Beef Cow-Calf Management Guide

Scott Duggan, Gene Pirelli, Charles Estill, Juliana Ranches and Dale W. Weber

Credit: Scott Duggan, © Oregon State University

Raising cattle for profit requires a detailed management plan that sets production goals and timelines days, weeks and even years in advance. These guidelines for health, nutrition and reproductive management will help beef cattle producers make critical decisions. Specific recommendations fall into an annual production cycle consisting of four periods:

1. Lactation, breeding and early pregnancy.
2. Midgestation and weaning.
3. Dry period and pre-calving.
4. Calving.

These activities occur at the same relative time in the cycle regardless of winter, spring or fall calving. This guide is a source of practices typically used by cow-calf producers. Use the practices that best fit your operation. Adapt them to your location and management goals. Contact Extension professionals or a local veterinarian for more information.

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Recommended production goals for the beef operation

- Maintain cows and replacement heifers at the proper body condition score, or BCS, for each stage of the annual production cycle. This will make it more likely that you will achieve the rest of your production goals. See “Body condition score.”
- Produce a calf crop of 90% to 95%. 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.
  % calf crop = (# of calves weaned / # of cows exposed) x 100
- Maintain a calving interval for each cow that is no greater than 365 days. Some producers use a 64-day breeding season to ensure all cows have at least three chances to become pregnant.
- Manage a 60-day calving season. In the first 21 days of the calving season, 60% of the herd should calve. Eighty percent of the herd should calve in 45 days and 100% within 60 days.
- Produce healthy, average-sized calves at birth (similar in weight to breed average). A group of uniform calves is more attractive to potential buyers.
- Consider consumer demands and produce cattle that are desired by the market. Feedlots, niche and organic markets may have different specifications to meet their demand.
- Keep feed costs to a minimum. For example, use alternative feed sources such as crop residues and food-processing byproducts. To optimize nutrition management and minimize cost, seek nutritional guidance from Extension publications or personnel.
- Continuously improve the herd by selecting for traits that will result in increased production efficiency, return on investment and ease of cattle handling. Examples include birth weight, weaning weight, mature cow size and docility. Research has indicated that 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 in the market.
- Evaluate the profitability of your operation each year. When setting goals, consider the economic return per acre in addition to production per animal. Compare pounds of beef produced per acre or per dollar invested. This type of analysis will show actual profitability more clearly.

Red Angus cow and calf.

Credit: Scott Duggan, © Oregon State University

Introduction

Here are some recommendations for reproduction, nutrition and health in a beef cow-calf operation. See the glossary for help in understanding any of the terms used here.

Reproduction

Efficient reproduction is the most important management category. The primary goal of beef producers is to produce one live calf per cow each year. One measure of reproductive efficiency for cow-calf operations is the percent annual calf crop. By using sound fertility management, producers can attain a 90% to 95% annual calf crop. To achieve this goal, consider reproductive traits in all management strategies.

Poor fertility is frequently the reason for reduced calf crops. Factors that reduce fertility include nutrition, herd health, genetics, cow age, bull fertility and environment. Each plays a major role in the reproductive efficiency of cattle. A deficit in any one area typically affects other factors, ultimately reducing the reproductive performance and overall production of the herd.

Many of the factors affecting reproductive performance can be controlled to some extent. A well-planned and executed reproductive management program will improve fertility and productivity.

Nutrition

When developing a cow-calf nutrition program, examine all variables critically and try to optimize available feed resources. When developing a ration, consider cow size, milk production, body condition score, age, stage of gestation, weather and growing conditions. Determine the nutrient content of the feed or forage for your herd by sending feed samples to an analytical laboratory. Knowing the nutritional quality of the feed is essential when formulating feed rations. To learn more about developing a nutrition program, see *Beef Cattle Nutrition Workbook,* (https://catalog.extension.oregonstate.edu/em8883) EM 8883.

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

Pay close attention to the levels of minerals available in cattle feed. Formulate salt and mineral supplementation based on needs specific to your area and available feeds. Also, be aware of the timing and source of the supplement you choose to use. Cattle respond differently to organic and inorganic supplement sources. Give special attention to calcium and phosphorus ratios, as well as to levels of selenium and copper. Contact your nutrition consultant or Extension professional for recommendations. To learn more about mineral supplementation, see *Mineral Supplementation of Beef Cattle in the Pacific Northwest,* (https://catalog.extension.oregonstate.edu/pnw670) PNW 670.

Depending on the feed source, cattle producers may need to provide protein supplements. Use caution when using nonprotein nitrogen, or NPN, supplements, and seek the advice of a nutritionist. Supplements containing non-protein nitrogen NPN should be fed with caution when cattle are consuming a low-quality, high-roughage diet. Ruminant bacteria need a rapidly available energy source to successfully use urea, or excess ammonia may enter the bloodstream, causing toxicity and potentially death. Forage-based diets typically do not have a large amount of rapidly degradable energy. Consequently, livestock producers need to limit the use of NPN supplements. Feeder-quality alfalfa hay is often the most economical source of supplemental 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%–3% of the animal's body weight, but will depend on the quality of the feed. A pound of dry hay contains more dry matter than does a pound of alfalfa silage. Average grass or alfalfa hay contains 85%–90% dry matter, while alfalfa silage contains only 25%–35% dry matter.

The quality and palatability of the feed has a strong influence on intake. Maximize the production and utilization of your forage resources. Use Management-intensive Grazing to maximize forage production and reduce feeding costs.

