



Feeding during shortages of home-grown feeds

A. J. Heinrichs, V. A. Ishler and R. S. Adams



Department of Dairy and Animal Science
The Pennsylvania State University
324 Henning Building
University Park, PA 16802
(814) 865-5491 • FAX (814) 865-7442
www.das.psu.edu/teamdairy/

Shortages of home-grown forages on dairy farms can occur because of drought or other adverse conditions. Questions that arise are: "What should be done now?", "Should forage intakes be kept at a minimum?", "Should hay or other forage be purchased?", and "Should roughages or high-fiber feedstuffs be used?" The economics of the situation, including effects on cash flow and interest charges, should receive top priority. In addition, potential feed ingredient sources should be considered based on their palatability and suitability for use in the feeding system.

One of the first things a producer can assess is the condition and yield potential of the crop. Weather stressed crops, like corn and soybeans, can make nutritious silages even if they have been drought-stricken. Whenever possible, drought-stricken corn should be allowed to reach as much maturity (days from planting) as possible. The moisture content of the whole plant material should not drop below 60 to 63%. The plant will increase in sugar and energy content even if no kernels formed due to lack of pollination.

Soybeans can make an acceptable forage source. As with corn, drought-stricken soybeans should be allowed to mature as much as possible before ensiling. Some pod or bean development enhances their feeding value. The plant should be ensiled before it drops below 65% moisture. Soybean silage will approach the nutrient content value of a mixed mainly legume silage (average analysis), but it may not be as palatable. If soybeans are high in moisture and lack pod or bean development, add 100 to 200 pounds of ground grain per ton when direct-cutting, rather than wilting to 65 to 70% moisture. This will dry the crop and add a fermentable carbohydrate source for better silage preservation.

Emergency forage crops such as small grains can be planted in late fall and early spring to use as supplemental forage. Spring oats can be used for fall grazing or silage. They can be planted during August and early September. Winter grains can be used for forage in the fall (grazing) or the following spring (grazing or silage).

Normal harvest dates (boot to head emerged stages) are rye in late April, barley in early May, wheat in mid May, and triticale in mid to late May.

Producers should evaluate their on-farm inventory to estimate the extent to which forages may be short. If considerable amounts of forages need to be purchased to meet minimum forage intake levels, then forage feeding rates should be reduced to near safe minimum levels as soon as possible. Check costs and supplies of various quality hays, roughages, and high-fiber feeds.

If it is determined that forages will be in short supply, then feeding limited amounts of forage is an alternative. However, a minimum of forage dry matter intake is needed to keep cows healthy and the milk composition normal. At least 40% or more of the total dry matter intake should be in the form of forages. When forage intake is held at minimum levels, high-fiber concentrate ingredients and some roughages may be needed to maintain the fiber content of the ration.

Recommended guidelines on forage neutral detergent fiber (NDF) intake and total NDF intake should be followed (Table 1). Forage dry matter intakes in conventionally fed herds should be at least 1.40 to 1.60% of body weight daily. Forage dry matter intake should be at least 1.20% of body weight daily for heifers.

When forage inventory reveals shortages and feeding alternatives are being evaluated, don't overlook least cost ration formulations. Another option is to use feed-evaluation factors to determine the economic nutritional value of various ingredients fed to dairy cows (Table 2). With these factors, the economic value of each available forage can be compared with number 2 shelled corn, 44% soybean meal, and alfalfa hay. Various concentrate ingredients can be considered if they are obtainable at prices appreciably below their relative maximum worth based on prices for shelled corn and soybean meal. If an ingredient is shown to be a good buy, it should be used in accordance with usual restrictions for palatability, fat content, and other reasons (Table 3). Farm grain prices per bushel may be converted to ton or hundredweight prices using factors given in Table 4.

The decision to use a particular ingredient should not be determined solely by price. Some feeds that are more costly than their maximum relative value indicates, may have to be used to meet the animals' nutritional needs. For example, some purchased hay may be necessary to meet minimum forage needs or soybean meal is needed to furnish part of the supplemental protein needs regardless of price.

Several options are available to producers if the supply of home-grown forages is inadequate. The following is a list of the main choices that can assist producers in making some sound decisions.

