

Feeding And Management Of The Dairy Heifers: 6 Months To Calving

From 20 to 30 percent of the animals in a milking herd are replaced each year. Success in improving the herd depends upon whether the replacement heifers are managed so that they will meet their genetic potential to produce milk. Cost of maintaining heifers varies among farms, but a cost of \$1 to \$2 per day is common. Scheduling first-calf heifers to calve 2 months earlier saves \$60 in feed costs. In addition, the heifer will also begin generating income earlier from the milk produced. Getting the heifer milking 2 months earlier may be worth \$200 to \$300 in additional income if she is in proper condition at calving.

The normal recommendation is to breed heifers at 15 months so they will calve at 24 months. Although this is a good goal, adequate skeletal size and weight of heifers at breeding and calving is more important than age. Table 1 lists the approximate weights and heights of large (Holsteins, Brown Swiss) and small (Ayrshire, Jersey Guernseys) breeds at different ages.

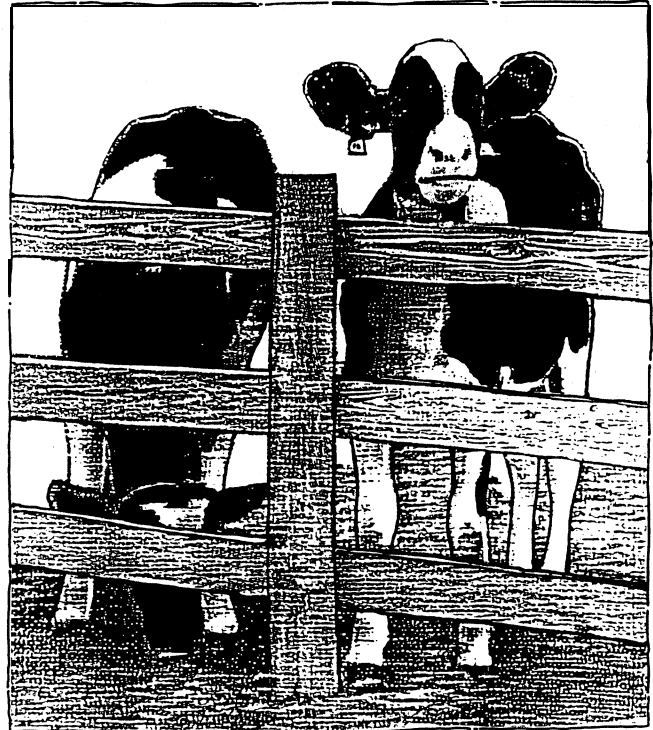
Table 1. Guidelines For Weights And Heights Of Dairy Heifers.

Age Months	Holsteins		Jerseys	
	Weight (lb)	Height(a) (in.)	Weight (lb)	Height(a) (in.)
0	96	29	55	26
2	170	34	115	30
4	270	39	195	34
6	370	44	275	39
8	500	46	385	41
10	600	48	460	43
12	700	50	520	44
14(b)	800	51	575	45
16(b)	900	52	650	46
18	990	53	730	47
20	1050	54	800	48
22	1175	55	875	50
24	1300	56	960	51

Source: University of Wisconsin.

(a) Height at withers.

(b) Target breeding age if heifers are at approximately these weights and heights.



A general guideline is for the heifer to weigh 60 percent of the desired mature weight at breeding. This amounts to approximately 800 to 875 pounds for large-breed heifers and allows the heifer, if fed satisfactorily to calve at 1,250 to 1,350 pounds.

These weights are slightly heavier than previous recommendations, but first lactation milk production is higher for larger heifers (Table 2). Milk production increases in body weight until a heifer weighs about 1,200 to 1,250 pounds. At body weights of more than 1,250 pounds, the increase in milk production per 50 pounds of body weight is not as great as the increase is at between 900 and 1,250 pounds. If the heifer weighs more than 1,450 pounds at calving, she may actually produce less milk than if she weighed 1,200 to 1,450 pounds. Based on this information, Holstein heifers should calve at about 1,250 pounds to maximize production and income.