If forage production is low, pasture renovation might be required. This may include reseeding, fertilization, weed control and planting new forage species. When grazing rangelands (open country with native vegetation), assess forage resources by estimating forage production, identify forage species, and establish a long-term rangeland monitoring protocol. See the *Western Oregon and Washington Pasture Calendar,* (https://catalog.extension.oregonstate.edu/pnw699)PNW 699, and *Pasture and Grazing Management in the Northwest,* (https://catalog.extension.oregonstate.edu/pnw614) PNW 614, for more information on pasture management. See *Applying Adaptive Grazing Management,* (https://catalog.extension.oregonstate.edu/pnw711) PNW 711, for more information on managing rangelands.

Allow cattle to harvest forage without overgrazing. Do not graze forages below 3–4 inches, or damage to the plant will occur. 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. Another option is to windrow the standing forage (such as tall fescue or Russian wildrye) to be grazed at a later time. Stockpiling and windrowing standing forage will only work well in drier climates.

Health

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

Establish a valid veterinarian-client-patient-relationship with a veterinarian who can assess the herd's reproductive and performance data, assess herd health and provide veterinary services.

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. For more information, see *The Veterinary Feed Directive: Questions and Answers for Oregon Livestock Producers,* (https://catalog.extension.oregonstate.edu/em9151) EM 9151, and *Cattle Vaccine Handling and Management Guidelines, (https://catalog.extension.oregonstate.edu/pnw637.)* PNW 637.

Natural breeding

The number of cows allocated per bull depends on a number of considerations, including:

- Age of the bull.
- Bull fertility and libido.
- Size of pastures.
- Vegetation.

- Climate.
- Topography.

It is important to use the appropriate number of bulls. Mature bulls can breed more cows due to their greater servicing capacity, but they might prevent younger bulls from breeding females.

PERIOD 1: Lactation, breeding and early pregnancy

POSTCALVING, 195 DAYS

Nutrition

See also Appendix 1, NRC requirements, months 1–6

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, re-establishing her reproductive cycle, and becoming bred. Nutritional status and body condition score during this period have a major influence on conception rate.

Not all hay has sufficient nutrients for cows at this stage of production. Alfalfa hay is usually more nutrient dense than grass hay. Maturity of the forage at harvest has a major influence on hay quality. Pull hay samples and send them to a certified laboratory to establish the nutrient quality of hay fed to cows. See *Analytical Laboratories Serving Oregon,* (https://catalog.extension.oregonstate.edu/em8677) EM 8677. For more information on forage testing, see *Understanding Your Forage Test Results, (https://catalog.extension.oregonstate.edu/em8801)* EM 8801.

The cow is expected to maintain a pregnancy for 283 to 285 days of the year while also caring for her calf from the previous year's pregnancy. This leaves approximately 80 days to breed back if she is to maintain a yearly calving interval. The postpartum anestrous interval (the interval from calving until she resumes estrus cycles) accounts for 50%–75% 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 re-establishes estrual behavior 45 days after calving. Thus, the calving interval might be longer than 365 days. It is critical to maintain this 365-day interval. If the interval exceeds 365 days, profitability will suffer, because calves will be younger and lighter at weaning. For this reason, it is important all cows be in optimal body condition (with a condition score in the range of 5–6). They should receive a diet higher in total digestible nutrients following calving to ensure that the cow promptly returns to estrous behavior.

Following conception, the major nutritional demand is lactation. Regardless of the time of year of the calving season, cows need to maintain a body condition score of 5 and heifers a BCS of 6 in order to have the body reserves needed for winter conditions and maintaining healthy fetal growth. Cows and heifers should not enter the lactation period in poor body condition. If cows score a BCS of 4 or less, additional feed is advised in order for cows to gain weight and maintain energy reserves in preparation for calving. For more information on BCS, see *Beef Cattle Nutritional Workbook, (https://catalog.extension.oregonstate.edu/em8883)* EM 8883 (chapter 7, "Body Condition").

Health

Cows and bulls should receive all vaccinations annually at least two to four weeks prior to breeding or estrus synchronization. This timing is considered safe whether using killed, genetically engineered, or modified live vaccines, or MLV. However, for some producers, it is logistically difficult to handle cattle pre-breeding, and it

becomes necessary to vaccinate pregnant cows, or calves and nursing pregnant cows. In these cases, the use of intramuscular MLV is not recommended unless the animals have been vaccinated with a product specified by the manufacturer within the past 12 months. On the other hand, MLV intranasal products can be used on pregnant animals regardless of previous vaccination history. Follow the directions on the product label and consult your veterinarian or Extension professional when questions arise.

Suggested vaccinations for the breeding herd

Cows

PREBREEDING — TYPICALLY THREE TO FOUR WEEKS PRIOR TO BREEDING

- Eight- or nine-way clostridial disease vaccine booster.
- Injectable IBR, BVDV, BRSV, PI3 viral disease and five strains of Leptospirosis.

PRE-CALVING

- Clostridial diseases if not done prebreeding.
- Scours vaccine — bovine rotavirus (serotypes G6 and G10), bovine coronavirus, *E. coli* and *Cl. perfringens* type C.
- Selenium injection, if needed.
- Deworm.

Replacement heifers

PRE-BREEDING — AT SIX AND THREE WEEKS BEFORE BREEDING

- Eight- or nine-way clostridial disease vaccine booster.
- Injectable IBR, BVDV, BRSV, PI3 viral disease and Lepto vaccine.
- In some situations additional vaccines such as Histophilus, trichomoniasis or campylobacteriosis.vaccines are recommended.
- Deworm.

