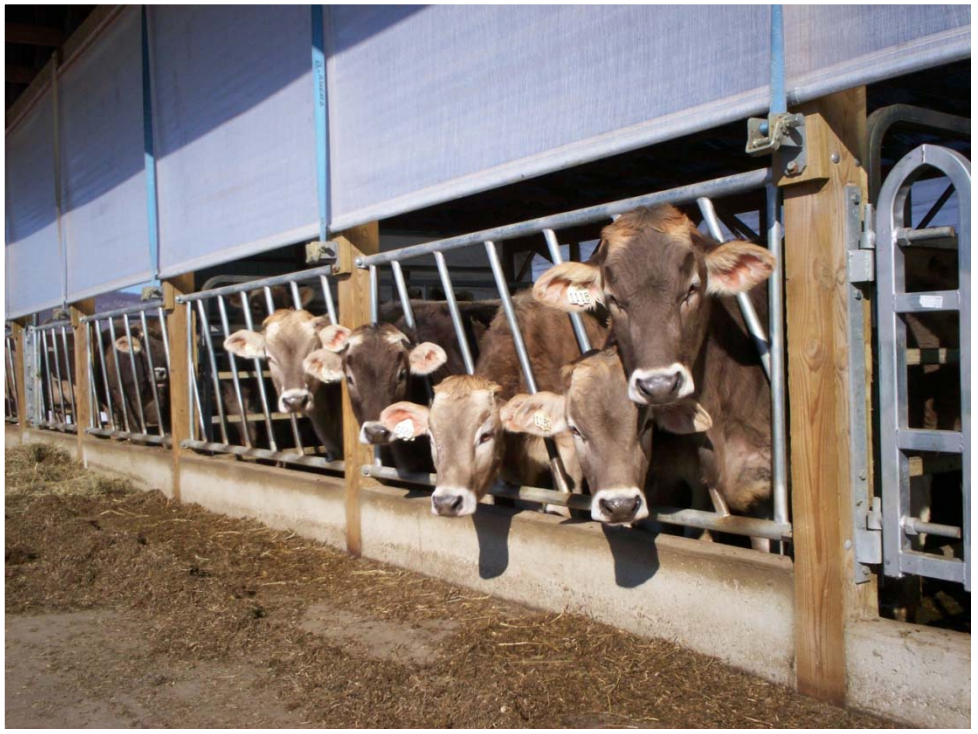
- High Moisture Corn & Dry Corn
  - Dry Matter Percent
  - Kernel Processing Score
  - Starch Percent
  - 7-Hour Starch Digestibility

Manure Samples

- Starch Content
- Total Tract Digestibility

The Results

- What can be done on farms to improve starch digestibility?

