Stocker and Finishing Programs For Fall-Weaned Calves

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Story in Brief

Studies were conducted to compare live and carcass weight gains and feed efficiencies of fall-weaned steer calves (1) placed directly in the feedlot or (2) carried as stockers on wheat pasture or bermudagrass hay (stocker phase) before being finished by feeding grain on small grains-interseeded bermudagrass (SG/B) pastures or by *ad libitum* feeding in drylot. Steers from each of the two stocker programs were also grazed to heavier weights on SG/B pastures for about 60 days before being finished in drylot. Live and carcass weight gains of steers grazed on wheat pasture were 1.88 and 1.33 lb/day, respectively. Live weights of steers fed bermudagrass hay during the stocker phase were only maintained, whereas carcass gains were −0.09 lb/day. The finishing phase performance of the steers fed bermudagrass hay was, however, very good. Feed consumption of steers finished by feeding grain on pasture was high, about 80 percent of that of paired drylot, *ad libitum*-fed groups. Live and carcass weight gains of steers fed on SG/B pastures were less than those of paired drylot groups fed an equivalent amount of feed. Steers fed on SG/B pastures required an estimated 0.75 lb of additional feed dry matter for the daily gains as compared with steers fed in drylot.

Introduction

In an effort to obtain greater returns to apply against increasing cow maintenance costs, cow-calf producers may elect to retain ownership of their weaned calves through the stocker and possibly feedlot phases of production. Often producers, in face of insufficient or no forage from wheat pasture, have to make decisions on other methods of carrying fall-weaned calves through the stocker phase of production. Cattle performance on optional stocker programs and its effect on subsequent feedlot performance are key questions.

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Finishing cattle by feeding grain on pasture is a frequently suggested alternative beef production system. The relative contributions of forage and grain to beef weight gains is an important consideration in evaluating the efficiency of finishing cattle by feeding grain on pasture.

The objectives of the studies reported herein were to:

1. Compare live and carcass weight gains of fall-weaned steer calves placed (1) directly in the feedlot or (2) on the following two stocker programs:
    A. Grazed on clean-tilled wheat pasture.
    B. Held on dormant bermudagrass pastures and fed bermudagrass hay *ad libitum*.
2. Compare the performance of steers from the above two stocker programs when grazed to heavier weights on small grains-interseeded bermudagrass pastures before being finished in drylot.
3. Determine the relative energy contributions from forage and grain to weight gains of steers fed grain *ad libitum* on small grains-interseeded bermudagrass pastures.
4. Develop enterprise budgets for each beef production system, and conduct break-even analyses for alternative price and gain relationships.

Experimental Procedure

Cattle

One-hundred and thirty-five (135) fall-weaned Hereford X Angus steer calves were purchased through an order buyer. After being carried through a receiving program of about 3 weeks, during which the calves grazed native tall grass pastures, the calves were randomly allotted to the treatment groups shown in Figure 1.

Initial feedlot group

Twelve steers (6 pens of 2 head/pen) were placed in drylot and fed *ad libitum* a finishing ration of whole shelled corn, cottonseed hulls, and supplement. The ration contained 40 percent cottonseed hulls initially, and corn was substituted for the hulls at a rate of about 1 percent per day until the steers were on a ration of 87 percent whole shelled corn, 5 percent cottonseed hulls, and 8 percent supplement. The supplement contained 60 percent crude protein on a dry matter basis.

Stocker phase

Fifty-seven (57) and 55 of the remaining steers were placed on (1) wheat pasture or (2) a dormant bermudagrass pasture and fed bermudagrass hay *ad libitum*, respectively, from November 16, 1976 to March 16, 1977. Core samples of about one-third of the bales of bermudagrass hay that were fed were