1. Check prices and availability on several types and quality hays or hay cubes. Some relatively low protein and energy hay or straw may be used if only 4 to 6 pounds are needed per head daily for milk cows. Such hay may be more economical for feeding dry cows and heifers. If more purchased hay needs to be fed, allocate the average to higher quality hays to milk cows.
2. Purchase ensiled forages and grains based on a dry matter basis. Test the moisture content of feeds periodically to use in making payments. When buying on a volume basis, such as feed stored in a silo, agree ahead of time on the amounts present. Capacity tables or charts can differ in their estimates of what storage structures can hold.
3. Check availability and costs on various roughages such as corn storklage, corn cobs, corn cannery waste, bean or pea-vine silage, straw, and apple pomace with or without hulls.
4. Obtain costs and check supplies of various high-fiber feedstuffs such as whole cottonseed, beet or citrus pulp, dehydrated alfalfa, wet and dry brewers grains, distillers grains, and soyhulls. Whole cottonseed may enter into least-cost rations when forage is relatively high in price.
5. Check costs and availability of various energy and protein sources such as barley, oats, wheat midds, corn gluten feed, and whole soybeans (raw or heat treated). Fat and oil products may be considered if they can be handled in the mixing or feeding system. Compared to shelled corn, barley, ear corn, and sometimes oats are a better buy.
6. Consider harvesting corn as ear corn if forage is in short supply. Ear corn provides more fiber when forages are limited.
7. Choose a course of action based on least-cost formulation of rations. Check prices on suitable complete dairy feeds, roughage substitutes, and protein mixes. Seek professional help to make certain that rations meet the dairy cow's nutritional and physical requirements.
8. Recalibrate feed scoops and other equipment when feeding by volume and when changes in feed formulas occur. Concentrates containing a lot of bulky, high-fiber ingredients may weigh considerably less per unit of volume than a corn and soybean meal mix. A high barley mix may weigh much more than one containing oats.
9. Balance rations for all groups of heifers and dry cows in addition to the milking animals. When conserving forages, feed a balanced ration to all animal groups to minimize wasted feed. If more heifers are on the farm than what are needed, consider selling the excess heifers. Possibilities exist to contract heifers out to areas where pasture or other feeds are plentiful. This may be cheaper than bringing feed to the farm.
10. Make sure cows are paying their way. They should be covering feed costs, labor, utilities, and other costs. Culling unthrifty animals and providing more and higher quality forages to the more efficient producers may improve production, especially if they are being limited by a lack of good feed.

Table 1. Neutral detergent fiber (NDF) intake levels from forages.

Forage NDF, as % body weight	NDF intake level
0.75 ^a	Minimum if ration provides 1.3-1.4% total NDF by use of byproduct ingredients.
0.85 ^a	Minimum if ration provides 1.1-1.2% total NDF by heavy use of grains or starch ingredients.
0.90	Moderately low.
0.95	Average. Example: 1300 lb cow x 0.0095 = 12.35 lbs forage NDF
1.00	Moderately high.
1.10	Maximum.

^a A higher minimum may be necessary if forage is chopped too finely.

Table 2. Feed-evaluation factors for feedstuffs and forages fed to dairy cows.

How to use the feed-evaluation factors

To determine the comparative value of any ingredient, use the factors listed opposite that ingredient. Multiply the "shell corn factor" by the current hundredweight price of shelled corn, multiply the "soybean oil meal factor" by the current hundredweight price of 44% soybean oil meal, and when working with forage, multiply the "alfalfa hay factor" by the current hundredweight price of alfalfa hay; then add the two (or three) answers. Subtract if one of the factors is preceded by a minus sign. Compare the computed value with the actual price of the ingredient. If the computed value of the ingredient is greater than the actual price, the ingredient being considered is a better buy (by the amount of the difference) than the same nutrients from a combination of shelled corn, soybean oil meal, and (with forages) alfalfa hay. If the computed value is less than the price of the ingredient, it is not a good buy. For greater precision, include preparation costs such as for grinding and mixing for whole grains.

Example 1:

Assume that dry shelled corn is worth \$4.60 /cwt and the price of 44% soybean oil meal is \$10.15/cwt. You can buy corn distiller's grain (dark) for \$8.11 /cwt. Should you use distiller's in a grain mix?

distiller's grain (dark) corn factor (0.599) x corn price (\$4.60) = \$2.76
 distiller's grain (dark) soybean meal factor (0.469) x soybean meal price (\$10.15) = \$4.76
 distiller's grain (dark) computed value = sum(difference) = \$2.76 + \$4.76 = \$7.52

Since the computed distiller's grain value (\$7.52) is less than its price (\$8.11), distiller's grain would not be a good buy.

Example 2:

Assume the same prices for shelled corn and 44% soybean meal given in example 1 and a price of \$5.65 /cwt for alfalfa hay. You can purchase first-cut, early-head MMG hay at \$5.05 per hundredweight. Should you buy this hay?

