

# Beef Cow-Calf Management Guide

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This management calendar provides guidelines for health, nutrition, and reproductive management procedures for the cow-calf producer. It begins with a brief discussion of production goals and general factors related to reproduction, nutrition, and health. It then presents specific recommendations, organized into a yearly production cycle consisting of four periods:

- Lactation, breeding, and pregnancy
- Midgestation and weaning
- Precalving
- Calving

The recommended management activities would occur at the same time in the production cycle regardless of whether you utilize spring or fall calving.

Many practices are suggested in this publication; we encourage you to use the ones that best fit your operation. Additional management practices might be required in certain locations. Contact university Extension professionals or a local veterinarian for more information.

## Suggested production goals

- Make every effort to maintain cows and replacement heifers at the proper body condition score for each stage of the yearly production cycle. Doing so will make it easier to attain the remaining production goals. (For a description of body condition scores, see CL720 in *Cow-Calf Management Guide and Cattle Producer's Library*.)



- Strive for a 90 to 95 percent calf crop. Percentage calf crop is based on the number of calves weaned compared to the number of cows exposed to artificial insemination or bulls during the breeding season ( $\{\text{calves weaned} \div \text{cows exposed}\} \times 100 = \% \text{ calf crop}$ ).
- The calving interval for each cow should be no greater than 365 days.
- In the first 21 days of the calving season, try to have 60 percent of the herd give birth. Try to have 80 percent of the cows calve in 45 days and 100 percent within 60 days. This goal may be attained more easily through the use of estrus synchronization and artificial insemination.

- Strive to have healthy, normal-sized calves at birth (similar in weight to breed average).
- Consider consumer demands and produce cattle that are desired by the market.
- Keep feed costs to a minimum. For example, utilize alternate feed sources such as crop residues and food-processing by-products. To optimize nutritional management and thereby minimize cost, seek nutritional guidance from sources such as the Internet or Extension publications and/or personnel.
- Strive to constantly improve the herd by selecting for traits that will result in increased production efficiency and return on investments. Examples include birth weight, weaning weight, mature cow size, etc. Remember, larger is not necessarily better. In part, herd improvement can be accomplished by developing a uniform herd and producing uniform calves. A uniform herd reduces the need to separate animals by size for winter feeding and results in a calf crop that will receive premiums at the marketplace.

## Introduction to the Cow-Calf Management Guide

### Reproduction

Sound reproduction probably is more important than any other management category. One measure of reproductive efficiency for any type of cow-calf operation is the percent annual calf crop. The primary goal of beef producers is to produce one live calf per cow each year. Nationally, the average annual calf crop is approximately 75 percent. However, by utilizing sound management of fertility, a 90 to 95 percent annual calf crop is attainable. To achieve this goal, reproduction should be considered a part of all management strategies.

Reductions in calf crop often can be attributed to infertility. Factors causing infertility can include nutrition, herd health, genetics, and environment. Each plays a major role in the reproductive efficiency of cattle. A deficit in any one area usually

causes or aggravates a shortage in other areas, ultimately reducing the reproductive performance and overall production of the herd.

Many of the factors affecting reproductive performance can be controlled to some extent. Therefore, a well-planned and implemented reproductive management program will improve fertility and result in increased productivity.

### Nutrition

When developing a cow-calf nutritional program, examine all variables critically and attempt to optimize available feed resources. Variables to consider should include cow size, milk production, body condition score, age, stage of gestation, weather, and growing conditions.

If possible, divide the herd into groups with similar nutritional needs. Some examples of groups include bulls, mature cows in average condition, older and thin cows, first-calf heifers, and yearling replacement heifers.

Formulate salt and mineral supplementation based on needs specific to your area. Consult your nutritional consultant or Extension professional for recommendations. Give special attention to calcium and phosphorus ratios, as well as to levels of selenium and copper.

Protein supplements may be needed. Use caution when using NPN (non-protein nitrogen) supplements and seek the advice of a nutritionist. Supplements containing NPN are not recommended for cattle consuming a low-quality, high-roughage diet. Feeder-quality alfalfa hay may be a more economical source of energy and protein.

Dry matter is that part of a feedstuff that contains no weight from moisture. Total daily dry matter intake of beef cattle should equal 2 to 3 percent of the animal's body weight. Remember that a pound of dry hay contains much more dry matter than does a pound of alfalfa silage. Average grass or alfalfa hay contains 85 to 90 percent dry matter, while alfalfa silage contains only 25 to 35 percent dry matter. Feed quality also influences intake.

Maximize the production and utilization of your forage resources. Pasture renovation might be required, including reseeded, fertilization, weed and brush control, and planting new forage species and varieties.

Let cattle harvest as much of the forage as possible, as grazing is the most economical method of harvesting grass. Extend the grazing season as much as possible by planting annual crops such as cereal grains for early spring and fall grazing, or by stockpiling standing forage for late fall or winter pasture.

## Health

For total herd health management, consider prevention, control, and treatment. A sustained program of vaccinations and parasite control, in addition to careful observation and prompt, accurate diagnosis, is essential to a successful health program.

Establish a relationship with a veterinarian who can assess the herd's reproductive and productive performance. A veterinarian can recommend a vaccination program tailored to your herd's specific needs and assist with the diagnosis and control of potential health problems.

## Period 1: Lactation, Breeding, and Pregnancy (postcalving, 195 days)

### Nutrition (See also Appendix 1, NRC requirements, months 1 through 6)

This is the most critical period nutritionally, as the cow is under enormous demands. During this time, she is maintaining a peak level of lactation, reestablishing estrual behavior, and becoming bred. Nutritional status during this period has a major influence on conception rate.