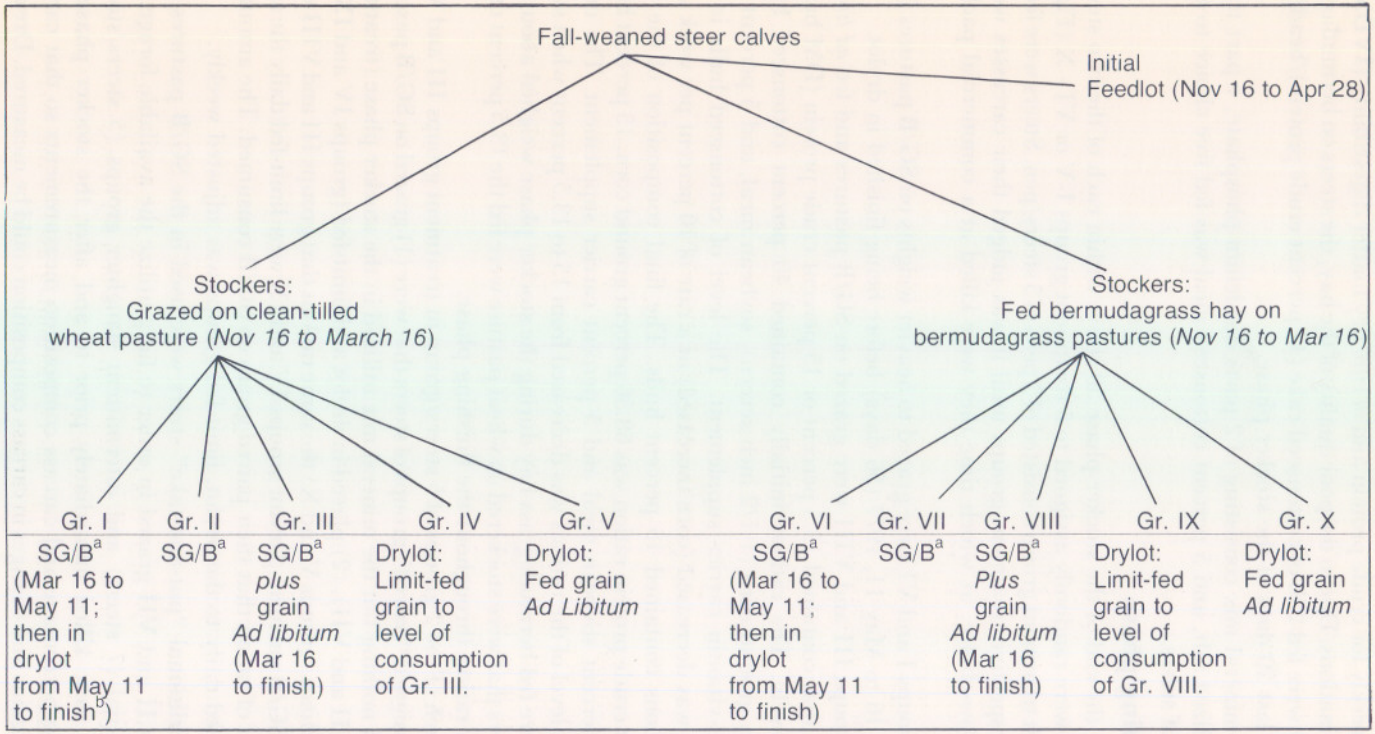

Figure 1. Steer treatment groups

[a]Small grains-interseeded bermudagrass pastures.

[b]Carcass quality of low choice.

taken weekly for crude protein and *in vitro* dry matter digestibility (IVDMD) determinations. Due to the poor quality of the hay, the steers on bermudagrass pasture were fed 2 lb of cottonseed cake (41 percent crude protein)/head/day for the last 20 days of the stocker phase.

A mineral mix consisting of 2 parts dicalcium phosphate, 1 part trace-mineralized salt, and 5 percent cottonseed meal was fed free choice to each group of steers.

Finishing phase

At the end of the stocker phase 50 steers within each of the two stocker groups were randomly assigned to 5 treatment groups I-V or VI - X (Figure 1). Each treatment group consisted of 2 pens of 5 steers/pen. Steers were fed on their respective treatment groups until it was judged their carcasses would grade low-choice, at which time they were killed at a commercial packing plant.

