

Using corn silage starch to navigate high-priced grain

Professor Randy Shaver

Dairy Science Department
University of Wisconsin - Madison



- Evaluate your corn silage & haycrop silage mixture

Corn Silage vs. Alfalfa Silage

- Lactation performance benefit to feeding 1/4th to 1/3rd of forage DM as corn silage
- Similar lactation performance for 1/3rd to 2/3rd of forage DM as corn silage
- Feeding 3/4^{ths} or more of forage DM as corn silage creates nutritional challenges

Corn Silage vs. Alfalfa Silage

- High Corn & Low/Moderate SBM prices favor higher corn silage diets
- Low Corn & High SBM prices favor higher alfalfa silage diets
- DM yield per acre advantage for corn silage over alfalfa silage a major economic factor

Potential on a starch basis to reduce corn grain by increasing the proportion of corn silage in the forage mixture

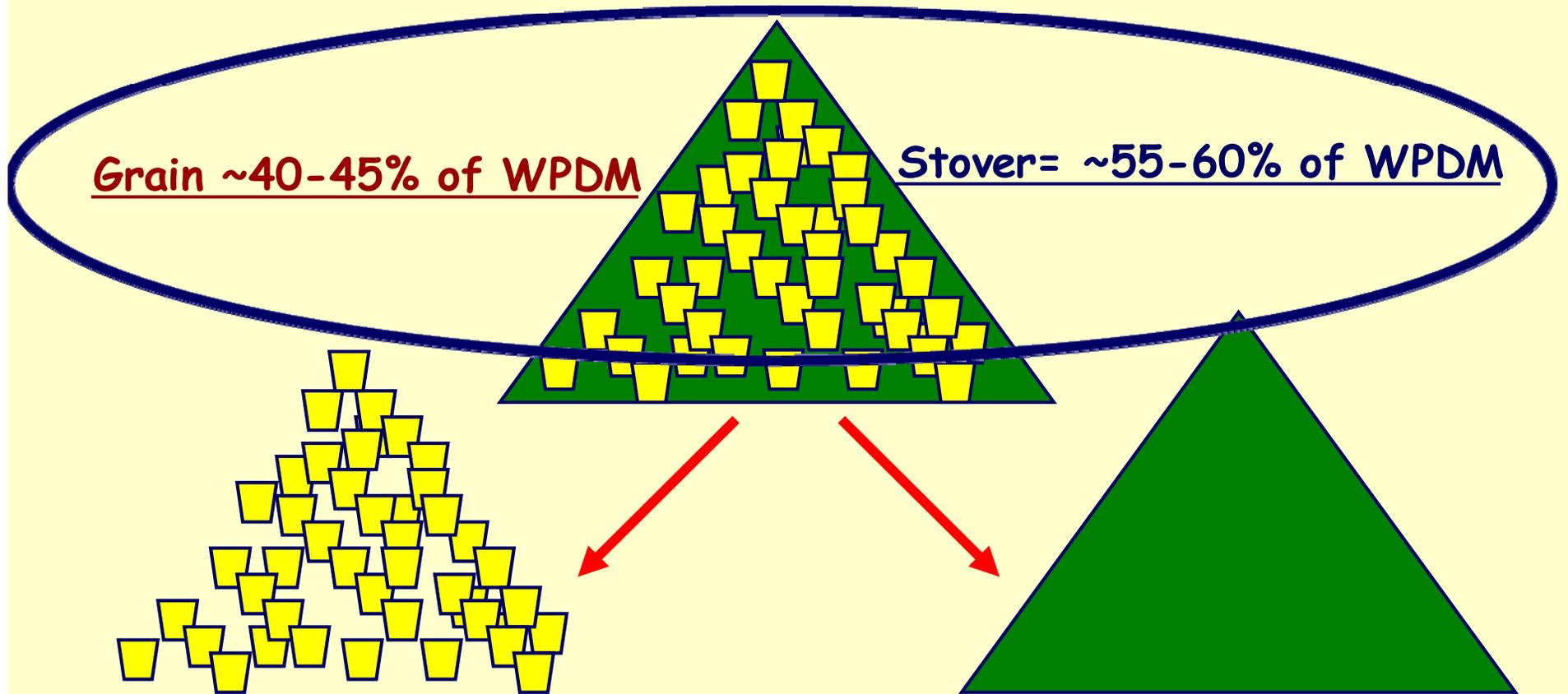
Proportion of corn silage in forage DM	% unit Corn reduction ¹	lb./cow/day Corn reduction ²
50% vs. 25%	4.5%	2.5
75% vs. 25%	9%	5.0