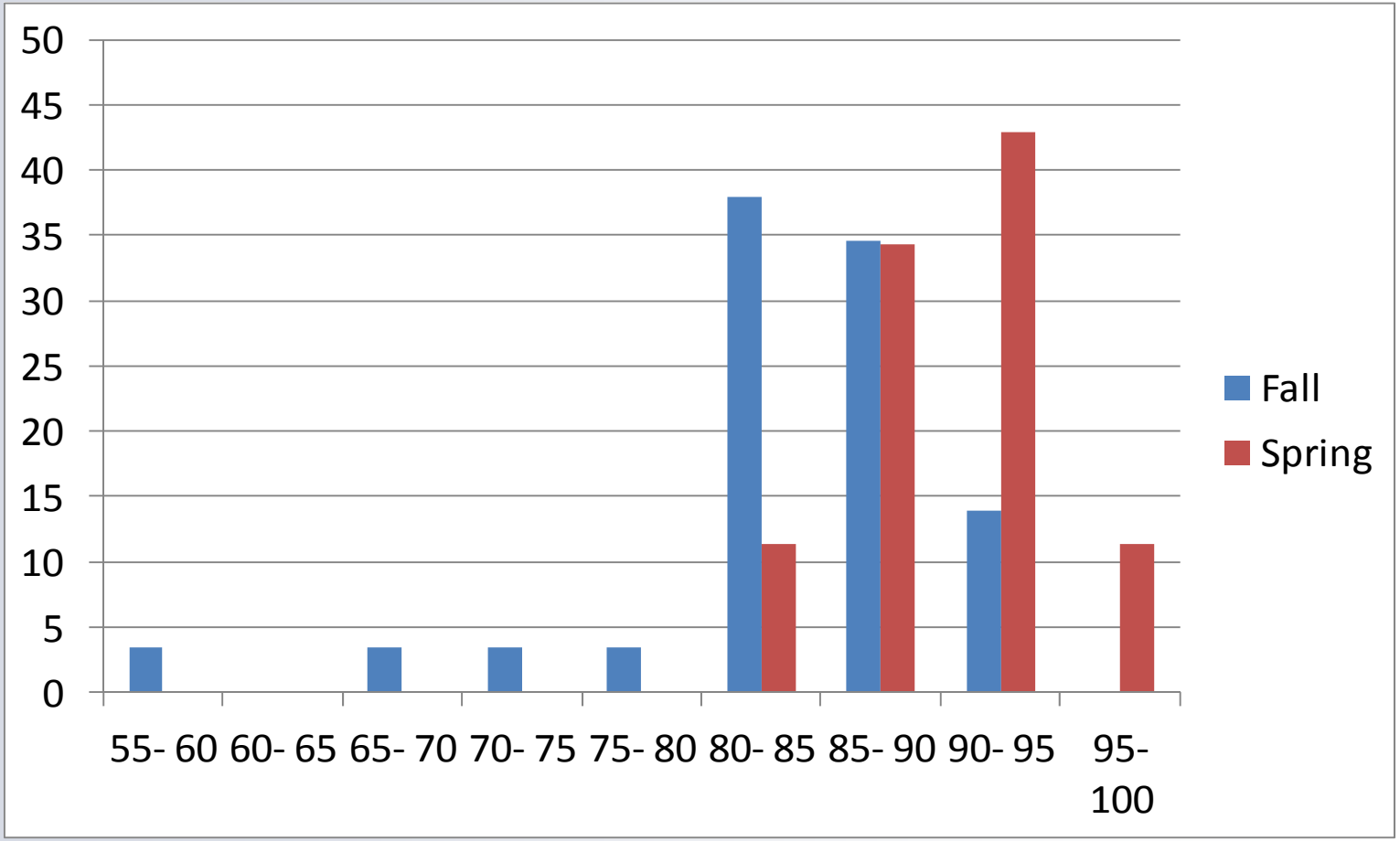


Corn Silage Results- Fall & Spring

Fall 2011				
	n	**Average**	**Standard Deviation**	**Range**
Dry Matter %	30	35.0	4.5	28.8- 49.5
Corn Silage Processing Score %	30	57.0	11.1	34.9- 74.4
Starch %	30		5.4	16.0- 44.1
7-hour Starch Digestibility %		83.7	.5	58.1- 93.9

Spring 2012				
	n	**Average**	**Standard Deviation**	**Range**
Dry Matter %	35	36.2	5.1	28.1- 50.5
Corn Silage Processing Score %	35	61.1	12.4	38.6- 88.7
Starch %	35		4.8	23.9- 41.9
7-hour Starch Digestibility %		90.3	.7	82.5- 96.2

