The Management of Beef Breeding Programs

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The reproductive efficiency of a beef herd is best measured in terms of marketable product per production unit. For most commercial herds a simple expression of reproductive efficiency is the total pounds of calf weaned divided by the number of cows and heifers exposed to breeding during a calendar year.

The pounds of calf weaned depend upon the number of calves weaned and the average weaning weight. It should be noted that total pounds of calf weaned is the product of independent factors in the formula:

Total lbs. of calf weaned = No. of calves x Ave. weaning wt.

As a result, the total pounds of calf weaned is limited by each factor.

Factorial equations are interesting since the product is no greater than the least efficient factor in the formula. For example, percent calf crop may be expressed as follows:

$$\%\,\text{calf crop} = 100\left(\frac{\%\text{ of cows bred}}{100} \times \frac{\%\text{ conception rate}}{100} \times \frac{\%\text{ of conceptions weaned}}{100}\right)$$

For example, a 100% calf crop requires that every factor in the equation is 100%. What if two factors are 100% but one is only 50%?

$$\left(\frac{50}{100} \times \frac{100}{100} \times \frac{100}{100}\right) 100 = 50\%\text{ calf crop!}$$

What if two factors are less than 100%?

$$\left(\frac{50}{100} \times \frac{70}{100} \times \frac{100}{100}\right) 100 = 35\%\text{ calf crop!}$$

Thus, the product of a factorial equation can be no greater than the least efficient factor.

The average weaning weight of the calves is limited by the genetic potential of the calves in response to the environment provided by management. The heritability of weaning weight $\left(\frac{\text{variation in weaning weight due to genotype}}{\text{total variation in weaning weight}}\right)$ is reasonably high; thus, selection of sires and dams for weaning weight will result in economic return from total pounds of calf weaned. However, the estimates of heritability of weaning weight suggest that about 70% of the variation in weaning weight is due to environment, while only about 30% is due to genotype. Thus, weaning weights can be increased more rapidly by improving management than by selection.

Moreover, heritability of reproductive performance seems to be so low that selection for reproductive performance would have little, if any, effect on economic return. In view of these facts, we propose that the cattle industry can make its most rapid gains in economic return by investing in improved management rather than genetic selection. We appreciate that selection for genotype will be the only avenue for progress when management has provided the most suitable environment and when we wean a calf from every cow in the herd at breeding time, but we have a whole lot of improved management to accomplish before we reach that point.

Our definition of management includes the prevention and control of disease, as well as the management of bull power, but this discussion relates primarily to management of the cow herd.

The effect of the number of calves weaned per hundred cows exposed to breeding in a herd with

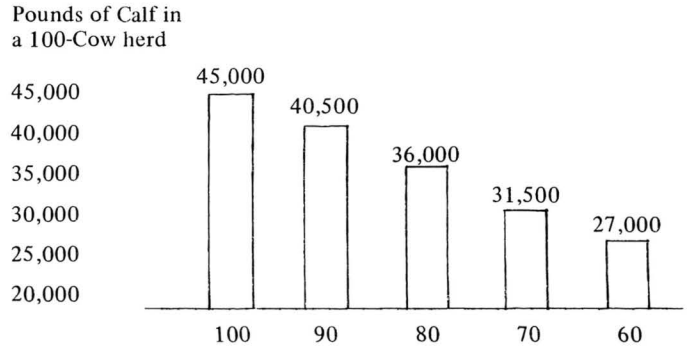

Figure 1. The effect of the number of calves weaned per 100 cows exposed to breeding in a herd with an average weaning weight of 450 pounds.

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an average weaning weight of 450 pounds is shown in Figure 1. For each 10% decrease in the number of calves weaned per 100 cows exposed, the rancher has 4,500 fewer pounds of calf to market.

The weaning weight of a calf depends on his birth weight, growth rate and age at weaning:

Weaning weight = birth weight + (average daily gain x days of age)

Older calves *weigh more* at weaning. The weaning weights of calves born at twenty-day intervals during the calving season are shown in Figure 2. These are actual figures from the herd at Fort Robinson, Nebraska. Calves born during the fourth twenty days of the calving season were more than 100 pounds lighter than calves born during the first twenty days of the calving season. Notice, too, that the greatest decreases in weaning weight occurred between the second and third twenty days and between the third and fourth twenty days.

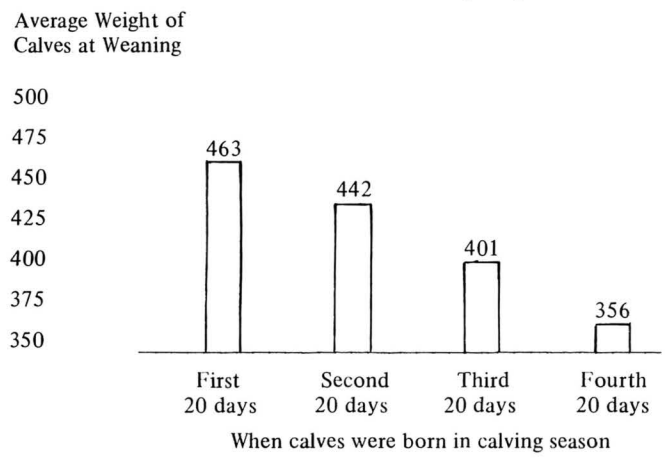

Figure 2. The effect of late calving on average weaning weights of calves at Fort Robinson, Nebraska.

