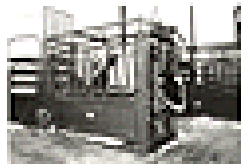
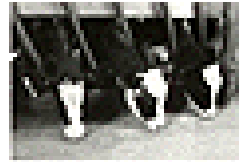
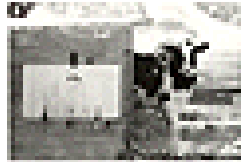
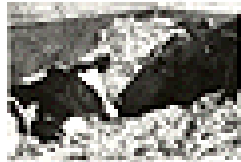


Extension Circular 385

Management of Dairy Heifers

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PENNSYLVANIA



College of Agricultural, Food, and Environmental Sciences

PENNSYLVANIA STATE UNIVERSITY



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Six Months of Age Through Calving

Feeding

Most forages, with the exception of silage, can be offered to heifers on a free-choice basis without causing an overeating problem. For this reason many dairy farmers keep forages available for their heifers at all times. Hay is most often available, while silage must be replenished at least once per day to avoid spoilage and reduced intake. The inconvenience associated with daily silage feeding can be reduced with a bunker silo equipped with a moveable electric fence or self feeder. With corn silage, anhydrous ammonia can be added at the time of silo filling to reduce the mold growth and increase the bunk life of this feed. Anhydrous ammonia treated corn silage can be fed on an every-other-day basis with less concern about the silage heating or spoiling.

Pasture also makes an excellent forage for heifers when an adequate amount is available. A large percentage of Pennsylvania farmers use pasture for heifers during all or part of the year (Table 20). In the hot dry parts of summer, supplemental forages must be fed to provide adequate amounts of dry matter. Forage intake for heifers should be 2.0 to 2.2 pounds of dry matter per 100 pounds of bodyweight.

Abundant pasture that is kept young and actively growing may provide most of the nutrients needed by heifers more than 9 months old. Pastured heifers should be provided with a minimum of free-choice dicalcium phosphate and trace mineral salt. If grass tetany or sudden deaths are a problem on pasture, supplemental magnesium should be provided in a manner to ensure intake of at least 1 ounce per head per day. Supplemental forage should be provided only when necessary to help control bloat on legumes or to make up for a lack of pasture. Limited grain feeding is necessary to provide a vehicle for bloat or tetany-control additives, to increase energy intake when pasture is scant or overmature, and to serve as a way to incorporate needed minerals, vitamins, and other feed additives, such as ionophores (monensin or lasalocid), into the diet.

Priorities for feeding young stock during this time are to supply a balanced diet on which they can grow and stay healthy so they can be bred at 13 and 15 months of age and maintain their pregnancy. To ensure heifers are receiving their required nutrients, it is advisable to test the forages that are being fed and to balance a ration for animals 6 through 12 months and those over

Older heifers on pasture.

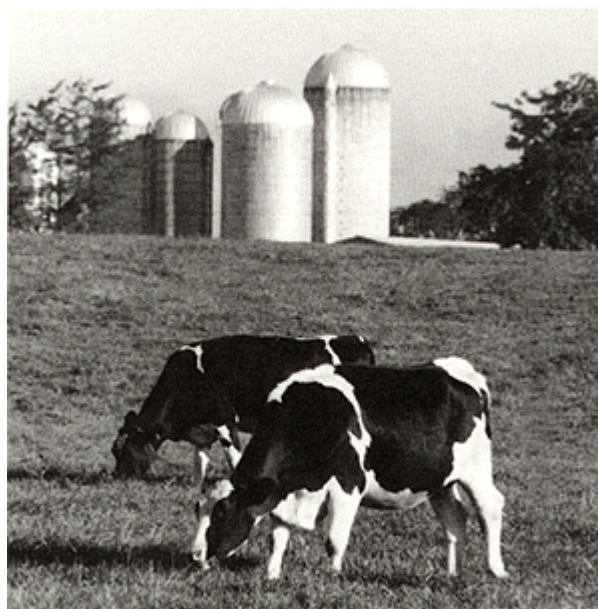


Table 20. Pasture usage and management.

Pasture usage ^a	(%)
Use pastures for heifers	
Summer only	62.5
Year round	23.8
Use supplemental feed while on pasture	
Forage	17.1
Grain	9.4
Combination	55.3
Use supplemental minerals on pasture	
	64.4
Use fly control on pasture	
	54.1

^aValues listed here are based on the number of farms using pastures, not the total number of farms responding to the survey.
Source: Penn State Data; Journal of Dairy Science 70:696, 1987.

12 months of age (Tables 21, 22). The effort put into feeding a balanced diet will pay off when these heifers eventually freshen and enter the milking herd.

