Use of corn silage instead of corn and dry stalks

Dirk Burken, Galen Erickson, Terry Klopfenstein,
Brandon Nuttelman, Adam McGee
Cody Schneider, Jana Harding

University of Nebraska Lincoln

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Outline

- Why corn silage?
- Feeding corn silage (historically)
- Is feeding corn silage different today
  - With byproducts
  - With new economics
- Conclusion and options

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Why corn silage

- Relative to corn and dry stover:
  - Retain solubles in the plant
  - Get high-moisture corn
  - Guarantee inventory
  - Fits in integrated feedlot-crop operations
  - Historically: silage was better at high-grain prices
    - Corn $250/dry ton ($6/bu)
    - At 8.5X corn price: Silage is $51/ton as-is
    - At 35% DM, $146/ton DM
    - Corn = $250 and Silage = $150
      Residue is worth $50 at 50:50 grain:forage

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Historical data

	Corn silage % in diet							
	10	20	30	40	50	60	70	80
ADG	2.52	2.49	2.43	2.36	2.28	2.17	2.05	1.91
DMI	15.3	15.7	16.0	16.1	16.2	16.0	15.6	15.1
F:G	6.06	6.32	6.58	6.84	7.10	7.36	7.62	7.88
Profit	25.09	25.10	26.49	29.33	32.03	34.74	37.10	39.27

Corn: $3.50/bu; Silage: $26.45/ton (32% DM)

Goodrich et al., 1974

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Historical data

Silage digestibility

ITEM	15CS	30CS	45CS	lin	quad
DMD	80.6	79.1	79.3	.36	.47
OMD	81.2	80.3	80.5	.65	.66
Rumen pH	5.78	5.85	5.99	F-test: 0.03	

Erickson et al., 2000

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Historical data

Yearling I (summer 98)

	15CS	30CS	45CS	lin	quad
ADG	3.64	3.15	3.31	.01	.01
DMI	23.9	23.9	23.6	.32	.52
F:G	6.54	7.58	7.09	.02	.01
HCW	808	764	778	.01	.01
MARB	502	513	485	.16	.07
FAT	.42	.39	.37	.02	.67

Erickson et al., 2000

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Historical data

Calves (winter) 98-99

	15CS	30CS	45CS	lin	quad
ADG	3.51	3.39	3.12	.01	.27
DMI	20.3	21.5	21.4	.01	.07
F:G	5.78	6.33	6.85	.01	.47
HCW	850	837	806	.01	.25
MARB	553	506	474	.01	.65
FAT	.54	.50	.43	.06	.74

Erickson et al., 2000

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Historical data

Yearling II (summer 99)

	15CS	30CS	45CS
ADG	3.70	3.47	3.34
DMI	24.7	24.5	24.1
F:G	6.67	7.04	7.19
HCW	838	820	810
MARB	558	561	525
FAT	.48	.44	.49

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Historical data

Silage Performance

Combined 3 experiments

ITEM	15CS	30CS	45CS	lin	quad
Initial wt., lb	787	788	788	.95	.78
Final wt., lb	1342	1301	1287	.01	.05
DMI, lb/d	22.9	23.3	23.0	.79	.10
ADG, lb	3.61	3.33	3.25	.01	.01
F:G	6.32	6.94	7.04	.01	.01
fat, in.	.48	.44	.43	.02	.39
marbling	538	527	495	.01	.35

Erickson et al., 2000

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Historical data

Old Silage economics

Yearling economic comparison

	15 CS	30 CS	45 CS
Diet cost, $/ton	74.85	73.04	71.28
Cost of gain, $/cwt	41.76	47.55	44.43
Breakeven, $/cwt	64.28	67.78	66.21
(fed to same wt as 15 CS)			
Cost of gain, $/cwt		46.99	43.99
Breakeven, $/cwt		66.43	65.20