From the foregoing, we conclude that there are two major areas to be improved in order to achieve economically rewarding reproductive efficiency:

1. Not enough of the cows and heifers exposed to breeding wean a calf.
2. Not enough of the calves are born during the first twenty days of the calving season.

This discussion, then, will deal with management factors that increase the number of cows that come in heat during the first twenty days of the breeding season, increase the conception rate at first service and decrease the loss of calves at or near birth.

WHY COWS FAIL TO BREED DURING THE FIRST TWENTY DAYS OF THE BREEDING SEASON

First, fertile reproductive function is not achieved for a period of time following parturition, and the time required is related to the age of the cow. The effect of time following parturition on the onset of first heat in cows of various ages is shown in Figure 3. By forty days after calving, only 56% of the five-year-old and older cows, only 26% of the four-year-old cows and only 14% of the three-year-old, first-calf heifers had shown heat. It was eighty days after calving before 90% of the oldest cows had shown heat, and it was 110 days after calving before 90% of the first-calf heifers had shown heat.

	Days after calving							
Age of cow	40	50	60	70	80	90	100	110
5 years old or older (in heat)	56	70	82	88	92	95	100	100
4 years old or older (in heat)	26	47	63	72	88	100	100	100
3 years old or older (in heat)	14	32	43	64	77	79	86	92

Figure 3. The percentage of cows of various ages that had shown heat at various times after calving.

The significance of the data in Figure 3 in terms of the percentage of cows showing heat during the first twenty days of the breeding season is shown in Figure 4. The herd represented in Figure 4 had an 80-day breeding season. Cows calved from 10 February through 1 May, and the breeding season began on 1 May. In order to have 90% of the older cows in heat during the first 23 days of the breeding season, they must all have calved prior to 22 March. If 90% of the younger cows (chiefly first-calf heifers) are to come in heat during the first 23 days of the breeding season, they must all have calved by 1 March.

	In Heat from May 1 to May 22	
Cows calving from	Older cows	Younger cows
February 10–March 1	100%	89%
March 2–March 21	94	78
March 22–April 10	85	53
April 11–May 1	63	23

Figure 4. The percentage of cows that showed heat during the first twenty days of an eighty-day breeding season.

We must *shorten* the *breeding season* to *45 days or less* in order to achieve maximum reproductive efficiency. This will result in a shorter calving season, allowing sufficient time for the cows to recover reproductive function and return to heat following parturition. Moreover, nulliparous heifers should be bred earlier than the cow herd, as they require a longer time from calving to first postpartum estrus. We recommend that breeding of the heifers should commence 20 days earlier than the

breeding season for the cows. We further suggest that the rancher should breed about 50% more heifers than he needs for replacements, then cull the open and late-calving heifers in the early fall.

The effect of time of calving on the reproductive efficiency of heifers for their first three calves is shown in Table 1. The figures are computed for an average daily gain of 1.5 pounds per day. Heifers that calved during the third 20 days of the first calving season weaned approximately 200 pounds of calf less than those calving 20 days prior to the start of the calving season for cows or those calving during the first 20 days of the cow-calving season. A heifer calving during the third 20 days of her first calving season could probably never make up this difference in her lifetime, regardless of differences in genetic potential. The main criterion, then, for selection of replacement heifers should be an early calving date.

TABLE 1

EFFECT OF TIME OF BIRTH OF FIRST CALF ON REPRODUCTIVE PERFORMANCE DURING FIRST THREE CALVINGS.

Time of birth of first calf	Pounds of calf weaned from 100 cows			
	1st calf	2nd calf	3rd calf	Total 3 calves
20 days prior to start of season	39,500	35,050	34,614	109,164
First 20 days of calving season	36,500	34,408	33,710	104,618
Second 20 days of calving season	33,500	30,720	32,533	96,753
Third 20 days of calving season	30,500	24,446	31,431	86,377

The principal cause of poor reproductive performance among late-calving heifers is a failure to show heat early in the breeding season. The effect of time of birth of a heifer's first calf on the occurrence of heat during the subsequent breeding season is shown in Table 2. All of the heifers that calved 20 days prior to the cow-calving season were in heat during the first 20 days of the breeding season for the cows, while only 28% of the late-calving heifers had shown heat during the first 20 days of the breeding season. One of the main ways to increase reproductive efficiency is to *make certain heifers calve early* the first time.