Groups I and VI were grazed to heavier weights on SG/B pastures from March 16 to May 11, 1977 (56 days) before being finished in drylot.

Groups III and VIII were grazed on SG/B pastures and fed *ad libitum* rations that contained 13.5 percent or 15 percent crude protein (DM basis), respectively. The rations initially contained 40 percent cottonseed hulls, coarsely ground corn (1 1/2 inch screen), soybean meal, and 5 percent of a mineral-vitamin carrier supplement. The level of cottonseed hulls in the rations was decreased (corn increased) at a rate of 10 percent per week until the rations contained 15 percent hulls. The final composition of the 13.5 percent crude protein ration was 68.56 percent ground corn, 15 percent hulls, 11.44 percent soybean meal and 5 percent carrier supplement. The crude protein level of the rations was decreased from 15 to 13.5 percent when steers that were fed bermudagrass hay during the stocker phase weighed about 650 lb. Steers that were stockered on wheat pasture were fed the 13.5 percent crude protein ration throughout the finishing phase.

Each of the 2 groups of 5 steers/group in treatment groups III and VIII were assigned "paired" groups of steers that were (1) grazed on SG/B pastures and fed nothing but the mineral mix utilized in the stocker phase (treatment groups II and VII), (2) placed in drylot and limit-fed (groups IV and IX) or fed *ad libitum* (groups V and X) the same rations that groups III and VIII were fed on SG/B pastures. Drylot groups IV and IX were limit-fed daily the same amount of ration that their paired group on SG/B consumed. The amount of ration fed daily to the drylot, limit-fed groups was adjusted weekly.

Additional "put-and-take" steers were used in the SG/B pastures that Groups II and VII grazed in order to fully utilize the available forage.

Initial (7 steers) and intermittent slaughter groups (5 steers/stocker group) were killed immediately prior to and after the stocker phase for dressing percentage and carcass composition measurements so that carcass weight gains and changes in carcass composition could be measured. Dressing

percentages of the initial slaughter group, and the wheat pasture, and bermudagrass hay fed steers *after* the stocker phase were 51.78 ± 1.09 percent, 58.5 ± 1.06 percent and 49.28 ± 1.43 percent, respectively.

The small grains-interseeded (SG/B) pastures were seeded with 40 and 60 lb. of Triumph 64 wheat and Bonel rye per acre, respectively, on September 24, 1976 with a John Deere Powr-Till Seeder. Fifty pounds of nitrogen was applied per acre in early October and again in February.

All steers weights used to calculate gains were taken after overnight shrinks (usually about 16 hr) without feed and water.

Results and Discussion

Stocker phase

Weight gains of steers during the stocker phase are shown in Table 1. Live and carcass weight gains of steers grazed on wheat pasture were 1.88 and 1.33 lb/day, respectively. Live weights of steers roughed through the winter on dormant bermudagrass pastures and fed bermudagrass hay *ad libitum* were only maintained, whereas carcass weight gains were −0.09 lb/day.

Finishing phase

Live weight gains and feed efficiencies (drylot only) of steers grazed to heavier weights on SG/B pastures for 56 days after the stocker phase and before being finished in drylot are shown in Table 2. Gains of steers fed bermudagrass hay during the stocker phase were very good during the 56 days on SG/B pastures (2.21 lb/day) and while in drylot (3.53 lb/day).

The specific stocker program on which a steer has been carried prior to being placed in feedlot has long been recognized to have a substantial impact on rate of growth and efficiency of feed utilization. It is generally expected that thin feeder cattle will make compensatory gains, whereas fleshy cattle are not expected to perform as well as cattle in thin or average condition. An important question is, however, how much gains can be restricted during stocker or carry-over programs without "stunting" subsequent performance. These results indicate that gains during carry-over programs can be reduced to maintenance without precluding the ability of steers to make compensatory gains. This is also supported by the live and carcass weight gains and feed efficiencies of the drylot, *ad libitum*-fed steers from the two stocker programs (Table 3).