The cow is expected to maintain a pregnancy for 283 to 285 days of the year (also caring for the calf resulting from her previous pregnancy a majority of this time), which leaves approximately 80 days to become rebred if she is to maintain a yearly calving interval. The postpartum anestrous interval (the interval from calving until she regains estrual behavior) accounts for 50 to 75 percent of this 80-day period.

The first and often the second estrus following the postpartum anestrous interval are of lower fertility. Therefore, it is likely that a cow will not conceive until two estrous cycles after the end of the postpartum anestrous interval—66 to 87 days after calving if she reestablishes estrual behavior 45 days after calving. Thus, the calving interval might be longer than 365 days. For this reason, it is important that all cows be in optimal body condition (condition score of 5) and receiving a



diet higher in total digestible nutrients following parturition (an increasing plane of nutrition) to ensure prompt reestablishment of estrous behavior.

Following conception, the major nutritional demand is to maintain lactation. In most beef operations, it is beneficial for the cow to gain weight during this period. Improving energy reserves, and thus body condition score, will help prepare her for the harsh environmental conditions that often follow this period. Fall calving herds often rely on stored feedstuffs by this time and encounter inclement weather, whereas spring calving herds experience elevated temperatures and declining forage quality.

## Health

### **Breeding animals**

Cows and bulls should receive all vaccinations annually at least 2 to 4 weeks prior to breeding or estrus synchronization. Follow the directions on the product label. Suggested vaccinations for the breeding herd are:

- Bulls: BVD, IBR-PI3, campylobacter (vibriosis), leptospirosis, and clostridial bacterins
- Cows: BVD, campylobacter (vibriosis), IBR-PI3, leptospirosis, and clostridial bacterins

Ask your veterinarian about other vaccines that might be needed in your area.

It also is important to control internal and external parasites. Use products that are effective against the parasites in your herd. Alternate products and type of insecticides yearly to slow the development of pesticide-resistant pests.

### **Calves**

Vaccinations for calfhood diseases are important, both for overall herd health and as preparation for the time when calves enter the feedlot. There are several suggested vaccination regimes, depending on the management of the herd and the severity of disease risk in your area. Clostridial bacterins vaccination is recommended for all calves. To be effective, a second booster dose must be given within 3 to 6 weeks. Additional vaccine protection is warranted in most areas. These vaccines include IBR, BVD, BRSV, hemophilus somnus, and leptospirosis.

Consult your veterinarian or university Extension professional for the recommended vaccination schedule in your area.

Dehorn and castrate calves as soon as possible after birth. It is strongly recommended that these procedures be completed by 90 days of age to minimize stress on the calves.

## Reproduction

Select a calving season that optimizes your resources. Heifers and cows should be bred to calve when your ranch resources can be best utilized. With fall calving, calves should be born early enough that cows can rebreed before the



onset of inclement weather. With spring calving, cows should calve before the rapid flush of spring growth. This allows calves to mature enough (approximately 45 to 60 days old) to utilize the flush of spring grass, and cows will benefit from spring grass before rebreeding. Also consider your summer forage resources, timing of weaning, and marketing strategies.

### **Heifers**

Plan to start breeding heifers 20 to 30 days before mature cows. This will allow you to commit more time to heifers during their first calving season and give them a longer postpartum period to recuperate before rebreeding.

### **Breeding season**

When resources permit, plan a 45-day breeding season for heifers and a 45- to 60-day breeding season for mature cows. If virgin heifers fail to become pregnant within 45 days, they likely have retarded development or impaired fertility. If they were to become pregnant at a later date, they might experience problems conceiving the following year within the desired breeding season.

### **Bulls**

Select bulls using a number of EPD traits (see Appendix 2), keeping in mind the weaknesses of your herd. Select sire(s) to balance and strengthen these weaknesses. It is not recommended to attempt to make rapid improvements in your herd by selecting for a single trait. Single-trait selection generally results in a decline in other important traits.

## Postpartum anestrous interval and calving interval

Complete preparation of the reproductive tract (involution of the uterus) for conception following calving requires 30 to 45 days. In addition, it generally is 45 to 60 days after calving before a cow reestablishes estrual behavior (the postpartum anestrous interval) and is observed in standing estrus. Several factors affect the duration of the postpartum anestrous interval, including body condition, age, and genetics.

Energy from feedstuffs is distributed first to maintenance, then to milk production, and finally to reproduction. Because the energy requirements following calving are greater than what a cow typically consumes, the reproductive system ceases to function. This is a normal physiological process that cannot be prevented. However, the length of the postpartum anestrous period directly affects the cow's ability to become pregnant and thus impacts the profitability of your operation. Good nutrition at this time is crucial to ensure prompt reestablishment of estrous behavior (see "Nutrition," page 3).

## Preparation for breeding

### Cows

Allow cows a minimum of 1 to 2 weeks to adapt to their breeding pasture before the beginning of the breeding season.

### Bulls

All bulls should be purchased and at the ranch for 60 days before the breeding season to adapt to the environment. (See page 10 for details regarding a breeding soundness exam.)

### Artificial insemination

Reputable suppliers collect semen for artificial insemination (AI) from bulls of superior genetics (see "Selection of Sires," Period 3). The EPD values for these bulls generally are highly accurate (see Appendix 2). Heifers can be mated to bulls proven to sire smaller calves in order to reduce the incidence of dystocia.

