

Selection and Management of Beef Replacement Heifers

Tom R. Troxel
Extension Beef Cattle
Specialist

Shane Gadberry
Extension Livestock
Specialist

Introduction

Acquiring or raising high quality replacement heifers is an essential and a major investment for the cow-calf producer. The replacement heifer becomes the genetic building block for the cow herd. The producer hopes that a replacement heifer will become a fertile cow that produces a calf, annually, for a long time.

Many management steps and decisions must be made in the process of selecting and growing replacement heifers. Consequently, replacement heifers must pass a number of “production tests” to remain in the herd and, hopefully, become a member of the cow herd. Selection at weaning, development from weaning to first breeding, evaluation after first breeding and calving season and establishment of successful rebreeding are the “production tests” a heifer must pass. Heifers not meeting production targets should be culled at any point in the process.

General goals for developing heifers should be to:

1. Reach puberty by 12 to 14 months of age.
2. Have a high percentage conceiving early in the breeding season.
3. Be structurally large enough at calving to minimize calving difficulty.
4. Rebreed in a timely manner.
5. Raise a good calf to weaning.

Selecting the right heifers, growing them properly and getting them bred early in their first breeding season has a long-term positive impact on cow herd production and profitability. This fact sheet provides

management options and ideas to help select and develop heifers in order to achieve long-term productive cows.

Buy or Raise Replacement Heifers?

A key decision facing cow-calf producers is whether to raise or purchase replacement heifers. Cow-calf producers should evaluate the replacement heifer enterprise separate from the rest of the cow-calf enterprise and identify its economic strengths and weaknesses. Raising replacements requires additional management, labor, facilities, feed and other resources. Therefore, the total cost of developing a replacement heifer can be quite high. Producers need to carefully weigh the advantages of home-raised heifers against their costs.

When evaluating the cost of home-raised heifers, a number of items should be considered. These items include:

- Costs of production (feed, veterinary cost, mineral supplementation, utilities, labor, bull or AI cost, etc.).
- Opportunity cost of operator labor and owned feed resources.
- Pregnancy rates from the first breeding.
- Death loss.
- Cull income (non-breeding culls, culled yearlings, etc.).
- Initial weight and growth rate.
- Heifer value at weaning.

The Arkansas Beef Improvement Program has assisted a number of cow-calf producers in evaluating their replacement heifer programs. Results

*Arkansas Is
Our Campus*

Visit our web site at:
<http://www.uaex.edu>

from this program indicated that the average cost for developing pregnant heifers was \$728 per head, with a range of \$600 to \$901 per head. Therefore, the financial question to ask is whether pregnant heifers of equal quality can be purchased for \$728 or less. In some circumstances this is feasible, and in other circumstances it is not.

Other factors to consider when deciding whether to purchase or raise replacements include:

- Disease control and biosecurity issues when bringing in animals from an outside herd or source.
- Finding the quality and heifer type that fits the cow herd and the environment.
- Locating a consistent supply of heifers.
- Time required to locate and purchase heifers.
- Genetic control.
- Purchasing replacement heifers will free-up resources for alternative uses.
- Generally, by purchasing replacement heifers, the herd can be expanded or changed (genetically) in less time.

Should Heifers Calve at Two or Three Years of Age?

Cow-calf producers differ as to which is better, calving heifers at two years or three years of age. This question is important because the management required for a heifer to calve at two years of age is much different than for a heifer to calve at three years of age (Table 1).

With very small profit margins in the cow-calf industry, improved production efficiency must be well thought out. Heifers bred as long-yearlings to calve as two-year-olds will produce an extra calf in their lifetime compared to heifers calving as three-year-olds.

In general, beef heifers are managed to calve first at either two or three years of age. It has been shown that during the early period of life, cows calving first at two years of age have more difficulties at calving and produce fewer calves and less calf weight at first calving than cows first calving at three years of age. Cows calving at two years of age in the long run, however, tend to recover and surpass the cumulative

performance of cows calving first at three years of age. Other advantages and disadvantages of calving heifers at two or three years of age are listed in the table below.

Cow-calf herds with spring and fall calving seasons can breed heifers to calve at approximately 2 1/2 years of age. Heifers born in the spring are bred at approximately 15 to 17 months to calve in the fall, and vice versa. This system would also allow late calving heifers to “slip back” to the next breeding season to increase their chances for rebreeding. For a two calving season system, however, breeding and calving records are very important. It would not be profitable to allow a heifer to “slip back” time and time again.