Table 2. The Relationship Between The Weight Of Holstein Heifers After Calving And Their First Lactation Milk Production.

Body weight after calving	Additional milk produced in first lactation (a) (lb)
900	0
901-950	432
951-1,000	698
1,001-1,050	935
1,051-1,100	1,194
1,101-1,150	1,250
1,151-1,200	1,566
1,201-1,250	1,777
1,251-1,300	1,818
1,301-1,350	1,949
1,351-1,400	1,989
1,401-1,450	1,999
1,450	1,945

Source: Keown. 1986. University of Nebraska. NebGuide G86-819.

(a) Difference from 900-pound heifer production.

Despite wanting large heifers, you should not over-feed energy because weight may be adequate, but skeletal growth (height) inadequate with such a regime. Such heifers may be either receiving too much feed or inadequate protein for growth. Overly fat heifers have more difficulty in calving and give less milk than those of adequate size. This excess weight is more of a problem if it is gained before puberty rather than after breeding. Underfeeding (lack of feed or poor feeds) heifers is a serious problem that should be avoided. Undersized heifers have difficulty in calving, produce less milk, and require extra feed for growth during the milking period.

The desired size can be attained if Holsteins gain about 1.7 pounds per day (50 pounds per month) and if Jerseys gain about 1.3 pounds per day (40 pounds per month). Weights and heights should be measured and compared to sizes in Table 1 to determine if gains are adequate.

Feeding To Attain Desired Growth

As indicated in Table 3, nutrient requirements of dairy heifers vary with their size. All nutrients must be supplied in the diet, yet some nutrients are more apt to be deficient in Alabama feeds. Therefore, supplementing such nutrients is critical. Energy and protein are major nutrients that are often deficient in many heifer rations, but the supply of other nutrients-minerals and vitamins-must also be considered. Insufficient amounts of these nutrients result in retarded growth, delayed puberty, and, as indicated above, reduced milk production. When feeding Alabama feeds to heifers, pay special attention to the status of energy, protein, calcium, phosphorus, sodium

(salt), and vitamin A. Supplement other minerals in various areas of the state or with specific feeds. Water is a nutrient that must be in adequate supply, near the animal's resting areas, and of good quality.

Table 3. Nutrient Requirements And Ration Specifications For Growing Heifers.

	Age (months)		
	6-12	12-18	19-24
Large breeds			
Body Weight (lb.)	550	800	1,100
Estimated dry matter intake (lb.)	12.0	18.5	27
Crude protein (%)	13.2	12.0	12.0
Small breeds			
Body weight (lb.)	385	575	825
Estimated dry matter intake (lb.)	9.7	14.0	21
Crude protein (%)	14.0	12.0	12.0
All breeds			
Total digestible nutrients (%)	66	63	58
Net energy (MCal/lb.)			
Maintenance	0.73	0.66	0.58
Gain	0.46	0.40	0.32
Calcium (%)	0.41	0.29	0.29
Phosphorus (%)	0.30	0.23	0.23
Magnesium (%)	0.16	0.16	0.16
Potassium (%)	0.65	0.65	0.65
Sodium (%)	0.10	0.10	0.10
Chlorine (%)	0.20	0.20	0.20
Sulfur (%)	0.16	0.16	0.16
Iron (ppm)	50	50	50
Cobalt (ppm)	0.10	0.10	0.10
Copper (ppm)	10	10	10
Manganese (ppm)	40	40	40
Zinc (ppm)	40	40	40
Iodine (ppm)	0.25	0.25	0.25
Selenium (ppm)	0.30	0.30	0.30
Vitamins			
A (IU/lb.)	1,000	1,000	1,000
D (IU/lb.)	140	140	140
E (IU/lb.)	11	11	11

Source: National Research Council. 1988. Nutrient Requirements of Dairy Cattle. Given as Guidelines.

Several sample rations are given in Tables 4 through 6 for different sizes of heifers. Many different feeds and combinations of feeds can be used for heifers. Due to cost, forage should be the foundation of all heifer rations. However, young heifers on forage alone cannot grow satisfactorily because of limited rumen capacity. As heifers mature, rumen capacity becomes sufficient for adequate growth on good quality forage. Nevertheless, most forages in Alabama are deficient in energy and protein for adequate growth

without some supplements. For example, corn silage is a high-energy feed, but it requires protein supplements. Most grass hays in Alabama require supplements of both energy and protein.

