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Sorting Strategies in an Extensive Forage Utilization Beef Production System

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Sorting yearling cattle by weight upon entry into the feedlot or by weight and fat depth at the end of the feeding period increases carcass weight without increasing fat thickness.

Summary

One hundred sixty crossbred steer calves were stratified by weight and allotted into four groups to test three sorting strategies against an unsorted control to compare methods of sorting long yearling steers to decrease variation in carcass weight and fat thickness, increase pounds of carcass weight sold, and increase profitability. Sorting by weight upon entry into the feedlot or by weight and fat thickness at the end of the feeding period increased average carcass weight. No statistical differences in variation or profitability were found, although numerical differences were present.

Introduction

Previous research conducted at the University of Nebraska suggests an average of 540 lb variation in final weight and 0.89 inch variation in 12th rib fat thickness exists within a feedlot pen at slaughter time (*1999 Nebraska Beef Report*, pp. 57-59). The previous research also found the relationship between reimplant weight and carcass weight to have correlation coefficients ranging from 0.46 to 0.86. However, this research used calf fed or short yearling steers. No data are available on long yearlings grown in an extensive forage utilization production system. Since these steers are older at slaughter, it is logical that more variation may exist. Also, these cattle likely only receive one implant while in the feedlot and thus do not have the opportunity to be sorted at reimplant time.

The objective of this trial was to test possible strategies for sorting long yearling cattle using logical methods in an extensive forage utilization production system. Logical sorting times for this type of production system include sorting at the beginning of the wintering period, at the beginning of the grazing period, at the beginning of the feeding period, and at the end of the feeding period. The goal was to increase average carcass weight and to reduce variation in carcass weight and 12th rib fat thickness by marketing individuals closer to their ideal marketing date. An individual animal's ideal marketing date is assumed to be when they reach 0.45 inch 12th rib fat depth but before they reach 1,500 lb in shrunk body weight. In doing this, pounds of carcass sold should be maximized while discounts received from overweight carcasses and yield grade four carcasses should be minimized.

Procedure

Two years of data collected at UNL were analyzed to determine the relationship of interim weights to final weight, and to determine the amount of variation in interim and final weights as well as variation in final fat thickness. Seventy-one animals were supplemented at a high rate of winter gain and shipped on the same slaughter date.

Based on the results from the analysis, 160 crossbred steer calves (550 lb) were stratified by weight and allotted into four treatments to test the effects of three sorting strategies. Treatments were: 1) 40 head sorted by weight going to grass (PASTURE), 2) 40 head sorted by weight entering the feedlot (FEEDLOT), 3) 60 head sorted by weight and ultrasound 12th rib fat thickness at the end of the feeding period (PEN), and 4) 20 head that were not sorted and served as the control (CON). Each treatment consisted of two replicates. Each replicate in the PASTURE and FEEDLOT treatments were sorted into heavy and light halves whereas cattle in the PEN treatment were sorted as individuals.

A main assumption of this trial is that a producer using this system purchases cattle from a ranch. It is therefore important to create a situation where the variation in the treatments is similar to that which could be expected from ranch cattle. To accomplish this, steers designated to this trial were from two ranch sources (two loads to obtain sufficient numbers of cattle). By using cattle from two ranches of similar average weights, it is assumed that each treatment has variability in weight and potential fat depth that is typical for cattle from a ranch source.

Steers were purchased in the fall and were wintered on corn residue from Nov. 30 through Feb. 9, and were then placed in a drylot from Feb. 9 through April 20. Cattle were fed ammoniated wheat straw while in the drylot and were supplemented with wet corn gluten feed (5 lb. per head per day, DM basis) during the entire winter period. On April 21, cattle were weighed, implanted with Revlor-G and were taken to smooth brome pastures near Mead, Neb. where they remained until May 15 (24 days). On May 16, they were fly tagged and transported to native warm-season pastures near Ainsworth, Neb. The light half of the PASTURE treatment was removed from grass on July 4 (44 days). The remaining cattle were removed from native range on Aug. 18 (95 days),

returned to smooth brome pastures near Mead, Neb., and were removed from grass on Sept. 12 (26 days). The light half of the PASTURE treatment was on grass for 68 days while the remaining cattle were on grass for 145 days.

