Minimizing DM Loss

Vita Plus Custom Harvester Meeting

February 19-20, 2013

Madison, WI

SILOSTOP

Keith Bolsen Ph.D. & Associates

Ruthie Bolsen[1] and Keith K. Bolsen[2]

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Dairy/Feedlot

Silage Triangle

Crop Grower — **Silage Contractor**

Corn Silage Production (NASS 2013)

2008	2009	2010	2011	2012

5-year average: 109.9 million tons

WI	14.6 (1st)
MN	6.6 (5th)
MI	4.4 (7th)
CA	11.6 (2nd)

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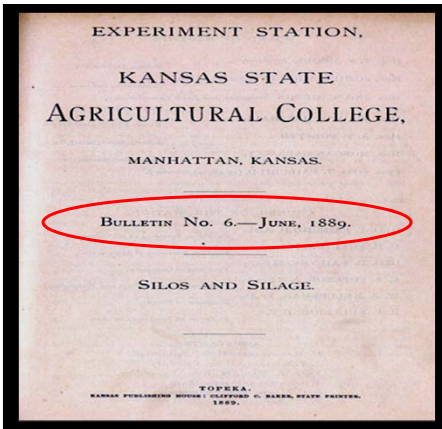
"SHRINK" LOSS is TOO HIGH, TOO OFTEN!


EXPERIMENT STATION,

KANSAS STATE

AGRICULTURAL COLLEGE,

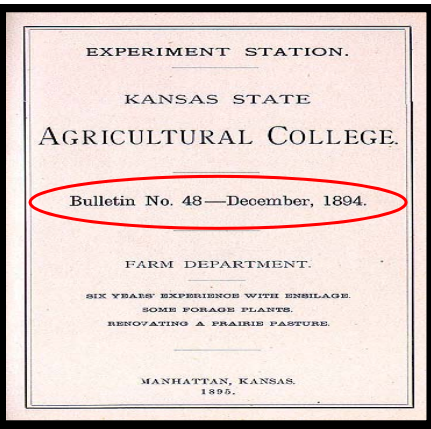
MANHATTAN, KANSAS.

BULLETIN NO. 6.—JUNE, 1889.

SILOS AND SILAGE.

TOPEKA.

Reported cattle performance and sources of loss in an 80 ton capacity tower silos. Seven percent of the whole-plant corn ensiled vs. weight of the silage removed could not be accounted for, so the authors explained it as a loss by evaporation.


EXPERIMENT STATION.

KANSAS STATE

AGRICULTURAL COLLEGE.

Bulletin No. 48—December, 1894.

FARM DEPARTMENT.

SIX YEARS' EXPERIENCE WITH ENSILAGE.
SOME FORAGE PLANTS.
RENOVATING A PRAIRIE PASTURE.

MANHATTAN, KANSAS.
1895.

77% of the forage ensiled was 'sound' and available for feeding'. Shorter chop lengths of ½-inch compared to 1-inch resulted in 'closer packs' and cattle 'ate it up cleaner'.

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What is the 'Market Value' of Corn Silage based on 'Shrink Loss' alone?

- $60.00 / ton ÷ 95.0% = $63.15
- $60.00 / ton ÷ 90.0% = $66.67
- $60.00 / ton ÷ 85.0% = $70.59
- $60.00 / ton ÷ 80.0% = $75.00
- $60.00 / ton ÷ 75.0% = $80.00
- $60.00 / ton ÷ 70.0% = $85.71

Forage In vs. Silage Out

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How much is Shrink Loss going to cost our Corn Silage Industry in 2012-2013?

About $1.30 billion! | **Could be only 600 million!**





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Fine-tuning Your Silage Program

1. Communicate & prepare
2. Inoculate at the forage chopper
3. Reach an optimum silage density
4. Apply the best cover/seal

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What can we learn from these PRODUCERS?

They had a MEETING!

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Economics of Inoculated Corn Silage for Dairy Cows. [a]

1. 80 lbs of milk/cow/day
2. 53 lb DMI/cow/day*
3. Milk price = $16 per cwt

[a] 48 lbs of corn silage

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Inoculated corn silage and other grain and forage inputs in the lactation ration.[1]

Ingredients	DM intake lb / day	DM, %	As-fed, lb / day	As-fed, $ / lb	Feed cost, $ / day
Corn silage	16.0	33.3	48.1	0.0325	1.56
Alfalfa haylage	9.0	45.0	20.0	0.060	1.20
Other forage	4.0	88.0	4.6	0.110	0.50
Grain/supplement	24.0	88.0	27.3	0.160	4.36
Total	53.0		100.0		7.63
Corn silage / cow / year, tons					8.42
Inoculant cost / ton of crop ensiled					0.75

[1]Numbers in yellow squares are user inputs.

