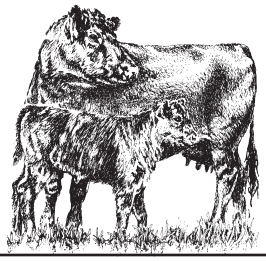

Western Beef Resource Committee *Fourth Edition*

Cattle Producer's Handbook

Management Section 745

How to Select and Manage Replacement Heifers

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Inclusion of replacement heifers into the cowherd is one of the most important factors for the overall efficiency of cow-calf systems. Replacement heifers bring new genetics and are the foundation in which the cowherd is built, being responsible for the long-term herd productivity.

For optimal economic return and lifetime productivity, replacement heifers should attain puberty by 12 months of age, conceive by 15 months of age, and calve as 2-year-olds (Lesmeister et al. 1973). Still, in this optimal scenario, replacement heifers will only provide economical returns to producers when they wean their first calf, approximately at 2.5 years of age.

Given that $800 is a typical cost to develop a 2-year-old pregnant heifer ready to calve, about 5 million replacement heifers are introduced into the U.S. cow-calf industry each year, accounting for more than $4 billion invested annually, with no immediate return into heifer development programs by U.S. cow-calf producers. These expenses are further increased when replacement heifers fail to conceive during their first breeding season but are kept and become pregnant for the first time as 2-year-olds, and wean their first calf at 3.5 years of age.

Therefore, management strategies that maximize the number of replacement heifers pubertal by 12 months of age and pregnant at 15 to 18 months of age are vital to the productivity of the U.S. cow-calf industry.

Selection of Replacement Heifers

Actual replacement rates vary ranch-to-ranch and year-to-year but average about 15 percent per year. If the goal is to maintain the size of the herd, the number of replacement heifers retained must be the same as the number of cows being culled during the year. On the other hand, if the goal is to increase or decrease the herd size, the number of replacement heifers retained must be greater or smaller, respectively, than the number of cows being culled from the herd. Nevertheless, it is important to consider retaining 5 to 10 percent more heifers than needed to account for potential heifer mortality and decreased pregnancy rates after their first breeding season.

Replacement heifers can be purchased ready for breeding or developed for their own heifers in feedlot, farm drylot, irrigated pasture, or range environments. In some areas of the country, custom heifer development programs are available as well. Economics, time, and resource availability generally dictate the best option for a particular operation. Computer programs or worksheets are available that allow one to calculate the costs of buying vs. developing replacement heifers.

Breed, age, and weight are the main variables that impact when heifers reach puberty, sexual maturity, and are capable of breeding. On average, *Bos taurus* breeds reach puberty at 12 to 14 months of age at 55 to 60 percent of their mature weight, whereas *B. indicus*-influenced breeds reach puberty at 15 to 18 months of age with 60 to 65 percent of their mature weight. A general recommendation is that heifers reach 60 to 65 percent of their mature body weight at the beginning of the breeding season.

Selecting the oldest and heaviest heifers at weaning as replacements, therefore, is a common strategy adopted by cow-calf producers. In some cases, *B. taurus* heifers at less than 60 percent of mature weight at the start of breeding have attained adequate production if managed to keep the heifers growing at acceptable rates before calving (Funston and Deutscher 2004).

The performance history of the dam and sire also should be considered in selection criteria. Selecting the oldest and heaviest heifers at weaning often means that their dams conceived early in the breeding season and had good maternal ability, which are desired characteristics for heifers returning to the cowherd. When records are available, heifers from cows that calve regularly every 12 months and raise fast-growing calves should be considered as replacements.

While selecting heifers from younger cows may be considered the newest or best genetics, selection of heifers from older cows that have proven they fit the environment or your ranch has considerable merit. Similarly, retaining heifers from sires with good maternal traits is advised, such as adequate expected progeny differences (EPDs) for calving ease, milk production, and growth (see 837, Understanding and Using Sire Summaries).

Also, select heifers that have the potential for a long productive life by choosing those with structural soundness in feet and legs and with a straight, strong back. Consider the skeletal size or frame, indicated by height at the hip and length of body. Also, consider the utility of using threshold Beef Improvement Federation (BIF 2010) frame scores to reduce the probability of increasing mature cow weights above what the environment can support.

Avoid heifers with abnormally heavy muscling, which is an indication of a lack of femininity. Select heifers with well-developed sex organs, and avoid those with excessive fat or waste in the brisket.

