DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

FSA4011

Individually Feeding Dairy Cows in the Milking Parlor

Michael Looper
Professor and
Department Head -
Animal Science

Dairy Cow Nutrition

Nutrient requirements for lactating dairy cows vary with the stage and level of lactation, growth rate and stage of gestation. Most dairy producers in Arkansas feed grain in the parlor as the cows are being milked. This allows producers the opportunity to feed cows according to their level of production and to manage the amount and quality of grain that the cow is consuming.

Figure 1 (page 2) shows the relationship and lactation curves for milk production, dry matter intake and body weight. Based on these curves, four distinct feeding phases can be defined.

- Phase 1. Early Lactation – 0 to 70 days after calving, which includes peak milk production for most animals and increasing dry matter intake.
- Phase 2. Peak Dry Matter Intake and Declining But High Milk Production – 70 to 140 days after calving.
- Phase 3. Mid and Late Lactation – 140 to 305 days or longer with declining milk production after calving.
- Phase 4. Dry Period – 50 to 60 days before the next lactation.

Balancing the diet of cows in various stages of lactation is very important. Feeding grain in the parlor offers the opportunity to feed various levels of grain according to the individual needs of the cow, i.e., her milk production, stage of gestation and body condition score. If all cows are fed the same amount of grain in the parlor, some cows will be overfed, which will increase feed costs. Overfeeding also leads to cows that are too fat, indicating that the feed is not utilized most efficiently. Other cows will be underfed, which will not allow them to optimize their level of production and may also deplete body reserves to the point that it affects reproduction and general health. Guidelines for daily dry matter intake for forages and concentrates are shown in Table 1.

Many different feeding systems are being used on dairy farms today. These systems largely result from the diversified housing and feeding facilities on farms throughout the state. If individual feeding of grain in the parlor is used to balance the total ration of the cow, feed the grain to maintain or increase production while minimizing feed cost and labor. When the ration varies greatly from the examples in Tables 2 and 3, discuss the ration with a competent nutritionist. **It is always best to test the chemical composition of your forage and generate a specific grain mix based on your forage analysis.**

It is best to balance all rations with computer programs. For total mix rations (TMRs) and partial or modified TMRs, rations can be balanced for groups of cows. Generally, all rations should include trace minerals and salt free choice to cattle, plus include it in the grain mix or TMR.

