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LOW-INPUT PASTURE BACKGROUNDING SYSTEM IS MORE PROFITABLE THROUGH HARVEST THAN HIGH-INPUT DRYLOT SYSTEM.

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ABSTRACT: Calves are commonly backgrounded for ≥ 45 d on the ranch of origin; however, few comparisons of on-ranch backgrounding programs exist. This study compared a low-input pasture backgrounding system (**PAST**) to a high-input drylot system (**DLOT**) of the same duration each year (42 - 45 d) to evaluate performance and profit during the backgrounding (**BACKGRD**; weaning to 42 - 45 d) and finishing (**FINISH**; end BACKGRD to harvest) phases. Over 3 yr, 250 calves (236 kg avg. initial BW; 133 steers and 117 heifers) were randomly assigned to PAST or DLOT treatments during BACKGRD. The DLOT calves were fed a corn/wheat midds-based pelleted ration (restricted max. intake 3.0% BW) plus alfalfa hay (0.68 to 1.13 kg/d), and PAST calves were supplemented with a 32% CP range cube (0.57 kg/d; 3×/wk). After BACKGRD, only steers were finished at a commercial feedlot where they were managed as a single group. During BACKGRD, DLOT calves gained more weight ($P < 0.01$) and had a higher final value ($P = 0.03$), but feed and total costs were more than 4-fold higher ($P < 0.01$). Net income during BACKGRD was $45 greater ($P < 0.01$) for PAST than DLOT. During FINISH, initial BW and value were similar ($P \geq 0.37$) among DLOT and PAST steers. The PAST steers had greater ADG ($P < 0.01$; 1.27 vs. 1.07 kg/d) through interim weight (74-94 days on feed; **DOF**) than DLOT steers, but subsequent ADG was similar ($P = 0.68$). There were no differences ($P \geq 0.13$) in interim BW, DOF, total ADG, carcass characteristics, or proportion of steers treated for sickness. However, DLOT steers had greater death loss ($P = 0.02$; 7.6% vs. 0.0%) and lower feed cost ($P = 0.04$; $221 vs. $238/steer). Although the average price received for carcasses sold was not different ($P = 0.11$), PAST steers garnered $111 more gross income during FINISH than DLOT ($P < 0.01$; $946 vs. $833/carcass), and had a net return advantage ($P < 0.01$) of $103/hd. The low-input PAST backgrounding system was more profitable than the DLOT system during both the backgrounding and finishing phases.

Key Words: Backgrounding, Beef Calves, Feedlot

Introduction

Price premiums for "VAC-45" calves marketed through Superior Livestock Auction video sales increased every year from 2000 to 2004, with annual average premiums ranging from $3.66 to $7.91/45.4 kg (King and Seeger, 2005). Justification for such premiums are supported by the analysis of New Mexico Ranch to Rail data by Waggoner et al. (2005), which showed that steers weaned 41 d or more before feedlot entry generated greater net income during finishing than steers backgrounded 21 to 40 d, or less than 20 d. Those findings also support the premise that backgrounding programs of 45 d or more improve finishing profit potential. Results of a 2005 Cattle-Fax membership survey revealed that 74% of respondents "weaned" calves for at least 45 d prior to shipping (Anonymous, 2005). However, studies evaluating backgrounding calves have typically focused on programs less than 40 d (Prichard and Mendez, 1990; Roeber et al., 2001; St. Louis et al., 2003), and controlled experiments evaluating the impact of divergent backgrounding systems on performance and profit through harvest are not available. Therefore, this study compared a low-input pasture backgrounding system to a high-input drylot system of the same duration (42 to 45 d) to evaluate performance and profit during the backgrounding and finishing phases.

Materials and Methods

Over 3 yr, 250 calves (236 kg avg. initial BW; 133 steers and 117 heifers) were used to compare two backgrounding systems at the New Mexico State University Corona Range Livestock Research Center (**CRLRC**) located 13 km east of Corona, NM (avg. elevation = 2000 m; avg. annual precipitation = 380 mm). All animal handling and experimental procedures were in accordance with guidelines established by the New Mexico State University Animal Care and Use Committee. Calves originated from the CRLRC spring-calving British cross cowherd, and were born in February, March, or April.

Steer calves were castrated at branding (early May). At branding and 16 to 21 d prior to weaning all calves were vaccinated against bovine respiratory syncytial virus, infectious bovine rhinotracheitis, bovine viral diarrhea, and parainfluenza 3, and were administered a 7-way clostridial vaccine.