When purchasing replacement heifers, consider using reproductive tract scoring (see 442, Use of Reproductive Tract Scoring in Range Beef Heifers) as a tool to aid in heifer selection. The use of pelvic measurement as an additional parameter for heifer selection should also be considered. Although predicting calving problems on an individual basis is not possible, heifers with extremely small pelvic openings will have a higher incidence of dystocia and should not be considered as replacements (see 446, Pelvic Area in Beef Cattle Production).

Management of Replacement Heifers

Birth to Weaning

While nursing, replacement heifers should receive proper health management, including vaccination at branding against viral and clostridial diseases (see 605, Vaccination and Immunization: Vaccination Programs for Cattle Operations).

Weaning body weight highly determines the probability of a heifer to become pregnant during her first breeding season. Therefore, producers should adopt strategies that optimize weaning body weight of replacement heifers, including management of the cowherd and/or nursing heifers. If heifers are selected as replacements at weaning, dams should be maintained in adequate nutrition and health throughout gestation and lactation to ensure that heifer calves are adequately developed (see 330, Nutritional Management of the Mature Beef Cow).

If needed and feasible, heifer calves can receive supplemental feed via creep-feeding, which has been shown to increase their weaning body weight (see 326, Creep Feeding Beef Calves). Early weaning can also hasten heifer reproductive development, particularly during drought years, if proper nutrition and management are provided to the heifer calf.

Weaned heifers should receive proper vaccination against brucellosis, clostridial, and respiratory diseases (see 605, Vaccination and Immunization: Vaccination Programs for Cattle Operations) and be dewormed.

Post-Weaning to Breeding

Given that heifers should weigh 60 to 65 percent of their mature body weight at the beginning of the breeding season, weaning weight will dictate the amount of gain needed after weaning. Weaned heifers are often managed to gain 1.5 pounds/day to achieve this goal without impairing their mammary gland development (Buskirk et al. 1996). Nutritional management of weaned heifers will depend on their requirements (Table 1) and the availability and nutritional content of feeds (forage and supplements when needed).

Table 1. Nutrient requirement of non-pregnant, weaned beef heifers (NRC 2000).

Heifer weight class	Crude protein		Total digestible nutrients (TDN)	
	(lb)	(% of diet dry matter)	(lb)	(% of diet dry matter)
400-lb heifer				
Gain 0.5 lb/day	0.87	8.9	5.2	54
Gain 1.0 lb/day	1.06	10.3	6.1	58.5
Gain 1.5 lb/day	1.24	11.5	6.8	63
500-lb heifer				
Gain 0.5 lb/day	0.98	8.5	6.2	54
Gain 1.0 lb/day	1.16	9.5	7.2	58.5
Gain 1.5 lb/day	1.33	10.5	8.1	63
600-lb heifer				
Gain 0.5 lb/day	1.08	8.2	7.1	54
Gain 1.0 lb/day	1.26	9	8.3	58.5
Gain 1.5 lb/day	1.42	9.8	9.3	63
700-lb heifer				
Gain 0.5 lb/day	1.18	7.9	8	54
Gain 1.0 lb/day	1.35	8.6	9.2	58.5
Gain 1.5 lb/day	1.5	9.2	10.4	63
800-lb heifer				
Gain 0.5 lb/day	1.27	7.7	8.9	54
Gain 1.0 lb/day	1.44	8.3	10.2	58.5
Gain 1.5 lb/day	1.58	8.8	11.5	63

Heifers should be fed and developed separately from other females on the ranch. But also take into account changes in heifer nutrient requirements due to severe winter conditions (see 760, Winter Stress in Beef Cattle).

Breeding

During their first breeding season, replacement heifers should be managed separately from the mature cowherd. Replacement heifers and mature cows have different nutrient requirements. Managing them separately allows for proper nutritional management for both classes.

Replacement heifers should be managed to gain 1.0 pound/day, according to their requirements (Table 1) and the nutritional content of available feeds during the breeding season. If heifers are not maintained in adequate nutritional status during their breeding season, their pregnancy rates will be impaired.

In general, it is a good strategy to begin breeding heifers 1 month before the mature cows. This strategy will allow producers to devote extra time and attention to heifers during their first calving season and gives the heifers extra time to recover after calving and rebreed with the mature cowherd. Yet, it is important to end the heifer breeding season 1 month earlier as well, to minimize additional labor and expenses during breeding and calving, and ensure that only reproductively efficient heifers (those that became pregnant during a defined breeding period) are maintained as replacements.

