

Increasing the Odds for Successful Beef Cattle Synchronization - AI Programs

by John C. Spitzer, Spitzer Ranch, Fair Play, SC

There are a variety of products and systems available for estrous synchronization in beef cattle. However, usage of synchronization systems and AI are not employed by the vast majority of beef producers.

Why? With beef cattle, all decisions, economic evaluations, and successes should be evaluated at the total herd level, not at the subgroup or individual level. On a total herd basis, most synchrony programs result in too few cows in heat and/or pregnant for the dollars and time invested.

Why? Most producers are still searching for the "silver bullet" or "magic elixir" or "miracle product" rather than applying basic principles of beef herd management. Synchronizing beef cattle actually complicates poor management rather than yielding improved results. Beef producers simply cannot successfully adopt new technology before management fundamentals are in place. If we are to have success, we must improve beef cattle management and sooner than when cows are in the chute for this year's drug of choice.

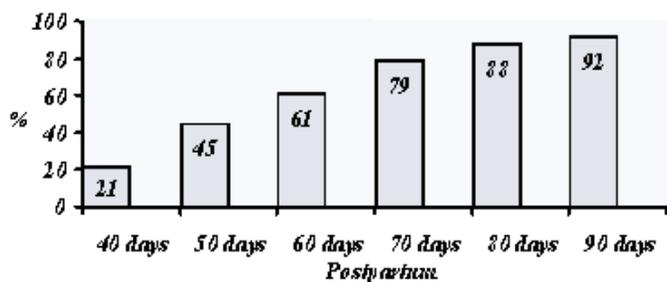
We will review key management factors critical for successful reproductive rates in beef herds. All of these must be attended to before estrous synchronization will yield satisfactory results. These controllable management factors are: 1) postpartum interval to start of breeding; 2) calving season duration; 3) herd health program; 4) nutrition/body condition (mature cows, first-calf-cows and replacement heifers); and 5) weight gain at and during breeding.

Postpartum Interval

There are volumes of literature where interval to first estrus after calving has been reported. Very simply, not many beef cows return to estrus before 50 days postpartum. In fact, in the Colorado study of Figure 1, those cows were 70 days or more following calving before a majority reinitiated estrous cycles.

Most recommendations suggest not enrolling cows in the synchrony program that are not at least 40-45 days postpartum. Since most of these programs require 7 to 10-day treatment duration, these cows would be approximately 50 days postpartum at withdrawal of treatment when they are scheduled to exhibit a synchronized estrus and only a few of those early postpartum cows will respond satisfactorily.

Figure 1. Postpartum interval to first estrus in mature beef cows calving with body condition scores of 4 thru 6.

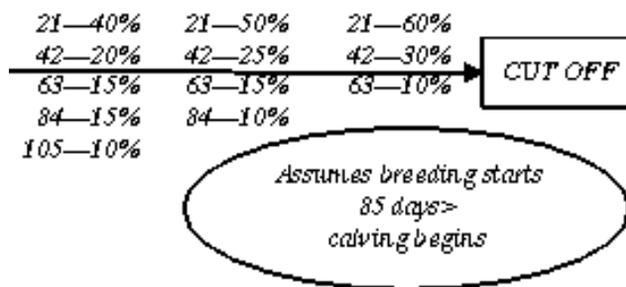


With a finite, fixed breeding season starting on or about the same date each year, there would then be cows treated which were between 45 days postpartum and 85 days postpartum. This is simple mathematics. If we begin breeding the same date each year and assume a 280-day average gestation, then breeding the subsequent year will begin approximately 85 days after the first cow has calved.

Calving Season

Cows will fall into a fairly predictable calving pattern, with some herd variation from year to year, based on length of the calving season (Figure 2). While this is only to be considered an example, it is surprising how accurate this depicts reality.

Figure 2. Typical dispersions of calving with 105, 84 and 63-day calving seasons.