MMG hay (first-cut, early-head) corn factor (-0.088) x corn price (\$4.60) = - \$0.40
 MMG hay (first-cut, early-head) soybean meal factor x soybean meal price (\$10.15) = - \$2.32
 MMG hay (first-cut, early-head) alfalfa hay factor (1.492) x alfalfa hay price (\$5.65) = \$8.43
 MMG hay (first-cut, early-head) computed value = sum(difference) = \$8.43 - \$2.32 - \$0.40 = \$5.71

Since the computed value of the MMG hay (\$5.71) is greater than its price (\$5.05), the MMG hay would be a good buy.

Notes:

1. To convert the price of 48% soybean oil meal to a 44% basis to use the feed-evaluation factors, multiply the price of 48% soybean meal by 0.94.
2. Use ingredients and feeds with the greatest margin of value over cost to the fullest extent possible (see Table 4).
3. Preferably use least-cost computer formulations to determine which ingredients and what levels should be used in rations balanced for all nutrients, including soluble protein, undegradable protein, fiber, nonstructural carbohydrates and fat among others.

Table 2a. Feed-evaluation factors for feedstuffs used in dairy cow rations, continued.

Ingredient Name	Feed Factors:		Crude Protein (% DM)	Net energy NEL (Mcal/lb)	% Dry Matter
	Corn	Soybean Meal			
Shell Corn - Dry (15.5%)	1.000	0.000	10.0	0.90	88.0
Soybean Meal - 44% Protein	0.000	1.000	50.0	0.88	90.0
Apple Pomace - No Hulls	0.871	-0.073	4.9	0.71	89.0
Bakery Product	1.078	0.014	11.0	0.94	92.0
Barley	0.901	0.077	12.8	0.87	89.0
Barley - High Moisture	0.723	0.068	13.1	0.87	72.0
Beet Pulp	0.913	0.018	9.7	0.81	91.0
Blood Meal	-1.010	2.078	93.0	0.68	91.0
Brewer's Grain - Dried	0.293	0.497	27.1	0.68	92.0
Brewer's Grain - Wet	0.065	0.124	28.0	0.68	22.0
Brewer's Yeast	0.007	0.968	46.9	0.83	93.0
Candy	1.488	-0.182	5.2	1.10	94.0
Candy Product	1.215	-0.022	10.8	1.05	90.0
Canola	0.075	0.824	40.8	0.77	92.5
Chocolate	1.600	-0.041	12.9	1.30	95.0
Citrus Pulp - Dry	0.974	-0.055	6.7	0.80	91.0
Ear Corn - Dry	0.890	0.000	9.0	0.81	87.0
Ear Corn - High Moisture	0.709	-0.004	8.8	0.81	69.0
Shell Corn - High Moisture	0.856	-0.010	9.5	0.90	74.4
Corn Distillers - Light	0.563	0.483	29.0	0.90	92.0
Corn Distillers - Dark	0.599	0.469	29.0	0.93	91.0
Corn Distillers - Wet	0.047	0.035	28.1	0.92	7.0
Corn Distillers - Sol. Only	0.592	0.500	29.8	0.93	93.0
Corn Gluten Feed	0.657	0.331	23.0	0.87	90.0
Corn Gluten Meal - 60%	-0.343	1.411	67.2	0.94	90.0
Cottonseed - Whole	0.781	0.313	23.7	0.98	88.4
Cottonseed - Delinted	0.855	0.293	23.0	1.01	90.0
Cottonseed Meal - 41% Protein	-0.018	0.926	45.6	0.79	91.0
Donuts	1.235	-0.096	8.0	1.10	82.0
Feather Meal	-0.966	1.988	88.0	0.70	92.0
Fish Meal - Menhaden	-0.598	1.481	66.7	0.76	92.0
Hominy Feed	1.000	0.035	11.5	0.91	90.0
Linseed Meal	0.188	0.720	37.4	0.79	91.0
Lupins	0.097	0.773	41.9	0.81	85.0
Malt Sprouts	0.362	0.516	28.1	0.74	94.0
Meat and Bone Meal	-0.307	1.176	54.0	0.74	93.0
Oats	0.798	0.101	13.0	0.80	89.0
Oats - High Moisture	0.707	0.081	12.5	0.79	79.0
Oat Mill By-product	0.392	0.003	3.9	0.34	92.0
Peanut Meal	-0.176	1.115	52.3	0.80	93.0
Peanut Skins	0.551	0.256	17.4	0.68	94.0
Potatoes - Raw	0.990	-0.014	8.9	0.85	91.0
Ren Plus	-0.789	1.624	71.1	0.70	93.0
Rye	0.880	0.098	13.8	0.88	88.0
Sorghum - Milo	0.918	0.026	10.4	0.84	89.0
Soy Plus	0.047	0.986	48.7	0.89	92.0
Soybeans - Cooked	0.359	0.766	41.8	0.99	90.0
Soybeans - Raw	0.317	0.774	41.8	0.96	90.0

Table 2a. Feed-evaluation factors for feedstuffs used in dairy cow rations, continued.

