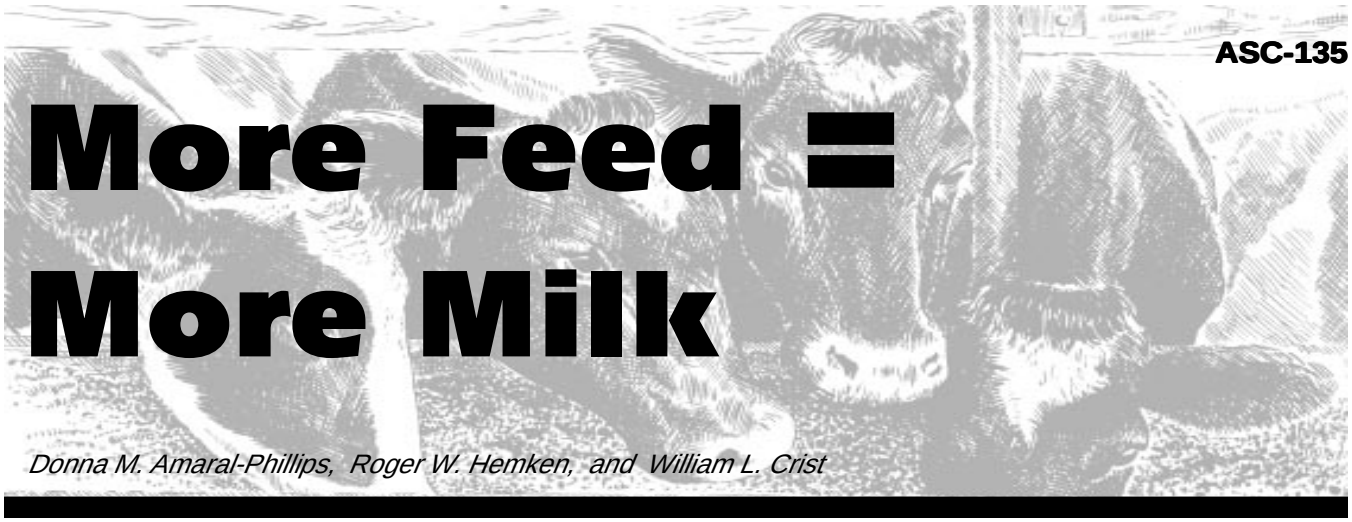
COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY • COLLEGE OF AGRICULTURE



ASC-135

More Feed = More Milk

Donna M. Amaral-Phillips, Roger W. Hemken, and William L. Crist

Feed intake governs the amount of each nutrient a cow receives and the amount of milk she can potentially produce. The more feed an early lactation cow consumes, the more nutrients she receives, and thus, more nutrients are available for milk production. Table 1 illustrates this concept. As feed intake increases, the potential to support a higher milk production also increases.

Dairy cows eat until their energy needs are met unless the diet does not provide a proper balance of nutrients or the quality of forages is so poor that the cow's rumen becomes full. The energy needs of milking cows are great, and cows must consume enough feed to meet these energy needs. For every extra pound of feed with 100% of the water removed that an early lactation cow eats, she can potentially produce an additional 2 to 2.4 lbs of milk. Proper management of the feeding program is very important in order to get cows to consume as much feed as possible so that they can milk to their genetic potential.

Table 1. The effects of increasing feed intake (on a dry matter basis) on daily milk production

In this example, a 1300 lb mature cow eating a diet containing 0.75 Mcal NE_L/lb dry matter was used. No weight gain or loss was assumed.

Milk Feed Intake (lbs dry matter)	Amount of Energy Supplied (Mcal/day)	Amount of 3.5% Supported by this Energy Intake (lbs/day)
30	22.5	42
35	26.2	54
40	30.0	66
45	33.8	78
50	37.5	90
55	41.2	102
60	45.0	114

Calculated using information contained in: Nutrient Requirements of Dairy Cattle. Sixth Revised Edition. 1989.

Dry Matter Intake Used To Express Feed Intake

Dry matter intakes are calculated to determine the amount of feed a cow or group of cows is eating. Dry matter intake is the amount of feed a cow consumes after all the water has been subtracted from the wet feeds. This allows a comparison in feed intake on different types of diets. Thus, feed intake from a dried hay diet can be compared to a silage-based diet.