Gains of steers stockered on wheat pasture were significantly less ($P<.05$) during the 56 days on SG/B than those of the steers fed bermudagrass hay during the stocker phase (1.69 *vs* 2.21 lb./day), and were about 10 percent less (1.69 *vs* 1.88) than their gains on clean-tilled wheat pasture. At the end of the stocker phase, the steers coming off of wheat pasture were fairly fleshy (20.84 ± 0.96 percent estimated carcass fat versus 9.01 ± 1.12 percent carcass fat for steers fed bermudagrass hay), and probably should have been taken directly to the feedlot. The feed efficiencies of steers fed bermudagrass hay during the

Table 1. Performance of steers during stocker phase

	Wheat pasture	Bermudagrass hay[c]
Initial live wt, lb	414[a]	445[b]
Final live wt, lb	637[a]	445[b]
ADG (live), lb	1.88[a]	0.00[b]
ADG (carcass), lb	1.33[a]	−0.09[b]

[a, b]Means with different lettered superscripts are statistically different (P< .05).
[c]Mean crude protein and TDN were 7.85 ± .31 and 44.14 ± .42 percent, respectively.

Table 2. Performance of steers from two previous stocker programs when grazed on small grains-interseeded bermudagrass pastures, and then finished in drylot.

	Wheat pasture	Bermudagrass hay
Initial wt, lb	640[a]	447[b]
Final wt, lb	990	946
ADG, lb		
SG/B[c]	1.69[a]	2.21[b]
Drylot	3.28	3.53
SG/B and drylot	2.62[a]	3.08[b]
Feed/grain[d]	6.64	6.49

[a, b]Means with different lettered superscripts are statistically different (P<.05).
[c]While grazing small grains-interseeded bermudagrass pastures (56 days).
[d]Pounds feed dry matter per pound of gain.

stocker phase were slightly better (P>.05) than those of steers grazed on wheat pasture.

Live and carcass weight gains of steers fed *ad libitum* on SG/B pastures were about 78 and 84 percent, respectively, of those of their paired drylot, *ad libitum*-fed groups (Table 3). Feed consumption of steers fed grain on pasture was high — e.g., approximately 80 percent of the feed consumption of their paired drylot, *ad libitum*-fed groups. Increased maintenance energy requirements and negative associative effects of the ration that was fed and the consumed forage could account for the decreased gains of the steers fed on SG/B pastures. The combined magnitude of the possible increased maintenance energy requirements and negative associative effects, expressed as additional pounds of feed required for the observed average daily gains (bottom of Table 5), was estimated by regression analysis for each of the four groups of steers fed on SG/B pastures. Regression equations (ADG on feed intake) were calculated within each replicate, from the observed average daily gains of the drylot, (1) limit-fed and (2) *ad libitum*-fed steers, and (3) calculated daily gains for a third group of steers with feed intakes of 90 percent of the feed consumed by the steers fed on SG/B pastures. The calculated daily gains for the third group of steers, within each replicate, were multiplied by adjustment factor (Table 4 footnote C) prior to calculation of the regression equations. All calculated gains were based on the California net energy system, and ration

Table 3. Performance of steers during finishing phase

Stocker phase:	Wheat pasture					Bermudagrass hay				
Group Number:	I	II	III	IV	V	VI	VII	VIII	IX	X
Initial wt, lb[f]	640	647	641	640	638	447	445	454	447	438
Final wt, lb[f]	990		892	940	915	946		895	921	946
Hot carcass wt, lb[f]	616		549	577	573	555		537	535	563
Days fed in drylot[f]	78		108	108	92	107		163	163	154
Total days in finishing phase[f]	134	108	108	108	92	163	163	163	163	154
ADG (live), lb	2.61^{bc}	1.26^{a}	2.35^{b}	2.77^{bcd}	3.01^{cde}	3.08^{de}	1.70^{a}	2.72^{bcd}	2.92^{cde}	3.32^{e}
ADG (carcass), lb	1.80^{ab}		1.67^{a}	1.88^{ab}	2.17^{bc}	2.06^{bc}		1.93^{abc}	1.94^{abc}	2.27^{c}
Feed DM, intake, lb	21.77^{cd}		18.49^{ab}	19.20^{abc}	23.63^{d}	22.90^{d}		16.97^{a}	16.79^{a}	20.71^{bcd}
Feed/gain (live)[g]	6.64^{ab}		7.87^{c}	6.98^{bc}	7.86^{c}	6.49^{ab}		6.25^{ab}	5.74^{a}	6.29^{ab}
Feed/gain (carcass)[g]			11.05^{c}	10.24^{bc}	10.89^{c}			8.81^{ab}	8.65^{a}	9.22^{ab}