Backgrounding Phase. All BW were measured unshrunk, and a 4% pencil shrink was applied. At weaning (d 0), calves were weighed, assigned a market price, and randomly assigned to one of two treatments: 1) high-input drylot backgrounding system (**DLOT**) or 2) low-input pasture backgrounding system (**PAST**). Each treatment was replicated within year. Following vaccination and measuring weaning BW, calves were transported to their

respective pen/pasture. The same two native range pastures (minimum 4.1 ha/hd) and drylot pens (minimum 17.8 m^2/hd) were used each year. Free choice access to water and a loose mineral mix (38% NaCl, 12% Ca, 8% P, 2% K, 2% Mg, 2500 ppm Mn, 1000 ppm Cu, 1000 ppm Zn, 13 ppm Se, and 125,000 IU/kg Vitamin A; Hi-Pro Feeds, Friona, TX) was provided.

Native range pastures were not grazed during the summer growing season prior to stocking for backgrounding. Average CP, NDF, and ADF content (% DM) of forage samples collected from each pasture at the end of the backgrounding period was 8.3, 67.2, and 42.5, respectively. Forage availability exceeded cattle needs during all three years.

On d 0 - 6 following weaning, PAST calves were trained to hand-delivery of protein supplement by enticement with alfalfa hay (max. 0.75 kg/hd), plus protein supplementation with a 32% CP range cube fed at 0.57 kg/d. Beginning d 7, protein supplement delivery frequency was reduced to 3×/week. Calves were fed between 1000 and 1200 h each day feed was delivered.

On d 0, DLOT calves were fed 4.54 kg/hd alfalfa hay (92.4% DM; 17.3% CP, 45.8% NDF, and 38.1% ADF of DM). Beginning d 1, DLOT calves were offered 2.25 kg/hd of a corn/wheat midds-based backgrounding pellet (Table 1), plus alfalfa hay. Pellets and hay were offered in feed troughs (300 × 60 cm) allowing access from both sides. Linear trough space exceeded 30 cm/hd. Pellet intake was increased by 0.68 kg/hd when all troughs in a pen were completely empty at 0700, and pellet offering was restricted to 3.0% BW/d. Pellets were increased to 4.54 kg/hd by d 7. Hay was reduced to 0.68 to 1.13 $kg \cdot hd^{-1} \cdot d^{-1}$ by d 13, and maintained at that amount throughout the backgrounding phase.

All calves were weighed on a single day each year near the mid-point (d 19 or 21) and at the end of the backgrounding phase (d 42 to 45). The day final backgrounding BW was measured marked the end of the backgrounding phase. The backgrounding treatment period was 45 d in yr 1, 44 d in yr 2, and 42 d in yr 3. All steers were place in a common drylot pen and fed alfalfa hay to appetite for 5 to 9 d prior to shipping. Therefore, steers remained at the CRLRC for 46 to 54 d post-weaning.

Each year, weaning price and final backgrounding price was individually applied to each calf based upon prices in the New Mexico Weekly Weighted Average Feeder Cattle Report (USDA CV LS795) for the week of the beginning and end of the backgrounding phase. No premium for backgrounding was applied. Purchased feed cost varied by year, with delivered price/ton ranging from $204 to $213 for backgrounding pellets, $244 to $262 for range cubes, and $130 to $165 for alfalfa hay. Feed costs were applied as weight of feed delivered to each pasture/pen times unit feed cost. A grazing fee was charged to PAST calves at 0.132\cdot hd^{-1} \cdot d^{-1}$. Time spent delivering feed to calves was recorded for each pasture/pen to calculate labor cost, which was charged at $6.00/h.

Finishing Phase. Heifers were not included in the finishing phase. Steers were fed at a commercial feedlot (Double A Feeders, Clayton, NM) where they were entered into the New Mexico Ranch to Rail Program. Final BW and price of steers from the backgrounding phase was used as the initial BW and price of steers for the finishing phase.

Steers were received at the feedlot on a single day in mid-November each year, and were managed according to standard procedures in place at the feedlot at the time of finishing. Steers were diagnosed as morbid based on subjective visual appraisal by feedlot staff. Upon arrival, all steers were administered a growth-promoting implant and preventive pharmaceuticals based on the judgment of feedlot management at receiving. Steers were housed in pens of varying sizes, but all pens allowed more than 9.3 m^2/hd and 40 cm/hd linear bunk space.

