Economics of Feeding Elevated Levels of Corn Silage in Finishing Diets Containing MDGS

Dirk B. Burken
Terry J. Klopfenstein
Galen E. Erickson[1]

Summary

Economic assumptions were applied for substitution of corn with corn silage in diets with modified distillers grains plus solubles (MDGS) for determination of cost of gain and profit per head when corn was priced at $3.50, $5.00, or $6.50 per bushel and corn silage was priced at 8, 8.5, or 9 times the bushel price of corn on an as-is basis. Cost of gain linearly decreased and profit per head linearly increased as corn silage inclusion increased when corn silage was priced at 8 and 8.5 times the price of corn, regardless of corn price.

Introduction

Distillers grains have been shown to be an economical partial replacement of corn in finishing diets, especially when corn price is high. Corn silage was researched many years ago and was found to be economical when corn prices increase, however, ADG and F:G become less favorable with elevated levels of corn silage. Nonfeed costs (yardage and interest) may increase with elevated levels of corn silage in finishing diets due to lower ADG and additional DOF. However, economically priced corn silage and distillers grains relative to corn can more than offset these higher nonfeed costs with reductions in diet DM costs and total feed costs.

Due to the performance results of *2013 Nebraska Beef Cattle Report*, pp. 74-75, it was hypothesized that there may be economic incentives to feeding elevated levels of corn silage in finishing diets containing distillers grains. Therefore, the objective of this experiment was to determine the economic outcomes of *2013 Nebraska Beef Cattle Report*, pp. 74-75 using corn priced at $3.50, $5.00, and $6.50/bushel as well as corn silage priced at 8, 8.5, and 9 times the bushel price of corn (as-is basis).

Procedure

Economic data were based off performance results of *2013 Nebraska Beef Cattle Report*, pp. 74-75. Due to the effect of variable carcass weight across treatments, DOF were adjusted on a pen basis so that all pens were fed to a constant average carcass weight of 866 lb (DOFc). Initial purchase cost was calculated using average initial weight of a pen multiplied by an initial price/lb determined to achieve a breakeven or net return of $0/head for the 15% corn silage control treatment. Cattle interest charges were calculated as 7.5% interest * (purchase price-$200/steer down) * (DOFc/365). Corn (1:1 blend of dry rolled corn and high moisture corn) was priced at $3.50, $5.00, or $6.50 per bushel with an additional $2.17/ton (DM) for the cost of corn processing. Corn silage was priced at 8, 8.5, or 9 times the bushel price of corn on an as-is basis (i.e., $3.50 per bushel corn would calculate to $28/unshrunk ton of corn silage at 35% DM and 8 times the bushel price of corn). Modified distillers grains with solubles feed costs were calculated as 90% the price of corn on a DM basis. Supplement was assumed to be equal to the price of corn on a DM basis. A pencil shrink was applied to all ingredients; 1% was used for corn and supplement, 5% for MDGS, and 10% for corn silage. Feed costs were determined by using diet DM costs * DMI * DOFc. A feed interest charge of 7.5% for one half of total feed charges was used. Processing and medicine charges were assumed at $20/steer. Yardage was calculated as $0.45/head/day utilizing DOFc. Cost of gain calculations included yardage,

Table 1. Effect of corn silage and MDGS inclusion on cost of gain ($/cwt).

	Treatment[1]							*P*-value[2]			
Item	15:40	30:40	45:40	55:40	30:65	45:0	SEM	Lin.	Quad.	30	45
$3.50/bu corn											
8[3]	52.13	50.07	48.90	49.09	51.03	52.97	0.65	<0.01	0.16	0.30	<0.01
8.5[3]	52.35	50.51	49.59	49.90	51.49	53.69	0.65	<0.01	0.16	0.29	<0.01
9[3]	52.57	50.95	50.28	50.71	51.94	54.41	0.65	0.02	0.16	0.28	<0.01
$5.00/bu corn											
8[3]	68.39	65.30	63.42	63.40	66.26	68.92	0.88	<0.01	0.17	0.44	<0.01
8.5[3]	68.70	65.93	64.41	64.56	66.91	69.94	0.87	<0.01	0.17	0.42	<0.01
9[3]	69.01	66.56	65.39	65.72	67.57	70.97	0.87	<0.01	0.17	0.41	<0.01
$6.50/bu corn											
8[3]	84.65	80.53	77.95	77.71	81.49	84.86	1.11	<0.01	0.17	0.54	<0.01
8.5[3]	85.05	81.35	79.23	79.22	82.34	86.19	1.10	<0.01	0.18	0.52	<0.01
9[3]	85.46	82.17	80.51	80.72	83.19	87.53	1.09	<0.01	0.18	0.51	<0.01

[1]15:40 = 15% Corn Silage, 40% MDGS; 30:40= 30% Corn Silage, 40% MDGS; 45:40= 45% Corn Silage, 40% MDGS; 55:40= 55% Corn Silage, 40% MDGS; 30:65= 30% Corn Silage, 65% MDGS; 45:0= 45% Corn Silage, 0% MDGS.
[2]Lin. = *P*-value for the linear response to corn silage inclusion, Quad.= *P*-value for the quadratic response to corn silage inclusion, 30 = t-test comparison of treatments 30:40 and 30:65, 45 = t-test comparison of treatments 45:40 and 45:0.
[3]Corn silage priced at 8, 8.5, or 9 times the bushel price of corn on an as-is basis.

Table 2. Effect of corn silage and MDGS inclusion on profit per head ($).