Synchronization of estrus will reduce time required for observation of estrus (heat checking) and result in more calves being born early in the calving season. If utilizing estrus-synchronizing products, follow the manufacturer's instructions closely. Plan thoroughly, and take time to lay out the treatment schedule carefully on your calendar. Be sure to have adequate help and proficient technicians. Have the synchronization compounds on hand and stored properly. *Never* administer vaccines in conjunction with estrus-synchronization hormones. Order semen early and have adequate amounts on hand.

If breeding on heat (estrus detection), watch all females morning and evening for a minimum of 30 minutes to observe for signs of estrus. Signs of estrus include:

- Standing to be ridden by a herd mate or an altered male (primary sign)
- The remaining estrous signs are only aids when detecting estrus, and females should not be bred based on these signs alone. These secondary signs include:
  - Mounting other females
  - Muddy sides (ribs and flanks) in wet environments
  - Ruffled hair on tail head
  - Swollen vulva
  - Restlessness, including bawling
  - Clear mucous discharge from vulva

Heat detection aids are available when economically feasible. These aids include tail head paint, pressure-activated patches, and pressure-activated radio transmitters. Gomer (vasectomized, epididymized, and/or deviated) bulls can be used to assist in the detection of estrus. Chin-ball or chest harnesses can be used with Gomer bulls to assist in estrus detection.

Artificially inseminate heifers and cows 12 hours after the observation of standing heat. Use a clean-up bull for the remainder of the breeding season after the conclusion of AI. Record the date when clean-up bulls are introduced into the herd. These records will assist you in determining

the success of your estrus synchronization and AI programs. Remember to remove bulls on the proper date to maintain a 60-day breeding season.

***If using natural breeding***

Use the appropriate number of bulls (Table 1). Mature bulls can breed more cows, but they might prevent younger bulls from breeding females; therefore, cow-to-bull ratios vary considerably when using more than one sire.

Take the breeding pasture size and topography into account. Cow-to-bull ratios should be considerably lower on large pastures or rough terrain.

Observe bulls and cows during the natural mating period for breeding activity and bull libido. Bulls often become injured during the breeding season, resulting in a reduced pregnancy rate.

**Table 1.—Number of bulls needed for natural breeding.**

Age of bull	Number of cows able to service
Yearling	10–20
2-year-old	20–30
Mature	25–35

**Period 2: Midgestation and Weaning (110 days)**

**Nutrition (See also Appendix 1, NRC requirements, months 7 through 10)**

This period has the lowest nutritional demands for the cow, particularly after the calves are weaned. Utilize the lowest quality feed resources during this period. Utilizing poorer quality roughage, such as crop residues, and lesser quality hay is ideal. However, it is important that the cow not lose excessive body condition during this time. Cows should never lose more than 1 to 1.5 condition scores. Keep in mind that an average body condition score of 5 is optimal.

Prepare calves for the stress of weaning by supplying feed that meets their requirements for growth and maintenance of an effective immune system. Enhance their immune system with selected vaccines. Keeping freshly weaned calves on an adequate ration is very important to minimize the effects of weaning stress and to maintain health.

**Health**

For calves, give vaccines in two doses: an initial dose followed by a booster dose within 2 to 6 weeks. Give the first dose 4 to 6 weeks before weaning so that the second dose can be given at least 10 days before weaning. Consult your veterinarian or Extension professional for recommended



vaccines. Typically, if calves are destined for an auction, backgrounding lot, or feedlot after weaning, vaccination for IBR, BVD, and BRSV is recommended.

Heifers kept for breeding should also be vaccinated against BVD and campylobacter (vibriosis). In addition, heifers kept for breeding must be vaccinated for brucellosis (Bang’s disease). State regulations vary as to the time of vaccination. Check with your state veterinarian or local practicing veterinarian for specific information on brucellosis.

Control internal and external parasites in your herd. Follow the label directions related to dosage

for different weights and ages; administer treatments a minimum of 4 weeks before breeding.

Always follow the label directions for all health products. In addition, follow the recommended Beef Quality Assurance locations for injectable products. (See *Cow–Calf Management Guide and Cattle Producer’s Library* CL 212-1 and 290-1 for more information on Beef Quality Assurance.)

## Reproduction

Ideally pregnancy diagnosis exams should be scheduled with your veterinarian 60 to 90 days after the breeding season. Identification of open cows (not pregnant) will permit you to market them as soon as possible after weaning; this will minimize resources utilized on open cows and maximize income from open females.

### **Reasons to cull cows at weaning**

- Open
- Failed to wean a calf
- Unsound (cows with poor udders, legs and feet, or worn or missing teeth)
- Poor disposition. The saying “a bad apple spoils the whole barrel” also applies to a herd of cows. Culling one “spooky” or “excitable” cow, regardless of her production record, to obtain a calm herd is invaluable.
- Poor calf performance. Light calf weaning weights, due to either deficient milk production or a late calving date, cost you pounds of beef and profit.
- Poor maternal behavior. Time lost caring for an abandoned calf or sick calves resulting from reduced colostrum intake costs you money.
- Calving difficulties (dystocia)

Consider your herd goals. Have you met your targets or are some production goals deficient? Review and summarize the previous year’s calving and production records. Information you may wish to consider includes percentage of cows calving during each 21-day period of the calving season, calf birth weight, calving difficulties, maternal disposition, weaning weight of calf, and weaning weight ratio for each cow.

