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VETERINARY CONTINUING EDUCATION



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## PURCHASING AND FEEDING ALTERNATIVE FEEDS

J.G. Linn<sup>1</sup>, V.A. Oraskovich<sup>2</sup> and M.F. Hutjens<sup>3</sup>

As dairy herds become larger and feeding systems change, there is an increased interest in using alternative or by-product feeds. Reduced ration costs is the main reason for using alternative feeds but they also may improve ration quality and extend home grown feed supplies. Several factors, including pricing, must be considered in deciding when and how to use alternative feeds in dairy rations. This paper will discuss some of these considerations and offer some suggestions on how to profitably feed alternative feeds.

### FEED COSTS

In 1991, southern Minnesota farm records indicated it cost \$895.00 to feed a lactating dry cow for the year. Average milk production was 16,677 lb. Feed costs can be divided as follows:

<u>Feed</u>	<u>\$/cow/year</u>	<u>\$/cwt milk</u>	<u>% of total</u>
Hay	268	1.61	30
Haylage/silages	119	.72	13
Grain	253	1.52	28
Purchased feeds	<u>255</u>	<u>1.53</u>	<u>29</u>
	895	5.38	100

Purchased feed costs for lactating dairy cows generally include protein supplements, minerals, vitamins, fat, by-product feeds, additives, and excellent quality hay. These purchased feeds can add up to \$1.73 per cow per day.

• Protein supplements (4 lb @ 11¢/lb)	=	.44
• Purchased hay (5 lb @ 6¢/lb)	=	.30
• By-product feeds (5 lb @ 8¢/lb)	=	.40
• Minerals (.5 lb @ 22¢/lb)	=	.11
• Vitamins	=	.03
• Fat (1½ lb @ 22¢/lb)	=	.33
• Additives	=	.12

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<sup>1</sup> Extension Dairy Nutritionist - University of Minnesota

<sup>2</sup> Extension Educator, Carver County - University of Minnesota

<sup>3</sup> Extension Dairy Nutritionist - University of Illinois

Purchased feeds generally include charges for services (forage testing, ration balancing, consulting, feed quality, monitoring and mixing). Thus, questions concerning service costs must be considered when alternative feeds are substituted for commercially prepared and purchased feeds.

### BY-PRODUCT FEEDS

By-product feeds can be an economical nutrient alternative. Table 1 lists breakeven prices for by-product feeds based on shelled corn for an energy value (\$2.00 per bushel), soybean meal for crude and undegradable protein values (\$170 per ton), tallow for fat and oil values (\$.22 per lb), dicalcium phosphate as a source of phosphorus and calcium (\$7 per cwt). Feeds are evaluated on a crude protein and energy basis with no value for fat (Column A) which could represent a value for low producing cows, dry cows, and growing heifers. Column B places a dollar value on feeds adding undegraded protein and fat or oil which is needed and utilized by high producing cows. Dairy producers must consider quality and variability of by-product feeds, responsibility if no company is involved, shrinkage, waste, and financial charges when buying large quantities of by-product feeds. Some additional costs in purchasing alternative feeds with guideline estimates, besides the original cost of the feed are listed below. An example is a 22 ton load of whole cottonseed delivered to St. Paul from Wisconsin (130 miles).

Item	Example \$/ton
Market price - FOB	144.00
Transportation - \$1.15/miles	6.80
Loading and unloading costs - \$8/ton*	8.00
Handling loss - 1% of delivered price	1.59
Insurance - .1% per ton (FOB price)	.14
Interest - 1%/month (2 months)	3.21
Analysis cost - \$1/ton	22.00
<b>Total cost</b>	<b>\$185.74</b>

\* Loading costs may be included in FOB market price.

Feed value constants for pricing feeds based on soybean meal (protein) and energy (corn) are a quick way of looking at breakeven prices. A list containing the approximate composition (DM basis) and pricing constants is attached. To use constants, multiply the price (\$/ton) of soybean meal by the protein constant and the price of corn (\$/ton) by the energy constant, and add to determine price (\$/ton). For example: whole cottonseed is worth \$139.48/ton when corn is \$85.70/ton (\$2.40/bushel) and soybean meal is \$200/ton ( $.3108 \times \$200 + .9021 \times \$85.70$ ).