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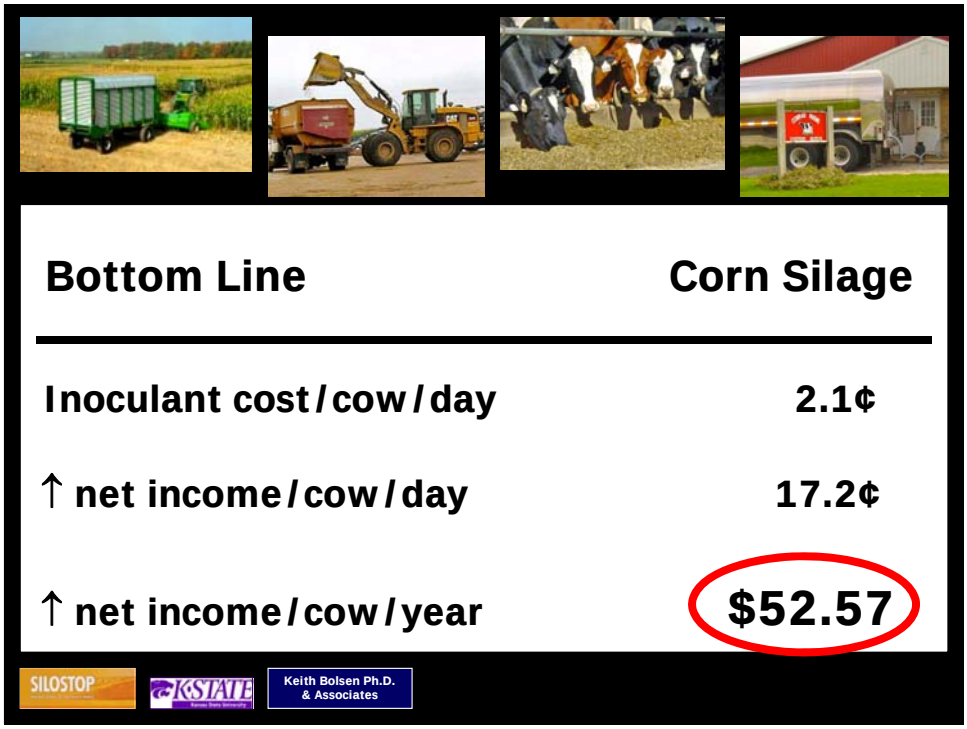
Bottom Line
Corn Silage
Inoculant cost / cow / day
2.1¢
↑ net income / cow / day
17.2¢
↑ net income / cow / year
$52.57
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Scales
Five Bad Ideas for Application!

Fine-tuning Your Silage Program

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Dry Matter Loss as Influenced by Silage Density: Adapted from Ruppel et al. (1995)

Density, lbs of DM per ft³	DM loss at 180 days, % of the DM ensiled
10	20
12	18
14	16
16	14
18	12
20	10

Avg. = 14.5

Targets:
16 lbs of DM
48 lbs of fresh weight

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Spreadsheet Calculations of the Average Corn Silage Densities in a Bunker Silo at a *Case Study Feedlot*.[1]

Component	Predicted-135 1 packing	Predicted-135 2 packing
Bunker wall height, ft	12	12
Silage height above wall, ft	3	3
Forage delivery rate, fresh tons/hr	135	135
Forage DM content, %	33.3	33.3
Est. forage packing layer thickness, inches	9 →	5
1 tractor	55,000 (65)[2]	55,000 (65)[2]
2 tractors		50,000 (85)
Estimated avg. DM density, lbs/ft³	11.2	16.9
Estimated avg. bulk density, lbs/ft³	33.6	50.7

[1] Values above the line are user inputs. [2] Estimated packing time as % of filling time.