Upon entry into the feedlot, all steers were implanted with Revlor-S and placed into pens. All cattle were in 10 head pens except for the PEN treatment which had 30 head per pen. Steers were stepped up on feed in 21 days using four step-up diets containing 45%, 35%, 25%, and 15% roughage fed for three, four, seven and seven days, respectively. The final diet contained 7% roughage and was formulated to contain 12% CP, 0.7% Ca, 0.35% P, 0.6% K, 30 g/ton monensin, and 10 g/ton tylosin (DM basis). The finishing diet contained 40% wet corn gluten feed, 48% high moisture corn, 7% alfalfa and 5% supplement (DM basis). Initial weights for the winter, summer, and finishing periods were an average of two weights taken on consecutive days following a four day limit feeding at 2% BW. The limit fed diet consisted of 47.5% wet corn gluten feed, 47.5% alfalfa hay and 5% supplement. This was done to equalize gut fill so that weights taken were a true reflection of relative differences in weight rather than differences in gut fill.

Each treatment had an individual marketing strategy based on fat thickness or a combination of fat thickness and weight. Ultrasound was used to estimate fat thickness. The PASTURE treatment was marketed in two groups (light and heavy halves) when the average of each group averaged 0.45 inch 12th rib fat thickness. The FEEDLOT treatment also was marketed in two groups (light and heavy halves). The light half was marketed when the group averaged 0.50 in 12th rib fat thickness to allow them to gain additional carcass weight. The heavy half was marketed when the group averaged 0.40 inch 12th rib fat thickness to avoid overweight carcasses. The average market fatness of the FEEDLOT treatment was intended to be 0.45 inch 12th rib fat thickness. The PEN treatment was marketed as individuals in four kill dates. Back fat thickness was measured by ultrasound periodically once the cattle were on feed for approximately 50 days. Cattle were marketed once they reached about 0.45 inch 12th rib fat thickness or 1,500 pounds shrunk body weight (4% shrink).

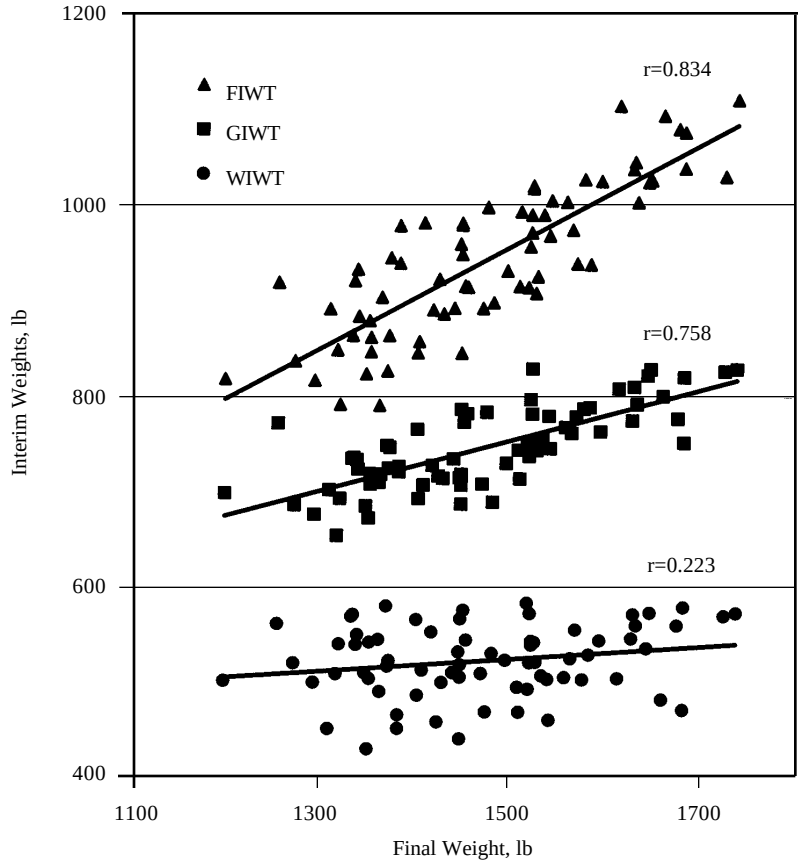

Figure 1. Relationship of interim weights to final weight from a previous research trial. FIWT=Feedlot initial weight, GIWT=Grass initial weight, WIWT=Winter initial weight.

Results

Figure 1 shows the relationship of interim weights taken at different times in the production system to final weight. Interim weights include winter initial weight, grass initial weight, and feedlot initial weight. These weights were selected because they are logical sorting points in this type of production system and because limit fed weight data were available for analysis. Correlation coefficients for these interim weights were 0.223, 0.758, and 0.834 respectively. This suggests a poor relationship to final weight at the beginning of the winter feeding period, but a reasonably good relationship to final weight when cattle go to grass and when they enter the feedlot.

