Heifer Management to Make Successful Cows

J. Rhinehart, Assistant Professor[1]

[1]Middle Tennessee Research and Education Center, University of Tennessee, Spring Hill, TN

The phrase "replacement heifers are the future of the cow herd" has been repeated enough that it might have lost some of its significance. But, for such a simple and obvious statement, it is as true now as it has ever been. And, with the current situation of the US cow herd it is critical that cattlemen continue to think about the role replacement heifers will play in their herd for several years after that initial investment is made. This discussion will, by necessity, include economic considerations. But the overall intent is to focus on management practices that help insure optimum returns from investments made in purchasing or raising replacement heifers for commercial cow/calf herds.

How much does a replacement heifer cost?

This question is usually answered by citing the most recent bred heifer sale in the relevant region. That is certainly the part of the answer as true price discovery is established at auction. But, price and cost are not always considered in the same way. For example, many producers choose to retain replacement heifers from their calf crop each year because the "sticker shock" of purchasing a bred replacement seems like too much to bear. However, retained heifers carry their own cost.

Table 1. Example cost considerations for retained and purchased replacement heifers on a per-head basis.

	Retained	Purchased
Deferred Revenue*	$1,260	-----
Development†	$550	-----
Opportunity Cost‡	$270	-----
Purchase Price∆	-----	$2,000
Total	$2,080	$2,000

*700 lb heifer at $180/cwt

† Includes nutrition, breeding, labor and death loss.

‡ Revenue lost from running three fewer cows with the recourses used to develop five heifers.

∆ Estimated average purchase price for heavy-bread, superior genetic replacements in 2013.

Taking a more critical look at the cost of raising replacement heifers can make the purchase price of heavy bred heifers seem less drastic (Table 1). At the time of preparing these proceedings, southeastern feeder heifers averaged $180/cwt. By not selling those yearling heifers, the producer defers income of $1,260 per head. Feeding the retained replacements from weaning until confirmed pregnant, including the cost of breeding and 1% death loss costs another $550 per head. Furthermore, if heifers were not retained every year more cows could be carried with those resources. In this example, three more cows could be maintained with the resources used to develop five heifers.

This example is not intended to be a comprehensive analysis of every cost associated with raising or purchasing replacements. But, it should serve as sufficient reason to at least consider purchasing replacements. Tax issues, cash flow and interest should also be considered from a purely economic standpoint. Other management considerations such as maintaining maximum heterosis and more rapid genetic advancement will be discussed in a subsequent section of this discussion.

The adage that "time is money" is applicable here. Consider another example outlining the time investment involved in retaining replacement heifers from the calf crop each year (Table 2). Beginning with a cow that calves the heifer in question (lines 1 & 2) and continuing through confirming that heifer bred back for its second pregnancy, there is essentially a three year time investment in a retained replacement. This extremely long period of time is often overlooked as part of the investment in individual replacements.

Table 2. Example of time investment for retained replacement heifers.

	Time Period	Days
1	Sixty day breeding season	60
2	Gestation period for brood cow	285
3	Birth to weaning	210
4	Weaning to breeding	240
5	Gestation period for heifer	280
6	Calving until re-breeding	80
7	Rebreeding until pregnancy exam	45
	Total time in days	1200 Days
	Total time in months	40 Months (3+ Years)

There is a third option for replacement heifers; custom development. Raising heifers under contract from consigners can be thought of as a value added stocker operation. The benefits of this arrangement are similar to several of those outlined in the discussion above about purchasing replacements. Having a custom developer raise and breed heifers to return to the home farm allows the consigner to use resources to run additional mature cows. A custom developer can specialize their management practices to reduce input cost (by taking advantage of economies of scale) and give each heifer the opportunity to express their full genetic potential for performance and fertility.