Arkansas Is Our Campus

Visit our web site at:
https://www.uaex.uada.edu

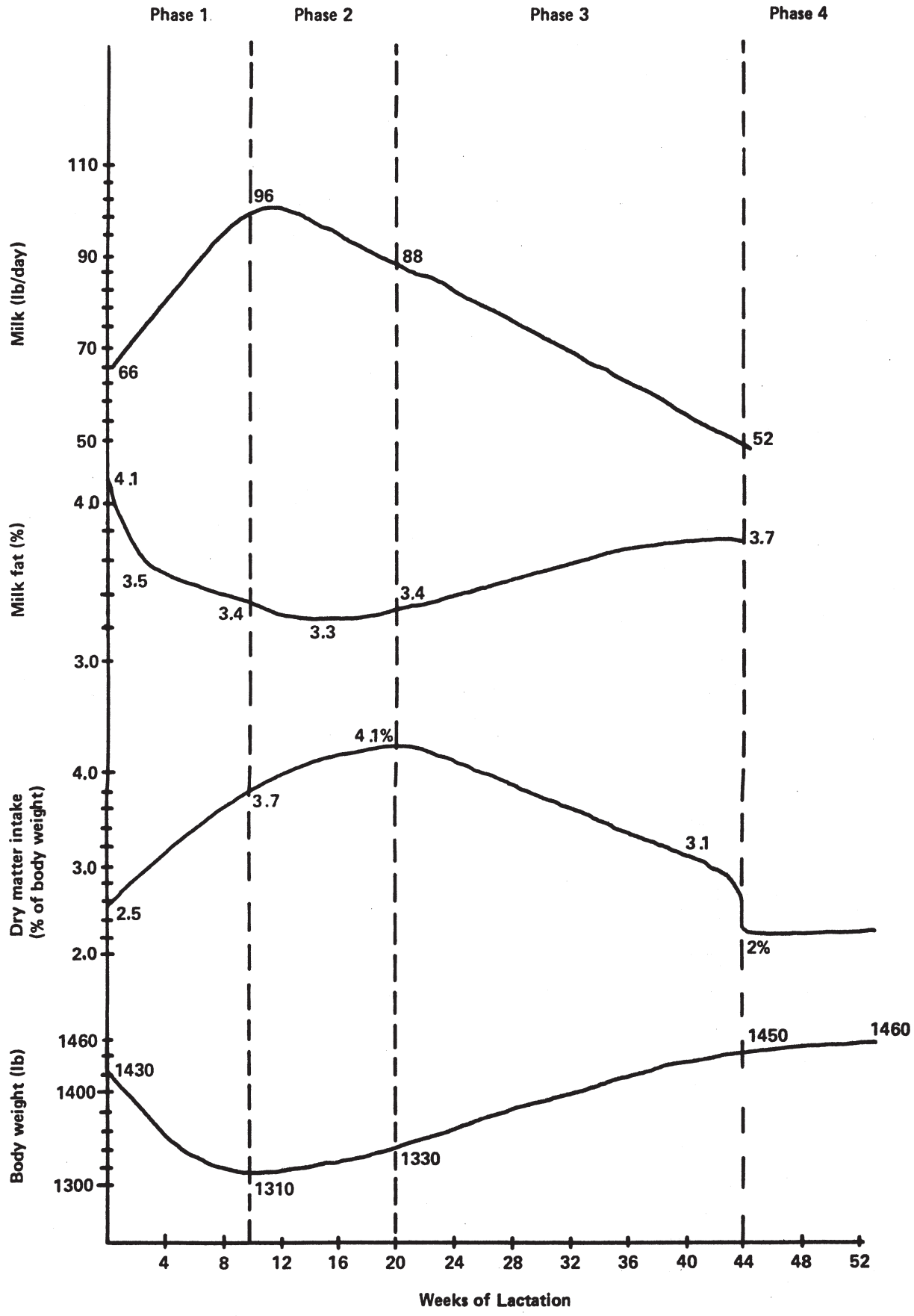

Figure 1. Lactation cycle phases with corresponding changes in milk production, milk fat percentage, dry matter intake and body weight.

(From "Feeding the Dairy Herd," MN-AG-BU-0469, revised 1988.)

Table 1. Total Daily Dry Matter Intake Guidelines for Forage and Concentrate

	Cow Body Weight				
Milk[1]	900	1100	1200	1300	1500
lbs/day	% of body weight[2]				
20	2.6	2.3	2.2	2.1	2.0
30	3.0	2.7	2.6	2.5	2.3
40	3.4	3.1	2.9	2.8	2.5
50	3.8	3.4	3.2	3.1	2.8
60	4.1	3.7	3.5	3.4	3.1
70	4.6	4.0	3.8	3.6	3.3
80	5.1	4.3	4.1	3.8	3.5
90		4.7	4.4	4.1	3.7
100		5.0	4.7	4.4	3.9

[1]Fat corrected milk = (Milk lbs x .4) + (Fat lbs x 15). [2]Intakes may be up to 18 percent less for cows in early lactation.

Table 2. Pounds of Grain Mix Fed at Different Production Levels and Different Forages[1]

	Forage		
Milk (lbs/day)	24 lbs Grass Hay[2]	68-70 lbs Bermuda Pasture[3]	7-8 lbs Hay and 80 lbs. Wheat Pasture[4]
	lbs grain to feed		
30	14	10	7
35	17	13	9
40	19	15	11
45	22	18	12
50	24	20	14
55	27	23	16
60	29	25	17
65	32	28	19
70	35	30	20
75	38	33	23
80	41	35	25

[1]1300-lb cow, 3.5% milkfat, 150 days in milk, 1.2 lead factor
[2]9% CP, 52% TDN, 39.5% ADF, 70% NDF, 88.5% DM
[3]9.5% CP, 62% TDN, 32.5% ADF, 70% NDF, 35% DM
[4]16% CP, 73% TDN, 21.3% ADF, 52% NDF, 26% DM

This fact sheet primarily provides general guidelines for individually feeding grain according to production in the parlor. Many different combinations of feeding grain may be utilized. In general, it is recommended that no more than 15 pounds per cow per feeding of grain be fed in the milking parlor. This means that if cows are being fed more than 30 pounds of grain per day, additional grain should be available from other sources for the cow. In some cases, it is recommended to feed 10 or more pounds per cow outside the parlor and then feed the remaining grain allotment in the parlor according to production. In other cases, individually feeding grain in the parlor may complement the feeding of a mixed ration outside. For example, some of the highest producing herds in the state are fed 10 to 15 pounds of grain in a mixed ration outside the parlor and then fed grain according to milk production in the parlor. In other cases, producers utilize electronic or computer feeders to feed grain outside while feeding a variable or fixed amount of grain per cow as cows go through the parlor.

