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Determining the Best Time to Wean

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DETERMINING THE BEST TIME TO WEAN

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INTRODUCTION

Production analysis and survey data suggests that the greatest contribution to annual cow production costs in the Northern Plains is harvested and purchased feed (Taylor and Field, 1995). Harvested hay is not only expensive to purchase, but it is expensive to put up and feed. Dunn (2002) showed that interest and depreciation on capital (required to handle hay) were major factors limiting profitability of ranching operations. 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). Low input systems, or systems that reduce hay feeding, may add profitability to producers. Systems that rely more on grazing and less on harvested and purchased feedstuffs have a higher potential to be profitable (Adams et al., 1994).

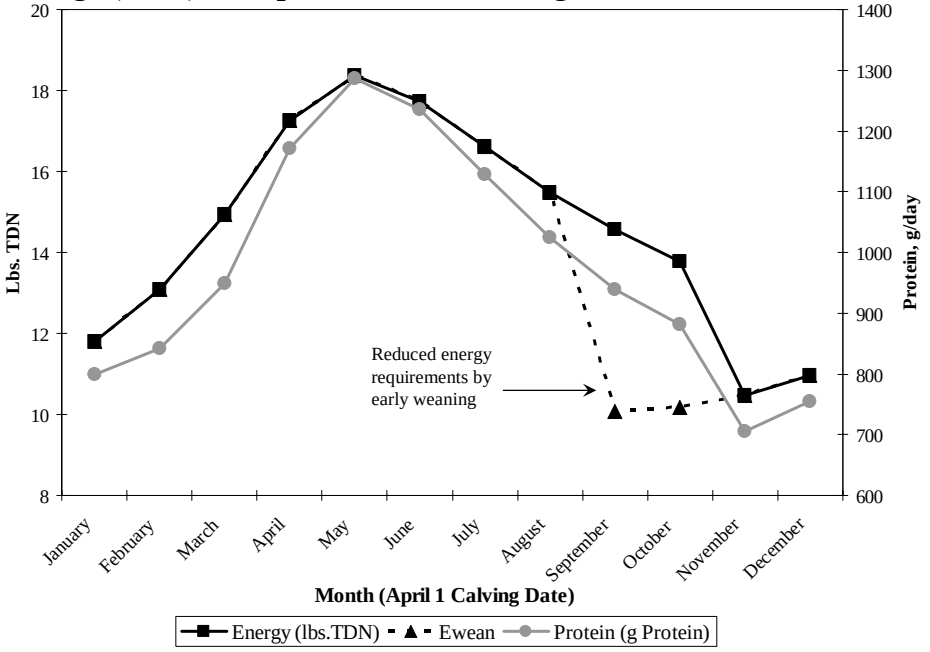
Early weaning practices may be beneficial when forage supplies are low and supplemental feed is costly. Work done by Meyers et al. (1999a, b) and Fluharty et al. (2000) showed early-weaned steer calves when compared to those calves weaned at traditional ages may have comparable average daily gains and improved feed efficiency during the postweaning period.

While it is clear that reduced-input systems have a greater potential for positive returns, management of cattle becomes increasingly important on these low- or reduced-input systems. Management of calving dates, weaning dates, supplementation programs and monitoring and managing cow condition at critical times throughout the production year**,** are key elements in achieving good performance in the herd.

NUTRIENT REQUIREMENTS OF THE COW

In general, the cow's highest energy and protein requirements are during early lactation. (NRC 1996, Figure 1). As lactation continues, energy requirements are reduced as milk production tapers back, and the cow's lowest energy requirements occur just after weaning, when the cow no longer has any lactation requirement, and the nutrient demands of the developing fetus are relatively low. Low input systems that utilize later calving dates typically adjust time of calving in an attempt to better match their own unique forage resources, both quantity and quality, with the nutrient requirements of the cow. It is important to remember that each operation has their own unique set of forage, labor and pasture resources that determine their optimum calving date. Later calving dates also allow the herd additional time to recover weight and body condition prior to calving. Weaning early, at approximately 4-5 months, as depicted in Figure 1, can also dramatically reduce the cow's energy requirements, also impacting her forage requirements.

