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How to select, grow, and manage replacement heifers

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Replacement heifer production covers a major portion of the budget of most beef operations. Nationally, about 7.5 million heifers are developed annually to replace cows removed from the herd. The costs are estimated to exceed $500 for each heifer kept for breeding.

Of these, 20% fail to conceive and calve as 2-year-olds, and another 20% don't rebreed to calve as 3-year-olds. You can reduce these losses—and improve profitability—by properly selecting, feeding, and managing these heifers.

Selection

Actual replacement rates vary ranch-to-ranch and year-to-year, but they average about 15% per year. Keeping more heifers than you actually need will allow culling at strategic points in a heifer's life as she develops. At weaning time, hold the top 40 to 50% of the heifer calves for possible replacements.

Puberty and fertility are important traits and are interrelated. Puberty is a function of age and weight. Beef cattle breeds currently used in the United States have the genetic ability to reach puberty at appropriate ages if managed properly.

Selection and management programs should emphasize animals and methods that develop proper weights. Actual weights reflect the progress to mature weight.

A Nebraska study indicates that heifers that are light at weaning, or that aren't allowed to gain adequate weight from weaning until breeding, will fail to show heat at the desired time. Hereford heifer calves averaging 350 lb at weaning showed first heat 45 days later than heifers of the same age that averaged 428 lb at weaning.

Both groups were fed to gain .81 lb per day, which is adequate for most replacement heifers, but smaller heifers didn't breed early in the breeding season. Late breeding means late calving, and so it's part of an overall economic problem.

A heifer should reach 65% of her mature weight by breeding time and

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85% at calving time. In general, it's a good idea to select the larger calves at weaning. Weaning weight is a function of genetics and a cow's ability to give milk.

So the larger calves should come from the higher-producing cows, and they should be genetically superior in production of growth and milk. The larger calves are usually also older; thus, the chances of early conception are higher.

In addition to selecting on weight, pick heifers that have the potential for a long productive life—choose those with structural soundness in feet and legs, with a straight strong back. Consider the skeletal size or frame, indicated by height at the hip and length of body.

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

Growth-promoting implants are not recommended for any prospective breeding animals, either heifers or bulls. While implants will increase growth rate, the risks far outweigh any potential benefits. Among the problems encountered are vaginal/uterine prolapses, late puberty, and reduced conception rates.

Try to select a heifer based on her dam's performance record. Cows should calve regularly every 12 months and raise rapid-growing calves. Performance records will aid in improved accuracy of selection.

On ranches where calving problems are high, culling heifers with small pelvic size might be helpful. However, management programs based on proper weights are important for efficient production.

There's growing interest in the use of pelvic measurements as a tool for selecting heifers. At the present time, however, we don't know enough to use these measurements to accurately predict the individual's expected calving problems.

Calf size is by far the biggest factor in dystocia and can't be measured until after calving. Although predicting calving problems on an individual basis isn't possible, a group of heifers with small pelvic openings will have higher percentages of dystocia than a group with larger openings.

So pelvic measurements can be a useful tool when you select replacement heifers in herds where dystocia is a major problem. You could cull heifers with pelvic openings below a certain standard (160 cm^2 at 12 months) or the 10% of the heifers with the smallest pelvic area.

If possible, select heifers from appropriate sires. However, it may not be possible to do selective mating of cows under ranch conditions—all sires may need to have good maternal traits. In any case, selecting bulls with high maternal expected progeny differences (EPD's) and with positive growth EPD's is advised.

In addition, heifers from bulls with large testicles reach puberty at a young age. Thus a ranch can increase reproductive performance by using bulls with adequte testicular development.

A listing of EPD's in national sire summaries is available from each of the national breed associations (and see EC 1345). Always insist on performance records for both dam and sire before you buy young bulls.

Growing

Select replacement heifers at weaning time, approximately 7 months of age, and feed them to gain 1.0 to 1.5 lb per day for the next 7 months (breeding time). If they're of the British breeds, they should weigh 600 to 700 lb when bred at 14 to 15 months.

In general, heifers of the large continental breeds such as Charolais, Simmental, and Main Anjou should be fed to grow at a faster rate than heifers of the British breeds.

Breed and sire influence weight and age of heifers at puberty. However, heifers of the larger breeds should reach puberty at 750 to 800 lb. Review table 1 for some average estimates of weights at puberty for various breeds.