Good, lush pasture is an excellent source of both protein and energy for heifers, but younger animals (less than 500 to 600 pounds) may not have adequate capacity to consume sufficient amounts due to the high water content of pasture. Supplying 2 to 4 pounds per day of a grain or by-product (example: corn, soy hulls) along with a mineral supplement (about 16 percent calcium and 6 percent phosphorus) and trace mineral salt will meet the needs of smaller calves grazing most winter pastures of good quality. Larger calves will usually have adequate growth on winter pastures if the pastures are managed satisfactorily and heifers are provided with access to trace mineral salt and a low calcium-low phosphorus mineral supplement. However, winter pasture quality drops rapidly if seed heads are present or if fescue leaf exceeds about 4 weeks of growth before grazing. In such cases, heifers will need to be supplemented with a high energy grain mix containing 12 to 16 percent protein. If heifers are grazing fescue that is endophyte infected, growth will not be satisfactory (0.6 to 1.0 pound per day). High-energy supplements containing about 16 percent protein will be needed for all size heifers on such pastures. Endophyte-infected fescues should be replaced with

low-endophyte fescues or at least interseeded with clovers to lessen the effects of the endophyte. Some reports indicate that selenium supplementation is helpful when endophyte fescue is grazed.

Early well-managed summer pastures can provide adequate growth for larger dairy heifers, but most summer pastures mature very rapidly in Alabama and are difficult to manage so as to provide adequate growth. Therefore, energy supplementation is routinely necessary for smaller heifers on pasture and even for larger heifers during much of the summer when pasture quality is low. Under these situations, heifers should be supplemented with a grain mix similar to that provided for heifers when grass hay is fed. In late summer when pasture is very mature and of limited supply a high energy supplement containing 16 percent protein is advised. The amounts to feed will vary with heifer size, pasture condition, and growth desired. As much as 4 to 6, 6 to 9, and 8 to 11 pounds supplementation may be required for the small, mid-size, and large heifers (Table 4), respectively, during late summer for the heifers to continue to grow at the desired rate. This amount of grain mix appears rather high, but note that the heifers are fairly large, the gain needed is 1.7 and 1.3 pounds per day for large and small breeds, respectively, and the pasture quality is low. Higher quality pasture requires less grain. However, pasture quality is often overestimated.

Table 4. Example Rations For Large Breed Heifers Averaging 500 Pounds And Small-Breed Heifers Averaging 385 Pounds.

Ingredients ^a	Rations									
	1		2		3		4		5	
	L	S	L	S	L	S	L	S	L	S
Corn silage	18.8	15.2	18.8	15.2	-	-	-	-	-	-
Alfalfa hay	36	29								
Grass hay, excellent					81	65				
Grass hay, average			28	22			68	55		
Mature pasture									FC	FC
Grain ^b	15	12	16	13	43	35	50	40	55	45
Protein Supplement ^c	0.9	0.7	1.6	1.3	0.6	0.5	1.5	1.3	1.1	0.9
Calcium Carbonate ^d			0.05	0.04	0.04	0.04	0.06	0.05	0.07	0.06
Dicalcium phosphated	0.03	0.02	0.02	0.02	-	-	0.01	0.01	0.01	0.01
Dynamate ^{CF}					0.05	0.04	0.01	0.01	0.03	0.03
Salt ^d	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.02
Trace mineral/vitamins ^{d~e}	+	+	+	+	+	+	+	+	+	+

^aComposition (% CP and TDN on a dry-matter basis): Corn silage, 35% DM, 7.5% CP 67% TDN; Alfalfa hay, 17% CP, 57% TDN; Ex grass hay, 12% CP 54% TDN; Av grass hay, 7% CP 46% TDN; Pasture, 9.5% CP 48% TDN.

^bCorn, other grains, or high energy grain by-products (soyhulls, corn gluten feed, wheat mill run) can be used.

