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Integration of Pasturing Systems for Cattle-finishing Programs

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Abstract
In areas consisting of highly productive land interdispersed with highly erodable land, the latter would best fit the concept of sustainable agriculture by being placed into permanent pasture. The objective of this study was to graze steer calves for varying lengths of time on such permanent pasture and then to finish then in drylot and determine the subsequent impact on feedlot performance, carcass composition, and economic return.

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Introduction

In areas consisting of highly productive land interdispersed with highly erodable land, the latter would best fit the concept of sustainable agriculture by being placed into permanent pasture. The objective of this study was to graze steer calves for varying lengths of time on such permanent pasture and then to finish then in drylot and determine the subsequent impact on feedlot performance, carcass composition, and economic return.

Materials and Methods

A three-year study, involving 84 fall-born and 28 spring-born crossbred calves of Hereford and Angus breeding each year, was conducted using bromegrass in a rotational grazing system. The bromegrass pasture consisted of 16 paddocks, each 1.7 acres in size. Each grazing treatment of 14 steers had access to one paddock at a time. Early in the season, cattle were rotated among paddocks every 3 to 4 days; later in the season rotation occurred about every 2 days. Nitrogen was applied to the pasture in late April at the rate of 100 lb per acre and again in mid-August at the rate of 80 lb per acre. Five treatments were assigned the fall-born calves when weaned in the spring. Treatment 1 calves (JI) received ionophore and Treatment 2 calves (JNI) did not; both were placed on pasture in May of each year and then moved to the feedlot in July and fed the finishing diet. Treatment 3 (OI) and Treatment 4 (ONI) were placed on pasture as in treatments 1 and 2, and removed to the drylot in October. Treatments 1–4 each involved 14 calves. Treatment 5 (FEEDLOT) consisted of 28 calves placed directly into drylot following weaning. An 82% concentrate diet containing whole shelled corn, ground alfalfa hay, and a protein-vitamin-mineral supplement with ionophore and molasses was provided *ad libitum* daily. In the fall, 14 weaned calves were assigned to Treatment 6 and received an ionophore while on pasture for approximately 3 weeks in early October, and then placed in drylot for finishing. Treatment 7 involved 14 calves handled in the same manner but not receiving ionophore on pasture.

Cattle were processed into beef when a pen of cattle averaged about 1,150 lbs. Following a 24-hour chill, backfat and ribeye area were measured over the 12th rib on the left half of each carcass. Carcass quality grades, yield grades, and percent KPH fat were called by USDA Meat Grading Service personnel.

A budget worksheet was prepared using the “Finishing Yearlings Steers” budget worksheet in Livestock Enterprise Budgets (Iowa State University). Values used in the calculations were from the corresponding year of the experiment. Variable costs included the costs of the feeder animal, feed, veterinary and health, machinery and equipment, marketing, and miscellaneous expenses and interest on feed and other costs. Fixed costs included housing, machinery, and equipment. Total revenue for each animal was determined by multiplying hot-carcass weight by price received for carcass grades represented. Profit was obtained by subtracting fixed and variable costs from income. For price sensitivity analysis, effect of a 5% increase or decrease in corn price, feeder price, and carcass price was used to determine effects on profitability.

Results and Discussion

As shown in Table 1, overall daily gains favored cattle spending the most time in drylot.

However, cattle carcass grades were similar in spite of numerical differences and regardless of feeding regime.

When applying four economic scenarios as illustrated in Table 2, it is shown in Scenario 1—where actual costs of production and prices received were used—that treatments displaying the most profit were those where cattle made extensive use of pasture. In Scenario 2—where average prices from a 10-year period for feed components and feeder and fed cattle were used—fall born calves were most profitable. Scenario 3 used the same criteria as Scenario 2, except that prices for feed components were derived from a 10-year average for corresponding months in which cattle were fed. Here, fall-born calves and calves using pasture again the most profitable. Scenario 4 used 10-year average prices for feed components and feeder and fed cattle prices for the corresponding months in which the activity occurred. In this scenario, fall-born calves with access to pasture were clearly the most profitable.

The price sensitivity analyses (Table 3) clearly illustrates that carcass price has the greatest impact profitability, followed by feeder price and corn price.

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Table 1. Growth performance and carcass characteristics.

Variable	Feedlot*	JI	JNI	OI	ONI	SI	SNI	P<
Pasture gain, lb/day	--	1.43^{ac}	1.23^{c}	1.53^{a}	1.35^{ac}	$.63^{b}$	$.41^{b}$	.03
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}	.03
Overall gain, lb/day	2.89^{a}	2.51^{b}	2.49^{b}	2.14^{c}	2.11^{c}	2.70^{d}	2.70^{d}	.01
DMI (in feedlot), lb/day	17.91^{a}	18.62^{b}	18.56^{b}	18.64^{b}	18.52^{b}	18.33^{c}	18.29^{c}	.01
FE (in feedlot), lb feed/lb gain	6.26^{a}	6.47^{a}	6.38^{a}	7.20^{b}	6.89^{b}	6.44^{a}	6.31^{a}	.02
Final wt, lb	1179	1170	1178	1161	1148	1168	1160	--
Dressing percentage	61.1^{a}	61.8^{bc}	62.2^{b}	61.3^{ac}	61.2^{ac}	61.3^{ac}	61.8^{b}	.05
Ribeye area, in.^{2}	12.55	12.57	12.60	12.30	12.48	12.70	12.67	--
Backfat, in.	$.55^{a}$	$.54^{a}$	$.49^{ac}$	$.44^{bc}$	$.42^{c}$	$.50^{ab}$	$.45^{bc}$	.05
KPH, %	2.28^{a}	2.49^{bc}	2.55^{c}	2.14^{a}	2.19^{a}	2.29^{ab}	2.68^{c}	.04
Yield grade	2.68^{a}	2.62^{a}	2.63^{a}	2.35^{b}	2.29^{b}	2.34^{b}	2.39^{b}	.05
Quality grade**	7.73^{a}	7.43^{ac}	7.47^{ac}	6.98^{b}	7.19^{bc}	6.81^{b}	6.97^{b}	.03