Custom heifer development and stocker operations specializing in marketing bred replacement heifers is not a new concept. However, it has likely not reached its full market potential. If the beef industry continues to consolidate and pursue efficiency, it could possibly become much more popular. Many states offer custom development consignment opportunities associated with land-grant university Extension or research programs. Currently, a rapid decline in the southeastern dairy industry has resulted in dairy producers transitioning into beef cattle production with many of them opting for custom heifer development.

Considering all these factors associated with the investment in replacement females, the decision about which method is most appropriate will depend on many factors including the number of replacements needed each year and access to purchase of heifers with known genetics and management. Regardless of whether heifers will be retained and developed on-farm, the management practices that make good heifers into productive and prolific cows are the same.

What makes a good heifer a productive and prolific cow?

Selection

Selecting early born heifers may be useful since older heifers will be more likely to reach target weights by the start of breeding. A less aggressive nutritional program may be used for heavier weaning heifers and possibly reduce feed costs. However, genetically superior heifers born later in the calving season can be managed to reach proper target weights by breeding and should be considered as replacements over older heifers with less performance potential. Also, selecting only the largest heifers at weaning could

result in larger mature cows that are less efficient. Evaluating the mature size and genetic growth potential of the sire and dam will also be important.

Temperament should be a key selection criterion in deciding which heifers warrant development as herd replacements. Many beef producers have adopted a "chute scoring" method to keep temperament records. When heifers are restrained in the working chute, they are assigned a score from 1 to 4 (1 = calm; 2 = restless shifting; 3 = squirming; 4 = twisting and rearing). Temperament is a very heritable trait and removing temperamental heifers from the herd will improve farm safety. Furthermore, temperament can negatively affect feeding behavior of not only the individual heifer but the group it is fed with as well.

All heifers selected for development as breeding females should be structurally sound. Leg and hoof structure are good indicators of skeletal ruggedness. Heifers that do not fit ranch specifications for breeding females may be better suited for post-weaning development programs that ultimately result in harvest prior to advanced maturity.

Nutritional Management

The most important consideration in developing weaned heifers is nutritional management. The traditional approach to developing heifers has been the "target weight" method. For heifers to breed at 13 to 15 months of age and calve as two-year-olds, they must achieve approximately 65 to 70 percent of their mature weight by the start of the breeding season. For British breeds this usually means that heifers need to weigh approximately 700 to 750 pounds at 14 to 15 months of age. For Continental breeds this typically means that heifers should weigh approximately 750 to 800 pounds at 14 to 15 months of age. Brahman influence cattle may be slower maturing. For example, if a heifer is expected to weigh 1,200 pounds as a mature cow, she should weigh 780 to 840 pounds before the beginning of the breeding season. This is referred to as target weight. After the target weight is determined, the time from weaning to breeding should be calculated. If the heifers are weaned on October 1st and will be bred on April 25th, that leaves 177 days to reach the target weight. Then determine the average daily gain (ADG) required over the 177 day period to reach target weight. For this example; if the heifers are weaned at 500 pounds and the target weight is set at 800 pounds. (1,200 x 67 percent = 800), they will need to gain a total of 300 pounds in 177 days. That results in a required ADG of 1.69 pounds (300 ÷ 177 = 1.69). Monitor weight gains every 30 to 60 days to make sure that the heifers are gaining on schedule, and make adjustments to the feeding program if appropriate.

To calculate target weights:

1) determine the desired breeding date based on desired calving date
2) determine heifer age at start of breeding
3) determine expected mature weight
4) determine required average daily gain

When designing a nutritional program to develop heifers to target breeding weights, evaluate pasture, hay quality and supplies ahead of time. Supplemental feed requirements can be determined by examining weight gains needed to reach target breeding weights, animal nutrient requirements, and forage program deficiencies. The plane of nutrition for reaching the target weight can be altered to match forage availability or feed cost. For instance, if forage is abundant or supplemental feed is relatively inexpensive early in the development period, heifers can be fed to maintain a high ADG early and reach the target weight faster. Then, when forage or supplemental feed availability declines, they can be maintained on a maintenance (or slightly above maintenance) diet until breeding. On the other hand, if forage is limited

and supplemental feed cost is high during early development, heifers can be maintained on a low ADG and then pushed to reach the target weight as forage becomes available or supplemental feed cost decreases. If supplemental feed and forage availability are not a concern, a steady ADG can be maintained. At this point in developing replacement heifers, experience in feeding cattle is critical. Frequent weights should be taken to ensure that the heifers reach their target.

