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Compensatory Growth and Slaughter Breakevens of Yearling Cattle

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Increased winter gains resulted in heavier final weights and increased profits ($/head) when compared to animals wintered on a minimal input system or calf finishing.

Summary

A two-year summary of growing/finishing systems indicates that steer calves wintered at 1.5 lb/day had lower slaughter breakeven (P < .05) costs compared to animals wintered at 0.5 lb/day. Additionally, feeding wet corn gluten feed as an energy source to increase winter gains tended (P < .15) to produce slaughter breakevens which were lower than the same winter gains produced by feeding corn. Restricting animal gain over the winter (0.5-1.0 lb/day) resulted in 25-32% compensation on grass compared to controls (1.5 lb/day). Comparison of calf finishing vs. yearling growing/finishing systems showed that steers wintered with a "fast" rate of gain (1.5 lb/day) profited $28.85/head compared to losses by steers wintered with a "slow" rate of gain (0.5 lb/day; $-30.24/head) or calf finishing ($-20.87/head).

Introduction

Many backgrounding systems vary in length, grow cattle at various rates of gain, and are designed around available resources. Because producers and resources vary widely, different degrees of compensatory growth are experienced based on wintering conditions. Predicting the amount of compensatory growth based on gain during the winter and/or feed resources used will allow producers to make informed and economically sound decisions when evaluating a growing/finishing program. If a large and reliable compensation response can be achieved, backgrounding animals with minimal inputs should result in increased profitability. However, research conducted at the University of Nebraska indicates that compensation of animals backgrounded at 0.5 lb/day is consistently around 30% compared to animals wintered at 1.5 lb/day (2000 Nebraska Beef Cattle Report, pp. 23-26; 1999 Nebraska Beef Cattle Report, pp. 26-28). Therefore, in the absence of greater compensation, animals must be backgrounded at increased rates of winter gain for maximum profits.

The objectives of this report were 1) to examine the compensatory growth response of yearling steers on grass following backgrounding and evaluate subsequent slaughter breakevens, and 2) to compare profitability of calf finishing and growing/finishing systems.

Procedure

Yearling Trials

Wintering Period. One hundred eighty medium-framed english cross steers (519 lb) were used in each of two years. Steers were purchased in the fall and allowed a 28-day acclimation period. Steers were wintered on cornstalks from about Dec. 1 through Febr. 15 (phase I), and placed in drylots from Febr. 16 through May 1 (phase II). Cattle were assigned randomly to one of five treatments used to establish winter gains for subsequent evaluation of compensatory growth on grass. Treatments were: 1) "Fast"-gaining steers supplemented with wet corn gluten feed (WCGF) for the entire winter, 2) "Fast"-gaining steers supplemented with corn (CORN) for the entire winter, 3) "Intermediate"-gaining steers fed to gain "fast" (using wet corn gluten feed) during phase I followed by a "slow" rate of gain in phase II (FAST/SLOW), 4) "Intermediate"-gaining steers fed to gain "slow" during phase I followed by a "fast" rate of gain (using wet corn gluten feed) in phase II (SLOW/FAST), and 5) Steers fed to gain "slow" for the entire wintering period (SLOW; Figure 1). Cattle were managed in three groups during the winter. In phase I, WCGF steers (group 1) were supplemented with 5 lb/head/day (DM basis) of wet corn gluten feed and 0.18 lb/head/day (DM basis) of a mineral supplement, group 2 (CORN) consisted of steers which received 4 lb/head/day (DM basis) of corn and 1.8 lb/head/day (DM basis) of a sunflower meal-based supplement, and group 3 (SLOW) consisted of steers which grazed cornstalks and received 1.8 lb/head/day (DM basis) of the same sunflower meal based supplement. In phase II, half of the WCGF steers were switched to the SLOW treatment and half of the SLOW steers were switched to the WCGF treatment, resulting in FAST/SLOW and SLOW/FAST treatments (Figure 1). During phase II, WCGF steers received ammoniated wheat straw ad-libitum, 5 lb/head/day (DM basis) wet corn gluten feed, and 0.14 lb/head/day (DM basis) of a mineral supplement. Steers on the CORN treatment received ammoniated wheat straw ad-libitum, 4 lb/head/day (DM basis) rolled corn, 0.6 lb/head/day (DM basis) of the sunflower meal-based protein supplement, and 0.2 lb/head/day (DM basis) of a mineral supplement. The SLOW steers received ad-libitum ammoniated wheat straw and 0.2 lb/head/day (DM basis) of a mineral supplement.