### **Heifer selection criteria**

Take the following factors into account when selecting heifers:

- Weaning weight (consider a heifer’s ability to reach a breeding target weight of 65 percent of expected mature body weight; see Appendix 3). However, recent research has demonstrated that first-calf heifers with high-growth EPDs often have an extended postpartum anestrous interval and are slower to breed back for their second calf. In addition, selecting only the biggest heifers could result in increasing the average mature size of your herd. Therefore, it is important to use a balance when selecting replacement females; consider birth date, EPDs, and actual performance, as well as conformation.
- Heifers that were born early in the calving season will be older and tend to weigh more at breeding. They are the daughters of reproductively efficient cows and have the potential to be more reproductively efficient.
- The dam’s production record
- The sire’s expected progeny difference (EPD) values (see Appendix 2)
- The heifer’s conformation
- The heifer’s temperament
- Never select freemartin heifers (a sterile or otherwise sexually imperfect female calf born as the twin of a bull calf).
- Select 20 percent more replacement heifers than are actually needed to allow culling for reproductive failure.

### **Onset of puberty**

**Remember** that weight, age, heredity, and breed affect puberty. Heifers can be bred only after they reach sexual maturity or puberty. The most critical factor affecting the onset of puberty is weight (see Appendix 3).

- Determine target weights for breeding—65 percent of expected mature body weight at an average body condition score of 5.5 to 6.
- Calculate days to breeding and average daily gain needed to attain breeding target weight.
- Weigh heifers monthly to ensure that all heifers weigh 65 percent of expected mature body

weight by the beginning of the breeding season. Heifers may need to be grouped accordingly for feeding. Avoid feeding all heifers to the average; this approach will result in some heifers being overfed and others not attaining their target weight. Overfeeding causes excess body condition and mammary fat deposition. Fat deposited in the mammary gland (udder) results in impaired milk production. Excess body fat also can reduce fertility, resulting in poor conception rates.

**Reproductive tract examination**

Palpate all heifers at 12 months of age to determine:

- Size of pelvic opening
- Shape of pelvic opening
- Reproductive tract score (see Table 2)

Your veterinarian or Extension professional can assist in collecting these measurements.

After breeding, keep the replacement heifers separate from cows. Maintain replacement heifers in moderate condition (body condition score of 5.5 to 6) and feed them to weigh 85 percent of expected mature body weight at calving. Underfeeding will not reduce birth weights or the incidence of dystocia (difficult labor). However, underfeeding can result in a delayed return to estrus following calving, reduced milk during lactation, or impaired lifetime productivity. Overfeeding, on the other hand, can result in an increased incidence of dystocia and reduced milk production.

**Table 2.—Reproductive tract scoring system and its relationship to reproductive performance.**

Score	Uterine horns	Ovaries—approximate size (mm)				Follicle diameter	Pregnant to AI after synchronization (%)	Total pregnant (%)
		Length	Height	Width				
1	Immature < 20 mm diameter No tone	15	10	8	< 8	2.6	28.2	
2	20–25 mm diameter No tone	18	12	10	8	22.6	74.2	
3	20–25 mm diameter Slight tone	30	16	10	9–10	39.5	76.8	
4	30 mm diameter Good tone	32	18	12	> 10 Possible corpus luteum	54.6	94.1	
5	30 mm diameter Good tone	> 32	20	12	> 10 Possible corpus luteum	55.0	85.0	

Adapted from Anderson et al., 1990, and Odde et al., 1994.

## Period 3: Precalving (60 days)

### Nutrition (See also Appendix 1, NRC requirements, months 11 and 12)

This period is the shortest, but it should not be overlooked. During these final 50 to 60 days of gestation, approximately 65 to 80 percent of fetal growth occurs. Thus, if the birth weight is 80 to 85 pounds, the increase in fetal weight during this period is 50 to 60 pounds.

Cows receiving inadequate nutrition direct nutrients away from other demands to meet fetal growth requirements. Poor nutrition during this period can result in weak labor, increased dystocia, an extended postpartum anestrous interval, impaired milk production, reduced calf weaning weight, and poor rebreeding performance. On the other hand, gross overfeeding during pregnancy can result in reduced birth weight, decreased milk production, increased dystocia, and neonatal death loss. Studies have shown that birth weight decreased as cow condition score decreased below 3.5 or increased above 7, but it did not change significantly within the range of cow condition scores from 3.5 to 7.

### Health

Vaccinations are given to cows prior to calving in order to pass antibody protection to calves through the colostrum. If scours is a problem in your herd, vaccination is suggested at this time.

### Prepare calving area and supplies

If possible, rotate the calving area yearly to help reduce the incidence of scours and disease.

Suggested items to have on hand include:

- Injectable antibiotics
- Drench or oral tube feeding bag
- Electrolytes
- 7 percent iodine for navels
- Frozen colostrum (thaw slowly) or commercial colostrum substitute
- Obstetrical assistance equipment
- Lubricants
- Disinfectants



### Reproduction

Timing of feeding has been shown to be correlated with the time of day calving occurs. Consider beginning late afternoon/evening feeding about 1 month before the start of the calving season to increase the number of births occurring during daylight hours.

Begin feeding cows an increasing plane of nutrition approximately 50 to 60 days before the onset of calving. Improved cow body condition at this time will reduce the postpartum anestrous interval and thus increase the number of cows that rebreed.

### Selection of sires

Careful deliberation of genetics will allow you to make significant advancements in your herd. The bull you select should be able to contribute substantially superior genetics to your herd.