PRE-CALVING — SIX AND THREE WEEKS BEFORE CALVING

- Eight- or nine-way clostridial disease vaccine booster.
- Scours vaccine. Requires initial and booster injections for first calvers.

Bulls

ANNUALLY

- Eight or nine-way clostridial disease vaccine booster.
- Injectable viral disease and Lepto vaccine, Vibrio vaccine.

Calves

DAY OF BIRTH

- Vitamin E/selenium injection if needed.
- Scours vaccine if dam not vaccinated before calving — rotavirus and coronavirus.

2–4 MONTHS (BRANDING)

- Eight- or nine-way clostridial disease vaccine.
- Intranasal viral vaccine — IBR,PI3 and BRSV.

PREWEANING — SIX TO EIGHT WEEKS BEFORE WEANING

- Eight- or nine-way clostridial disease vaccine booster.
- Injectable viral disease vaccine.
- Deworm.

Ask your veterinarian about other vaccines that might be needed. For more information on selenium supplementation, see *Selenium Supplementation Strategies for Livestock in Oregon,* (https://catalog.extension.oregonstate.edu/em9094) EM 9094.

It also is important to control internal and external parasites. Internal parasites damage internal organs such as the gastrointestinal tract, liver and lungs. External parasites that can damage hides (cattle grubs), suck body fluids and spread disease (lice, ticks), and annoy the animals and reduce feed intake (flies, mosquitoes). Work with the veterinarian familiar with your herd to identify problem parasites and recommend treatments.

For internal parasites, take a fecal sample and submit it to a veterinarian or a veterinary diagnostic laboratory for analysis. Do not treat if there are no parasites or the parasite count is low. Treatment in these cases increases parasite resistance to de-worming drugs. If there are parasites, choose a dewormer that is specific for the type of parasite present. Use products that are effective against the parasites in your herd. Look for signs of external parasites such as excessive rubbing or hair loss. Alternate products and the type of anthelminthics each year to slow the development of drug-resistant external parasites.

Dehorn and castrate calves as soon as possible after birth, with careful attention to pain management. A veterinarian can provide drugs and teach you how to properly use them to reduce the pain and suffering associated with routine surgical procedures. These may include sedation, analgesia, local or regional anesthesia and anti-inflammatory medications. According to the American Veterinary Medical Association, procedures causing pain and distress, such as castration, dehorning and branding, should be conducted as early as possible. Younger cattle exhibit less pain, stress and distress in response to the procedures.

Reproduction

Select a calving season that optimizes your resources. Heifers and cows should be bred to calve when your ranch grazing 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 (reaching an age of about 45 to 60 days) to use (rapid growth) 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 monitor heifers during their first calving season and give them a longer postpartum period to recuperate before rebreeding. Since heifers may have more calving difficulty than older cows, choose a calving ease bull or one with a low birthweight Estimated Progeny Difference. See *Understanding Expected Progeny Differences for Genetic Improvement in Commercial Beef Herds*, (https://www.ag.ndsu.edu/publications/livestock/understanding-expected-progeny-differences-for-genetic-improvement-in-commercial-beef-herds) AS 1770.

Breeding season

When resources permit, plan a 45-day breeding season for heifers and a 45- to 64-day breeding season for mature cows. If virgin heifers fail to become pregnant within 45 days, they likely have delayed development or impaired fertility. Culling heifers that fail to breed in 45 days is wise as they may be subfertile. In addition, if they were to become pregnant later, they might experience problems conceiving the following year within the desired breeding season.

Bulls

Select bulls using a number of Expected Progency Difference traits (see Appendix 2), keeping in mind the weaknesses (such as calving difficulty) of your herd. Select sires to balance and strengthen these weaknesses. Don't try 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 40 to 45 days. In addition, it generally is 45 to 60 days after calving before a cow reestablishes estrual behavior and is observed in standing estrus. Several factors affect the duration of this postpartum anestrous interval, including body condition, age and genetics.

Energy from feedstuffs is distributed first to maintenance, then to milk production and growth, 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 impacts the profitability of your operation.

Good quality forage, such as vegetative plants in pasture or rangeland, plus an appropriate mineral supplement are critical at this stage to ensure prompt re-establishment of estrous behavior. See *Beef Cow Nutrition Guide, (https://bookstore.ksre.ksu.edu/pubs/c735.pdf) C-735*.

Preparation for breeding

Cows

Allow cows at least one to two 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 "Selection of sires," for details on a breeding soundness exam.)

Artificial insemination

The number of cows that become pregnant during a breeding season has a direct impact on ranch profitability. An artificial insemination program can benefit a beef cattle operation in many ways. It can be a tool to improve herd genetics, improve calf crop uniformity, improve record keeping (as breeding dates are known), adjust the length of the breeding season and allow you to select an appropriate sire for each dam. For these reasons, it helps to have a basic understanding of the cattle estrous cycle and the details of an AI program.

The proper detection of cows and heifers in estrus is probably the most limiting factor for the success of an AI program. The estrus, standing estrus, or "heat," happens prior to ovulation, which occurs at the beginning of the estrous cycle (approximately 21 days in cattle). The estrus is highly distinctive from the other phases of the estrous cycle, due to cattle behavioral changes. Cows enter estrus gradually. Estrus lasts approximately 15 hours, but can range from six to 24 hours. During estrus, females will be sexually receptive, which is easily observed. The female will stand and allow mounting by other animals.