Feeding guidelines for alternative feeds are in Appendix A.

Table 1. Breakeven prices of by-product feeds based on crude protein, energy, calcium, and phosphorus (Column B). Source: University of Wisconsin Feed Val Programs.

Feed	Column A	Column B
	----- Value per ton (as fed) -----	
Beet pulp	69	58
Blood meal	251	501
Brewers grain, wet (20% DM)	27	33
Corn gluten feed, dry	114	91
Corn gluten meal (60%)	212	336
Cottonseed, fuzzy	124	165
Distillers grain, corn	125	172
Fish meal	268	471
Hominy feed	72	82
Meat and bone meal	281	464
Soy hulls	78	59
Soybeans, heated	161	251
Wheat midds	101	79

Feed values used: Shelled corn @ \$2/bu, soybean meal @ \$170/ton, tallow @ \$22/cwt, limestone @ \$7/cwt, and dicalcium phosphate @ \$17/cwt.

Both of the above pricing methods consider nutrients price only and provide no indication as to how the feed fits into a ration in relation to the other feeds in the ration. A least cost ration formulation is the most comprehensive way of determining whether or not a feed fits into a ration and at what price. The breakeven price of an ingredient will vary depending on production levels ration is being formulated for and other ingredients included in the ration. Using a least cost ration program allows the nutritionist to set the parameters desired in the ration and evaluate what alternative feeds fit into those parameters.

#### VALUE OF SERVICE

Time has an economic value when farmers receive ration formulating and consulting from a private consultant, feed company, veterinarian, or extension personnel. In Table 1, a value of 5¢ per cow per day was used. This charge results in \$1.50 per cow per month or \$90 per month (for a 60 cow herd). Several methods can be used to collect this cost of 5¢ per cow per day or \$90 per month.

- ½ day of time at \$22.50 per hour
- Add 5¢ per day to 20 lbs of pelleted complete grain mix fed per cow per day which raises grain price .25¢ per lb or \$5 per ton

- Add 5¢ per day to 2½ lb of protein supplement fed per cow per day which raises the protein price 2¢ per lb or \$40 per ton
- Add 5¢ per day to ½ lb of mineral/vitamin supplement which raises the mineral mix 10¢ per lb or \$200 per ton
- Add 5¢ per day to 1/10 lb trace mineral-vitamin premix which raises the premix price 50¢ per lb or \$1000 per ton

There is no "free" time or service. Dairy producers must avoid paying for nutritional service more than once (for example, through a commercial protein supplement plus a mineral supplement plus a trace mineral-vitamin premix plus a stress package). Mathematics become more interesting if you calculate 150 cow herd size, 10¢ per cow per day, and what services are expected such as forage testing, computer time, educational meetings, mileage and expenses incurred traveling to the farm, and expected time commitment (½ day per month, phone calls at night, and response to emergencies). An effective service representative could increase milk yield 3 lb per cow (worth 36¢ per day), lower feed costs 20¢ per cow per day, and/or reduced days open 10 days (worth \$30 per year or 8¢ per day). Service must be considered when answering the question: "How much is too much?"

#### ADDITIONAL CONSIDERATIONS

Items other than the direct cost of the feed need to be considered in using alternative feeds. Consideration should include:

1. Purchasing in large quantities for maximum savings.
2. Storage of large quantities.
  - a) Commodity shed can cost \$15,000 to \$20,000
  - b) Feed handling and moving equipment
3. Management time to locate and order best feed buys.
4. Inventory control to avoid running out of feed and make sure feeds are used up rapidly enough to prevent spoilage and deterioration losses.

RELATIVE FEED VALUES

FILE: RELFEEDG  
DATE: 4/7/92

These constants are derived from the 1978 NRC Dairy Requirements utilizing net energy and crude protein. Reference feeds are soybean meal, 44% crude protein, solvent and ground, shelled corn at 15% moisture. Variations will be specified.