^cProtein content, 48%. Supplements with lower protein content can be used, but amounts need to be adjusted so as to supply similar protein amounts.

^dMinerals and vitamins can be supplied by commercial mixes if approximately the same amounts of nutrients are supplied. Minerals and vitamins need to be premixed due to the small quantity required.

^eSufficient amounts of vitamins A and E and trace minerals should be supplied to meet recommendations as outlined in Table 3.

FC = Free choice.

Table 5. Example Rations For Large Breed Heifers Averaging 800 Pounds And Small Breed Heifers Averaging 575 Pounds.a

Ingredientsa	Rations									
	1		2		3		4		5	
	L	S	L	S	L	S	L	S	L	S
	---Pounds per head per day, as fed---									
Corn silage	34.0	26.0	29.0	22.0	.	.	.	.	.	.
Alfalfa hay	62 .	49 .								
Grass hay, excellent					14.7	11.1	.	.	.	.
Grass hay, average			62	44 .			12.5	9.4	.	.
Mature pasture									FC	FC
Grain			09 .	09 .	51 .	38 .	63 .	47	72	55
Protein Supplement	08 .	06 .	21	15	03	02	20	15	1.1	0.9
Calcium Carbonate			0'04	0'02	0'01	0'01	0'04	0.03	0.05	0.04
Dicalcium phosphate	0.01	0.01	-	-	-	-	-	-	-	-
Dynamate			0.04	0.04	0.1	0.08	0.02	0.02	0.04	0.04
Salt	0.03	0.03	0.03	0.03	0.01	0.01	0.02	0.02	0.03	0.03
Trace minerals/vitamins	+	+	+	+	+	+	+	+	+	+

aSee footnotes to Table 4.

Table 6. Example Rations For Large Breed Heifers Averaging 1,100 Pounds And Small Breed Heifers Averaging 825 Pounds.a

Ingredients"	Rations									
	1		2		3		4		5	
	L	S	L	S	L	S	L	S	L	S
	---Pounds per head per day, as fed---									
Corn silage	40.0	31.5	42.0	33.0	.	.	.	.	.	.
Alfalfa hay	13.6	10.8	.	.	.	.	.	.	.	.
Grass hay, excellent					23.0	18.2	.	.	.	.
Grass hay, average			10.3	8.1	.	.	19.5	15.4	.	.
Mature pasture									FC	FC
Grain					56 .	44 .	74 .	58 .	90 .	70 .
Protein Supplement	04 .	03 .	31	25	03	03	29	23	17	13
Calcium Carbonate			0'04	0'02	0'01	0'01	0.04	0.03	0.05	0.04
Dicalcium phosphate	0.02	0.02	-	-	-	-	.	.	.	.
Dynamate			0.05	0.04	0.04	0.03	0.02	0.01	0.04	0.04
Salt	0.03	0.02	0.03	0.03	0.01	0.01	0.02	0.02	0.03	0.03
Trace minerals/vitamins	+	+	+	+	+	+	+	+	+	+

aSee footnotes to Table 4.

Although corn and soybean meal are used as the energy and protein sources in the tables, almost any grain or grain by-product can be used. If available feeds cost less, include them at amounts to provide a similar amount of protein and energy as provided by the corn and soybean meal. Other forages such as ryegrass hay, sorghum silage, and Johnsongrass hay may also be used if prices and availability are better than those used to calculate the rations.

Various feeding systems and management approaches can be successful. Grain mixes can be fed separately from the forage or mixed with forage and fed as a total mixed ration (TMR). Ground hay can be used in a TMR, but use of silage eliminates the need

to chop hay. Hay used for a TMR should be chopped no shorter than 1 1/2 to 2 inches. Use of a wet product (silage, wet corn gluten feed, etc.) improves palatability of a TMR. If TMR feeds/are too dry (less than 50 percent moisture), water can be added at mixing time to reduce dust and improve intake.

Ionophores, special feed additives, can be fed to dairy heifers and have often improved the rate of gain. These feed additives (monensin marketed as Rumensin and lasalocid marketed as Bovatec) are available in products such as salt-mineral mixes, protein supplements, and grain mixes. Ionophores should be fed according to the manufacturers directions and do not replace good feeds or feeding management.