¹Assumes 25%-units more Starch in CS than AS on average (Dairyland Labs, 2007; NRC, 2001)

²Assumes 50 lb. DMI

- Evaluate your corn silage nutrient composition

Whole-Plant Corn Silage



Proportions of grain & stover highly variable

NDF Content of Corn Silages

<u>DM basis</u>	<u>1 Std Dev</u>	<u>Average</u>	<u>1 Std Dev</u>
Dairyland 2002-2007 n=13k/yr.	37%	43%	49%
Dairy One 2002-2007 n=19k/yr.	38%	44%	50%

Starch Content of Corn Silages

<u>DM basis</u>	<u>1 Std Dev</u>	<u>Average</u>	<u>1 Std Dev</u>
Dairyland 2002-2007 n=13k/yr.	23%	30%	37%
Dairy One 2002-2007 n=15k/yr.	24%	31%	38%

Impact of corn silage starch content on dietary content of corn grain

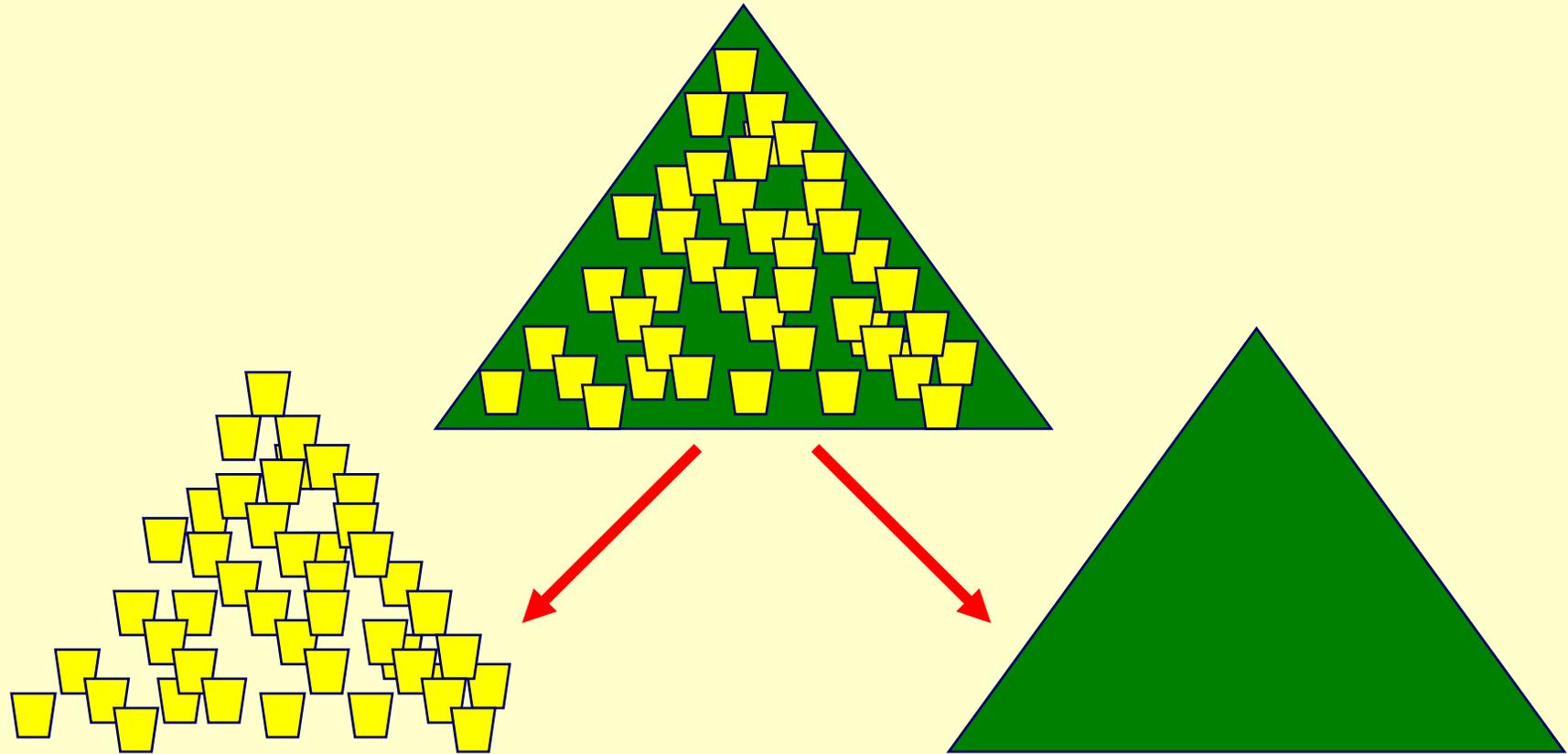
Corn silage starch content	% unit Corn reduction ¹	lb./cow/day Corn reduction ²
30% vs. 23%	2.5%	1.5
37% vs. 23%	5.0%	3.0