Spreadsheet Calculations of the Average Corn Silage Densities in a Bunker Silo at a *Case Study Feedlot*.[1]

Component	Predicted-270 2 packing	Predicted-270 3 packing
Bunker wall height, ft	12	12
Silage height above wall, ft	3	3
Forage delivery rate, fresh tons/hr	270	270
Forage DM content, %	33.3	33.3
Est. forage packing layer thickness, inches	7.5	6
1 tractor	55,000 (70)[2]	55,000 (70)
2 tractors	50,000 (85)	50,000 (85)
3 tractors		45,000 (95)
Estimated avg. DM density, lbs/ft³	11.8	15.6
Estimated avg. fresh wt. density, lbs/ft³	35.5	46.8

[1] Values above the line are user inputs. [2] Estimated packing time as % of filling time.

Spreadsheet Calculations of the Average Corn Silage Densities in a Bunker Silo at a *Case Study Feedlot*.[1]

Component	Predicted-405 2 packing	Predicted-405 3 packing
Bunker wall height, ft	12	12
Silage height above wall, ft	3	3
Forage delivery rate, fresh tons/hr	405	405
Forage DM content, %	33.3	33.3
Est. forage packing layer thickness, inches	9	6
	55,000 (60)[2]	55,000 (60)
2 tractors	50,000 (75)	50,000 (75)
3 tractors		45,000 (95)
Estimated avg. DM density, lbs/ft³	10.6	12.2
Estimated avg. fresh wt. density, lbs/ft³	31.8	36.6

[1] Values above the line are user inputs. [2] Estimated packing time as % of filling time.

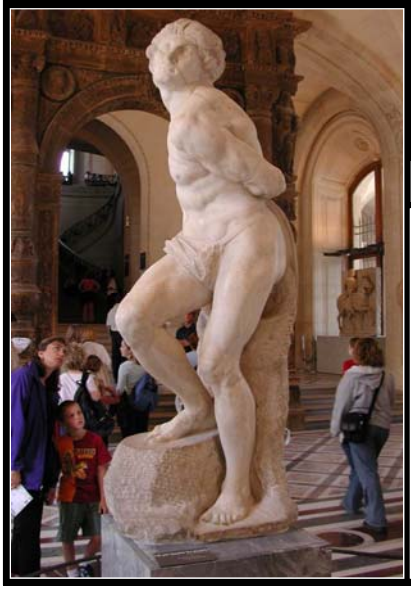
Spreadsheet Calculations of the Average Corn Silage Densities in a Bunker Silo at a *Case Study Feedlot*.[1]

Component	Predicted-405 4 packing
Bunker wall height, ft	12
Silage height above wall, ft	3
Forage delivery rate, fresh tons/hr	405
Fo405rage DM content, %	0.333
Est. forage packing layer thickness, inches	4.5
	55,000 (60)
	50,000 (75)
	45,000 (95)
	45,000 (95)


Estimated avg. fresh wt. density, lbs/ft³	15.7
Estimated avg. DM density, lbs/ft³	47.1

[1] Values above the line are user inputs. [2] Estimated packing time as % of filling time.

Does Your TEAM have a Michelangelo?



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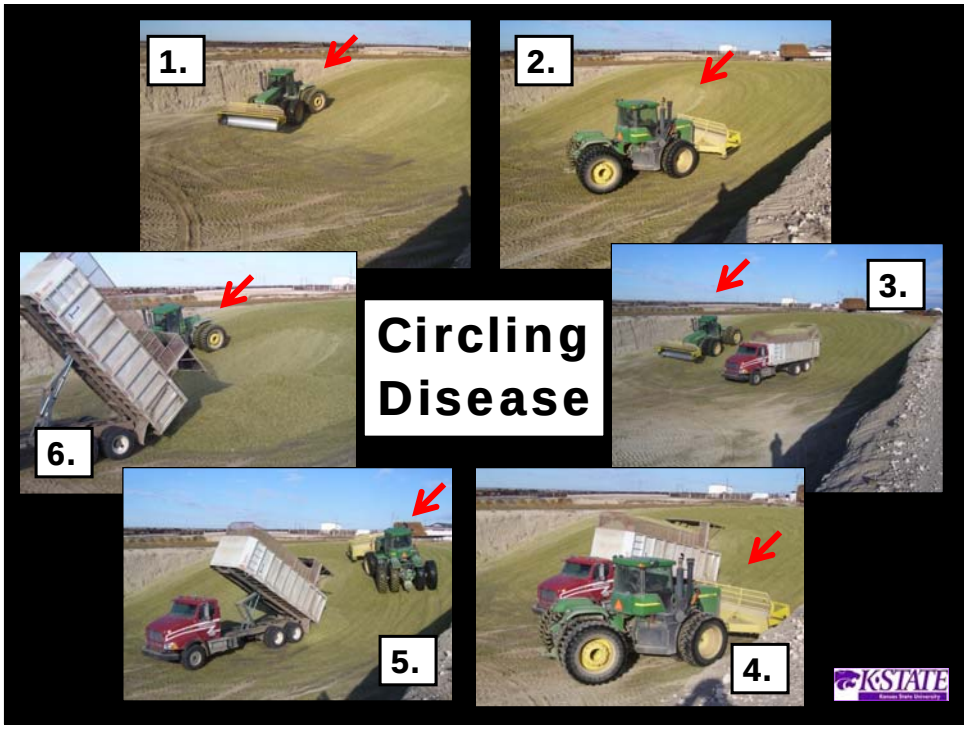
1.
2.
3.
4.
5.
6.
Circling Disease