The effect of nutrition on the occurrence of first post-partum estrus will be covered in a later section in conjunction with its effect on conception rate.

TABLE 2

EFFECT OF TIME OF BIRTH OF FIRST CALF ON THE OCCURRENCE OF HEAT IN FIRST-CALF HEIFERS.

Time of birth of first calf	Cows in heat and bred for second calf		
	by First 20 days of breeding season	by First 40 days of breeding season	by First 60 days of breeding season
20 days prior to start of breeding	100%	100%	100%
First 20 days of calving season	85%	100%	100%
Second 20 days of calving season	57%	85%	95%
Third 20 days of calving season	28%	57%	85%

Puberty In Heifers

One of the main problems encountered when we institute a program of breeding heifers 20 days before breeding the cow herd is that too few of the replacement heifers have achieved puberty at that time. This is the result of their being *too young* and *too light*. The effects of breed, age and nutritional level on puberty are shown in Figure 5. It is apparent that replacement heifers to be bred as yearlings (and we certainly recommend it) must be selected for age and fed to gain one pound daily from weaning to breeding.

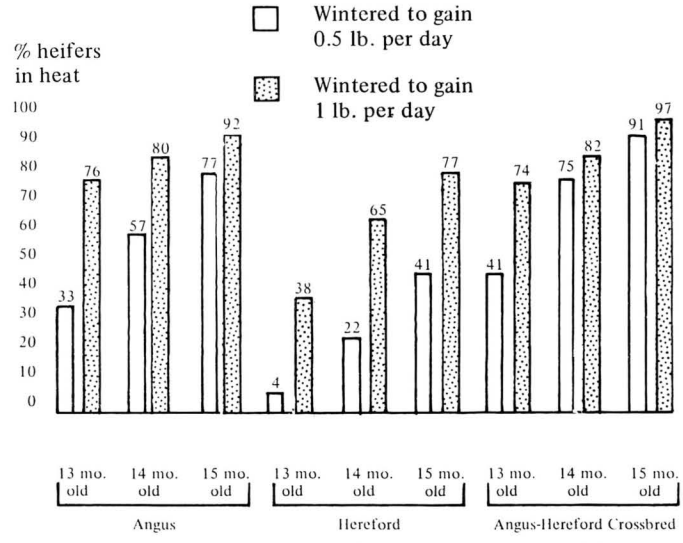

Figure 5: The effects of breed, age and nutritional level on puberty.

A word of caution regarding puberty in beef heifers is in order. The age and weight at puberty vary markedly. To represent an average age or weight at puberty is misleading. Age and weight do account for considerable variation in the onset of puberty, but they are decidedly influenced by genotype and other factors not yet identified. The

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complexity of factors influencing the onset of puberty is apparent from studying Tables 3 through 8. Notice the variations within and among breeds at the same and different locations. The heterotic, or hybrid vigor, effect is variable with the breeds involved. The response to more feed is also influenced by breed.

TABLE 3

AVERAGE AGE AT PUBERTY IN BEEF HEIFERS.

	Location									
Breed	Montana[a]	Nebraska[b]		Florida[cd]		Louisiana[ef]		Idaho[g]		
Hereford	339	457	413	456	---	---	471	378		
Angus	355	396	337	---	---	433	387	353		
Shorthorn	---	413	318	---	---	---	---	383		
Charolais	396	---	---	---	---	---	---	---		
Brahman	---	---	---	511	594	816	538	---		

a. Bellows, R. A. Field Day Report, Miles City, Montana.
b. Wiltbank, et al., *1966. J. Animal Sci. 25:744.*
c. Warnick, et al., *1954. Florida Exp. Sta. Annual Report.*
d. Warnick, A. C., 1967. Factors Affecting Calf Crop.
e. Reynolds, W. L., 1967. Factors Affecting Calf Crop.
f. Frank and England, 1967. Livestock producers Day report, Louisiana State University.
g. Christian, R. E., 1957. Proc. West. Sec. Am. Soc. An. Prod.

TABLE 4

AVERAGE AGE AT PUBERTY IN BEEF HEIFERS.

	Location									
Breed	Montana[a]	Nebraska[b]		Florida[c]		Louisiana[e]		Idaho[g]		
Hereford	583	592	674	500	---	---		635		
Angus	581	512	554	---	---	536		525		
Shorthorn	---	497	535	---	---	---		555		
Charolais	700	---	---	---	---	---		---		
Brahman	---	---	---	675	---	706		---		

a. Bellows, R. A. Field Day Report, Miles City, Montana.
b. Wiltbank, et al., *1966. J. Animal Sci. 25:744.*
c. Warnick, et al., *1954. Florida Exp. Sta. Annual Report.*
e. Reynolds, W. L., 1967. Factors Affecting Calf Crop.
g. Christian, R. E., 1957. Proc. West. Sec. Am. Soc. An. Prod.