Table 21. Daily nutrient requirements of dairy heifers after age six months.¹

Live weight (lb)	Gain (lb)	Dry matter intake (lb)	Energy			Protein	
			NEM ² (Mcal)	NEG ² (Mcal)	TDN (lb)	UIP ³ (lb)	CP (lb)
Large-breed growing females							
500	1.30	10.68	5.03	1.72	7.08	0.52	1.37
500	1.50	11.31	5.03	2.01	7.49	0.56	1.48
500	1.70	11.95	5.03	2.30	7.92	0.60	1.58
600	1.30	12.54	5.76	1.89	8.13	0.48	1.50
600	1.50	13.27	5.76	2.20	8.61	0.51	1.59
600	1.70	14.00	5.76	2.52	9.09	0.54	1.68
700	1.30	14.49	6.47	2.05	9.20	0.44	1.74
700	1.50	15.32	6.47	2.39	9.73	0.47	1.84
700	1.70	16.17	6.47	2.74	10.27	0.49	1.94
800	1.30	16.56	7.15	2.20	10.30	0.42	1.99
800	1.50	17.52	7.15	2.57	10.89	0.44	2.10
800	1.70	18.48	7.15	2.95	11.49	0.46	2.22
900	1.30	18.79	7.81	2.35	11.43	0.40	2.26
900	1.50	19.88	7.81	2.75	12.08	0.41	2.39
900	1.70	20.97	7.81	3.15	12.75	0.43	2.52
1,000	1.30	21.22	8.45	2.49	12.61	0.39	2.55
1,000	1.50	22.44	8.45	2.92	13.33	0.40	2.69
1,000	1.70	23.68	8.45	3.34	14.07	0.41	2.84
1,100	1.30	23.87	9.08	2.64	13.86	0.38	2.86
1,100	1.50	25.26	9.08	3.08	14.66	0.39	3.03
1,100	1.70	26.67	9.08	3.53	15.48	0.40	3.20
1,200	1.30	26.81	9.69	2.77	15.20	0.39	3.22
1,200	1.50	28.39	9.69	3.24	16.09	0.40	3.41
1,200	1.70	29.99	9.69	3.72	17.00	0.40	3.60
1,300	1.30	30.10	10.29	2.91	16.65	0.42	3.61
1,300	1.50	31.90	10.29	3.40	17.65	0.42	3.83
1,300	1.70	33.73	10.29	3.90	18.66	0.42	4.05
Small-breed growing females							
500	0.90	10.58	5.03	1.37	6.77	0.42	1.27
500	1.10	11.38	5.03	1.71	7.28	0.45	1.37
500	1.30	12.19	5.03	2.05	7.80	0.48	1.4
600	0.90	12.68	5.76	1.51	7.88	0.40	1.52
600	1.10	13.63	5.76	1.88	8.47	0.42	1.64
600	1.30	14.60	5.76	2.26	9.07	0.44	1.75
700	0.90	14.99	6.47	1.65	9.05	0.38	1.80
700	1.10	16.11	6.47	2.05	9.72	0.40	1.93
700	1.30	17.26	6.47	2.46	10.41	0.41	2.07
800	0.90	17.57	7.15	1.78	10.28	0.38	2.11
800	1.10	18.90	7.15	2.22	11.06	0.39	2.27
800	1.30	20.25	7.15	2.66	11.85	0.40	2.43
900	0.90	20.50	7.81	1.91	11.62	0.39	2.46
900	1.10	22.08	7.81	2.38	12.52	0.40	2.65
900	1.30	23.68	7.81	2.85	13.42	0.41	2.84
1,000	0.90	23.75	8.45	2.03	13.06	0.42	2.85
1,000	1.10	25.61	8.45	2.53	14.09	0.42	3.07
1,000	1.30	27.50	8.45	3.04	15.13	0.42	3.30

¹1989 NRC (Revised edition).

²NEM-net energy, maintenance; NEG-net energy, gain

³UIP-undegradable intake protein

Growing heifers often requires some grain. The amount of grain fed and the concentration of nutrients in it are determined by the average forage consumption and the average nutrient requirements for the group of heifers. This grain mixture is usually offered daily and the entire amount is consumed within a short period of time. Heifers being fed good-to-excellent quality forage need 1 to 3 pounds of concentrate per day, while those on poorer quality forages require 3 to 5 pounds of concentrate each day. The percentage of protein and other nutrients vary according to the forage being fed.

Under many management conditions, dominant heifers consume more than their proportionate share of concentrate, resulting in an excessive variation of individual growth rates within groups.

Table 22. Recommended nutrient content of diets for dairy heifers after age six months.^{1,2}

	6-12 mos	>12 mos
Energy		
NEM, Mcal/lb	0.72	0.63
NEG, Mcal/lb	0.44	0.37
TDN, % of DM	66	61
Protein equivalent		
Crude protein, %	12	12
UIP, %	4.3	2.1
Fiber content, minimum		
Crude fiber, %	15	15
Acid detergent fiber, %	19	19
Neutral detergent fiber, %	25	25
Minerals		
Calcium, %	0.41	0.29
Phosphorus, %	0.30	0.23
Magnesium, %	0.16	0.16
Potassium, %	0.65	0.65
Sulfur, %	0.16	0.16
Sodium, %	0.10	0.10
Chlorine, %	0.20	0.20
Iron, ppm	50	50
Copper, ppm	10	10
Manganese, ppm	40	40
Zinc, ppm	40	40
Cobalt, ppm	0.10	0.10
Iodine, ppm	0.25	0.25
Selenium, ppm	0.30	0.30
Vitamins		
A, IU/lb	1,000	1,000
D, IU/lb	140	140
E, IU/lb	111	11

¹1989 NRC (Revised edition).