Six loads already …

Can’t keep up …

Dealt a bad hand …

Drive slow & reverse gear …

Like to have that guy on my team …

Fine-tuning Your Silage Program

1. Communicate & prepare
2. Inoculate at the forage chopper
3. Reach an optimum silage density
4. Apply the best cover / seal

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Poorly SEALED bunker silos and drive-over piles are a HUGE problem!!


250 to 350 million dollars per year


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Field Trials with Silostop

Comparison of 6-mil black plastic & Silostop on pH, fermentation profile, estimated additional spoilage loss of OM, and ash content in corn silage (0 to 36 inches from the surface) and HM corn (0 to 18 inches from the surface) at 240 days post-filling. From: Bolsen et al. (2006)

	Trial 1 - Corn silage 0 to 36 inches		Trial 2 - HM corn 0 to 18 inches	
Item	**Std plastic**	**Silostop**	**Std plastic**	**Silostop**
DM content, %	29.2	31.6	72.3	73.2
pH	4.28	3.78	4.70	4.09
Est. OM loss [1,2]	34.8	17.8	12.1	6.7
Advantage for Silostop	---	+ 17.0	---	+ 5.4
	---------- % of the silage DM ----------			
Lactic acid	2.7	6.8	0.86	1.08
Ash	11.2	9.1	2.13	1.98

[1] Estimated OM loss, calculated from ash content using the equations by Bolsen et al. (1993).

[2] Ash content of the pre-ensiled samples was 7.6% for corn silage and 1.8% for HM corn.

Effect of Silostop and std. plastic on fermentation profile, nutritional quality and estimated loss of OM of corn silage at 0 to 18 inches from the surface at 300 days post-filling. From: Kuber et al. (2008 and 2010).

	Trial 3		Trial 4		Trial 5	
Item	Std	Silostop	Std	Silostop	Std	Silostop
DM, %	29.7	31.2	25.2	31.5	22.2	25.5
pH	4.46	3.80	4.97	3.84	5.44	3.80
Estimated OM loss, %[1,2]	40.1	31.8	37.8	24.2	41.1	19.0
Advantage for Silostop	---	+ 8.3	---	+ 13.6	---	+ 22.1
	---------- % of the silage DM ----------					
NDF	51.3	48.1	55.8	46.1	61.4	51.7
Lactic acid	2.1	3.4	1.3	3.9	1.1	4.7
Ash	5.3	4.52	5.77	4.57	8.1	5.6

[1] Estimated OM loss, calculated from ash content using the equations by Bolsen et al. (1993).

[2] Ash content of the pre-ensiled forage was 3.1% in Trial 3; 3.5% in Trial 4, and 4.6% in Trial 5.

Drive-over pile: 6 x 80 x 400 feet

4,000 to 4,800 tons

Corn silage = $60/ton

Sealing costs

Standard
$5,200 to $6,200

Silostop
$8,800 to $10,200

Net benefit from Silostop
$7,000 to $14,000

Economics of sealing corn silage in bunker silos with standard plastic or Silostop.

