

HEIFER DEVELOPMENT  
OSU Extension Beef Team  
<http://beef.osu.edu>

**WEANING/SELECTION**

**HEIFER SELECTION:** Heifers can be sold at weaning or anytime thereafter. Select at least 20% excess and continue growing the heifers until breeding. A second selection at yearling age is helpful. Let the bull or artificial insemination program select the heifers you keep by maintaining a relatively short breeding season (45 days). Pregnancy diagnosis after the breeding season provides another opportunity for culling. A final selection can be made after heifers wean their first calf. Weaning weight of the first calf is a fairly good, though not foolproof, indicator of future production.

**EARLY GROWTH (weaning and yearling weight) AND FRAME:** The traditional method for choosing replacements is pick the big ones at weaning. Traditional selection is simple and is not necessarily all bad. If growth is needed, selection on size will provide it. The bigger heifers are generally older, and thus selection is from the earlier calving cows. It also may (or may not) select heifers of heavier milking cows. Heavier and older heifers are more likely to cycle and breed early and be well on their way to having acceptable lifetime performance.

However, there are problems with the traditional method of selection. Some of the heaviest heifers at weaning may be fat and offer the potential of poor lifetime milk production due to fat deposits in the udder. Some big heifers are fast growing due to an endocrine imbalance and are subfertile at breeding.

The biggest problems traditional heifer selection is "frame creep". This is the gradual increase in mature cow size over time resulting from the use of larger frame bulls and retention of their daughters. The larger, higher maintenance dams may be too big for the feed resources. If nutrition does not change, these cows may suffer reproductively.

Selecting heifers for larger actual weight will generally result in a more uniform group capable of reaching pubertal weight at about the same time. So long as their sires and grandsires are not too big, there is little danger that selecting the larger heifers will cause significant "frame creep". Be careful not to mistake frame for weight. Framey heifers with below average body condition may be "hard keepers" later in life.

**FRAME SIZE: Matching the development program with genotype**

We know that most components of fertility that influence first calving and subsequent reproductive performance are not highly heritable. This suggests that management practices are most likely to influence the majority of factors related to reproductive performance. How we manage replacement heifer calves from the time they are weaned

from their dams to the beginning of the first breeding period is extremely critical for their subsequent performance.

Studies indicate that puberty can be expected to occur at a genetically predetermined size among individual animals, and only when heifers reach target weights can high pregnancy rates be obtained. In other words, heifers with the genetic potential to reach a heavier mature weight must attain a heavier prebreeding weight before their first breeding season. Using the standard set by the Beef Improvement Federation for nine frame-size classifications for U.S. breeding cattle (Table 5), producers can estimate body composition and energy requirements per pound of gain at various weights during the feeding period.

Table 5. Relationship of Frame Score and Hip Height to Estimated Mature Cow Weight<sup>a</sup>

Frame Score	Hip Height (inches)			Cow Weight
	7 Months	12 Months	Maturity	(estimated, lbs)
1	35	39	44	880
2	37	41	46	955
3	39	43	48	1030
4	41	45	50	1100
5	43	47	52	1175
6	45	49	54	1250
7	47	51	56	1320
8	49	53	58	1395
9	51	55	60	1470

<sup>a</sup>Hip height (in.) based on Beef Improvement Federation standards. Weights (lb) are expected averages for flesh condition (body condition score 5).

Source: Fox, D. G., C. J. Sniffen, and J. D. O'Connor. 1988. Adjusting nutrient requirements of beef cattle for animal and environmental variations. *Journal of Animal Science* 66:1475.

Weaning weight and yearling weight are moderately to highly heritable traits (.25-.50). As a rough guide, heifers that have within-herd weaning weight ratios below 90 (herd average 100) should be culled in a commercial herd. One caution to keep in mind is watch for calves that have high adjusted weaning weights and low actual weaning weights. These calves may come from heavy milking cows that are late calvers in the herd. In a purebred herd, the heifer's EPDs for weaning and yearling weight should be used when making selection decisions on growth. If seedstock producers are having trouble keeping their heaviest milking cows (high milk EPDs) in the early part of the calving season, they need to be aware of the impact that the some of these cows could have for their commercial bull buyers.

Yearling weights are a more accurate predictor of growth potential than weaning weights. Yearling hip heights are more accurate for predicting mature size than weaning hip height. Heifers with the heaviest yearling weights tend to be the largest framed. Maximum acceptable frame scores may need to be established to match cow size with feed resources. To remove your personal biases, it is suggested an unbiased 3<sup>rd</sup> party measure your heifers and categorize them to frame and estimated mature size.

Growth is an important trait in heifer selection but there are other important traits. What are those traits?