The type of management heifers receive from birth to breeding has a great influence on their life-time calf production. Therefore, providing adequate nutrition during this time not only benefits a heifer’s first breeding season, but it also pays benefits throughout her lifetime.

Preweaning Considerations

Good management of the replacement heifer actually begins before birth. When producing replacement females, cows should be bred to produce offspring with a high level of maternal merit. The cow should be in good body condition at calving, which will result in a thrifty calf and increase the level of colostrum produced. This will improve general thrift of the heifer calf throughout its early life. The suckling heifer should receive adequate nutrition to maintain a body condition score of 5 to 6, which will result in an adequate weaning weight. Excess fat deposition negatively impacts udder development. Consequently, fat heifers have reduced milk production later in life, and this condition should be avoided. Overconditioning preweaned heifers usually comes from creep feeding.

Before weaning, heifers should be vaccinated for blackleg (7-way), IBR-BVD, PI3, brucellosis (4 to 12 months of age), leptospirosis and any other diseases your local veterinarian determines necessary. Internal and external parasite control is also important.

Table 1. Advantages and disadvantages of calving heifers at two or three years of age.

	Advantages	Disadvantages
Calving at two years of age	<ol style="list-style-type: none"> 1. Dollar return occurs sooner. 2. Get more live calves throughout the cow’s lifetime. 3. Since calving is sooner, level of production can be measured sooner. 	<ol style="list-style-type: none"> 1. May be acquiring their permanent teeth near the time of calving. This could limit their ability to properly use some forages. 2. Heifers may have a smaller pelvis, thus increasing calving difficulties.
Calving at three years of age	<ol style="list-style-type: none"> 1. May reduce calving difficulty to a slight extent. 2. More heifers will be sexually mature at the time of breeding, thus resulting in higher pregnancy rates. 	<ol style="list-style-type: none"> 1. Dollar return delayed. 2. May get one less calf from a cow during her lifetime. 3. Does not fit a herd with a closed breeding season. 4. Delays chance to measure production.

Selection of Heifers at Weaning

At weaning, evaluate each heifer for weight, height, body capacity, structural soundness, health (thriftness) and other important production traits. Rank the heifers on traits such as 205-day adjusted weaning weight and frame score. If a heifer is structurally unsound, then eliminate her from consideration. Select those heifers with above average 205-day adjusted weights. Take into consideration that heifers that are overly fat at weaning may be uneconomical as mothers. Select against extreme muscling patterns and frame sizes (large and small). Do not keep heifers that were twinned with a bull. These heifers, also known as freemartins, are usually sterile.

Performance records are helpful in determining growth and reproductive potential and in identifying the calves from above average producing cows. It is desired to select heifers from dams that have shown a history of producing a heavy weaning weight calf every 365 days. The old rule of thumb to select the largest and oldest heifers because they will usually reach puberty earliest is still true. It also indicates that these heifers were conceived early in the breeding season, which gives some indication of dam fertility.

Managing Heifers During the Weaning Process

Weaning is a time of stress, and it is a time when heifer calves can fall behind in their development. A good weaning program can overcome the weight loss and nutritional stress of weaning. To offset the reduction in nutrient intake from depressed intake during weaning, feed supplements should contain a higher concentration of nutrients. Heifers fed good quality hay (11 percent protein and 56 percent TDN, dry matter basis) will require a supplement ranging from

14 to 16 percent crude protein on a dry matter basis (12 to 14 percent crude protein, as-fed basis) to gain approximately 1 pound per day over a two-week weaning period (Table 2).

Weaning or receiving rations can be blended on the farm, custom blended by local feed mills or purchased as commercial weaning rations. Follow the recommended guidelines when feeding weaning rations, in particular, formulated supplements blended on the farm or custom blended. These generally have very little roughage and must be limit fed to prevent digestive disorders.

Medicated feed additives are beneficial in weaning rations for stressed calves. Ionophores such as Bovatec (lasalosid) and Rumensin (monensin) help control coccidiosis and improve feed efficiency. Antibiotics such as chlortetracycline or chlortetracycline plus sulfamethazine also help maintain weight gain during periods of respiratory disease challenge associated with shipping fever. If mixing feeds on the farm, medicated feed additives can be either purchased as a concentrated pre-mix or some can simply be added by purchasing mineral mixes containing the desired medicated feed additive. Bovatec, Rumensin and chlortetracycline are commonly available in complete minerals.

The example supplements in the table below were formulated with feedstuffs readily available in Arkansas. These supplements were formulated for conditions of free access to good quality hay plus 5 lbs per head per day of supplemental feed over a two-week weaning period.