If we only initiate an estrus synchronization program on those cows 42 days postpartum or greater and the herd is on a 105-day long calving season, we will exclude 40% of the cows in the herd. Not many producers have taken the time to actually do the math and see the economic impact this makes on the synchrony program at the total herd level. Even with a 63-day calving season, it will take excellent management to have the calving pattern depicted so that 90% or more of cows in the herd can be enrolled in the program.

A Herd Health Program

We constantly hear of situations in the southeast where synchronization programs fail or are at least sub-optimum because of a disease situation. Herd level protection against most reproductive diseases takes a lot of scientific thought and management effort.

We have herds that are not vaccinated against known reproductive diseases and are not protected. Even worse, we also have a lot of herds that are over vaccinated and under protected. This may be the cheapest part of the entire program and a well thought out, total herd level vaccination program using

Increasing the Odds for Successful Beef Cattle Synchronization - AI Programs

the latest principles of immunology and epidemiology must be in place. Find an excellent cow-calf Veterinarian who can tell you what to vaccinate against, how and why. A good Veterinarian will cost little compared to the dollars they will save in lost productivity.

Nutrition/Body Condition

Most are now well aware of the 9-point body condition scoring (BCS) system used to evaluate body energy reserves in beef cattle (Table 1). Body condition score is our best measure of energy reserves or body fat. For the purists among us, BCS can be converted to percent fat (as a percent of total body weight). Cows with a BCS of 5 have about 16% total body fat and each BCS increase or decrease represents about a 4% change in total body fat.

Body condition at calving absolutely determines time to return to heat after calving. And, BCS at calving and plane of nutrition during breeding determines pregnancy rate. Body condition scores obtained at other times (particularly at weaning and 60-90 days prepartum) are key leverage points for management control.

There is some value in analyzing pregnancy rates based on BCS obtained at weaning since under most management situations we can generally assume cows have lost at least 1 unit of BCS by the time calves are weaned. However, it is a retrospective analysis and does not help to get more cows pregnant unless changes are initiated for the next year.

Mature Cows. Shorter intervals to first heat after calving and increased pregnancy rates are both observed when cows calve with increasing BCS. In the previously mentioned Colorado study, BCS were grouped as Thin = BCS of 2 and 3, Moderate = BCS of 4, 5 and 6 or Good = BCS of 7 and 8. Percent pregnant in the first 20 days of breeding were 35 and 39% for moderate and good cows, respectively, compared to 25% for thin cows. And at the end of an 80-day breeding season, pregnancy rates were 89 and 92% for moderate and good cows, respectively, compared to 72% for thin cows. Pregnancy rates for moderate and good cows were not statistically different.

All of these cows were on the same nutritional plane and gaining weight from calving thru the breeding season so these pregnancy rates were direct reflections of estrous response (Figure 3). However, it was 60 days postpartum before significant differences were observed in estrous response. By 80 days postpartum estrous response for thin cows was 62%, which was much less than the estrous response for moderate and good cows of 88 and 98%, respectively.

A follow-up study conducted in South Carolina used a series of orthogonal contrasts to determine where significant differences occurred among BCS. Cows calving in BCS greater than 5 were in heat at a higher rate earlier in the subsequent breeding season than cows calving in BCS of 4 or less. Furthermore, ADG from parturition through breeding had no effect on cows calving in BCS greater than 5, but dramatic effects on cows calving in BCS of 4 or less.

Figure 3. Body condition score at calving and estrous response in multiparous cows.

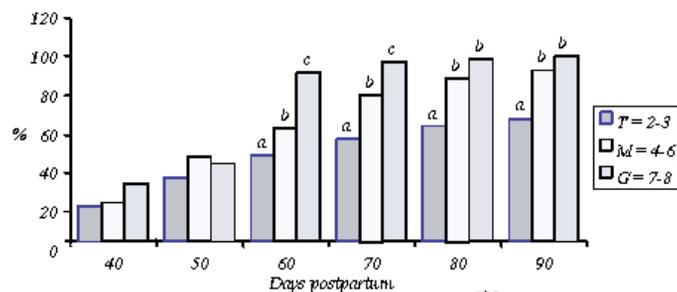


Table 1.