Steers were processed for secondary application of growth-promoting implants in late January or early February, thus days on feed (**DOF**) to secondary processing date ranged from 74 to 94. At that time, steers were weighed (interim BW) and individually assigned to marketing groups using the ultrasound technology and computer software of the Cattle Performance Enhancement Co. (CPEC, Oakley, KS). Once the optimum market date for each steer was estimated, steers were assigned to marketing groups harvested between March and early July. Cattle were harvested at a commercial facility (National Packing Co., Liberal, KS). Hot carcass weight (**HCW**) was collected at slaughter, and longissimus muscle area, fat thickness, calculated yield grade, and marbling score were evaluated by an independent data collection service (Cattle Trail LLC, Johnson, KS) following chilling.

At the completion of finishing, steers were sold on an individual carcass basis through the National Beef Grid. Premiums and discounts were applied using HCW and USDA quality and yield grade.

Statistical Analysis. The effect of backgrounding system on performance, carcass, and financial data was evaluated using the MIXED procedure of SAS (SAS Inst. Inc., Cary, NC) with pen/pasture as the experimental unit. The model included replicate, year, and treatment. Chi-square in the FREQ procedure of SAS (SAS Inst. Inc., Cary, NC) was utilized to evaluate the categorical distribution of USDA quality grade and yield grade, morbidity, and death loss.

Results and Discussion

Backgrounding Phase. There were no differences ($P \geq 0.56$) in weaning BW, price, or value between PAST and DLOT (Table 2). Between d 0 and interim backgrounding BW, PAST had higher ADG ($P < 0.01$). This likely occurred because PAST calves experienced less environmental and nutritional change following weaning. From interim BW to the end of backgrounding, DLOT calves had greater ADG ($P < 0.01$), which was expected because the preconditioning ration provided DLOT calves a higher plane of nutrition than pasture forage supplied the PAST calves. Overall, DLOT calves had greater ADG ($P < 0.01$) during backgrounding, resulting in heavier final backgrounding BW ($P = 0.03$) for DLOT calves.

Final backgrounding price was higher for the PAST calves ($P = 0.04$) because they were lighter, but the final value was $6.90/hd less ($P = 0.03$) for PAST than DLOT calves. The higher value of DLOT calves was offset by a

$52.76 difference ($P < 0.01$) in total costs. Feed and labor cost were 5-fold and 2-fold greater ($P < 0.01$), respectively, for DLOT than PAST. Consequently, net income during backgrounding was $44.59 greater ($P < 0.01$) for PAST calves. These results support the findings of St. Louis et al. (2003) that showed lower feed cost and greater net return ($43.17) for a 30-day ryegrass pasture backgrounding program compared to a 30-day drylot backgrounding program. A final price premium of $5.00/45.4 kg would have been required for the DLOT system to be profitable; however, the PAST backgrounding system was profitable without a premium.

Finishing Phase. Initial BW, price, and value of DLOT and PAST steers were similar ($P \geq 0.37$; Table 3), even though BW of steers and heifers combined collected at the end of backgrounding was different. The PAST steers had greater ADG ($P < 0.01$) through interim BW, but subsequent ADG was similar ($P = 0.68$). Higher ADG to interim BW among PAST steers supports the findings of Choat et al. (2003) who reported greater feedlot ADG from 15 to 70 DOF among steers previously wintered on native range with supplement compared to contemporary steers wintered on irrigated wheat pasture that entered the feedlot heavier. However, there were no differences ($P \geq 0.12$) in interim BW, total ADG, estimated final BW, DOF, calculated yield grade, or any measured carcass characteristics in this study. Additionally, the distributions of USDA quality and yield grade were similar ($P \geq 0.30$; data not shown).

The proportion of steers treated for sickness and medicine cost/hd were similar ($P \geq 0.14$); however, DLOT steers had greater death loss ($P = 0.02$). Even though morbidity was not different, the 7.6 percentage unit difference in death loss (all due to BRD complex) indicates that DLOT steers likely experienced some degree of suppressed immune function as compared to PAST steers.

The DLOT steers had lower feed cost ($P = 0.04$), but average price received for carcasses sold was not different ($P = 0.11$). Gross income was $111 greater ($P < 0.01$) for PAST steers because they had no mortalities and numerically higher carcass weight and carcass price. Consequently, PAST steers garnered $103/hd more net income ($P < 0.01$) than DLOT steers. To achieve the same finishing phase net income for DLOT and PAST steers, price of DLOT steers at the beginning of the finishing phase would need to be reduced by $17/45.4 kg.

Implications

Backgrounding programs that conform to "VAC-45" marketing requirements can vary in intensity and cost. However, the additional gain achieved with higher-input systems may not offset higher costs; and stress associated with dietary change and confinement immediately following weaning may impact subsequent death loss. Low-input pasture backgrounding systems can be more profitable than drylot systems of the same duration during the backgrounding and finishing phases.