If the calves have not been creep fed, placing hay in the feed bunk with the feed may help adapt the heifers to the feed bunk more quickly. Under conditions of minimal weaning stress, such as fenceline weaning, supplementation may not be necessary if the calves are weaned on good quality pastures.

Table 2. Examples of weaning or receiving rations.

	Example 1	Example 2	Example 3 ^a
	----- % As-Fed -----		
Corn	35	33	25
Cottonseed meal	7	11	--
Soybean hulls	--	45	30
De-oiled rice bran	45	---	--
Corn gluten pellets	--	--	33
Molasses ^b	5	5	5
Limestone	3	1	2
Complete mineral ^c	5	5	5

^aExample 3 would require either ground corn or loose hulls to adequately mix the limestone and mineral.

^bDry molasses can be used to enhance palatability. Liquid molasses has the added benefit of reducing feed dustiness.

^cThe mineral level used in these examples assumes a 4 oz intake. Most mineral mixes contain the maximum level of selenium that can be added to provide 3 mg per head per day; so follow the intake/mixing guidelines when adding minerals.

Management From Weaning to Breeding

The period between weaning and breeding is a very critical time for the long-term reproductive performance of replacement heifers. At weaning, heifers should be between 7 to 8 months of age and weigh 500+ pounds. It is very important to weigh the weaned heifer so that the weaning weight is known and not guessed. It is also recommended to determine the frame score of the replacement heifer. Frame score is a convenient way to describe the skeletal size of cattle. Hip height converted to frame score is a measurement that helps determine mature body size. Larger-framed heifers tend to be heavier and be later maturing (puberty) compared to medium- and small-framed heifers.

The recommended site for hip height measurement is a point directly over the hooks. The following table provides a conversion from hip height measures to frame score based on age of the heifers (Table 3).

Table 3. Hip height (inches), frame score and mature weight for heifers.

Age Months	Frame Score (hip height in inches)				
	3	4	5	6	7
6	38.2	40.3	42.3	44.4	46.5
7	39.2	41.2	43.3	45.3	47.4
8	40.1	42.1	44.1	46.2	48.2
9	40.9	42.9	44.9	47.0	49.0
Estimated Mature Weight	900 lb	1,000 lb	1,100 lb	1,200 lb	1,300 lb

Frame scores provide an estimate of a heifer's mature body weight. For example, a 7-month-old heifer with a hip height of 43.3 inches would be a frame score 5 and expected to weigh 1,100 pounds when mature.

When selecting replacement heifers at weaning time, it is recommended not to select heifers less than frame score 4 or more than a frame score 6. Heifers on either end of the frame score scale will be either too small or too large for efficient production. Frame score 4, 5 and 6 heifers are moderate size and prove to be more efficient in most situations.

The initial postweaning growing phase begins at the end of the weaning phase and continues to the time the heifers are exposed to the bull. The growth rate during this phase should be calculated to allow heifers to reach their target weight for breeding. The growth rate can be accelerated during this period so that heifers behind in development can catch up, but the gains should not exceed 2 lbs per day. The most critical point is that heifers be at the desired weight for breeding, which is approximately 65% of their mature weight. There are three ways to determine

the mature weight of a heifer. One method is to use the frame score system described in Table 3. A second method is to use published breed averages as listed in Table 4, and a third method is to use the weight of the heifer's dam.

Table 4. Weight needed to reach puberty by breed composition.

Breed or Breed Type	Weight (lbs)
Angus	650
Brangus	700
Charolais	775
Hereford	700
Charolais x British	775
Simmental Crosses	700
Limousin Crosses	700
Gelbvieh Crosses	650
Brahman x British	750

Puberty is a function of both weight and age. Some of the larger framed breeds or breed types may need to be older to reach puberty compared to the more moderate framed breed or breed types. A heifer could obtain the weight necessary for puberty but be too young for puberty to be expressed. Brahman influenced heifers may have a slower rate of sexual maturity compared to non-Brahman breeds.

Generally, the average daily gain of heifers will need to be about 1.25 lbs per day from weaning to first breeding, and while this can be achieved with pasture alone, typical hay or average pasture quality will require supplementation. The supplement may need to provide protein, energy or both, and hay should be analyzed to determine which is needed and in what amounts. It is also recommended to weigh the growing heifers every 30 to 45 days to determine if their gain is satisfactory. If the heifers are gaining too much or too little, supplementation can be adjusted.