²The approximate weight for growing heifers at 6 to 12 months is 559 pounds and at more than 12 months is 881 pounds; the approximate average daily gain is 1.543 pounds per day.

These problems can be reduced by sorting animals into more uniform groups by size and/or having some form of locking head gate to allow all animals the opportunity to receive their proper amounts of concentrates. All heifers should be able to be at the feed bunk at the same time.

Total mixed rations are ideal for heifers during this age group. When fed this way, heifers are allowed to consume rations free-choice with the fiber and/or bulk of the ration used to regulate intake. Since rations are available at all times, all animals are able to obtain adequate dry matter.

Health

The major health problems of young stock are internal parasites, external parasites, and infections causing respiratory problems and abortions. Any of these disease problems may cause significant damage before detection. It is definitely more cost-effective to prevent the problems than trying to contain the damage.

Most dairy farms have a routine treatment program for young stock. Worming should be started soon after calves are put into group pens. Manure samples from each group or pen can be examined by the herd veterinarian for presence of worm eggs or coccidia

oocysts. This helps determine the need for worming and monitors the success of the worming program. External parasites should be treated in fall or early winter. Several drugs are available for treatment of stomach and intestinal worms. Lungworms, when present, can be treated with levamisole. Coccidia are not affected by wormers, but can be controlled by one of several available coccidiostats.

External parasites, like the internal parasites, will cause serious production losses in young stock. The major external parasites of concern in Pennsylvania dairy herds are lice, mange mites, stable flies, house flies, face flies, horn flies, and heel flies. Any of these can be serious enough to affect growth rate and feed efficiency. As mentioned earlier, pastured heifers should be wormed and confined heifers may also need regular worming due to parasites that may be picked up in the dry lot, manger, and from other animals. Manure samples should be checked by a veterinarian for recommendations on a worming schedule.

Vaccines against diseases such as pinkeye and haemophilus may need to be considered in some herds. Heifers should be vaccinated against leptospirosis at least 30 days prior to breeding age. A vibrio vaccine should be considered if natural service is used.

An important element of a heifer health program is to have restraint facilities (chutes, corrals, self-locking stanchions) for all heifers, especially those of breeding age.

Heifer reproductive management

Heifers have reached puberty when normal sexual behavior is exhibited and ovulation occurs. Onset of puberty more closely relates to bodyweight than to age.

Heifers reach puberty when bodyweight is 30 to 40

percent of the average adult weight, and should be ready to breed around 13 to 15 months of age.

Table 23 gives more details about suggested sizes and weights at time of breeding.

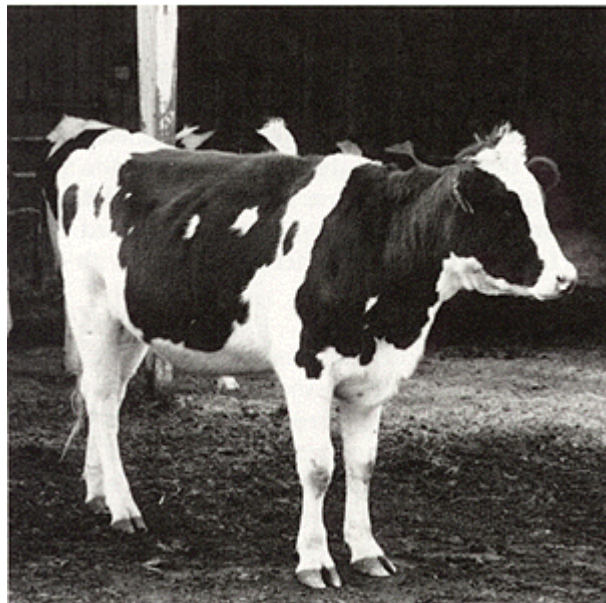
Table 23. Suggested breeding size for dairy heifers.

Breed	Bodyweight (lb)	Heart girth (inch)
Jersey	500 to 600	58 to 60
Ayrshire and Guernsey	650 to 700	61 to 63
Swiss and Holstein	750 to 800	64 to 66

Puberty is delayed if growth is slowed by underfeeding, disease, or parasites. Low dietary energy levels can lead to ovarian inactivity. Inadequate protein intake and nutritional problems leading to anemia can cause silent or irregular heats. Deficiencies of phosphorus, vitamin A, and vitamin E may also affect reproduction. Heifers approaching breeding age should be watched closely for heat to ensure that they are cycling. A veterinarian can examine heifers to determine those that are cycling and also identify those with congenital reproductive abnormalities.

A successful A.I. program involves routine heat detection and timely insemination. Considerable variation exists between animals. The average interval between heats for heifers is 20 days. All heat dates should be recorded on a chart so that future heats can be anticipated. To monitor heats accurately, dairy farmers must clearly identify heifers with neck chains, large ear tags, or freeze brands, and check animals for heat behavior twice a day. If heat detection is routine and frequent, heifers should be inseminated 12 hours after the beginning of standing heat. When the onset of heat cannot be accurately determined because of infrequent heat detection, heifers should be bred soon after standing heat is noticed. Keeping accurate records of the breedings is important for predicting calving dates.

