Performance and Economic Analysis of Calf-Fed and Yearling Systems for Fall-Born Calves

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Story in Brief

In a two-year study, 84 fall-born steers of uniform biological type were allotted to a 2 x 2 factorial arrangement including two weaning dates (normal-weaned [NW] at 210 d of age, or late-weaned [LW] at 300 d of age) and two finishing systems (feedlot placement as calf-feds [CF] at 310 d of age, or feedlot placement as yearlings [YF] at 400 d of age). Treatment combinations were: NW-CF, NW-YF, LW-CF, LW-YF. Steers were slaughtered at a common end point of an estimated .5 inch of backfat. Days on feed averaged 139 for CF and 126 for YF. Late-weaned steers were 29 lb heavier at the time of feedlot entry compared to NW steers. No other differences for time of weaning, nor any interactions between weaning and finishing system were detected. Yearling-fed steers were heavier (+74.9 lb) at time of feedlot placement, had greater DMI and greater feedlot ADG (4.27 vs 3.99 lb) than CF, resulting in greater final live weights and HCW with corresponding larger REA. No other differences were detected for any carcass traits measured. System economic analysis showed no differences in break-even selling price or system profitability.

Key Words: Carcass, Fall-Calving, Feedlot, Finishing System, Profitability, Weaning Date

Introduction

In the Southern Great Plains, fall-calving systems provide producers with numerous weaning and post-weaning management options and decisions. Calves can be weaned at a traditional age of around 7 mo in April or May, which generally corresponds to mild weather conditions, high quality forage availability, and high calf prices. Alternatively, some managers in this region have chosen to extend lactation through the spring and early summer and delay weaning until 10 to 11 mo of age. The primary benefit of this strategy is to increase weaning weight and gross revenue with little change in labor inputs. In the companion paper (Hudson et al., 2007), it has been shown that calves weaned in April and provided excellent quality forage, gained approximately 51 lb less during the spring grazing period compared to nursing calves regardless of previous cow management.

The current ethanol boom has increased competition for feed grains between the fuel and livestock industries, resulting in increased costs and decreased returns for traditional beef cattle finishing systems. This growing trend of grain to fuel is increasing interest in, and encouraging use of longer grazing periods prior to feedlot finishing. This approach results in more pounds of calf weight gain at a lower price prior to finishing compared to “calf-fed” systems with little to no post-weaning grazing. Previous reports have demonstrated excellent late-summer performance when stocker calves are grazing native range and receiving a protein supplement (Lalman et al., 2005). Therefore, late-summer grazing with protein supplementation could be an important component of an efficient beef production system given current market conditions.

Therefore, the purpose of this study was to determine the effects of time of weaning and finishing system on feedlot performance, carcass characteristics, and enterprise profitability of fall-born steers.

Materials and Methods

This study was conducted at the Range Cow Research Center, North Range Unit, approximately 16 km west of Stillwater, Oklahoma and at the Willard Sparks Beef Research Center (WSBRC), Stillwater, Oklahoma in accordance with an Oklahoma State University Animal Care and Use Committee approved protocol. In two successive years (Yr 1, n = 32; Yr 2, n = 52), fall-born steers from the Oklahoma State University Range Cow Research Center were stratified by age and BW to ensure groups were similar and were then randomly allotted to a 2 x 2 factorial arrangement of treatments in a completely randomized design to evaluate the effects of time of weaning and finishing system on feedlot performance, carcass characteristics, and enterprise

Cattle and Management. Steers are the progeny of cows previously assigned to one of two weaning dates: 1) normal weaning (NW) in mid-April at approximately 210 d of age, and 2) late weaning (LW) in mid-July at approximately 300 d of age. After weaning in July (d=0), steers were randomly assigned to two finishing systems: 1) feedlot placement in late July or early August at average calf age of 310 d (CF), and 2) feedlot placement in October at average calf age 400 d (YF). Treatment combinations were: NW-CF, NW-YF, LW-CF, LW-YF.