To ensure that all heifers reach the weights recommended before the breeding season, they should be fed separately from the cow herd and, if possible, sorted into feeding groups according to size and/or age at weaning. Lighter weight heifers will require a higher concentrate ration for the faster rate of gain necessary to reach the desired weights than larger, heavier heifers. It is also important to have enough bunk space so that all heifers have an equal opportunity to the supplement.

The following growing heifer example illustrates how to use the target weight concept to determine the desired rate of gain needed for heifer development (Table 5).

Table 5. Growing heifer example.

Situation at Weaning:	
Heifer age:	7 months or 210 days
Average weaning weight:	500 lbs.
Average frame score:	5
Weaning date:	October 1
Target Estimates:	
Target breeding date:	April 1
Target breeding weight:	715 lb (1,100 pounds times 65%)
Calculations:	
Gain needed:	715 minus 500 = 215 lb
Feeding period:	180 days (Oct 1 to April 1)
Average Daily Gain:	215 divided by 180 days = 1.19 lb/day

Once the forage is analyzed, a cost-effective supplement can be formulated to achieve the desired rate of gain. It is important to weigh heifers throughout the growing period to measure progress, and supplements can be adjusted accordingly. Another advantage of weighing heifers is it helps identify those heifers exhibiting poor growth. Those heifers that are not gaining well will not reach target weight and will probably not become pregnant or become pregnant late in the breeding period. The sooner poor growing heifers are identified and culled, the more efficient the growing program becomes.

It is not unusual for heifers to have no weight gain or a loss of weight in the early spring. When the new young tender grass growth occurs, heifers would prefer to consume the young tender grass rather than harvested hay. Although the young tender grass is higher in quality, the quantity during this time of year is limited. This results in a reduced weight gain during this period. The reduction in weight gain is short term and is quickly overcome.

Management from Breeding to Calving

Replacement heifers should be on a good health program. Heifers should be vaccinated or revaccinated for IBR-BVD-PI3, BRSV, vibriosis, leptospirosis and blackleg 7-way prior to first breeding. Calving difficulty is of great concern with first-calf heifers, as it is the primary cause of calf losses at birth. The major causes of dystocia are an oversized calf or an undersized heifer. A large calf and/or a heifer with a small birth canal can cause calving problems. The general rule of thumb is that a female (heifer or cow) should be able to calve 8% of their body weight. Therefore, if a heifer weighs 900 lbs at calving, she should be able to calve a calf weighing 72 lbs at birth. Two methods can be used to reduce the risk of calving difficulty. The first is to be sure the pregnant heifer is properly "grown-out" from breeding to calving. Pelvic area of heifers can be measured at yearling age, and those with small areas should be culled.

Another method of reducing dystocia is by reducing birth weights. Select low birth weight or high calving ease EPD bulls for breeding heifers. Birth weight information on a bull and his sire can be effective in reducing birth weights as well. Be very careful in selecting bulls if no prior calving information is known. Many yearling bulls are used on heifers satisfactorily, but the old belief that a young bull will sire smaller calves is not true. To reduce the risk of injury, however, smaller bulls should be used. Bulls should not weigh more than 170 to 180% of the female's (heifer or cow) body weight. If heifers weigh 800 lbs at the start of the breeding season, the bull selected to breed those heifers should not weigh more than 1,400 lbs.

It is recommended to breed replacement heifers 20 to 30 days before the cow herd. This permits more time and labor to be given to heifers during the calving season. Heifers can be watched more closely and assisted if necessary to reduce calf death losses. It also allows for a longer period from calving to rebreeding, which is needed by first-calf heifers to regain body condition and initiate estrous cycles.

The breeding season for replacement heifers should be approximately 45 days. Heifers should be checked for pregnancy 60 to 90 days after the end of the breeding season, and all open heifers should be culled. This increases selection pressure for high fertility and also ensures a short first calving season.

Heifers need to gain 0.8 to 1.0 lb per day from the time they are bred until calving. This can usually be achieved on pasture and mineral supplementation alone. At calving, heifers should weigh 85% of their expected mature body weight and be in good body condition (BCS = 6 to 7). If heifers are in thin body condition, they should be placed on a higher level of nutrition. It is difficult to improve heifer body condition as calving approaches, and it is especially difficult after calving. Improving condition will improve colostrum production and quality, will decrease post-calving anestrous period and increase the livability of their calves.

"Starving" heifers prior to calving does not reduce calving problems. Underfeeding can cause poor milk production, reduced weaning weights, lower rebreeding rates and increased calving difficulties. It also is not desirable for heifers to be overconditioned. Heifers which are overconditioned at calving have greater calf losses, excessive feed cost, depressed milk production, decreased life span and rebreeding difficulties.