TABLE 5

HETEROTIC EFFECTS ON AVERAGE AGE AT PUBERTY IN BEEF HEIFERS.

	Wintered at 1/2 lb. per head per day	Wintered at 1 lb. per head per day
Hereford[a]	457	413
Angus	396	337
Hereford X Angus cross	398	360
Hereford	457	413
Shorthorn	413	318
Shorthorn X Hereford cross	382	300
Angus	396	337
Shorthorn	413	318
Angus X Shorthorn cross	366	303
Angus[b]	433	
Brahman	816	
Brahman X Angus cross	460	
Brangus	531	

a. Wiltbank, et al., *1966. J. Animal Sci. 25:744.*
b. Reynolds, W. L., 1967. Factors Affecting Calf Crop.

TABLE 6

EFFECT OF NUTRITION ON AGE AT PUBERTY IN BEEF HEIFERS.

Wintered	Ave. age Hereford	Ave. age Angus	Ave. age Shorthorn	Ave. age crosses A x H	A x S	H x S
at 1/2 lb. per head per day	547	396	413	398	366	382
1 lb. per head per day	413	337	318	361	303	300
Difference	44	39	95	37	63	82

Wiltbank, et al., *1966. J. Animal Sci. 25:744.*

TABLE 7

EFFECT OF NUTRITION ON WEIGHT AT PUBERTY IN BEEF HEIFERS.

Wintered	Ave. wt. Hereford	Ave. wt. Angus	Ave. wt. Shorthorn	Ave. wt. crosses A x H	A x S	H x S
at 1/2 lb. per head per day	592	512	497	555	505	527
1 lb. per head per day	674	554	535	632	552	560
Difference	82	42	38	77	57	33

Wiltbank, et al., *1966. J. Animal Sci. 25:744.*

TABLE 8

PERCENT IN HEAT AT DIFFERENT AGES.

Age in months	10 %	11 %	12 %	13 %	14 %	15 %	16 %
Angus							
Low[a]	13	23	27	33	57	77	100
High[b]	40	56	64	76	80	92	100
Hereford							
Low	0	0	0	4	22	41	59
High	0	12	23	38	65	77	92
Shorthorn							
Low	0	6	16	25	56	91	100
High	65	65	69	73	85	92	100
A x H cross							
Low	3	12	27	36	73	91	94
High	28	36	50	75	82	96	100
A x S cross							
Low	23	26	40	71	77	94	100
High							
H x S cross							
Low	9	18	42	64	85	94	100
High	69	80	89	97	97	100	100

Wiltbank, unpublished data.

a. Low wintering level made 1/2 lb. a day gain from October to May.
b. High wintering level made 1 lb. a day gain from October to May.

Both groups were on grass from May to October.

Effect Of Nutrition On First Post-Partum Estrus And Conception Rate

Adequate levels of protein, carbohydrate, lipid, vitamins and minerals are all essential to maximum reproductive performance. We have found that the dietary elements which are most *frequently deficient* or *fed improperly* are *energy* and *phosphorus.* We do not wish to downgrade the importance of minimal requirements for *protein, vitamin A, salt* and *water,* as deficiencies of these factors are sometimes the cause of poor reproductive efficiency, but inadequate levels of phosphorus and improper levels of energy are more common in our experience.

Phosphorus

Phosphorus deficiency suppresses estrual behavior and estrous cycles. Phosphorus supplements should be mixed with an equal amount of salt and fed free choice. Phosphorus supplement should also be included at the level of 1% in the grain and protein supplement. Some ranchers have used increased levels of the less palatable phosphorus supplements to control the daily intake of grain supplements on the range.

Energy

The level of energy in the diet before and after calving affects the pregnancy rate by its influence on both the onset of post-partum estrus and conception rate. Data from four experiments will be used to show the effects of level of energy on reproduction. Results of experiments 1 and 2 have been combined because of their similarity. In all these experiments the cattle were in dry lots throughout the experiment in order to regulate the diet. The first two experiments started 140 days before anticipated calving, while the last two experiments began 120 days before expected calving. All cows received amounts of protein, minerals and vitamins in excess of the National Research Council's recommended levels (National Academy of Sciences—National Research Council Publication 1137).

Heat detection procedures began the day after calving, using sterilized bulls. Cows were individually mated to bulls in natural matings for the first two experiments. Six-year-old Hereford cows were used in the first experiment, while Herefords ranging in age from four to eleven years were used in the second experiment. In the last two experiments, two-year-old, first-calf Hereford and Angus heifers were inseminated artifically with semen from a single collection from a sire of the respective breed.

Effect of Low Level Of Energy Before Calving

As shown in Table 9, a low level of energy had no significant effect on the pregnancy rate during an 80-day breeding season but significantly decreased the number of cows becoming pregnant during the first 20 days of the breeding season. Sixty percent of the cows on the higher (NRC recommendation) level of total digestible nutrients (TDN) of energy came in heat and conceived during the first 20 days of the breeding season, compared to only 46% of the cows on the low level of TDN before calving. Note that the level of TDN (recommended by NRC) after calving was the same for both groups. Average figures for the two heifer experiments were similar.