If using multiple breeds, know the breed averages for birth weight, weaning weight, yearling weight, 365-day hip height, etc.

Consider utilizing the following criteria in the selection of sires:

- Expected progeny difference (EPD) values (see Appendix 2), considering birth weight, growth traits, maternal characteristics, and carcass traits. Expected progeny difference values are the most beneficial tool that can be utilized to

direct genetic changes within your herd. Choose bulls sired by bulls with high-accuracy EPDs to ensure that you are indeed purchasing the traits you desire.

- 205 and 365-day weight and ratio
- 205 and 365-day hip height. This trait will allow you to increase, decrease, or maintain the mature size of your cattle.
- Thickness and muscling (below average, average, above average)
- Semen quality (concentration, motility, and morphology of sperm)
- Scrotal circumference (at 1 year of age). Scrotal circumference (SC) in young bulls is a useful indicator of reproductive potential in beef cattle. It is positively correlated with total sperm production and favorably related to semen quality. In addition, there is a genetic relationship between SC and age at puberty in female offspring. Research has also shown a relationship between SC and age at first breeding and at rebreeding in female offspring.
- Bulls with an SC less than 32 cm generally are prepubertal and should not be used. Daughters of bulls with SC exceeding 36 cm usually attain

puberty at a younger age. If utilizing a terminal sire and no calves will be retained, a smaller SC sire is acceptable. Use caution when using a terminal sire and do not retain any replacement heifers resulting from this mating.

- Conformation and structural soundness
- Temperament
- Actual birth weight
- Performance data from sire, dam, and siblings (if available)

Frequently, true genetic improvement occurs in only a few herds. Unfortunately, price and pedigree often are higher priorities than a bull's actual performance compared to his contemporaries' performance and his potential genetic merit (EPD values).

Bulls should be given a breeding soundness exam and a fertility exam 60 days before the beginning of the breeding season. If bulls fail these exams, you will have ample time to secure replacements. Breeding soundness exams should include:

- A physical examination
- Examination of the reproductive tract
- A semen evaluation
- Evaluation of mating desire (libido)

## Period 4: Calving (1 day)

### Nutrition

Cows usually do not eat a significant quantity of feed immediately preceding or following parturition (birth). However, good-quality hay and adequate fresh water should be available at all times, especially after an assisted birth associated with dystocia.

### Health

Health practices at this time are related to making sure that the calf is off to a sound start and the cow does not suffer any long-term reproductive problems. Calving difficulties or a retained placenta may cause injury or illness to the cow,



extending her postpartum anestrous interval and preventing her from cycling within 45 days after calving.

Retained placenta may indicate a selenium deficiency; check feed samples and mineral supplements for adequate selenium. It is recommended that a retained placenta be allowed to be expelled naturally; treat cows only for infection or to encourage placenta expulsion.

Keep sick animals separate from the remainder of the herd to limit the transfer of infection. If feasible, separate pairs from pregnant cows daily or as often as possible. This will improve the ability to detect dystocia quickly, identify calves that are not claimed by their dam, and manage late-calving cows differently from those calving early in the calving season.

### ***Calf health procedures at birth***

- Apply 7 percent iodine solution to the navel. It is recommended that iodine be applied to the inside of the navel with a squeeze bottle. Avoid continual human skin contact with the solution.
- Provide colostrum for calves that do not nurse within 4 hours of birth. Colostrum will be absorbed by the calf for the first 12 hours following birth. Generally a 75-pound calf should receive 2 to 3 quarts of colostrum within 4 to 6 hours of birth.
- Identify calves with ear tags and/or tattoos.
- Record sex, birth date, dam, sire, and birth weight (if available).
- Check calves frequently for scours and pneumonia.
- This is the least stressful time to castrate. If using bands, ensure that both testicles are below the band. (Testicles are small and easy to miss at this age.)
- Calves with horn buds can be dehorned at this time with dehorning paste or a hot iron.

## **Reproduction**

### ***Dystocia (calving difficulty)***

Getting your cows bred is of primary importance. However, if the calf dies during delivery, all reproductive and genetic gains are lost. Dystocia occurs in only about 2 percent of mature cows, but in 10 to 12 percent of heifers. Therefore, observe heifers carefully during the calving season. Dystocia affects not only calf survival, but also future reproduction. It often results in retained placenta, and the postpartum anestrous interval typically is extended by 1 day for each 10 minutes of dystocia.

Look for these signs of calving difficulty:

- Only the calf's tail is visible.
- Only the calf's head is visible.
- Front feet protrude past the knees, but the calf's nose is not visible and cannot be located easily.
- Feet are upside down.
- The head and only one foot are visible.
- More than two feet are visible.
- No progress after 15 to 20 minutes of labor.