Corn Silage 7-hr Starch Digestibility, Fall vs. Spring



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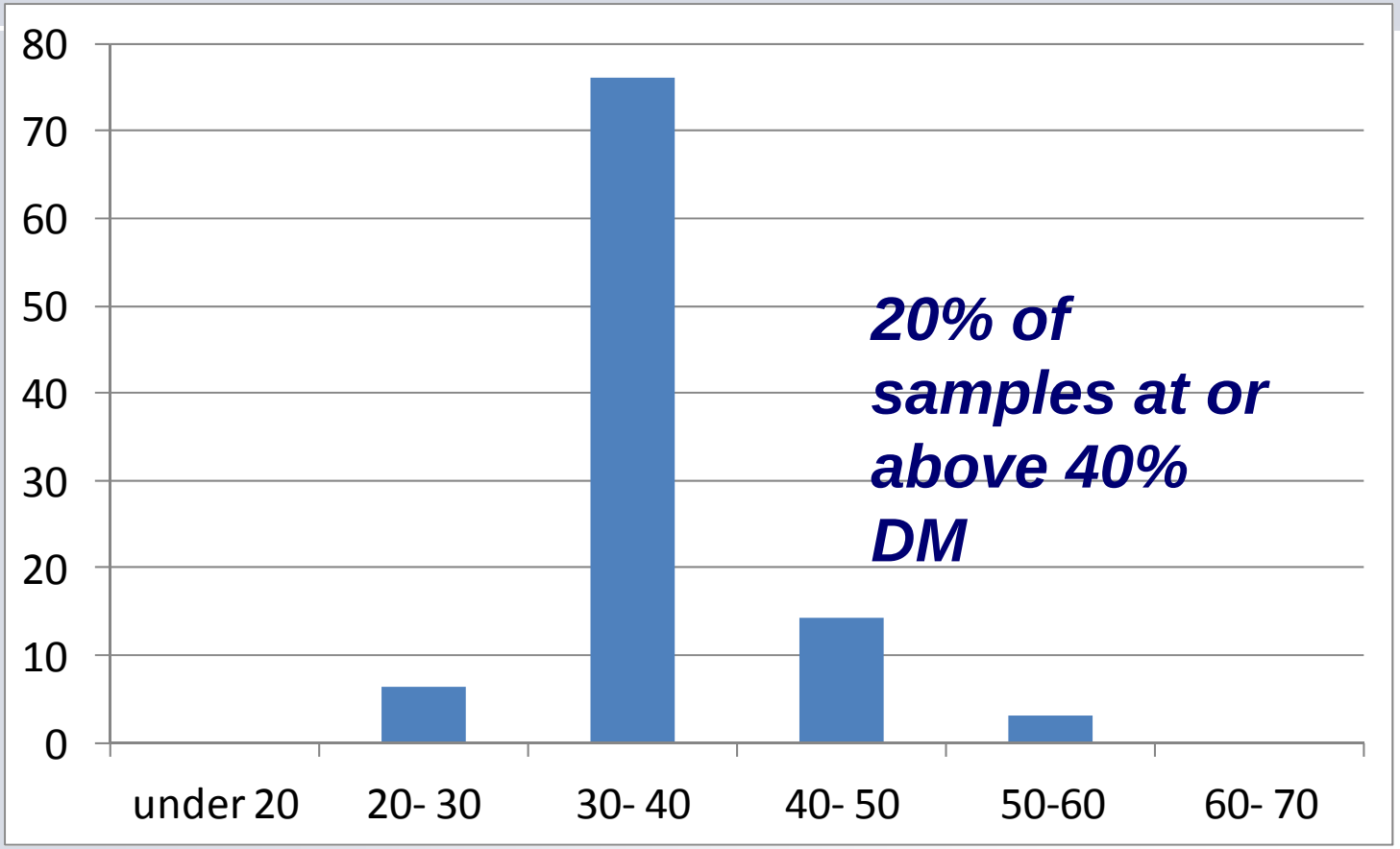
Recommendation #1:
Leave corn silage in storage longer