More recent reports have suggested that the "target weight" system for developing heifers has become outdated and costly. As beef cattle producers switched from calving heifers as three-year-olds to calving as two-year-olds, more emphasis has been placed on selecting heifers that reach puberty at an earlier age and lighter weight in relation to their expected weight as a mature cow. In support of this idea, field trials have demonstrated that heifers developed to only 53 percent of their mature weight achieved similar pregnancy rates and longevity in the herd over four years compared to traditionally fed heifers (67% of mature wt.). When cost of production outpaces revenue, developing heifers to a lighter target weight may be more appropriate. However, management practices should not be changed suddenly. Implementation of this practice should be done with caution and only when genetic potential of the specific group of heifers is known.

Regardless of the nutritional program used, it is important to remember that the heifers should not be allowed to lose weight ("back up") or become too fat during the developmental period. Losing weight can alter the age at puberty even if the target weight is reached at the desired time. If heifers are overfed, fat accumulation in the udder will inhibit milk production as a first-calf-heifer and mature cow. Furthermore, multiple feeding groups should be used because individual heifers will require different nutritional inputs.

Minerals and vitamins are important for reproductive success. Special attention should be given to salt because feedstuffs do not normally meet the requirements for sodium and calcium. Other macro minerals include magnesium, potassium, chlorine and sulfur. These may or may not need to be added to the diet depending on their concentrations in the forage, feedstuffs, and water. It is important to remember that feeding excessive mineral can be costly and negatively impact reproduction. Required trace minerals include copper, cobalt, iodine, iron, manganese and zinc. Growth and reproductive performance of developing heifers can be hindered if these are not present in the diet or if other elements affect their availability. Most of the required vitamins are made by the heifer or are already present in common feed ingredients and do not need to be added to the diet. Vitamin A may need to be added when heifers are grazing low quality forages or crop residue.

Some feed additives or specific feed ingredients can be used to improve heifer development and reproductive performance. Heifers fed an ionophore (Bovatec® and Rumensin®) during development will likely reach puberty at an earlier age and lighter weight. The effect of an ionophore is most obvious in less intensively managed herds. Dietary fat supplementation increases the energy density of the diet and can help improve reproductive function. Additionally, fat supplementation seems to have a direct impact on reproduction independent of the added energy. Similar to ionophores, supplemental fat is most effective when heifers are nutritionally challenged.

Reproductive Management

Puberty in heifers can be characterized as the first estrus (standing heat). Heifer fertility increases approximately 20 percent from the first to third estrus after puberty. Nutrition plays a large role in the attainment of puberty for heifers, and if the nutritional management outlined in the previous section is practiced, heifers should display estrus prior to the breeding season. However, genetics also influence the age at puberty. Numerous studies have reported both between-breed and within-breed differences in age and weight at puberty. Breed differences, sire and dam effect within breed, and heterosis (hybrid vigor)

all contribute to heifer age at puberty and should be considered when selecting heifers at weaning or when making breeding decisions for cows who will potentially produce replacements. Producers utilizing Brahman-influence genetics should plan heifer development programs taking the later maturity rates generally associated with these cattle compared to other beef breeds into account. Crossbred heifers with less than 75 percent of one breed have a significantly reduced age at puberty compared to purebred heifers. Additionally, overall fertility is increased in crossbred heifers due to hybrid vigor.

