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8-1-1996

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### Recommended Citation

Schingoethe, David J., "Ration Energy -- Is Highers Priced Corn the Only Answer?" (1996). *Extension Extra*. Paper 111.  
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# Extension Extra

ExEx 4011  
August 1996  
Dairy Science  
Nutrition

SOUTH DAKOTA STATE UNIVERSITY / U.S. DEPARTMENT OF AGRICULTURE

## Ration Energy -- Is Higher Priced Corn the Only Answer?

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The sharp increase in the price of corn in recent months is reason to take a closer look at alternative ration formulations. Before one decides to replace corn totally with other feeds, it may be best to consider some of the options available:

- Feeding more forages and less grain mix.
- Replacing part or all of the corn with other grains or grain by-products.
- Feeding high-fat products.
- Feeding other by-products

The nutrient content of many alternative feeds is listed in Table 1.

### Feeding More Forages

This is as good a time as any to emphasize the importance of feeding top quality forage. Top quality forage would allow one to reduce the amount of grain mix needed to maintain -- or even increase -- milk production. However, top quality alfalfa also will likely be more expensive this year because of several factors such as extensive winter-kill, the late spring, and variable rain fall. Unless forage quality is improved, reducing the amount of grain mix fed will likely decrease milk production.

### Other Grains

In the upper Midwest, more grains are available from which to select than in many other areas of the country.

However, price, nutrient content, and other possible limitations may restrict the use of some of these grains.

**Barley** contains nearly as much net energy per pound as corn and it contains more protein. Barley is fermented quite rapidly in the rumen, which may allow the use of greater proportions of ruminally degradable protein in the diets. Dairy producers in the Northwest and California get very good milk production when feeding barley; however, Midwest producers get more milk when feeding corn.

Perhaps the barley available in the Northwest differs from what is available in the Midwest. SDSU research never gets as high a production from barley as that obtained when feeding corn, partially because barley was less palatable than corn.

**Oats** contains less energy, primarily because of more fiber, than is available in most of the other cereal grains. That, coupled with cost, makes it a less likely substitute for corn than some other grains.

**Rye** contains only slightly less energy than corn and more protein. Ergot contamination may be more of a potential toxicity problem than with some other grains, and it is less palatable than most other grains. Even though South Dakota is the number one rye-producing state, availability also may be a problem.

**TABLE 1. Typical Nutrient Content of Some Energy Feeds.**

Feed	Dry Matter (%)	NE <sub>L</sub> (Mcal/lb)	Crude Protein	Fat	Fiber			Minerals		
					NDF	ADF	Lignin	Ash	Ca	P
(Fiber and Minerals are % of dry matter)										
Barley	88	0.88	13.5	2.1	19	7	2	2.1	0.05	0.38
Beet pulp, dried	91	0.81	9.7	0.6	54	33	2	4.4	0.69	0.10
Brewers dried grains	92	0.68	25.4	6.5	46	24	6	4.8	0.33	0.55
Canola seeds	90	1.52	20.5	40.5	18	12	3	4.6	0.44	0.68
Corn	88	0.89	10.0	4.3	9	3	2	1.6	0.03	0.29
Corn cannery waste	23	0.72	8.8	2.7	—	46	—	5.9	0.34	0.63
Corn distillers grains	94	1.00	33.0	9.8	58	23	7	2.4	0.11	0.43
Corn distillers solubles, condensed	27	1.14	18.1	21.5	23	7	1	12.5	0.35	1.37
Corn gluten feed	90	0.86	18.0	2.4	45	12	—	7.5	0.36	0.82
Cottonseed, whole	92	1.01	23.0	20.0	44	34	10	4.8	0.21	0.64
Tallow, and other fats & oils	99	2.65	—	99.9	—	—	—	—	—	—
Grain screenings	89	0.68	12.0	2.6	—	11	—	3.4	0.46	0.32
Oats	89	0.80	13.3	5.4	32	15	3	3.4	0.07	0.38
Oat hulls	92	0.34	3.9	1.8	78	42	8	6.6	0.15	0.15
Potatoes	23	0.85	9.5	0.4	—	—	—	4.8	0.04	0.24
Rye	88	0.88	13.8	1.7	—	—	—	1.9	0.07	0.37
Sorghum (milo)	87	0.84	9.7	3.5	18	9	1	2.1	0.04	0.34
Soybeans	92	1.05	42.8	18.8	—	10	—	5.5	0.27	0.65
Soybean hulls	91	0.80	12.1	2.1	67	50	2	5.1	0.49	0.21
Sunflower seeds	90	1.28	19.6	46.0	24	16	—	3.8	0.26	0.67
Sunflower hulls	90	0.19	5.8	5.6	83	68	14	2.3	—	—
Wheat	89	0.93	14.4	1.8	—	8	—	1.9	0.04	0.42
Wheat middlings	89	0.71	18.4	4.9	37	30	—	5.2	0.13	0.99
Whey, liquid	7	0.85	14.2	0.7	—	—	—	9.8	0.73	0.65
Whey permeate, liquid	5	0.81	2.5	0.1	—	—	—	14.3	1.48	1.19

**Sorghum (milo)** is widely used in the Southwest as a grain source for dairy rations and may be an option in some parts of South Dakota. The starch in sorghum is fermented (degraded) even more slowly in the rumen than is corn starch. However, Arizona research has indicated that steam-flaking sorghum greatly increases its feeding value for dairy cows.

**Wheat** is a good energy source that is rapidly fermented in the rumen. It can be fed in relatively large amounts. However, it's best to feed wheat in a total mixed ration to avoid acidosis. Wheat prices have gone up as fast as corn prices, generally making wheat an expensive alternative to corn.

