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Effects of Weaning Date and Retained Ownership on Cattle Performance and Forage Disappearance in Spring Calving Beef Systems

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ABSTRACT: Weaning calves early from spring calving cows can have multiple impacts on beef systems. The objective of this two-year three-state study was to evaluate the effects of mid-August (AW) versus early-November weaning (NW) on cow and calf production traits, forage utilization, and economic return. Five hundred-five cow-calf pairs from the NDSU-Dickinson Research Extension Center (**DREC**; n=176), SDSU-Antelope Research Station (**ANT**; n=136) and the University of Wyoming Beef Unit (**UW**; n=193) were stratified by BW and body condition score (BCS) and assigned to either **AW** (August Wean - weaned at approx. 140 d of age) or **NW** (November Wean - weaned at approx. 215 d of age). Cows grazed native range between the two weaning dates. At AW date, a subset of cows from each treatment at DREC were randomly assigned to six 20-ha. pastures (n=3/treatment) to measure biomass disappearance between AW and NW dates. Steer calves at ANT and DREC were weaned and backgrounded 7.4 wk and finished in a commercial feed yard. Steers at UW were backgrounded 42 d and finished on site. Treatment by location interactions were detected for cow BW change, BCS change, calf ADG, and gain:feed. At each location, AW cows lost less weight (P<0.01) than NW cows. Similarly, cow BCS change was improved (P<0.01) for AW vs. NW at DREC (0.91 and -0.55), and ANT (0.34 and -0.02). At UW BCS change did not differ (0.22 and 0.47). Forage biomass disappearance, between weaning dates, was reduced by 27.7% (P=0.15) when calves were AW. AW steers at DREC had higher (P<0.01) ADG during backgrounding than NW; AW steers at DREC and ANT were more feed efficient (P<.01). During finishing, AW steers grew slower (P<.01), but were more efficient (P<.01). On average, at all locations, NW steers entered the feedlot heavier (P<0.01) and required less days (P<0.01) on feed to harvest; however, AW steers were 46 days younger at harvest. Weaning regime lowered feedlot cost/calf and regression analysis of carcass characteristics and weaning treatment suggests a positive effect on annualized rate of return. Weaning spring-born calves early reduced forage utilization, improved cow BW and BCS, improved backgrounding performance and finishing FE, reduced the number of days from birth to harvest, yielded similar finishing performance, and increased annualized rate of return.
Key Words: Early Weaning, Cow Performance, Forage Disappearance, Annualized Return

Introduction

Profit margins in cow/calf production are slim due to high production costs (Taylor and Field, 1995) and lost opportunity to capture value from marketable ranch products (NASS, 1999). Development of systems that lower production costs while adding value to calves would be beneficial to sustaining and improving rural communities in the drier regions of the Western United States. The majority of costs in cow/calf businesses are for harvested feed (Taylor and Field, 1995). Systems that rely more on grazing and less on harvested and purchased feedstuffs have a higher potential to be profitable (Adams et al., 1994).

Body condition of cows at time of calving has been shown to influence subsequent pregnancy rates (Richards et al., 1986), and the body condition score of spring calving cows grazing winter range is influenced by body condition score in the fall (Adams et al., 1987). Lamb et al. (1997) showed spring calving cows grazing native range lost 0.4 of a body condition score if nursing a calf from September to November, whereas cows that had their calves weaned in September maintained condition from September to November. Management of body condition score by weaning early can improve subsequent reproduction and/or reduce the

requirements for non-grazed feed inputs that would be required for thin cows.

The Beef Cattle NRC (1996) predicts a spring calving cow lactating in August will have a 9% greater daily intake of range forage than a dry cow. Weaning calves early may allow standing forage to be spared, reducing late season supplemental feed requirements.

Performance of early-weaned calves during the backgrounding and finishing phase is important. Research has shown calves weaned at 100 to 150 days of age were heavier and younger at slaughter than normal weaned (weaned at 225-250 days) calves (Peterson et al., 1987). Meyers et al. (1999) reported that 40% more early weaned steers graded average choice or higher than their normal weaned counterparts. Carcass quality improvement in early weaned calves managed for maximum economic yield parallels value-based marketing trends (Cattle-Fax, 2003).