Summer Period. On about May 1, steers were weighed, fly tagged, and implanted with Synovex S. In year 1, steers 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

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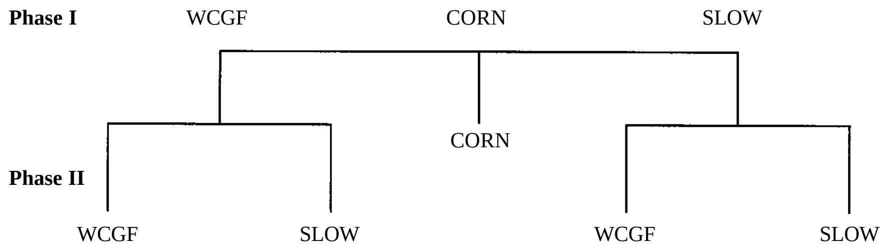

Figure 1. Treatment structure.

Sept. 2, 1998 (82 days). On Sept. 3, 1998, steers were returned to Mead, and grazed bromegrass re-growth until Sept. 28, 1998 (26 days). Steers were managed in one group throughout the summer. Steers were rotated on bromegrass pastures in late spring and early fall so that forage never became limiting to steer performance. On warm-season pastures, steers were rotated between two 320 acre pastures (total = 640 acres) in the same manner. In year 2, it was necessary to change the pasture management strategy following poor grass gains in year 1. Because the Rose, NE location contains significant low-land areas, poor gains were likely due to significant cool-season grasses. Steers were sent to that location in mid-June, and cool-season grasses had likely matured, contributing to decreased steer performance. Therefore, in year 2, cattle were managed in two groups. One group was sent to Rose, NE while the other group remained on cool-season grass at Mead, from May 4, 1999 through October 5, 1999. Again, an effort was made to manage both groups so that forage quality and quantity never became limiting to steer performance.

Finishing Period. In both years, upon removal from grass, all steers were implanted with Revalor-S and placed into the feedlot for finishing (18 head/pen). Steers were adapted to the 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 mg/kg 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 (63). 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 three days of limit feeding a common diet containing 50% wet corn gluten feed and 50% alfalfa hay fed at 2% of body weight (DM basis).

Economic Analysis. Portions of the costs associated with each treatment were different through the growing phases. Differences between systems in input costs will be noted, otherwise it should be assumed that inputs were similar.

For initial steer cost, average weight of a pen was multiplied by the 7-year average October calf price ($82.57/cwt.) for 500-550 lb feeders (USDA Agricultural Marketing Service). Simple interest was charged on the total sum of initial animal cost for the entire ownership period. All interest charges discussed herein were based on a simple 9.8% rate. Twenty-five dollars/head was charged for health, processing, and implanting. Interest was charged against health cost over the entire ownership period.

All three winter groups were charged a stalk charge of $0.12/head/day during phase I. Interest was charged for half of the stalk grazing period plus the remainder of ownership. Also, during phase I, animals in the WCGF group were supplemented with wet corn gluten feed (5lb/head/day; DM basis) at a cost of $102.99/ton (DM basis), which is equal to a corn price of $2.48/bu (as-is), and a mineral supplement ($36.40/ton; DM basis) at the rate of 0.18 lb/head/day (DM basis). Interest was charged on wet corn gluten feed and mineral supplement for half of the stalk period and for the remainder of ownership. Steers in the CORN group received 4 lb/head/day (DM basis) of dry-rolled corn ($2.48/bu; as-is) in phase I and 1.8 lb/head/day (DM basis) of protein supplement ($216.60/ton; DM basis). Interest was charged on the cost of both corn and protein supplement for half of the stalk grazing period plus the remainder of ownership. Steers in the SLOW group received the same protein supplement in phase I as the CORN group at the same feeding rate and cost. Interest was handled in a similar way as described above.