On d 0, steers were weighed after a 16 hr withdrawal from food and water, dewormed based on individual BW with Ivomec Plus® and implanted with Component E-S with Tylan. Calf-fed steers were transported to the WSBRC, assigned to pens based on arrival BW, and placed on an 18-d step-up program followed by a high-concentrate finishing diet. On d 54, CF steers were re-implanted with Revalor-S. Yearlings remained at the Range Cow Research Center grazing native range with abundant forage at a stocking rate of approximately 1.16 ac/animal. On Mondays, Wednesdays, and Fridays, YF steers received 2.33 lb of a 40% CP cottonseed meal-based supplement (equivalent to 1 $lb \cdot hd^{-1} \cdot d^{-1}$) in a feeding barn equipped with individual stanchions to ensure precise and consistent supplement consumption. On d 84, steers weights were recorded after a 16-hr withdrawal from feed and water, and steers were shipped to the WSBRC. Upon arrival at the feedlot, steers were dewormed based on actual BW with Ivomec Plus®, re-implanted with Revalor-S, and allotted to pens based on arrival BW. Yearlings were placed on the same 18-d step-up program as CF, followed by high-concentrate finishing. Steers in both groups remained on a high concentrate diet until experienced feedlot personnel estimated 12th rib back fat thickness to be .4 in. Steers were slaughtered at a commercial packing plant and carcass data collected by the same trained technicians for both groups.

Economic Analysis. Actual least-squares means for initial and final weights, ADG, and DMI were used in conjunction with 10 yrs of historical prices to determine the break-even selling price and profitability of each system. Steers were priced into the post-weaning phase using the mean steer weight of each group according to USDA weighted average pricing for Oklahoma in August (http://www.ams.usda.gov/lsmnpubs). Table 1 details fixed prices used for the analysis. Interest charged varied and was input as the average prime rate during the specified period. The feedlot ration cost was estimated based on the average corn price for the specified period (www.cattlefax.com, 2007). Initial feedlot price for yearlings was set as the breakeven selling price off of pasture, as calculated using the OSU Stocker Planner (http://www.ansi.okstate.edu/software/). Selling price for both groups was based on USDA weighted average live pricing for Select/Choice (35-65) price spreads for the month sold in Texas and Oklahoma (http://www.ams.usda.gov/lsmnpubs). Initial and final weights, ADG, and DMI used for the analysis were based on actual LS means observed for each group in the study. The break-even selling price and profit/loss were determined for each system using the OSU Feedlot Performance Program and the OSU Breakeven Feedlot Calculator (http://www.ansi.okstate.edu/software/).

Table 1. Fixed inputs used for economic comparison of two finishing systems

	System	
Item	CF	YF
Freight	$3/loaded mile	$3/loaded mile
Medical	$12	$10 grazing; $7.50 feedlot
Yardage	$.35/hd	$.35/hd
Pasture	---	$.25/lb gain
Death loss	2 %	2 % grazing; 1 % feedlot
Equity	$100	$100

Statistical Analysis. Grazing performance for the yearlings, feedlot performance for both YF and CF steers (excluding DMI and gain:feed), and carcass data were analyzed using steer as the experimental unit. Dry matter intake and feed efficiency were calculated on a pen basis. Data were analyzed using the PROC MIXED procedure of SAS (SAS Inst. Inc., Cary, NC). The model for grazing performance included weaning treatment as a fixed effect with breed of sire as a covariate and year as a random effect. The model for feedlot weight and gain and carcass characteristics included weaning treatment and system as fixed effects and a term for the interaction. Breed of sire was included as a covariate and year was considered a random effect. The model for DMI, feed efficiency, and economics included system as a fixed effect and year as random effect. All interactions and covariates remained in the model regardless of significance. Significance was declared when the P-value for the F-statistic was $\leq$.05.

