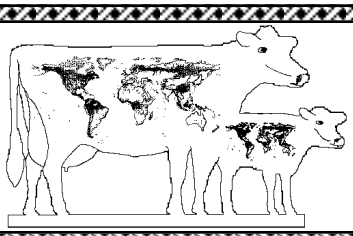
Babcock Institute for International Dairy Research and Development

University of Wisconsin-Madison



Dairy Essentials

HEIFER RAISING—WEANING TO CALVING
33) FEEDING AND HOUSING

Michel A. Wattiaux
Babcock Institute

FEEDING

Once a calf is weaned, most health problems are over. It is then necessary to decide on a desirable growth rate and to feed the most economical sources of energy, protein, minerals and vitamins to satisfy those requirements.

Nutritional requirements and intake capacity change over time. Heifers less than one year of age have high nutrient requirements but lack rumen capacity. As a result, growth rates will remain sub-optimal if they are fed forage alone. Grains or concentrates must be included in the diet of young heifers, but not necessarily in diets of older heifers (Table 1).

On some farms, heifers are fed the ration not consumed by the cows (refusals). A diet made of refusals is likely to be rich in fiber and poor in protein. Usually, refusals may be offered to heifers older than six months of age, as long as the ration is properly balanced and the palatability remains acceptable.

Feeding from weaning to breeding

Typically, from three to six months of age, heifer rations should contain between 40% and 80% forage. For heifers from seven to 12 months of age, the percentage of forage in the diet may vary from 50 to 90%. As heifers grow older, the concentration of protein in the diet can be decreased and the concentration of fiber (NDF) can be increased. Forage of low quality should be avoided in the rations of three- to six-month-old heifers. Poor quality forage fed to older heifers must be adequately complemented with concentrates and minerals (Table 2). The percentage of crude

Table 1: Concentrates and forages for heifers of a large breed.

	Age (months)			
	3 - 6	**7 - 12**	**13 - 18**	**19 - 22**
Average weight, kg	150	270	400	500
Estimated intake, kg / d	3.2 - 4.0	5.4 - 7.3	7.7 - 9.5	10 - 11.8
Excellent forage[1], kg	1.8 to 2.2	5.0 to 6.0	8.0 to 9.0	10 to 11
Concentrate, kg	1.4 to 1.8	0 to 1.0	0 to 1.0	0 to 1.0
Good forage[2], kg	1.4 to 1.8	4.5 to 5.0	6.4 to 7.3	9.0 to 10
Concentrates, kg	1.8 to 2.2	1.4 to 1.8	1.4 to 1.8	1.0 to 1.4
Poor forage[3], kg	0.9 to 1.4	3.2 to 4.0	5.4 to 6.4	7.3 to 8.2
Concentrates, kg	2.3 to 2.7	2.3 to 2.7	2.7 to 3.6	2.7 to 3.6
	..... Diet composition, % of diet dry matter			
Forages	40 to 80	50 to 90	60 to 100	60 to 100
Fiber -NDF	34	42	48	48
Crude protein	16	15	14	12
Calcium	0.5	0. 4	0.3	0.3
Phosphorus	0.3	0.3	0.2	0.2

[1] Excellent forage = more than 60% TDN (corn silage, early maturity grass)
[2] Good forage = 54% to 56% TDN (mid- to full-bloom alfalfa)
[3] Poor forage = 48 to 50% TDN (straw, poor grass hay, etc.)

Table 2: Examples of rations for dairy heifers

	3 to 6 months of age				7 to 12 months of age			
	1	2	3	4	1	2	3	4
INGREDIENTS	**..... AMOUNT (Dry Matter Basis).....**							
Alfalfa mid bloom, kg	2.2	--	1.7	--	3.2	--	5.7	--
Alfalfa-grass, kg	--	--	--	1.1	--	2.8	--	--
Grass hay, kg	--	1.6	--	--	--	--	--	--
Corn stalk, kg	--	--	--	--	--	--	--	4.3
Corn silage, kg	--	--	0.9	1.1	2.7	2.8	--	--
Shelled corn, kg[1]	1.4	1.5	1.0	0.9	0.5	0.5	1.1	1.2
44% CP supplement. kg	0.27	0.64	0.36	0.64	0.27	0.5		1.1
Mineral, 23% Ca - 18% P, g	14.0	--	14.0	9.0	18.0	9.0	18.0	23.0
Limestone feed or $CaC0_3$, g	--	40.0	--	18.0	--	--	--	18.0
Trace mineral premix, g	9.0	9.0	9.0	9.0	18.0	18.0	18.0	18.0
Total (intake, kg / d)	3.9	3.7	4.0	3.7	6.7	6.6	6.8	6.6

	13 to 19 months of age				19 to 22 months of age			
	1	2	3	4	1	2	3	4
INGREDIENTS	**..... AMOUNT (Dry Matter Basis).....**							
Alfalfa mid bloom, kg	5.1	10.1	--	--	11.4	7.3	6.6	--
Alfalfa-grass, kg	--	--	5.4	--	--	--	--	--
Grass hay, kg	--	--	--	--	--	--	--	--
Corn stalk, kg	--	--	--	6.5	--	--	4.1	8.6
Corn silage, kg	4.0	--	3.6	--	--	3.6	--	--
Shelled corn, kg[1]	--	--	--	1.5	--	--	0.73	1.2
44% CP supplement. kg	--	--	0.27	1.3	--	--	--	1.5
Mineral, 23% Ca - 18% P, g	36.0	23.0	18.0	41.0	18.0	36.0	50.0	50.0
Limestone feed or $CaC0_3$, g	--	--	--	23.0	--	--	--	23.0
Trace mineral premix, g	23.0	23.0	23.0	23.0	29.0	27.0	29.0	28.0
Total (intake, kg / d)	9.1	10.1	9.2	9.3	11.4	10.9	11.4	11.3

[1] Oats, barley or high-energy by-product feed can be used to replace all or part of the corn. All non-forage ingredients may be included in a total grain mix.

protein needed in the concentrate depends primarily on the crude protein content of the forage in the diet. Usually, a concentrate mixture of 16% crude protein (which is sometimes formulated for the lactating cow) can be used satisfactorily for heifers.