Management and genetic factors associated with dystocia include:

- Calf birth weight
- Age and parity of dam
- Dam's pelvic area
- Dam's breed and/or size
- Sex of calf
- Sire breed
- Gestation length
- Dam's sire
- Nutrition and body condition score of dam
- Geographic region
- Exercise
- Hormonal factors

## Appendix 1. NRC Diet Nutrient Density Requirements of Beef Cows<sup>1</sup>

	Months since calving											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>1,200 lb mature weight, 20 lb peak daily milk production<sup>2</sup></b>												
TDN, % DM	58.70	59.90	57.60	56.20	54.70	53.40	44.90	45.80	47.10	49.30	52.30	56.20
ME, mcal/lb	0.98	1.00	0.96	0.94	0.94	0.89	0.75	0.76	0.79	0.82	0.87	0.94
NE <sub>m</sub> , mcal/lb	0.59	0.61	0.57	0.55	0.53	0.51	0.37	0.38	0.41	0.44	0.49	0.55
DM, lb/day	26.80	27.70	28.40	27.40	26.50	25.70	24.20	24.10	24.00	23.90	24.10	24.60
Milk, lb/day	16.70	20.00	18.00	14.40	10.80	7.80	0.00	0.00	0.00	0.00	0.00	0.00
CP % DM	10.10	10.69	9.92	9.25	8.54	7.92	5.99	6.18	6.50	7.00	7.73	8.78
Ca % DM	0.29	0.31	0.29	0.26	0.24	0.22	0.15	0.15	0.15	0.26	0.25	0.25
P % DM	0.19	0.21	0.19	0.18	0.17	0.15	0.12	0.12	0.12	0.16	0.16	0.16

<sup>1</sup>Nutrient Requirements of Beef Cattle, 7th revised edition, 1996.

<sup>2</sup>Note: If mature cow weight is over or under 1,200 lb and if milk production is over or under 20 lb per day, also see NRC, 7th revised edition, 1996, Appendix Tables 21 and 23, pp. 226 and 228.

## Appendix 2. Expected Progeny Difference

An Expected Progeny Difference (EPD) is the expected difference in the performance of a bull's progeny compared to the average performance of progeny from all bulls evaluated within a breed. That is, an EPD is the difference for a given trait compared to the breed average. An EPD gives a prediction of future progeny performance of one sire compared to that of another sire for a specific trait. Note that EPDs are breed-specific; for example, the EPD values for an Angus sire cannot be compared to those for a Simmental sire.

EPDs can be a plus or minus value and are reported in the units of measurement for a given trait. For example, birth, weaning and yearling weight, and maternal milk are reported in pounds, and are the expected differences from breed average.

Expected progeny difference values are most useful when two sires are compared directly. For



example, if the birth weight EPD for Sire A is -3 pounds and the birth weight EPD for Sire B is +2 pounds, on average we could expect the birth weight of calves from Sire B to be 5 pounds heavier than that of calves from Sire A. This result will occur only if both bulls are mated to cows

with similar genetic potential and all cows are managed uniformly. Thus, EPDs allow prediction of differences in expected performance, not actual performance. In other words, the predicted performance difference of Sire A and Sire B is 5 pounds, but it is not possible to predict actual birth weight accurately.

### **Accuracy values**

An EPD value alone is not very useful; the accuracy value associated with the EPD is equally important. The accuracy value of an EPD tells us how much data was used in calculating the EPD. An EPD value below 0.75 cannot be considered highly accurate.

The EPD values for a young bull are based on the average EPDs of his parentage and have low accuracy levels. For example, if one of the bull's parents is minus for milk and the other parent is plus for milk, the average may appear acceptable. However, the bull might sire calves that tend to have characteristics closer to either of the grand-parents. A low-accuracy EPD is a preliminary estimate of how a young sire will perform. The EPD value for this sire may change as more data from his offspring become available. However, even a low-accuracy EPD provides more information about a sire than his performance records alone.

### **Using EPDs in your herd**

If you are primarily a cow-calf producer and sell calves at weaning, EPDs for birth weight and

weaning weight should be of highest importance. If calves are held until yearlings, birth weight and yearling weight EPDs should be considered first. However, remember that your primary product is beef, so always consider carcass trait EPDs (carcass weight, marbling, rib eye area, backfat, and percent retail product). If ownership is retained to slaughter, birth weight and carcass trait EPDs are of primary importance. If replacement heifers are retained in any of these scenarios, also consider maternal traits such as milk production, stayability, maternal calving ease, and mature size.

### **Using a balance**

It is important to select bulls using a number of EPD traits, keeping in mind the areas you wish to improve in your herd. This will allow you to select sires to balance and strengthen these weaknesses. It is not recommended to attempt to make rapid improvements in your herd by selecting for a single trait. Single trait selection generally results in a decline in other important traits.

### **Conclusion**

By using EPD values from sire summary data, you can improve the performance of offspring from your herd and make significant genetic improvements within the herd. Rapid improvements in carcass traits can be attained with EPD values, thus providing a means to remain competitive in today's markets, considering the movement toward value-based marketing,

## Appendix 3. Heifer Development from Weaning to Breeding

The period from weaning to breeding is a very critical time in a beef female's life. At weaning, she is between 7 and 10 months old and can weigh anywhere from 350 to 650 lb. Approximately 6 months later, she is exposed to a bull or to artificial insemination. Ideally, most of these heifers conceive in the first 21 days, and 80 percent or more are pregnant after a 45-day breeding season.

Age, weight, breed, and environmental stresses such as temperature and parasitism all affect the onset of puberty. Weight is the one factor that producers can readily manipulate. Researchers and ranchers have observed that a high percentage of heifers will not reach puberty until they have reached approximately 65 percent of their expected mature body weight (often referred to as the breeding season "target weight"). If heifers weigh only about 55 percent of their expected mature body weight, you can expect only 50 percent of them to be cycling at the beginning of the breeding season. However, about 90 percent of most beef heifers will have attained puberty when they weigh 65 percent of their expected mature body weight.