	Treatment[1]							*P*-value[2]			
Item	15:40	30:40	45:40	55:40	30:65	45:0	SEM	Lin.	Quad.	30	45
$3.50/bu corn											
8[3]	—	14.01	22.33	19.61	3.63	(10.52)	5.44	<0.01	0.21	0.18	<0.01
8.5[3]	—	12.53	19.20	15.31	2.06	(13.81)	5.48	0.03	0.20	0.18	<0.01
9[3]	—	11.04	16.06	11.01	0.50	(17.11)	5.52	0.10	0.20	0.18	<0.01
$5.00/bu corn											
8[3]	—	20.39	32.94	33.81	10.45	(8.17)	6.47	<0.01	0.25	0.28	<0.01
8.5[3]	—	18.27	28.46	27.67	8.21	(12.88)	6.53	<0.01	0.24	0.28	<0.01
9[3]	—	16.15	23.99	21.52	5.97	(17.59)	6.59	0.01	0.24	0.28	<0.01
$6.50/bu corn											
8[3]											
8.5[3]	—	26.77	43.54	48.01	17.27	(5.82)	7.55	<0.01	0.28	0.38	<0.01
9[3]	—	24.01	37.73	40.02	14.35	(11.94)	7.62	<0.01	0.28	0.37	<0.01
	—	21.25	31.91	32.03	11.44	(18.06)	7.70	<0.01	0.27	0.37	<0.01

[1]15:40 = 15% Corn Silage, 40% MDGS; 30:40= 30% Corn Silage, 40% MDGS; 45:40= 45% Corn Silage, 40% MDGS; 55:40= 55% Corn Silage, 40% MDGS; 30:65= 30% Corn Silage, 65% MDGS; 45:0= 45% Corn Silage, 0% MDGS.
[2]Lin. = *P*-value for the linear response to corn silage inclusion, Quad.= *P*-value for the quadratic response to corn silage inclusion, 30 = t-test comparison of treatments 30:40 and 30:65, 45 = t-test comparison of treatments 45:40 and 45:0.
[3]Corn silage priced at 8, 8.5, or 9 times the bushel price of corn on an as-is basis.

processing and medicine, and total feed costs (feed and feed interest charges). A sale price of $1.926/lb * 866 lb or $1667.92/head was used for all cattle. To calculate profit per head, initial purchase cost (including cattle interest charges), total feed costs, processing and medicine, yardage, and a 1% calculated death loss was subtracted from sales price.

Economic data were calculated on a pen basis for statistical analysis utilizing the mixed procedure of SAS (SAS Inst. Inc., Cary, N.C.). Pen was the experimental unit, and block was included as a fixed effect. Orthogonal contrasts were used to test the effects of corn silage inclusion level within diets containing 40% MDGS. Pairwise preplanned contrasts were used to test 45% corn silage with and without MDGS and 30% corn silage with 40 or 65% MDGS.

Results

Corn silage pricing was based around the premise that the ratio of corn silage to corn price is affected by corn price, cost of grain harvest, and cost of corn silage harvest. Using current average custom rates for Nebraska the ratio is 8.6 at $3.50 per bushel corn, 8.4 at $5.50 per bushel corn, and 8.2 at $6.50 per bushel corn. When pricing corn at 8.5 times the bushel price of corn in this experiment, the optimum corn silage inclusion level for maximum profit per head was 45% at $3.50 per bushel corn and 55% at $6.50 per bushel corn with 45 and 55% inclusion being nearly equal at $5.00 per bushel corn (Table 1).

Cost of gain (COG) was linearly decreased ($P < 0.05$; Table 1) as corn silage inclusion was increased regardless of price combination evaluated. When comparing the highest (55%) and lowest (15%) inclusion levels of corn silage, there was a $3.04, $4.99, and $6.93/cwt improvement in COG when corn silage was priced at 8 times the bushel price of corn and when corn was priced at $3.50, $5.00, and $6.50 per bushel, respectively.

Profit per head was linearly increased ($P < 0.05$; Table 2) as corn silage inclusion was increased for all price combinations when corn was priced at $5.00 or $6.50 per bushel. When corn was priced at $3.50 per bushel, there was a linear increase in profit per head ($P < 0.05$) when corn silage was priced at 8 and 8.5 times the bushel price of corn. Compared to the cattle consuming the 15% corn silage treatment diets, there was an improvement in profit per head of $19.61, $33.81, and $48.01 with the inclusion of 40% more corn silage in the diet (55:40 treatment) when corn silage was priced at 8 times the price of corn and when corn was priced at $3.50, $5.00, and $6.50 per bushel, respectively. When comparing the same treatments and looking at corn silage priced at 8.5 times the price of corn, the profit per head at the corn prices evaluated was $15.31, $27.67, and $40.02.

The apparent synergistic effect of combining elevated levels of corn silage with distillers grains becomes particularly noticeable when looking at the economic outcomes of the two t-test comparisons (Table 2). When comparing cattle consuming 45% corn silage diets, the inclusion of MDGS (40% of the diet DM compared to 0%) resulted in improvements in cost of gain (range of $4.00 to $7.12/cwt) and profit per head (range of $32.63 to $50.68; $P < 0.01$) for all evaluated price combinations. For cattle fed diets containing 30% corn silage and either 40% or 65% MDGS, there was no difference in cost of gain or profit per head ($P > 0.05$) at any corn and corn silage price combination.

These data suggest that there is an economic incentive to feeding elevated levels of corn silage with distillers grains when market conditions dictate. The substitution of corn for elevated levels of corn silage and distillers grains in finishing diets becomes more economically appealing when cattle feeders are faced with higher corn price levels.

[1]Dirk B. Burken, research technician; Terry J. Klopfenstein, professor Animal Science; Galen E. Erickson, professor, University of Nebraska–Lincoln Department of Animal Science, Lincoln, Neb.