Feed quality is variable. Average- to high-quality forage usually has from 50 to 60% total digestible nutrients (TDN). Grain usually has from 75 to 85% TDN. With any forage, a chemical analysis to determine protein is recommended—it's impossible to determine protein differences visually.

The Oregon State University Extension agent for your county can help you take forage samples and submit them to a laboratory for analysis.

Growing heifers and lactating cows need high-quality feeds. Low-quality feeds are best used with mature, nonlactating cows.

Table 1.—Breed differences in estrous percentages in 14- to 15-month-old beef heifers[a]

	Body weights (lb) by breed						
% in estrus	Angus	Herfd.	Charl.	AxH	SxE	LxE	BxE
50	551	606	706	551	675	675	675
65-70	606	675	728	606	706	706	706
85-90	675	706	772	675	772	772	772

[a]Key: A = Angus; H = Small Hereford; E = English; L = Limousin; S = Simmental; B = Brahman.

Table 2.—Approximate nutrient requirements of various classes of beef cattle

Class of cattle	Crude protein		Total digestible nutrients (TDN)	
	Lb	%	Lb	%
500 lb med.-frame heifer calves (gain 1.0 lb per day)	1.11	9.4	7.3	62
850-lb pregnant heifer (gain 0.9 lb per day)	1.40	8.2	9.6	54.5
1,000-lb pregnant cow (mature, 3rd trimester of (gestation)	1.60	7.9	10.5	53.6
1,000-lb lactating cow (average milk level)	2.00	9.6	11.5	56.6

The approximate nutrient requirements of weaned heifer calves, compared to bred heifers and mature cows, are shown in table 2.

Breeding heifers to calve about 1 month before the cow herd allows extra time and attention to heifers during calving and gives them extra time to recover after calving so they'll rebreed with the main herd. However, the calving season and associated labor demands are then extended for 30 days, which may not be desirable.

With proper management, beef cattle calving in the first 3 weeks of the calving season will more readily rebreed in the subsequent breeding season.

It might be appropriate to breed heifers for a shorter period of time (30 to 45 days) and select only pregnant heifers as replacements. Open heifers can be marketed as heiferettes at an economic advantage. Over the long term, this should improve herd fertility and profitability.

Research at the USDA Range Livestock Experiment Station at Miles City, Montana, involving 1,583 heifers over a 23-year period, indicates that heifers that don't produce a calf during the first calving season are a poor risk for lifetime productivity.

Heifers that produced a calf early in the calving season as a heifer continued to calve early and wean heavier calves throughout their lifetimes. Heifers that produced their first calf late in the calving season had a more erratic lifetime reproductive performance—they didn't calve every year.

Grow the heifers out so they conceive early in the breeding season and (consequently) calve early in the first calving season. It's evident that proper nutrition helps to set the stage for more and heavier calves throughout their productive life.

In a Miles City study, 89 weaned Hereford-Angus crossbred heifers were assigned at random to one of three winter-gain groups.

Projected winter gains were 0.6, 1.0, and 1.5 lb per day—low, moderate, and high nutritional levels, respectively. Heifers were held in feedlots during the 152-day wintering period, from December 5 until May 6.

Heifers assigned to the low-gain group received only alfalfa-grass hay (crude protein analysis, 17.0 %) throughout the wintering period.

Heifers in the moderate- and high-gain groups received the same type of hay, plus either 2 or 4 lb per head, daily, of grain mix. The mix consisted of 70% ground barley, 12.5% linseed meal, 12.5% wheat bran, and 5% molasses (15.8% crude protein analysis).

In addition, all heifers were fed a mix (2 parts salt, 1 part bonemeal), on a free-choice basis, throughout the study. Protein and mineral requirements were met or exceeded throughout the wintering phase.

Twenty percent of the heifers wintered at the low rate of gain failed to cycle during the breeding season.