Corn Silage Dry Matter Percent, Fall & Spring

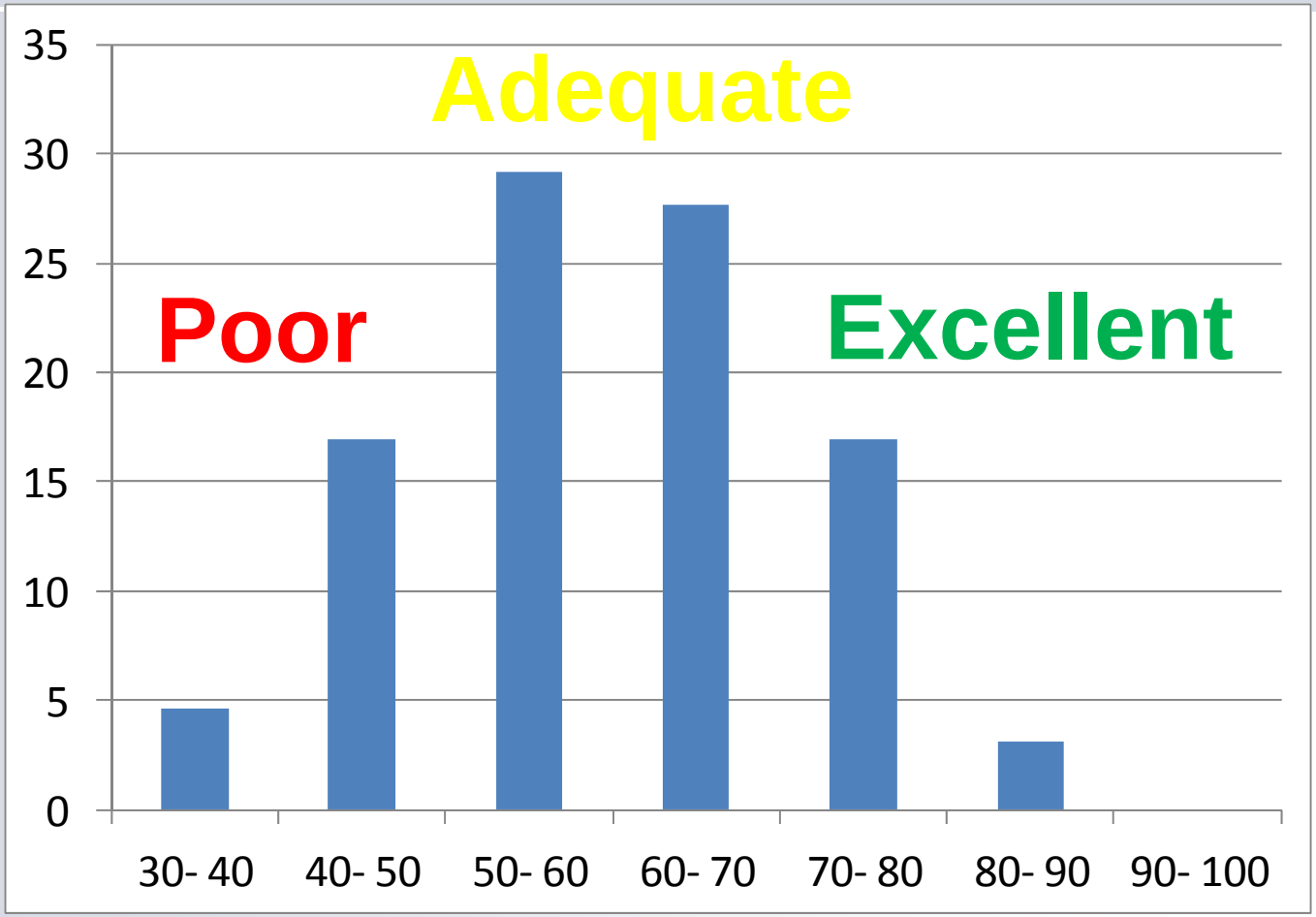


Improving Starch Digestibility

Recommendation #2
Harvest corn silage at a lower dry matter content

Image Source: http://meyerdairy.wordpress.com/2012/08/31/corn-silage-harvest-2012/