Figure 2 shows the mean, standard deviation, and actual variation of interim weights, final weight, and final fat thickness for the two years of data that were analyzed. As cattle grow, variation in weight increases. The actual variation in final weight and final fat thickness agree with the findings of Cooper et. al. (*1999 Nebraska Beef Report*, pp. 57-59).

Performance, carcass, economic, and variance data for the sorting trial are shown in Table 1. Cattle in the PASTURE treatment were on grass fewer days, and thus had a higher average daily gain on grass. This difference in gain is probably due to the maturity of the forage while they were grazing. Since half of the pasture treatment was removed from grass early, cattle in other treatments were likely performing similarly during the same time period. Early removal from grass is also the likely reason the PASTURE treatment was

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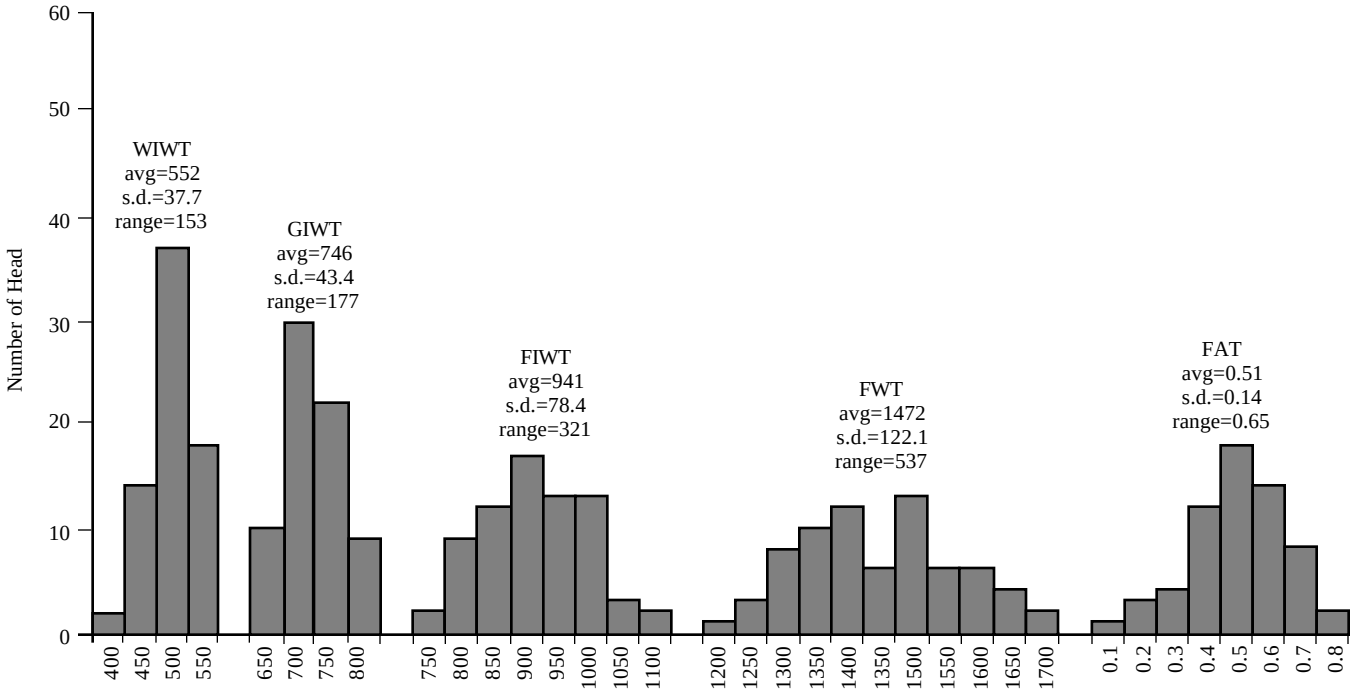

Figure 2. Mean and variances of weight and fat from a previous research trial. WIWT=winter initial weight (lb), GIWT=grass initial weight (lb), FIWT=feedlot initial weight (lb), FWT=final weight (lb), FAT=12th rib fat depth measured at slaughter (in), s.d.=one standard deviation from the mean (lb), range=actual difference between maximum and minimum weight (lb) or fat depth (in).

lighter entering the feedlot and required more days on feed compared to other treatments. The light half of the PASTURE treatment entered the feedlot on July 4, compared to Sept. 12 for all other treatments. The additional heat that cattle in the light half of the PASTURE treatment endured while in the feedlot combined with their lower weight entering the feedlot could explain their reduced dry matter intake.