Figure 1. Daily energy and protein requirements for a 1200 lb April calving cow with average (20 lb) milk production, with August vs. late October weaning date.

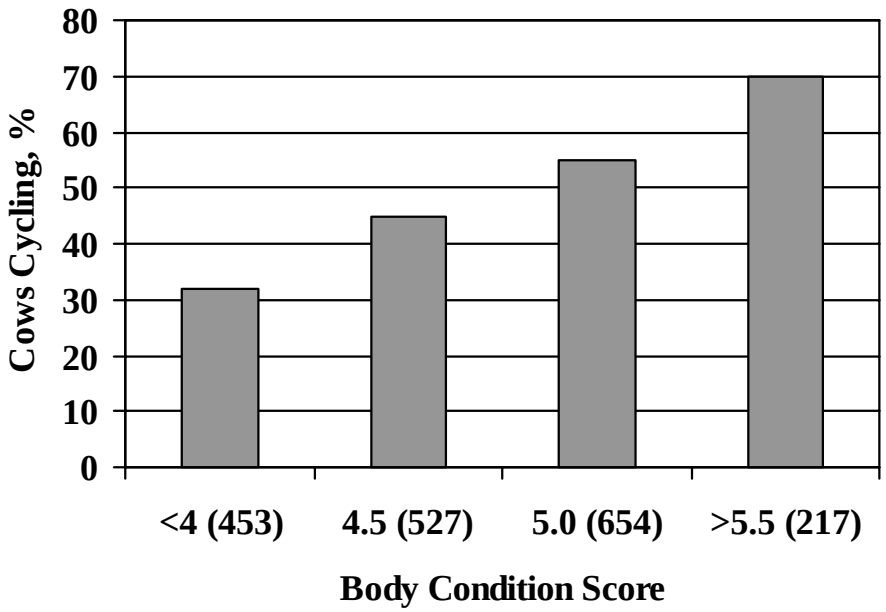


IMPORTANCE OF COW BODY CONDITION

Cows that are thin at calving are less likely to cycle (Stevenson, 2000; Figure 2) and are at higher risk for reproductive failure (Pruitt, 1988). Often we will evaluate body condition after the fact – as a way to explain poor breed-up, lower A.I. success, etc. It might be important to think about managing cow condition in the spring, when most producers are looking objectively at their cows, considering turning in bulls, or guessing their success at A.I. Evaluating and managing body condition during the summer and fall, when there are opportunities to improve condition through stocking rates, strategic supplementation, and weaning dates, is an important management tool to ultimately reduce winter feed requirements and overall feed costs to the cow/calf enterprise.

As has been discussed countless times, body condition scoring may sound technical, but it isn't. It is safe to assume that all cattle producers mentally condition score our cows as they come to the bunk, or as they are checking calves and putting out mineral. Body Condition scoring (BCS) is a quick way to estimate the cow's energy reserves, both protein and energy. Improved condition, in the form of increased adipose and muscle mass, is a "battery" of potential energy to be used during late gestation and early lactation for body temperature regulation, milk production, and maintenance/repair of the reproductive tract prior to breeding. Cows that are thin, or BCS 4's, are characterized as appearing "sharp" across the hooks and pins, and having several visible ribs. Cows in adequate condition, or BCS 5, are characterized by a smooth topline and fleshiness or "cover" over the ribs. Adult cows are typically managed to have an average BCS of 5 at calving to improve herd reproductive performance (discussed later). Most recommendations suggest that two- and three-year old cows should be managed to achieve a BCS of 5.5 or 6 at calving.

Figure 2. Effect of body condition score on percentage of cows cycling (Stevenson, 2000).