Housing

In Alabama, housing heifers from 6 months to calving can vary from essentially no housing to total-confinement housing. Because of the difference in nutrient requirements for animals of different sizes, heifers should be grouped according to size. Small groups allow for closer observation and are less apt to result in timid heifers being kept from feed. Groups of 10 to 25 heifers are best, especially if they are under total confinement, but grouping on pasture is also advisable. Ventilation is very important for confined housing in Alabama, especially if used during summer months. Any housing should be relatively dry and free of cold drafts during winter months and provide shade in the summer. Housing space needed per animal varies with size and type of housing. Some minimum recommendations are given in Table 7. Self-locking head catches at feed bunks make several management practices easier. Many heifers in Alabama are raised without any housing. Feeding and management needs to be observed closely under such conditions. Wind breaks should be provided during the winter. Dry, clean shade should be available during the summer.

Table 7. Minimum Housing space For Heifers.

Type of facility	Age (months)			
	5-8	9-12	13-15	16-25
	-Square feet/animal-			
Resting area	25	28	32	40
Paved lot	35	40	45	50+
Total confinement	25	30	40	60
	Dimensions			
Free Stalls	2'6"x5'	3'x5'6"	3'6"x6'6"	3'6"x6'6"
Minimum alley width	8'10"	8'10"	8'10"	8'10"

Source: U. Wisconsin

Breeding Management

Dairy heifers should be bred to dairy bulls, **not** beef bulls. Considering that the average dairy cow only produces three calves during her herd life, dairy producers who breed heifers to beef bulls automatically lose one-third of the potential replacement heifers. Given a 50:50 sex ratio at birth, that means only one of the subsequent two calves she produces before being culled will be a heifer. Therefore, dairy producers who breed heifers to beef bulls will be lucky to get just one female calf born to replace each cow culled. That does not allow for any selection. These producers must use every heifer raised, no matter how bad she might turn out to be and will probably have to purchase extra heifers just to maintain herd

size. Did you ever wonder where those "extra" heifers come from? They come from farms where heifers were bred to dairy bulls, resulting in a surplus of young dairy females. With 50 percent more female calves being born, producers can select the best for their own replacements and sell the rest (at a profit) to their neighbors who used beef bulls.

Artificial insemination (AI) has many advantages over natural service in the dairy industry whether the animal is a mature cow or young heifer. In a progressive breeding program, heifers should be the most genetically advanced animals on the farm. Breeding the best females on the farm to a herd bull of unknown genetics just because it is easier to let him pasture breed them is a step backward; the resulting calf will probably be worse than the dam. Virgin heifers are also the most fertile animals in the herd because they are not in a negative energy balance from lactation and they have not experienced reproductive problems such as calving difficulty and uterine infection.

When breeding heifers artificially, you should select semen from AI sires proven to transmit those genetic traits that will benefit you the most. This usually means a major emphasis on pounds of milk, dollar value of milk and its components, and correction of functional type traits such as poor feet and legs or udder attachments. "When breeding heifers, it is also important to select AI bulls identified for calving ease. This will reduce the chance of the smaller, developing heifer having difficulty delivering her first calf.

A successful AI breeding program depends on successful heat detection and proper AI technique. Heifers should be easy to identify (ear tags, neck chains, paint brand), and observed at least twice daily (dawn and dusk) for estrous activity. Commercial products are available to synchronize estrus (prostaglandins and progestin implants) and reduce the amount of time spent observing. If you are interested in synchronization, ask your local veterinarian or county Extension agent for an explanation of how these products work and how they can be used most effectively in your herd. Various heat-detection aids (for example, markers) help with breeding and identification.

If AI is absolutely not possible and you must resort to natural service, select bulls unrelated to your herd. Purchase them from a well-established herd and from an identified cow family with proven superior genetics. Again, your best heifers are too valuable to breed to some old "calf getter" of unknown genetic value. You should provide one fertile bull for every 10 to 15 heifers. It is best to use bulls that have not been exposed to older cows, thereby limiting the likelihood of transmitting disease from older to younger animals.