When breeding females based on observation, watch all females in the morning and evening for a minimum of 30 minutes for signs of estrus. More frequent observations may increase the chances of detecting a female in heat. A primary sign of estrus includes:

- Standing to be ridden by a herd mate or an altered male.
- Secondary signs of estrus may help detect estrus; however, females should not be bred based on these signs alone. These secondary signs include:
  - Muddy sides (ribs and flanks) in wet environments.
  - Ruffled hair on tail head.
  - Swollen vulva.
  - Restlessness, including bawling.
  - Clear mucous discharge from the vulva.

You may want to use one of several common heat detection aids. These include tail head paint, pressure-activated patches and pressure-activated radio transmitters. You can also use Gomer (vasectomized, epididymized or deviated) bulls or hormone-treated steers to help detect estrus. You can use chin-ball or chest harnesses with Gomer bulls and steers.

Greatest AI conception rates have been observed when females are artificially inseminated between four and 12 hours after observed estrus. Ovulation tends to happen about 12 hours after the end of estrus. The AM/PM rule is useful when breeding females. For example, a group of females that showed heat during the morning check should be bred in the afternoon of the same day, while a group of females that show heat in the afternoon or evening check should be bred in the morning of the following day, respecting a 12-hour interval from heat detection to breeding.

An alternative to conventional AI is the use of estrus synchronization. This practice reduces the time required for observation of estrus and can result in more calves being born early in the calving season. These calves would therefore be heavier at weaning. Many options for estrus synchronization are available. The key considerations for selecting an estrus synchronization protocol should include the time and skills available for heat detection, body condition of the cows or heifers, days postpartum, the availability of facilities, personal experience and costs. A list of estrus synchronization protocols was compiled by the *Beef Reproduction Task Force* (https://beefrepro.unl.edu/pdfs/2020%20Protocols%20for%20Sire%20Directories.pdf), a group composed of representatives from the AI and pharmaceutical industries, veterinarians and reproductive physiologists.

After selecting the most appropriate estrus synchronization protocol, follow the manufacturer's instructions closely. Plan the treatment schedule carefully on your calendar, as success depends on proper administration and timing of treatments. Be sure to have adequate help and proficient technicians when working cows. Do not vaccinate females during the estrus synchronization protocol. Studies have shown that vaccination around the time of breeding can

reduce pregnancy success, likely due to negative effects on corpus luteum function.

Another important point in an AI program is the selection and management of semen. Purchase semen from reputable suppliers. They will collect semen for AI from bulls of proven superior genetics using EPD values (see "Selection of sires," Period 3). The Expected Progency Difference values for these bulls generally are highly accurate. The accuracy of EPDs is primarily a function of the amount of information available on an individual. As more information becomes available and the progeny record grows longer, an animal's calculated EPD for a trait will change.

When storing semen at the ranch, remember to record the liquid nitrogen levels in the tank weekly or biweekly to establish a schedule for replenishment, as unnecessary thawing of semen can reduce fertility.

Finally, use a cleanup bull after the conclusion of AI to breed those females not successfully inseminated. Record the date when bulls were introduced into the herd. These records will help determine the success of the AI and estrus synchronization programs.

For this reason, cow-to-bull ratios vary considerably when using more than one sire.

Bulls vary in their desire to mate, so bull-to-cow ratios can range from 1:10 to 1:60. Bull-to-cow ratios can also depend on the capability of individual bulls and the situation in which they are placed (synchronized or nonsynchronized herds, for example). A study by J. Walker and colleagues of South Dakota State University found final pregnancy rates of cows on estrus synchronization and AI protocols that were exposed to cleanup bulls was similar when using a 1:25 bull-to-female ratio and a 1:50 bull-to-female ratio. Producers need to evaluate the cost difference of purchasing and maintaining twice as many bulls to maintain a 1:25 bull-to-female ratio following estrus synchronization and AI.

Another consideration is the size and topography of the breeding pasture. 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 to assess bull libido. Bulls may become injured during the breeding season, resulting in a reduced pregnancy rate. Injured bulls need to be removed and replaced immediately.

PERIOD 2: Midgestation and weaning

110 DAYS

Nutrition

See also Appendix 1, NRC requirements, months 7–10

This period has the lowest nutritional demands for the cow, particularly after the calves are weaned. Use the lowest quality feed resources during this period. Poorer quality roughage, such as crop residues, and lesser quality hay are ideal. However, it is important that the cow not lose excessive body condition during this time. Cows should never drop more than 1 to 1.5 points in condition scores. Aim for an average body condition score of 5–6.

Prepare calves for the stress of weaning by supplying feed that meets their requirements for growth. Enhance their immune systems with the vaccines recommended by your veterinarian. Keeping freshly weaned calves on an adequate ration is critical to maintaining health and minimizing the effects of weaning stress.

Carefully observe calves during weaning. The stress of separation often causes reduced feed and water intake and can depress the immune system. This results in a greater likelihood of sickness and even death. Consider low-stress weaning methods such as fence-line weaning and two-step weaning. See Weaning management of beef calves. (https://extension.oregonstate.edu/animals-livestock/beef/weaning-management-beef-calves)

Health

Most vaccines used to protect calves against respiratory and clostridial diseases require an initial vaccination followed by a subsequent booster, usually two to six weeks later. Carefully read and follow the vaccine manufacturer's directions. The vaccine series should be completed at least 10 days prior to weaning. Consult your veterinarian or Extension professional for recommended vaccines. Typically, if calves are destined for an auction, backgrounding lot or feedlot after weaning, intranasal vaccination for IBR, PI3 and BRSV is recommended.