Erickson et al., 2000

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Historical data

Old Silage economics

Calf economic comparison

	15 CS	30 CS	45 CS
Diet cost, $/ton	75.94	73.74	71.46
Cost of gain, $/cwt	38.82	40.91	43.44
Breakeven, $/cwt	62.06	63.53	65.61
(if fed to same wt as 15 CS)			
Cost of gain, $/cwt		40.81	43.06
Breakeven, $/cwt		63.11	64.26

Erickson et al., 2000

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Why corn silage

- Hypothesize
  - Perhaps silage is more competitive today
    - Grain price
    - Lots of interest in using residue but dry stalks lose the solubles
    - How does it fit with wet distillers grains
      - Had some evidence of synergy

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Corn Silage Feedlot Performance

- Materials and Methods
  - 36 pens; 9 head per pen; 324 calf-fed steers
  - 173 DOF
  - Harvested 5-9-12

Diet Composition

Ingredient	15:40	30:40	45:40	55:40	45:0	30:65
Corn Silage	15.0	30.0	45.0	55.0	45.0	30.0
MDGS	40.0	40.0	40.0	40.0	---	65.0
Dry rolled corn	20.0	12.5	5.0	---	25.0	---
High moisture corn	20.0	12.5	5.0	---	25.0	---
Supplement[1]	5.0	5.0	5.0	5.0	5.0	5.0

[1]Formulated to provide 338 mg/hd/day Rumensin and 90 mg/hd/day Tylan. The 45:0 treatment supplement contained urea formulated for 1.49% dietary inclusion (DM basis). Soypass was also fed to the 45:0 treatment for 84 days to meet metabolizable protein requirements.

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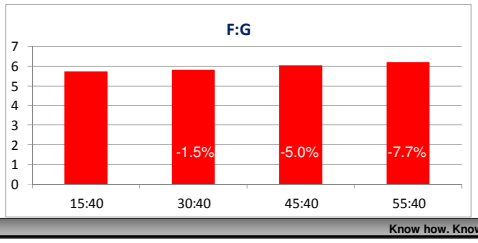
Corn Silage Feedlot Performance

	Treatment				*P*-value	
Item	15:40	30:40	45:40	55:40	Lin	Quad
Final BW	1426	1403	1375	1335	<0.01	0.21
DMI	23.15	22.77	22.70	21.92	0.01	0.45
ADG	4.04	3.92	3.76	3.53	<0.01	0.19
F:G	5.73	5.81	6.03	6.21	<0.01	0.33
Dress %	63.3	62.6	61.2	61.1	<0.01	0.54
Marbling	556	557	543	532	0.13	0.52
Fat thickness	0.55	0.53	0.52	0.43	<0.01	0.09



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Corn Silage Feedlot Performance

	Treatment		
Item	45:40	45:0	*P*-value
Final BW	1375	1340	0.02
DMI	22.70	22.26	0.30
ADG	3.76	3.55	0.02
F:G	6.03	6.28	0.04
Dress %	61.9	61.1	0.07
Marbling	543	539	0.85
Fat Thickness	0.52	0.49	0.29

	Treatment		
Item	30:40	30:65	*P*-value
Final BW	1403	1353	<0.01
DMI	22.77	21.66	0.01
ADG	3.92	3.62	<0.01
F:G	5.81	5.98	0.12
Dress %	62.6	62.1	0.19
Marbling	557	547	0.55
Fat Thickness	0.53	0.50	0.29

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Corn Silage Feedlot Economics

- Economic assumptions were applied to performance data to determine:
  - Profit per head
  - Cost of gain
- Corn grain priced at $3.50, $5.00, and $6.50/bu

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Corn Silage Feedlot Economics

- Corn silage priced at 8, 8.5 and 9 times corn
  - i.e. $28/ton unshrunk 35% DM silage at $3.50 corn
- Using NE custom rates, corn silage pricing:
  - 8.6 times price of corn at $3.50/bu
  - 8.4 times price of corn at $5.00/bu
  - 8.2 times price of corn at $6.50/bu

