The Cost of Raising Replacements

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It behooves producers to make some attempt to estimate the cost of producing a replacement heifer in their individual operations.

Colorado State University researchers conducted an in-depth economic analysis of raising replacement heifers up to the time their first calves were weaned at 31 months of age.

Depending upon heifer retention rates and reproduction rates, heifer breakeven values ranged from $601 to $733 when production costs were normal (expected). If production costs were 15 percent higher than expected, the range was $692 to $832. If production costs were 15 percent lower than expected, breakeven values ranged from $407 to $634.

If your cost is found to be inordinately high, one of two things should be done: (1) Examine the total heifer development program and make changes that are needed, or (2) consider the possibility of purchasing replacements, if they can be bought at a price and level of quality that makes it economically advantageous to do so. Of course, when purchasing replacements, herd health implications must be given serious consideration.

Here are 10 economically important traits which deserve consideration in the selection of replacement heifers:

1. Early Growth

Selecting heifers that have the heaviest actual weights at weaning time has two advantages: (1) the larger heifers tend to be older, which means they are out of earlier-calving cows; and (2) the larger heifers tend to be out of heavier-milking cows.

There is some risk in selecting extremely heavy heifers. They may be overfat, which could lower their eventual milk production because of fat deposits in the developing mammary tissue. Furthermore, extremely fast-gaining heifers may have a slight endocrine (hormone) imbalance which could impair their future fertility. Numerous producers have indicated that their largest heifer often fails to rank high in productivity as a mature cow.

Nevertheless, weight is what a commercial cow-calf producer has to sell. Research has shown that the weight of the calf is closely related to biological efficiency (pound of calf produced per pound of TDN consumed by the cow-calf unit). However, it must be kept in mind that as you place continual selection pressure on growth, there are three antagonisms that can occur: (1) higher birth weights; (2) larger mature cow size along with increased maintenance requirements; and (3) calves that finish out at higher than optimum slaughter weights (1,100 to 1,300 pounds).

Weaning weight and yearling weight are moderately to highly heritable traits (.25 to .50) which means that selection for early growth is effective. As a rough guide, heifers that have weight ratios below 90 (herd average = 100) should be considered possible candidates for culling.

2. **Early Puberty**

The younger a heifer begins to cycle, the better her chances of conceiving at a date that will allow calving at 24 months of age. Early puberty is moderately to highly heritable and appears to be positively related to the heifer's future fertility.

Research at the U.S. Meat Animal Research Center (MARC) has shown that age at puberty ranges from 10 to 14 months of age across various breedtypes. It is interesting to note that there was a tendency for the higher milk, lower lean breedtypes to reach puberty at a younger age than the lower milk, higher lean breedtypes.

Researchers at Colorado State University have developed a system of rectally palpating heifers one month prior to their first breeding season and assigning them a reproductive tract score (RTS), which is an estimate of puberty status. Scores range from 1 to 5, where 1 is infantile and 5 is a cycling heifer with a palpable corpus luteum. This trait was shown to be moderately heritable (.32).

Research has also shown that bulls with a larger scrotal circumference will tend to sire heifers that reach puberty at an earlier age than bulls with a smaller scrotal circumference.

3. **Fertility**

Heritability estimates of fertility (conception rate) have shown it to be a lowly heritable trait (.00 to .10). But, because reproductive rate is so important economically, it should not be ignored in a selection program. Over time, culling heifers that fail to conceive within a set breeding season should enhance cow herd fertility.

When visually evaluating heifers, avoid extremely coarse, masculine-appearing females; they could be marginal in fertility. Overly-refined, frail-appearing heifers should also be discriminated against. However, the real test of fertility in a herd of heifers is a high first-service conception rate and a high pregnancy rate at the end of the breeding season. Good goals would be a 60 to 65 percent first-service conception rate and a 95 percent pregnancy rate after no more than 60 days of breeding.