A heifer ready to breed 13 to 15 months old in good shape.



Dairy farmers who cannot routinely check for heats may consider using heat synchronization and a concentrated A.I. breeding program for selected months during the year. Heat detection can be made easier and more efficient by use of heat mount detectors, crayon or chalk markings, surgically altered bulls, and/or androgenized heifers equipped with chin-ball markers.

Facilities should be provided where heifers can be confined for close observation or until they are individually restrained for breeding or examination. For a relatively small investment in time and money, most heifer facilities can be upgraded and equipped to provide convenient restraint and efficient handling of heifers. Such facilities can also be used for prebreeding examinations, vaccinations, worming, pregnancy examinations, estrous synchronization, and possibly embryo transfers.

Precalving

Bred heifers can be fed and handled in the same manner as other yearling heifers until about the last 3 months of pregnancy, when the unborn calf makes nearly two-thirds of its growth. During the final 3 months, bred heifers may need extra nutrients to maintain proper body condition for their first lactation and support for their growth plus that of the fetus.

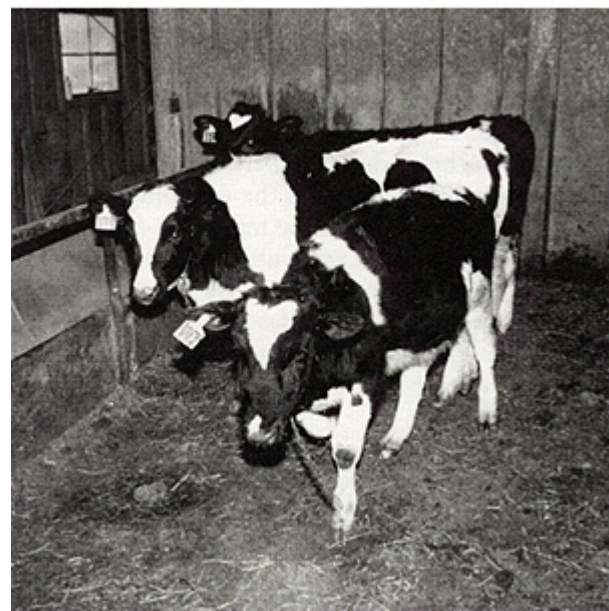
Heifers being fed excellent-to-good quality forages (forages containing 60 percent or more TDN on a dry matter basis) should receive 2 to 4 pounds of concentrate per head per day. This should be balanced according to the protein and mineral needs of the animal. Those heifers being fed fair-to-poor quality forages (those containing less than 60 percent TDN on a dry matter basis) should be given 4 to 6 pounds of concentrate per head per day.

Improper feeding and management practices often result in undersized heifers. The common cause is underfeeding forages as well as feeding

Restraint facility for heifers.



Undersized heifers.



an unbalanced grain mixture, especially in the areas of protein and minerals. The problem often is solved by access to better pasture and to supplemental feeds.

Slowing growth below recommended levels is unprofitable because it eventually shortens the production portion of the heifers' lives. The result of underfeeding heifers is reduced growth and delayed first calving (greater than 26 months). Stunted growth will also result in smaller and less productive cows. More calving difficulties are encountered with undersized heifers than with those that are well grown.

Accelerating the growth of heifers to the extent that they become fat is also undesirable because lifetime milk production and longevity decrease. Studies have shown that excessive intakes of energy (140 percent of recommended levels) before breeding result in fatty infiltration of the mammary gland and reduction of the number of alveolar cells available for milk synthesis. Overconditioned or fat heifers often are the result of overfeeding high quality forages, especially corn silage, and in some cases is caused by excessive feeding of concentrates.

About 30 days before calving, bred heifers should be moved to a clean and dry environment. Lack of this clean environment can cause heifers to have mastitis and high somatic cell counts. If possible, it is a good idea to house these heifers with the milking herd. Permitting heifers to become accustomed to the new surroundings of the milking herd as well as the milking parlor, if that is the case, will enable them to deal with some of the new stresses they will have to face in their early weeks of lactation.

It is important to avoid high intakes of either corn silage or legume forage during this time. Grain intake should be gradually increased to reach a level of about 0.5 percent of bodyweight daily. If lactating cows receive nonprotein nitrogen (NPN) in their diets, heifers should also receive it throughout the prefreshening period. This practice ensures that their digestive system will be well adapted to this source of protein. It may be important to limit minerals, especially salt, if caked or congested udders are a major herd problem. Balancing and evaluating the overall ration may be necessary in such cases.

Monitoring Growth in Dairy Heifers

Much can be learned about the success of a calf and heifer rearing program by measuring height and weight of these animals. Most dairy farmers, extension agents, feed industry people, and veterinarians are able to recognize underconditioned or overconditioned animals. However, few can judge by sight whether a heifer's height or weight is normal for her age. Measuring and weighing allow a comparison to standards or breed averages and can indicate some problem areas that should receive attention.