The main reason for the poor performance of cows on the low level of energy before calving was a delay in the onset of post-partum estrus. The percent of cows in heat at various times after calving is shown in Table 10. Eighty percent of the

TABLE 9

EFFECT OF LEVEL OF FEED BEFORE CALVING ON PREGNANCY RATE AND EARLY CALVING.

Experiment No.	Level of feed		Start of experiment to 1 week before calving	24 hrs. after calving to 90 days after calving	Number cows	% Pregnant	% pregnant first 20 days of breeding season
	Before calving	After calving					
	TDN	TDN			Older cows		
1 &2	9.0	16.0	67 lbs.	14 lbs.	21	95	60
	4.5	16.0	-118 lbs.	22 lbs.	20	95	46
					2-year old cows		
3	8.0	13.0	150 lbs.		37	73	56
	4.3	13.0	35 lbs.		41	73	27
					2-year old cows		
4	8.0	13.0	120 lbs.	19 lbs.	24	79	54
	4.3	13.0	13 lbs.	64 lbs.	23	83	48

cows (experiments 1 & 2) on the high level of energy before calving had shown heat by 60 days after calving, while only 45% of the cows on the low level had been in heat. A similar delay in the onset of post-partum estrus was observed in the two-year-old, first-calf heifers that received a low level of energy before calving. The incidence of estrus among the cows on inadequate energy levels before calving did not approach that of cows on adequate levels until 90 days after calving.

In order to have a *high proportion* of cows *cycling normally* during the *first 20 days* of the breeding season, the cows *must* be *adequately*

nourished prior to calving. We recommend that cows should gain 100 to 135 pounds between weaning and the next calving, depending on condition at the time of weaning the last calf. When adequate levels of energy are provided in the diet, adequate levels of high-cost protein are seldom deficient. TDN can be roughly estimated by figuring 50 to 55% TDN in alfalfa hay and 70 to 75% TDN in grains.

TABLE 10

EFFECT OF FEED LEVEL BEFORE CALVING ON TIME COWS SHOW HEAT.

Experiment number	Level of feed		Days after calving					
	Before calving	After calving	40	50	60	70	80	90
	TDN	TDN	Older cows					
1 & 2	9.0	16.0 (in heat)	---	65%	80%	90%	90%	95%
	4.5	16.0 (in heat)	---	25%	45%	70%	80%	85%
			2-year old cows					
3	8.0	13.0 (in heat)	18%	68%	82%	90%	92%	97%
	4.3	13.0 (in heat)	7%	27%	49%	66%	73%	83%
			2-year old cows					
4	8.0	13.0 (in heat)	21%	38%	71%	92%	96%	100%
	4.3	13.0 (in heat)	13%	30%	52%	70%	83%	91%

The results of feeding an adequate (NRC recommendation) level of TDN before calving but a low level after calving are seen in Table 11. In experiments 1 and 2, 95% of the cows on an adequate level of feed after calving were pregnant at the end of the breeding season, while the pregnancy rate was only 77% in the cows on a low level of feed after calving. Similar results were observed in the heifers in experiment 3, but the difference in the over-all pregnancy rates among groups in experiment 4 was very slight. The heifers in experiment 4 were in better flesh during the breeding season than those in experiment 3.

Differences in the pregnancy rates during the first 20 days of the breeding season as a result of low levels of feed after calving are even more remarkable than the lowered pregnancy rates during the entire breeding season (Table 11). The differences in pregnancy rates during the first 20 days of the season ranged from about 25% in experiments 1, 2 and 3 to 31% in experiment 4.

All cows and heifers on the high level of TDN after calving came in heat during the breeding season, while only 86%, 81% and 92% of the cattle on the low level of feed showed heat during the season in experiments 1 and 2, 3 and 4, respectively. (The figures shown for 90 days in Table 12 did not change during the remainder of the breeding season for cattle on the low level of energy after calving.) Too many cows that are losing body weight after calving do not resume normal estrous cycles during the breeding season.

TABLE 11

EFFECT OF LEVEL OF FEED AFTER CALVING ON PREGNANCY RATE AND EARLY CALVES

Experiment number	Level of feed		Wt. gain experiment to 1 week before calving	Calving to 90 days after calving	Number cows	% Pregnant	% Pregnant first 20 days
	Before calving	After calving					
					Older cows		
1 & 2	9.0	16.0	67	14	21	95	60
	9.0	8.0	89	-97	22	77	34
					2-year old cows		
3	8.0	13.0	131	81	37	73	56
	8.0	7.0	135	-79	42	64	31
					2-year old cows		
4	8.0	13.0	120	19	24	79	54
	8.0	7.0	184	-136	13	76	23

TABLE 12

EFFECT OF LEVEL OF FEED AFTER CALVING ON TIME COWS SHOW HEAT.