^{abcde}Means with different lettered superscripts are statistically different ($P < .05$).
[f]Statistical analysis of data not compiled.
[g]Pounds feed dry matter per pound of gain.

Table 4. Calculation of adjustment factors used to adjust calculated ADGs of third group of steers

Stocker group:	Wheat pasture	Bermudagrass hay
Drylot, *ad libitum*-fed steers		
Observed ADG		
Rep. 1	3.12 (.894)[a]	3.68 (1.146)[a]
Rep. 2	2.89 (.938)	2.96 (.952)
Calculated ADG[b]		
Rep. 1	3.49	3.21
Rep. 2	3.08	3.11
Drylot, limit-fed steers		
Observed ADG		
Rep. 1	2.60 (.996)[a]	3.01 (1.176)[a]
Rep. 2	2.93 (1.291)	2.83 (1.258)
Calculated ADG[b]		
Rep. 1	2.61	2.56
Rep. 2	2.27	2.25
Calculated adjustment factors[c]		
Rep. 1	.945	1.161
Rep. 2	1.114	1.105

[a]Parenthetical numbers equal observed ADG divided by calculated ADG.
[b]Calculated for the observed feed intakes.
[c]Mean of the observed ADGs of the drylot, limit- and *ad libitum*-fed steers divided by the calculated ADGs for their observed feed intakes.

Table 5. Estimated magnitude[a] of combined increased maintenance energy requirements and negative associative effects of feeding steers on SG/B pastures.

Stocker phase:	Wheat pasture		Bermudagrass hay	
Replication:	1	2	1	2
Observed ADG, lb	2.25	2.45	2.78	2.65
Observed feed DM intake, lb/hd/day	19.18	17.79	17.68	16.26
Calculated feed DM required for observed ADGs, lb/hd/day	19.84	15.60	16.72	15.74
Observed minus calculated feed DM, lb	− 0.66	+ 2.19	+ 0.96	+ 0.52

[a]Observed feed dry matter minus calculated feed dry matter for observed ADGs.

$NE_{maintenance}$ and NE_{gain} values were reduced 10 percent since no growth-promoting implants were used in this study.

The calculations indicate that the steers grazed on wheat pasture (replication 2) or fed bermudagrass hay (replications 1 and 2) during the stocker phase, and then fed on SG/B pastures required 2.19, 0.96 and 0.52 additional pounds of feed dry matter for the observed average daily gains as compared with steers fed in drylot. A small feed-sparing effect of consumed forage is indicated by the −0.66 lb. of feed dry matter calculated for replication 1 of the steers stockered on wheat pasture.

Table 6. Steer carcass characteristics

Stocker phase:	Wheat pasture				Bermudagrass hay			
Group Numbers:	I	III	IV	V	VI	VIII	IX	X
Dressing %	62.18[c]	62.07[c]	61.33[bc]	62.68[c]	58.63[a]	59.93[ab]	58.09[a]	59.48[a]
Fat thickness, in	.84[ab]	.78[a]	.79[a]	.86[ab]	.98[bc]	.96[bc]	.92[abc]	1.08[c]
REA, sq in	12.42[d]	10.77[bc]	11.70[cd]	11.42[cd]	10.11[ab]	9.56[a]	10.03[ab]	9.74[ab]
KPH fat, %	2.90	2.85	3.05	2.95	2.85	3.05	2.95	2.95
Yield grade	3.53[a]	3.67[a]	3.53[a]	3.77[a]	4.38[b]	4.50[b]	4.21[b]	4.80[b]
Conformation score[g]		11.7[bc]	12.1[c]	12.1[c]	10.4[a]	10.8[ab]	10.8[ab]	11.0[ab]
Marbling score[h]	14.7	12.7	14.7	14.4	13.2	12.8	12.5	14.2
Quality grade[g]	10.1	9.4	10.4	10.3	9.7	9.4	9.2	10.0