During phase II, all three groups were fed ammoniated wheat straw ad-libitum. Intake of the groups was monitored for cost calculations (12.3, 15.1, and 15.3 lb/head/day [as-is] for WCGF, CORN and SLOW, respectively). Ammoniated wheat straw was priced at $40/ton (as-is) and interest was charged on straw for half of phase II plus the remainder of ownership. In phase II, steers in the WCGF group were supplemented with a mineral supplement ($40.40/ton; DM basis) at the rate of 0.158 lb/head/day (DM basis) and wet corn gluten feed in the same manner as in phase I. Therefore, costs and feeding rate for wet corn gluten feed were the same in phase II as in phase I. Steers in the CORN group received corn in the same way as in phase I (feeding rate and cost were similar), the same protein supplement as in phase I at the rate of 0.6 lb/head/day (DM basis), and a mineral supplement at the rate of 0.185 lb/head/day ($86.00/ton; DM basis). Steers in the SLOW group were fed the same mineral supplement as the CORN group at the rate of 0.278 lb/head/day (DM basis). Interest was charged on all feed ingredients for all groups for half of phase II plus the remainder of ownership. Stalk and drylot yardage was charged at the same rate ($0.12, 0.11, and 0.10/head/day for WCGF, CORN and SLOW, respectively). Yardage charge differences were the result of increased feeding costs associated with wet corn gluten feed and corn compared to the SLOW group. The WCGF group was charged slightly more than the CORN group because a feed

truck was required for wet corn gluten feed delivery as opposed to corn feeding which was fed using a pick-up truck. In addition to the drylot yardage charge, a day charge of $0.12/head was applied to animals in all groups. Interest was charged on yardage and drylot costs for half of the respective period plus the remainder of ownership.

For summer costs, grazing was charged at the rate of $0.50/head/day, and interest was charged for half of the grazing period plus the remainder of ownership.

Finishing costs include both feed and yardage. For feed, DM intakes for a pen were determined and a diet cost of $114.20/ton (DM basis) was applied. Feedlot yardage was applied at $0.30/head/day. Interest was charged on feed and yardage costs for half of the feeding period. Total steer cost was the sum of steer, winter, summer, and finishing costs plus 2% death loss. To calculate slaughter breakeven, total cost was divided by final weight.

For all supplemental ingredients, prices were determined based on actual prices paid for those ingredients by the University of Nebraska Feed Mill with a 5% handling fee. Supplemental ingredients include all ingredients used in the winter protein and mineral supplements, and the supplemental ingredients used in the finishing diet. Wet corn gluten feed, whole corn, dry-rolled corn and high-moisture corn were charged on an equal dry basis, and price was determined using 10-year average corn price for Nebraska ($2.48/bu; as-is). A 10% shrink, processing, and handling fee was applied to corn and wet corn gluten feed. Alfalfa in the finishing diet was priced based on 10-year average price in Nebraska ($60.72/ton; as-is) along with a 10% markup.

Calf vs. Yearling Comparison

Experiments. The calf vs. yearling comparison used data from four years of calf finishing and yearling growing/finishing systems compiled at the University of Nebraska from 1995-1998. Calf finishing trials were chosen which had begun in the fall of the year, meaning that calves would have been sorted from a pool of animals from which calves placed into the yearling systems originated. Yearling systems were handled in the same way as described previously in the yearling trials; however, two additional years of data were used which were not reported previously. In addition, only SLOW and WCGF treatments were used in the comparison.