4. **Ease of Calving**

Nationally, the incidence of dystocia (calving difficulty) in first-calf heifers averages around 30 percent, resulting in about a 10 percent calf mortality rate. In some herds, heifer dystocia can run well over 50 percent. In addition to increased calf losses, heifers that require assistance will be more difficult to breed back.

Recent research has shown that the birthweight of the calf relative to the dam's pelvic area (PA) is the primary determinant of calving difficulty. Therefore, dystocia could theoretically be reduced by culling heifers with small PA's and mating the remainder to sires whose calves will not be disproportionately large.

Some producers are now measuring PA in their heifers prior to breeding season and culling those below a specific threshold level. Dividing PA by a factor of 2.2 can serve as a rough guide to the size of the calf the heifer may deliver without assistance.

For example, a heifer with a PA of 180 sq. cm should be able to give birth to an 82 pound calf (180 sq. cm ÷ 2.2 = 82 pounds).

For those using A.I., you can confidently use highly proven sires with low birthweight EPDs (expected progeny difference) to mate to yearling heifers. For those using natural service, it is advisable to seek out a bull that is a son of a low birthweight EPD sire as well as having a low birthweight himself.

Because PA is a highly heritable trait (.05), one could conceivably make progress in his cowherd by using bulls with large PA's and retaining their heifers. In comparing PA's among year-

ling bulls, they should be adjusted to a constant age or weight. The adjustment factor for age is .25 sq. cm per day of age. The adjustment factor for weight is .09 sq. cm per pound.

A word of caution: selection for PA should be done within a size category. Allowing size and PA to increase together will likely allow birthweight and PA to increase in a parallel fashion.

5. Milking Ability

Research has clearly shown there is an optimum range in milk production for a given environment. For example, abundant feed resources will accommodate a relatively high level of milk, Conversely, lower milk levels are better suited to limited feed conditions such as those in the arid Southwest.

Within a breed, the most effective way to improve milk is to use sires or sons of sires that have high EPDs for maternal milk and then save their daughters. Retaining heifers out of the heaviest milking cows is also recommended. However, if a prepubertal heifer is overly fat from nursing her heavy milking dam, her own milking ability may be reduced.

Milking ability is not as highly heritable as the growth traits. Heritability estimates range from .15 to .30 Consequently, progress from selection for milk within a breed will be slower than when selecting for growth.

6. **Structural Soundness**

Structural soundness contributes to longevity, a trait which research has shown to be related to cow herd efficiency. However, there appears to be a relatively wide range of acceptability in the physical traits that are involved.

The Skeleton. Common foot problems are: excessive growth, curled claws, small feet, weak pasterns, shallow heels and steep pasterns. Common hind limb problems are: post-legged, sickle-hocked, cow-hocked and bow-legged. Common front limb problems are: steep shouldered, buck-kneed, knock-kneed, bow-legged, splay-footed, pigeon-toed and coarse open shoulders. Some of these conditions are interrelated.

The Eyes. Pigmentation of the eyelid and skin around the eye is a positive trait because cattle with no pigment are more predisposed to cancer eye. Pigmentation is a moderately heritable trait (.30 to .40).

In areas where there is a great deal of bright sunlight and a high incidence of cancer eye, producers prefer the eyeball to be “hooded’ or "shaded" by a heavy eyebrow. Moreover, cattle with prominent eyes (pop-eyed) are discriminated against.

The Jaw. Jaw defects are relatively rare. However, “parrot mouth” (overshot) is occasionally seen. This condition could impair the heifer’s ability to forage.

The ***Mammary System.*** It is difficult to assess the mammary system on virgin heifers. However, it is wise to avoid European heifers whose teats are barely visible and appear to be embedded in a nest of long hair and fatty tissue. Furthermore, daughters of "ballon-teated," "pendulous-uddered," and "goat-uddered" cows should be discriminated against.

