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Effects of Sorting Cattle by Weight and Time of Year on Finishing Performance, Carcass Characteristics and Economics

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Summary

Sorting steers for three different finishing systems (calf-feds, summer yearlings and fall yearlings) resulted in no differences in performance or average carcass characteristics compared to unsorted steers. Sorting decreased variation in hot carcass weight and number of carcasses over 950 lb. Sorting did not increase profit when calf-feds or fall yearlings were sold live compared to unsorted calf-feds and fall yearlings. However, when sold on a grid basis, sorting did increase profit for summer and fall yearlings.

Introduction

Cattle are commonly sorted by weight into different production systems at the time of weaning. The three production systems are calf-feds, summer yearlings and fall yearlings. There are many different variations of these three production systems. In Nebraska, it is common for calves to be born in March and weaned in the fall in October or November. When a calf is weaned, weight is used to determine which production system is best for that particular animal. This is done because calf-feds tend to be excessively fat and yearlings become overweight by the time of slaughter (*2007 Nebraska Beef Report*, pp. 58-60).

The first objective of this study was to determine if sorting cattle for a particular system by initial body weight (BW) decreases variation in hot carcass weight (HCW) and overweight carcasses (> 950 lb) at harvest. The second objective was to determine the economic effects of sorting and feeding genetically similar cattle throughout different times of the year.

Procedure

Experiments

The three production systems compared were calf-feds, summer yearlings and fall yearlings. All cattle entered the UNL facility at the time of weaning in the fall. Calf-feds entered the feedlot at weaning, were finished during the winter months and marketed in May. Summer yearlings grazed cornstalks throughout the winter and were supplemented with wet corn gluten feed at 5 lb/steer daily. Summer yearlings did graze grass for less than 30 days just prior to entering the feedlot in May. The summer yearlings were finished during the summer months and marketed in October. Fall yearlings grazed cornstalks during the winter months, similar to the summer yearlings, and also received 5 lb/steer of wet corn gluten feed daily. When the fall yearlings were removed from cornstalks, they grazed native range throughout the summer months (at University of Nebraska Barta Brothers Ranch) and were fed in the feedlot from September to January.

The year 1 group was comprised of Nebraska ranch direct calves (n = 288), while cattle in year 2 were from a Nebraska sale barn (n = 288). In each year, all cattle were purchased in October. After being limit fed for five consecutive days, weights were collected on two consecutive days. The cattle were then assigned randomly into either a sorted (n = 144) or unsorted group (n = 144) on day 0. The average BW of the sorted and unsorted group was similar. In the unsorted group, cattle were assigned randomly into one of three groups: calf-feds, summer yearlings and fall yearlings, but were never sorted based on BW. The sorted group was sorted based on BW after the five-day limit-feeding period. The heaviest third of the sorted group was placed into the calf-fed production system to minimize overweight carcasses at slaughter. The remaining two-thirds of the sorted group were placed on cornstalks to graze over the winter. In the spring, the sorted group was then sorted based on BW after grazing cornstalks. Of the remaining two-thirds of the sorted group, the heaviest half were fed as summer yearlings during the summer, and the lightest half grazed native range and were fed as fall yearlings to decrease the number of overweight carcasses (Figure 1).

When cattle from each production system (calf-fed, summer yearling and fall yearling) were in the feedlot, there were eight steers/pen and six replications (pens) as sorted and unsorted. This configuration was repeated both years. The experimental design was a 2 x 3 factorial with pen being the experimental unit. The factors were sorted, unsorted and three different feeding time periods (calf-fed, summer yearlings and fall yearlings).

Economics

The profitability of these three production systems was examined under three scenarios: live vs. grid pricing, time of year the cattle were finished and sorted vs. unsorted. The sorted calf-feds were calculated to a maximum breakeven purchase price by subtracting all costs from the final live price and dividing by the weight of the animal at receiving. Total costs included feed cost, yardage, death loss and animal interest, as shown in Table 1, to make comparisons relative

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Table 1. Animal price in $/steer along with cost for different parts of the production system broken down by year then by sorted and unsorted for the different production systems (calf-feds, summer yearlings and fall yearlings).

