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GRAIN/ENERGY SUPPLEMENTATION FOR DAIRY GRAZING SYSTEMS

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The use of and interest in pasture as a major source of forage for dairy cows continues to increase, primarily because of economic constraints. Feed costs are the largest expense on the dairy farm and are typically decreased about $1.00 to $1.50/cwt. of milk during the grazing season. Supplemental feeding with pasture based systems is more difficult than with confinement systems. Some of the most common nutritionally related questions from producers and consultants with pastures systems include:

- How much supplemental grain or energy should be fed?
- What should be the feed ingredients and nutrient composition of the grain mixtures?
- What is the profitability of each additional unit of grain that is fed?

These questions and others like them will be the focus of some of the articles written for this column. This article will touch on some of the reasons why supplemental grain feeding for grazing dairy cows is a profitable decision for many graziers.

A recent article in a widely read grazing magazine questioned the economics of supplemental feeding in the United States when pasture is well managed and of high quality and quantity. The essence of this article is that it is not economical to feed grain, bypass protein, supplementatl forages (unless pasture quantity is inadequate), or total mixed ration (TMR). However, science, producer experiences, and economics do not support the "no supplementation" approach with high producing cows in the U.S. Certainly, improved grazing management to increase the quantity and quality of pasture can reduce the supplemental feed needs and improve profitability.

Your own farm information about feed costs, herd health, milk production, body condition, and reproductive performance can be very useful in making feeding management decisions. Many graziers have looked to the New Zealand dairy system for help in making grazing decisions. While this information can be very useful, keep in mind the differences between the New Zealand situation and your own farm situation. Cows in New Zealand graze low cost pasture year round as the sole source of nutrients with no supplemental grain and produce about 7,000 pounds of milk per cow. In New Zealand, grain costs are often double and milk prices one-half compared to Pennsylvania. Despite the fact that current economic conditions in New Zealand do favor supplemental grain feeding, current research for dairy producers in New Zealand is focusing on nutritional strategies to increase production and optimize profit.

Forage alone. What can we expect from Pennsylvania cows if pasture is the only source of feed? Research studies in the U.S. with high producing cows fed only pasture are limited. A study in Wisconsin in which high quality alfalfa hay crop silage was the only forage had a total lactation milk yield of 12,700 pounds of milk or 41.6 pounds per day. The DMI for the total lactation averaged 41 pounds per day, or 3.1 percent of body weight. These cows had lower body condition than cows fed varying the amounts of supplemental grain.

Based on this and other studies, and on estimates of energy needs for maintenance and activity vs. energy intake from pastures, herbage from well managed pastures should be sufficient to maintain 35 to 45 pounds of milk per day with little or no supplemental energy. This production may be higher with legume and grass/legume pastures than with mostly grass pasture because of higher DMI from pasture containing legumes.

Cows in early lactation may be expected to produce 50 to 60 pounds of milk per day with pasture as the only forage. However, these cows would lose extensive body weight and condition because of inadequate dry matter and energy intake from only pasture. Cows often have a lower body condition when grazed compared to cows under confinement. Reproductive efficiency may decline if cows lose too much condition.

Supplemental energy/grain. Energy is thought to be the most limiting nutrient for profitable milk production and normal reproductive performance when pasture is the major source of forage. The amount of grain fed to increase the total energy intake on a pasture based system can have long-term effects on energy balance, milk production, body weight and condition changes, reproductive performance, and profitability. Research and producer experiences indicate that supplemental energy from grain is beneficial and profitable with high producing cows under a grazing system.

Grain benefits the cow in two ways: (1) providing needed energy for activity (walking, grazing) and (2) providing a source of rumen available non-structural carbohydrate (NSC). While pasture can be quite high in protein, it lacks NSC. Without additional NSC in the diet, protein is used for energy, and excess nitrogen is excreted in urine. Thus, valuable protein is lost to the animal and excreted into the environment. The result is lower animal production and a higher nutrient loading into soil and water.

Providing grain supplements rich in NSC and lower in protein (nitrogen) can help to "capture" more of the protein in pasture and "convert" it to milk protein. This efficient use of resources helps to balance out the total use/reuse of nutrients in the whole farm system. Research shows milk production responses of ½ to 1½ pounds for each pound of grain fed. The milk response to grain is usually highest with the first amounts of grain fed and diminishes as additional grain is fed. In the previously mentioned Wisconsin research with alfalfa haylage crop silage, the milk response to the first 2,000 pounds of grain fed was about 2,000 pounds of milk, or 1 pound of milk per 1 pound grain. Research at Ohio State reported about a 1 pound milk response to 1 pound of grain fed with both orchardgrass and alfalfa based pasture systems. With milk priced at 12 cents per pound and grain at 6 cents per pound, *grain feeding on pasture makes economic sense.* In addition, each pound of grain fed displaces or substitutes for about ⅓ pound of pasture DM. Thus, total DMI will increase with each pound of grain fed.

Bottom line. The bottom line is that grain feeding for high producing cows on pasture results in higher DMI, which translates into higher, profitable milk production and improved body condition. Based on this information and our research at Penn State, we have developoed the grain feeding guidelines in the following table.

Grain (DM) feeding guidelines for a grass based pasture system during the grazing season[a]

4% FCM	Spring		Summer		Fall	
Production (lb)	lb	G:M[c]	lb	G:M[c]	lb	G:M[c]
>80	20	1:4 to 1:5	25-27	1:3	20	1:4 to 1:5
70	16-18	1:4 to 1:5	21-23	1:3 to 1:4	16-18	1:4 to 1:5
60	12-14	1:4 to 1:5	15-18	1:5	12-14	1:5
50	8-10	1:5 to 1:6	10-12	1:4 to 1:5	8-10	1:4 to 1:5
<40	6-8	1:6 to 1:7	8-10	1:5 to 1:6	6-8	1:6 to 1:7

[a]Assume 1300 lb. bodyweight
[b]These guidelines are based on high quality grass pasture availbale in adequate quantities assuming the approximate DMI. Lower quality forage will require more grain. Maximum grain DM fed should be equivalent to about 2% of bodyweight. Some adjustment of grain should be made based on body condition scores and stage of lactation. Lower amounts are likely needed when the pasture contains legumes.
[c]Grain: milk ratio (DM basis).

The amount of grain or supplement to feed depends on the "manager's eye" when monitoring milk production and body condition. The make-up of the concentrate mixture can range from either simple to complex formulation, but should complement the forage.

Future articles will discuss the makeup of the concentrate mixture in more detail. The values in the table are merely guidelines. Higher rates of grain feeding may be needed when cows are thin, walking long distances to pasture,

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