Corn Silage Kernel Processing Score, Fall & Spring



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Recommendation #3
Increase kernel processing at harvest

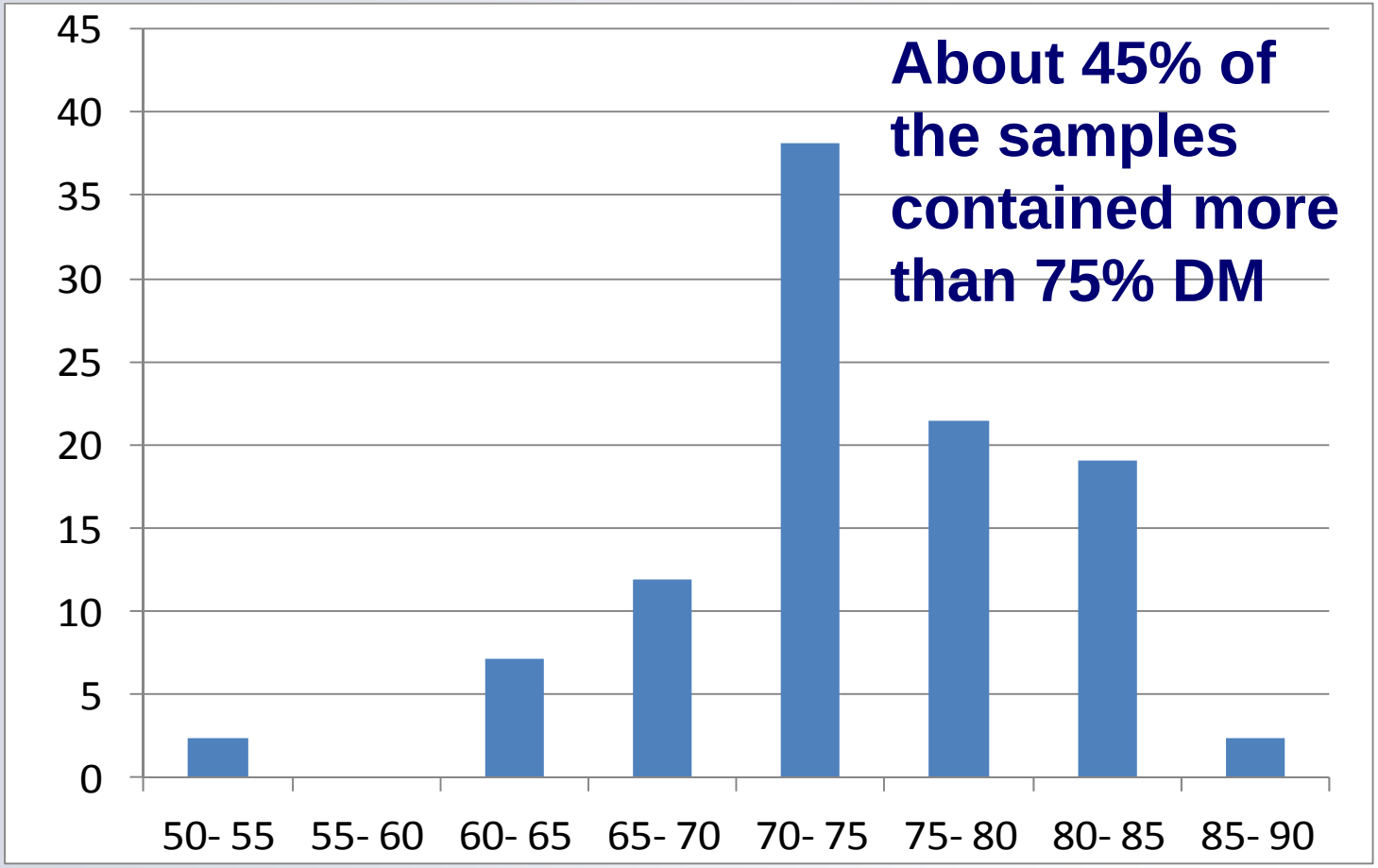
Image Source: http://talk.newagtalk.com/forums/thread-view.asp?tid=326814&mid=2550104