Effects of Cow composition on calving and rebreeding success. Cows in low body condition, especially 2 and 3 yr old cows, not only lose external fat; they sacrifice a significant amount of muscle as well. A Wyoming study reported by Lake et al., (2005) illustrates the effect of weight loss on body composition. Two groups of 3 yr old cows from the same herd were managed to have either a BCS of 4 (thin) or BCS of 6 (adequate) at calving. These two groups were weighed and ultrasounded for 60 days after calving. As expected, the BCS 4 cows weighed less (1038 vs 1290 lb), and had less backfat (.05 vs. .21 inches; Figure 3), but what was surprising was the difference in ribeye area. The thin cows averaged 6.8 in^2, while the BCS 6 cows averaged 10.2 in^2, a difference of over 3 square inches (Figure 4). Loss of condition not only impacts reproductive performance, but can also have a significant effect on calving difficulty and calf health. Earlier studies (Kroker and Cummins, 1979; Ridder et al., 1991) have demonstrated that thin cows have more calving difficulties and longer labors. In these studies, the thinner cows also required more time to stand after calving, potentially affecting colostrum intake of the calf as well.

As stated earlier, body condition of young (1st and 2nd calf) cows is important to maintain reproductive performance (Spitzer et al., 1995). While BCS of mature cows can fluctuate with minimal effects on reproductive performance, maintaining a BCS of 5.5 or higher is critical for young cows. Primiparous cows are challenged with the additional requirements for continued growth during their first lactation. This becomes increasingly important during the fall and winter months, when the young cow must compete for forage and hay with mature cows. Thin (BCS 4) first calf heifers are at a large disadvantage, because in addition to requirements for lactation and growth, they must also regain condition prior to breeding. Figure 5 illustrates the increased energy requirements of young cows in

adequate (BCS 5.5) as well as thin (BCS 4) condition.

Figure 3. Backfat thickness 0-60 days postpartum of 3 yr old cows from the same herd, managed to attain BCS 4 and 6 at calving.

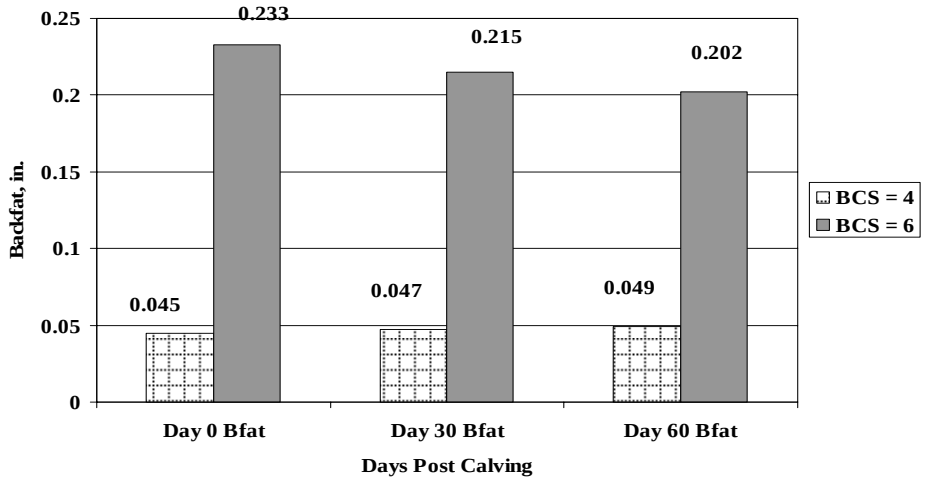


Figure 4. Longissimus Dorsi (Ribeye) Area 0-60 days postpartum of 3 yr old cows from the same herd, managed to attain BCS 4 and 6 at calving.