Heifers kept for breeding should also be vaccinated against BVD, PI3, IBR, BRSV, campylobacter (vibriosis), and leptospirosis between 4 and 10 months of age. In addition, heifers kept for breeding must be vaccinated for brucellosis (Bang's disease) by a licensed, accredited veterinarian. State regulations vary as to the time of vaccination, but is typically at 4–12 months of age. 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 four weeks before breeding.

Always follow the label directions for all health products. In addition, follow the recommended Beef Quality Assurance injection sites for all products. For more information, see Beef Quality Assurance. (https://www.bqa.org/)

Reproduction

Testing heifers and cows for pregnancy 35 to 45 days after the breeding season reduces operating costs. Detection of pregnant and open (not pregnant) cows allows producers to allocate resources to productive cows and sell cows that are not going to produce a calf next year. The producer can sell the cows that are not pregnant immediately after testing or weaning the calf in order to avoid the cost of feeding a cow that will not produce a calf the following year.

Ideally, schedule pregnancy diagnosis exams with your veterinarian soon after the breeding season. There are three methods for detecting pregnancy: rectal palpation, ultrasound and blood testing. A veterinarian can detect pregnancy through rectal palpation as early as 35–45 days after breeding. An ultrasound can detect pregnancy as early as 28 days. The advantages of these methods are that results are available immediately and the veterinarian can estimate the calving date.

Alternatively, a producer can choose to order a blood test that detects the presence or absence of a protein associated with pregnancy. Blood test kits can be ordered online and delivered through the mail. Blood tests indicate whether an animal is pregnant or open, but provide no estimated fetal age. In addition, the results are not immediately available. However, these tests are relatively cheaper to conduct and their results are highly accurate. Producers collect 2 cubic centimeters of blood from under the tail of the cow and ship it to the lab. The lab tests for pregnancy-associated glycoproteins, or PAGs, and returns the results with either a positive (pregnant) or negative (open) result with no age estimate for the fetus. Blood from heifers and open cows may be collected as soon as 30 days after breeding. Lactating cows need to wait 73–90 days after calving because a false pregnancy test may result

due to residual PAGs from the previous pregnancy.

Regardless of which type of pregnancy test you choose, detecting the pregnancy of open cows can help producers make culling decisions that can ultimately save money.

Reasons to cull cows at weaning

- The cow is open.
- The cow has failed to wean a calf.
- The cow is 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, helps calm a herd. A recent study by OSU proved that cows with poor disposition have lower percentages of breeding back in 60 days. To learn more about disposition and its effect on reproduction, see *Temperament and Performance of Beef Cattle, (http://osu-wams-blogs-uploads.s3.amazonaws.com/blogs.dir/2753/files/2016/09/Temperment-and-Performance-of-Beef-Cattle.pdf)* BEEF021.
- 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. Consider the 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% of expected mature body weight by the time she will be bred; see Appendix 3. 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. Seek a balance when selecting replacement females.
- Birthdates. Heifers that were born early in the calving season 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 EPD values (see Appendix 2).
- The heifer's conformation.
- The heifer's temperament.
- Never select freemartin heifers (a sterile or otherwise sexually imperfect female born as the twin of a bull calf).
- Select 20% more replacement heifers than are needed to allow culling for reproductive failure.

Onset of puberty

Remember that weight, body composition, age, heredity and breed affect puberty. Heifers can be bred only after they reach sexual maturity or puberty. The two most critical factors affecting the onset of puberty are age and

weight (see Appendix 3).

- Determine target weights for breeding — at least 65% of expected mature body weight at an average body condition score of 5 to 6.
- Calculate days to breeding and average daily gain needed to attain breeding target weight.
- If time and resources allow, weigh heifers monthly to ensure that all heifers reach 65% of expected mature body weight by the beginning of the breeding season. Heifers may need to be grouped according to weight 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 between weaning and puberty may cause excess body condition and mammary gland fat deposition. Fat deposited in the mammary gland, or udder, results in impaired milk production. Excess body fat also can reduce fertility, resulting in poor conception rates.

Reproductive tract examination

The success of a breeding season correlates with the percentage of heifers that reached puberty before or early in the season. The pubertal status of heifers prior to breeding season has been suggested as a main factor affecting conception rates.

Determine puberty achievement and initiation of normal estrous cycle by evaluating the heifer reproductive tract four to six weeks prior to the breeding season. The reproductive tract score, or RTS, is a subjective measure of the sexual maturity of a heifer. A trained professional (usually a veterinarian) will palpate the heifer's reproductive organs through the rectum. The veterinarian will determine the score based on the degree of uterine development and ovarian status (the size of the dominant follicle and the presence or absence of a corpus luteum). Each heifer is assigned a score from 1 to 5 (1 = immature; 5 = presence of a corpus luteum). (Table 1).