7. **Disposition**

Research has shown disposition to be a transmittable trait, ranging from approximately .15 to .40 in heritability. Cattle with extremely bad dispositions are not only difficult to handle, but dangerous. Furthermore, research has demonstrated that extremely nervous females exhibit a lower A.I. conception rate than quiet females. Heifers with extremely bad dispositions should be culled.

8. **Fleshing Ability**

Heifers that flesh (fatten) easily will generally be easy-keepers in the cowherd. They can subsist on lower-quality feeds and less total feed energy. Furthermore, they are more apt to breed back on schedule year after year

Overly-lean heifers are apt to transmit

less marbling to their slaughter progeny. Beyond a certain point, however, fleshing ability is a liability because it runs contrary to the consumer's desire for leaner cuts of beef.

The goal here would be to avoid the extremes: (1) those heifers that are obviously too lean and "hard-doing" in their appearance; and (2) those that are obviously predisposed to extra fat.

9. **Muscle Thickness**

In recent years, there has been an emphasis on greater muscle thickness, which is related to muscle-to-bone ratio in the carcass. There are research results to suggest that long-term extreme selection pressure for muscling could ultimately have a negative impact on maternal traits (puberty, fertility and calving ease).

Here again, the key would be to avoid the extremes: (1) heifers that are obviously too narrow, flat and light muscled and (2) those that are extremely thick, coarse and highly defined in their musculature, somewhat approaching double muscled cattle in their appearance.

10. Frame Size

Frame size, as measured by height, is a highly heritable trait that responds to selection. There is evidence to suggest that over the past 20 years, frame size has been increasing at an average rate of 0.1 frame score per year. In many purebred herds in recent years, the rate has been faster (.15 to .20 frame score per year). The average frame size of the commercial cattle population is somewhere around 5.0.

Frame size can be used to estimate the weight at which young cattle will reach a given market endpoint such as Choice grade. Today the beef industry generally discriminates against carcasses that fall outside the weight range of 550 to 850 pounds. Carcasses that grade Choice within this range would likely come from slaughter cattle with frame scores that range between 4 and 7.

When to Make Decisions

Assuming a cow herd attrition rate of 15 to 20 percent, an average weaning percentage of 80 to 85 percent and a pregnancy rate of 90 to 100 percent on heifers, it would be necessary to retain a minimum of 35 to 55 percent of the heifer calf crop so as to maintain a constant herd size.

In order to allow some room for selection on traits other than fertility, this implies that it is necessary to retain about one-half to two-thirds of the heifer crop at weaning time. These heifers should be fed a growing ration from weaning to puberty (12 to 14 months) and then another cut made at that time. A third cut should be made after a pregnancy examination of the heifers following the completion of the breeding season. A final cut should be taken after the remaining heifers have had an opportunity to wean their first calves. AJ

Replacement Heifer Guidelines

The following table presents a list of selection guidelines for two breedtypes ofcattle in differing environments. These are only meant to be a guide and will vary with each individual operation.

Replacement Heifer Trait	Mod. size, mod. milk limited feed resources	Lrg. size, hi milk, abundant feed resources
Minimum weaning weight, pounds	475	550
Minimum weaning weight ratio	90	90
Minimum yearling weight, pounds	650	800
Minimum yearling weight ratio	90	90
Maximum age at puberty, months	12	12
Minimum pelvic area at breeding, sq. cm	140	160
Minimum condition score at breeding	6	6
Minimum weight at breeding (65% of mature weight), pounds	700	875
Maximum age at conception, months	14.5	14.5
Maximum services per conception	2.0	2.0
Minimum weight at calving (85% of mature weight), pounds	900	1,150
Minimum conformation score (17-point scale)	13	13
Minimum frame score	4	5
Maximum frame score	6	7
Disposition	Calm	Calm
Structural Soundness	Adequate	Adequate
Average daily milk production, pounds	12	18
Mature cow weight, pounds	1,050	1,350