Economic Analysis. Economics for yearling systems were handled in the same manner as described previously in the yearling trials. Calf finishing (CALF) slaughter breakevens were calculated on pens of animals from each of the respective trials. Initial animal cost was based on the USDA 7-year average October feeder cattle price discussed previously for the yearling trials ($82.57), indicating $78.44/cwt. for 600-650 lb steer calves. However, data from Oklahoma suggests about $2.66/cwt. (total = $81.10/cwt.). should be added back to the purchase price for black exotic cross steers (May 15, 2000 Feedstuffs, pp. 9). In our calf finishing trials, black exotic cross steers were purchased. Additionally, calf purchase data compiled at Nebraska over the past seven years shows that $81.65/cwt. was paid for animals weighing 600-650 lb. Therefore, an average between Oklahoma and Nebraska data was used to arrive at a purchase price of $81.38/cwt. for 600-650 lb steers used for calf finishing. Interest was applied to initial cost of the animal over ownership. Health, processing, and implanting were assessed a flat rate of $25.00/head. Feed charges for the CALF treatment were based on the same finishing diet cost charged to the yearlings ($114.20/ton; DM basis). Average DM intake for each pen was used to determine feed consumption. Yardage was charged at $0.30/head/day. Interest was charged on the finishing diet and yardage for half of the feeding period. A 2% death loss was applied to all of the calves. To calculate slaughter breakeven, total cost was divided by final weight. Profitability was determined for both CALF and yearling (WCGF and SLOW) treatments. Profitability was calculated using the seven-year average May-June USDA Choice slaughter steer price ($66.21/cwt.; USDA Agricultural Marketing Service) for the CALF data. Likewise, the seven-year average December-January USDA Choice slaughter steer price ($67.48/cwt.; USDA Agricultural Marketing Service) was used for yearling data.

Results

Yearling Trials

Winter Period. Significant ADG differences were established between faster gaining treatments (WCGF and CORN), intermediate treatments (FAST/SLOW and SLOW/FAST), and the SLOW treatment ($P < .05$; Table 1). More importantly, differences in final winter weight ($P < .05$) were established for subsequent evaluation of compensatory growth on grass (Table 1).

Summer Period. Animals on FAST/SLOW, SLOW/FAST, and SLOW treatments gained faster ($P < .10$) compared to animals on fast gaining treatments (WCGF and CORN). No differences were noted in gains of steers on the two "faster" gaining winter treatments (Table 1). Gains of steers on the SLOW treatment and "intermediate" treatments were similar ($P > .10$). Prior research conducted at the University of Nebraska has shown that animals restricted to be 50 lb lighter compared to a "fast" gaining group at the end of a winter period (106 days) fully compensated at the end of summer grazing (1989 Nebraska Beef Cattle Report, pp. 34-35). In contrast, another study demonstrated that animals more severely restricted (150 lb weight difference; 160 days) only compensated 20% at the end of summer grazing (1998 Nebraska Beef Cattle Report, pp. 63-65). In the present study, "intermediate" gaining treatments began the summer period approximately 80-90 lb lighter than animals on WCGF and CORN treatments. Following summer grazing, a 50-60 lb weight difference remained, resulting in compensation of 33%. At the onset of summer grazing, steers on the SLOW treatment were approximately 145 lb lighter than steers on "faster" gaining treatments. By the end of the summer, the weight difference was 108 lb, resulting in compensation of 26%. Clearly, degree of restriction had little

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effect on compensation. In addition, winter energy source (WCGF vs. CORN), length of restriction (intermediate treatments vs. SLOW), and pattern of restriction (FAST/SLOW vs. SLOW/FAST) had little or no effect on compensation. Previous work which found that full compensation could be expected following summer grazing has not been supported in four consecutive years of compensatory gain work (two years not reported here). Therefore, it appears that steers fed at "faster" rates of winter gain can be expected to maintain 70-80% of their weight advantage following summer grazing. While summer gains reported here are below those typically seen in Nebraska, other studies in which steers have gained 2 lb/day have shown similar compensation, indicating that level of summer gain may not be a key factor (2001 Nebraska Beef Cattle Report, pp. 34-36; 2000 Nebraska Beef Cattle Report, pp. 30-32).

Finishing Period. No differences among winter treatments were noted in ADG, DM intake, or feed conversion ($P > .10$; Table 1). Only differences in final weight were apparent which are a carryover from differences imposed in the winter.