CORN PRICE (\$/ton): 85.70  
SBM-44 PRICE(\$/ton): 200.00

Ingredient	Dry Matter (%)	-----Dry Matter-----		Net Energy Factor (per cwt.)	-----Constants-----		Value (\$/ton)
		Crude Protein(%)	NEL (Mcal per cwt.)		% SBM	% Corn	
***** GRAINS-CONCENTRATES *****							
Alfalfa pellets, 17%	93	19.70	63.49	75.46	0.3309	0.4371	103.63
Barley	89	13.90	86.62	98.52	0.1111	0.8786	97.51
Barley-90% d.m. (1)	90	13.90	86.62	99.63	0.1123	0.8885	98.60
Barley, malted *	91	15.80	88.00	102.34	0.1578	0.8719	106.29
Barley screenings *	92	12.00	72.00	84.19	0.1063	0.7399	84.66
Barley needles *	94	14.00	82.00	98.08	0.1325	0.8537	99.66
Bakery waste, dried	92	11.90	93.42	109.83	0.0448	1.0553	99.40
Beans, navy	90	25.40	86.62	99.63	0.3999	0.6126	132.48
Beet pulp, dried	91	8.00	81.18	94.41	-0.0207	0.9639	78.47
Brewers dried grains *	92	26.00	75.00	88.18	0.4564	0.4439	129.32
Brewers wet grains, 30% C.P. *	21	30.00	80.00	21.47	0.1243	0.0954	33.04
Blood meal *	92	87.20	68.00	79.95	2.0403	-1.1580	308.82
Canola meal, 38%, sol *	92	44.00	78.00	91.70	0.9082	0.0457	185.56
Carrots, fresh	12	10.10	85.71	13.14	0.0026	0.1289	11.57
Corn cobs, grnd	90	2.80	46.71	53.72	-0.0569	0.5918	39.34
Corn, ear, 15% moist (1)	85	9.30	83.45	90.65	0.0056	0.9011	78.34
Corn, ear, HM *	70	9.30	87.00	77.83	-0.0029	0.7810	66.35
Corn, flaked, 14% moist (1) *	86	10.00	93.00	102.21	-0.0024	1.0244	87.30
CORN, SHELLED, GR., 15% MT (1)	85	10.00	92.06	100.00	0.0000	1.0000	85.70
Corn, shelled, 11% moist	89	10.00	92.06	104.71	0.0000	1.0470	89.73
Corn, shelled, HM *	70	10.00	93.00	83.19	-0.0020	0.8338	71.06
Corn screenings (variable) *	88	10.00	89.00	100.09	0.0081	0.9930	86.73
Corn gluten feed, dried	90	25.00	85.71	98.58	0.3924	0.6093	130.69
Corn gluten feed-21, dried *	90	21.00	85.71	98.58	0.2923	0.7053	118.91
Corn gluten feed, moist *	42	21.00	88.00	47.23	0.1335	0.3442	56.20
Corn gluten feed, 50% d.m.*	50	24.00	88.00	56.23	0.2006	0.3698	71.82
Corn gluten meal, 60%	91	65.90	87.98	102.31	1.4247	-0.3437	255.48
Cottonseed, hulls	90	4.30	36.73	42.24	0.0078	0.4150	37.12
Cottonseed, whole	93	23.00	101.00	120.04	0.3108	0.9021	139.48
Cottonseed, whole *	91	22.00	102.00	118.62	0.2761	0.9212	134.18
Cottonseed meal, 41%,sol	93	44.80	78.00	92.70	0.9387	0.0264	190.01
Distillers grains, dried	92	29.50	87.98	103.44	0.5098	0.5452	148.69
Dist. grains w/sol, dried	92	29.80	92.06	108.24	0.5062	0.5967	152.37
Distillers grains, wet *	30	29.00	93.00	35.65	0.1575	0.2054	49.11
Fat, animal	99	0.00	238.09	301.22	-0.7114	3.6946	174.35
Fish meal, menhaden	92	66.60	76.64	90.11	1.4897	-0.5282	252.68
Grain screening (variable)	92	15.60	66.67	78.38	0.2137	0.5788	92.34
Hominy feed	91	11.80	96.60	112.34	0.0331	1.0916	100.16
Linseed meal, 34%, sol	91	38.60	78.91	91.77	0.7593	0.1892	168.07
Malt sprouts *	94	28.10	74.00	88.89	0.5240	0.3862	137.90
Meat and bone meal, 50%	93	54.10	74.38	88.40	1.1892	-0.2569	215.82