**MATERNAL/PRODUCTION TRAITS:** The traits that are important in replacement heifers are the maternal traits: early puberty, fertility, calving ease, milk, soundness (longevity), temperament and efficiency. Early puberty is highly heritable ( $H^2 = 50\%$ ) and related to early first pregnancy. Calving ease is important because it affects the time required for rebreeding. Soundness traits (feet, legs, udders, eye, etc.) are highly heritable and are related to longevity and productivity. Genes for mastitis resistance have been identified; selection for bloat resistance have been accomplished; evidence has been developed indicating genetic differences in the incidence of fescue toxicity.

**HEIFER SELECTION WITH CROSSBREEDING SYSTEMS:** Hybrid vigor is important but is not everything. Producers should not overlook good replacement prospects just to gain a little more hybrid vigor. Keeping heifers of terminal sires may cause "frame creep".

**TIME WHEN BORN:** Adjusted 205-day weights and ratios provide a better estimate of the true genetic differences in preweaning growth of the calves and milking ability of the cow than do actual weaning weights. Late-born calves with light, actual weaning weights can still have excellent adjusted 205-day weights and ratios.

**MILK PRODUCTION:** Caution, some heavy milking cows may not meet nutritional requirements through the available forage. The calving intervals for these cows will generally exceed 370 days. Selecting replacement heifers out of these cows could eventually cause an increase in open cows. Heifers with the heavier actual weaning weights are more likely to cycle early and calve early as 2-year-olds. Therefore, actual weaning weights may do a better job of identifying the heifers and cows that will be the most productive. Seldom should heifers be selected as replacements that have low actual weaning weights, but high adjusted weights and ratios.

Seedstock producers are selling the "genetics" for growth and milk. The adjusted weights and other genetic indicators such as pedigree EPDs become more important. However, seedstock operators should not produce cattle that are not adaptable to their customer's resources. If seedstock producers are having trouble keeping their heaviest milking cows in the early part of the calving season, they need to be aware of the impact that the some of these cows could have for their commercial bull buyers.

**DISPOSITION:** Research has found differences in chute scores between heifer and steers. It has been found that steers have a lower (more desirable) average temperament rating than heifers. Cattle that are calmer have higher average daily gains than do cattle with excitable temperaments.

The Beef Improvement Federation suggest scoring beef cattle temperament during restraint of the animal in a squeeze chute. This system utilized a categorical system (Table 6) ranging from one to six where 1=Docile and 6=Very Aggressive. Several organizations have

adopted this scoring methodology to collect records of cattle disposition including the American Angus Association (AAA) and North American Limousin Foundation (NALF). NALF has shown a positive increase in the mean docility EPD with an increase in mean docility EPD of approximately 15% of the past 20 years.

Table 6. Beef Improvement Federation recommended chute temperament scores and descriptions.

Score	Description	
1	Docile	Mild disposition. Gentle and easily handled. Stands and moves slowly during processing. Undisturbed, settled, somewhat dull. Does not pull on headgate when in chute. Exits chute calmly
2	Restless	Quieter than average, but may be stubborn during processing. May try to back out of chute or pull back on headgate. Some flicking of tail. Exits chute promptly
3	Nervous	Typical temperament is manageable, but nervous and impatient. A moderate amount of struggling, movement and tail flicking. Repeated pushing and pulling on headgate. Exits chute briskly.
4	Flighty (Wild)	Jumpy and out of control, quivers and struggles violently. May bellow and froth at the mouth. Continuous tail flicking. Defecates and urinates during processing. Frantically runs fence line and may jump when penned individually. Exhibits long flight distance and exits chute wildly.
5	Aggressive	May be similar to Score 4, but with added aggressive behavior, fearfulness, extreme agitation, and continuous movement which may include jumping and bellowing while in chute. Exits chute frantically and may exhibit attack behavior when handled alone.
6	Very Aggressive	Extremely aggressive temperament. Thrashes about or attacks wildly when confined in small, tight places. Pronounced attack behavior.

Another method to evaluate disposition is a pen score. Animals are penned in small groups (approximately 5 per pen) and approached by observers. The individual animal response to human approach is scored on a scale from 1 to 5 as described in Table 7.

Table 7. Temperament pen scores and descriptions.

Pen Score	Description	
1	Non-aggressive (Docile)	Walks slowly, can approach closely, not excited by humans or facilities
2	Slightly Aggressive	Runs along fences, will stand in corner if humans stay away, may pace fence
3	Moderately Aggressive	Runs along fences, head up and will run if humans move closer, stops before hitting gates and fences avoid humans
4	Aggressive	Runs, stays in back of group, head high and very aware of humans, may run into fences and gates even with some

		distance, will likely run into fences if alone in pen
5	Very Aggressive	Excited, runs into fences, runs over humans and anything else in path (crazy)

**THE WEANING PROCESS:** Weaning can be one of the most stressful events in the life of a calf. When these stressors occur in a matter of days, you are asking for trouble. Calves are the most susceptible to shipping fever (Bovine Respiratory Disease) when they are 6-8 months of age. Earlier in life, calves are protected from disease by maternal antibodies from colostrum. When calves are yearlings, they have a fully developed immune system and are better able to respond to a disease challenge.