Management from Calving to Rebreeding

A number of signs indicate that a heifer is getting ready to calve. They include relaxation of the pelvic ligaments, enlargement and thickening of the vulva and enlargement of the teats and udder. Checking bred heifers three to four times per day and watching for calving signs can help reduce the possibility of calving losses.

No aid should be given unless it is absolutely necessary. However, if a delivery does not occur within approximately two hours from the beginning of labor pains, assistance may be required. Some common causes for concern are breach birth (indicated by hooves of the feet pointed upward), one leg protruding, no legs protruding, head turned to one side making normal delivery difficult or impossible, and an abnormally large calf. Calving assistance may also be needed if there is no progress made for 30 minutes after the feet or water bag appears.

If a well-developed heifer that calves in good body condition loses condition rapidly after calving, she will have a less than desirable reproductive rate. Nutrition is very important for the first-calf heifer. Plan the first calf heifer's nutritional program in advance. Provide the highest quality hay or pasture available, and be prepared to provide a grain supplement. Heavy-milking heifers are especially prone to rapid weight loss and subsequent reduced chance of rebreeding. It is a good idea to provide a high magnesium mineral supplement with adequate trace minerals 30 days prior to and during lactation for heifers grazing cool season grasses or small grains in the spring to reduce the chances of grass tetany. Magnesium requirements increase with the onset of lactation.

Rebreeding the First-Calf Heifer

Rebreeding first-calf heifers for their second calf is often difficult. Other management programs have been shown to reduce the postpartum anestrus of first-calf heifers. These include once-a-day suckling, progesterone treatment, early weaning and cow-calf separation for 48 hours. These systems have additional labor requirements and, in some cases, special facility requirements.

Maintaining heifers in good body condition is the essential key to reproductive performance. Under normal circumstances, with good nutrition and good body condition first-calf heifers should rebreed in a timely manner. First-calf heifers that do not rebreed should be culled.

Culling Heifers Based on Their First Calf's Performance

The first calf a heifer raises can tell a great deal about the future productivity of the heifer as a cow. Data from the University of Arkansas Cow Herd

Performance Testing Program ranked cow performance based on calf's 205-day adjusted weaning weight ratio. It was determined that first-calf heifers ranking in the top one-third of the herd with their first calf had a 51% probability of ranking in the top one-third with their second calf. Conversely, first-calf heifers that ranked in the bottom one-third had 43% and 49% probabilities of ranking in the bottom one-third with their second and third calf. First-calf heifers are often given a "second chance" to produce a desirable calf because they are first-calf heifers. This data would suggest that it is wiser to cull the poor performing first-calf heifer after her first calf and not invest any more resources in her.

Summary

The replacement heifer becomes the genetic building block for the cow herd. Many management steps and decisions must be made in the process of selecting and growing replacement heifers. Consequently, replacement heifers must pass a number of "production tests" to become part of the cow herd. Selecting heifers at weaning, developing heifers from weaning to first breeding, evaluating heifers after their first breeding and calving season and establishing rebreeding results are the "production tests" a heifer must pass.

The extra management time invested in the replacement heifer enterprise can pay large dividends throughout the lifetime of the beef female. Paying attention to detail is the key for a successful replacement heifer selection and management program.

References

Jones, R., et al. Raising beef replacement heifers. Kansas State University.

Nunez-Dominguez, R., et al. 1991. Lifetime production of beef heifers calving first at two vs. three years of age. *J. Anim. Sci.* 69:3467-3479.

Poore, M.H. Nutrition for developing replacement heifers. North Carolina State University.

Troxel, T.R., et al. 2002. Using adjusted 205-day weight ratios to predict beef cow-calf performance. *J. Anim. Sci.* (Suppl. 1) 80:102.

Printed by University of Arkansas Cooperative Extension Service Printing Services.

The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Arkansas Cooperative Extension Service is implied.

DR. TOM R. TROXEL, Extension beef cattle specialist, and **DR. SHANE GADBERRY**, Extension livestock specialist, are with the University of Arkansas Division of Agriculture, Cooperative Extension Service, Little Rock.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director, Cooperative Extension Service, University of Arkansas. The Arkansas Cooperative Extension Service offers its programs to all eligible persons regardless of race, color, national origin, religion, gender, age, disability, marital or veteran status, or any other legally protected status, and is an Equal Opportunity Employer.