Experiment number	Level of feed		Days Cows showing heat after calving					
	Before calving	After calving	40	50	60	70	80	90
	TDN	TDN	Older cows					
1 & 2	9.0	16.0 (in heat)	---	65%	80%	90%	90%	95%
	9.0	8.0 (in heat)	---	76%	81%	81%	86%	86%
			2-year old cows					
3	8.0	13.0 (in heat)	18%	68%	82%	90%	92%	97%
	8.0	7.0 (in heat)	37%	73%	76%	81%	81%	81%
			2-year old cows					
4	8.0	13.0 (in heat)	21%	38%	71%	92%	96%	100%
	8.0	7.0 (in heat)	23%	85%	92%	92%	92%	92%

The first-service conception rates in the cows and heifers on the high level of feed in experiments 1 and 2, 3 and 4 were 67%, 64% and 50%, respectively (Table 13). Conception rate at first service for cattle on an inadequate level of feed after calving was 42%, 53% and 33% in experiments 1 and 2, 3 and 4, respectively (Table 13). Cows that are losing or only maintaining body weight after calving are hard to settle.

Low levels of feed after calving result in cows that *don't show heat* during the breeding season and *lower* the *conception rate.* We recommend that cows should *gain a half to three-fourths* of a *pound* in body weight daily from *calving* to the *end* of the *breeding season.*

Calculation of nutritional levels before and after calving is somewhat tedious and almost impossible for pastured cattle. We recommend that 5 to 10% of the cattle be marked as "weigh animals" to be weighed periodically. Weight gains are a reasonably accurate index of the level of nutrition and are simple to obtain.

TABLE 13

EFFECT OF LEVEL OF FEED AFTER CALVING ON CONCEPTION RATE AT FIRST SERVICE

Experiment number	Level of feed		No. Cows	% Pregnant from First breeding	Cows in Heat During experiment
	Before calving	After calving			
	TDN	TDN	Older cows		
1 & 2	9.0	16.0	21	67	100
	9.0	8.0	19	42	86
			2-year old cows		
3	8.0	13.0	36	64	100
	8.0	7.0	34	53	81
			2-year old cows		
4	8.0	13.0	24	50	100
	8.0	7.0	12	33	92

Losses At Calving

Losses of calves are chiefly the result of:

1. Dystocia
2. Stress following delivery
3. Disease

We believe that intensive management during a short calving season is practical and capable of reducing calfhood diseases. Intensive care of calving heifers or cows is possible when the calving season is limited to 45 days or less, rather than the more common 90- to 120-day season.

Calf losses are greater among heifers that are *highly* conditioned than among heifers in moderate or thin condition (Table 14). There was no difference in calf losses from heifers in moderate or heifers in thin condition.

TABLE 14

HEIFERS WHICH ARE EXTREMELY FAT HAVE AN INCREASE IN CALVING DIFFICULTY.

	No. heifers	Calves dead at birth (%)	Calves died within 24 hours after birth (%)
Extremely fat heifers (Grade--Choice or Prime)	22	18	27
Heifers in moderate condition (Grade--Good)	34	9	0
Thin heifers	20	10	0

The results of another trial to examine the effect of nutritional level on calving performance in two-year-old heifers are shown in Table 15. The heifers weighed 775 pounds at the start of the experiment, 120 days before calving. Heifers on the moderate level of feed (8.0 lbs. of TDN daily) weighed 925 pounds, while those on the low level (4.3 lbs. of TDN daily) weighed 740 pounds, one week before calving. Calving difficulty and death losses in the two groups were very nearly the same, even though the average birth weight of calves in the thin group was seven pounds lighter than that of calves in the moderately fed group. We have already seen the disastrous effect of a low level of feed before calving on the occurrence of heat early in the breeding season. Thus, there is little to gain and much to lose in providing an inadequate diet to reduce calving losses.

TABLE 15

THE EFFECT OF NUTRITIONAL LEVEL ON CALVING PERFORMANCE IN 2-YEAR-OLD HEIFERS.

Energy level	Weight gain 120 days before calving 1 week before calving	No. heifers	Heifers having calving difficulty	Dead Calves at birth	Birth to one week	Birth weight	Retained placenta
Moderate	150 lbs.	140	36%	8%	3%	70 lbs.	7%
Low	- 35 lbs.	94	33%	6%	2%	63 lbs.	7%

Crossbreeding, especially the use of Angus bulls, has been advocated to reduce calving problems. The results shown in Table 16 fail to support this practice. Within breeds, however, there are bulls which sire calves which present fewer dystocia (Table 17). A complexity of factors, including calf size, conformation and presentation, posture and position, seem to be involved. At any rate, *one method* to *reduce calving losses* is to *breed* heifers

TABLE 16

EFFECT OF CROSSBREEDING ON CALVING DIFFICULTY IN HEIFERS.