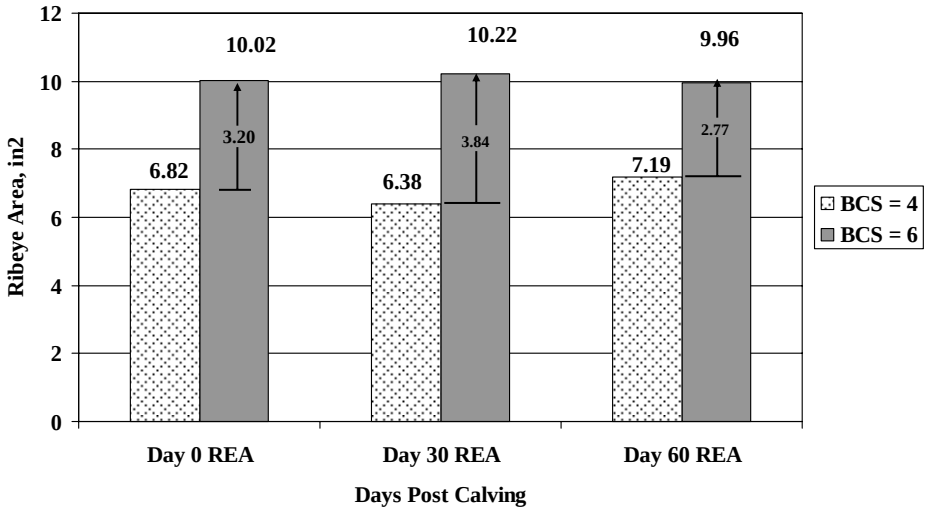
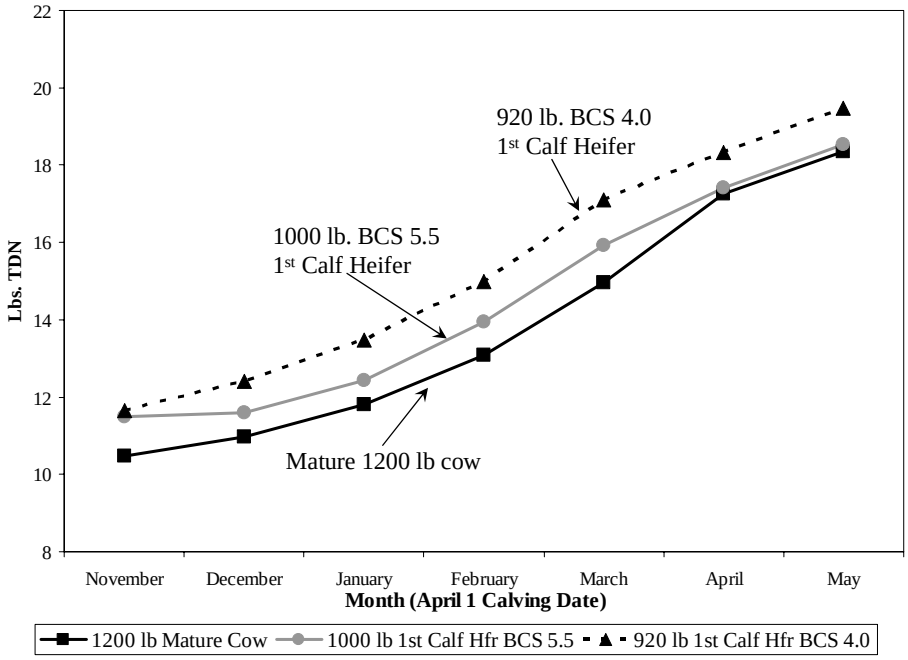


Figure 5. Energy requirements (NRC, 1984) of April-calving mature cows vs. heifers from November-May.



The graph depicts a 1200 lb cow's energy requirements (lb. TDN) from weaning (Nov.) to just prior to breeding. Also depicted is a primiparous cow in adequate (BCS 5.5) condition, as well as a thin (BCS 4) primiparous cow. Despite being 300 lb lighter, the thin heifer has an overall energy requirement that is greater than the mature cow. In addition, the heifer's expected forage intake can be as much as 4 lb/day less than the mature cow. This illustrates the importance of management steps to insure adequate condition for 1st and 2nd calf heifers. This may include sorting the herd to address the increased nutrient demands of young and thin cows, strategic supplementation, or early weaning programs to improve body condition going into the winter.

SUPPLEMENTATION STRATEGIES

Providing supplements containing elevated levels of fat. One of the more recent management practices investigated is the use of supplemental fat to potentially improve herd reproductive rates. In a recent review, Hess (2003; Table 1) evaluated and summarized several studies that investigated the use of supplemental fat. In general, supplemental fat does not guarantee any improvement in production efficiency of cow-calf units. There are instances, however, where supplemental fat may have a positive effect.

Postpartum fat supplementation. Beef cows fed fat postpartum tend to exhibit increased ovarian follicular growth and development, but cows fed supplemental fat during this period did not exhibit increased reproductive performance. It may be possible to impair the cow's ability to conceive at first service by feeding fat high in linoleic acid. Therefore, caution must be exercised when feeding fat to postpartum beef cows.