Many ranchers do not routinely weigh the mature cows in their herd to know what average mature weight to expect. Therefore, they underestimate the mature body weight of their cows and tend to underestimate the target weights for their heifers. American Angus Association data indicate that the average mature body weight of the seedstock portion of their breed is about 1,200 lb. Heifers from 1,200-lb dams need to weigh roughly 780 lb by the beginning of their first breeding season. Likewise, heifers with a potential mature body weight of 1,000 lb can be expected to attain puberty at approximately 650 lb. These weights are not exact because there is considerable variation within breeds, but they show that larger frame, heavier cattle must be fed for greater growth rates than smaller frame, lighter cattle.



Weaned replacement heifer feeding programs must be designed to cause heifers to gain enough from weaning to 13 months of age to cause a high percentage of them to begin cycling. Smaller, lightweight heifers have difficulty gaining enough weight from weaning to breeding to attain puberty before the beginning of the breeding season. It should be emphasized that replacement heifers need to be fed separately from the rest of the herd. Because of their size and age, as well as higher nutritional demands, they simply cannot compete with the rest of the cow herd, nor can they be expected to conceive as yearlings if fed the poorer quality forages often fed to mature cows.

Calculate the number of days between initial weighing and beginning of the breeding season. Then determine the average daily gain necessary to reach the desired breeding weight and feed heifers to attain that average daily gain. The addition of approved levels of ionophores to the ration will improve the average daily gain and has been demonstrated to hasten onset of puberty.

Individual heifer weight, rather than average group weight, should be utilized when feeding replacement heifers. Simply because a group of heifers has reached the desired average target weight at 15 months of age does not mean they all will have reached puberty. If the group averages 700 lb, some heifers probably weigh 600 lb, while

others weigh 800 lb. Those that weigh 600 lb will not breed well, while those weighing 800 lb have been fed more than was required. Replacement heifers should be sorted by size and fed to reach the desired target weight, thereby giving additional feed only to the heifers that need it.

Age also is an important factor affecting the onset of puberty, especially in Brahman and

Brahman cross cattle. Many of these heifers do not reach puberty until they are 16 to 20 months of age. The same rule of thumb concerning 65 percent of the expected mature body weight still applies, but the additional days of age also are important. Thus, it may be beneficial to feed Brahman heifers to reach 68 percent of their expected mature body weight.

**Table 3.—Puberty weight of heifers by breed (assumes small to moderate frame).**

<b>Breed</b>	<b>Weight at breeding (lb) 50% cycling</b>	<b>Weight at breeding (lb) 90% cycling</b>	<b>Anticipated mature weight (lb)</b>
<i>(Average puberty age 13–16 months)</i>			
Angus	550	650	1,000
Brangus	600	700	1,075
Charolais	700	775	1,190
Hereford	600	700	1,075
Shorthorn	500	600	925
British x British	575	675	1,040
Charolais x British	675	775	1,190
Limousin x British	650	775	1,190
Simmental x British	625	750	1,150
<i>(Average puberty age 16–20 months)</i>			
Brahman	700	750	1,150
Brahman x British	675	750	1,150

## Glossary

- Body condition score**—A numerical value (ranging from 1 to 9, with 1 being extremely thin and 9 being obese), derived from visual appraisal based on apparent external fat cover, muscle appearance, and perceptible skeletal features.
- Brucellosis (Bang's disease)**—A contagious venereal disease caused by bacteria and characterized by abortion, infection of sex glands in the male, and infertility in both sexes.
- BVD (Bovine virus diarrhea)**—A mucosal disease complex caused by a virus, characterized by diarrhea and dehydration. Pregnant cows should not be vaccinated against BVD; the vaccine can cause abortion and birth defects.
- Campylobacter (Vibriosis)**—A disease that causes abortion in the middle one-third of gestation.
- Clostridia**—A genus of bacteria responsible for a variety of cattle diseases such as black leg, malignant edema, and overeating disease.
- Colostrum**—The first milk produced after calving. It is high in energy, antibodies, and minerals. Calves should consume colostrum within 4 hours of birth.
- Conformation** – The physical form or make-up of an animal; its shape and arrangement of parts.
- Corpus luteum** – A yellowish body on the ovary. The corpus luteum arises from cells that formed the follicle and secretes progesterone.
- Dry Matter (DM)**—That part of a feedstuff that contains no weight from water.
- Dystocia**—A slow or difficult labor or delivery during parturition.
- Electrolyte solution**—A solution used to replace a dehydrated animal's lost minerals and fluids.
- Epididymized** – Removal of the epididymis (a long coiled tubule leading from the testis to the vas deferens) to render a male sterile.
- Estrous cycle**—A naturally occurring reproductive cycle, hormonally controlled, marked by a period of sexual activity and ovulation.
- Estrual behavior**—The behavior exhibited by a sexually active female when she is in estrus; includes standing to be ridden by a herd mate or bull.
- Estrus**—The period when females are sexually active, stand to be ridden by a herd mate or bull, and will mate with a sexually active bull.
- Estrous synchronization**—The use of hormones to bring the estrous cycle of all animals to the same stage, facilitating the use of artificial insemination.
- EPD (Expected progeny difference)**—The expected difference in the performance of a bull's progeny compared to the average performance of progeny from all bulls evaluated within the same breed.
- Freemartin**—A sterile or otherwise sexually imperfect female calf born as the twin of a bull calf.
- Gestation**—The period during which an animal is pregnant.
- Gomer bull**—A bull that has been surgically sterilized and is used to detect estrus during artificial insemination breeding season.
- IBR (Infectious Bovine Rhinotracheitis)**—An acute, contagious, viral infection characterized by inflammation of the upper respiratory tract. It can cause abortion at any time during gestation.
- Ionophores**—Antibiotics added to feed to alter rumen metabolism and improve animal performance. Currently, two ionophores (Rumensin and Bovatec) are approved by the FDA for commercial use in cattle.
- Involution**—Return of the uterus to its normal size or condition after being enlarged during pregnancy.
- Lepto (Leptospirosis)**—An abortion disease with the additional symptoms of high fever, poor appetite, and bloody urine.
- ME (metabolizable energy)**—Gross energy in the feed minus the sum of energy in the feces,

gaseous products of digestion, and energy in the urine. Energy that is made available for body uses.