Table 3.—Summary of feed effects on heifer reproduction

Animal group	Winter gain group		
	Low	Moderate	High
Number of animals	30	29	30
Winter gain (lb / day)	0.6	1.0	1.5
Puberty age (days)	434	412	388
Percent in heat:			
Before breeding season	7	31	83
During breeding season	73	66	17
After breeding season	20	3	0
Percent bred and conceived:			
First 20 days	30	62	60
Second 20 days	10	21	20
Third 20 days	10	3	7
Percent not bred	20	3	0

Table 4.—Winter rations for weaned heifers

Ration	Lb
1. Alfalfa hay (full fed)	12 to 16
2. Grass or meadow hay	10 to 12
barley or oats	2
cottonseed meal or soybean oil meal	.5
3. Silage (corn or grass)	15 to 20
hay (legume)	7 to 8
4. Meadow hay	10 to 12
alfalfa meal	3
5. Wheat hay	6 to 8
oats or dried beet pulp	6
cottonseed meal, soybean oil meal, or 36% protein supplement	.5

Table 5.—Winter rations for bred heifers

Ration	Lb
1. Alfalfa	18 to 22
2. Grass or meadow hay	20 to 22
Protein supplement can be cottonseed meal, soybean oil meal, or 36% protein supplement (liquid or dry)	1
3. Corn or grass silage	25 to 30
4. Oat or barley hay	16 to 18
Cottonseed meal, soybean oil meal, or 36% protein supplement (liquid or dry)	1
5. Wheat hay	7 to 10
Wheat, barley, or corn	7

This automatically reduces the maximum attainable calf crop to 80%, compared with 97 to 100% maximum for the moderate- or high-level gain heifers (table 3).

The percentages of heifers bred and conceiving during the first, second, or third 20-day period indicates another important effect of winter feed level. Only 30% of the heifers from the low level conceived during the first 20-day period, compared to 62 and 60% for heifers from the moderate and high groups, respectively.

Another study, at the University of Nebraska Experiment Station, Fort Robinson, compared the difference in weight and age at puberty of heifers fed to gain .5 lb per head per day compared to heifers fed to gain 1 lb per day.

Those gaining 1 lb per day reached puberty approximately 2 months earlier and were 60 lb heavier at puberty than those gaining .5 lb per day. These studies show that level of nutrition from weaning until puberty can influence lifetime production.

For most replacement heifers, the growth from weaning until breeding is during the first winter and spring. They should be fed high-quality roughage. Desired growth can be achieved by simple high-roughage rations like straight alfalfa, or a full feed of grass hay properly supplemented with energy and protein.

Weaned calves will consume air-dry feed equal to about 3% of their body weight. Rations for weaned heifers that will give 1 to 1.25 lb daily gain are shown in table 4.

Make salt and a mineral mix available on a free-choice basis for all rations. Carefully plan the selenium and copper levels in cooperation with a veterinarian.

Weaned replacement heifers should grow rather than fatten. Proper winter nutrition for heifer calves is most important to subsequent reproductive performance.

Feeding bred heifers

Keep bred heifers separate from the main herd and feed so they continue to grow at a normal rate of about .6 to 1 lb per day. An adequate level of nutrition during the first pregnancy influences not only calf viability but also rate of rebreeding.

A study at Oregon State University's Squaw Butte Experiment Station compared two levels of protein fed during the winter pregnancy of heifers bred to calve as 2-year-olds. Those on an adequate plane of nutrition gained an average of .82 lb per day compared to .26 lb gain per day for heifers on a low level of protein, which was only slightly above maintenance requirements.

Excessive levels of dietary protein and/or energy are not recommended. Besides being expensive, they've been reported to increase calf birth weights, which resulted in more dystocia. It's very important that heifers receive adequate protein, but not excessive levels.

Effects of the winter rations carry over into the calf crop. Heifers on the higher level of protein weaned 6% more calves, and the calves averaged 20 lb heavier at weaning. Average rate of rebreeding was 90% for the heifers on the higher level of protein, compared to 72% for the lower group.

Some suitable rations for wintering bred heifers are shown in table 5.

Select the proper level of nutrition based on your specific type of cattle, available feeds, and the economics involved.

Management

It's usually good management to breed yearling heifers to bulls with known or predicted low calving difficulty. Avoid breeding yearling heifers to large-framed bulls. Calving difficulty increases with increasing size of calf at birth, which is directly related to the mature weight of the sire.

The age of the bull, in itself, does not influence weight of his calves. Some cattle producers like to use yearling bulls on yearling heifers, which reduces stress at breeding time but doesn't decrease incidence of calving difficulty.