Body Condition Scoring (BCS)

Thin

1 - Emaciated - Cow is extremely emaciated with no palpable fat detectable over spinous processes, transverse processes, hipbones, or ribs. Tail-head and ribs project quite prominently.

2 - Poor - Cow still appears somewhat emaciated by tail-head and ribs are less prominent. Individual spinous processes are still rather sharp to the touch, but some tissue cover over dorsal portion of ribs.

3 - Thin - Ribs are still individually identifiable but not quite as sharp to the touch. There is obvious palpable fat along spine and over tail-head with some tissue cover over dorsal portion of ribs.

Borderline

4 - Borderline - Individual ribs are no longer visually obvious. The spinous processes can be identified individually on palpation but feel rounded rather than sharp. Some fat cover over ribs, transverse processes and hipbones.

Optimum/Moderate

5 - Moderate - Cow has generally good overall appearance. On palpation, fat cover over ribs feels spongy and areas on either side of tail-head now have palpable fat cover.

6 - High Moderate - Firm pressure now needs to be applied to feel spinous processes. A high degree of fat is palpable over ribs and around tail-head.

7 - Good - Cow appears fleshy and obviously carries considerable fat. Very spongy fat cover over ribs and around tail-head. In fact, "rounds" or "pones" beginning to be obvious. Some fat around vulva and in crotch.

8 - Fat - Cow very fleshy and over-conditioned. Spinous processes almost impossible to palpate. Cow has large fat deposits over ribs and around tail-head and below vulva. "Rounds" or "pones" are obvious.

9 - Extremely fat - Cow obviously extremely wasty and patchy and looks blocky. Tail-head and hips buried in fatty tissue and "rounds" or "pones" of fat are protruding. Bone structure no longer visible and barely palpable. Large fatty deposits might even impair animal's mobility.

Increasing the Odds for Successful Beef Cattle Synchronization - AI Programs

Pregnancy rates at 20, 40 and 60 days of the breeding season for cows calving in BCS of 4 or less were 41, 67 and 84%, respectively; while for cows calving in BCS greater than 5 pregnancy rates were 52, 79 and 91%, respectively. Cows calving in BCS greater than 5 were also pregnant an average of 6 days sooner than cows calving in BCS of 4 or less.

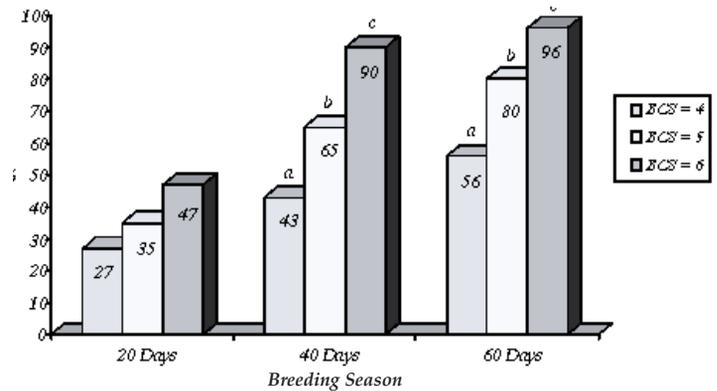
A final issue with BCS in mature cows is that it does not appear to matter how cows achieve a BCS of 5 by calving. A four state study (SC, OK, LA, AR) was conducted where diet was manipulated to create cows in an array of BCS from 2 through 8 at 90 days prior to calving. Those cows were then assigned to one of three groups based on BCS where thin cows were BCS 2, 3 and 4 (AVE = 3.6), moderate cows were BCS 5 and 6 (AVE = 5.5) and good cows were BCS 7 and 8 (AVE = 7.1). These groups were then fed during the last third of pregnancy so all cows would calve with a BCS of 5 (AVE = 5.1). Pre-calving BCS changes were 1.4, -0.4 and -2.0 units for cows initially in thin, moderate or good groups, respectively. Even with these dramatic prepartum changes in ADG and BCS, there were no differences in pregnancy rate among groups when all cows calved with BCS of 5.