Ingredient Name	Feed Factors:			Crude Protein (% DM)	Net energy NEL (Mcal/lb)	% Dry Matter
	Corn	Soybean Meal				
Soybean Meal - 48% Protein	-0.070	1.104		54.5	0.91	90.0
Soyhulls - Unheated	0.838	0.081		12.1	0.80	91.0
Triticale	0.806	0.194		17.6	0.88	90.0
Wheat	0.965	0.035		11.3	0.89	89.0
Wheat Bran	0.599	0.221		17.1	0.73	89.0
Wheat Middlings	0.549	0.249		18.0	0.71	89.0
Whey - Dried	0.907	0.091		13.0	0.85	93.0
"Whey - Liquid, Acid"	0.068	0.007		13.0	0.85	7.0
"Whey - Liquid, Sweet"	0.071	0.000		9.1	0.81	7.0
"Whey - Liquid, Leprino"	0.053	0.050		29.3	0.88	9.2

Table 2b. Feed-evaluation factors for forages fed to dairy cows.

Feed Ingredient Name	Feed Factors:			Crude Protein (DM %)	Net energy NEL (Mcal/lb)	NDF (DM %)	% Dry matter
	Corn	Soybean Meal	Alfalfa				
Shell Corn - Dry (15.5%)	1.000	0.000	-0.000	10.0	0.90	9.0	88.0
Soybean Meal - 44% Protein	0.000	1.000	0.000	50.0	0.88	14.0	90.0
Legume Hay, average	-0.000	0.000	1.000	18.6	0.60	47.7	90.0
Grass Hay, Average	-0.106	-0.424	1.761	10.5	0.59	66.0	90.0
Grass Sil, Average	-0.053	-0.131	0.674	12.6	0.56	62.5	39.0
MMG Hay, Average	-0.104	-0.308	1.554	12.5	0.57	62.0	90.0
MMG Sil, Average	-0.064	-0.103	0.646	14.0	0.54	61.0	40.0
Legume Hay, Average	-0.000	0.000	1.000	18.6	0.60	47.7	90.0
Legume Sil, Average	-0.045	0.001	0.539	19.3	0.57	51.0	45.0
MML Hay, Average	-0.064	-0.115	1.246	16.8	0.59	54.0	90.0
MML Sil, Average	-0.044	-0.040	0.577	17.4	0.57	54.0	43.0
Corn Sil, Average	0.100	-0.126	0.460	8.8	0.69	49.0	33.0
Small Grain Sil, Average	-0.017	-0.101	0.550	14.0	0.63	59.0	32.3
Sorghum-Sudan Sil, Average	-0.034	-0.124	0.548	11.0	0.57	64.1	30.0
Alfalfa Meal, 22% Crude Protein	-0.260	-0.086	1.695	23.9	0.69	60.0	93.0
Alfalfa Meal, 20% Crude Protein	-0.248	-0.094	1.593	22.0	0.64	60.0	92.0
Alfalfa Meal, 17% Crude Protein	-0.182	-0.169	1.588	18.9	0.63	60.0	92.0
Alfalfa Meal, 15% Crude Protein	-0.163	-0.182	1.506	17.3	0.60	60.0	90.0
Grass Hay, 1st Cut, Pre Hd	-0.060	-0.176	1.484	18.4	0.69	56.0	89.0
Grass Hay, 1st Cut, Early Hd	-0.153	-0.336	1.755	14.5	0.63	65.0	89.0
Grass Hay, 1st Cut, Full Hd	-0.289	-0.486	2.042	11.0	0.55	75.3	89.0
Grass Hay, 1st Cut, Mature	-0.363	-0.619	2.265	7.7	0.50	82.7	89.0
Grass Hay, Aftermath	-0.196	-0.343	1.796	14.5	0.61	66.9	89.0
Grass Hay, Late Fall	-0.097	-0.247	1.591	16.5	0.66	59.8	89.0