Based on one survey (NAHMS) fifty percent of us wean calves based on age and weight. Typically, we take a 7-month old calf when it is most susceptible to disease and we put a whole bunch of stress on it. Weaning, trucking, vaccination, no feed, no water, crowding, co-mingling, new pathogens, new source of feed, and new source of water.

The best way to keep calves healthy is to **vaccinate before** calves are stressed and to reduce, eliminate, or spread out the stress calves are exposed to. Bottom line is that stressed calves don't respond as well to vaccines. If you don't vaccinate prior to these stresses, some calves may not develop antibodies soon enough to protect them from respiratory disease upon entering the feedlot. To implement a vaccination program for calves is there a time you are working the cows prior to weaning. If you are doing pregnancy checking of cows this might be a convenient time to do some vaccination of calves. Work with your veterinarian in developing a feasible system for your operation.

Management strategies can be employed to reduce calf stress at weaning time. Castration and dehorning is best done when calves are young (1-3 months of age). These procedures should not be performed at weaning time.

Not taking the horns off can also cost you money and can add to the stress at actual time of weaning. The following data was collected from some Guernsey-Noble Feeder Calf Association Sales. The presence or absence of horns did not affect market weight. Buyers were willing to bid an additional \$5 per 100 pounds of body weight to avoid horns. The result was \$27 in total value if the calf did not have horns. Bidders appeared to be more sensitive to steers having horns than heifers.

Put yourself in the seat of the buyer. Even if the horns are removed, do you want to see medication from dehorning running down the sides of a calf's head? Is the buyer going to be concerned about possible stress/sickness? Calves need adequate time to recover so the sooner you do this procedure the better. Therefore, dehorning at an earlier time helps in spreading out the stress of weaning.

Calves can be weaned at 30-45 days prior to shipping. This separates the stress of weaning from all the other stresses associated with shipping and marketing. Shipping less than 30 days post weaning is not recommended for several reasons. A 30-45-day period gives the calf time to learn to how to eat from a feed bunk and recoup the post-weaning weight. Weaning 45 days before shipping may be more profitable because it gives the

calf producer will have more pounds of beef to sell. You will have to run a pencil on the cost of this procedure and work with auction barns or other buyers to evaluate the financial outcomes needed to evaluate this management strategy.

A couple of options for weaning calves are maintaining them on pasture or they can be confined in a drylot. Supplemental feed needs to meet energy and protein needs for growth and immune system function. Calves that remain on pasture should be provided with a grain-based supplement in a bunk. Grain intake should be 5-10 lbs/day based on quality of pasture and the eventual destination of the calves. Target gains are 1.75 to 2 pounds per day.

There is evidence from Penn State University and Canadian research that indicates that weaned calves actually do better if they have fence line contact with their dams. You may want to move the cows to a pasture adjacent to the calves, rather than the traditional “out of sight, out of mind” approach. This also fits well with many Ohio producers who do not have adequate acreage to really get the cows “out of earshot.” Admittedly you need a good fence between the cows and calves. A standoff electric wire might be considered if you have problems with either group breaking through.

Calves weaned on drylot or pasture should be fed about 50% grain 50% forage diet. Feed good quality hay. High-quality alfalfa is **not** the best choice for stressed calves because it is highly laxative (scoring). Delay feeding silage until most of the calves are eating well.

There is not a magic list of nutrient requirements for weaning calves but the following numbers are “in the ballpark.” A weaning diet should be 45-50 Mega calories of Net Energy Gain/100 lbs of feed dry matter and contain approximately 16% protein. Protein, vitamin and mineral requirements must be met so calves can grow and have a fully functioning immune system. The mineral content should be .5% calcium, .3% phosphorus and .8-1.2% potassium. A high level of vitamin A (50,000 IU/day) is desirable the first few days after weaning. After all of the calves are eating, 10-15,000 IU daily should be an adequate amount of vitamin A. This mineral supplement may not be the same one you’re feeding the cows. Typically calcium levels need to be higher since grains are lower in calcium than forage. Forages can be deficient in minerals such as copper, zinc and selenium. If providing free-choice mineral, provide enough for 2-3 days. This will assure the freshness of the mineral supplement and improve consumption. A high quality protein and vitamin/mineral supplement(s) from a reputable feed company is recommended. If pellets are used, calves seem to prefer small pellets (under ½ inch in diameter) with few fine particles. Natural protein sources are recommended during the weaning or preconditioning phase. Consider a product for coccidiosis control. The follow mix was used in a weaning study conducted at OARDC Branch Stations.