The objective of this multi-state investigation is to evaluate the impact of early weaning and retained ownership decisions on the relationship between weaning date and herbage availability, cattle performance, and economic returns.

Materials and Methods

Over a two-year period, cow herds from the SDSU Antelope Range and Livestock Research Station (136 cows), the NDSU Dickinson Research Extension Center (176 cows) and the UW Beef Unit (193 cows) were used in the study. At each location, spring-born calves were weaned from cows at approximately 140 days (mid-August, **AW**) or 215 days of age (early-November, **NW**). Cow body weight and body condition score changes were monitored between the August and November weaning dates to determine the impacts of weaning on cow performance. During the second year of the study, the cow herd at the Antelope Station became compromised with persistently infected BVD virus and did not participate.

Calf weaning weights were recorded at each location. The steer calves from Antelope Station (Yr. 1) and Dickinson were transported immediately after weaning to the NDSU Hettinger Research Extension Center for backgrounding. The steers were backgrounded an average 52 days, using a diet consisting of locally grown forage and a commercial co-product pellet. Two-to-four weeks prior to each weaning date, calves were immunized against calfhood diseases and were administered a booster vaccination at weaning.

Following the 7.4 week backgrounding phase, Antelope and Dickinson steers were transported to Decatur County Feed Yard, Oberlin, Kansas, for finishing using electronic cattle management and fat depth end point of 10 mm. Steers were slaughtered at a commercial plant and carcass data were collected.

Steers and heifers at the UW were managed in a similar manner, but backgrounded at the UW, Laramie, Wyoming, for an average 50.1 days. Following backgrounding, the cattle were finished at the UW Beef Unit. Harvest endpoint was determined based on ultrasound backfat depth and percent intramuscular fat measured between the 12^{th} and 13^{th} ribs. Cattle were slaughtered at a commercial plant and carcass data were collected.

Grazing, backgrounding, and finishing performance were analyzed by ANOVA using a PROC GLM of SAS (SAS Inst. Inc., Cary, NC). Since treatment by location interactions were identified, treatment means were compared within location.

Vegetation samples were collected at the Dickinson to determine the magnitude of biomass disappearance among cows suckling calves from August to November (NW; n=3 pasture groups) versus dry cows grazing from August to November (AW; n=3 pasture groups). A 240 ha pasture was subdivided into 12 20-ha pastures in a wagon-wheel configuration with central watering. A subset of cattle from each treatment at the Dickinson, were rotated into six previously ungrazed pastures at the August weaning date (3 pastures/treatment; 8 cows/pasture).

Clipped forage samples were obtained in the six pastures just prior to the AW date and again at the end of grazing when all cows were removed from the pastures in November. Samples (0.25 m^2) were cut to ground level, using battery-powered electric shears. Samples were oven dried. Forage disappearance was calculated as the difference between pre- and post-grazing estimates.

Analysis of variance was used to evaluate weaning treatment effect on biomass disappearance.

Dickinson steers (n = 55) were used to evaluate the economics of early weaning on the decision to retain ownership from feedlot placement to final harvest. Analysis of variance was used to separate

means for feedlot performance, carcass measurements, and effect of calf age. Annualized rate of return from feedlot placement to harvest was determined using regression analysis. The annualized rate of return is regressed on carcass characteristics at harvest and a weaning effect variable.

Results and Discussion

In this multi-state weaning date study, early weaning improved cow body weight ($P<0.01$) and ending body condition score ($P<0.01$) at each location (Table 1). Body condition score change from AW to NW was improved ($P < 0.01$) for Antelope and Dickinson cows but did not differ for UW cows ($P > 0.10$).

The AW system utilized 72% of the available biomass when compared to the NW system. Forage disappearance for cows that had calves weaned early was estimated to be 803 kg per ha, whereas forage disappearance among cows that continued to nurse their calves for an additional 75 days was estimated to be 1109 kg per ha ($P = 0.15$). The difference in forage utilization was attributed to calf removal and less trampling.

Weaning weights for NW steers at Antelope and Dickinson were heavier ($P < 0.01$), but at the UW weaning weight did not differ ($P = 0.29$).