Feeding from breeding to calving

Heifers that are more than 13 months old have sufficient rumen capacity for adequate growth when fed good quality forage rations alone. In fact, high energy forage such as corn silage should be offered in limited quantities because older heifers may overeat and become obese. A combination of corn silage and a legume or well-fertilized grass provides adequate energy and protein intake. Concentrate should be used primarily when the forage in the ration is low quality. Rations based on feeds of contrasting quality are presented in Table 2.

One to two months prior to calving, the feeding program must be adjusted to prepare the heifer for calving and first lactation. These heifers should receive forage and progressively more concentrate to ensure a smooth transition and encourage high dry matter intake as soon as possible after calving.

It is important to avoid inappropriate (low or high) body condition score at calving. Emaciated (too thin) or obese (too fat) heifers are more prone to difficult calving and post-calving problems.

Table 3: Recommended floor surface area for dairy heifers in various housing systems[1]

Age (months)	Weight (kg)	Surface area of the resting area (m^2)			
		Sloped (self cleaning)[2]	Bedded area (straw, etc.)[3]	Confinement on slotted floor	Paved outside lot
0 - 2	45 - 90	Do not use	hutches or pen[4]	Do not use	Do not use
3 - 5	90 - 160	Do not use	2.6	Do not use	Do not use
6 - 8	160 -225	0.9	2.3	1.1	3.3
9 - 12	225 - 300	1.1	2.6	1.2	3.7
13 - 15	300 - 360	1.4	3.0	1.6	4.2
16 - 24	360 - 544	1.7[5]	3.7	2.3	4.7
Dry cow	> 600	1.9[5]	4.6	3.3	5.1

[1] Adapted from Dairy Freestall Housing and Equipment. Fifth edition, 1995. MidWest Plan Service, Ames Iowa.
[2] 8% slope (8 cm per meter).
[3] Assuming total confinement and access to 3 meter wide scraping alley.
[4] Dimension of a hutch: 1.2m x 2.4m and dimension of a floor pen: 1.2m x 2.1 m.
[5] Heifers and dry cows in late pregnancy may have difficulty breathing if they lie downhill on self-cleaning floors.

However, late pregnancy is a period to prepare the heifer for the stress of early lactation and not a period to adjust body condition score.

HOUSING

As heifers grow, there are considerable changes in their needs for resting area and feeding space. In addition, many management practices require animal restraint (vaccination, parasite treatment, artificial insemination, measuring height, taping for weight, etc.). Facilities for older heifers should be designed to meet an animal's requirements and ease the work of the operator. Housing features for older heifers should allow for convenience of:

- Feeding;
- Bedding and cleaning;
- Moving and restraining animals.

After weaning, heifers may be grouped. Heifers should first be grouped in small numbers, primarily according to their nutritional requirements. The size and number of groups will also depend on herd size and available housing. Similar body size as well as age are important when grouping animals.

Weaned calves: 2-5 months old

Weaned calves of similar size should be placed in small groups (four to six calves) in transitional housing designed to maintain the same characteristics as individual housing—clean, dry bedding, good ventilation, easy access to water and feed, etc. There should be sufficient manger space for all calves to eat at the same time (Table 4), especially when a concentrate is fed in restricted amounts. Opportunities for competition between young calves should be avoided.

Pre-pubertal heifers: 6-11 months old

Groups of pre-pubertal heifers may consist of 10 to 20 animals. Maximum weight variations within a group should not exceed 70-90 kg. Feeding and growth rates should be carefully monitored as excessive body weight gain during this period may impair future milk production ability. In contrast, insufficient body weight gain will delay age of puberty, breeding and first calving. Monitoring

Table 4: Feed space requirements (cm per animal)[1]

Age (months)	Weight (kg)	Feed always available	Limited feed or time availability
3 - 5	90 - 160	30	30
6 - 8	160 -225	30	46
9 - 12	225 - 300	38	56
13 - 15	300 - 360	46	66
16 - 24	360 - 544	46	66
Dry cow	> 600	46	66-76

[1] Adapted from Dairy Freestall Housing and Equipment. Fifth edition, 1995. MidWest Plan Service, Ames Iowa.

Figure 1: Free stall or bedded pack are adequate housing for weaned dairy heifers.

heifer height, weight and body condition score is helpful at this stage for evaluating feeding practices.

Breeding age heifers: 12-15 months old

These heifers should be grouped primarily for ease of heat detection and breeding purposes. Maximum range in body weight should not exceed 130 kg.

Pregnant heifers: 16-22 months old

During this period, feeding and growth rates should be monitored to have heifers of desired height, weight and body condition at parturition. Minimum housing requirements and flexible feeding programs make grazing suitable for bred heifers.

Heifers in late pregnancy: 22-24 months old

A few days prior to calving, first-calf heifers may be taken through the milking parlor along with the milking cows to help them adjust to the milking routine. If possible, first-calf heifers should be kept in their own group after calving as they may suffer from the stress of entering a group of older cows.

Figure 2: Loose housing and pasture are also adequate for pregnant heifers.