**Grain by-products** available from processing of grains and oilseeds can be useful feeds. Some products may be available only in certain locations or at certain times and may or may not be priced competitively as a source of the nutrients ordinarily supplied by corn and soybean meal. Some by-products are available either wet or dried. Moisture content may limit how far a product can be transported economically, how long the product can be stored without spoilage, and dry matter intake.

Brewers grains contains less energy but more protein than corn. It's a good feed to use if available at a competitive price.

**Corn by-products** include corn distillers grains (CDG), corn distillers solubles, or these two products blended together as corn distillers grains plus solubles as by-products of ethanol production (dry milling); and corn gluten feed and the protein supplement, corn gluten meal, as by-products of corn wet-milling operations. The CDG available today from ethanol plants in the upper Midwest contains more energy and protein than listed in previous nutrient content tables.

Research at SDSU demonstrated very good milk production by cows fed CDG or condensed corn distillers solubles. Increased corn prices also may be reflected as increased prices for CDG and other corn by-products, thus these by-products may not always be a good buy.

**Corn gluten feed** contains slightly less energy but more

protein than corn; however, check the nutrient content of a product you are considering to use, because analysis may differ from the values listed in Table 1. One should likely limit corn gluten feed to less than 25% of ration dry matter because of possible palatability problems, even though current prices may encourage feeding larger amounts.

**Wheat midds** and **grain screenings** usually contain less energy than corn but sometimes fit well into dairy rations if priced competitively. Check nutrient content – especially of grain screenings – because variations are likely to occur.

**Soy hulls** are quite digestible, which gives them an energy value about 90% of the energy value of corn. Soy hulls may fit well into rations, especially if there is some room to include a non-forage fiber source.

**Oat hulls** and **sunflower hulls** contain a lot of fiber that is poorly digested, thus they are not recommended in rations for lactating cows.

### High-Fat Products

Feeding supplemental fat is an effective way to increase the energy density of the diet without reducing fiber content. Adding fat to rations may allow one to increase the proportion of forage in the diet and reduce the amount of corn or other grains, while still maintaining the net energy content of the diet. As long as the fat content of the total ration dry matter does not exceed 8%, feed intake, ration digestibility, and milk production should remain fine. This means that high-producing cows can be fed 1 to 2 pounds of supplemental fat daily, in addition to the fat already present in forages and grains. Supplemental fat can be supplied as oilseeds, animal fats, or dry fat products.

**Oilseeds**, such as canola, cottonseed, soybeans, and sunflower seeds provide protein and fibrous, nonfat energy as well as fat.

**Canola** isn't as readily available here as in Canada, but it can be a good energy source. The seeds should be ground, crushed, or otherwise processed to break the hard seed coat and improve utilization by animals.

Cottonseed is a good source of energy, both from fat as well as from digestible fiber, which makes it a popular and effective high-fat product.

Heat soybeans by roasting or extrusion to destroy antinutritional factors such as trypsin inhibitors, if planning to feed more than 4 pounds per head daily.

Sunflower seeds need no processing although processing them through a roller mill may improve animal utilization.

Vegetable and animal fats and oils such as tallow, lard, and hydrogenated vegetable oils are essentially pure fat products that can be utilized in livestock rations. They are sometimes used in small amounts for dust control in grain mixes, but amounts up to the usual dietary fat limitations can be fed daily. These fats often require some heating or other special handling prior to incorporation into diets.

Dry fat products, such as calcium salts of long-chain fatty acids (Megalac®), Booster Fat®, and Energy Booster® and other prilled fats, are highly concentrated fat products that may work well in some rations. Ease of handling is a major advantage of such products because they are dry and free flowing, which makes it easy to add them to a ration; however, cost is often a disadvantage.

### Whey and Whey Permeates

Liquid whey products can be useful feeds in areas where available. The dry matter of whole whey contains about the same amount of energy as corn and the same amount of protein as small grains plus more calcium and phosphorus. However, whey permeates have had most of the protein removed and sometimes -- with deproteinized, delactosed permeate -- much of the lactose is also removed, leaving a high-mineral, low-protein, and medium- to low-energy product.

The high mineral content may limit how much whey product can be fed. Whey and whey permeates may sometimes be condensed, which makes it affordable to move the product farther because of less water content. The condensed products should be blended in a total mixed ration to control consumption and avoid fatal overconsumption.

Know the content of dry matter, crude protein, ash (mineral), and possibly also lactose of the product being considered, in order to effectively utilize the product in the total ration. Liquid whey or permeate, which contain only 5 to 7% solids, usually can be fed safely as a liquid although special feed handling systems and adaptation of animals to the products may be a consideration.

### Least-Cost Rations

When various commodities are changing prices rapidly is a good time to look at least-cost ration formulations. However, such an approach sometimes brings surprises. In early June 1996, an SDSU evaluation of rations priced at the "very high" prices of corn and many other ingredients showed that corn, corn gluten feed, cotton seed, and tallow were frequently included. Soybean meal still tended to be the protein supplement of choice, and diets containing high amounts of alfalfa (listed at \$110 per ton) were more cost effective than high corn silage diets.

The typical alfalfa, corn silage, corn, and soybean meal based ration costs more than a year ago. However, on the positive side, milk prices also are up, which makes the income-over-feed cost not much different than a year ago.

### Recommendations

Check feed costs closely, but also **consider quality**. **Don't make drastic changes** in rations unless there is **good assurance that it will be beneficial**.



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650 copies printed by CES at a cost of 16 cents each. August 1996.