Compensatory Growth Response and Breakeven Economics of Yearling Steers on Grass

D. J. Jordon
University of Nebraska-Lincoln

Terry J. Klopfenstein
University of Nebraska-Lincoln, tklopfenstein1@unl.edu

Todd Milton
University of Nebraska-Lincoln

Rob Cooper
University of Nebraska-Lincoln

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Increased winter gains resulted in heavier final weights and reduced slaughter breakevens compared to animals wintered on a minimal input system.

Summary

A trial was conducted to evaluate compensatory growth in yearling cattle while on summer pasture, following variations of winter feed restriction. Winter gains were FAST, FAST/SLOW, SLOW/FAST, and SLOW. No summer gain differences were found among restricted cattle (FAST/SLOW, SLOW/FAST, or SLOW); however, gains were increased on grass compared to steers on the FAST treatment. SLOW cattle compensated 17.4% during grazing. FAST steers had lower slaughter breakevens compared to SLOW (64.05 vs 66.94 $/cwt, respectively). Due to little compensation by steers on the SLOW treatment, steers on the FAST treatment had heavier slaughter weights resulting in lower slaughter breakevens.

Introduction

Backgrounding programs, by design, restrict cattle to varying degrees. The programs are typically minimal-input systems which are based on available feed resources, desired gain, and possibly even preferred marketing times. Because not all producers have the same resources available to them, it is important to examine the potential for compensatory growth which animals have following restrictions which vary in severity, duration and types of feedstuffs used. Previous research conducted at the University of Nebraska has resulted in variable results regarding compensatory growth of animals on grass (1999 Nebraska Beef Cattle Report, pp. 26-28). Reasons why animals compensate differently from year to year have been elusive; however, it would appear that severity and duration of restriction play some role. Upon the realimentation, or refeeding period, animals are placed either into the feedlot for finishing or on grass. Typically, summer grazing produces excellent gains (1.5-2.0 lb/day) and should result in ample opportunity for compensatory growth. In addition, maximizing grazed forage gain while cost of gain is low reduces overall breakeven costs of forage based systems (1997 Nebraska Beef Cattle Report, pp. 56-59). If animals that gain slower over the winter as a result of lower inputs can compensate during summer grazing, slaughter breakevens should be favorable.

The objective of our research was to evaluate duration of winter restriction on subsequent compensatory growth and slaughter breakevens of yearling steers on grass.

Procedure

Wintering Period

One hundred and eighty medium-framed crossbred steers (initial weight = 535 lb) were purchased in the fall and allowed a 28-day acclimation period. All steers were wintered on cornstalks from Dec. 4, 1997 through Feb. 19, 1998 (phase I), and placed in drylots from Feb. 20, 1998 through April 28, 1998 (phase II). Cattle were assigned randomly to one of five treatments which were used to establish winter gains for the evaluation of subsequent compensatory growth in the summer. Treatments were: 1) Steers supplemented with wet corn gluten feed (FAST) for the entire winter to produce higher gains, 2) Steers supplemented with corn (CORN) for the entire winter to produce higher gains, 3) Steers supplemented with wet corn gluten feed to produce faster gains during phase I of the winter period followed by minimal supplementation to produce low gains in phase II (FAST/SLOW), 4) Steers minimally supplemented to have low gains during phase I of the winter period followed by supplementation with wet corn gluten feed in phase II to produce faster gains (SLOW/FAST), and 5) Steers minimally supplemented to produce low gains for the entire wintering period (SLOW; Figure 1). Cattle were essentially managed in three groups during phase I of the wintering period. Group 1 (FAST) consisted of steers supplemented with 5 lb/hd/day (DM basis) of wet corn gluten feed (WCGF) while on cornstalks; group 2 (CORN) consisted of steers which originally were supposed to receive 4 lb/hd/day (DM basis) of corn and 1.4 lb/hd/day (DM basis) of a sunflower meal based supplement while on cornstalks. However, on Oct. 23, 1997 (prior to the majority of the corn harvest), an early and severe snowstorm hit Eastern Nebraska which resulted in an unusually large amount of residual corn remaining in cornstalk fields.

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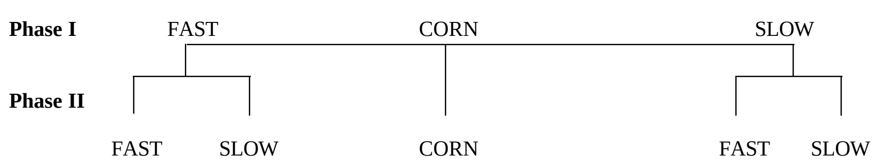

Figure 1. Treatment structure.