During the breeding season, select bulls that are suitable to breed heifers (i.e., known or predicted low calving difficulty). Injuries to both bulls and heifers increase when bulls that are too large for the heifers are selected for natural service. The age of the bull, in itself, does not influence calf birth weight. Some producers like to use yearling bulls on replacement heifers to reduce stress at breeding time, but predictability of calving ease among yearling bulls is less precise and can increase the incidence of calving difficulty.

The use of estrus synchronization and artificial insemination programs is highly beneficial. These programs allow for the use of sires with superior genetics (as well as less calving difficulty) and known EPDs on replacement heifers, maximize the number of heifers pregnant at the beginning of their first breeding season, and can also induce puberty and sexual maturity in heifers that are still not cycling when breeding begins. For additional information, see articles 404, 405, 406, and 407 in the Reproduction Section of this book.

Gestation

After the breeding season, it is important to keep heifers separated from the mature cowherd as they still need specific nutritional management. Heifers should be managed to reach at least 85 percent of their mature body weight to ensure proper body development for calving, estrus resumption, and successful rebreeding as first-calf heifers.

On average, gestating heifers should be managed to gain between 1.0 to 2.0 pounds/day to ensure proper body growth and adequate nutritional status for pregnancy development (Table 2). See article 402, Effects of Management and Nutrition on Embryo and Fetal Development, for information regarding how nutrition during gestation impacts pregnancy development and future performance of the offspring. During gestation, it is also essential to follow the specific vaccination calendar for replacement heifers, including brucellosis, viral, respiratory, and clostridial vaccines (see 605, Vaccination and Immunization: Vaccination Programs for Cattle Operations).

Table 2. Nutrient requirement of pregnant, non-lactating beef heifers (NRC 2000).

Heifer weight class	Crude protein		Total digestible nutrients (TDN)	
	(lb)	(% of diet dry matter)	(lb)	(% of diet dry matter)
800-lb heifer Gain 1.0 lb/day	1.4	8.2	9.2	54.8
850-lb heifer Gain 1.0 lb/day	1.5	8.2	9.6	54.5
900-lb heifer Gain 1.0 lb/day	1.5	8.1	9.9	54.3
950-lb heifer Gain 1.0 lb/day	1.5	8.0	10.3	54.1
1,000-lb heifer Gain 1.0 lb/day	8.0	1.3	10.5	54.0

Calving Season

Give special care to heifers when they calve for the first time. Have them calve in a lot or pasture separated from the mature cowherd, where these heifers can be closely monitored and assistance can be provided. Such a calving lot should have access to a calving stall and should be equipped with calf pulling equipment.

Provide calving assistance early, within 1.5 hours of seeing hooves, as every 30-minute delay in calving assistance after 1.5 hours results in a 6-day delay to subsequent pregnancy. For specific information regarding proper calving management, see 447, Handling Calving Difficulties.

During the calving season, heifer nutritional management becomes even more critical because they demand nutrients for milk production, their own body development, and to resume estrous cycles. After calving, heifer nutritional requirements increase substantially compared with pre-calving (Table 3), and their nutritional management should be immediately adjusted. For comprehensive information regarding man-

Table 3. Nutrient requirement of 2-year-old beef heifers during early lactation producing an average of 10 lb/milk per day (first 3 to 4 months) (NRC 2000).

Heifer weight class	Crude protein		Total digestible nutrients (TDN)	
	(lb)	(% of diet dry matter)	(lb)	(% of diet dry matter)
900-lb heifer	2.0	10.4	12.0	62.7
950-lb heifer	2.0	10.2	12.5	62.3
1,000-lb heifer	2.1	10.0	12.9	61.9
1,050-lb heifer	2.1	9.8	13.4	61.5
1,100-lb heifer	2.2	9.6	13.8	61.2

agement of first-calf heifers, see 413, Rebreeding the First-Calf Heifer.

Conclusions

Development of replacement heifers is a critical component within cow-calf production systems and requires special attention by the beef producer. In general, replacement heifers should reach puberty by 12 months of age, conceive by 15 months of age, and calve as 2-year-olds to maximize their lifetime productivity.

Productive and development goals are specific to each phase within heifer development, including pre- and post-weaning, as well as during breeding, gestation, and calving season. Hence, heifer management should be specific to each phase in order to enhance heifer development and overall profitability of cow-calf systems.

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