High Moisture Corn- Fall & Spring

Fall 2011				
	n	Average	Standard Deviation	Range
Dry Matter %	19	72.0	7.2	51.4- 81.4
Particle Size, microns	19	1725	562	780- 2710
Starch %	19	72.1	6.2	56.9- 81.8
7-hour Starch Digestibility %	19	75.7	8.2	65.4- 89.6

Spring 2012				
	n	Average	Standard Deviation	Minimum
Dry Matter %	23	74.8	5.9	60.1- 86.6
Particle Size, microns	23	1548	626	539- 26.84
Starch %	23	68.3	9.3	48.3- 79.1
7-hour Starch Digestibility %	23	74.5	7.2	61.6- 85.8

High Moisture Corn Dry Matter Content, Fall & Spring



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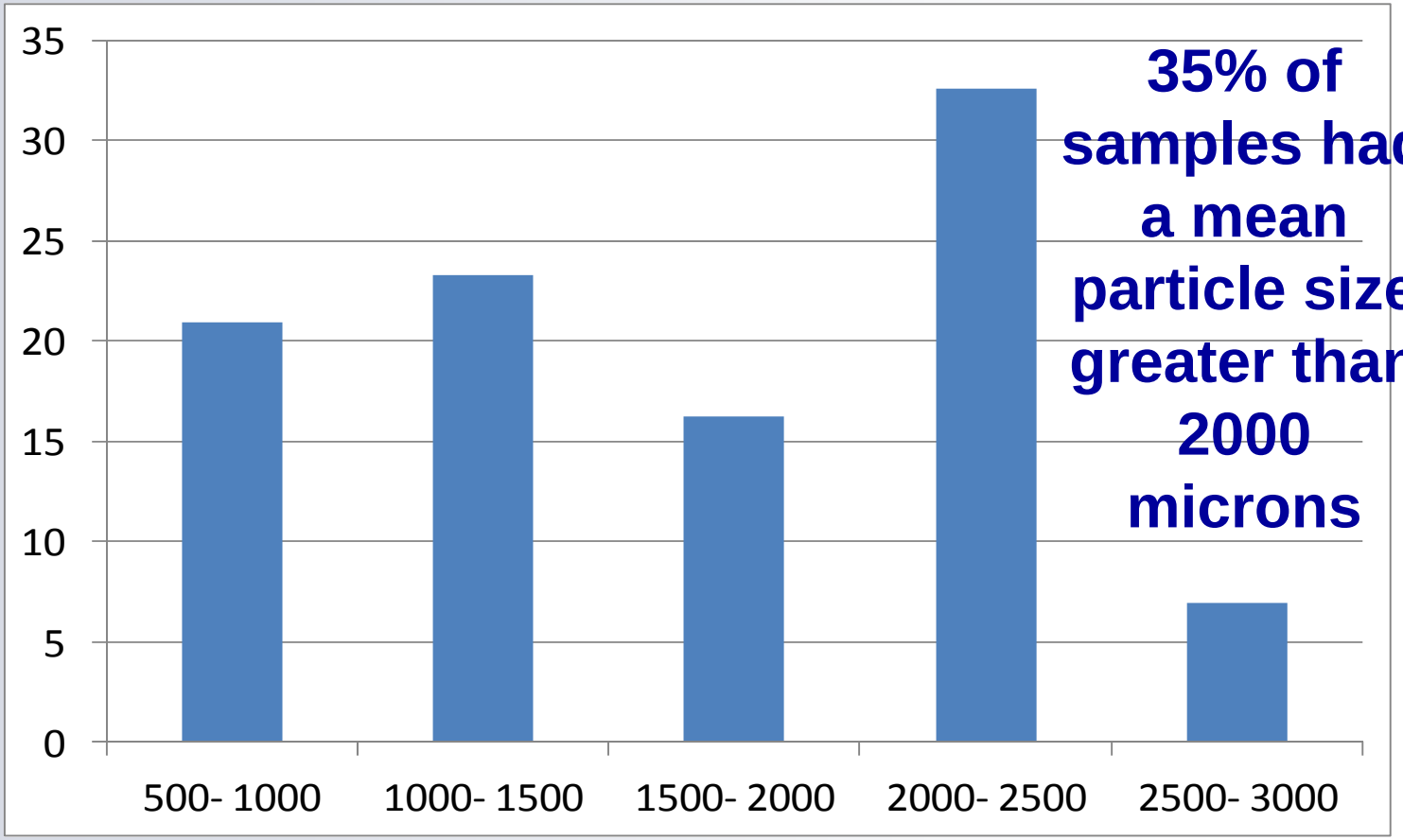
Recommendation #4:

Control moisture levels at high moisture corn harvest

High Moisture Corn Particle Size, Fall & Spring



Improving Starch Digestibility

Recommendation #3

Increase kernel processing at harvest for corn silage and high moisture corn

Image Source: http://talk.newagtalk.com/forums/thread-view.asp?tid=926814&mid=2550104

Dry Corn- Fall & Spring

Fall 2011 & Spring 2012				
	n	**Average**	**Standard Deviation**	**Range**
Dry Matter %	9	84.1	4.0	76.4- 90.0
Particle Size, microns	8	550	61	461- 635
Starch %	5	74.9	2.4	70.6- 76.5
7-hour Starch Digestibility %	9	73.5	4.1	68.6- 81.5

Improving Starch Digestibility

Recommendation #5

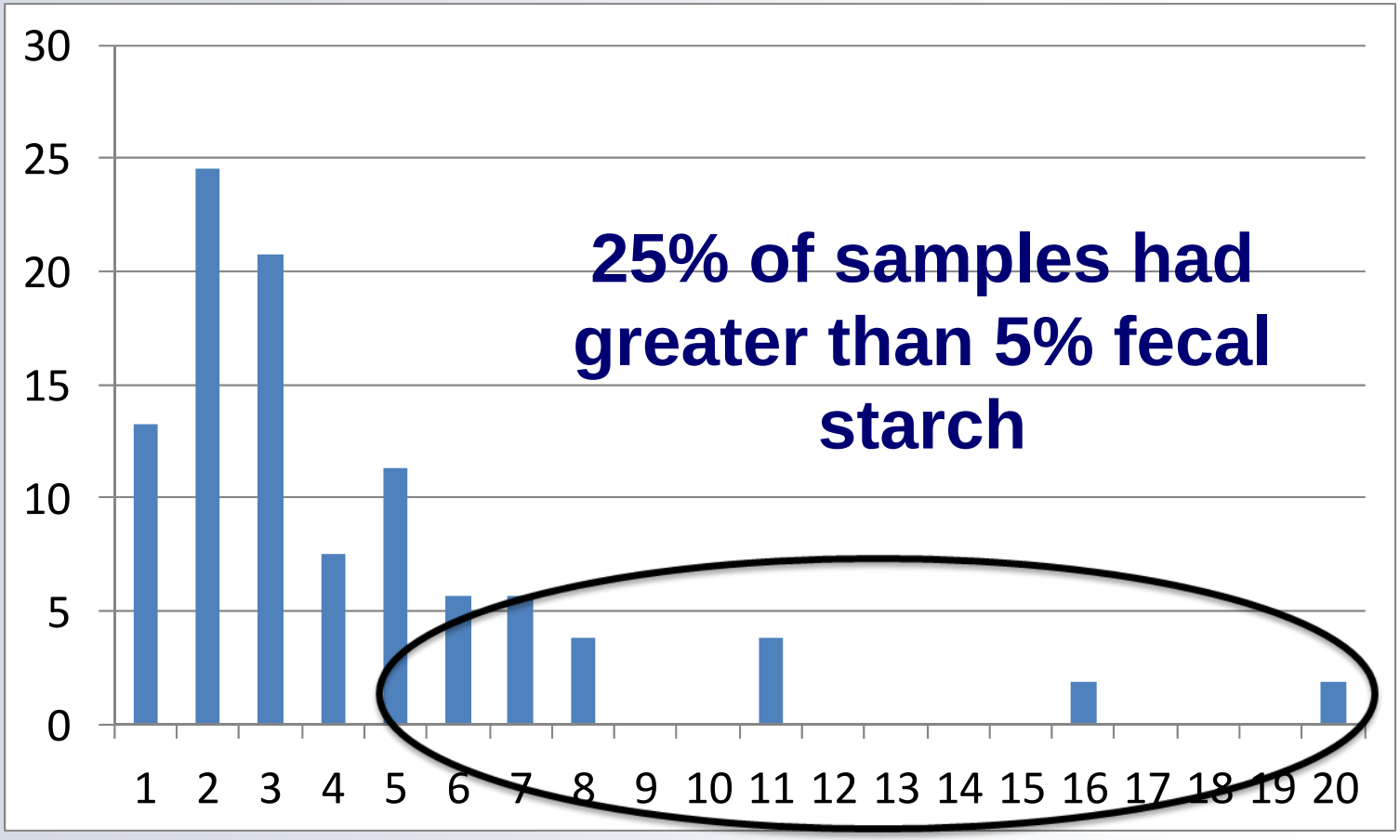
Grind dry corn to a fine particle size

Fecal Samples- Fall & Spring

Fall 2011				
	n	**Average**	**Standard Deviation**	**Minimum**
Starch %	29	3.3	3.0	0.4- 15.2
Total Tract Starch Digestibility %	29	95.9	3.7	80.9- 99.5

Spring 2012				
	n	**Average**	**Standard Deviation**	**Minimum**
Starch %	30	4.1	4.0	0.6- 19.6
Total Tract Starch Digestibility %	30	94.9	5.0	75.5- 99.2

Fecal Starch Results, Fall & Spring



Factors Limiting Starch Digestibility

FARM A 148 cows 70 lbs/day		DM %	KPS % or microns