	Year 1						Year 2					
	Sorted			Unsorted			Sorted			Unsorted		
	Calf[1]	Summer[2]	Fall[3]	Calf[1]	Summer[2]	Fall[3]	Calf[1]	Summer[2]	Fall[3]	Calf[1]	Summer[2]	Fall[3]
Initial price	733.68	652.52	593.66	662.10	659.63	634.36	659.15	609.83	592.42	614.10	614.95	615.53
Winter cost[4]		112.15	112.15	112.15	112.15	114.39	114.39	114.39	114.39			
Summer cost[5]		28.51	124.15	28.53	133.32	37.60	117.29	36.81	125.30			
Feed cost	318.46	303.96	280.51	309.97	301.62	297.62	325.24	295.91	291.43	310.07	292.02	314.51
Yardage[6]	66.8	53.20	46.40	66.80	53.20	46.40	78.40	58.00	52.80	78.40	58.00	52.80
Interest[7]	33.59	53.00	62.53	30.90	53.45	66.49	36.70	54.41	66.50	34.51	54.72	68.69
Total cost	1192.18	1239.94	1253.18	1108.00	1245.31	1324.81	1137.66	1205.75	1268.17	1074.34	1206.62	1325.32
Live value	1179.76	1267.63	1286.30	1138.71	1270.80	1367.48	1164.13	1246.01	1270.91	1127.59	1237.49	1327.14
Grid value	1230.37	1252.79	1289.37	1171.75	1236.63	1337.45	1170.12	1231.74	1287.97	1139.51	1209.56	1307.35
Live P/L[8]	-12.43	27.69	33.12	30.70	25.50	42.67	26.46	40.26	2.74	53.25	30.87	1.82
Grid P/L[8]	38.19	12.85	36.19	63.74	-8.681	2.64	32.46	26.00	19.80	65.17	2.94	-17.97

[1]Calf-fed system.
[2]Summer yearling system.
[3]Fall yearling system.
[4]For cornstalks, grazing yardage was charged at a rate of $0.20/head/day and rent (feed cost) was $0.12/head/day along with feed interest.
[5]For grass, grazing yardage was charged at $0.10/head/day along with grass cost and interest for grass.
[6]Yardage for feedlot was charged at $0.40/head/day.
[7]Animal interest for total time period the animal was owned.
[8]P/L = profit or loss.

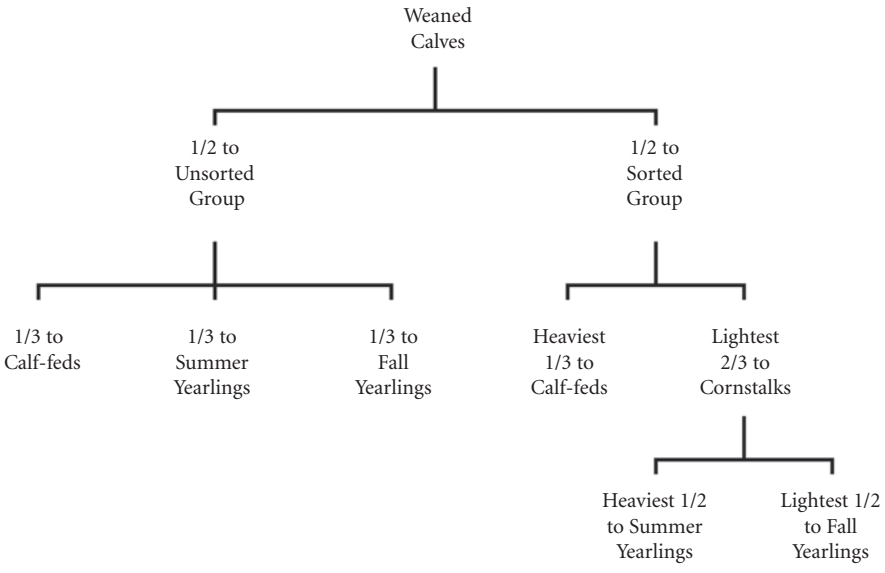

Figure 1. Experiment design.

to the sorted calf-feds. The average 2007 dressed price was multiplied by 0.63 to determine the final live price for the cattle (Table 2). The initial feeder cattle price was figured for the sorted calf-feds first. Using the average weight and price of the sorted calf-feds, a feeder cattle price slide was calculated (Dhuyvetter, Extension agricultural economist, Kansas State University), assuming a corn price of $4/bu. The slide included the feeder cattle weight, corn price and predicted fed-cattle price. The price slide was then used to yield feeder cattle prices for different weights of feeder cattle.

The total costs for the finishing period for all three production systems were calculated similarly. Corn was priced at $4/bu, and wet distillers grains were priced at 80% the price of corn (DM basis). The summer yearlings and fall yearlings had additional costs for grazing corn stalks and grass. The costs for the wintering period and summer grazing, which are shown in Table 1, were added to the initial animal price to give the price of the

animal entering the feedlot.

