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Integration of Pasturing Systems for Cattle Finishing Programs

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Abstract
A 3-year study, using 84 fall-born and 28 spring-born calves of similar genotypes, was conducted to integrate pasturing systems with drylot feeding systems. Calves were started on test following weaning in May and October. Seven treatments were imposed: 1) fall-born calves directly into feedlot; 2 and 3) fall-born calves put on pasture with or without ionophore and moved to the feedlot at the end of July; 4 and 5) fall-born calves put on pasture with or without ionophore and moved to the feedlot at the end of October; 6 and 7) spring-born calves put on pasture with or without ionophore and moved to the feedlot at the end of October. A bromegrass pasture consisting of 16 paddocks, each 1.7 acre in size, was available. Each treatment group had access to 1 paddock at a time and was rotated at approximately 3-day intervals. In the feedlot, steers were provided an 82% concentrate diet containing whole-shelled corn, ground alfalfa hay, and a protein, vitamin and mineral supplement containing ionophore and molasses. As pens of cattle reached about 1150 lb. average live weight, they were processed and carcass traits were evaluated. Pasture daily gains were highest for cattle on pasture for the longest duration ($P < .03$), and overall daily gains were highest for drylot cattle ($P < .01$) and decreased with increased time spent on pasture. Although differences among treatments existed in numerical scores for yield and quality grades ($P < .05$ and $P < .03$, respectively), all treatments provided average yield grade scores of 2 and quality grades of low Choice or higher. Use of four production costs and pricing scenarios revealed that fall-born calves placed on pasture for varying lengths of time were the most profitable ($P < .04$) among the treatments. Furthermore, employing a 5% price sensitivity analysis, indicated that fed-cattle selling price had great impact on profit potential and was followed in importance by feeder purchase price and corn grain price. Overall, these findings should provide significant production alternatives for some segments of the cattle feeding industry and also lend substantial credence to the concept of sustainable agriculture.

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Summary

A 3-year study, using 84 fall-born and 28 spring-born calves of similar genotypes, was conducted to integrate pasturing systems with drylot feeding systems. Calves were started on test following weaning in May and October. Seven treatments were imposed: 1) fall-born calves directly into feedlot; 2 and 3) fall-born calves put on pasture with or without ionophore and moved to the feedlot at the end of July; 4 and 5) fall-born calves put on pasture with or without ionophore and moved to the feedlot at the end of October; 6 and 7) spring-born calves put on pasture with or without ionophore and moved to the feedlot at the end of October. A bromegrass pasture consisting of 16 paddocks, each 1.7 acre in size, was available. Each treatment group had access to 1 paddock at a time and was rotated at approximately 3-day intervals. In the feedlot, steers were provided an 82% concentrate diet containing whole-shelled corn, ground alfalfa hay, and a protein, vitamin and mineral supplement containing ionophore and molasses. As pens of cattle reached about 1150 lb. average live weight, they were processed and carcass traits were evaluated. Pasture daily gains were highest for cattle on pasture for the longest duration ($P < .03$), and overall daily gains were highest for drylot cattle ($P < .01$) and decreased with increased time spent on pasture. Although differences among treatments existed in numerical scores for yield and quality grades ($P < .05$ and $P < .03$, respectively), all treatments provided average yield grade scores of 2 and quality grades of low Choice or higher. Use of four production costs and pricing scenarios revealed that fall-born calves placed on pasture for varying lengths of time were the most profitable ($P < .04$) among the treatments. Furthermore, employing a 5% price sensitivity analysis, indicated that fed-cattle selling price had great impact on profit potential and was followed in importance by feeder purchase price and corn grain price. Overall, these findings should provide significant production alternatives for some segments of the cattle feeding industry and also lend substantial credence to the concept of sustainable agriculture.

Introduction

Highly erodible arable land is best suited for production of permanent stands of pasture. In areas where such land is interdispersed among highly productive land suitable for row crop production, it becomes a challenge to effectively maintain and sustain such land without yielding to the temptation to include it in row crop production. One possibility is to develop a cattle feeding system in which cattle use the pasture during their initial growing phase and then use the grain provided by the land suitable for row crop production during the latter stages of their finishing period. This experiment was designed to investigate how extended grazing periods might impact rate and efficiency of growth and development of feeder cattle prior to being finished in drylot and to determine the impact of extended grazing periods on carcass composition and economic returns.

Materials and Methods

A 3-year study was conducted at the Western Iowa Research and Demonstration Farm at Castana, Iowa following establishment of a smooth bromegrass pasturing system. To reduce genetic variation and backgrounding differences among steer calves, all calves were purchased from the Stuart Ranch at Caddo, Oklahoma. The primarily crossbred calves were derived from the Hereford and Angus breeds and delivered in the fall or spring following weaning at about 7 months of age. Prior to this, they had received their calfhood vaccinations and had been castrated. Each spring, 84 fall-born calves were used in the initial phase of the study. Following 12 hours of transportation, they arrived at the research farm on April 17, 15, and 15 in 1996, 1997 and 1998, respectively. On arrival, the calves were provided alfalfa hay until placed on test on May 7, 8, and 5 of the respective years. Chlortetracycline was top dressed on the hay each day at the rate of .25 lb. per animal of 4 grams/lb. AS-700® crumbles as a health precaution. Amprolium® was added to the water source for 2 weeks after arrival to aid in controlling coccidiosis. Prior to going on test, the calves were identified with an ear tag, implanted with Compudose®, and injected with Ivomec® plus Flukocide®. Each year during the first week of June, the cattle were ear tagged with Saber™ insecticide ear tags, and this was repeated during the first week of August. They were randomly separated into 12 groups of 7 animals each, weighing on average 367, 350 and 432 lbs. in the three years, respectively.