Postweaning backgrounding performance for Antelope, Dickinson, and UW steers is shown in Table 2. Normally weaned steers were heavier at the end of the backgrounding phase ($P<0.01$) at each location. Average daily gain was greater for AW steers at Dickinson, but not at the other locations ($P< 0.01$). Average daily feed intake was greater for NW steers ($P<0.01$) at Dickinson and Antelope, but did not differ at UW. Early weaned steers were more efficient ($P<0.01$) at Antelope and Dickinson, but did not differ at the UW ($P =0 .99$).

Finishing performance for the two management systems is shown in Table 3. Normally weaned steers were an average 87 kg heavier on arrival ($P<0.01$) for all locations and were heavier at harvest for the Dickinson steers. However, harvest weight for Antelope and UW steers did not differ ($P > 0.10$). On average, and overall, AW steers was 32 days younger ($P < 0.01$) at harvest than NW steers. On average, when backgrounding and finishing days are combined, AW steers required 51 more days on feed in the feedlot ($P<0.01$). August weaned steers were more feed efficient ($P < 0.01$) at Antelope and Dickinson, but did not differ at the UW ($P = .22$).

Hot carcass weight did not differ for Antelope and UW steers, however, Dickinson NW steer carcasses were heavier ($P <0.01$). Rib-eye area was greater for Dickinson and UW steers ($P < 0.05$). Fat depth at Dickinson and Antelope did not differ, but was greater ($P < 0.01$) for AW steers at the UW. Yield grade did not differ at Dickinson and Antelope, but was greater ($P < 0.01$) for AW steers at UW. Quality grade was improved ($P < 0.01$) at Dickinson and UW, but did not differ at Antelope ($P = 0.69$). The number of steers grading Choice was low for Dickinson and Antelope steers suggesting the steers needed to be fed longer.

August weaned steers had a higher level of production efficiency and lower average cost of production, but AW steers, on average, had a lower return on investment. Regression analysis; however, suggests that, when other finishing variables are held constant, early weaning increases annualized net return by 29% ($P = 0.01$) ($R^2 = 0.68$).

Implications

These data suggest that weaning spring-born calves 75 days early (140 versus 215 days) can reduce late summer native forage utilization, improve cow body condition, improve calf backgrounding performance, and improve annualized net return.

Literature Cited

Adams, D. C., R. T. Clark, S. A. Coady, J. B. Lamb, and M. K. Nielsen. 1994. Extended grazing systems for improving economic returns from Nebraska sandhills cow/calf operations. J. Range Manage. 47:258-263.

Adams, D. C., R. E. Short, and B. W. Knapp. 1987. Body size and body condition effects on performance and behavior of grazing beef cows. Nutr. Rep. Int. 35:269-277.

Cattle Fax. 2003. Developing a profitable marketing plan in today's marketplace. NCBA Cattlemen's College, Nashville, TN.

Lamb, J. B., D. C. Adam, T. J. Klopfenstein, W. W. Stroup, and G. P. Lardy. 1997. Range or meadow regrowth and weaning effects on 2-year-old cows. J. Range Manage. 50:16-19.

Meyers, S. E., D. B. Faulkner, F. A. Ireland, L. L. Berger, and D. F. Parrett. 1999. Production systems comparing early weaning to normal weaning with or without creep feeding for beef steers. J. Anim. Sci. 77:300-310.

National Agriculture Statistics Sevice. 1999. 1997 Census of Agriculture. USDA-NASS. Volume 1, Geographic Area Series, 1A, 1B, 1C, CD-ROM set.

NRC. 1996. Nutrient Requirements of Beef Cattle. National Academy Press, Washington, D. C.

Peterson, G. A., T. B. Turner, K. M. Irvin, M. E. Davis, H. W. Newland and W. R. Harvey. 1987. Cow and calf performance and economic considerations of early weaning of fall-born beef calves. J. Anim. Sci. 64:15-22.

Richards, M. W., J. C. Spitzer, and M. B. Warner. 1986. Effect of varying levels of postpartum nutrition and body condition at calving on subsequent reproductive performance in beef cattle. J. Anim. Sci. 62:300-306.

Taylor, R. E., and T. G. Field. 1995. Achieving cow/calf profitability through low-cost production. Proc. The Range Beef Cow Symposium XIV. Gering, Nebraska.