For most producers, a pelleted feed is fed in the milking parlor. Cows will generally eat 1 to 1.5 pounds of pelleted feed per minute if it is highly palatable. In contrast, a finely ground or coarsely ground feed in the parlor may only be consumed at 0.5 or 0.9 pound per minute, respectively. If cows are in the parlor for an average of 12 minutes of eating time, usually about 15 pounds of a pelleted feed is the maximum that a cow will consume per milking.

Factors Affecting Amount of Grain in Dairy Rations

General guidelines are available to assist in providing the pounds of grain to individually feed cows. Primarily, these guidelines are based on body weight of the cow and her production of milk and fat. They follow a pattern similar to total dry matter intake (Table 1). However, the forage that is being fed to the cows will markedly affect the amount of grain needed for milk production. Table 2 indicates the amount of dairy grain mix that is typically needed

with a grass hay, bermuda pasture and lush-growing wheat pasture. As indicated in Table 2, less grain is needed if the forage is higher in energy (TDN – total digestible nutrients or NE – net energy) and lower in fiber. A vegetative forage is eaten in greater quantities because the fiber content of the forage is less. This decreased fiber content allows the cows to more rapidly digest the forage, and fewer nutrients are needed in the grain mix to balance the diet.

Cows that need extra body condition and first-lactation cows that are growing may be fed an extra 5 pounds of grain per day to meet these additional energy needs. It is critical that cows not be fed excessive grain to the degree that forage intake is depressed, which can cause ruminal acidosis.

Another factor to consider when individually feeding cows according to milk production is the protein content of the grain mix. The protein level in the grain mix is affected by the protein level in the forage, as well as the level of production (Table 3). In general, the crude protein (CP) content of the grain mix should be 16 percent (as-fed) for animals who are on lush vegetative grass pasture (16 percent CP on a dry matter basis). However, the CP should be 18 percent (as-fed basis) if the animals are on grass hay or mature pasture which is less than 10 percent crude protein. (Note that the crude protein content of a commercially available grain mix is expressed on an as-fed basis which is different from the dry matter – DM-basis used for other feeds, especially forages.)

Table 3. Percent Crude Protein (CP) in Grain Mix for Different Forages

	Lbs Milk Per Day		
Forages	**40**	**60**	**80**
	. . % CP in grain mix[2] . .		
9% CP Grass Hay[1]	18	18	18
9.5% CP Bermuda Pasture	18	18	18
16% CP Wheat Pasture	16	16	18
18% CP Alfalfa Hay	10	12	16

[1]Dry Matter Basis [2]As-fed

Grain Feeding Guidelines. Before calving, gradually increase grain intake of the cows up to 10 to 12 pounds per day. This can best be achieved by running the cows through the milking parlor once per day to get them accustomed to the parlor as they approach calving. Usually, 10 to 14 days before calving, start cows with 5 pounds of grain per day. Gradually increase the grain to approximately 12 pounds per day before calving.

After calving, cows can be increased to 10 pounds per feeding twice per day. Then, gradually increase grain feeding by 3 to 5 pounds per week. Continue to increase the grain mixture as rapidly as possible while providing at least 15 to 20 pounds of dry matter from hay or other high-quality forage daily to ensure normal rumen function. As indicated in Figure 1, cows will gradually increase their level of intake more slowly than their level of production after calving. Cows will have a negative energy balance and tend to lose weight in early lactation; therefore, it is very important to get cows eating well as soon as possible after calving so that their weight loss is minimized.

When milk production peaks and levels off, attempt to feed the level of grain indicated in Table 2 and hold at that level for a period of time to ensure that the cows are in a positive energy balance. Usually, this level of production will be maintained for 45 to 60 days. As milk production declines, reduce the grain level accordingly so that cows are most efficiently utilizing the feed.

For some very high-producing herds, animals may be top dressed with additional protein supplement to provide their protein needs. This may be accomplished by top dressing (adding extra feed on top of other feed) in the parlor or grouping the cows outside so that high-producing cows are fed separately from the rest of the herd. Cottonseed is an excellent feed to supplement protein, energy and fiber. Other protein sources also work well.