Consider implementing the following three management practices one month before the breeding season begins:

1. Pelvic area measurements
2. Reproductive tract scores
3. Vaccination and parasite control

Pelvic area measurements are simply a measurement of the inside area of the pelvis. The original use of pelvic area measurements was to relate the size of heifer, size of pelvic area, and potential size of an easily deliverable calf. To determine the size of a deliverable calf, divide the pelvic area measurement by the ratio as determined from the chart using age and weight of the heifer. For example, a 900-pound yearling heifer with a pelvic area of 170 square centimeters should be able to deliver a 71-pound calf (170/2.4) without assistance. Because the ratios used to determine size of a deliverable calf are only about 80 percent accurate, most custom heifer development programs will cull heifers with a pelvic area too small to allow delivery of a 70- to 75-pound calf. Therefore, an 800-pound yearling heifer with a pelvic area of less than 160 square centimeters would be culled.

Reproductive tract scores are used to determine a heifer's reproductive maturity. This procedure was developed because directly measuring puberty in a group of heifers is time consuming and labor intensive. The score can range from one (immature) to five (cycling). It is simply a subjective estimate of sexual maturity based on ovarian follicular development and palpable size and tone of the reproductive tract. It is critical to use an experienced, reliable technician for reproductive tract scoring. This measurement is usually taken at the same time pelvic area is assessed. If estrus synchronization is not going to be used, consider culling heifers with a reproductive tract score less than three, especially if the genetic value is marginal. If estrus will be synchronized by using melengestrol acetate (MGA) or a Controlled Intervaginal Drug Releasing device (CIDR**)**, a tract score of two is acceptable.

The third practice to be completed one month prior to the breeding season is vaccination. Heifers should be vaccinated against *Vibrio fetus*, Leptospirosis, and a respiratory complex that includes Parainfluenza Type 3 (PI_3), Bovine Respiratory Syncytial Virus (BRSV), Bovine Viral Diarrhea (BVD), and Infectious Bovine Rhinotracheitis (IBR). It is also suggested to test each heifer for persistently-infected Bovine Viral Diarrhea Virus (BVD-PI). Heifers should also be dewormed at this time. Effective fly control is needed during the fly season as well.

The next step in heifer development is breeding. Using estrus synchronization and/or artificial insemination (AI) present advantages. The advantage of using estrus synchronization is increased pregnancy rates, a more uniform calf crop at weaning, and increased labor efficiency at breeding and calving. The major benefit offered by AI is access to proven calving ease sires with superior growth and carcass performance genetics. Because most calving problems occur when heifers calve for the first time, special attention should be given to make sure the sire has a desirable calving ease and/or birth weight Expected Progeny Difference (EPD) with a high degree of accuracy. Calving ease direct EPDs account

for birth weight information, provide information about the expected assistance required at birth for an animal's calves, and predict the ease with which an animal's calves will be born to first-calf heifers. Calving ease direct indicates the percent of calves out of a particular animal that are expected to require more or less assistance at calving out of two-year-old heifers. Calving ease should also be considered when selecting a "clean-up" or natural service sire to be used for the remainder of the breeding season after AI. Choosing an estrus synchronization protocol that uses some form of progestin (MGA or CIDR) will stimulate heifers that are on the threshold of puberty to begin to cycle and have a better chance to breed later in the breeding season.

Do heifers need to be managed more specifically than mature cows after the breeding season?
Yes. Management of heifers from the end of the breeding season until calving often receives less attention and fewer resources than nutritional development and breeding, yet it is as important to longevity as any other management practice. The first step in post-breeding management should be pregnancy diagnosis. Depending on the skill and experience of the practitioner, this can be done by hand palpation about 45 to 60 days after the clean-up bull is removed. This allows for enough fetal development in the last heifers bred by natural service to be detected by transrectal palpation. Ultrasound pregnancy diagnosis can be performed 30 days after the clean-up bull is removed with the same accuracy as palpation performed at a later date. Blood pregnancy tests can also be used 30 days after the cleanup bulls are removed. These tests have become more available and more widely used over the past several years.