Results

Time of Weaning Effects and Grazing Performance. Figure 1 depicts time of weaning and feedlot entry and corresponding steer BW. Grazing performance during the 84-d grazing period is presented in Table 2. Time of weaning did not influence performance during the grazing period (P=.30 to .95). Yearlings weighed 628 ± 69.8 lb at the beginning of the grazing period and gained 97.8 ± 18.1 lb for an ADG of 1.17 ± .22 lb. On average, yearlings were 400 d of age and weighed 729 lb at time of feedlot entry.

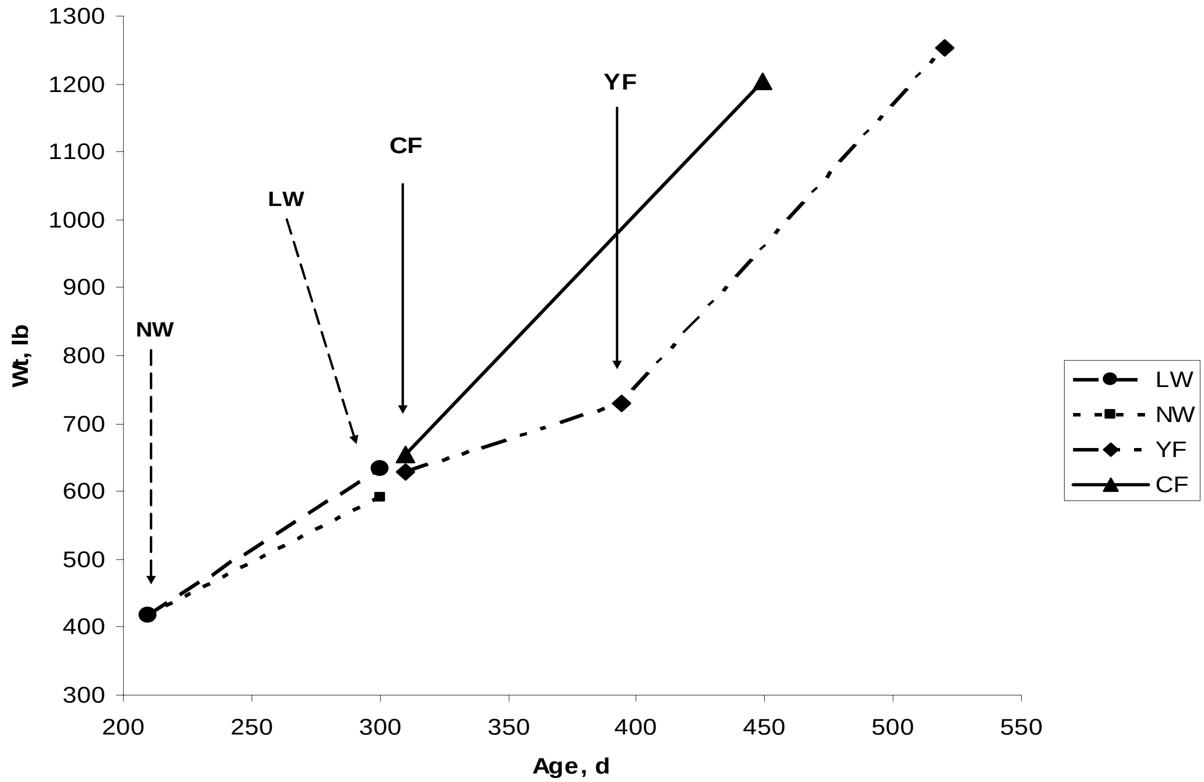

Figure 1. Growth curves throughout the experiment. The dashed arrows indicate time of weaning for normal-weaned (NW) and late-weaned (LW) calves. The solid arrows indicate the beginning of the feedlot phase for the calf-fed (CF) and yearling-fed (YF) cattle.