Figure 5 [below] depicts the results of measuring a large number of heifers in Pennsylvania. The graph lists the average of all heifers measured and represents good growth ranges for the breed. Holstein breed standards developed from the measurements are listed in Table 24 [left]. The graph in figure 5 points out that

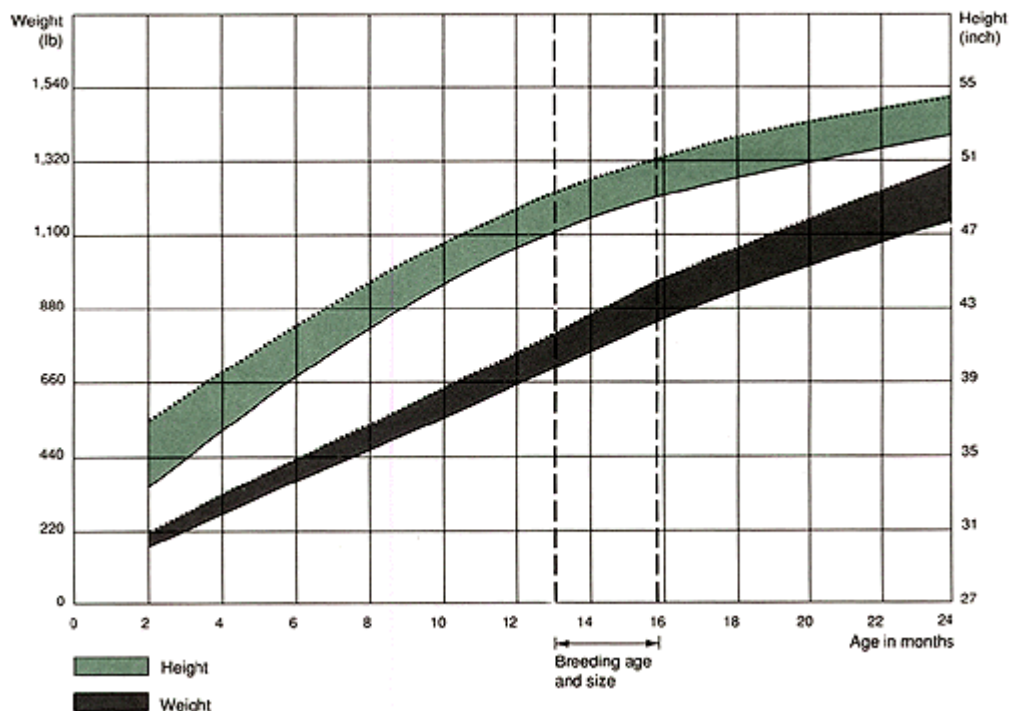
the variability of height at the withers is greatest in the younger heifers. In general, the variability of weight increases with age. The overall goal of a heifer raising program should allow for a relatively constant rate of growth. Holstein heifers should reach 750 to 800 pounds and 48 to 50 inches by the desired breeding age of 13 to 15 months. Beyond this, heifers should be calving at 1137 to 1296 pounds and measuring 52 to 54 inches tall when they are 24 months of age.

Table 24. Range of recommended Holstein heifer weights and heights developed from Penn State measurements.

Age (mos)	Weight range (lb)	Height range (inch)
1	133-155	31.7-33.2
2	178-209	33.5-35.2
3	225-263	35.2-37.1
4	272-319	36.9-38.8
5	320-374	38.4-40.4
6	368-430	39.8-42.0
7	417-486	41.1-43.3
8	466-541	42.3-44.5
9	514-597	43.4-45.7
10	563-652	44.5-46.7
11	611-707	45.4-47.6
12	659-761	46.3-48.5
13	706-814	47.1-49.3
14	752-866	47.8-50.0
15	798-917	48.5-50.6
16	812-966	49.1-51.2
17	885-1014	49.7-51.7
18	926-1061	50.2-52.1
19	966-1106	50.6-52.6
20	1005-1148	51.0-53.0
21	1041-1189	51.4-53.3
22	1075-1227	51.7-53.7
23	1107-1263	52.0-54.0
24	1137-1296	52.2-54.3

Source: Journal of Dairy Science 70:653-660, 1987.

Figure 5. Holstein calf and heifer growth chart.

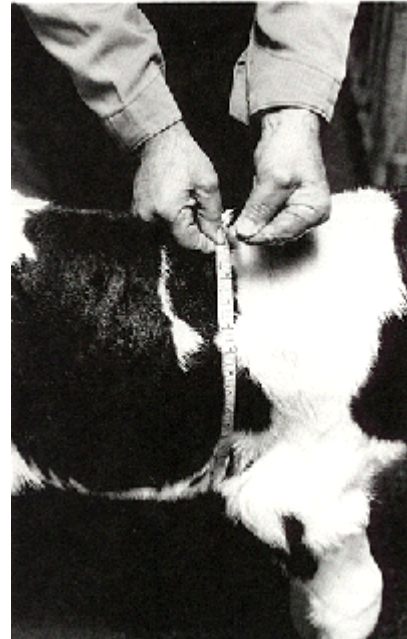


The accompanying growth charts should represent the type of Holstein heifers that are being raised today in many parts of the United States. While every heifer may not conform to these standards, the majority of heifers should be somewhat near these standards in order to be large enough to breed at 13 to 15 months of age and, subsequently, to calve at 24 months of age. The only real way to tell how heifers are growing is to weigh and measure them several times a year. Once or twice a year is better than not at all.