**NEm (net energy of maintenance)**—The energy required for maintenance of the animal.

**NPN (Non-protein nitrogen)**—Dietary nitrogen supplied in an inorganic form, such as urea or ammonia.

**Parity**—The number of times that a female has given birth.

**Parturition**—The process of giving birth.

**PI3 (Parainfluenza III)**—Viral pneumonia that usually affects cattle between 1 and 8 months of age.

**Postpartum anestrous interval**—The period from calving to reestablishment of estrual behavior during which the female is sexually inactive.

**Prepubertal (prepuberty)**—The phase of physical development immediately preceding puberty (incapable of sexual reproduction).

**Puberty**—The stage of becoming physiologically capable of sexual reproduction, marked specifically by genital maturation.

**Stayability**—A measure of longevity that assesses the likelihood of a female remaining in the herd to at least 6 years of age.

**TDN (Total digestible nutrients)**—A measure of the total energy content of a feedstuff.

**Terminal sire**—A sire used to breed cows from which *all* calves will be sold for meat and not replacement heifers.

**Trich (Trichomoniasis)**—A contagious, venereal protozoan disease characterized by sterility, uterine infection, and abortion.

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*Producer's Library*, 2nd ed. J.R. Adams (ed.). Cooperative Extension System, Agricultural Communications Center, University of Idaho, Moscow, ID.

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## Useful Web sites

### Agricultural market reports and statistics

Census of Agriculture—<http://www.usda.gov/nass/census/census.htm>

Chicago Board of Trade—<http://www.cbot.com/>

Chicago Mercantile Exchange—<http://www.cme.com/>

USDA Agricultural Marketing Service, Livestock and Grain Market Branch—[http://www.ams.usda.gov/lsg/mncs/lsg\\_main.htm](http://www.ams.usda.gov/lsg/mncs/lsg_main.htm)

USDA Livestock Report—<http://ianrwww.unl.edu/markets/livestck.htm>

### Animal sciences departments

California State University, Chico Integrated Animal Systems—<http://www.csuchico.edu/agr/agSystems.shtml>

Colorado State University—<http://ansci.colostate.edu/>

Oklahoma State University Department of Animal Science—<http://www.ansi.okstate.edu/>

Oregon State University Department of Animal Sciences—<http://oregonstate.edu/dept/animal-sciences/>

University of California–Davis Department of Animal Science—<http://animalscience.ucdavis.edu/>

University of Idaho Animal and Veterinary Science Department—<http://www.av.uidaho.edu/>

University of Nebraska Animal Science Department—<http://animalscience.unl.edu/>

Utah State University Department of Animal Dairy and Veterinary Sciences—<http://www.advs.usu.edu/>

Washington State University Department of Animal Sciences—<http://www.ansci.wsu.edu/>

### Cattlemen's associations

Beef Cattle Associations—<http://www.cattlehome.com/assoc.html>

California Cattlemen's Associations—<http://www.calcattlemen.org/>

Idaho Beef Council—<http://www.idbeef.org/>

National Cattleman's Beef Association—<http://www.beef.org/>

Oregon Cattlemen's Association—<http://www.orbeef.org/oca.htm>

Washington Cattlemen's Association—<http://www.washingtoncattlemen.org/>

### Federal government

Animal and Plant Health Inspection Service (APHIS)—<http://www.aphis.usda.gov/>

United States Department of Agriculture (agencies and staff offices)—<http://www.usda.gov/>

### Magazines and publications

American Small Farm—<http://www.smallfarm.com/>

Beef—<http://industryclick.com/magazine.asp?siteid=5&magazineid=13>

Cattle Today On-Line—<http://www.cattletoday.com/>

Drovers—<http://www.drovers.com/>

Farm Journal—<http://www.farmjournal.com/>

High Plains Journal—<http://www.hpj.com/>

Successful Farming/Agriculture Online—<http://www.agriculture.com/>

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Government Information Sharing Project—<http://govinfo.kerr.orst.edu/>

Livestock Virtual Library—<http://www.ansi.okstate.edu/library/index.htm>

National Climatic Data Center—

<http://lwf.ncdc.noaa.gov/oa/ncdc.html>

Oregon State University Extension Publications and Videos—<http://eesc.oregonstate.edu/agcomwebfile/edmat/Edmatindexag.html>

Oregon State University Extension and Experiment Station Communications Related Web Sites—<http://eesc.oregonstate.edu/agcomwebfile/related/default.html>  
The Farmer's Guide to the Internet—[http://rural.org/Farmers\\_Guide/](http://rural.org/Farmers_Guide/)  
Veterinary Science and Livestock—<http://netvet.wustl.edu/vet.htm>

### **State government**

Oregon Department of Agriculture—  
<http://www.oda.state.or.us/>  
Oregon Department of Fish and Wildlife—  
<http://www.dfw.state.or.us/>

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