Five treatments, involving four grazing and one drylot treatment with the latter serving as the control treatment, were assigned at random. Supplement blocks with or without monensin were provided to pasture treatments. Treatment one cattle (JI) received ionophore and were stocked on smooth bromegrass pasture on May 7, 8, and 5 for each of the years, respectively, and then were moved to the feedlot on July 30, 29, and 28 to be fed the finishing diet during the remainder of the trial. Treatment two involved 14 steers (JNI) not receiving ionophore, which were stocked on pasture for the same inclusive dates as in treatment one. Fourteen cattle in each of the treatments three (OI) and four (ONI) were stocked on pasture at the same time as treatments one and two, and were provided supplement blocks with or without ionophore. The cattle in treatments three and four remained on pasture until October 22, 21, and 16 of the respective years and then were moved to drylot for finishing. A fifth treatment, the control group (FEEDLOT), consisted of 28 steers (7 head per pen) which were placed directly into drylot after acclimation and gradually adapted to an 82% concentrate diet containing whole shelled corn, ground alfalfa hay, and a natural protein, vitamin, and mineral supplement containing ionophore and molasses. As cattle moved from pasture to drylot, they were fed the same feed formulation as the control group. When animals reached approximately 800 lbs. in the feedlot, the all-natural protein supplement was changed to a urea-based 40% crude protein, vitamin, and mineral premix. Approximately 100 days before slaughter, cattle were reimplanted with Revalor®.

On September 17, 15, and 15 of the three years respectively, 28 spring-born calves were delivered and processed in the same manner as described for the fall-born calves. These calves (14 head) constituted a sixth treatment (SI) and received ionophore and were placed on pasture on October 1, September 30, and September 29 during the three years respectively, and then were moved to drylot for finishing on October 22, 21, and 16. A seventh treatment (SNI) involved 14 calves placed on pasture and handled in the same manner as calves in treatment six; however, they did not receive ionophore.

The smooth bromegrass pasture consisted of 16 paddocks, each 1.7 acres in size. Each grazing treatment of 14 calves had access to 1 paddock at a time. Cattle were rotated among paddocks on the basis of forage availability. Since early in the summer the calves were unable to consume enough forage to match its growth in all paddocks, they were rotated to a new paddock every 3-4 days. Later in the growing season, when grass growth showed, cattle were rotated about every 2 days. Nitrogen fertilizer was applied in two applications, once in late April at the rate of 100 lbs./acre and again in mid-August at the rate of 80 lb./acre.

The feedlot facility consisted of pens with concrete floors (87 ft. x 14 ft.) with 23 ft. of overhead shelter at the north end of each lot. Steers were provided feed in fence-line concrete bunks, providing 2 ft. of feedbunk space per steer on the south side of the lot. One automatic waterer was shared between every 2 pens.

Daily feed allotment was determined prior to the morning feeding. Cattle were fed *ad libitum*, and feed intake levels were maintained such that feed was always available in the feedbunks. Feed levels were increased when the bunks in approximately one-half of the pens in a treatment were completely empty at 7 a.m. prior to the morning feeding.

Daily dry matter intake (DMI) was determined by recording the daily amount of air-dry feed fed to each pen of steers and converting the amount to a dry matter (DM) basis. Feed samples were collected twice weekly and DM was determined.

Every 28 days steers were individually weighed and average daily gains were calculated. Feed conversion was calculated on the basis of total DM consumed and total gains by a pen of cattle.

Cattle were processed into beef at IBP in Denison, Iowa when a pen of cattle averaged approximately 1150 lbs. They were delivered to the plant at about 5 p.m. and allowed access to water until slaughtered the next morning at about 7 a.m. Liver abscesses were noted following slaughter, and hot carcass weights were recorded. Following a 24-hour chill, backfat and the ribeye area were measured over the 12th rib on the left half of each carcass. Carcass quality grades, yield grades, and percent of kidney, pelvic, and heart fat were called by USDA Meat Grading Service personnel.

A budget worksheet was prepared using the “Finishing Yearling Steers” budget worksheet in Livestock Enterprise Budgets (Iowa State University). Values used in the calculations were from the corresponding year of the experiment. Feeder-calf price was determined by dividing total money paid by the total weight of the steers when placed on test and multiplying this value by the average weight of the steers. A 10% interest rate was used, and it was further assumed that all money for purchasing cattle was borrowed. Days on feed were calculated from the day cattle went on test until they were weighed off test and transported to the packing plant. Prices received each month by Iowa producers for corn and alfalfa were used in calculating corn and alfalfa costs. Natural and urea-based protein supplement prices were obtained from the Livestock Enterprise Budgets for Iowa. Molasses prices were obtained from *Feedstuffs* magazine, using the average of prices quoted for Kansas City, Missouri and Minneapolis, Minnesota. Improved pasture prices per acre were derived from the Livestock Enterprise Budgets for Iowa, and pasture cost for treatments was calculated by considering the time cattle spent on pasture. Interest on feed and other variable costs was determined to be 10% and was calculated as interest on these variables for half the days on feed. Total variable costs were the sum of the costs of the feeder animal, feed, veterinary and health care, machinery and equipment, marketing and miscellaneous expenses, and interest on feed and other costs. Fixed costs were associated with housing, machinery, and equipment. Total revenue for each individual animal was determined by multiplying its hot carcass weight in pounds by the price received each year for the carcass grades it represented. Income over variable cost was determined by subtracting total variable cost from total revenue. Income over all costs, or profit, was obtained by subtracting fixed and variable costs from income. Break-even selling price for all costs was obtained by dividing the sum of the fixed and variable costs by the actual sale weight. For price sensitivity analysis, the effect of a 5% increase or decrease in feeder price, carcass price, and corn price was determined to observe their effects on profitability and break-even price.

For statistical analysis, the experimental unit was a pen of cattle consisting of 7 steers. There were 7 treatments, 6 with two replications and 1 with four replications. The analysis took the form of a one-way analysis of variance with 6 degrees of freedom for treatments and 9 degrees of freedom within treatments or experimental error. The data were analyzed using the General Linear Model procedure of SAS, and contrast statements were used to compare treatments.