The first step in calculating the dry matter intake is to accurately measure the amount of each feed the average cow in the herd is consuming. (For more information on how to measure feed intake, see section in this publication entitled "Suggested Ways to Accurately Measure Feed Intakes.") Next, the dry matter (or moisture) content of a feed must be measured. A microwave oven and a small scale can be used to determine the dry matter content of forages. (See section in this publication entitled "Using a Microwave Oven to Determine the Dry Matter Content.")

Table 2. Estimated dry matter intakes for eight high-producing herds in Wisconsin

Herd #	Breed	Number of cows	Times Milked Per Day	3.5% Fat-Corrected Milk (lbs)	Daily Milk (lbs)	Dry Matter Intake (lbs/day/cow)
1	Holstein	37	2	30,531	83.2	63.5
2	Holstein	84	3	29,860	90.6	56.2
3	Holstein	105	3	28,632	82.4	54.5
4	Holstein	74	3	28,089	82.5	59.6
5	Holstein	83	3	28,499	89.5	50.5
6	Holstein	48	2	27,986	82.4	52.1
7	Holstein	106	2	27,425	79.9	49.2
8	Guernsey	82	2	22,774	54.4	45.4

Source: Survey made in 1990 by W.T. Howard and R. D Shaver of the University of Wisconsin. Journal of Dairy Science. Vol 75. (Suppl.1). Page 186.

Hays should contain 85 to 92% dry matter if they are harvested properly and stored inside a barn. Most dried grains contain 88 to 90% dry matter.

Feed intakes and dry matter content of wet forages and byproducts should be measured monthly or when a new lot of feed is fed. Feed intakes must be measured accurately. Overestimation or underestimation of dry matter intakes can be very costly if milk production is compromised. “Guesswork can be as costly as giving a blank check to a thief.”

Eight high-producing herds in Wisconsin were studied to determine how much feed these cows were consuming. Table 2 summarizes this information. The seven Holstein herds averaged 28,561 lbs of 3.5% fat-corrected milk and daily consumed 55 lbs of dry matter per cow.

Factors Affecting Dry Matter Intake

Dry matter intake increases as milk production and body weight increase. Table 3 shows the estimated dry matter intake required at different body weights and milk production. For example, a 1300-lb Holstein cow producing 50 lbs of 4% fat-corrected milk would need to consume 40.3 lbs dry matter (1300 lbs x 3.1%). If production increased to 80 lbs of milk, dry matter intake would have to increase to 49.4 lbs dry matter or 9.1 lbs more than was needed by the same cow producing 50 lbs of milk if no body fat stores are used.

First-calf heifers eat less than mature cows because they are smaller. Herds that contain a large percentage of first-calf heifers may experience lower dry matter intakes than expected. Also, when milk production decreases in a herd, dry matter intake will most likely decline.

Maximizing dry matter intake in early lactation is very important. Normally, early lactation cows (first three to four weeks of a lactation) consume less feed when their nutrient needs are the highest. Feed intake may be decreased by as much as 17%. Mature cows

Table 3. Estimated dry matter intakes of mature cows expressed as a percentage of body weight

4% Fat-Corrected Milk (lbs/day)	Body weight (lbs)				
	900	1000	1100	1200	1300
	% of Body Weight				
30	3.0	2.9	2.7	2.6	2.5
40	3.4	3.2	3.1	2.9	2.8
50	3.8	3.6	3.4	3.2	3.1
60	4.1	3.9	3.7	3.5	3.4
70	4.6	4.3	4.0	3.8	3.6
80	5.1	4.7	4.3	4.1	3.8
100	---	5.5	5.0	4.7	4.4
120	---	---	---	5.4	5.0

To calculate 4% fat-corrected milk:
(0.4 x lbs of milk) + (15 x lbs milk fat)

Source: Nutrient Requirements of Dairy Cattle. Sixth Revised Edition. 1989.

which calve with excessive amounts of body condition or fat stores (body condition scores greater than 4.0 on a 5 point scale) usually have lower dry matter intakes in early lactation. Early lactation cows need to be managed so that dry matter intake is maximized. For each additional pound of dry matter consumed during early lactation, enough nutrients are consumed to support an additional 2.0 to 2.4 lbs of milk.

Dry matter intake is influenced by environmental conditions. As the humidity and temperature rise, dry matter intake decreases. Cows are the most comfortable when the temperature of the environment is between 40° and 75°F. When the temperature rises above 80°F or the humidity is high, cows become stressed by the heat and dry matter intake decreases. This frequently causes a decrease in milk production. Thus, minimizing heat stress during the summer is very critical in order to maintain dry matter intake.