Table 8. OSU pelleted weaning supplement

Ingredient	Weaning supplement
	100% Dry

Ground corn	55.10
Wheat midds	20.25
Soybean meal	17.12
Dried molasses	3.21
Calcium sulfate	.23
Limestone	1.86
Trace mineral salt	1.35
Rumensin™, 80 g/lb	.06
Selenium, 201 mg/kg	.66
Vitamin A, 30,000 IU/g	.03
Vitamin D, 3,000 IU/g	.03
Vitamin E, 44 IU/g	.10
<i>Nutrient composition, %<sup>b</sup></i>	
Crude protein	16.0
Calcium	.8
Phosphorus	.5
Potassium	.8

Adequate bunk space (1.5-2 ft/calf) is necessary so all calves can eat at one time. Clean, fresh water should always be available. The water should be accessible and not hard for the calves to find. A slowly running hose can attract the calves to the water source. However, if accomplish this causes a mud situation then just focus on accessibility. If using a hose, keep the spout above the water level. This help produce the sound of water running but perhaps more importantly, prevent flow of dirty water back into the water system.

People starting calves on feed should be as finicky as horse people. Avoid finely ground, dusty feed or year-old hay the may be dusty as well. Cracked corn works well is one of our cheap sources of calories (energy). This can be an excellent place to use digestible fiber sources such as dried distillers grain, corn gluten feed, pelleted soybean hulls and wheat midds. The grain supplement can be top-dressed of quality forage.

Creep feeding for 2 weeks before weaning may ease the transition to bunk feeding after weaning. Alternately fence-line feeding a small amount of grain to cows and calves a few days before weaning is a good substitute if you don't want to creep feed.

Facilities for feeding weaned calves don't need to be fancy or elaborate. Drylot pens should be small to reduce fence walking and allow closer observation. Pens should be dry but not dusty. Dr. Loerch was involved with a project weaning calves into big feedlot pens (without fence line contact with their dams). The study used pedometers to record the walking activity of calves. Calves walked 10 miles the first two days after weaning. Bawling, dust and exhaustion definitely contribute Respiratory Disease. Feed and water should be located on the perimeter of the pen because that is where the calves will be. The bunks should be placed perpendicular to the fence with one end touching. Keep pen

sizes small if you have a large pen, plan on splitting it with portable panels with a pen depth of 60 feet. With smaller pen sizes, the calves are less likely to spook and cause wandering calves to more easily come across feed bunks and water tanks. When newly weaned, calves about 60 square feet per head and 1-2 feet of bunk space and need to see open water. If weaning on pasture, the same principles should be used. Calves and their dams can be introduced to the weaning pasture 3 days prior to weaning so as to acclimate the calves. You might consider a relatively small pasture area, such as 2 to 5 acres for 100 head with 3-4 strands of electric wire the first 4 to 5 days of weaning. Later, you can make the pasture area larger and use less electrified wires. If all this fencing is not feasible, you might consider placing the calves in drylot for the first 2 to 3 days. This can reduce forage losses due to trampling and fence walking is reduced.

An interesting twist you might consider is “weaning the cows.” The first step is moving the cow-calf pairs to small pastures near the corral or pens that you have good quality forage. This allows the calves to become accustomed to the environment. The cows are then put in the pens for a few days and the calves remain on pasture and are provided a supplement. The better the pasture, the less supplement may be needed. The pasture is probably less dusty than the pens and the calves have become accustomed to the pasture. This may not reduce bawling by the cows but may reduce the bawling by the calves. The cows are then moved out of the corral after 3 days. Like the other systems the source of water and feed for the calves is kept close to the corral at least for the first few days. Another option is to use a combination of pen and pasture weaning.

Regardless of the system used, weather is a major factor for success. Watch the weather reports to locate a good window for at least the first 3-4 days of the actual weaning process.

**HEALTH MANAGEMENT AT WEANING:** Heifers should be vaccinated against *Vibrio fetus*, Leptospirosis, and the respiratory disease complex which includes PI3, BRSV, BVD, and IBR. A modified-live vaccine is preferred because it generally stimulates a better immune response. A typical strategy is to vaccinate using killed vaccines 3 weeks before weaning and then follow up with MLV booster. Heifers also need to be dewormed at this working.

**COST OF PRODUCTION:** Cost of production to weaning will vary from farm to farm. Costs of production may range from \$280 to \$380.