¹Assumes 35% corn silage in diet DM

²Assumes 50 lb. DMI

- **Improve starch digestibility of your corn silage**

Whole-Plant Corn Silage



75 to 98% starch digestibility

- Kernel maturity
- Kernel particle size
- Endosperm properties

Maturity effects in corn silage

Bal & co-workers, JDS, 1997; UW Madison

	ED	1/4 ML	2/3 ML	BL
CS DM%	30	32	35	42
CS Starch, %	18	29	37	37
CS aTT StarchD, %	90 ^a	88 ^a	86 ^b	75 ^c
Diet aTT StarchD, %	94 ^a	93 ^a	92 ^b	88 ^c

DM Content of Corn Silages

	<u>1 Std Dev</u>	<u>Average</u>	<u>1 Std Dev</u>
Dairyland 2002-2007 n=13k/yr.	29%	37%	45%
Dairy One 2002-2007 n=19k/yr.	23%	34%	45%

Digestibility Responses to Kernel Processing

Total Tract % units for Processed minus control

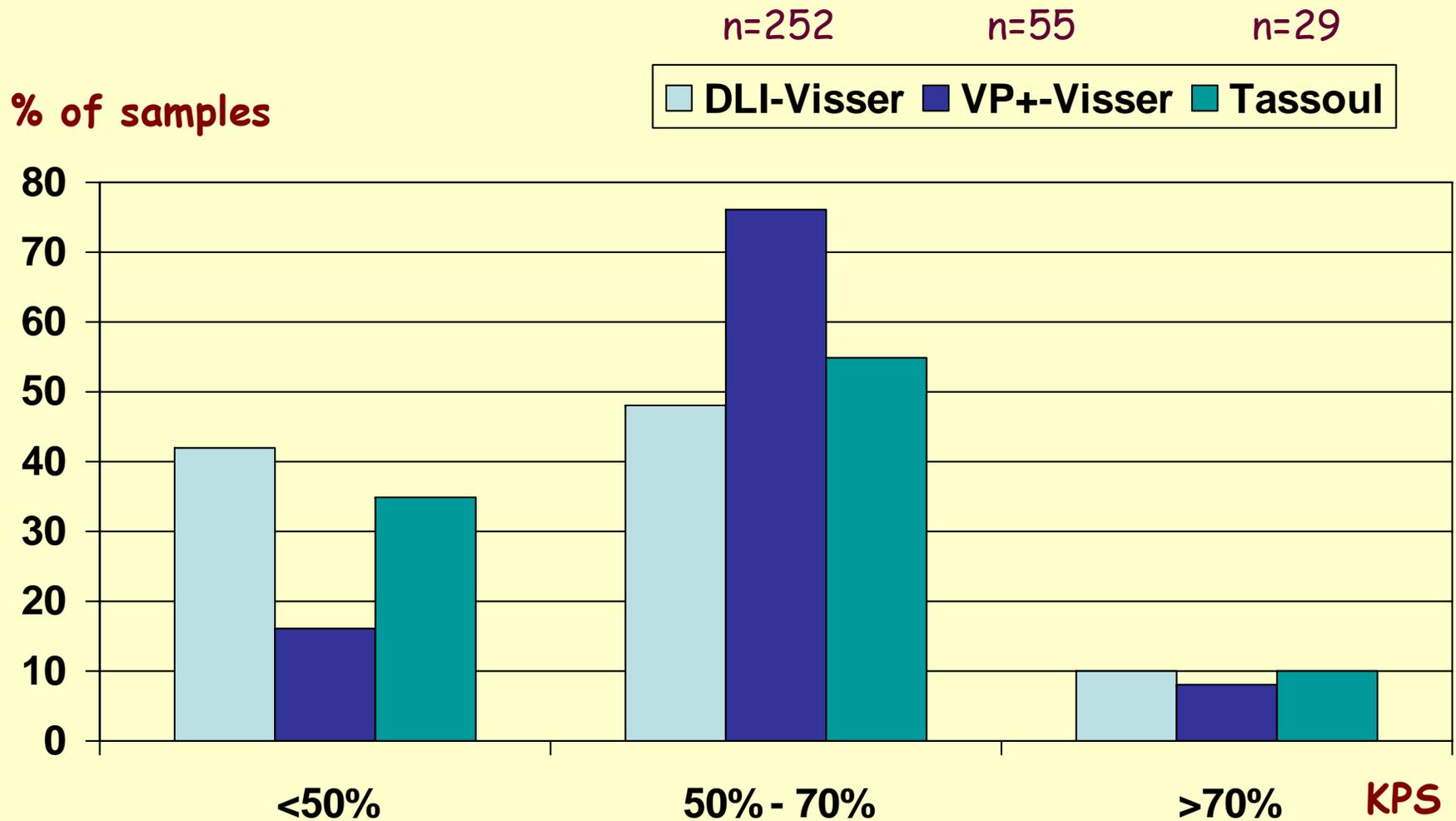
Trial	StarchD
ISU	+5
USDFRC ₁	+3
WI ₁	+4
OSU	+3
WSU	+6
USDFRC ₂	+6
WI ₂	+5
USDFRC ₃	+6
GA-Tifton	+6
DE	+12

Corn silage processor settings

Cooke & Bernard, JDS, 2005, GA