Regardless of how heifers are bred, routine pregnancy checks are valuable for identifying open (non-pregnant) animals that should be culled before you invest any more time and feed in them.

Heifer Health

Although heifers are the "future of the herd,!" they are often the most neglected group on the farm. By systematically monitoring the growth of this important group of animals, you force yourself to look at them critically and to evaluate your heifer health and development program in an unbiased way. Without such a system, evaluating heifers becomes what one prominent veterinarian calls a "chin rubbing exercise!"

The growth guidelines in Table 1 should be used to simultaneously evaluate the heifer health and nutrition programs. If heifer nutrition is found to be adequate, heifers that fall below the targets for height and weight at a particular age may be suffering from the lingering effects of disease. If the number of calves not meeting height and weight targets is significant, it may reflect disease occurring in very young calves. For example, calftlood scours or pneumonia can cause retarded growth although the primary disease process happened months before.

Young stock on pastures in the Southeast are very susceptible to the effects of internal parasites, such as stomach worms. Failure to adequately deworm calves can result in their falling below growth targets. In general, deworm heifers in the spring and summer with an effective dewormer. Consult with your veterinarian on what dewormer to use. Many products can be used in heifers that cannot be used in lactating cows because of drug residues in the milk. By closely monitoring growth, your deworming program can be adjusted, such as by adding a fall deworming.

Weights and heights of heifers should be measured at least at 6 months of age, at breeding, and at calving. If target weights and heights are not being met, weighing more often might be necessary to allow for evaluation of corrective measures, such as alterations in diet or dewormings.

If heifers have not received a vaccination for Blackleg (*Clostridia* bacteria) by 6 months of age, they should receive one at that time. The "3-way" or "4-way" Blackleg vaccination is adequate, unless the disease caused by one of the less common clostridial bacteria has been documented. Before breeding, heifers should routinely receive a vaccination for leptospirosis and a booster vaccination within a few weeks. As with all vaccines and drugs, **read the label closely**. Other vaccines may be recommended in your herd, such as IBR (Infectious Bovine Rhinotracheitis), BVD (Bovine Viral Diarrhea), BRSV (Bovine Respiratory Syncytial Virus), *Hemophilus*, *Campylobacter* (vibrio), and

brucellosis (calftlood vaccination for Bang's disease). It may be recommended to vaccinate heifers in late gestation for likely calftlood diseases, such as *E. coli* scours, so that the antibodies they pass on to their calves in their colostrum will be high. Consult your veterinarian about the specific recommendations for your herd.

Avoid intermingling home-raised heifers with purchased animals being brought onto the farm. Quarantine new animals for at least 30 days. Several cases of severe disease have occurred in groups of heifers exposed to such animals. Some diseases such as Johne's disease, if present in the milking herd, may require rigid segregation of heifers from cows. Again, consult your veterinarian.

Heifer mastitis, or maiden mastitis, seems to be an increasing problem. Although blind quarters may result from young calves suckling each other, many cases of blind quarters are due to a bacteria being picked up by heifers under adverse conditions, such as filth and mud. Flies have been implicated in the occurrence of teat irritation and the spread of mastitis. Flies and biting gnats must be controlled in order to reduce this problem, although this is often difficult. One or more quarters may become infected and swollen in young heifers at various ages, even prior to breeding. Although mastitis in heifers may cause severe sickness, many cases are unobserved because their udders are not observed twice daily as with milking cows. In some herds with heifer mastitis problems, heifers may benefit from routine intramammary treatment as part of a control program. Consult with your veterinarian in such a case. If heifers are treated with dry cow intramammary infusions, be sure that an adequate withdrawal time has occurred before calving to avoid a residue problem. As in all such cases, if in doubt about residues, test the milk before putting it into the bulk tank.



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This publication was prepared by B.R. Moss, *Extension Animal Scientist*, Professor; D.A. Coleman, Associate Professor; and J. Floyd, *Extension Veterinarian*, Associate Professor; all in Animal and Dairy Science at Auburn University.

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