Measuring height.



Measuring weight.



The materials needed to weigh and measure calves and older heifers are a weight tape, a measuring stick, a piece of paper, and a pencil. It works best with three people: two to do the weighing and measuring and one to do the recording of numbers. Twenty animals per hour can be done in any reasonable restraining facility.

Some important points to remember when taping animals:

- Make measurements with the animal standing straight on a level hard floor surface and with weight equally balanced on all feet.
- Watch for excess manure and dirt on the underside of the heifers which could bias the tape measurements.

Growth charts should be used to evaluate the performance of a heifer management program and to spot any major problems that may be occurring. These charts will show problem areas where whole groups of animals are either undersized, underweight, or overweight—all good indicators of improper feeding or poor overall management.

Costs of Raising Dairy Heifers

Dairy Replacement Costs

Raising heifers for replacements is an expensive item on dairy farms. Often many homegrown items are not considered in the actual costs involved in raising heifers, although they should be. Few farmers realize the true costs of raising heifers. Table 25 lists expenses that are incurred when raising replacements and indicates the significance of prices paid. These values are based on an actual Pennsylvania survey with average costs based on heifers calving at 24 months and a range of 20 percent above or below the average. Feed costs make up over one-half of the total variable costs (average feed costs of \$567.20 compared to average nonfeed costs of \$390.07). Cutting back on feed costs can be a big savings. Hay is listed as the only forage for heifers age 6 to 24 months, but the hay can be partially or completely replaced with corn silage or haylage to help reduce feed costs. Feed program evaluations can help find the least expensive route to follow without jeopardizing the daily requirements of rapidly growing heifers.

Reducing replacement costs

The largest expense incurred when raising calves and heifers is feed costs. Feeding for optimum growth accounts for about 53 percent of the rearing cost. Starting with the baby calf, some ways to lower these costs include feeding discarded or surplus colostrum and milk replacers instead of saleable milk. Colostrum is often wasted and it can be fed to calves. Overfeeding of liquids can also be costly as this tends to keep the calves full and inhibits their desire for forage and grain.

Grain mixes containing byproduct ingredients can be fed to calves and heifers without sacrificing quality. Examples of byproduct ingredients include bran, corn gluten feed, or dried brewers grain. Ear corn tends to be a better buy than shell corn, and using some oats or barley can lower the cost of a grain mix.

Forages fed to all age groups should be of the appropriate quality and cost. Fine, stemmy hay should be fed to preweaned calves with good quality forages being fed to calves until 12 months

Table 25. Costs to raise replacements.

	\$ Low	\$ Avg	\$ High
Expenses¹	892.53	1225.27	1514.52
Variable costs	686.53	957.27	1184.52
Variable, nonfeed costs	296.31	390.07	460.80
Value of calf	80.00	100.00	120.00
Build. & equip. repairs	19.20	24.00	28.80
Vet. & med.	8.00	10.00	12.00
Breeding	19.20	24.00	28.80
Supplies	28.80	36.00	43.20
Utilities	13.60	17.00	20.40
Bedding (1 ton @ \$50.00)	25.00	50.00	75.00
Other	2.00	2.50	3.00
Labor (27 hr/heifer @ \$4.00/hr)	86.40	108.00	129.60
Average interest (on variable nonfeed costs)	14.11	18.57	23.00
Variable, feed costs	390.22	567.20	723.72
<i>Birth-weaning</i>			
milk or replacer	0.00	30.00	40.00
starter (80 lb @ \$.08/lb)	5.12	6.40	7.68
forage (40 lb @ \$.05/lb)	1.60	2.00	2.81
<i>Weaning-6 months</i>			
hay (.45 tons @ \$70.00/ton)	25.20	31.50	37.90
grain (600 lb @ \$.07/lb)	33.60	42.00	50.40
<i>6-14 months²</i>			
hay (1.7 tons @ \$65/ton)	88.40	110.50	132.60
grain (960 lb @ \$.07/lb)	53.76	67.20	80.64
<i>14-24 months</i>			
hay (3.1 tons @ \$60.00/ton)	148.00	186.00	223.20
grain (300 lb @ \$.06/lb)	14.40	18.00	21.60
<i>Additional months' feed costs</i>			
hay (\$60/ton/month) 0,2,4 mos	0.00	37.20	74.40
grain (\$.06/lb/month) 0,2,4 mos	0.00	7.20	14.40
<i>Average interest on feed costs</i>	20.14	29.20	37.70
Fixed costs³	206.00	268.00	330.00
Housing	120.00	160.00	200.00
Equipment	86.00	108.00	130.00

¹ Low costs are estimated as 80 percent of average and high costs as 120 percent of average except for milk replacer costs, bedding costs, and additional months of feed cost.