Prepartum fat supplementation. Supplementing the beef cow's diet with fat for approximately 60 days before parturition resulted in a 6.4% improvement in pregnancy rates during the subsequent
breeding season. Therefore, feeding fat to cows for the last 60 days of gestation can potentially
improve overall reproductive efficiency.

Effects of fat supplementation on the calf. Calf birth weight was not affected by feeding fat to beef cows during late gestation. Calves born to cows receiving supplemental fat prepartum had greater plasma linoleic acid and greater tolerance to the cold when born in and exposed to colder environments (Bellows et al., 2001). In addition, prepartum supplemental fat may also bolster immune status and function of neonatal calves (Small et al., 2004). Although there is potential for a positive response to prepartum supplementation, the potential benefits should always be weighed against the additional costs.

Table 1. Reproductive responses by beef cows to provision of dietary fat (Hess, 2003)

	Pre-partum			Post-partum		
Response	Control	Fat	*P*	Control	Fat	*P*
Exhibited luteal activity	Not evaluated			50.8%	73.6%	0.0001
Estrus detected	84.5%	81.6%	0.49	69.7%	73.4%	0.53
Postpartum interval	Average = 66 ± 5 d		0.25	74.8 d	73.2 d	0.47
1st service conception rate	64.3%	67.0%	0.60	65.1%	58.4%	0.22
Overall conception rate	86.3%	91.8%	0.05	84.5%	84.2%	0.94

WEANING DATE AS A MANAGEMENT TOOL

Cow condition and rebreeding success. As stated earlier, body condition of cows at time of calving has been shown to influence subsequent pregnancy rates, 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. In an ongoing cooperative research project between NDSU, SDSU and the University of Wyoming (Landblom et al., 2005), cattle from 3 respective research herds received similar management, and were used to evaluate the impacts of a mid-August vs. November weaning date. Cow weight change and BCS from August-November was improved by August weaning (Table 2), illustrating that cow weight and condition loss can be minimized, and potentially improved, by early weaning the calf in mid-August. The same results were seen in the second year of the study when looking at the University of Wyoming herd. While we often think that adult cows are very efficient re-breeders, and require less management, first and second calf heifers still require additional help. Often the breeding success with these 1st and 2nd calf heifers was determined the previous year. Early weaning a portion of the herd, such as young and/or thin cows, will help to minimize weight loss during late summer and fall, and improve condition and weight on high-risk cows as they enter the winter months. Heifers that were marginal to thin condition at breeding may

settle, but they often conceive on their 2nd or 3rd cycle. Later calving dates make it much more difficult for those heifers to breed back the following year. This may be an important management consideration for 1st and 2nd calf heifers this fall. Keeping these cows in good condition will help their chances of staying in the herd in subsequent years.

Table 2. Body weight and condition score change among early and normal weaned cows from NDSU-Dickinson REC, SDSU- Antelope Station and UW - Beef Unit (2003).

	NDSU Dickinson REC		SDSU Antelope Station		UW Beef Unit	
Item	Weaning Period		Weaning Period		Weaning Period	
	Early	Normal	Early	Normal	Early	Normal
August Cow Wt., lb	1285	1332	1341	1329	1207	1242
November Cow Wt., lb[a]	1273	1135	1375	1281	1228	1178
Cow Wt. Change, lb[a]	-12	-197	36	-47	21	-65
August BCS	5.52	5.52	5.63	5.65	5.43	5.59
November BCS[a]	5.91	4.32	5.97	5.63	5.38	4.82
BCS Change[a]	0.39	-1.20	0.34	-0.02	-.05	-.78
August Calf Wt., lb[b]	386	405	407	403	443	436
November Calf Wt., lb	-	543	-	582	-	607

[a]Treatments at each location differ (P<.01)

[b]Treatments at Dickinson location differ (P<.10)

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.