Table 1. Reproductive tract score guidelines

Reproductive tract score	Uterine horns (diameter, mm)	Ovarian length (mm)	Ovarian height (mm)	Ovarian width (mm)	Ovarian structures
1, Prepubertal	Immature, less than 20 mm, no tone	15	10	8	No palpable follicles
2, Peripubertal	20–25 mm, no tone	18	12	10	8 mm follicles
3, Peripubertal	20–25 mm, slight tone	22	15	10	8–10 mm follicles
4, Pubertal	30 mm, good tone	30	16	12	> 10 mm follicles
5, Pubertal	> 30 mm	> 32	20	15	CL possible or present

Anderson, K.J., D.G. LeFever, J.S. Brinks, and K.G. Odde. 1991. The use of reproductive tract scoring in beef heifers. *Agri-Practice* 12:19–26.

In addition, palpate heifers at 12 months of age to determine the size and shape of the pelvic opening. Obtaining pelvic measurements on yearling heifers and culling those with the smallest pelvic areas can help reduce the

incidence of dystocia, or difficult births. Do not select heifers based on pelvic area alone; in fact, pelvic dimension appears to be highly correlated with dam size. By selecting for large pelvic dimensions, producers are also indirectly selecting for large heifers, which typically have greater nutritional requirements and produce large calves. Your veterinarian or Extension professional can help you collect these measurements.

After breeding, keep the replacement heifers separate from cows, as their nutritional requirements are different. Maintain replacement heifers in moderate condition (body condition score of 5 to 6) and feed them to weigh 85% of expected mature body weight of the herd at calving. Underfeeding will not reduce birth weights and may actually increase the incidence of dystocia. Underfed heifers lack the energy and strength necessary for delivery. Further, underfeeding can result in a delayed return to estrus following calving, reduced milk production during lactation, or impaired lifetime productivity. Underfeeding can also impair the ability of the calf to nurse quickly after birth, decreasing the amount and quality of colostrum received. Overfeeding, on the other hand, can result in an increased incidence of dystocia, likely due to a fat-filled birth canal and increased abnormal presentations.

PERIOD 3: Dry period and pre-calving

60 DAYS

Nutrition

See also Appendix 1, NRC requirements, months 11 and 12

This period is the shortest, but it should not be neglected. During these final 50 to 60 days of gestation, approximately 65% to 80% of fetal growth occurs. If the birth weight is 80 to 85 pounds, the increase in fetal weight during this period is 50 to 60 pounds, or about a pound per day.

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, overfeeding during pregnancy can result in reduced birth weight, decreased milk production, increased dystocia and neonatal death loss. Studies have shown that birth weight decreases as cow condition score decreases below 3.5 or increases above 7. But it does not change significantly within the range of 3.5 to 7. For more information on BCS, see *Beef Cattle Nutritional Workbook* (https://catalog.extension.oregonstate.edu/em8883)(chapter 7, “Body Condition”), EM 8883.

If resources allow, separate the herd into groups with similar nutritional needs. At a minimum, first calf heifers should be grouped separate from the cow herd. Other groups to consider are cows in good BCS (5 or 6) and cows in inadequate BCS (less than 5) and older cows.

Mineral supplementation is especially important during this stage of gestation. An Oregon State University study found that providing organic trace mineral supplements to mother cows in late gestation benefited calf performance through weaning.

Selenium (an essential trace mineral for livestock) is deficient in many Oregon soils. A deficiency of selenium (Se) can cause nutritional myodegeneration, also known as white muscle disease. Selenium deficiency also causes effects that are not immediately observable and result in poor livestock performance. Examples include poor fertility, abortion, weak calves and aborted calves.

For over 20 years, research at Oregon State University has demonstrated the potential for using selenium as a fertilizer amendment to increase concentrations in forage for livestock feeds. This approach adds organic selenium to an animal's diet through agronomic biofortification. Agronomic biofortification increases concentrations of essential elements (such as selenium) in the edible portions of crop plants through enriched fertilization and uptake by the plants being grazed or harvested for subsequent feeding. This practice can potentially overcome the inconsistent intake of salt-mineral mix selenium supplementation. Higher amounts of selenium can be provided safely through fertilization.

Health

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

Prepare calving area and supplies

The preparation of the calving area and gathering of calving supplies is often overlooked. However, preparing in advance for calving can help to reduce future problems.

If possible, rotate the calving area annually to help reduce the incidence of scours and disease. Use your cleanest pastures for first calf heifers.

Suggested items to have on hand include:

- Injectable antibiotics.
- Drench or oral tube feeding bag.
- Electrolytes.
- Disinfectant for navels.
- Frozen colostrum (thaw slowly) or commercial colostrum substitute.
- Obstetrical assistance equipment.
- Obstetrical lubricants and disinfectants.
- Sanitizers for calving area.

Reproduction

Timing of feeding has been shown to influence the time of day calving occurs. Consider beginning late afternoon/evening feeding about one 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 increase the number of cows that rebreed quickly.

Selection of sires

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

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

Consider these criteria in choosing sires:

- Expected progeny difference values (see Appendix 2), considering birth weight, growth traits, maternal characteristics (if raising your own heifers) and carcass traits. EPD values are the most beneficial tool 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 adjusted weight.
- 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 motility and morphology of sperm.
- Scrotal circumference (at 1 year of age). Scrotal circumference 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. See *Scrotal Circumference in Bulls Linked to Puberty in Replacement Heifers, (http://media.clemson.edu/public/extension/beef_cattle/bc_2007.pdf)* BC-2007.
- Yearling bulls with an SC less than 32 cm generally are prepubertal and should not be used. Daughters of young bulls with SC exceeding 36 cm usually attain puberty at a younger age. If using 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).

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

- A physical examination.
- Examination of the internal and external reproductive tract.
- A semen evaluation.
- Evaluation of libido. This observation is made by the rancher.