² Forage may be dry hay, silage, or pasture. If pasture contributes a significant amount of the total forage, (a) estimate the amount of dry hay that it replaces and (b) substitute the cost of pasture for the fraction of the dry hay cost it replaces.

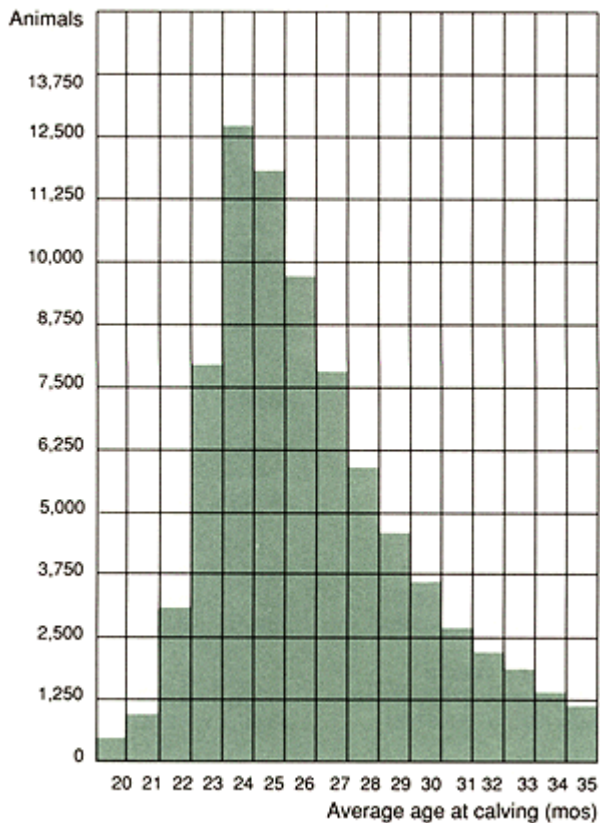
³ These values are the average costs charged against the value of housing and equipment, considering depreciation, interest, rent, property taxes, and insurance for two years (birth to freshening). It is important to use your own estimate of fixed costs because these will vary substantially from farm to farm and will depend on the level of investment in heifer housing and facilities. Adapted from J. Hlubik and Dairy Science Extension Mimeo# 88-21, Costs to Raise Dairy Heifers.

of age. Poorer quality forages can be utilized beyond 12 months; but only if proper grain rates are maintained. In addition, feed refusals from lactating cows can be incorporated into a heifer ration.

Forage testing and feed programs need to be examined for all heifer groups, ranging from 0 to 6 months, 7 to 11 months, and 12 to 24 months. This helps ensure that heifers are not going to become overconditioned or underconditioned. Excessive fattening of dairy heifers is detrimental to conception rates, calving ease, production, and longevity—all of which add up to lost dollars. Underfeeding of bred heifers results in calves only slightly smaller than those from well-fed heifers. More calving difficulties are encountered with undersized heifers than with those that are well grown. Heifers fed a balanced ration will be able to reach about 85 percent of mature weight by 24 months. To reach this goal, calves need an average daily gain of about 1.7 pounds to weigh 1,200 pounds at 24 months.

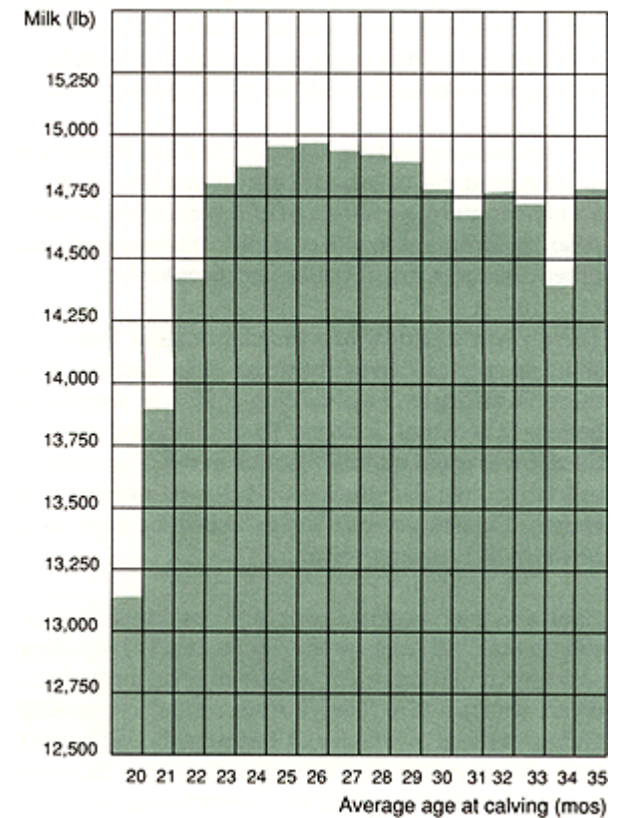
Data taken from the Pennsylvania DHIA indicate that nearly two-thirds of first-calf heifers calve past 24 months of age (Figure 6). This indicates that not enough farmers put their attentions to growing heifers properly. There is the general rule that the older the animals, the more actual milk and fat they will produce during their first lactation. These data show that increases in milk production from month to month are negligible.