[abcde]Means with different lettered superscripts are statistically different (P< .05).
[g]12 = high choice; 10 = low choice; 8 = average good.
[h]17 = average modest; 14 = average small; 11 = average slight.

The carcass characteristics of the steers from the different stocker and finishing programs are shown in Table 6. Steers from the various finishing programs that were fed bermudagrass hay during the stocker phase had lower dressing percentages, greater fat thicknesses, smaller ribeye areas, higher yield grades, and lower conformation scores compared to steers grazed on wheat pasture during the stocker phase.

The live weight gains of steers grazed on SG/B pastures (groups II and VII, Table 3) were calculated from weights taken at the time that their paired groups, fed on SG/B pastures (groups III and VIII) were killed. Groups II and VII steers were held on the SG/B pastures until September 29, 1977, and five of the ten steers that had been stockered on wheat pasture and which showed the greatest degree of finish were killed. The mean live weight and average daily gain (during finishing phase only) of the five steers was 916 lb and 1.12 lb/day, respectively. Carcass quality grade of the steers ranged from low- to average-good. The steers had grazed SG/B pastures for 197 days, and had been on forage (stocker and finishing phases) for 316 days.

Performance and carcass data of the steers that were initially placed in feedlot (November 16, 1976) versus that of steers stockered on wheat pasture or bermudagrass hay prior to being finished by feeding *ad libitum* in drylot (groups V and X) are shown in Table 7. Carcass average daily gains (drylot only) of steers initially placed in the feedlot were lower (P<.05) than those of either group of steers that were carried through as stockers before being finished in drylot. Feed required per pound of gain was lower (P>.05) for steers initially placed in the feedlot. The average slaughter weight of 866 lb and carcass quality grade of slightly under low-choice indicate that the initial feedlot steers should have been fed a little longer. In general, the carcass characteristics of steers stockered on wheat pasture before being finished in drylot were more desirable; whereas carcass characteristics of steers fed bermudagrass hay during the stocker phase and the initial feedlot steers were similar.

Table 7. Performance and carcass data of initial feedlot steers versus steers carried through as stockers before being finished in drylot

Group:	Initial feedlot	Wheat pasture	Bermudagrass hay
Initial weight, lb[a]	412	638	438
Final weight, lb[a]	866	915	946
Days in stocker program	0	119	119
Days in drylot	163	92	154
Total number of days	163	211	273
Feed DM intake, lb	15.98	23.63	20.71
ADG (live), lb	2.78	3.01	3.32*
ADG (carcass), lb	1.86	2.17*	2.27*
Feed/gain (live), lb[b]	5.71	7.86	6.29
Feed/gain (carcass), lb[b]	8.53	10.89	9.22
Hot carcass weight, lb[a]	516	573	563
Dressing %	59.64	62.68*	59.48
Fat thickness, in	.93	.86*	1.08*
REA, sq in	9.75	11.42*	9.74
KPH fat, %	3.29	2.95*	2.95*
Yield grade	4.33	3.77*	4.80*
Conformation score[c]	11.4	12.1*	11.0
Marbling score[d]	13.4	14.4	14.2
Quality grade[c]	9.7	10.3*	10.0

*Significantly different from drylot group (P<.05).
[a]Statistical analysis on data not compiled.
[b]Pounds feed dry matter per pound of gain.
[c]12 = high choice; 10 = low choice; 8 = average good.
[d]17 = average modest; 14 = average small; 11 = average slight.