	<u>1.0" TLC 2 mm on KP</u>	<u>1.0" 8 mm on KP</u>
DMI, lb/d	48	48
ECM, lb/d	84 ^a	75 ^b
Diet aTT StarchD, %	87 ^a	75 ^b

Corn Silage KPS



In Vitro Starch Digestibility in Corn Silages

% of Starch	<u>1 Stdev</u>	<u>Average</u>	<u>1 Stdev</u>
CVAS—7h Ruminant n=5290	52%	62%	72%

Impact of corn silage starch digestibility on dietary content of corn grain

Corn silage starch digestibility	% unit Corn reduction ¹	lb./cow/day Corn reduction ²
+10% units	2.5%	1.5
+20% units	5.0%	3.0

¹Assumes 35% corn silage (30% starch content) in diet DM

²Assumes 50 lb. DMI

Potential Reduction in Feed Costs

Corn Reduction	\$3/bu.	\$4/bu.	\$5/bu.	\$6/bu.
lb/cow/day	\$ per cow per month ¹			
-1.5	\$1.02	\$1.36	\$1.70	\$2.04
-2.5	\$2.04	\$2.73	\$3.41	\$4.09
-5.0	\$3.41	\$4.54	\$5.68	\$6.81

¹Corn silage priced at 8x per bushel price of corn used to calculate the cost of filling diet formulation space with corn silage

?