PERIOD 4: Calving

1 DAY

Nutrition

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

Newborn calf and cow.

Credit: Scott Duggan

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 of calving.

A retained placenta may indicate a selenium deficiency; check feed samples and mineral supplements for adequate selenium. Allow the cow to expel a retained placenta naturally; treat cows only for signs of systemic illness. A cow with a nursing calf should have adequate oxytocin stimulation to expel a retained placenta. Consult your veterinarian if the placenta is retained longer than 12 hours or the incidence is over 10% of calvings.

Keep sick animals separate from the remainder of the herd to limit the transfer of infection and facilitate observation. 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. This practice also reduces the spread of disease in the event of an outbreak.

Calf health procedures at birth

- Apply disinfectant solution to the navel.
- When “dipping,” immerse the full length of the cord in the solution, right up to the calf’s belly. Use a fresh disposable paper cup for each calf or a nonreturn teat dip cup for dipping to avoid transmitting disease between animals. The tincture formulation of iodine is desirable because the alcohol will promote drying; however, 7% tincture of iodine is now a controlled substance and will require a prescription from your veterinarian. Do not attempt to substitute an iodine-based teat dip, as it will delay drying of the cord and not be effective.
- Provide colostrum for calves that do not nurse within four 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 four to six hours of birth.
- Identify calves with ear tags or tattoos.
- Record sex, birthdate, dam, sire and birth weight (if available).
- Check calves frequently for scours and pneumonia.

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% of mature cows, but in 10%–12% of heifers. Observe heifers

carefully every two hours during the calving season. Dystocia affects not only calf survival, but also future reproduction and often results in retained placenta.

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 30–60 minutes of active straining. In this event, an examination is recommended.
- Increased respiratory rate.

Management and genetic factors associated with dystocia include:

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

Summary

The *Beef Cow-Calf Management Guide* provides information to help experienced and novice beef cattle producers manage the annual production cycle of a cow-calf operation. This set of recommendations for the four major production periods will help the beef producer prioritize tasks and provide a foundation for a successful operation.

Additional resources

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APPENDIX 1. NRC diet nutrient density requirements of beef cows

Table 2. Diet evaluation for lactating cows

Diets	Total digestible nutrients % dry matter	Metabolizable energy	Net energy maintenance meal/kg	Net energy gain
A	55	2.03	1.18	0.62
B	60	2.22	1.36	0.78
C	65	2.40	1.52	0.93
D	70	2.59	1.68	1.07

	Months since calving											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Diet A												
Dry matter intake, kg/day	11.6	11.9	11.7	11.4	11.2	10.9	10.7	10.6	10.5	10.4	10.4	11.1
Metabolizable energy bal., megacalorie/day	-2.6	-3.7	-3	-1.9	-0.8	0.1	0.6	0.6	0	-1.2	-3.5	-5
Crude protein, % dry matter	8.2	8.3	8.3	8.2	8.1	8	7.8	7.7	7.4	7.1	6.6	6.5
Rumen degradable protein, % CP	62.6	61.9	62.3	63.1	64	65	66.2	67.7	70.1	73.6	78.9	80.1
Calcium, % dry matter	0.29	0.31	0.3	0.27	0.25	0.23	0.21	0.19	0.18	0.29	0.29	0.27
Phosphorus, % dry matter	0.19	0.2	0.2	0.18	0.17	0.16	0.15	0.14	0.14	0.18	0.18	0.16
Diet B												
Dry matter intake, kg/day	12.1	12.4	12.2	11.9	11.6	11.4	11.2	11.1	11	10.9	10.9	11.5
Metabolizable energy bal., megacalorie/day	1.8	0.9	1.4	2.4	3.4	4.2	4.5	4.5	3.9	2.6	0.4	-1.3
Crude protein, % dry matter	10	10.1	10	10	9.9	9.8	9.6	9.5	9.2	8.8	8.3	8.1
Rumen degradable protein, % CP	55.6	55.2	55.5	56	56.7	57.4	58.2	59.3	61	63.6	67.6	69.4
Calcium, % dry matter	0.28	0.3	0.28	0.26	0.24	0.22	0.2	0.19	0.18	0.28	0.28	0.26
Phosphorus, % dry matter	0.18	0.2	0.19	0.18	0.16	0.15	0.14	0.14	0.13	0.17	0.17	0.16
Diet C												
Dry matter intake, kg/day	12.7	12.9	12.8	12.5	12.2	11.9	11.8	11.6	11.5	11.5	11.4	12

	Months since calving											
	1	2	3	4	5	6	7	8	9	10	11	12
Metabolizable energy bal., megacalorie/day	6.3	5.4	5.9	6.8	7.7	8.3	8.7	8.6	7.9	6.6	4.3	2.6
Crude protein, % dry matter	11.8	11.8	11.8	11.7	11.6	11.5	11.4	11.2	11	10.6	10.1	9.7
Rumen degradable protein, % CP	50.9	50.6	50.8	51.2	51.7	52.2	52.8	53.6	55	56.9	60	61.9
Calcium, % dry matter	0.26	0.28	0.27	0.25	0.23	0.21	0.19	0.18	0.17	0.27	0.26	0.25
Phosphorus, % dry matter	0.18	0.19	0.18	0.17	0.16	0.14	0.14	0.13	0.12	0.16	0.16	0.15
Diet D												
Dry matter intake, kg/day	13.3	13.5	13.4	13.l	12.8	12.6	12.4	12.2	12.1	12.l	12	12.5
Metabolizable energy bal., megacalorie/day	10.9	10.1	10.5	11.4	12.1	12.7	12.9	12.8	12.1	10.8	8.5	6.7
Crude protein, % dry matter	13.5	13.5	13.5	13.4	13.4	13.3	13.l	13	12.7	12.3	11.8	11.4
Rumen degradable protein, % CP	47.5	47.3	47.5	47.8	48.1	48.5	49	49.7	50.7	52.3	54.7	56.4
Calcium, % dry matter	0.25	0.27	0.26	0.24	0.22	0.20	0.18	0.17	0.16	0.25	0.25	0.24
Phosphorus, % dry matter	0.17	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.12	0.16	0.15	0.15