Economic Analysis. Steers on the WCGF treatment tended ($P < .15$) to have a lower breakeven compared to steers on the CORN, FAST/SLOW, and SLOW/FAST treatments (Table 2). Animals on the SLOW treatment had the highest breakeven ($P < .05$). Final weight appears to be the largest single factor which accounts for a reduced slaughter breakeven ($P < .0001$; as final weight increases, slaughter breakeven decreases), accounting for 78% of the variation. Because of increased winter weight gain and little summer compensation by steers in the "intermediate" and SLOW treatments, steers on the WCGF treatment had a lower slaughter breakeven. Breakeven differences between WCGF and CORN treatments are due to increased winter inputs (protein supplement) for the CORN treatment, whereas wet corn gluten feed supplied energy, protein, and minerals in one package.

Table 1. Steer performance and carcass data.

Item[a]	WCGF	CORN	FAST/SLOW	SLOW/FAST	SLOW
Winter					
Days	154	154	154	154	154
Initial weight, lb	520	518	521	513	523
ADG, lb	1.48[b]	1.43[b]	0.89[c]	0.96[c]	0.49[d]
Final weight, lb	747[b]	739[b]	658[c]	661[c]	598[d]
Summer					
Days	154	154	154	154	154
ADG, lb	1.29[e]	1.26[e]	1.46[f]	1.45[f]	1.52[f]
Final weight, lb	944[b]	932[b]	881[c]	883[c]	830[d]
Finishing					
Days	94	94	94	94	94
ADG, lb	4.77	4.83	4.81	4.78	4.69
DMI, lb/day	31.4	31.6	31.5	31.0	30.7
Feed/gain[g]	6.56	6.54	6.55	6.48	6.55
Final weight, lb[h]	1396[b]	1389[b]	1337[c]	1338[c]	1276[c]
Carcass Data					
Carcass weight, lb	879[b]	875[b]	842[c]	843[c]	804[d]
Yield grade	2.6	2.6	2.6	2.4	2.5
Fat thickness, in	.48[b]	.46[bc]	.46[bc]	.43[d]	.44[cd]
Quality grade[i]	522[bc]	527[c]	513[bcd]	502[cd]	500[d]

[a]WCGF = wet corn gluten feed; CORN = corn; FAST/SLOW = fast gain then slow winter gain; SLOW/FAST = slow gain then fast winter gain; SLOW = slow winter gain.
[bcd]Means within row with unlike superscripts differ ($P < .05$).
[ef]Means within a row with unlike superscripts differ ($P < .10$).
[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 (63).
[i]Quality grade: 400-499 = Select, 500-599 = Choice.

Table 2. Economics and slaughter breakevens.

Item[a]	WCGF	CORN	FAST/SLOW	SLOW/FAST	SLOW
Steer cost, $	475.20	474.14	476.52	469.11	477.80
Health	27.69	27.69	27.69	27.69	27.69
Winter costs, $					
Feed	74.23	93.69	58.34	70.45	54.97
Yardage	29.45	27.79	27.88	27.69	26.12
Summer costs, $					
Grazing	80.27	80.27	80.27	80.27	80.27
Finishing costs, $					
Yardage	28.63	28.63	28.63	28.63	28.63
Feed	170.83	172.30	171.48	168.68	166.99
Total costs, $	899.46	917.84	883.83	885.49	875.41
Final weight, lb	1396[b]	1389[b]	1337[c]	1338[c]	1276[d]
Breakeven, $/100 lb[e]	64.56[b]	66.22[b]	66.23[b]	66.25[b]	68.68[c]

[a]WCGF = wet corn gluten feed; CORN = corn; FAST/SLOW = fast gain then slow winter gain; SLOW/FAST = slow gain then fast winter gain; SLOW = slow winter gain.
[bcd]Means within row with unlike superscripts differ ($P < .05$).
[e]Slaughter breakeven price.

Table 3. CALF vs. yearling steer performance.

Item	CALF	FAST	SLOW
Winter initial wt., lb	—	522	524
Winter ADG, lb	—	1.53	0.42
Grass initial wt., lb	—	764	592
Grass ADG, lb	—	1.21	1.64
Days on feed	182	91	105
Feedlot initial wt., lb	611	931	814
Feedlot ADG, lb	3.47[a]	4.55[b]	4.26[c]
DM intake, lb/day	21.1[a]	30.8[b]	28.9[c]
Final wt., lb[d]	1238[a]	1359[b]	1242[c]
Carcass wt., lb	780[a]	856[b]	783[c]
Fat, in.	0.47	0.49	0.47
Yield grade	2.40	2.65	2.61

[abc]Means within a row with unlike superscripts differ ($P < .05$).
[d]Calculated from hot carcass weight adjusted to a common dressing percentage (63).