Table 2. Performance of yearling-fed steers weaned at two different dates grazing native range and receiving a protein supplement

	Weaning Treatment	
Item	LW	NW
Initial wt, d=0	648	637
D 28 wt	722	711
D 56 wt	744	737
Final wt, d=84	744	731
Wt gain, d-0 to d-28	73.6	76.4
Wt gain, d-28 to d-56	22.2	22.7
Wt gain, d-58 to d-84	.55	-3.96

Cumulative gain, d-0 to d-84	96.9	96.7

When analyzed across both finishing systems, LW steers were 28.6 lb heavier (P<.001) than NW steers (707 vs 678 lb) at initial feedlot entry (data not presented). However, no other differences were observed for time of weaning throughout the experiment. Additionally, no significant interactions between time of weaning and finishing system were detected for feedlot performance or carcass characteristics. Therefore, only main effects of finishing system will be reported in the following tables.

Feedlot Performance and Carcass Characteristics. Table 3 summarizes growth performance for the feedlot phase. Averaged across both years, DOF was 139 d for CF and 126 d for YF. Yearlings were 74.9 lb heavier upon feedlot entry than were CF steers. Due to increased DMI and greater ADG (P<.001), YF steers were also heavier at the time of slaughter (1253 vs 1203 lb; P<.0001).

Table 3. Effects of growing/finishing system on steer feedlot performance.

	System			
Item	CF	YF	SEM	P-value
Age at feedlot entry, d	313	400	10.8	<.001
Initial wt, lb	654	729	29.5	<.001
Final wt, lb	1202	1253	12.6	<.001
DOF	139	126	10.6	<.01
ADG, lb/d	3.99	4.27	.22	<.001
Dry matter intake and feed efficiency				
DMI, lb/d	23.3	26.2	.48	<.001
Gain:Feed	.1789	.1720	.009	.16

Carcass data are presented in Table 4. Both groups were slaughtered when 12th rib fat thickness was estimated to be .4 in. Actual backfat thickness was .47 and .48 in for CF and YF, respectively. Dressing percent, marbling, and YG were not influenced by finishing system. However, due to increased initial weights and greater ADG, final weights were greater for YF steers. Increased final weights resulted in YF steers having greater HCW (782 vs 736 lb; P<.0001) with corresponding larger (P=.01) REA.

Table 4. Effect of growing/finishing system on carcass characteristics.

	System			
Item	CF	YF	SEM	P-value
Live wt, kg	1220	1293	18.5	<.001
Final shrunk wt, kg	1172	1240	17.8	<.001
Dressing percent	62.6	63.1	.60	.29
HCW, kg	736	782	10.4	<.001

REA, cm2	13.1	13.7	.36	.01
12th rib backfat, in	.47	.48	.04	.81
% Select	30.3	23.9	8.7	.53
% Total Choice	68.2	75.8	9.7	.46
% Upper 2/3 Choice	15.3	3.0	19.5	.16
YG	2.75	2.78	.09	.78

[a] Marbling score: small = 400-499.

Economics. System profitability and break-even selling price data are presented in Table 5. System did not influence break-even selling price or overall profitability. It is important to note the large standard errors associated with this analysis, particularly profit/loss. Figure 2 illustrates the dramatic variation in profitability over the 10-yr period as well as the price of corn for each year. The YF system was more profitable 5 out of 10 yr (Figure 2). Due to recent dramatic increases in corn prices compared to the previous 10 yr, we conducted a projected profitability analysis using current and projected corn and cattle prices. This projection is also shown in Figure 2, and reflects an advantage for the yearling system due primarily to the reduced reliance on high priced corn.

Table 5. Breakeven selling price and profit/loss of steers assigned to two finishing systems.

	System			
Item	CF	YF	SEM[a]	P-value[b]
Breakeven selling price, $/lb	.73	.72	.22	.17
Profit/loss, live basis, per steer	45.42	60.95	28.64	.62

[a] Most conservative SEM.

[b] Probability of a greater F-statistic.