Because of excessive residual corn, a decision was made to estimate the amount of residual corn in all fields, and attempt to manage the stalks in a manner that would allow the steers to consume an appropriate amount of corn in the form of residual corn rather than corn supplemented in a bunk. In order to manage this, group 2 (CORN) was allowed to graze all of the stalk fields before groups 1 (FAST) and 3 (SLOW) so they would consume the majority of the residual corn. After group 2 had been in a particular field, either group 1 or 3 would follow. Group 3 (SLOW) consisted of steers which grazed cornstalks and received 1.4 lb/hd/day (DM basis) of the same protein supplement as described previously. In phase II of the winter period, half of the steers on the FAST treatment were switched to the SLOW treatment, and half of the steers on the SLOW treatment were switched to the FAST treatment. In this way, the FAST/SLOW and the SLOW/FAST treatments were developed (Figure 1). During phase II of the winter, steers again were managed in three groups. Group 1 (FAST) received ad-libitum ammoniated wheat straw, 5 lb/hd/day (DM basis) wet corn gluten feed, and 0.14 lb/hd/day (DM basis) of a mineral supplement. Group 2 (CORN) received ad-libitum ammoniated wheat straw, 4 lb/hd/day (DM basis) rolled corn, 0.47 lb/hd/day (DM basis) of the previously described protein supplement, and 0.2 lb/hd/day (DM basis) of a mineral supplement. Group 3 (SLOW) received ad-libitum ammoniated wheat straw and 0.2 lb/hd/day of a mineral supplement.

Summer Period

On April 29, 1998 steers were weighed, fly tagged, and implanted with Synovex®-S. Steers then were placed on bromegrass near Mead, NE for 45 days (April 29, 1998 through June 12, 1998). On June 13, 1998, steers were weighed and shipped to native warm-season pastures near Rose, NE, where they remained until Sept. 2, 1998 (82 d). On Sept. 3, 1998 steers were returned to Mead, NE where they grazed bromegrass regrowth until Sept. 28, 1998 (26 d). Steers were managed as one group throughout the summer, and an attempt was made to manage the forages to achieve maximum gains. Steers were rotated on bromegrass pastures both in the late spring and early fall so that forage never became limiting. Steers were rotated to a new pasture when it appeared forage quantity might begin to limit animal performance. On the warm-season pastures, steers were rotated between two 320-acre pastures (total = 640 acres) in the same manner.

Finishing Period

Upon removal from pastures, all steers were implanted with Revalor®-S and placed into the feedlot for finishing (18 head/pen). Steers were adapted to the final finishing diet in 21 days using four step-up diets containing 45, 35, 25, and 15% roughage fed for 3, 4, 7, and 7 days, respectively. The final diet (7.0% roughage) was formulated to contain a minimum of 12% CP, .7% Ca, .35% P, .6% K, 30 g/ton monensin, and 10 g/ton tylosin (DM basis). The finishing diet contained 40% wet corn gluten feed, 48% high-moisture corn, 7.0% alfalfa, and 5% supplement (DM basis). Final weights were calculated using hot carcass weight and a common dressing percentage (62). Hot carcass weights were obtained at slaughter, and fat thickness over the 12th rib, quality grades, and yield grades were gathered following a 24-hr chill.

Initial and final weights in the winter, summer and finishing periods were the average of two consecutive day weights following 3 days of limit-feeding of a common diet containing 50% WCGF and 50% alfalfa hay fed at 2% of body weight.

The data set was analyzed as a completely randomized design using the GLM procedures of SAS with feedlot pen as the experimental unit.

Results

Winter Period

Winter performance data are presented in Table 1. Cattle remained on cornstalks for a total of 78 d. Steers then were moved into the drylot where they received ammoniated wheat straw and their respective treatment supplements for a total of 68 d. At the conclusion of the winter period, gains by treatment were 1.38, 1.34, 0.85, 0.86, and 0.47 lb/

Table 1. Steer performance and carcass data.