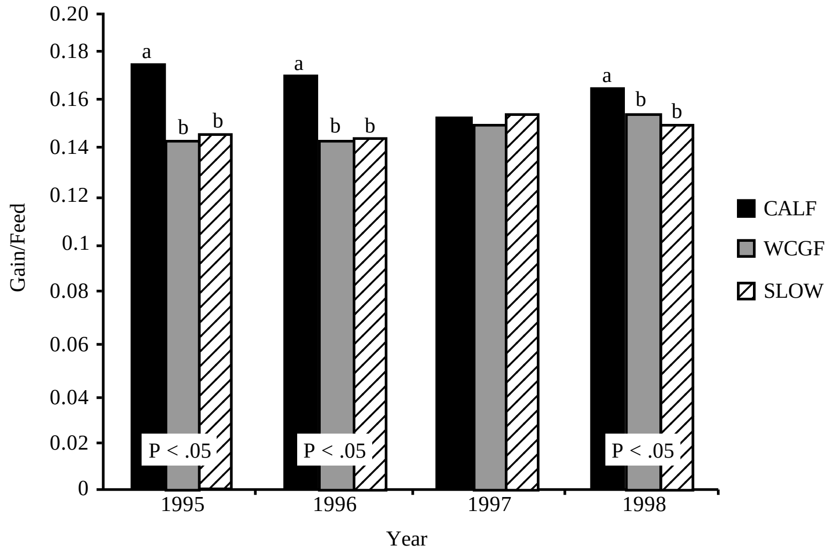

Figure 2. Feed efficiency year × treatment interaction.

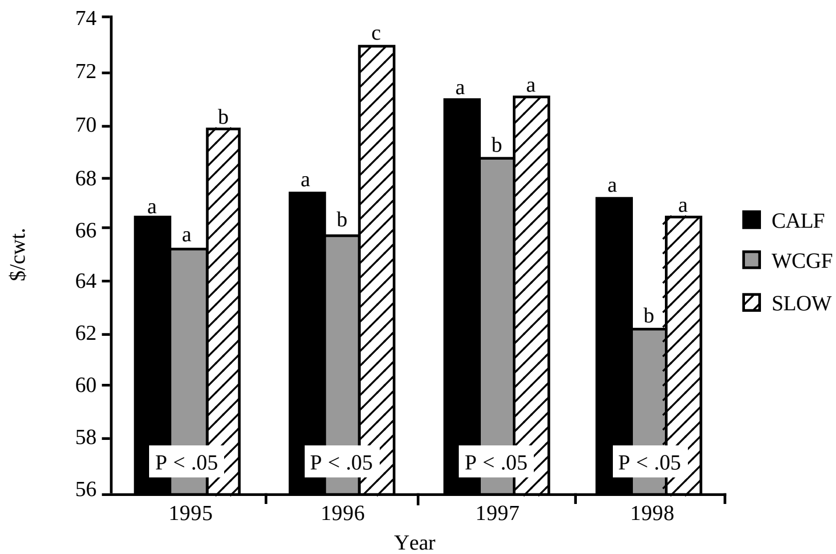

Figure 3. Slaughter breakeven year × treatment interaction.