Results and Discussion

As a result of increased body size (Table 1), the longer cattle remained on pasture, the higher their daily gains ($P < .03$). In addition, cattle receiving ionophore on pasture tended to gain more rapidly. In contrast, daily gains in drylot favored the cattle spending less time on pasture ($P < .03$), with a tendency for the nonionophore pasture fed cattle gaining slightly faster. Overall daily gains favored ($P < .01$) the FEEDLOT cattle (2.89 lb.), followed, in order, by cattle spending respectively lesser amounts of time on pasture (SI and SNI = 2.70 lbs., JI and JNI = 2.50 lbs., OI and ONI = 2.12 lbs.). As might be expected, daily DMI in drylot was lowest ($P < .01$) for FEEDLOT cattle (17.91 lbs.), followed by SI and SNI cattle (18.31 lbs.), and JI and JNI cattle (18.59 lbs.), and OI and ONI cattle (18.58 lbs.), with the latter two pairs of treatments not differing from each other. Feed conversion in drylot was similar among treatments except for OI and ONI cattle ($P < .02$), which required more feed per pound of gain as a result of their larger frame size and heavier weight going into drylot.

Table 1. Performance of cattle both in feedlot and on pasture.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI
Pasture gain, lb/day	--	1.43^{ac}	1.23^{c}	1.53^{a}	1.35^{ac}	0.63^{b}	0.41^{b}
Feedlot gain, lb/day	2.89^{ab}	2.90^{ab}	2.96^{a}	2.66^{c}	2.76^{bc}	2.90^{ab}	2.93^{a}
Overall gain, lb/day	2.89^{d}	2.51^{e}	2.49^{e}	2.14^{f}	2.11^{f}	2.70^{g}	2.70^{g}
DMI (in feedlot), lb/day	17.91^{d}	18.62^{e}	18.56^{e}	18.64^{e}	18.52^{e}	18.33^{f}	18.29^{f}
FE (in feedlot), lb feed/lb gain	6.26^{h}	6.47^{h}	6.38^{h}	7.20^{i}	6.89^{i}	6.44^{h}	6.31^{h}

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.
^{abc}Means with different superscripts in the same row are significantly different ($P<0.03$).
^{defg}Means with different superscripts in the same row are significantly different ($P<0.01$).
^{hi}Means with different superscripts in the same row are significantly different ($P<0.02$).

Average final weight for all cattle in all treatments was 1166 lbs. and did not differ among treatments (Table 2). Although dressing percentage differed ($P < .05$) among treatments, it was difficult to establish any consistent pattern. Average ribeye area did not differ among treatments; however, backfat was highest ($P < .05$) for FEEDLOT cattle and decreased with increasing time spent on pasture for fall-born calves. Generally, KPH fat was highest ($P < .04$) for JI and JNI cattle and lowest for OI and ONI cattle, resulting in higher ($P < .05$) yield grade scores for FEEDLOT, JI, and JNI cattle. However, all cattle in all treatments averaged a yield-grade score of two, thus indicating very acceptable lean carcasses across all treatments. While FEEDLOT, JI, and JNI cattle averaged higher ($P < .03$) numerical quality grade scores, average quality grade across all treatments was low Choice or higher. This indicates that steer calves fed on pasture for varying periods of time before being finished in drylot produced carcasses comparable to cattle finished entirely in drylot.

Table 2. Carcass characteristics of cattle.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI
Final weight, lbs	1179	1170	1178	1161	1148	1168	1160
Dressing %	61.1^{a}	61.8^{bc}	62.2^{b}	61.3^{ac}	61.2^{ac}	61.3^{ac}	61.8^{b}
Ribeye area, inch^2	12.55	12.57	12.60	12.30	12.48	12.70	12.67
Back fat, inch	0.55^{a}	0.54^{a}	0.49^{ac}	0.44^{bc}	0.42^{c}	0.50^{ab}	0.45^{bc}
KPH, %	2.28^{d}	2.49^{ef}	2.55^{f}	2.14^{d}	2.19^{d}	2.29^{de}	2.68^{f}
Yield grade	2.68^{a}	2.62^{a}	2.63^{a}	2.35^{b}	2.29^{b}	2.34^{b}	2.39^{b}
Quality grade**	7.73^{g}	7.43^{gi}	7.47^{gi}	6.98^{h}	7.19^{hi}	6.81^{h}	6.97^{h}

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.
**Average Choice = 8; low Choice = 7; high Select = 6.
^{abc}Means with different superscripts in the same row are significantly different (P<0.05).
^{def}Means with different superscripts in the same row are significantly different (P<0.04).
^{ghi}Means with different superscripts in the same row are significantly different (P<0.03).

Production costs and revenue for steers in each of the 7 treatments are presented in Table 3. In this first scenario, actual costs of production and prices received were used to determine profit or loss for each treatment. Total cost of production ($/head) was highest (P < .05) for FEEDLOT, SI, and SNI cattle. This resulted primarily because of heavier weaning weights (500 vs. 383 lbs.) for spring born calves and higher (P < .0001) total feed costs for FEEDLOT cattle, which, in turn, was influenced by higher corn costs (P < .0001). Even though FEEDLOT cattle had average Choice versus low Choice quality grades for all other treatments, their carcass price ($/cwt.) was the lowest (P < .02) among treatments. This resulted because they were sold around late January and early February, when fed cattle prices are traditionally lower than in the following months of March, April, and May, during which the steers in the remaining treatments were marketed. Total revenue thus was highest (P < .06) for JI, JNI, SI, and SNI cattle; however, due to their high total costs of production, SI and SNI cattle actually lost money. Therefore, the treatment groups showing the most profit potential (P < .04) were the JI, JNI, OI, and ONI fed cattle or the fall-born cattle fed on pasture for part or all of the summer months.