Item[a]	FAST	CORN	FAST/SLOW	SLOW/FAST	SLOW
Winter					
Days	146	146	146	146	146
Initial weight, lb	541[b]	534[c]	542[b]	530[d]	530[d]
ADG, lb	1.38[b]	1.34[b]	0.85[c]	0.86[c]	0.47[d]
Final weight, lb	742[b]	728[c]	665[d]	655[e]	598[f]
Summer					
Days	153	153	153	153	153
ADG, lb	1.03[b]	0.95[b]	1.17[c]	1.23[c]	1.19[c]
Final weight, lb	899[b]	874[c]	845[d]	843[d]	780[e]
Finishing					
Days	97	97	97	97	97
ADG, lb	4.67	4.80	4.70	4.84	4.78
DMI, lb/day	31.2[bc]	31.8[b]	31.6[bc]	31.6[bc]	30.8[c]
Feed/gain[g]	6.67	6.62	6.71	6.49	6.45
Final weight, lb[h]	1353[i]	1339[ij]	1304[j]	1313[ij]	1251[k]
Carcass Data					
Carcass weight, lb	852[i]	844[ij]	821[j]	828[ij]	788[k]
Yield grade	2.6[ij]	2.7[j]	2.5[ik]	2.3[k]	2.3[k]
Fat thickness, in	.45[i]	.42[i]	.43[i]	.38[j]	.38[j]
Marbling score[l]	535[m]	514[mn]	513[mn]	504[n]	498[n]

[a]FAST = fast winter gain; CORN = corn; FAST/SLOW = fast gain then slow winter gain; SLOW/FAST = slow gain then fast winter gain; SLOW = slow winter gain.
[bcdef]Means within row with unlike superscripts differ ($P < 0.10$).
[g]Feed/gain was analyzed as gain/feed. Gain/feed is the reciprocal of feed/gain.
[h]Calculated from hot carcass weight adjusted to a common dressing percentage (62).
[ijk]Means within a row with unlike superscripts differ ($P < 0.10$).
[l]Marbling Score: 400-499 = Select, 500-599 = low Choice.
[mn]Means within row with unlike superscripts differ ($P < .05$).

day for the FAST, CORN, FAST/SLOW, SLOW/FAST, and SLOW treatments, respectively. While all gains were slightly lower than projected (1.5 lb/day for fast treatments, 1.0 lb/day for intermediate, and 0.5 lb/day for slow), the critical differences between the treatments were established for examination of the compensatory growth response.

Summer Period

Summer performance of steers is presented in Table 1. While grazing summer forage, the three restricted treatments (FAST/SLOW, SLOW/FAST, and SLOW) all gained faster ($P < .05$) than the FAST and CORN treatments. Gains over the summer period were 1.03, 0.95, 1.17, 1.23, and 1.19 lb/day for the FAST, CORN, FAST/SLOW, SLOW/FAST, and SLOW treatments, respectively. No differences ($P > .10$) were noted in the gains of the two faster gaining treatments (FAST and CORN).

A longer period of restriction for the SLOW cattle (compared to intermediate gaining treatments) resulted in a smaller percentage of compensation in relation to the fast-gaining treatments. However, in terms of total pounds, cattle on the SLOW treatment made up the same amount of weight as the intermediate treatments, but they started with a greater deficit, resulting in a poorer percentage of compensation. One possible reason for the similar gains may have been the overall performance of the animals over the summer period. Summer gains were actually lower than winter gains of the FAST and CORN treatments. Obviously either quality or quantity of summer forage was limiting steer gains across all treatments. Based on the management scheme applied to these animals, gains approaching 2.0 lb/day are realistic. Steers were placed on smooth bromegrass early in the season while it was in the vegetative stage and quantity was not limiting. Steers then were moved to native warm-season range at a time when bromegrass typically experiences a summer slump in growth. Near the end of the summer period, steers then were moved back to bromegrass to use some of the regrowth. Steer weights (full weights; not reported) were collected prior to each forage change during the summer. Based on those full weights, it would appear that gains were typical of what might be expected on smooth bromegrass (2.0-2.5 lb/day) in the spring and late summer/early fall; however, gains on the native warm-season range through mid-summer were disappointing and resulted in lower than expected overall steer gains. When comparing SLOW vs. FAST, steers compensated 17.4% over the summer period. Intermediate gaining treatments (FAST/SLOW and SLOW/FAST) compensated 28.9 and 35.6%, respectively, when compared to FAST. Previous research conducted at the University of Nebraska has indicated that compensation results can range from 18-100%. Our results obviously agree with the lower end of that range. Despite poor summer performance of animals in this particular trial, it is not believed that the performance affected the compensation results. Another trial conducted in the same year involving cattle wintered similarly, but placed in another location during the summer found similar compensation results when steers gained nearly 2.0 lb/day on grass (2000 Nebraska Beef Cattle Report, pp. 20-22).