Forages. High-quality forages must be a major component of the diet throughout lactation. High-quality forages can minimize the amount and crude protein of grain needed to balance the ration, as indicated in Tables 2 and 3. A minimum amount of forage, for example, 1.5 pounds of forage dry matter intake per 100 pounds of body weight, is recommended to prevent acidosis and low-fat milk syndrome. Preferably, a minimum of 2 percent of body weight of good-quality forage is consumed per day. On high-quality forage such as fast-growing pasture or high-quality corn silage, dry matter intake from forages may exceed 2.5 percent of body weight. For annual grasses grazed in the vegetative stage of growth, dry matter intake of the forages may exceed 3 percent of body weight as these forages will be low in acid detergent fiber (ADF) and neutral detergent fiber (NDF).

Some dairy producers will feed 25 pounds of grain per cow per day regardless of the level of milk production. Although these herds often average around 50 to 60 pounds of milk per cow per day, higher-producing cows are probably limited in their ability to produce greater quantities of milk unless the forage is very high quality, such as annual grasses, because 25 pounds of grain will not provide enough energy for extremely high levels of production. Production varies with the different fiber content of forages (Table 2). Furthermore, cows

eating 25 pounds of grain when producing less than 40 pounds of milk often will decrease their forage intake because additional nutrients are not needed in the diet (Table 4). Then, these cows are more prone to go off feed and experience acidosis problems because a constant amount of fiber has not been consumed.

Vitamins and Minerals. Recommended levels of vitamins and minerals are also necessary in the diet of both lactating and dry cows. Trace mineralized salt should always be available to all animals on the farm. Vitamin premixes and proper supplementation with calcium, phosphorus and other trace minerals should be provided in the grain mix. Avoid feeding excessive levels of calcium and phosphorus since the ratio as well as the quantity of these nutrients is important in the diet (Table 4). It also can affect dry cows' tendency to develop metabolic problems such as udder edema and milk fever.

Troubleshooting Hints

- *Phase 1. Early Lactation – 0 to 70 Days Postpartum*

Milk production increases rapidly following calving, peaking at 4 to 10 weeks after calving. (Heifers will be later than older cows.) Since feed intake lags behind milk production, body fat will be mobilized to meet energy requirements for milk production. Increasing grain after calving is essential to minimize loss of weight as well as minimizing off-feed problems and acidosis. Excessive levels of grain can cause acidosis and low-fat milk. It is critical that cows receive at least the daily minimum amount of forage, i.e., 1.5 percent of their body weight but preferably 2 percent or more of a high-quality, low-fiber forage. **Cows should be monitored carefully to make sure they are eating well and that both forage and grain are being consumed.**

Top-quality forage should be fed to these animals with an adequate amount of protein in the grain mix. After calving, most cows can eat 20 pounds of grain per day if healthy. As much as possible, increase the grain intake at a constant rate of 3 to 5 pounds per week after calving so that animals do not go off feed. It is important to get cows eating soon after calving to minimize loss of body weight. **Minimize other stresses as well as allow access to grain more often than at milking time if possible.** Add sodium bicarbonate or other buffers to the grain mix to decrease the likelihood of acidosis problems, and consider adding fat for extra energy if necessary.

- *Phase II. Peak Dry Matter Intake – 70 to 140 Days Postpartum*

This is a period of slowly declining milk production after cows have reached their peak. Feed intake should be near maximum and can supply nutrients for the cows. **Cows should be maintaining weight or slightly gaining (Figure 1).** Grain should be fed according to the level of production as well as the cow's individual body condition score. Thin cows may be fed up to 5 pounds of grain extra per day. Also, first-calf heifers should be fed approximately 5 pounds of grain per day extra to allow for growth and to ensure that they are consuming adequate quantities to maintain a good body condition so that they will breed back for the next lactation. Potential problems during this period of time include (1) cows being too thin, which can cause them to not show proper signs of heat plus have a low conception rate, and (2) cows declining too rapidly in milk production, which also might be related to poor body condition score.