Characteristics of the ration can influence dry matter intake. In order to maximize dry matter intake, a ration must be balanced to match the cow's nutrient needs and formulated using palatable feedstuffs. Rations composed of poor quality forages high in acid detergent (ADF) and neutral detergent (NDF) fiber decrease dry matter intake. (For more information on forages, consult Extension publication ID-101, *Interpreting Forage Quality Reports*.) Silage-based rations which are too wet (less than 40% dry matter in the total diet) may decrease dry matter intakes. On the other hand, silages rations which are too dry (greater than 60% dry matter) often contain molds, and some of the protein is heat-damaged which can decrease the intake of nutrients and milk production.

Table 4. The effects of quality of alfalfa hay on forage intake for mid-lactation Holstein cows

Quality of Alfalfa Hay	Stage of Maturity Harvested	Neutral Detergent Fiber (NDF) (%)	Alfalfa Hay Consumed (lbs dry matter)
Excellent	Prebud	40	29.0
↓	↓	45	25.7
		50	23.2
↓	↓	55	21.1
Poor	Full Bloom to Mature	60	19.3

Source: Kawas et al. 1983. University of Wisconsin.

Managing Cows to Increase Dry Matter Intake

Managing the milking herd properly to maximize dry matter intake is very important for a profitable dairy operation. Attention to details regarding the feeding and management program is very important if this goal is going to be reached. Listed below are three areas that are very important in maximizing dry matter intake:

■ **Feed Cows a Balanced Ration:** Cows should be fed a ration balanced to provide the nutrients needed.

■ **Manage the Feed Bunk Properly:** Proper management of the cows' feed bunk translates into more profit. The following points are important so that each cow is given the opportunity to consume as much dry matter as possible.

▮ **Cows should not be allowed to go hungry;** they should always have quality feed available. They should not be denied access to feed for more than three hours per day which includes the time they are in the holding pen waiting to be milked.

▮ **Cows should be fed at a consistent time and place.** Cows are creatures of habit, and managers who follow strict routines generally get more milk from cows.

▮ **The feed bunk should be cleaned out daily** to prevent feed from spoiling and molding and to remove materials (e.g., corn cobs) cows will not eat. Cows should not be fed feed that is molded or spoiled. Feed from the face of newly opened silos should not be fed to prevent cows from eating molded feed and, thus, going off-feed.

▮ **Cows should have adequate bunk space** to allow all cows, including timid heifers, to have equal access to the bunk. Enough bunk space is needed so that timid heifers will be able to compete with the boss cows for feed space. In addition, escape routes should be considered when deciding where to place a feed bunk so that timid heifers and cows can get away from boss cows. Fresh cows and heifers are more sensitive to limited bunk space.

If cows are fed fresh feed once or twice a day, 30 inches of bunk space should be allowed per cow. Herds where feed is always available can have less bunk space available per cow (18 to 24 inches per cow).

▮ **Feeding cows several times a day stimulates cows to go to the feed bunk more often** and may increase the total amount of dry matter they consume. Frequent feeding also helps stabilize the rumen fermentation which may enhance fiber digestion and improve milk fat test. During hot weather, more frequent feeding helps encourage greater feed intake.

▮ **Managing the social interactions within the milking herd helps minimize the stress on timid cows.** Frequent movement of cows from one group to another (especially heifers) increases fighting to establish social dominance and can reduce feed consumption.

▮ **Changes in forages should be made gradually** to allow time for the bacteria in the rumen to adjust to these changes.

■ **Feed High Quality Forages:** High quality forages allow cows to get more nutrients in every bite they take and to increase feed intake. They also allow more forage to be fed while at the same time meeting the cows' nutrient needs. Table 4 (page 3) shows the effects on hay intake of feeding different qualities of alfalfa hay. As hay is harvested at later stages of maturity, quality and intake of hay decrease. Producing quality forages should be a high priority of every dairy farmer. This may mean finding ways to harvest quality forages regardless of the weather.

Early lactation cows naturally have limitations on dry matter intake, and high quality forages help them get as many nutrients as possible from the feed they eat. The highest quality forages should be fed to early lactation cows. If early lactation cows are not housed in a separate group, the best quality forages should be reserved for the time when the highest percentage of cows freshen. Cows fed poor quality forages are often thin, low-producing cows that are hard to breed back and may be more susceptible to health problems.