The light half of the PASTURE treatment was marketed at a fat thickness of 0.55 inch rather than 0.45 inch. In order to compare them to other treatments, fat thickness was adjusted at a rate of 0.0048 inch/day to 0.45 inch fat thickness. This rate of fattening was arrived at by calculating the fattening rate for similar cattle that were serially slaughtered approximately 35 days apart. This was compared to the fattening rate of cattle that were progressively measured with ultrasound during the last four weeks of the feeding period. The two methods closely agreed on the rate of fattening for long yearling cattle during the end of the feeding period. Days on feed was adjusted back by 21 days for the light half of the PASTURE treatment and carcass

Table 1. Performance, carcass, economic, and variance data.

	Treatment[a]				
Item	Control	Pasture	Feedlot	Pen	SEM
Winter					
Days	142	142	142	142	—
Initial weight, lb	548	550	549	551	0.90
Daily gain, lb	1.15	1.13	1.18	1.19	0.01
Summer					
Days	145	110	145	145	—
Initial weight, lb	712	711	717	720	2.62
Daily gain, lb	1.68	1.80	1.69	1.71	0.03
Finishing					
Days	79	101	93	89	—
Initial weight, lb	955[e]	905[f]	962[e]	968[e]	5.02
Daily gain, lb	4.69	4.47	4.64	4.67	0.13
Dry matter intake, lb	31.51[e]	29.00[f]	30.97[e]	31.09[e]	0.20
Feed/gain	6.74	6.50	6.69	6.67	0.20
Carcass data					
Weight, lb	828[b]	845[bd]	867[c]	861[cd]	6.75
Yield grade	2.6[bc]	2.75[b]	2.5[c]	2.5[c]	0.06
12th rib fat, in.	0.445	0.470	0.440	0.450	0.01
Marbling score[g]	495[b]	539[c]	502[b]	509[b]	7.93
% choice	55.0	77.5	55.0	57.6	8.47
Break even, $/cwt	67.01	66.70	66.17	66.16	0.58
Profit, $/head	6.31	10.54	18.17	18.03	7.87
Standard deviation[h]					
Winter initial weight, lb	54.82	48.07	50.48	47.40	0.02
Summer initial weight, lb	63.56	60.20	60.52	58.84	0.02
Feedlot initial weight, lb	62.61[e]	35.28[f]	58.74[e]	65.85[e]	0.04
Carcass weight, lb	48.47[bc]	42.21[c]	46.21[c]	56.67[b]	0.03
Fat thickness, in.	.124	.135	.156	.111	0.11

[a]Treatments: control=no sorting, pasture=sorted based on weight going to grass, feedlot=sorted based on weight entering the feedlot, pen=sorted by weight and fat thickness at the end of the feeding period.
[b,c,d]Means within row with unlike superscripts differ ($P < 0.10$).
[e,f]Means within row with unlike superscripts differ ($P < 0.05$).
[g]Marbling score: 400 = slight 0; 450 = slight 50; 500 = small 0; 550 = small 50; etc.
[h]Statistical analysis and SEM based on log base 10 of standard deviation.

weight was adjusted by using individual ADG. These adjustments are critical for treatment comparisons of carcass weight break even, and profitability. It is difficult to make accurate adjustments in yield grade, quality grade, and percentage choice. Thus, these measurements were not adjusted, which accounts for the increase in these factors compared to other treatments.

Sorting upon entry into the feedlot or by weight and fat thickness at the end of the feeding period successfully increased carcass weight sold without increasing fat thickness compared to the control (Table 1). Although not statistically different due to a high standard error, profitability was numerically increased compared to the control. Numerical differences in profitability are likely due to additional pounds of carcass weight sold. Presumably, it is more profitable for a producer to add additional pounds of carcass weight to an animal as long as discounts are avoided. This is often difficult to accomplish because long yearlings are often heavy when entering the feedlot and gain weight quite rapidly. Furthermore, this type of cattle typically fatten at a rapid rate at the end of the feeding period. These characteristics lead to a small window of opportunity for marketing individuals. Since cattle are typically marketed as groups rather than as individuals, discounts received from overweight carcasses and yield grade four carcasses may by likely. An average of 3.14 % of cattle in this trial received discounts for overweight or yield grade four carcasses with no statistical differences among treatments. Sorting long yearling cattle by weight upon entry into the feedlot may be a viable way for producers to increase total pounds of carcass weight sold while avoiding discounts. If ultrasound technology is available, sorting by weight and fat thickness at the end of the feeding period may also increase carcass weight, decrease discounts received, and decrease variation in 12th rib fat thickness.

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