Figure 6. Number of Holstein heifers calving at various ages, Pennsylvania DHIA, 1989.



Source: The Pennsylvania Dairy Herd Improvement Association.

Figure 7. Actual milk production of Holstein heifers calving at various ages, Pennsylvania DHIA, 1989.



Source: The Pennsylvania Dairy Herd Improvement Association.

Figure 7 illustrates actual milk production according to when these heifers calved. The gradual increase in actual milk production from 23 to 27 months generally runs less than 100 pounds per month increase in age. The actual average milk production for heifers calving at 24 months is 14,881 pounds, while those calving at 25 months had an average production of 14,966 pounds.

The following analysis considers the profit that is lost by raising these older heifers. It is not easy to determine all additional costs involved in raising older heifers. To simplify this analysis, it is easier to consider feed costs as the only added cost involved in raising heifers for a month. In a ration with 2 pounds of grain and mixed hay, the total cost would be close to \$.87 per day or \$26.10 per month per heifer.

Finding what profit, if any, milk from 27-month-old heifers would bring, determine the feed cost for the 3 extra months ($\$26.10 \times 3 = \78.30), then the value of the increase in milk produced ($27 \text{ lbs./month} \times 3 \text{ months} = 81 \text{ lbs. at } \$12.00/\text{cwt} = \$9.72$). Finally, subtract these values. The loss is \$68.58 per heifer by not calving them at 24 months of age. This \$68.58 cost is based on a simple feed program.

On a typical 70-cow farm with 25 percent of the milk herd as two-year-olds, this amounts to about \$1,200 of extra costs per year just to feed those heifers to 27 months rather than 24 months of age. Addition of the extra housing costs, equipment costs, and interest costs would increase the amount lost per heifer. To alleviate this type of loss, heifers must calve at an average of 24 months. Since a few will go beyond 24 months for one reason or another, some should calve at 22 and 23 months. The 24-month calving goal will require a high level of feeding and management.

Other expenses for raising replacements which should be noted are operating and ownership costs. Operating costs include labor, veterinarian, medicine, breeding, bedding, utility, interest, and death losses. Calf mortality and death loss represent major economic losses associated with raising dairy replacements. Calf mortality means the loss of genetic improvement for the herd. If calf mortality is high, then calf morbidity usually runs high. This in turn affects the growth rate of dairy heifers and their age at first calving. In the long run, calf mortality inhibits these animals to develop their full lactation potential.

Contract heifer raising

Many situations exist when facilities or other components of a farm operation are limited whereby contract heifer raising, or having someone else raise the heifers is a viable option. Contracts need to be fair to the farmer and grower and flexible to accommodate cost changes and needs of both parties.

Contracts offer a number of advantages and disadvantages for both the operator and the dairy replacement grower. The advantages to the operator include the possibility of expanding herd size by 25 percent or more with existing facilities. Another advantage is the opportunity to specialize in milking cows and raising crops. The present breeding program can be continued; but if the calf and heifer part of the operation is costly and/or inefficient, contract heifer raising may be less expensive.

The advantages to the grower are that facilities inadequate for grade A milk production may be sufficient for raising heifers; but these facilities must have proper ventilation, water supply, and allow animal grouping. Contracting can provide part-time employment for a semiretired person, someone who works off the farm, or someone who wants to raise animals without the need to milk cows. It also allows the replacement grower to feed available grain and forages.

Some possible disadvantages for the dairy farmer are an increased risk of introducing disease into the herd and encountering a shortage of replacement heifers. Also, replacements could cost more if labor, feed, and other resources are not allocated profitably.

The grower could be at a disadvantage if there is a short supply of calves from the dairy farmer or if there is difficulty in obtaining a steady supply of heifers from other sources. To obtain good results, the grower must maintain above average sanitation practices, a regular routine, and close supervision of chores. Otherwise, calf losses could be high and result in little or no profit.

Contracts may contain an option-to-purchase (owner sells the calf but reserves the right to buy the resulting springer at market price) or they may be limited to a direct contract (the dairy farmer retains ownership and pays the grower a fee). Contracts should protect both the operator and the grower. Some items to consider are the length of the contract term, a provision for termination, and a method of arbitration. Health requirements such as calfhooD vaccinations need to be taken care of as well as how death losses are handled and who assumes the necessary veterinary costs. It must be decided who assumes the responsibility for breeding the heifers and paying the cost of breeding. The responsibility for transportation to and from the grower must also be decided.

Contracts drawn on a year-to-year basis provide flexibility in establishing fees and other cost figures that parallel the general farm economy. Contracts should be written to permit the addition and deletion of animals as conditions dictate.

Conclusions

Healthy, productive herd replacements are the result of good management before the calves are conceived and continue to the time when they enter the milking herd. Accurate records must be kept so a sound breeding program can be followed. The total process ensures that genetically superior animals will enter the herd.

Once calves are born, the manager must make sure they will have a healthy environment with proper facilities, water, high quality feeds, daily observations, and health care. This kind of attention should extend beyond the baby calves. A carefully managed, well-planned facility enables dairy farmers to efficiently use their time and labor while rearing healthy replacements that freshen at 24 months of age.

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