Suggested Ways to Accurately Measure Feed Intakes

Silage:

1. Keep cows away from the feed bunk and fill bunk with silage to the normal level.
2. Measure three one-foot sections and weigh the amount of silage found in each section.
3. Determine the average weight of silage found in these three sections and multiply this average weight by the length of the silage bunk.
4. Divide the total weight of silage fed by the number of cows eating from the bunk.

▮ Remember to include all cattle eating from the silage bunk.

▮ Remember to take into account the amount of silage wasted or left by cattle.

Square bales of hay:

1. Gather 8 to 10 bales at random from each lot of hay.
2. Weigh each bale using a hanging scale.
3. Calculate the average weight of the bales.
4. Multiply the average weight of a bale by the number of bales fed each day.
5. Subtract the amount of hay wasted from the total amount of hay fed per day.
6. Divide the total pounds of hay consumed per day by the number of cows [plus heifers, dry cows, and bull(s)] eating.

Large round bales of hay:

1. Weigh a couple of large round bales at a local mill or on a truck scale.
2. When calculating intake, remember to subtract the amount of hay wasted. The amount wasted can be quite large in bales stored outside.

Grain:

1. Determining average grain intake for the whole milking herd:

▮ Divide the weight of a batch of feed by the number of days a batch of grain mix lasts.

▮ Divide the result from above by the number of cattle fed the batch of feed.

▮ For example: If a batch of feed weighs 4000 lbs, lasts 5 days, and is fed to an average of 40 cows, the average grain intake is 20 lbs.

4000 lbs feed/5 days =
800 lbs feed/day

800 lbs feed/day/40 cows =
20 lbs/cow

2. Grain fed through the milking parlor:

▮ The amount of feed delivered per unit (pull or electronic setting) should be measured every three months to keep a close check on how many pounds of feed actually are being delivered per unit.

3. Grain fed through a computer feeder:

▮ Recalibrate amount of grain delivered at different settings every three months or when type of grain mix is changed.

▮ Feeders need to be checked daily to make sure they are actually delivering feed.

Total Mixed Rations:

Scales need to be used routinely and need to be calibrated monthly to make sure they are working properly.

More Quality Feed Consumed = More Milk

The amount of dry matter cows consume regulates the amount of nutrients they receive and the amount of milk they can produce. Efficiently managing the feeding program is very important so that feed intake can be maximized. Dairy cows need:

- a balanced ration that provides the nutrients they need,
- high quality forages, and
- ready access to fresh, high quality feed and drinking water.

Maximizing feed intake is one barrier that must be broken in order to obtain profitable milk production.

Using a Microwave Oven to Determine the Dry Matter Content

Supplies needed:

- Microwave oven
- Small kitchen, dietary, or postage scale, preferably one that weighs in grams
- Paper plate
- Scissors
- Small (8 oz) glass of water

Procedure:

1. Collect a sample of forage or wet byproduct.

2. Cut the forage into pieces 2-3 inches long.

3. Accurately weigh out the sample using a small scale (wet weight). The size of the sample should be approximately one pound or 100 grams.

4. Place the wet sample on a paper plate, spread to form a thin layer, and place the paper plate in a microwave oven.

5. Place an 8-oz glass of water (¾ full) in the back corner of the microwave. Try to keep the water level constant during microwave use.

6. Heat the forage sample as follows:

A. For silages or other high-moisture feeds (25-50% dry matter):

- Heat for 4 minutes.
- Remove from oven. If the sample feels dry, weigh and record weight (dry weight).
- Stir feed, rotate plate, and return to microwave.
- Heat 1 minute.
- Continue weighing and reheating until sample weight does not change more than 1 to 2 grams and/or feed starts to char.

B. Hays or haylages with greater than 65% dry matter: Follow sample procedure as for silages; however, heat for 2 minutes initially and reheat at 30-second intervals.

7. Calculate percent dry matter:

A. First, calculate percent moisture:

$$\text{Percent moisture} = \frac{\text{Wet weight} - \text{Dry Weight}}{\text{Dry weight}} \times 100$$

B. To calculate percent dry matter:

$$\text{Percent dry matter} = 100 - \text{percent moisture}$$

Adapted from: *Dairy Profit Series: Nutrition (DYS-3023).* L. H. Kilmer. Iowa State University. 1989.

Educational programs of the Kentucky Cooperative Extension Service serve all people regardless of race, color, age, sex, religion, disability, or national origin. Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, C. Oran Little, Director of Cooperative Extension Service, University of Kentucky College of Agriculture, Lexington, and Kentucky State University, Frankfort.
Issued 10-92, 500 copies