While small-boned, small-bodied bulls might produce lower birth weights, these calves generally possess less genetic potential for growth. Again, national sire summary data (EPD's) can be useful in identifying bulls that produce calves with low levels of calving difficulty and still possess the genetics for growth. See EC 1345.

Give special care to heifers when they calve for the first time. Have them calve in a lot or pasture where assistance can be given if necessary. Such a calving lot should have access to a calving stall and be equipped with calf-pulling equipment.

Experience and training are helpful in knowing how to handle difficult calving situations. The first rule when you assist a heifer in the birth process is to know your personal limitations. A veterinarian's assistance is often a wise investment, and it may save both dam and calf.

A recurring misconception is that calving problems can be "starved" out of a heifer. The theory is that reduced feed during the last trimester will reduce birth weight and (therefore) calving problems.

This is untrue! Calving difficulty is decided at conception by the genetics of the heifer and bull and the management of the heifer up to that point. Reducing the late gestation feed (energy) will reduce the heifer's weight and condition, but it won't affect the calf's birth weight.

Increased dystocia may occur since the heifer may be weak. It's important to maintain adequate levels of both energy and protein, particularly during the last trimester of pregnancy.

Studies show that heifers experiencing calving difficulty (dystocia) usually rebreed later than those that don't have difficulty. Difficult calving can be caused by a large calf, a small pelvic opening, or both.

Malnutrition of the heifer may contribute to weak and/or small calves. Heifers suffering from dystocia need extra nutrition if they're to respond and rebreed satisfactorily.

A critical time comes after the heifer has calved. Adequate nutrition is required to supply enough milk for her suckling calf as well as to build her own body, which is still growing and preparing to rebreed in 60 to 90 days. Heifers that are well grown out and fed properly before calving will respond and breed back sooner than underfed heifers.

After calving, the need for digestible protein and total digestible nutrients are greatly increased to provide for milk production. Insufficient feed at this critical time can cause poor milking and decrease rebreeding performance.

Heifers should actually gain weight during the breeding season. Spring-calving heifers usually have plenty of good pasture during the late spring and early summer, but cattle are often turned to pasture when feed is sparse. You might consider supplementing their feed with range cubes or other high-energy feed.

Heifers calving late in the calving season usually breed back late in the breeding season, if at all. These late producers may need additional feed both before and during the breeding season. You should probably cull exceptionally late calving heifers. These are generally low producers with low fertility, and they'll probably be open the subsequent calving season.

Fall-calving 2-year-olds usually don't have access to abundant pasture during this growth period. Provide good quality hay and/or grain for them. Calves of these young cows may need supplemental feed, which you can provide with a creep feeder.

Many ranchers wean calves from first-calf heifers when the calves are 5 to 6 months of age. This gives the heifer time to rebuild her own body before she calves for the second time.

These first-calf heifers should produce a fairly good calf at weaning, should rebreed early in the breeding season, and should produce a larger calf next year.

Disease prevention and general programs of herd health will help the productivity of all breeding cattle. Brucellosis vaccination of breeding females is not only an excellent idea, it's also legally required if the heifer is to be resold.

This vaccination should be given by a veterinarian when your heifer is between 4 and 10 months old. Veterinarians can advise you on continuous herd health programs.

Individual identification allows you to determine productivity of each cow. Either ear tags or number brands can be effective for this purpose. Number branding can be done with either freeze brands or hot iron.

Your nutritional program should be adequate to allow optimum biological performance from each animal in the breeding herd. Adequate nutrition will help shorten the breeding season. Pregnancy testing and culling of open females will increase efficiency, which could increase the number of calves at weaning time.

A high rate of reproduction can be the result when all cows in the herd have been selected, grown out, and managed properly. Developing replacement heifers is an important key to greater herd productivity and profitability.

For further reading

In July 1992, the OSU Extension Service publications warehouse was destroyed by fire. We are replacing our supplies. The following publication may be available in the office of the OSU Extension Service that serves your county. Check with that office for current prices.

You also may call Agricultural Communications at Oregon State University, (503) 737-2513, to learn the availability and current price of the publications.

Zollinger, William A., *Using National Sire Summaries to Improve Selection Skills,* Oregon State University Extension Circular 1345 (Corvallis, 1990). 50¢

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