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BEEF REPORT

LIMIT-FED, HIGH ENERGY DIETS FOR GROWING CATTLE

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Summary

Limit-fed, high energy (57 Mcal per cwt dry matter) diets were compared to full-fed, low energy (46 Mcal per cwt dry matter) corn silage and alfalfa hay diets. Feed conversions were 5.68 and 5.78 lb of dry matter per lb of gain for the limit-fed silage and alfalfa diets vs 6.86 and 7.45 lb of dry matter per lb of gain for the full-fed silage and alfalfa hay diets, respectively. Break-even roughage prices were calculated from feed efficiency and ration cost information. If corn is valued to the bunk at $1.50 per bushel and soybean meal is worth $200 per ton, limit feeding is more economical than full feeding if corn silage and alfalfa hay cost more than $16.73 and $47.70 per ton to the bunk.

(Key Words: Limit Feeding, Growing Programs, Corn Silage, Alfalfa Hay.)

Introduction

Backgrounding or feedlot growing programs are designed to limit the gain of light cattle, enabling them to grow frame prior to full feeding of a high energy finishing diet. Traditionally, high roughage, low energy diets have been used to grow light cattle. These diets are full fed and limit gain due to their lower energy density. Roughage is usually the most expensive energy source in the diet. Limit feeding high energy diets for light cattle is based on the premise that grain is usually cheaper per unit of energy than roughage. Therefore, limit feeding high energy diets may decrease cost of gain when grain is priced relatively cheap and roughage relatively high.

In order to more precisely describe the economics of limit feeding, reliable estimates of feed efficiency and feedlot performance are needed. The objectives of this research were to (1) compare performance of limit-fed and full-fed cattle during the growing phase, (2) compare corn silage and alfalfa hay as roughage sources in limit-fed diets and (3) use performance data to study the economics of limit feeding.

Materials and Methods

One hundred ninety-two preconditioned Angus steer calves were purchased from western South Dakota and transported to the Southeast South Dakota Experiment Farm near Beresford. Cattle were placed on a 3-week starter program prior to limit feeding. Cattle were weighed, implanted with Synovex-S, stratified by weight and allotted to four experimental treatments (table 1) with six pens per treatment.

At the start of the limit feeding study, steers fed the corn silage diets were fed diet 3 for 5 days. Steers fed the alfalfa hay diet were fed diet 4 for 5 days. During the next 7 days, limit-fed steers were fed a diet with moderate roughage levels (50.3% silage or 31.0% alfalfa hay on a dry matter basis). This step-up period allowed the cattle to become accustomed to the limit-feeding regimen.

Full-fed cattle were allowed to consume their feed ad libitum. Limit-fed cattle were offered diets 1 and 2 in amounts computed to enable the cattle to grow at 2.25 lb per head per day. Each week the limit-fed cattle were assumed to have grown 16 lb and daily feed intake was increased accordingly. On days when the wind chill was between 0 and 20 F, -20 and 0 F or less than -20 F at 8 am, the daily feed allowance was increased by 10, 20 or 30%, respectively. During the 96-day trial, cattle were weighed initially and at 14-day intervals following a 16-hour withdrawal from feed.

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TABLE 1. COMPOSITION OF EXPERIMENTAL DIETS

Item	Diet			
	Limit-fed		Full-fed	
	Corn silage (1)	Alfalfa (2)	Corn silage (3)	Alfalfa (4)
Ingredient[a]				
Corn silage	35.00	--	70.00	--
Alfalfa hay	--	22.00	--	42.00
High moisture corn	47.33	66.43	19.03	46.94
Supplement	17.67	13.57	10.97	11.07
Soybean meal	15.85	12.20	10.00	1.50
Ground corn	--	--	--	4.00
Dehy alfalfa	--	--	--	5.00
Dicalcium phosphate	.50	.55	--	.25
Limestone	1.00	.50	.65	--
Trace mineral salt	.30	.30	.30	.30
Vitamin A-30	.02	.02	.01	.01
Composition				
NEm[b]	84.85	89.03	74.23	78.98
NEg[c]	55.54	57.37	46.84	47.12
Crude protein	14.51	14.51	12.01	12.01
Potassium	.85	.87	.98	1.10
Calcium	.67	.68	.50	.79
Phosphorus	.46	.47	.31	.35
Dry matter	52.28	77.25	39.90	80.59

[a] Percentage of dry matter.
[b] Net energy for maintenance, Mcal per cwt dry matter.
[c] Net energy for gain, Mcal per cwt dry matter.