Inputs & calculations	Bunker 1 std. plastic	Bunker 2 Silostop
Silage value, $ per ton 'as-fed'	65.00	
Bunker avg. depth, ft	12	
Bunker width, ft	60	
Bunker length, ft	250	
Silage lost in original top 3 ft % of crop ensiled[2]	25.0	15.0
Bunker capacity, tons	3,938	
Silage in the original top 3 ft, tons	900	
Total silage lost in bunker, % of the crop ensiled	15.4	13.1
Sealing cost, $	2,243 →	3,713
Net silage saved by sealing, $	12,383	16,763
Net benefit from Silostop, $	---	**4,380**

Bunker silo: 12 x 60 x 250 feet

Corn silage = $65/ton

3,940 tons

Sealing costs:
$2,243 vs. $3,713

Net silage saved:
Std plastic = $12,383
Silostop = $16,763
+ $4,380

Shrink loss:
Std plastic = 15.4%
Silostop = 13.1%
+ 2.3


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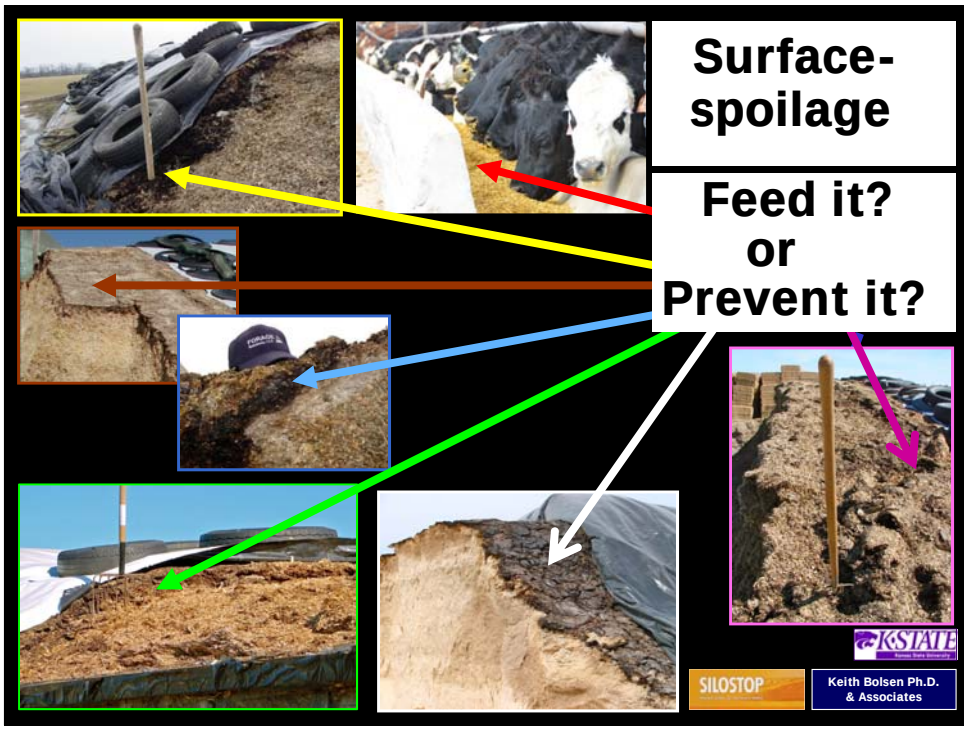
1
2
4
3


Surface-
spoilage
Feed it?
or
Prevent it?
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Surface-spoiled Corn Silage Research at Kansas State

Whitlock et al. (2000)

'Slime' in the ration

0, 5.4, 10.7 & 16.0 %

- ✓ Depressed DM intake
- ✓ Destroyed the forage mat in the rumen
- ✓ Reduced fiber digestibility dramatically

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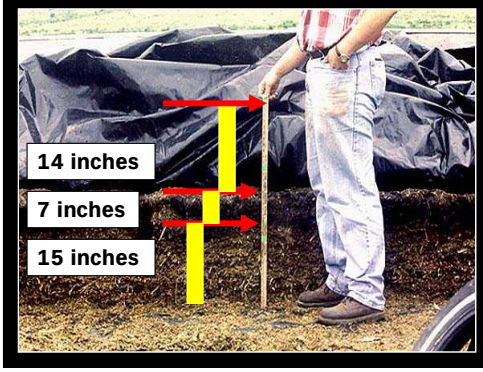

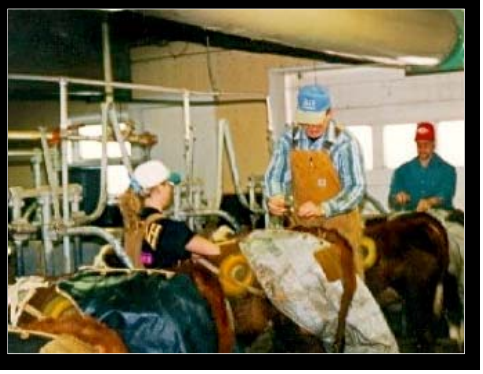

How much does feeding surface-spoiled corn silage cost dairy producers?