Table 3. Economic variables for treatments, 1st scenario.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, $/cwt	94.58	94.58	94.58	94.58	94.58	84.30	84.30	--
Purchase price, $/head	367.05^{a}	366.77^{a}	367.42^{a}	367.73^{a}	366.51^{a}	418.97^{b}	418.39^{b}	0.0001
Hot carcass weight, lbs	720.96^{ab}	723.05^{ab}	731.97^{a}	711.17^{ab}	701.17^{b}	715.57^{ab}	717.24^{ab}	0.03
Carcass price, $/cwt	100.42^{a}	105.26^{b}	104.91^{b}	104.07^{bc}	103.30^{c}	104.83^{b}	104.74^{b}	0.02
Total revenue, $/head	715.89^{a}	753.48^{bc}	760.36^{b}	732.65^{ac}	718.41^{ad}	742.92^{bcd}	744.09^{bcd}	0.06
Total feed cost, $/head	250.33^{a}	237.93^{b}	239.59^{b}	216.24^{c}	216.17^{c}	193.30^{d}	194.82^{d}	0.0001
Corn cost, $/head	163.89^{a}	139.13^{b}	140.89^{b}	111.29^{c}	111.35^{c}	122.56^{d}	123.99^{d}	0.0001
Interest, $	39.41^{a}	41.45^{b}	41.57^{b}	43.62^{c}	43.36^{c}	35.90^{d}	35.82^{d}	0.02
Total variable cost, $/head	741.86^{b}	726.70^{bc}	728.26^{bc}	710.32^{ac}	704.16^{a}	735.25^{b}	735.28^{b}	0.06
Total cost, $/head	762.86^{a}	742.70^{bc}	744.26^{ab}	726.32^{bc}	720.16^{c}	756.25^{a}	756.28^{a}	0.054
Cost of gain, $/cwt	49.93^{a}	47.73^{b}	47.68^{b}	46.34^{b}	46.66^{b}	51.24^{ac}	51.53^{c}	0.03
Break-even price, $/cwt hot carcass	105.77^{a}	102.71^{b}	102.11^{b}	102.32^{b}	103.29^{bc}	105.86^{ac}	105.72^{ac}	0.04
Profit, $/head	-46.08^{a}	11.53^{b}	16.86^{b}	6.96^{bc}	-1.13^{bc}	-12.62^{c}	-11.48^{c}	0.04

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.
^{abcd}Means with different superscripts in the same row are significantly different with respect to their P–values.

Since the first scenario used actual costs of production and prices received, a second scenario was developed using average prices for feed components, feeder cattle and fed cattle over a 10-year period. Because the cattle cycle historically involves a 10-year period, this was an attempt to employ average feed costs and feeder cattle and fed cattle prices for the set of feeding treatments involved in this study. As indicated in Table 4, total cost of production ($/head) was highest (P < .0001) for SI and SNI cattle and all other treatments were lower and similar. This higher cost of production for spring-born calves occurred in spite of their having the lowest (P < .0001) total feed costs; however, it is reflective of their higher purchase price. As total revenue per head was similar for all treatments, profit per head was lowest (P < .0001) for spring-born calves, with as much as a $72.79 spread in profit between JNI and SNI steers.

Table 4. Economic variables for treatments, 2nd scenario.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, $/cwt	98.59	98.59	98.59	98.59	98.59	90.29	90.29	--
Purchase price, $/head	377.75[a]	377.46[a]	378.16[a]	378.51[a]	377.22[a]	452.41[b]	451.77[b]	0.0001
Fed cattle price, $/cwt	69.46	69.46	69.46	69.46	69.46	69.46	69.46	--
Hot carcass weight, lbs	720.96[ab]	723.05[ab]	731.97[a]	711.11[ab]	701.17[b]	715.57[ab]	717.24[ab]	0.03
Carcass price, $/cwt	113.75[a]	112.54[bc]	111.88[b]	113.50[ac]	113.64[ac]	113.37[a]	112.43[bc]	0.03
Total revenue, $/head	811.01	804.88	809.87	798.32	792.67	802.92	797.92	NS
Total feed cost, $/head	223.72[a]	209.82[b]	211.29[b]	211.75[b]	211.40[b]	194.89[c]	195.98[c]	0.0001
Corn cost, $/head	149.40[a]	131.74[bd]	133.28[b]	112.86[c]	112.64[c]	127.00[d]	128.04[bd]	0.04
Interest, $	39.34[a]	41.88[b]	42.00[b]	44.95[c]	44.70[c]	38.10[d]	38.01[d]	0.05
Total variable cost, $/head	726.95[a]	718.10[a]	719.51[a]	725.01[a]	718.70[a]	774.73[b]	774.31[b]	0.0001
Total cost, $/head	747.95[a]	734.10[a]	735.51[a]	741.01[a]	734.70[a]	795.73[b]	795.31[b]	0.0001
Cost of gain, $/cwt	46.81[a]	45.25[b]	45.21[b]	46.75[ab]	47.04[a]	52.00[c]	52.31[c]	0.03
Break-even price, $/cwt live weight	63.45[a]	62.56[a]	62.44[a]	63.63[a]	63.85[a]	68.17[b]	68.40[b]	0.0001
Break-even price, $/cwt hot carcass	103.83[a]	101.42[b]	100.75[b]	104.28[a]	105.23[a]	111.38[c]	111.05[c]	0.05
Profit, $/head	63.94[a]	72.53[a]	76.11[a]	58.93[a]	57.89[a]	7.89[b]	3.32[b]	0.0001

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.

[abcd]Means with different superscripts in the same row are significantly different with respect to their P–values.