Corn Silage	Fall	32.5	44.78
	Spring	[illegible]	[illegible]
HMC	Fall	78.1	2292
	Spring	76.78	2684
	Fall	80.34	1284
	Spring	80.6	1402
		Starch %	
Fecal	Fall	15.2	
	Spring	19.6	

Factors Limiting Starch Digestibility

FARM B 80 cows 45 lbs/day		DM %	KPS % or microns
Corn Silage	Fall	33.67	54.14
	Spring	38.33	60.08
HMC	Spring	84.48	1143
		Starch %	
Fecal	Fall	4.7	
	Spring	10.5	

Factors Limiting Starch Digestibility

FARM C 173 cows 50 lbs/day		DM %	KPS % or microns
Corn Silage	Fall	40.03	44.57
	Spring	33.14	42.69
HMC	Fall	73.54	831
		Starch %	
Fecal	Fall	7.6	
	Spring	10.8	

Dollars and Cents…

- Herd A
  - 148 cows
  - 70 lbs milk/day

If fecal starch improved from

15 to 10 percent…

5 lbs milk per cow per day= 740 lbs milk

$18 cwt milk= $133/day

Improving Starch Digestibility

Recommendation #6

Sample manure for fecal starch content to better manage starch digestibility on the farm

Source Image: http://dairyinnovation.files.wordpress.com/2010/10/dsc_0083.jpg

Improving Starch Digestibility, Today and In the Future…



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THANK YOU!

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