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Table 1. Drylot backgrounding pellet[1]

Ingredient	% of Diet (as-fed)
Corn, ground	34.7
Wheat middlings	32.0
Soybean hulls	15.0
Cottonseed meal	5.8
Cottonseed hulls	5.0
Molasses	5.0
Calcium carbonate	1.5
Potassium Chloride	0.5
Salt, vitamins, trace minerals[a]	0.5
DM analysis	
CP, %	15.8
NE_m, Mcal/kg	1.83
NE_g, Mcal/kg	1.10

[a]Includes Rumensin-80 at 0.0125 %.

TABLE 2. Backgrounding performance and profitability of mixed steers and heifers backgrounded in a drylot or pasture

	Backgrounding System			
Item	**Drylot**	**Pasture**	**SE**	***P***
Number of head	125	125		
Performance[1]				
Weaning BW, kg	235	236	1.1	0.56
Interim BW, kg[2]	244	251	1.3	<0.01
Final BW, kg[3]	263	257	1.3	0.03
ADG, d 0 to Interim, kg/d	0.43	0.71	0.03	<0.01
ADG, Interim to Final kg/d	0.84	0.30	0.04	<0.01
Total ADG, kg/d	0.64	0.50	0.02	<0.01
Financial				
Weaning Price, $/45.4 kg	109.31	109.08	0.34	0.65
Weaning Value, $	564.88	566.16	1.96	0.66
Final Price, $/45.4 kg	104.39	105.35	0.27	0.04
Final Value, $	602.79	595.89	1.72	0.03
Feed Cost, $	60.84	11.91	0.09	<0.01
Drylot Pellet	54.52	0		---
Hay[4]	6.31	0.61		---
Range Cube[5]	0	5.55		---
Grazing Fee[6]	0	5.70		---
Labor[7]	5.93	2.10	0.04	<0.01
Total Cost, $	66.77	14.01	0.10	<0.01
Net Income, $	(28.87)	15.72	1.71	<0.01

[1]A 4% pencil shrink was applied to all BW.
[2]Interim BW collected d 21 in yr 1 and 3, and d 19 in yr 2.
[3]Final BW collected on d 45, 44, and 42 during yr 1, 2, and 3, respectively.
[4]Hay fed to PAST steers during initial week to train steers to range cubes.
[5]Range cubes (32% CP) provided to PAST steers at 0.57 kg/d; delivered 3×/wk.
[6]Grazing fee charged to PAST steers $0.132·hd^{-1}·d^{-1}.
[7]Labor cost based on $6.00/h.

TABLE 3. Feedlot performance, carcass characteristics, and profitability of steers backgrounded in a drylot or pasture

	Backgrounding System			
Item	**Drylot**	**Pasture**	**SE**	***P***
Number of steers	66	67		
Performance				
Initial BW, kg[1]	274	270	1.7	0.27
Interim BW, kg[2]	361	363	3.1	0.78
Final BW, kg[3]	493	502	6.2	0.34
Days on Feed	168	173	2.9	0.26
ADG, d 0 to Interim, kg/d	1.08	1.27	0.03	<0.01
ADG, Interim to Harvest, kg/d	1.50	1.51	0.02	0.68
Total ADG, kg/d	1.33	1.35	0.01	0.32
% Treated for sickness[4]	47.6	34.3		0.14
% Death loss[4]	7.6	0.0		0.02
Carcass				
Hot Carcass Weight, kg	309.9	316.6	4.1	0.29
Fat Thickness, cm	1.35	1.39	0.04	0.59
Longissimus Area, cm^2	80.8	79.6	1.3	0.54
Marbling Score[5]	472	481	6.5	0.35
Calculated Yield Grade	2.90	3.06	0.06	0.12
Financial				
Initial Price, $/45.4 kg[1]	105.94	106.65	0.53	0.38
Initial Value, $	636.36	631.78	3.02	0.32
Medicine cost, $	28.32	23.01	3.54	0.33
Feed Cost, $	220.53	238.18	4.68	0.04
Total Cost, $	932.60	941.40	7.90	0.46
Carcass Price, $/45.4 kg	133.48	135.67	0.82	0.11
Gross Income, $	834.27	945.64	15.54	<0.01
Net Income, $	(98.33)	4.68	10.64	<0.01

[1]Initial BW and Price = Final backgrounding BW and Price of steers; 4% pencil shrink applied to BW.
[2]Interim BW occurred at 74, 77, and 94 DOF during yr 1, 2, and 3, respectively; 4% pencil shrink applied.
[3]Final BW is an estimate calculated as carcass weight ÷ average dressing % of marketing group.
[4]Chi-square analysis.
[5]Marbling score: Small 00 = 500.