Table 2. Economics and slaughter breakevens.

Item[a]	FAST	CORN	FAST/SLOW	SLOW/FAST	SLOW
Steer cost, $[b]	503.43	496.79	505.23	493.69	494.15
Interest[c]	46.03	45.39	46.23	45.09	45.15
Health[d]	25.00	25.00	25.00	25.00	25.00
Winter costs, $					
Feed[e]	60.07	72.51	50.26	51.37	41.56
Yardage[f]	18.00	18.00	14.60	18.00	14.60
Summer costs, $					
Grazing[g]	76.50	76.50	76.50	76.50	76.50
Finishing costs, $					
Yardage[h]	28.95	28.95	28.95	28.95	28.95
Feed[ij]	165.67	168.76	168.09	167.39	163.65
Total costs, $[k]	865.47	874.38	856.41	848.48	831.84
Final weight, lb[l]	1353	1339	1304	1313	1251
Breakeven, $/100 lb[m]	64.05[n]	65.38[no]	65.89[no]	64.63[no]	66.94[o]

[a]FAST = fast winter gain; CORN = corn; FAST/SLOW = fast gain then slow winter gain; SLOW/FAST = slow gain then fast winter gain; SLOW = slow winter gain.
[b]Initial weight × $80/100 lb.
[c]Interest rate = 9%.
[d]Health costs = implants, fly tags, antibiotics, etc.
[e]Winter feed includes stalks at $0.12/day, stalk mineral supplement at $0.0065/day, gluten feed at $0.225/day (5 lb/day; DM basis), corn at $0.20/day (4 lb/day; DM basis),ammoniated wheat straw at $0.02/lb, drylot mineral supplement at $0.00905/day for WCGF and $0.03026 for CORN and SLOW, and protein supplement at $0.12/day, where appropriate.
[f]Winter yardage includes $0.10/day while on stalks, $0.10/day for SLOW while in drylot, and $0.15/day for WCGF and CORN while in drylot.
[g]Summer grazing cost at $.50/day.
[h]Feedlot yardage cost at $.30/day.
[i]Average diet cost = $.0543/day (DM basis) and 9% interest for half of feed.
[j]Calculated using 15 yr average corn price at $2.41/bu.
[k]Total cost includes 2% death loss for each system.
[l]Calculated from hot carcass weight adjusted to a common dressing percentage (62).
[m]Slaughter breakeven price.
[no]Means within row with unlike superscripts differ ($P < .10$).

Finishing Period

Finishing data are presented in Table 1. Differences were noted in the feedlot only in DM intake when comparing cattle on the SLOW treatment to cattle on the CORN treatment ($P = 0.074$). However, an explanation for this difference is not readily apparent. Despite the difference in DM intake, no difference was noted in feed efficiency. The only other difference noted in the feedlot phase of the trial was in final weights. Final weight differences are to be expected based on the summer gains and lack of compensation by slower gaining animals.

Steers on the FAST treatment had a lower ($P = 0.056$) breakeven compared to steers on the SLOW treatment (Table 2). Additionally, the breakeven of steers

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on the SLOW/FAST treatment tended to be lower compared to steers on the SLOW treatment (Table 2). The higher breakevens for steers on the SLOW treatment stem from poor compensation. Therefore, the faster gaining animals had more sale weight at the conclusion of the finishing period. However, animals on the SLOW treatment were leaner (P > .05) compared to steers on the FAST treatment. Had the two treatment groups been fed to a more common fat endpoint (which would likely have resulted in the sale of more weight), slaughter breakevens might have been more similar between the treatments. The correlation coefficient for final weight and slaughter breakeven was r = -0.886 (P = 0.0012). Despite steers on the CORN treatment having a higher final weight compared to the SLOW treatment, slaughter breakevens were only numerically different (Table 2). Supplementing corn rather than wet corn gluten feed resulted in higher input costs because the wet corn gluten feed brought energy, protein and P into the diet, which are all expensive to supplement. Steers on the CORN treatment required a protein supplement in addition to the corn, which also added to wintering costs. No other differences (P > 0.15) were noted among treatments.

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[1]D. J. Jordon, research technician; Terry Klopfenstein, professor; Todd Milton, assistant professor; Rob Cooper, research technician, Animal Science, Lincoln.