*Cattle direct to feedlot = FEEDLOT; cattle with or without ionophore on pasture to feedlot in July or October = JI, JNI, OI and ONI, respectively; cattle to pasture late September or early October and with or without ionophore and to feedlot in October = SI and SNI, respectively.
**average Choice = 8; low Choice = 7; high select = 6.
^{abcd}Means with different superscripts in the same row are significantly different with respect to their P–values.

Table 2. Economic variables for treatments under four scenarios.

Variable	Feedlot*	JI	JNI	OI	ONI	SI	SNI	P<
Hot carcass wt, lb	720.96^{ab}	723.05^{ab}	731.97^{a}	711.17^{ab}	701.17^{b}	715.57^{ab}	717.24^{ab}	.03
Scenario 1								
Purchase price, $/head	367.05^{a}	366.77^{a}	367.42^{a}	367.73^{a}	366.51^{a}	418.97^{b}	418.39^{b}	.0001
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}	.0001
Total cost, $/head	762.86^{a}	742.70^{bc}	744.26^{ab}	726.32^{bc}	720.16^{c}	756.25^{a}	756.28^{a}	.054
Total revenue, $/head	715.89^{a}	753.48^{bc}	760.36^{b}	732.65^{ac}	718.41^{ad}	742.92^{bcd}	744.09^{bcd}	.06
Profit, $/head	-46.08^{a}	11.53^{b}	16.86^{b}	6.96^{bc}	-1.13^{bc}	-12.62^{c}	-11.48^{c}	.04
Scenario 2								
Purchase price, $/head	377.75^{a}	377.46^{a}	378.16^{a}	378.51^{a}	377.22^{a}	452.41^{b}	451.77^{b}	.0001
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}	.0001
Total cost, $/head	747.95^{a}	734.10^{a}	735.51^{a}	744.01^{a}	734.70^{a}	795.73^{b}	795.31^{b}	.0001
Total revenue, $/head	811.01	804.88	809.87	798.32	792.67	802.92	797.92	NS
Profit, $/head	63.94^{a}	72.53^{a}	76.11^{a}	58.93^{a}	57.89^{a}	7.89^{b}	3.32^{b}	.0001
Scenario 3								
Purchase price, $/head	377.75^{a}	377.46^{a}	378.16^{a}	378.51^{a}	377.22^{a}	452.41^{b}	451.77^{b}	.0001
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}	.002
Total cost, $/head	753.31^{a}	739.62^{ab}	741.08^{ab}	734.56^{b}	728.45^{b}	789.29^{c}	788.88^{c}	.055
Total revenue, $/head	811.01	804.88	809.87	798.32	792.67	802.92	797.92	NS
Profit, $/head	58.58^{a}	67.02^{a}	70.55^{a}	65.39^{a}	64.12^{a}	14.34^{b}	9.75^{b}	.0001
Scenario 4								
Purchase price, $/head	397.08^{a}	397.87^{a}	398.61^{a}	398.98^{a}	396.47^{a}	436.98^{b}	436.36^{b}	.0001
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}	.002
Total cost, $/head	775.21^{a}	761.82^{ab}	763.63^{ab}	757.06^{ab}	750.81^{b}	772.81^{a}	772.44^{a}	.06
Total revenue, $/head	826.65^{a}	833.62^{a}	838.79^{a}	822.23^{a}	813.32^{ac}	788.58^{bc}	783.68^{bc}	.04
Profit, $/head	52.33^{a}	73.56^{b}	77.18^{b}	66.80^{ab}	64.15^{ab}	16.48^{c}	11.95^{c}	.01

*See footnotes to Table 1.

^{abcd}Means with different superscripts in the same row are significantly different with respect to their P–values.

Table 3. Dollar profit per head with 5% increase or decrease in economic variable.

Variable	Feedlot*	JI	JNI	OI	ONI	SI	SNI	P<
Corn price								
Increase	-54.28^{a}	4.58^{b}	9.81^{b}	1.39^{bc}	-6.70^{bc}	-18.75^{c}	-17.68^{c}	.05
Decrease	-37.89^{a}	18.49^{b}	23.90^{b}	12.52^{bc}	4.44^{bc}	-6.49^{c}	-5.28^{c}	.04
Feeder price								
Increase	-65.76^{a}	-5.89^{b}	-4.07^{b}	-12.07^{b}	-23.33^{bc}	-35.06^{c}	-35.51^{c}	.06
Decrease	-26.41^{a}	33.31^{b}	36.55^{b}	28.28^{bc}	20.20^{bc}	9.74^{c}	11.14^{c}	.04
Carcass price								
Increase	-10.29^{a}	49.21^{b}	54.87^{b}	43.59^{bc}	33.88^{bc}	24.52^{c}	25.73^{c}	.05
Decrease	-81.88^{a}	-26.14^{b}	-21.16^{b}	-29.67^{bc}	-37.89^{bc}	-49.77^{c}	-48.68^{c}	.05

*See footnotes to Table 1.

^{abcd}Means with different superscripts in the same row are significantly different with respect to their P–values.