Breed of sire	Breed of dam	First group 2-year old heifers		Second group 2-year old heifers	
		No. calves	Calving difficulty	No. calves	Calving difficulty
Hereford	Hereford	75	40%	84	24%
Angus	Hereford	44	43%	62	29%
Angus	Angus	42	28%	55	26%
Hereford	Angus	72	30%	71	30%

TABLE 17

VARIATION IN CALVING DIFFICULTY AMONG SIRES WITHIN BREED.

	No. calves	Total	Difficulties	
			Abnormal Presentation	Normal Presentation
Angus sire				
602	29	41%	3%	38%
609	30	13%	3%	10%
610	31	19%	6%	13%
611	25	36%	4%	32%
Hereford sire				
702	29	34%	3%	31%
705	35	40%	8%	32%
750	34	24%	3%	21%
753	22	14%	9%	5%

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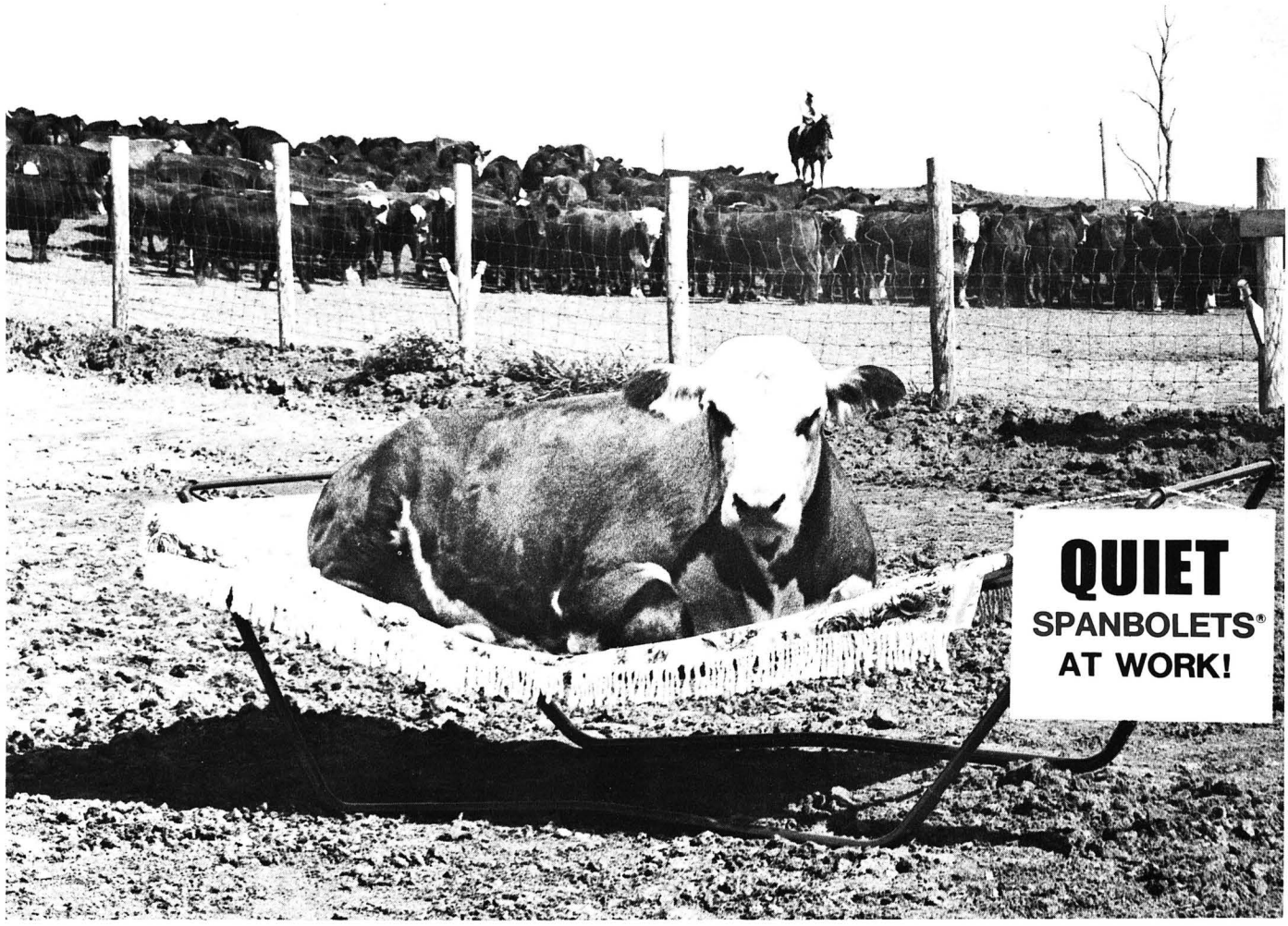

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Long periods of quiet, relaxed rest. Plus continuous, sustained-release sulfa medication. **Just what the doctor ordered for treatment of shipping fever and other bacterial infections!**

Single-treatment Sulfamethazine 'Spanbolets' let you employ "R&R" because there's seldom a need for re-treatment.