Effect of early weaning on calf performance.In addition to cow reproductive performance, weight gain and feed efficiency 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). Additionally, Meyers et al. (1999a) reported an improvement in quality grade in early weaned calves. These trends were also reflected in the 3-state cooperative study (Landblom; Table 3 and 4). Similar results were seen the second year of the study with the University of Wyoming herd. The improvement in carcass quality associated early weaning programs managed for maximum economic yield, especially in continental-cross calves, matches very well with the beef industry's continued trends towards value-based marketing and grid pricing (Cattle-Fax, 2003).

Table 3. Summary of backgrounding performance for early and normal weaned steers at NDSU-Dickinson REC, SDSU- Antelope Station and UW - Beef Unit (2003)

	NDSU Dickinson REC		SDSU Antelope Station		UW Beef Unit	
Item	Early	Normal	Early	Normal	Early	Normal
No. Steers	40	38	36	35	26	23
Days on Feed	49	54	49	54	43	40
Start Wt., lb[a]	407	553	414	600	445	622
End Wt., lb[a]	578	715	568	765	536	718
ADG, lb[b]	3.50	2.99	3.12	3.05	2.13	2.56
DM Intake, lb[c]	12.0	12.5	11.7	13.2	11.6	16.4
Feed:Gain, lb[d]	3.44	4.16	3.76	4.35	5.47	6.45

[a]Treatments at each location differ (P<.01)
[b]Treatments at Dickinson and UW locations differ (P<.01)
[c]Treatments at Dickinson and Antelope locations differ (P<.05)
[d]Treatments at Dickinson and Antelope locations differ (P<.01)

Table 4. Feedlot finishing performance and carcass measurements. (Decatur County Feed Yard, Oberlin, KS and UW Livestock Center, Laramie, WY)

	NDSU Dickinson REC		SDSU Antelope Station		UW Beef Unit	
Item	Early[a]	Normal	Early	Normal	Early	Normal
Receiving Wt., lb[b]	559	700	562	744	536	718
Harvest Wt., lb.	1136	1174	1110	1174	1219	1229
Days at Feed Yard, da[b]	188.5	129.1	183.0	133.0	224	150
ADG, lb.[b]	3.08	3.69	2.99	3.22	3.08	3.42
F:G, lb.[c]	5.20	5.18	5.18	5.86	6.07	6.17
Hot Carcass Wt., lb.	719	720	702	725	735	734
Rib Eye Area, sq. in.	12.19	12.83	12.15	12.41	11.57	12.17
Fat Depth, in.[d]					.55	.44
Yield Grade,[d]	2.61	2.54	2.68	2.7	2.76	2.45
Quality Grade[e]	2.95	2.78	3.00	2.8	4.95	4.38
Percent Choice, %	26.4	25.71	13.9	23.53	85.7	59.1

[a]Two steers died of bloat during finishing.
[b]Treatments at each location differ (P<.01)
[c]Treatments at the Antelope location differ (P<.01)
[d]Treatments at the UW Beef Unit differ (P<.05)
[e]Treatments at the UW Beef Unit differ (P<.10)

EARLY WEANING AND PASTURE MANAGEMENT

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.

Landblom et al., (2005) reports that cows that had calves weaned early utilized 73% of the available biomass from August to November as compared to the cows suckling calves during the same August to November period. Forage disappearance for cows that had calves weaned early was estimated to be 715 lb/ac whereas forage disappearance among cows that continued to nurse their calves was estimated to be 978 lb/ac (P = 0.17). The difference in forage utilization was attributed to calf removal and less trampling. Ranchers have used winter grazing to reduce reliance on raised and purchased feed. Limited grazing of winter-pastures during summer may increase utilization without reducing winter forage and could be used to increase overall carrying capacity or reduce grazing pressure on summer pastures to improve range condition.

SUMMARY

- By adjusting calving and weaning dates, beef operations can reduce their reliance on harvested feeds.

- Cow condition at calving remains a critical management point for cow-calf producers. Managing cows to achieve a BCS of 4.5 to 5.0 is important for optimal herd performance. First and second calf heifers should be managed to achieve 5.5 to 6.0 BCS at calving.

- A key measurement in low input systems is fall body condition score. Strategic early weaning may be used to improve condition of young and (or) thin cows, improving their chances of maintaining condition throughout the winter.

- Be sure to weigh all potential benefits against the associated costs.

- All management decisions should be based on sound, scientific data.

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