For the third scenario (Table 5), the same criteria as used in the second option were assumed, except prices for feed components were derived from the corresponding months. In this case, even though total feed costs were lowest (P < .002) for spring-born calves and with a slightly greater margin than in the second scenario, total production costs were still highest (P < .055) for spring-born calves relative to the other treatments. While all treatment groups exhibited a profit, the SI and SNI steers were the least (P < .0001) profitable, although the profit margin difference between the spring-born and fall-born calves was less than in scenario two ($53.09 vs. $60.28, respectively). In reality, using the corresponding month feed prices may be a bit more accurate in determining profit potential.

A fourth scenario was developed in which prices over a 10-year period for feed components were again derived from corresponding months of usage; but in addition, corresponding month prices for feeder and fed cattle were used for the month in which the steers were purchased and sold. Table 6 illustrates that, although spring-born calves had higher (P < .0001) purchase costs due to their greater purchase weights, the total purchase cost spread was not as large as in the three previous scenarios. Consequently, total production costs per head were similar for spring-born and fall-born calves except for ONI steers, which had lower (P < .06) total production costs than SI and SNI steers. Since fall-born steers generally generated higher (P < .04) total revenue per head than spring-born calves, fall-born steers provided greater profits. In addition, pasture fed JI and JNI cattle provided the greatest (P < .01) profit, followed in order by OI and ONI cattle and then FEEDLOT cattle. This latter finding tends to corroborate the findings in scenario one, in which actual costs of production and prices received revealed that JI and JNI steers offered the greatest profit potential, followed by OI and ONI steers. In scenario four, FEEDLOT steers exceeded SI and SNI steers in profit potential, which contradicted the findings in scenario one.

Table 5. Economic variables for treatments, 3rd scenario.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, $/cwt	98.59	98.59	98.59	98.59	98.59	90.29	90.29	--
Purchase price, $/head	377.75 [a]	377.46 [a]	378.16 [a]	378.51 [a]	377.22 [a]	452.41 [b]	451.77 [b]	0.0001
Fed cattle price, $/cwt	69.46	69.46	69.46	69.46	69.46	69.46	69.46	--
Hot carcass weight, lbs	720.96 [ab]	723.05 [ab]	731.97 [a]	711.11 [ab]	701.17 [b]	715.57 [ab]	717.24 [ab]	0.03
Carcass price, $/cwt	113.75 [a]	112.54 [bc]	111.88 [b]	113.50 [ac]	113.64 [ac]	113.37 [a]	112.43 [bc]	0.03
Total revenue, $/head	811.01	804.88	809.87	798.32	792.67	802.92	797.92	NS
Total feed cost, $/head	228.89 [a]	215.16 [b]	216.68 [b]	205.47 [c]	205.31 [c]	188.64 [d]	189.76 [d]	0.002
Corn cost, $/head	153.24 [a]	135.53 [b]	137.10 [b]	112.57 [c]	112.37 [c]	125.76 [d]	126.82 [d]	0.005
Interest, $	39.53 [a]	42.05 [b]	42.18 [b]	44.79 [c]	44.53 [c]	37.91 [d]	37.83 [d]	0.02
Total variable cost, $/head	732.31 [a]	723.62 [ab]	725.08 [ab]	718.56 [ab]	712.45 [b]	768.29 [c]	767.88 [c]	0.053
Total cost, $/head	753.31 [a]	739.62 [ab]	741.08 [ab]	734.56 [b]	728.45 [b]	789.29 [c]	788.88 [c]	0.055
Cost of gain, $/cwt	47.49 [a]	45.95 [b]	45.92 [b]	45.95 [b]	46.27 [a]	51.06 [c]	51.33 [c]	0.03
Break-even price, $/cwt live weight	63.90 [a]	63.08 [a]	63.04 [a]	63.26 [a]	63.53 [a]	67.73 [b]	68.04 [b]	0.0001
Break-even price, $/cwt hot carcass	104.57 [a]	102.18 [bd]	101.51 [b]	103.38 [ab]	104.35 [ad]	110.47 [c]	110.13 [c]	0.05
Profit, $/head	58.58 [a]	67.02 [a]	70.55 [a]	65.39 [a]	64.12 [a]	14.34 [b]	9.75 [b]	0.0001

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.

[abcd]Means with different superscripts in the same row are significantly different with respect to their P–values.

Table 6. Economic variables for treatments, 4th scenario.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, $/cwt	103.92	103.92	103.92	103.92	103.92	87.21	87.21	--
Purchase price, $/head	397.08 [a]	397.87 [a]	398.61 [a]	398.98 [a]	396.47 [a]	436.98 [b]	436.36 [b]	0.0001
Fed cattle price, $/cwt	70.80	71.94	71.94	71.54	71.54	68.22	68.22	--
Hot carcass weight, lbs	720.96 [ab]	723.05 [ab]	731.97 [a]	711.11 [ab]	701.17 [b]	715.57 [ab]	717.24 [ab]	0.03
Carcass price, $/cwt	115.94 [a]	116.55 [ac]	115.88 [a]	116.89 [a]	117.39 [c]	111.34 [b]	110.43 [b]	0.01
Total revenue, $/head	826.65 [a]	833.62 [a]	838.79 [a]	822.23 [a]	813.32 [ac]	788.58 [bc]	783.68 [bc]	0.04
Total feed cost, $/head	228.89 [a]	215.16 [b]	216.68 [b]	205.47 [c]	205.31 [c]	188.64 [d]	189.76 [d]	0.002
Corn cost, $/head	153.24 [a]	135.53 [b]	137.10 [b]	112.57 [c]	112.37 [c]	125.76 [d]	126.82 [d]	0.005
Interest, $	41.07 [a]	43.84 [b]	43.97 [b]	46.82 [c]	46.55 [c]	36.88 [d]	36.80 [d]	0.001
Total variable cost, $/head	754.21	745.82	747.36	741.06	734.81	751.81	751.44	NS
Total cost, $/head	775.21 [a]	761.82 [ab]	763.36 [ab]	757.06 [ab]	750.81 [b]	772.81 [a]	772.44 [a]	0.06
Cost of gain, $/cwt	47.68 [a]	46.18 [b]	46.15 [b]	46.21 [b]	46.54 [ab]	50.90 [c]	51.17 [c]	0.04
Break-even price, $/cwt live weight	65.76 [ab]	64.98 [a]	64.94 [a]	65.20 [ab]	65.49 [ab]	66.31 [ab]	66.62 [b]	0.045
Break-even price, $/cwt hot carcass	107.61 [ab]	105.25 [ac]	104.57 [c]	106.54 [ab]	107.56 [ab]	108.17 [b]	107.84 [ab]	0.05
Profit, $/head	52.33 [a]	73.56 [b]	77.18 [b]	66.80 [ab]	64.15 [ab]	16.48 [c]	11.95 [c]	0.01

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.