Culling criteria should be based on:

- Pregnancy diagnosis
- Performance data
- Genetic potential

After pregnancy diagnosis, open (non-pregnant) heifers should be sold as soon as the market is optimal. Feeding open heifers may only be profitable when cost-of-gain allows added pounds to increase the profit margin. Marketing heifers as soon as they are confirmed open is usually the most economical decision. At the time of writing this document, long yearling heifers have a tremendous amount of salvage value as heavy feeders. Therefore, early pregnancy detection and marketing open heifers can yield as much as twice the value of an open heifer above keeping it through what would be the gestation period and marketing it for non-fed cow prices at a later date.

If the number of bred heifers exceeds the required replacements, cull those bred late in the breeding season. Search for a beef cattle producer that uses a later calving season to market these heifers at a larger profit than heavy open heifers. Further culling should be based on performance data and genetic potential. Keep heifers that grew well and were more efficient during the development phase or that have a dam and/or sire with proven valuable EPDs or performance records.

Body condition scoring (BCS) is useful in evaluating heifer nutritional status as calving approaches. It can be easily evaluated in the pasture. Heifers are still growing and have higher nutrient requirements than mature cows, so they should be managed to calve at a body condition score of 6 (where 1 = extremely thin and 9= extremely fat) or high moderate condition with considerable fat cover cows and heifers use energy for maintenance, growth, lactation and reproduction. A beef heifer's energy needs for maintenance, growth and lactation must be met before energy is used for reproduction.

Adequate nutrition is critical during the last two months of gestation since much of the fetal growth occurs during this time. Separating heifers from the mature cow herd limits competition for bunk space

and allows them to be placed on a separate nutritional program that better meets their requirements. Depending on breeding weight, bred heifers will usually need to gain about one pound per day until calving. The weight at first calving should be 85 to 90 percent of the expected mature weight. This translates to a target weight at calving of approximately 850 to 950 pounds for British breeds and approximately 950 to 1050 pounds for Continental breeds. They should have a BCS of 6.0 and be on a positive plane of nutrition prior to calving. Underfeeding heifers just prior to calving will not significantly reduce calf weight and will increase calving difficulty and decrease calf immunity. Thin heifers may lack the stamina to deliver a calf without distress.

A heifer that has just calved needs to be able to milk well and return to estrus (start cycling) prior to the start of the breeding season. This requires additional nutrients for the first few months after calving. Reproduction is tied to nutrition, so having cattle in proper body condition at calving will positively impact rebreeding rates. Cows and heifers in thin body condition at calving time are slower to rebreed, produce less colostrum (first milk after calving that is very important for proper calf immune function), and are less likely to wean a live calf seven to eight months later. In addition, research has shown that calves born to heifers with a BCS of five or six stand sooner after birth than calves out of heifers with a BCS of three or four. Even though adequate nutrition is crucial prior to calving, heifers should not be fed to excess. Excessive body fat will decrease fertility at re-breeding and fat accumulation in the udder will inhibit milk production. Ideally, heifers should not lose more than one BCS after calving.

What are the key factors to remember in raising replacement heifers?

There is a tremendous amount of management and investment involved in making good heifers become productive and prolific cows. Much of this investment can be lost if the heifers are not managed apart from the mature cows with some special attention. Having a defined plan for managing nutrition, reproduction and health should insure optimum performance and fertility throughout the adult productive life as mature cows.

It is also important to recognize that some producers might not be able to manage heifers to their optimum performance with reasonable investment. Therefore, it could be time to consider selling the entire calf crop as feeders and purchasing bred replacements with known genetics and management. The “sticker shock” is not as extreme when all the benefits are considered. Finally, if a producer is interested in keeping their own genetics, custom heifer development is an option.