Thus, the animal avoids the handling stress that goes with multi-dose sulfas or antibiotics . . . and you avoid the bother and expense of callbacks.

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Sulfamethazine SPANBOLET® Tablets (brand of sulfamethazine in sustained-release form).

Composition: Each Sulfamethazine 'Spanbolet' tablet contains 22.5 gram of sulfamethazine.

Indications: Treatment: For treatment of infectious diseases of non-lactating cattle in which the causative organism is sensitive to sulfamethazine, including: Hemorrhagic septicemia/shipping fever complex, pneumonia, foot rot, bacterial enteritis, diphtheria, bacterial meningitis and/or encephalitis.

Prophylactic: The diseases usually associated with the shipping and handling of cattle as they move from range to feedlot can be significantly reduced by the prophylactic use of this sustained action sulfonamide.

Dosage: (Prophylactic or therapeutic) Administer orally one Sulfamethazine 'Spanbolet' per 185-200 lb. body weight. Do not repeat within five days.

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Since 'Spanbolet' tablets provide sustained release of the sulfamethazine, tissue levels remain for a longer period of time than when administered in conventional forms. Federal law prohibits slaughter of treated animals for food within 21 days after receiving this drug.

Caution: U.S. Federal law restricts this drug to use by or on the order of a licensed veterinarian.

Supplied: Carton of 50 and 5-10 paks.

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Unless the bovine practitioner performs a very thorough necropsy examination, he may easily miss the cardinal lesions of TEME. Unless the correct tissues are examined, and microaerophilic culture techniques are employed, *Haemophilus somnus* will not be recovered by the diagnostic bacteriologist. It would be of great interest to learn how many cases currently diagnosed as "shipping fever," polioencephalomalacia, or clostridial infection might actually be unrecognized *Haemophilus somnus* septicemias. With increased awareness of its apparently widespread incidence may come a demand for adequate preventative measures aimed at control of this disease.

Summary

In addition to characteristic "thrombo," *Haemophilus somnus* infection may result in acute respiratory disease or chronic stiffness of feedlot cattle. Unless the bovine practitioner performs very complete post mortem examinations, he may entirely miss the lesions of this disease, or mistake them for those of shipping fever or clostridial infection.

Clinical signs and lesions characteristic of field cases may be experimentally reproduced in susceptible calves by either intravenous or intratracheal innoculation with pure *Haemophilus somnus* cultures. Complement fixation tests confirm the widespread incidence of this infection. Development of immunizing agents for use in feedlot cattle may be warranted.

References

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2. Panciera, R. J., Dahlgren, R. R. and Rinker, H. B. Observations on Septicemia of Cattle Caused by a *Haemophilus*-like Organism. *Pathologica Veterinaria* 5: 212-226. 1968.

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to *bulls* which *sire calves* that present *fewer dystocias.* These bulls *cannot* be selected (at this time, at least) on the basis of *phenotype* (body size or conformation). They must be selected on the basis of *performance records.*

A Plan For Improving Reproductive Performance

Any improved management system designed to increase beef cow reproductive performance must produce:

1. A high percentage of the herd with normal estrous cycles during the first 20 days of the breeding season. This can be accomplished by increasing the interval from calving to the start of the breeding season. This means the *breeding* and *calving seasons* must be *reduced to 45 days or less.* The cattle must be *fed* to be in *good flesh* at calving and *gaining* in body weight until the *end* of the breeding season.
2. A high first service conception rate.

   The interval from calving to breeding must be increased to allow the reproductive tract time to recover. The breeding and calving seasons *must be short.* The cows must be *gaining body weight* steadily from *calving* until the *end* of the breeding season.
3. Low calf losses at or near birth. Calf losses can be reduced by *intensive care* during a *short calving season.* Heifers should be *mated* to *bulls* that *sire calves presenting few calving problems.*

We suggest the following management practices:

1. Feed heifers to gain a pound a day from *weaning through* the *breeding season.* The English breeds should weigh at least 650 pounds at the start of the breeding season.
2. Start breeding yearlings (or 2-year-old nulliparous heifers) twenty days before the breeding season for the cows. Breed heifers no longer than 45 days. Keep more replacement heifers than needed and cull on the basis of early pregnancy.
3. Breed heifers to a bull that sires calves that are associated with few calving problems.
4. Separate young cows from the older cows in the herd, or they won't be able to compete for available feed.
5. Have all cows in good condition at calving time. They should gain 100 to 150 pounds between weaning and calving, so body weight after calving will equal or slightly exceed body weight at weaning. Cows that are suckled down at weaning time should gain more.
6. All cows should gain *0.5 to 0.75* pounds per day after calving until the end of the breeding season.

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