- ✓ 0.3 to 3.0 lbs less milk /cow/day.[1,2]
- ✓ $15 to $145 less milk /cow/year ($16 cwt).

[1] Assumes that 1 percentage unit of NDF digestibility equals 0.55 lbs of milk /cow/day.

[2] Assumes that 1% surface-spoilage in the ration decreases NDF digestibility by 1.3 percentage units.

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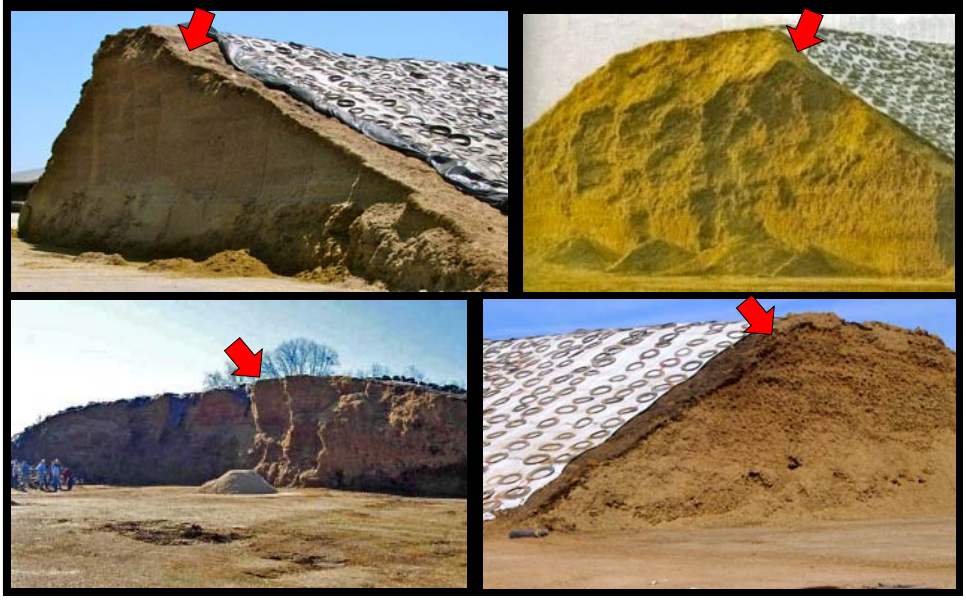
Pitch the Spoilage?

No! It is just too Dangerous!

But … It can be Prevented!!



Don't do something STUPID!!

February 2010 | Hay & Forage Grower

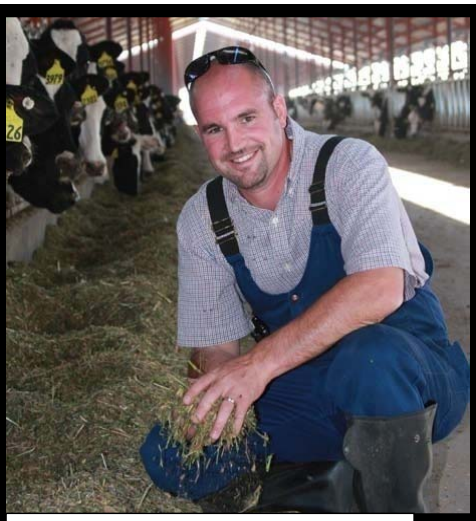


Photo: by Hay and Forage

Surviving A Silage Avalanche

By Fae Holin, Managing Editor

Photo: by Doug DeGroff

SILOSTOP | K-STATE | Keith Bolsen Ph.D. & Associates

Luke

Drew

Makenna

Keith Bolsen Ph.D. & Associates | K-STATE | SILOSTOP

“Please, Let’s Start taking Silage Safety Seriously … Today”.

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Safe Silage

Efficient Silage

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Thank
You
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