APPENDIX 2. Expected progeny difference

An expected progeny difference, or 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 directly compared to those for a Simmental sire without specialized software. Oregon State University offers a free Across-Breed EPD Calculator (https://blogs.oregonstate.edu/beefcattle/epd-calculator/) to help you compare bull EPDs from different breeds.

Expected progeny differences 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 comparing two sires 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 grandparents. 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

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. Don't try 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

EPD values from sire summary data can help you improve the performance of offspring from your herd and make significant genetic improvements within the herd. EPD values can also help you achieve rapid improvements in carcass traits, helping you to remain competitive in a market focused on value.

APPENDIX 3. Heifer development from weaning to breeding

The period from weaning to breeding is a critical time in a beef female's life. At weaning, she is between 7 and 10 months old and can weigh anywhere from 500 to 750 lb. (depending upon breed and desired frame score). Approximately six 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% 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% of their expected mature body weight (often referred to as the breeding season "target weight"). If heifers weigh only about 55% of their expected mature body weight, you can expect only 50% of them to be cycling at the beginning of the breeding season. However, about 90% of most beef heifers will attain puberty when they weigh 65% 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 lbs. Heifers from 1,200 lb. dams need to weigh roughly 780 lbs. by the beginning of their first breeding season. Likewise, heifers with a potential mature body weight of 1,000 lbs. can be expected to attain puberty at approximately 650 lbs. These weights are not exact because there is considerable variation within breeds. However, they show that heavier cattle with larger frames need to be fed for greater growth rates than lighter cattle with smaller frames.

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.

Remember 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 the 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. Add approved levels of ionophores to the ration to improve the average daily gain and hasten the onset of puberty.

Use individual heifer weight, rather than average group weight, 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 lbs., some heifers probably weigh 600 lbs., while others weigh 800 lbs. Those that weigh 600 lbs. will not breed well, while those weighing 800 lbs. have been fed more than was required. Sort replacement heifers by size and feed them to reach the desired target weight, giving additional feed only to the heifers that need it.

Age is an important factor affecting the onset of puberty, especially in cattle with Bos indicus influence (such as Brahman and Nelore breeds). Many of these heifers do not reach puberty until they are 16 to 20 months old. The same rule of thumb concerning 65% of the expected mature body weight still applies, but the additional days of age are important. It may be beneficial to feed Brahman heifers to reach 68% of their expected mature body weight.

APPENDIX 4. Body condition scoring

Body condition scoring, or BCS, is an important method for visually evaluating whether a cow is at the proper weight for her age, breed, stage of gestation, etc. BCS scores range from 1 to 9, with a 9 being obese, a 5 signifying moderate condition and a score of 1 equaling emaciated. Keeping cows in moderate body condition is critical. Cows that are too heavy or too thin will take longer to breed back or may not breed back at all. Time is money in the cattle business, and in order to maintain a 365-day calving interval, cows must breed back within 83 days of calving — preferably within 60 days. Research has shown that cows that take longer to breed back give birth to smaller calves that weigh less at weaning. Lower calf weights at sale time mean less income and lost profits for ranchers. Therefore, it is essential to BCS score cattle several times per year in order to keep cows in a BCS score of 5–6 for optimal reproductive performance that ultimately produces a profit for the livestock owner. See the *Beef Cattle Nutrition Workbook*, (https://catalog.extension.oregonstate.edu/em8883) EM 8883.

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 four hours of birth.

Conformation — The physical form or makeup 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.

Estrous cycle – A naturally occurring reproductive cycle, hormonally controlled, marked by a period of sexual activity and ovulation.

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.

Management-intensive Grazing (MiG) — Several grazing systems wherein animals are allowed to graze only a small portion of the pasture (an individual paddock) while other paddocks are rested and allowed to recover. Pasture yield is increased and the distribution of the forage is improved.

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 re-establishment 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.

Vasectomized (Epididymized) — Removal of the epididymis (a long, coiled tubule leading from the testis to the vas deferens) to render a male sterile.

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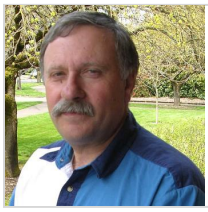
About the authors

Scott Duggan (https://extension.oregonstate.edu/people/scott-duggan)
Livestock



Gene Pirelli (https://extension.oregonstate.edu/people/gene-pirelli)
Academic Wage Appointment, Animal and Rangeland Sciences

Charles Estill (https://extension.oregonstate.edu/people/charles-estill)
Extension Veterinarian

Juliana Ranches (https://extension.oregonstate.edu/people/juliana-ranches)
Assistant Professor, Extension Beef Specialist

Dale W. Weber

Professor Emeritus, Dept. of Animal and Rangeland Sciences