DAIRY SOLUTIONS

Piecing together the puzzle to economically maximize milk fat production

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In current dairy economics, milk fat accounts for a large percentage of the milk check. As production per cow has grown over the years, so has the milk fat test (Figure 1). As we move forward through increasingly tough economic times for the industry, we must continue to evaluate the rations for high-producing dairy cows to optimize diets for sustained increases in production and components while paying attention to the bottom-line economics of the feed bill.

Figure 1: U.S. National Statistics for Milk; USDA NASS

	2020	2019	2018	2017	2016	2015
Total milk production (million lbs.)	223,220	218,441	217,568	215,527	212,451	208,508
Number of cows (million)	9.388	9.337	9.398	9.405	9.352	9.197
Annual milk (thousand lbs./head)	23,777	23,395	23,150	22,914	22,716	22,672
Average milk (lbs./head/day)	78.0	76.7	75.9	75.1	74.5	74.3
Annual milk fat test (%)	3.95	3.92	3.89	3.84	3.79	3.75

High-producing dairy cows need a tremendous amount of energy to thrive and sustain high levels of milk production and components. Commonly, these high-producing cows need at least 65 mega calories of metabolizable energy per day, with approximately 27% of that going toward maintenance, while the remaining 73% is used for lactation. Furthermore, energy demands exceed energy intake for cows 60–100 days postpartum, as the cow relies heavily on their stored energy supply. Inadequate energy in the ration can lead to these high-producing cows losing weight as they peak in production, further leading to issues such as ketosis, reduced reproductive performance, shorter milk peaks and decreased milk yield down the road. Strategically formulating diets for energy demand at specific times in the lactation cycle is crucial to maximizing cow production and herd profitability.

Cereal grains can provide an economical source of energy, but fiber minimums, as well as maximum fermentable carbohydrate, can limit the amount that can be fed. Feeding fat to the milking herd increases the amount of energy in the diet. Fats contain 2.25 times more energy than the starches and digestible fibers found in common grain or forage sources. More energy can be packed into each mouthful of feed a cow eats by adding fat to the diet.

Fats come in many different forms, affecting how they are digested and utilized by the cow. For example, understanding the fatty acid composition of the fat (saturated vs. unsaturated) is crucial as the cow more easily utilizes saturated fats. Comparatively, high levels of unsaturated fat can lead to increases in rumen biohydrogenation, which can negatively impact milk fat production. Understanding physical nature (free oil, in-seed, ground seed, extent of grinding, extruded, size of prills) is also valuable as cows benefit more easily from fat sources that make it through the rumen before being utilized. The chemical form (triglyceride, glycolipids, phospholipids, free fatty acids) of the fat source is also important. Within each of these classes, considerable variability results in different physical characteristics of the fat. In dairy nutrition, nearly all long-chain fatty acids found as part of forage or cereal grains/oilseeds will ultimately be converted to free fatty acids before they can be absorbed Free fatty acid supplements are one way to quickly and easily maximize the energy density of a diet, with a high efficiency of digestibility within the cow. But these come with increasingly high economic constraints. Before adding a pound of expensive rumen-inert fat to satisfy your energy needs, it is crucial to ensure you have maximized your more economical fat sources through diet ingredient selection while keeping in mind the maximum acceptable rumen unsaturated fat level in the diet.

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While every farm is different, high-producing milk cows can typically thrive on a ration of 5–6% total dietary fat on a dry matter basis, with up to 2.8% total unsaturated fat as a percent of diet dry matter. However, unsaturated fat levels greater than 2.8% can quickly lead to decreases in milk fat production. To minimize purchased feed costs in regard to fat purchased, the first 2.8% of fat in the diet normally will come from common ingredients in the diet, including forages, ground corn and protein sources (soybean, distillers grains, canola, meat and bone meal, heat-treated soybean meal, roasted soybeans).

With rumen-inert fat sources currently priced at or above all-time highs — due largely to lack of ingredient availability — it is crucial to look at other ingredients that may be able to reduce the need for expensive fat additives. Three value-packed ingredients to focus on in current dairy economics and what they can provide to the diet in terms of fat in addition to bypass protein are:

1. Whole cottonseed
2. Roasted soybeans
3. Heat-treated soybean meal

Whole cottonseed (23% protein and 20% fat)

Feeding five pounds of whole cottonseed can provide one pound of fat to the ration from an "in-seed" source, which does not contribute as much to the 2.8% maximum unsaturated fat level of the ration. If the current market value of whole cottonseed is $350/ton, it would cost $0.87/cow/day to include the cottonseed into the ration. By doing so, you would be able to decrease a different ration protein source as you would also be bringing in 1.15 pounds of protein with the five pounds of cotton. In terms of fat cost, whole cottonseed is an excellent source of fat with the added benefits of protein and fiber.

Roasted soybeans (40% protein and 20% fat)

Feeding three to four pounds of roasted soybeans can provide 0.6–0.8 pounds of fat to the ration. However, halving and/or quartering the roasted beans is crucial for adequate bypass of the rumen, as fine-grinding roasted soybeans exposes them to rapid degradation in the rumen while making the fat content immediately available in the rumen, potentially causing undesirable biohydrogenation and lower butterfat production. Roasted soybeans are a great ingredient to utilize within the 2.8% unsaturated fat constraints of the diet, but routine sampling is necessary to quantify dietary fat contribution appropriately.

Heat-treated soybean meal (50% protein and 2–8% Fat)

Feeding three to four pounds of heat-treated soybean meal has been extensively researched and found to add significant bypass protein to milk cow rations with only a marginal increase in cost compared to traditional soybean meal. There are several different commercially available products on the market, so it is crucial to know the fat content of the heat-treated soybean meal as they vary significantly (from 2–8%). Higher fat, heat-treated soybean meal can be an excellent addition to rations, as it can provide an extra 0.25–0.33 pounds of fat to the diet when fed at three to four pounds, with no additional cost compared to other lower-fat, heat-treated soybean meals.

Once the 2.8% of unsaturated fat inclusion in the ration has been reached and whole cottonseed has been included (based on regional economics), specialty rumen-inert fat sources should be evaluated to achieve the desired 5–6% total fat in the diet, based on production goals. With many of these ingredients costing more than $1 a pound to supplement, return on investment should be carefully calculated to ensure production, health and reproductive goals are achieved after supplementation. It is important to remember that not all supplemental specialty fats are the same. Specific products have differing fatty acid profiles, which, depending on the formula chosen, can increase milk production, maintain body condition score and/or increase milk fat percentage.

If you have questions about the fat levels or supplementation in your ration, reach out to your local Hubbard Feeds dairy nutrition representative to evaluate your ration to achieve maximum performance and ensure return on investment.