To calculate the grid price received, the average 2007 dressed price was used. A seven-year index was used to get the price for the month in which the cattle were marketed and adjusted based on the index. The index-adjusted price was then added to one, minus the percent Choice, multiplied by the Choice-select spread shown in Table 2, in order to calculate the price for yield grade 3 Choice carcasses. The grid base price for the three months in which the cattle were sold (January, May and October) was then averaged to get the final base grid price. Discounts were given for select grade carcasses along with yield grade 4 and 5 carcasses and any carcasses over 950 lb and 1000 lb. Premiums were awarded for upper 2/3 Choice or better and prime quality grades and yield grades 1 and 2 (Table 2).

Table 2. Dressed price/cwt adjusted for live price and a base grid price, along with premiums and discounts used to determine final grid value

Fed Cattle Prices	
2007 Ave. dressed price/cwt	$146.57
Adjusted live price/cwt	$92.34
Grid Base Price	
Final grid base price/cwt	$151.08
Premiums and Discounts/cwt	
Prime	$7.34
Upper 2/3 Choice	$2.07
Choice	$0.00
Select	$-10.01
YG 1	$2.87
YG 2	$1.38
YG 3	$0.00
YG 4	$-13.30
YG5	$-18.53
Over 950	$ -7.03
Over 1000	$-17.99

Table 3. Animal performance as simple effects of sorting (sorted and unsorted) and production system (calf-fed, summer yearlings and fall yearlings).

	Sorted			Unsorted			
	Calf-fed	Summer	Fall	Calf-fed	Summer	Fall	System*sort[1]
Initial BW lb	648[d]	794[c]	869[b]	576[e]	789[c]	928[a]	< 0.01
I BW SD lb[2]	48	34	53	587	395		
ADG lb/day	3.55	4.08	4.15	3.59	4.10	4.28	0.80
DMI lb	20.9[d]	25.3[c]	27.10[b]	20.1[d]	25.1[c]	29.0[a]	< 0.01
F:G	5.91[c]	6.27[b]	6.57[a]	5.59[d]	6.18[b]	6.81[a]	< 0.01
HCW lb	811[d]	858[c]	873[b]	774[e]	856[c]	919[a]	< 0.01
HCW SD lb[3]	58	41	62	67	67	88	
Fat in.	0.55	0.57	0.47	0.52	0.53	0.50	0.33
Marbling[4]	572	516	565	566[e]	+12		
% > 950 lb	3.27[c]	2.08[c]	6.40[bc]	1.04[c]	10.42[b]	35.42[a]	< 0.01
% > 1000 lb	1.19[fb]	0.00[b]	1.04[b]	0.00[b]	2.08[b]	17.71[a]	< 0.01

[1]*P*-value for sorting by production system interaction.
[2]Initial body weight standard deviation.
[3]HCW standard deviation.
[4] USDA called marbling with 400 = Slight[00]; 500 = Small[00]; etc.
[a,b,c,d,e]Means within a row with different superscripts are statistically different.

Results

Weight

There were interactions ($P < 0.01$) between sorting and system for initial BW and HCW (Table 3) by design. The calf-feds in the sorted group had greater initial BW compared to the unsorted calf-feds. There was no difference in initial BW between sorted and unsorted summer yearlings. The unsorted fall yearlings had higher initial BW compared to the sorted fall yearlings. The HCW follows the same pattern as the initial BW. The standard deviations for initial BW and HCW were lower for the sorted groups compared to the unsorted groups for all three systems (Table 3).

There also was a significant interaction for dry matter intake (DMI) ($P < 0.01$) and feed-to-gain ratio (F:G) ($P = 0.03$). The unsorted fall yearlings had the highest DMI. The sorted fall yearlings had the next highest DMI, which was higher than DMI for both the sorted and unsorted summer yearlings and calf-feds. There was no difference in DMI between the sorted and unsorted summer yearlings. However, the sorted and unsorted summer yearlings did have a higher DMI than their calf-fed counterparts. DMI was generally related to BW.

The unsorted calf-feds had the lowest F:G followed by the sorted calf-feds (Table 3). There was no difference in F:G between the sorted and unsorted summer yearlings, which had a lower F:G than the fall yearlings. Within the fall yearlings system, there was no F:G difference between the sorted and unsorted groups. Many have the perception that heavier calf-feds are the "best doers" and lighter calf-feds are the "poor doers." However, in this study the lightest cattle that entered the feedlot had the lowest F:G (Table 3). There was no interaction for average daily gain (ADG) ($P = 0.80$). Gains were affected by system, with calf-feds having the lowest ADG; however, there was not a difference in ADG between summer and fall yearlings.