Results and Discussion

Performance of cattle during the growing phase is displayed in table 2. Differences in average daily gain between the limit-fed corn silage and the full-fed treatments were not significant. Cattle fed the limit-fed alfalfa hay diet gained less weight than cattle fed the other treatments. Fill differences may account for this, since these cattle received less dry matter and less total feed than the other treatments. All cattle gained significantly more than the projected 2.25 lb per head per day. This may be due to underestimating the energy content of the diets. Also, adjustments made for intake due to inclimate weather may have been too large.

By design of the experiment, limit-fed cattle consumed less dry matter than full-fed cattle (14.55 vs 19.37 lb per head daily). Cattle consuming the full-fed alfalfa diet consumed more dry matter than the full-fed corn silage cattle (20.49 vs 18.25 lb per head daily).

As expected, feed/gain was improved by limit feeding. Limit-fed cattle required approximately 5.73 lb dry matter per lb of gain compared to 7.16 for the full-fed cattle. High energy diets generally cost more per cwt dry matter than high roughage diets. For limit feeding to be economical, the improvement in feed efficiency must pay for higher ration costs. Solving the following equation provides estimates of the break-even silage and alfalfa prices for limit feeding versus full feeding:

Ration cost (limit)*F/G (limit) = ration cost (full)*F/G (full)

TABLE 2. PERFORMANCE OF CATTLE DURING THE GROWING PHASE

Item[a]	Diet			
	Limit-fed		Full-fed	
	Corn silage	Alfalfa	Corn silage	Alfalfa
Initial wt, lb	552	552	556	552
ADG, lb	2.64[b]	2.44[c]	2.66[b]	2.75[b]
F/G	5.68[b]	5.78[b]	6.86[c]	7.45[c]
DMI, lb/	15.00[b]	14.10[b]	18.25[c]	20.49[d]

[a] ADG = average daily gain, F/G = feed to gain ratio, DMI = daily dry matter intake.

[b,c,d] Means in same row with unlike superscripts differ (P<.05).

Table 3 shows break-even roughage prices in tabular form. If roughage costs are above those listed, feed costs favor limit feeding. If roughage costs are below those listed, feed costs favor full feeding. If corn is $1.50 per bushel to the bunk and soybean meal is $200 per ton, the break-even price for corn silage is $16.73 and for alfalfa hay is $57.80 per ton.

TABLE 3. BREAK-EVEN ROUGHAGE PRICES ($/TON)[a]

SBM price ($/ton)	Roughage[b]	Corn price, $/bushel			
		1.00	1.50	2.00	2.50
150	CS	11.83	15.40	19.04	22.61
	ALF	36.26	36.61	36.96	37.31
200	CS	13.16	16.73	20.37	23.94
	ALF	47.34	47.70	48.05	48.40
250	CS	14.49	18.06	21.70	25.27
	ALF	58.61	58.96	59.31	59.66

[a] Assumes corn silage has 35% dry matter and alfalfa hay has 88% dry matter and 14% crude protein.

[b] CS = corn silage, ALF = alfalfa hay.

Cattle were finished as outlined in article Cattle 87-7 of this report. Table 4 shows the finishing performance of cattle that were limit-fed during the growing phase versus cattle that were full-fed. During the first 14 and 28 days of the finishing period, limit-fed cattle had lower dry matter intake than full-fed cattle, but overall intakes were similar for both groups. Average daily gain, feed conversion and carcass traits were similar for limit-fed vs full-fed cattle during the finishing phase.

Limit feeding appears to be a viable option for cattle feeders to consider. Careful analysis of feed costs considering corn, roughage and supplement prices as well as reliable estimates of feed efficiency are absolutely essential to determine which management scheme is most economical.

TABLE 4. PERFORMANCE OF CATTLE DURING THE FINISHING PHASE

Item[a]	Treatment	
	Limit-fed	Full-fed
DMI 14. lb[b]	17.52	18.58
DMI 28, lb	19.00	19.55
DMI, lb	22.68	22.86
ADG, lb	2.36	2.29
F/G	9.79	10.15
Quality grade[c]	2.06	2.04
Yield grade	2.78	2.68
Dressing percent	62.98	62.79
Shrink, %	4.19	4.06
Days on feed	130	128

[a] DMI 14, DMI 28 and DMI = average daily dry matter intake first 14 days, first 28 days and entire trial, respectively; ADG = average daily gain, F/G = feed to gain ratio.
[b] $P<.07$.
[c] 2 = choice, 3 = good.

Potential differences in nonfeed costs must also be considered. Limit feeding requires a higher degree of management than traditional high roughage growing programs. Limit-fed cattle are always hungrier than full-fed cattle and may be more susceptible to acidosis and bloat problems. Additional bunk space may be needed to enable all cattle to eat their required ration. Feeding two times daily 2 hours apart (i.e., 9 and 11 am) may alleviate bunk space shortage.