- *Phase III. Mid to Late Lactation – 140 to 305 Days Postpartum*

This phase also is a period of declining milk production and should be the easiest to manage. The cows should be pregnant and animals should be slightly gaining weight so that they will be in a body condition score of 3.5 to 4 on a 5-point scale at dry off. Pay particular attention to young cows that may need additional nutrients as well as some high-producing cows that may not be bred at this point. Thin cows or first-lactation cows may still need an extra 5 pounds per day of grain above that needed for their level of milk production. **A drop in milk production of 8 to 10 percent per month is normal throughout the declining phase of milk production.** Watch the 10 percent of the herd that tends to get fat at the end of lactation. These fat cows can be fed less grain.

- *Phase IV. Dry Period – 50 to 60 Days Before the Next Calving*

The dry period is a critical phase of the lactation cycle. A sound dry cow program can increase milk production or severely affect milk production during the following lactation. It can also serve to minimize metabolic problems around the time of calving.

In general, if a high-quality forage is provided, dry cows will not need additional grain until 10 to 14 days before calving. Most producers in the state, however, do not provide forage that is 56 percent TDN, so a small quantity (usually 2 to 5 pounds) of grain is necessary for cows to maintain their body condition score during the dry period. Whole cottonseed also makes an excellent feed for dry cows.

An appropriate dry cow mineral with proper calcium and phosphorus levels is necessary. Usually calcium intakes of 50 to 80 grams and phosphorus intakes of 30 to 40 grams are sufficient for most dry cows. These nutrients are provided in rations of 0.40 percent calcium and 0.24 percent phosphorus on a dry matter basis. Trace minerals, especially selenium, should also adequately supplement the dry cow's diet.

Table 4. Recommended Nutrient Content of Diets for Dairy Cattle (Dry Matter Basis)

Cow weight (lb)	Milk fat %	Weight gain lb/day	Lactating cow diets Milk yield, lb/day						
900	5.0	0.5	14	29	44	58	74		
1100	4.5	0.6	18	36	55	73	91	Early	
1300	4.0	0.7	23	47	79	93	117	lact.	Dry
1500	3.5	0.8	26	52	78	104	130	(weeks	pregnant
1700	3.5	1.0	29	57	86	114	143	0-3)	cows
Energy									
NE_L, Mcal/lb			0.65	0.69	0.73	0.78	0.78	0.76	0.57
TDN, % of DM			63	67	71	75	75	73	56
Protein equivalent									
Crude protein, %			12	15	16	17	18	19	12
Undegradable, %			4.5	5.4	5.7	6.0	6.3	7.2	
Degradable, %			7.9	8.8	9.7	10.4	10.4	9.7	
Fiber content (minimum)									
Crude fiber, %			17	17	17	15	15	17	22
ADF, %			21	21	21	19	19	21	27
NDF, %			28	28	28	25	25	28	35
NDF, % in DM from forage			21	21	21	21	21	21	35
Ether extract (minimum), %			3	3	3	3	3	3	3
Added fat (maximum), %			3-4	3-4	3-4	3-4	3-4	3-4	3-4
Minerals									
Calcium, %			0.43	0.53	0.60	0.65	0.66	0.77	0.39
Calcium, with added fat, %			0.65	0.70	0.75	0.80	0.80-0.90	0.90-1.00	
Phosphorus, %			0.28	0.34	0.38	0.42	0.41	0.49	0.24
Magnesium, %			0.20	0.20	0.20	0.25	0.25	0.25	0.16
Magnesium, with added fat, %			0.25	0.25	0.25	0.30	0.30	0.30	
Potassium, %			0.90	0.90	0.90	1.00	1.00	1.00	0.65
Sodium, %			0.18	0.18	0.18	0.18	0.18	0.18	0.10
Chloride, %			0.25	0.25	0.25	0.25	0.25	0.25	0.20
Sulfur, %			0.20	0.20	0.20	0.20	0.20	0.25	0.16
Vitamins									
Vitamin A, IU/lb			1450	1450	1450	1450	1450	1800	1800
Vitamin D, IU/lb			450	450	450	450	450	450	540
Vitamin E, IU/lb			7	7	7	7	7	7	7

Summary

In summary, individually feeding dairy cows in the milking parlor can decrease feed costs for many dairy producers. By feeding adequate quantities of grain in the parlor to supplement the forage in the diet, cows can be maintained in a proper body condition, which should not only enhance milk production efficiency but also increase health and reproduction.

Printed by University of Arkansas Cooperative Extension Service Printing Services.

DR. MICHAEL LOOPER is a professor and department head of the Department of Animal Science, University of Arkansas Division of Agriculture, and is located at the University of Arkansas in Fayetteville.

FSA4011-PD-7-12RV