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Corn Silage Feedlot Economics

- Materials and Methods
  - Cattle purchase cost
    - 15:40 steers at breakeven
  - DOFc= DOF required for 1375 lb
  - Cattle sales at $1667.92/steer

Other Assumptions	
Cattle Interest	7.5% * purchase price -$200/steer down
Ingredient price	MDGS= 90% of corn, Supplement= corn
Ingredient shrink	1% for corn, supplement; 5% for MDGS; 10% for corn silage
Feed costs	Diet DM cost * DMI * DOFc
Feed Interest	7.5% * ½ feed costs * DOFc/365
Yardage	$0.45/steer/day
Medicine/Processing	$20/steer
Death loss	1%

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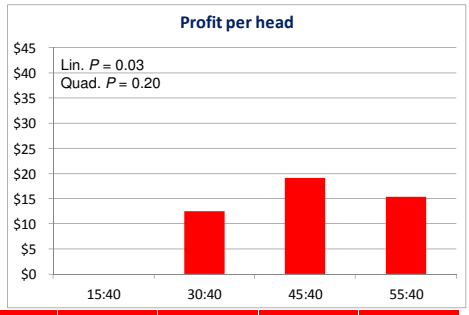
Corn Silage Feedlot Economics

$3.50/bu Corn, 8.5 times Corn silage



COG	$52.35	$50.51	$49.59	$49.90

Lin. $P < 0.01$ Quad. $P = 0.16$

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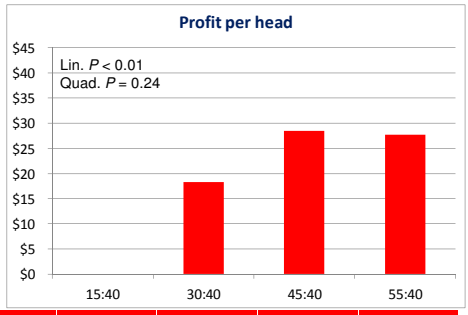
Corn Silage Feedlot Economics

$5.00/bu Corn, 8.5 times Corn silage



COG	$68.70	$65.93	$64.41	$64.56

Lin. $P < 0.01$ Quad. $P = 0.17$

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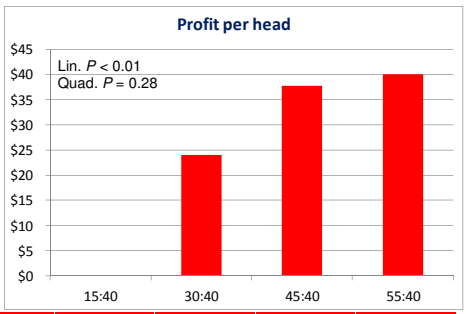
Corn Silage Feedlot Economics

$6.50/bu Corn, 8.5 times Corn silage



COG	$85.05	$81.35	$79.23	$79.22

Lin. $P < 0.01$ Quad. $P = 0.18$

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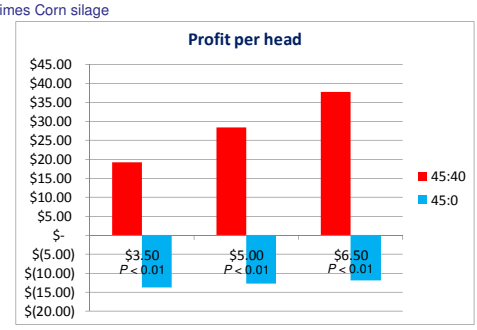
Corn Silage Feedlot Economics