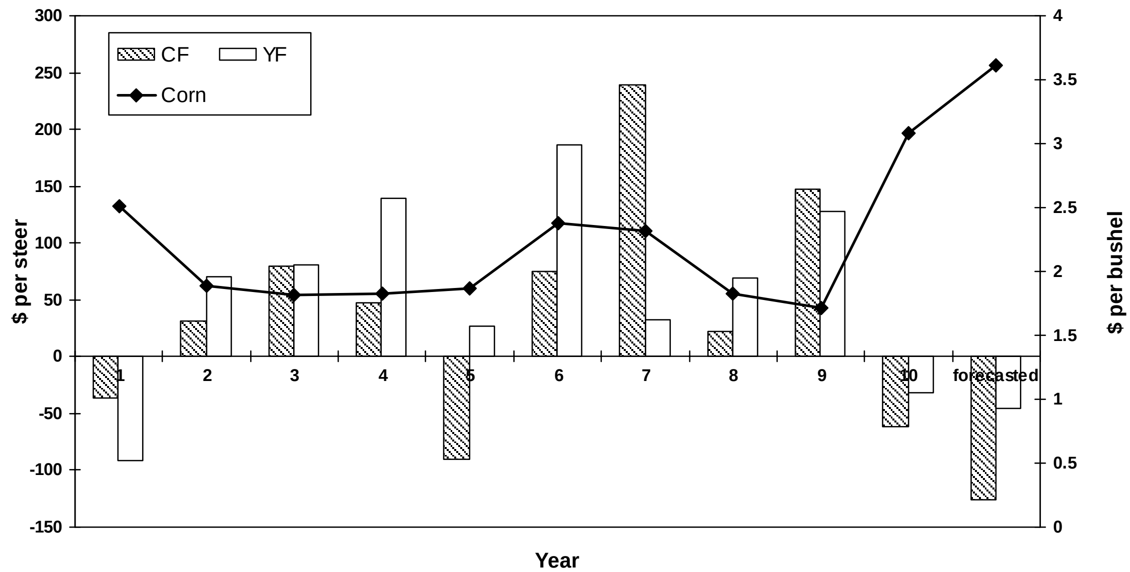

Figure 2. Comparison of profit/loss for steers assigned to two finishing systems overlaid with corresponding price of corn.

Conclusions

When determining the most appropriate time of weaning and finishing system, one must consider cattle breed and type, forage availability for back-grounding, and financial ramifications. The decision to place cattle directly into the feedlot as calf-feds or allow a grazing period prior to finishing is predicated on understanding how each strategy may affect market timing, feedlot performance, carcass characteristics, and profitability.

The present study indicates that with the exception of initial feedlot weight, time of weaning of fall-born steers of British or British x Continental breeding does not influence feedlot and carcass characteristics. Likewise, time of weaning does not interact with finishing system. Similar to many of the published reports, the current study illustrates that yearling-fed steers consume more DM and gaining weight more rapidly than calf-feds. Consequently, final weights and carcasses were heavier for YF steers than for CF steers. This increase in weight translates to increased ribeye area, although no change in overall cutability.

The length of the back-grounding period and the degree of nutrient restriction are often greater determinants of feedlot performance and carcass traits. In the present study, when allowed an 84-d grazing period with a protein supplement, many of the differences in carcass characteristics were moderated, with only differences in HCW and REA observed. When evaluated on an economic basis, extreme market volatility makes it difficult to determine if there is a difference in overall profitability of these two systems. Current corn prices will likely encourage more cattle to be grazed for longer periods prior to feedlot entry. Our data suggests little, if any, change in carcass quality when similar yearling production systems are applied to fall-born calves.

Literature Cited

Hudson, M.D. et al., 2007. Okla. Ag. Exp. Sta. Res. Rep.

Lalman, D.L. et al., 2005. Okla. Ag. Exp. Sta. Res. Rep.

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Hudson, M. D. - Graduate Student

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