Visit UW Extension Dairy Cattle Nutrition Website

<http://www.uwex.edu/ces/dairynutrition/>

Cooperative Extension Extension

Dairy Cattle Nutrition UW-Extension

Home About Contact Search

[Conferences](#)
[Presentations](#)
[Publications](#)
[Spreadsheets](#)
[Links](#)

Download a copy of the free Adobe Acrobat Reader to view and print information provided as PDF files.
[Get Adobe Reader](#)

Welcome to Dairy Cattle Nutrition UW-Extension

The Dairy Cattle Nutrition UW-Extension site is designed to provide research-based information for the public seeking resources on applied aspects of the nutrition of dairy cattle.

Web Site Highlights

-  [Dairy Team News from the University of Wisconsin](#)
-  [2009 Four-State Dairy Nutrition & Management Conference Proceedings](#)

UW Feed Grain Evaluation System

-  [Technical note: A method to quantify prolamin proteins in corn that are negatively related to starch digestibility in ruminants](#) (Josh Larson and Pat Hoffman - JDS paper)
-  [Corn Biochemistry: Factors related to starch digestibility in ruminants](#) (Pat Hoffman and Randy Shaver - Conference paper)
-  [Corn Biochemistry: Factors related to starch digestibility in ruminants](#) (Pat Hoffman and Randy Shaver - slide set)
-  [A guide to understanding prolamins](#) (Pat Hoffman and Randy Shaver)
-  [UW Feed Grain Evaluation System](#) (Pat Hoffman and Randy Shaver)
-  [Relative Grain Quality - RGQ](#) (Pat Hoffman and Randy Shaver)

Spreadsheets

-  [MILK2006 Corn Silage: Calculates TDN-1x, NEL-3x, Milk per ton, and Milk per acre](#)

Publications

-  [Benchmarking forage nutrient composition and digestibility](#)
-  [Feeding Programs in High Producing Dairy Herds](#)

Presentations

-  [Benchmarking forage nutrient composition and digestibility](#)
-  [Diets fed in selected WI high-producing dairy herds](#)



Dr. Randy Shaver
 Professor - UW Madison & Extension Dairy Nutritionist
 280 Animal Sciences Building
 1675 Observatory Drive
 Madison, WI 53706-1284
 Phone: (608) 263-3491
 Fax: (608) 263-9412
rdshaver@wisc.edu

[Biographical Information](#)



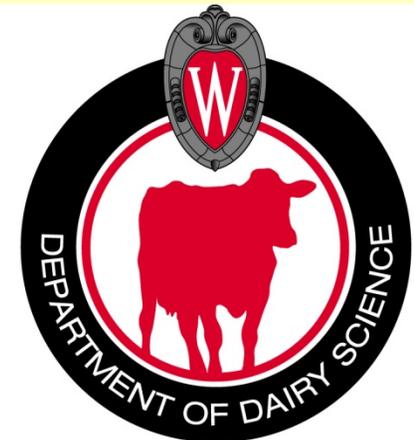
Pat Hoffman
 Professor - UW Extension
 Marshfield Ag Research Station
 8396 Yellowstone Drive,
 Marshfield, WI 54449
 Phone: (715) 387-2523
 Fax: (715) 387-1723
pchoffma@wisc.edu

[Biographical Information](#)



EXCELLENCE IN EDUCATION AND DISCOVERY
 UNIVERSITY OF WISCONSIN - MADISON

UW Extension



EXCELLENCE IN EDUCATION AND DISCOVERY

UNIVERSITY OF WISCONSIN - MADISON
www.wisc.edu/dlysci



THE UNIVERSITY
of
WISCONSIN
 MADISON