[abcd]Means with different superscripts in the same row are significantly different with respect to their P–values.

As noted in the four economic scenarios presented, the three main factors affecting cattle feeding profitability are feed costs, feeder cattle purchase price, and fed cattle selling price. The impact that each of these factors has upon economic returns is illustrated by taking actual costs of production and prices received in scenario one and calculating a 5% increase or decrease in corn price, feeder cattle cost, and fed cattle price received, then determining their impact upon profitability.

A 5% increase or decrease in corn price (Tables 7 and 8) reveals a \$5.57–\$8.20 gain or loss in profit per steer, depending upon treatment. In the case of ONI steers, a 5% decrease in corn price was sufficient to move them into a profit, rather than a loss, position. When a 5% increase or decrease in feeder price occurred (Tables 9 and 10), a \$17.42–\$24.03 shift in profit or loss potential occurred. A 5% decrease in feeder price resulted in all treatments showing a profit except FEEDLOT cattle. When evaluating a 5% increase or decrease in fed cattle price, a \$35.01–\$38.01 shift in profit or loss potential occurred. A 5% increase in fed cattle price moved all treatments except FEEDLOT cattle into a profit situation, and a 5% decrease moved all treatments into a loss situation. Thus, under the

Table 7. Economic variables when corn price increases 5 %.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, \$/cwt	94.58	94.58	94.58	94.58	94.58	84.30	84.30	--
Purchase price, \$/head	367.05 [a]	366.77 [a]	367.42 [a]	367.73 [a]	366.51 [a]	418.97 [b]	418.39 [b]	0.0001
Hot carcass weight, lbs	720.96 [ab]	723.05 [ab]	731.97 [a]	711.17 [ab]	701.17 [b]	715.57 [ab]	717.24 [ab]	0.03
Carcass price, \$/cwt	100.42 [a]	105.26 [b]	104.91 [b]	104.07 [bc]	103.30 [c]	104.83 [b]	104.74 [b]	0.02
Total revenue, \$/head	715.89 [a]	753.48 [bc]	760.36 [b]	732.65 [ac]	718.41 [ad]	742.92 [bcd]	744.09 [bcd]	0.06
Total feed cost, \$/head	258.53 [a]	236.49 [b]	238.28 [b]	214.74 [c]	214.68 [c]	198.70 [d]	200.29 [d]	0.0001
Corn cost, \$/head	172.08 [a]	146.09 [b]	147.93 [b]	116.85 [c]	116.92 [c]	128.68 [d]	130.19 [d]	0.0005
Interest, \$	39.41 [a]	41.45 [b]	41.57 [b]	43.62 [c]	43.36 [c]	35.90 [d]	35.81 [d]	0.02
Total variable cost, \$/head	750.05 [a]	733.66 [ab]	735.30 [ab]	715.88 [bc]	709.73 [c]	741.38 [a]	741.48 [a]	0.02
Total cost, \$/head	770.17 [a]	748.90 [b]	750.55 [ab]	731.25 [bc]	725.10 [c]	761.67 [ab]	761.77 [ab]	0.05
Cost of gain, \$/cwt	50.96 [a]	48.61 [b]	48.57 [b]	47.06 [b]	47.38 [b]	52.17 [c]	52.47 [c]	0.04
Break-even price, \$/cwt hot carcass	106.91 [a]	103.67 [b]	103.07 [b]	103.10 [b]	104.08 [bc]	106.71 [ac]	106.58 [ac]	0.04
Profit, \$/head	-54.28 [a]	4.58 [b]	9.81 [b]	1.39 [bc]	-6.70 [bc]	-18.75 [c]	-17.68 [c]	0.05

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.

[abcd]Means with different superscripts in the same row are significantly different with respect to their P–values.

Table 8. Economic variables when corn price decreases 5 %.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, $/cwt	94.58	94.58	94.58	94.58	94.58	84.30	84.30	--
Purchase price, $/head	367.05[a]	366.77[a]	367.42[a]	367.73[a]	366.51[a]	418.97[b]	418.39[b]	0.0001
Hot carcass weight, lbs	720.96[ab]	723.05[ab]	731.97[a]	711.17[ab]	701.17[b]	715.57[ab]	717.24[ab]	0.03
Carcass price, $/cwt	100.42[a]	105.26[b]	104.91[b]	104.07[bc]	103.30[c]	104.83[b]	104.74[b]	0.02
Total revenue, $/head	715.89[a]	753.48[bc]	760.36[b]	732.65[ac]	718.41[ad]	742.92[bcd]	744.09[bcd]	0.06
Total feed cost, $/head	242.14[a]	222.57[b]	224.19[b]	203.61[c]	203.54[c]	186.44[d]	187.89[d]	0.0001
Corn cost, $/head	155.69[a]	132.18[b]	133.84[b]	105.72[c]	105.78[c]	116.43[d]	117.79[d]	0.0005
Interest, $	39.41[a]	41.45[b]	41.56[b]	43.62[c]	43.36[c]	35.89[d]	35.82[d]	0.02
Total variable cost, $/head	733.66[a]	719.75[ab]	721.22[a]	704.75[b]	698.60[b]	729.12[a]	729.08[a]	0.06
Total cost, $/head	753.78[a]	734.99[ab]	736.46[a]	720.12[b]	713.97[b]	749.42[a]	749.37[a]	0.06
Cost of gain, $/cwt	48.91[a]	46.85[b]	46.80[b]	45.63[b]	45.93[b]	50.32[c]	50.58[c]	0.05
Break-even price, $/cwt hot carcass	104.63[a]	101.74[b]	101.15[b]	101.54[b]	102.49[ab]	105.00[a]	104.85[a]	0.03
Profit, $/head	-37.89[a]	18.49[b]	23.90[b]	12.52[bc]	4.44[bc]	-6.49[c]	-5.28[c]	0.04

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.