First-Calf-Cows. First calf, two-year-old cows can have reproductive rates comparable to mature cows but will require calving in a higher BCS. In a Louisiana study pregnancy rates for two-year-old cows calving with BCS of 4 and 5 were 65 and 71% respectively, while pregnancy rates for two-year-old cows calving with BCS of 6 and 7 were 87 and 91% respectively.

Intervals from parturition to pregnancy were 92, 82, 74 and 76 days for first calf cows calving with BCS 4, 5, 6 and 7, respectively.

An intense multi-state study (SC, OK, LA) was conducted with two-year-old beef cows where they calved in BCS 4, 5 or 6. Pregnancy rates improved with each improvement in BCS at parturition (Figure 4). Final pregnancy rates for a 60-day breeding season were 56, 80 and 96% for first calf cows calving with BCS 4, 5 and 6, respectively. These increased pregnancy rates due to increasing BCS were achieved with no increases in dystocia even though there were increases in birth weight of 3 to 4 pounds per increase in BCS.

Figure 4. Body condition score at calving and pregnancy rate in first calf cows.



AI Programs

Heifers (Puberty). A general rule of thumb for virgin yearling heifers is to have them weigh 65% of their mature weight prior to start of breeding. Actually, this concept can be refined based on the frame score of the heifer (Table 2). Frame score 2 heifers do indeed need to achieve 65% of their mature weight to have a high rate of cyclicity while 60% of mature weight would be appropriate for frame score 7 and 8 heifers.

Table 2. Target weight concept: estimates of weight at puberty by frame score.

Frd	205-D		Breeding		Maturity		%
	HT	WT	HT	TWT	HT	WT	
2	37	43	618	46	950	65%	
3	39	45	650	48	1025	63%	
4	41	47	690	50	1100	63%	
5	43	49	730	52	1175	62%	
6	45	51	765	54	1250	61%	
7	47	53	800	56	1325	60%	
8	49	55	840	58	1400	60%	

Fox et al. 1988 (Adapted)

Economical management at least begs an awareness of these target weights and whether or not feeding systems can be designed to achieve these weights with some cost management. In some cases, feeding less resulting in a lower body weight and lower rates of cyclicity and retaining more heifers would have an economic advantage. Virgin yearling beef heifers achieving target weights represented in Table 2 would be in a BCS of 5 or 6.

Weight Gain at Breeding

Does weight gain or loss during the breeding season influence pregnancy (conception) rates? I believe so, you believe so (I think), but we do not have definitive data to be certain.

We absolutely have data indicating rates of gain during breeding does effect pregnancy rates in cows calving in BCS of 4 or less (or 5 or less for two-year-old cows). But, is this a reflection of weight gain on conception rates or just increasing BCS and therefore increasing estrous response so more cows are bred and become pregnant?

Certainly, there is anecdotal evidence to suggest that after estrous cyclicity is established (virgin heifers) or reestablished (postpartum cows); those cows "breed better" if gaining weight. However, we find no empirical evidence to support that hypothesis. Experiences though tell us we don't want females losing weight during the breeding season.

In summary, we can make these assertions about BCS:

- 1) BCS = % Body Fat,
- 2) BCS is a reliable predictor of return to estrus,
- 3) threshold BCS for mature cows = 5,
- 4) threshold BCS for first-calf, two-year-old cows = 6,
- 5) virgin yearling heifers at target weights indicated in Table 2 will be BCS = 5 or 6,
- 6) if cows are gaining weight ever so slightly during breeding, BCS at calving is a very reliable predictor of pregnancy.
- 7) these basic beef cattle management principles will impact synchronization of estrus/AI programs much more than which drug or protocol is utilized. ■

John C. Spitzer, MS, PhD, Dipl. ACT (Hon), Dipl. ACAP, PAS served on the faculties of Texas A&M University, Clemson University and the University of Nebraska Great Plains Veterinary Educational Center. Since 2003 he has been engaged in ranching and maintains a consulting practice.