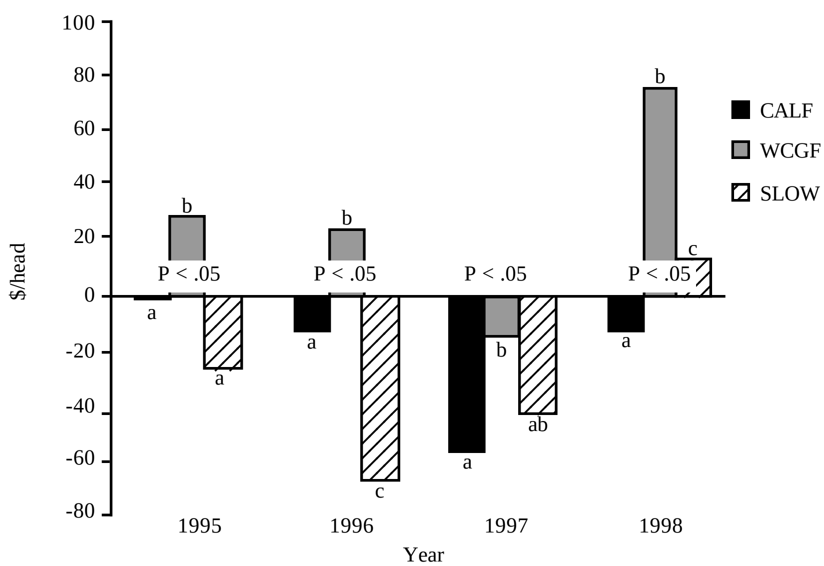

Figure 4. Profit/loss year × treatment interaction.

Calf vs. Yearling Comparison

Animals on the CALF treatment gained slower and consumed less feed compared to yearling systems ($P < .05$; Table 3). For feed efficiency, a year × treatment interaction was evident ($P < .05$; Figure 2). In 1995 and 1996, calves were more efficient compared to the yearling systems ($P < .05$); however, in 1997 no differences in efficiency were noted ($P > .05$). Likely, the reason for the discrepancy in 1997 is that calves on feed in the spring of 1998 encountered significant mud which reduced performance (ADG and feed efficiency). In 1998, calves were more efficient ($P < .05$) than both yearling treatments, and the WCGF treatment was more efficient ($P < .05$) compared to SLOW. The WCGF treatment produced carcasses which were heavier (~75 lb; $P < .05$) compared to SLOW and CALF treatments. In terms of slaughter breakeven, a year × treatment interaction ($P < .05$; Figure 3) was evident. In 1995, WCGF and CALF treatments resulted in similar breakevens, while SLOW treatment breakevens were higher ($P < .05$). In 1996, the WCGF treatment had the lowest ($P < .05$) breakeven compared to CALF which was lower ($P < .05$) compared to SLOW. In 1997 and 1998, the WCGF treatment had a lower breakeven ($P < .05$) compared to both CALF and SLOW.

When comparing groups which were fed (and therefore sold and slaughtered) at different times, slaughter breakeven may not be appropriate. Profitability is a better measure because it accounts for different marketing times. Figure 4 shows the profitability of each of the treatments within each year. Calf finishing failed to show a profit in all four years, whereas the WCGF yearling system was profitable in three years. The SLOW yearling system was profitable in 1998; however, it also produced the largest losses in two of the years examined with the most substantial losses occurring in 1996. While not statistically appropriate based on the year× treatment interaction, averaging profit/loss numbers across years is realistic in terms of producer profitability. The WCGF yearling system was

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advantageous compared to CALF or SLOW, showing an average profit of $28.85/head over the four-year period. Losses incurred by CALF and SLOW were $-20.87 and -30.24/head, respectively. Final weight was the largest determining factor in terms of both slaughter breakeven and profit/loss, explaining 47 and 49% of the variation, respectively.

Steer purchase price can have a relatively large impact on profitability. Data from Kansas indicates that large deviations in the price spread can occur with changes in the price of corn (2000 Kansas State Cattleman"s Day Report, pp. 88-91). For example, the price differential between 500 and 800 lb steers with below average corn price ($1.68/bu) is approximately $20.00/cwt.; however, when corn price rises to $3.52/bu, the price differential can diminish to $7.00/cwt. for the same steers. Producers should be aware of the price differential paid for calves for calf finishing compared to calves which will be grown in a yearling program, as well as marketing times and expected prices received before making decisions to background or place calves on feed.

In the present analysis, the WCGF wintering system was superior to either calf finishing or a growing/finishing system utilizing a "slow" rate of winter gain; however, several factors can interact with slaughter breakevens and profitability such as corn price, purchase price and slaughter cattle price.

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