[abcd]Means with different superscripts in the same row are significantly different with respect to their P–values.

Table 9. Economic variables when feeder price increases 5 %.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, $/cwt	99.31	99.31	99.31	99.31	99.31	88.52	88.52	--
Purchase price, $/head	385.28[a]	385.11[a]	385.79[a]	386.11[a]	384.84[a]	440.33[b]	439.31[b]	0.0001
Hot carcass weight, lbs	720.96[ab]	723.05[ab]	731.97[a]	711.17[ab]	701.17[b]	715.57[ab]	717.24[ab]	0.03
Carcass price, $/cwt	100.42[a]	105.26[b]	104.91[b]	104.07[bc]	103.30[c]	104.83[b]	104.74[b]	0.02
Total revenue, $/head	715.89[a]	753.48[bc]	760.36[b]	732.65[ac]	718.41[ad]	742.92[bcd]	744.09[bcd]	0.06
Total feed cost, $/head	250.33[a]	229.53[b]	231.23[b]	209.18[c]	209.11[c]	192.57[d]	194.09[d]	0.0001
Corn cost, $/head	163.89[a]	139.13[b]	140.89[b]	111.29[c]	111.35[c]	122.56[d]	123.99[d]	0.0001
Interest, $	40.79[a]	42.96[b]	43.21[b]	45.97[c]	45.19[c]	37.34[d]	37.58[d]	0.03
Total variable cost, $/head	761.54[a]	745.26[ab]	748.46[ab]	737.43[bc]	724.10[b]	758.15[ac]	763.99[ac]	0.03
Total cost, $/head	781.65[a]	760.50[bc]	763.71[ab]	752.80[b]	739.47[b]	778.44[ac]	784.28[ac]	0.06
Cost of gain, $/cwt	50.11[a]	47.81[b]	47.86[b]	46.35[b]	46.99[b]	51.52[a]	51.76[ac]	0.04
Break-even price, $/cwt hot carcass	108.48[a]	105.07[bc]	104.99[bc]	104.72[bc]	106.37[ac]	109.01[a]	108.90[a]	0.02
Profit, $/head	-65.76[a]	-5.89[b]	-4.07[b]	-12.07[b]	-23.33[bc]	-35.06[c]	-35.51[c]	0.06

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.

[abcd]Means with different superscripts in the same row are significantly different with respect to their P–values.

Table 10. Economic variables when feeder price decreases 5 %.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, $/cwt	89.85	89.85	89.85	89.85	89.85	80.09	80.09	--
Purchase price, $/head	348.59 [a]	348.44 [a]	349.05 [a]	349.34 [a]	348.19 [a]	398.39 [b]	397.47 [b]	0.0001
Hot carcass weight, lbs	720.96 [ab]	723.05 [ab]	731.97 [a]	711.17 [ab]	701.17 [b]	715.57 [ab]	717.24 [ab]	0.03
Carcass price, $/cwt	100.42 [a]	105.26 [b]	104.91 [b]	104.07 [bc]	103.30 [c]	104.83 [b]	104.74 [b]	0.02
Total revenue, $/head	715.89 [a]	753.48 [bc]	760.36 [b]	732.65 [ac]	718.41 [ad]	742.92 [bcd]	744.09 [bcd]	0.06
Total feed cost, $/head	250.33 [a]	229.53 [b]	231.23 [b]	209.18 [c]	209.11 [c]	192.57 [d]	194.09 [d]	0.0001
Corn cost, $/head	163.89 [a]	139.13 [b]	140.89 [b]	111.29 [c]	111.35 [c]	122.56 [d]	123.99 [d]	0.0001
Interest, $	38.03 [a]	39.68 [b]	39.97 [b]	42.08 [c]	41.93 [c]	34.52 [d]	34.47 [d]	0.01
Total variable cost, $/head	722.18 [a]	704.59 [ab]	708.33 [ab]	693.95 [bc]	688.18 [b]	713.35 [ac]	714.32 [ac]	0.04
Total cost, $/head	742.30 [a]	719.84 [bc]	723.58 [ab]	709.32 [b]	703.56 [b]	733.64 [ac]	734.61 [ac]	0.04
Cost of gain, $/cwt	49.76 [a]	47.34 [b]	47.45 [b]	46.01 [b]	46.50 [b]	51.10 [ac]	51.16 [c]	0.06
Breakeven price, $/cwt hot carcass	103.06 [a]	99.70 [b]	99.34 [b]	99.24 [b]	100.39 [bc]	102.74 [ac]	102.46 [ac]	0.04
Profit, $/head	-26.41 [a]	33.31 [b]	36.55 [b]	28.28 [bc]	20.20 [bc]	9.74 [c]	11.14 [c]	0.04

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.

[abcd]Means with different superscripts in the same row are significantly different with respect to their P–values.