There was not a significant sorting by feeding period interaction for fat thickness ($P = 0.32$) and USDA called marbling scores ($P = 0.09$) (Table 3). However, there was a difference due

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to the production system ($P < 0.01$) in which the cattle were finished. Fat thickness was not different for calf-feds and summer yearlings. Fall yearlings had less fat thickness compared to the calf-feds and summer yearlings. The summer yearlings had the lowest marbling score, and there was no difference in marbling between the calf-feds and fall yearlings. There was an interaction for the percent of carcasses that had a HCW of 950 lb or higher and 1000 lb or higher ($P < 0.01$). The unsorted fall yearlings had the highest percentage of carcasses over 950 lb, with 35.4%. Of the unsorted summer yearlings, 10.42% had overweight carcasses, followed by 6.4% of the sorted fall yearlings. In each of the remaining three groups, approximately 2% had HCW over 950 lb. The unsorted fall yearlings had the highest percentage of carcasses over 1000 lb (17.71%), which was greater than all other groups.

Pasture gain for summer and fall yearlings in year 2 was poor compared to gain in year 1. The cattle for year 1 had an average BW of 711 lb going onto grass and entered the feedlot weighing 976 lb. Year 2 cattle averaged 724 lb going onto grass and entered the feedlot at 825 lb.

The overall summary from the performance analysis was that the sorted calf-feds had a higher initial feedlot BW compared to the unsorted calf-feds. The unsorted fall yearlings had a higher initial feedlot BW compared to the sorted fall yearlings. The unsorted calf-feds, the lightest cattle to enter the feedlot, were the most efficient. The amount of initial BW and HCW variation was decreased for the sorted groups compared to the unsorted groups. Decreasing the variation of HCW did not affect fat thickness or quality grade. This led to fewer overweight carcasses for the sorted fall yearlings when compared to the unsorted fall yearlings.

Economics

Weights used for the feeder calf prices were 450 lb, 550 lb, 650 lb and 750 lb, with prices of $122.39/cwt, $112.06/cwt, $107.26/cwt and $103.25/cwt, respectively, based on the feeder cattle price slide. The prices of the diets were $0.0887/lb for year 1 and $0.0819/lb for year 2, because of different diets between years. The summer yearlings had the highest live profit ($31.08/steer) on average. The calf-feds were next with an average value of $24.50/steer. The fall yearlings were least profitable of the three groups on average, with a live value of $20.09/steer. The calf-feds had a grid profit of $49.89/steer. The fall yearlings' profit was $12.67/steer, and the summer yearlings' profit was $8.28/steer on average.

The fall yearlings were the least profitable on a live basis, due to this group having the highest production costs of all three groups. The fall yearlings were heaviest, but that did not make them more profitable, due to the extra weight that had to be gained in the feedlot in the second year of the study instead of gaining the weight on grass. In the first year, fall yearlings gained 1.78lb/day on grass compared to 0.66lb/day for year two with 149 days and 152 days on grass, respectively.

On the grid basis, the calf-feds had the highest profit, followed by the fall yearlings. The calf-feds and fall yearlings graded well compared to the summer yearlings. The summer yearlings were least profitable because the percent choice was lowest at 59.4% choice.

The marketing method (i.e., live or grid) used had a large impact on profit or loss. The sorted calf-feds had the largest change in profits of $28.31/steer going from a live to grid basis, with unsorted calf-feds increasing $22.48/steer. The summer yearlings were not profitable going from the live to grid values. The sorted summer yearlings had a smaller decrease in profit ($-14.55/steer) than the unsorted summer yearlings ($-31.06/steer). The summer yearlings decreased in profit primarily because the cattle did not grade USDA Choice. The sorted fall yearlings increased profit by $10.07/steer on the grid compared to live value. However, the unsorted fall yearlings, when going from the live to grid values, lost $24.91/steer, due to the amount of overweight carcasses in the unsorted group. The sorted cattle always had a higher profit when going from a live value to a grid value.

Over all feeding periods, the unsorted cattle had a higher profit on a live basis compared to the sorted cattle, at $30.80/steer and $19.64/steer, respectively, because the unsorted calf-feds were more efficient and ate less than the sorted calf-feds. This greater efficiency decreased the production cost for the unsorted group. On the grid basis, the sorted cattle were better at $27.58/steer compared to the unsorted cattle at $19.64/steer, due to the discounts for overweight carcasses in the unsorted group.

This analysis would indicate sorting cattle for a production system did not increase profit when cattle were marketed live. However, assuming all cattle were sold on a grid, then sorting increased profits. There also are arguments suggesting that cattle be sold on a grid in order to avoid the discounts associated with marketing cattle on a live basis. Discounts may be applied to cattle sold on a live basis because the cattle buyer cannot be certain of the quality of the cattle purchased. The assumption in this paper, however, is that all cattle sold live are given the average price.

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