8.5 times Corn silage



COG	$49.59	$64.41	$79.23
COG	$53.69	$69.94	$86.19
	P < 0.01	P < 0.01	P < 0.01

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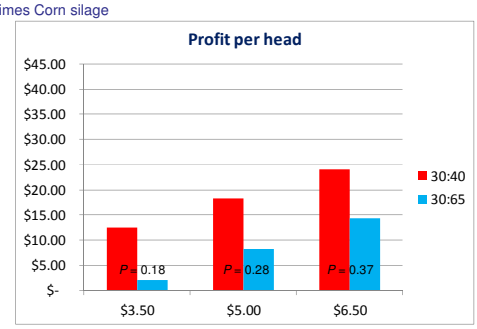
Corn Silage Feedlot Economics

8.5 times Corn silage



COG	$50.51	$65.93	$81.35
COG	$51.49	$66.91	$82.34
	P = 0.29	P = 0.42	P = 0.52

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Corn Silage Plot Research

- Corn silage production needs to accomplish:
  - Corn silage yield
  - Corn silage nutritive quality
  - Flexibility-corn grain yield
    - With or without residue harvest
- Allow feeders to maximize corn silage yield and quality with the flexibility to harvest corn grain when market dictates.
- Objective: Effects of corn hybrid and season length, plant density, and harvest timing on corn plant yield and quality.

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Corn Silage Plot Research

- Corn grain yield research plots near York, NE

- Samples separated into:
  - Grain
  - Cob
  - Husk
  - Remaining residue (stem, leaf, and shank)

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Corn Silage Plot Research

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Corn Silage Plot Research

- Three harvest times:

Sept 1 Sept 15 Sept 29

MEM hybrids=38.33% DM
MLM hybrids=34.84% DM

MEM hybrids=45.45% DM
MLM hybrids=41.16% DM

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Corn Silage Plot Research

	Season Length[1]		
Item	MEM	MLM	*P*-value
Grain Yield	190.7	199.3	0.02
DM Yield	10.95	11.34	<0.01
Grain, %	56.00	56.67	<0.01
Residue NDF	64.18	65.54	<0.01
Residue TDN	47.50	48.21	0.04
Corn Plant TDN	71.49	71.27	0.22

[1]MEM= Moderately early maturity hybrids (107-111 day)
MLM= Moderately late maturity hybrids (112-117 day)

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Corn Silage Plot Research

	Planting Density (plants/acre)				*P*-value	
Item	20,000	26,000	32,000	38,000	Lin.	Quad.
Grain Yield	166.4	198.9	203.5	211.2	<0.01	<0.01
DM Yield	9.84	10.93	11.67	12.14	<0.01	<0.01
Grain, %	54.25	55.71	55.94	55.42	<0.01	<0.01
Residue NDF	63.07	63.98	65.82	66.58	<0.01	0.84
Residue TDN	49.10	48.00	47.36	46.96	<0.01	0.32
Corn Plant TDN	71.53	71.60	71.37	71.00	0.02	0.22

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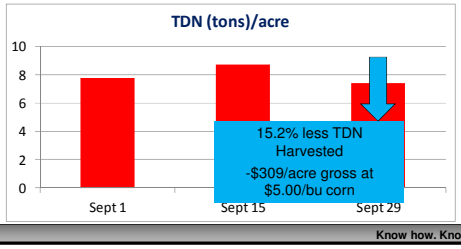
Corn Silage Plot Research

	Harvest			*P*-value	
Item	1	2	3	F-test	Lin.
Grain Yield	195.0	195.0	195.0		
DM Yield	11.00[b]	12.18[a]	10.25[c]	<0.01	<0.01
Grain, %	51.36[c]	52.40[b]	62.23[a]	<0.01	<0.01
Residue NDF	65.42[b]	62.51[c]	66.65[a]	<0.01	<0.01
Residue TDN	49.97[b]	51.05[a]	42.55[c]	<0.01	<0.01
Corn Plant TDN	70.59[c]	71.46[b]	72.08[a]	<0.01	<0.01



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Corn Silage Plot Research

- Corn silage production depends of decisions:
  - Hybrid or season length
  - Planting density
  - Harvest timing
- Harvest timing has most profound impact.
  - Harvest as corn silage or corn grain and stover?

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http://beef.unl.edu