Table 11. Economic variables when carcass price increases 5 %.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, $/cwt	94.58	94.58	94.58	94.58	94.58	84.30	84.30	--
Purchase price, $/head	367.05 [a]	366.77 [a]	367.42 [a]	367.73 [a]	366.51 [a]	418.97 [b]	418.39 [b]	0.0001
Hot carcass weight, lbs	720.96 [ab]	723.05 [ab]	731.97 [a]	711.17 [ab]	701.17 [b]	715.57 [ab]	717.24 [ab]	0.03
Carcass price, $/cwt	105.44 [a]	110.53 [b]	110.15 [b]	109.28 [bc]	108.46 [c]	110.08 [b]	109.98 [b]	0.024
Total revenue, $/head	751.69 [a]	791.15 [b]	798.38 [b]	769.28 [ab]	753.50 [ac]	780.07 [bc]	781.30 [bc]	0.04
Total feed cost, $/head	250.33 [a]	229.53 [b]	231.23 [b]	209.18 [c]	209.11 [c]	192.57 [d]	194.09 [d]	0.0001
Corn cost, $/head	163.89 [a]	139.13 [b]	140.89 [b]	111.29 [c]	111.35 [c]	122.56 [d]	123.99 [d]	0.0001
Interest, $	39.41 [a]	41.45 [b]	41.57 [b]	43.62 [c]	43.39 [c]	35.90 [d]	35.81 [d]	0.02
Total variable cost, $/head	741.86 [b]	726.70 [bc]	728.26 [bc]	710.32 [ac]	704.26 [a]	735.25 [b]	735.28 [b]	0.06
Total cost, $/head	761.97 [a]	741.95 [bc]	743.51 [ab]	725.69 [bc]	719.63 [c]	755.54 [a]	755.57 [a]	0.054
Cost of gain, $/cwt	49.93 [a]	47.73 [b]	47.68 [b]	46.34 [b]	46.66 [b]	51.24 [ac]	51.53 [c]	0.03
Break-even price, $/cwt hot carcass	105.77 [a]	102.71 [b]	102.11 [b]	102.32 [b]	103.29 [bc]	105.86 [ac]	105.72 [ac]	0.04
Profit, $/head	-10.29 [a]	49.21 [b]	54.87 [b]	43.59 [bc]	33.88 [bc]	24.52 [c]	25.73 [c]	0.05

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.

[abcd]Means with different superscripts in the same row are significantly different with respect to their P–values.

Table 12. Economic variables when carcass price decreases 5 %.

Variable	FEEDLOT*	JI	JNI	OI	ONI	SI	SNI	P<
Feeder price, $/cwt	94.58	94.58	94.58	94.58	94.58	84.30	84.30	--
Purchase price, $/head	367.05 [a]	366.77 [a]	367.42 [a]	367.73 [a]	366.51 [a]	418.97 [b]	418.39 [b]	0.0001
Hot carcass weight, lbs	720.96 [ab]	723.05 [ab]	731.97 [a]	711.17 [ab]	701.17 [b]	715.57 [ab]	717.24 [ab]	0.03
Carcass price, $/cwt	95.40 [a]	100.00 [b]	99.66 [b]	98.87 [bc]	98.13 [c]	99.59 [b]	99.50 [b]	0.024
Total revenue, $/head	680.10 [a]	715.81 [b]	722.34 [b]	696.01 [ab]	681.74 [ac]	705.78 [bc]	706.88 [bc]	0.04
Total feed cost, $/head	250.33 [a]	229.53 [b]	231.23 [b]	209.18 [c]	209.11 [c]	192.57 [d]	194.09 [d]	0.0001
Corn cost, $/head	163.89 [a]	139.13 [b]	140.89 [b]	111.29 [c]	111.35 [c]	122.56 [d]	123.99 [d]	0.0001
Interest, $	39.41 [a]	41.45 [b]	41.57 [b]	43.62 [c]	43.39 [c]	35.90 [d]	35.81 [d]	0.02
Total variable cost, $/head	741.86 [b]	726.70 [bc]	728.26 [bc]	710.32 [ac]	704.26 [a]	735.25 [b]	735.28 [b]	0.06
Total cost, $/head	761.97 [a]	741.95 [bc]	743.51 [ab]	725.69 [bc]	719.63 [c]	755.54 [a]	755.57 [a]	0.054
Cost of gain, $/cwt	49.93 [a]	47.73 [b]	47.68 [b]	46.34 [b]	46.66 [b]	51.24 [ac]	51.53 [c]	0.03
Break-even price, $/cwt hot carcass	105.77 [a]	102.71 [b]	102.11 [b]	102.32 [b]	103.29 [bc]	105.86 [ac]	105.72 [ac]	0.04
Profit, $/head	-81.88 [a]	-26.14 [b]	-21.16 [b]	-29.67 [bc]	-37.89 [bc]	-49.77 [c]	-48.68 [c]	0.05

*Cattle directly into feedlot = FEEDLOT; cattle provided or not provided ionophore on pasture to feedlot in July = JI and JNI, respectively; cattle provided or not provided ionophore on pasture to feedlot in October = OI and ONI, respectively; cattle to pasture in late September or early October and provided or not provided ionophore on pasture and to feedlot in October = SI and SNI, respectively.

[abcd]Means with different superscripts in the same row are significantly different with respect to their P–values.

cattle feeding conditions as described, the profitability of cattle feeding is extremely sensitive to fed cattle prices received and, to a substantial but lesser extent, to feeder cattle purchase price. While changes in corn prices impacted profit potential, they did not have the impacts of cattle purchase and selling prices.

Implications

Grazing steer calves on bromegrass pasture for various lengths of time impacted steer growth rate but did not have adverse effects on carcass grades. Furthermore, grazing fall-born steer calves for either part or all of the grazing season, prior to being finished in drylot, showed significantly greater profit potential than placing calves directly into drylot at weaning or grazing spring-born calves for a short time following weaning in the fall, and then finishing in drylot. These findings should not only provide another production alternative to the cattle feeding industry but should lend additional credence to the concept of sustainable agriculture.