Table 1. Body weight and condition score change among early and normally weaned cows located at the NDSU-Dickinson REC, SDSU-Antelope Station and UW-Beef Unit (2003; 2004).

	NDSU Dickinson REC		SDSU Antelope Station[a]		UW Beef Unit	
	Weaning Period		Weaning Period		Weaning Period	
	Early	Normal	Early	Normal	Early	Normal
August Cow Wt., kg[z]	589	606	609	603	562	567
November Cow Wt., kg[x]	596	544	624	582	615	579
Cow Wt. Change, kg[x]	7	-62	15	-21	50	12
August BCS[z]	5.18	5.26	5.63	5.65	5.53	5.60
November BCS[x]	6.09	4.71	5.97	5.63	5.75	5.14
BCS Change[y]	0.91	-0.55	0.34	-0.02	0.22	-0.46
August Calf Wt., kg[z]	180	183	185	183	212	211
November Calf Wt., kg	-	212	-	264.	-	297

[a]Antelope Station means are for year one only.
[x]Treatments at each location differ ($P<.01$)
[y]Treatments at Dickinson and Antelope locations differ ($P < 0.01$)
[z]Treatments at all locations did not differ ($P > 0.10$)

Table 2. Summary of backgrounding performance for early and normally weaned steers at the NDSU-Dickinson REC, SDSU-Antelope Station and UW-Beef Unit (2003; 2004)

	NDSU Dickinson REC		SDSU Antelope Station[a]		UW Beef Unit	
	Early	Normal	Early	Normal	Early	Normal
No. Steers	68	66	36	35	46	46
Days on Feed	52.5	52.5	49	54	50	51.3
Start Wt., kg[x]	187	262	188	272	221	311
End Wt., kg[y]	269	337	258	347	273	372
ADG, kg[z]	1.56	1.43	1.43	1.39	1.03	1.21
DM Intake, kg[x]	7.57	9.62	7.28	8.96	6.11	8.35
F:G[x]	4.85	6.72	5.09	6.45	5.93	6.90

[a]Antelope Station means are for year one only.
[x]Treatments at Dickinson and Antelope locations differ (P<.01)
[y]Treatments at Dickinson and Antelope locations differ (P<.01); UW differs (P < 0.10)
[z]Treatments at Dickinson differ (P<.01)

Table 3. Feedlot finishing performance and carcass measurements. (Decatur County Feed Yard, Oberlin, Kansas, and UW Livestock Center, Laramie, Wyoming) (2003; 2004)

	NDSU Dickinson REC		SDSU Antelope Station[b]		UW Beef Unit	
	Early[a]	Normal	Early	Normal	Early	Normal
Receiving Wt., kg[u]	260	335	255	338	269	372
Harvest Wt., kg[x]	504	546	504	533	534	549
Kill Age[u]	366	421	371	405	414	421
Days at Feed Yard, da[u]	167	137	183	133	198	117
ADG, kg[y]	1.49	1.55	1.36	1.47	1.34	1.53
F:G[w]	5.13	5.86	5.18	5.86	7.55	7.11
G:F, kg/100kg[w]	19.50	17.07	19.31	17.06	13.24	14.06
Hot Carcass Wt., kg[x]	318	327	319	329	330	336
Rib-eye Area, sq. cm.[y]	79.4	82.5	78.4	80.1	76.8	81.9
Fat Depth, mm.[w]	.12.07	12.18	.53	.48	12.7	9.65
Yield Grade,[w]	2.57	2.64	2.68	2.7	2.71	2.34
Quality Grade[y]	3.29	4.91	3.00	2.8		
Marbling Score[z]					447	408
Percent Choice, %	33.0	40.0	13.9	23.5	67.7	32.4

[a]Two steers died of bloat during finishing.
[b]Antelope Station means are for year one only.
[u]Treatments at each location differ (P<.01)
[y]Treatments at Dickinson differ (P < 0.05); at Antelope and UW locations differ (P < 0.01)
[w]Treatments at UW Beef Unit differ (P<.10)
[x]Treatments differ at Dickinson location (P < 0.01)
[y]Treatments at Dickinson and UW differ (P < 0.05)
[z]Treatments at the UW Beef Unit differ (P<.05)