Ingredient	D. M.	C. P.	NEI	NEI Factor	Protein	Energy	Value
Molasses, beet	77	8.70	78.00	76.75	0.0049	0.7628	66.35
Molasses, cane	75	4.30	74.38	71.29	-0.0788	0.7884	51.82
Molasses, cane, dehy	96	10.70	69.84	85.68	0.0831	0.7771	83.21
Oats, 32-36 lb/bu *	90	13.00	68.00	78.21	0.1404	0.6474	83.56
Oats, >36 lb/bu	89	13.60	78.91	89.75	0.1244	0.7782	91.56
Oat hulls *	92	3.90	34.00	39.97	0.0053	0.3947	34.88
Oat, cereal by-product *	91	16.20	96.60	112.34	0.1443	0.9849	113.27
Oil, vegetable *	100	0.00	238.00	304.15	-0.7183	3.7305	176.04
Peanut meal, 45%, sol	92	54.20	79.82	93.84	1.1639	-0.1782	217.51
Potato tubers, fresh	25	9.60	82.09	26.23	0.0047	0.2577	23.03
Potato byproduct *	16	10.50	82.00	16.77	0.0071	0.1609	15.20
Rice bran *	91	14.10	73.00	84.89	0.1560	0.6992	91.13
Rye, grain	88	13.80	83.45	93.85	0.1158	0.8273	94.06
Safflower meal, 42%, sol	92	46.90	76.00	89.35	0.9879	-0.0542	192.93
Sorghum-milo, grain	88	11.70	83.45	93.85	0.0644	0.8766	88.01
Soybean hulls	91	12.00	81.18	94.41	0.0805	0.8668	90.38
Soybeans, seeds *	90	42.80	96.00	110.41	0.8096	0.3274	189.97
Soybeans, seeds, heat trt *	92	42.20	99.00	116.39	0.8039	0.3927	194.43
Soybean screenings *	91	29.66	89.00	103.39	0.5050	0.5494	148.07
SOYBEAN MEAL, 44%, sol	89	49.60	84.35	95.94	1.0000	0.0000	200.00
Soybean meal, 48%, sol	89	54.00	84.35	95.94	1.1088	-0.1044	212.81
Sunflower meal, 28% *	89	30.98	48.00	54.84	0.6401	-0.0657	122.38
Sunflower meal, 45%, sol	93	50.30	66.67	79.24	1.1127	-0.2751	198.95
Urea, 45% N *	99	281.00	0.00	0.00	7.7298	-7.4158	910.43
Wheat, grain	89	14.40	92.06	104.71	0.1088	0.9426	102.55
Wheat bran	89	18.00	72.10	82.00	0.2515	0.5788	99.89
Wheat middlings	90	18.70	83.45	95.98	0.2410	0.7286	110.63
Wheat millrun	90	17.00	76.64	88.15	0.2169	0.6733	101.09
Whey, dried	93	14.00	81.18	96.48	0.1339	0.8363	98.45
Whey, 7% solids *	7	14.20	82.00	7.34	0.0103	0.0635	7.50
Whey permeate*	7	0.50	75.00	6.71	-0.0149	0.0814	4.00
Yeast, brewers, dried	93	48.30	81.18	96.48	1.0203	-0.0140	202.85
Other	0	0.00	0.00	0.00	0.0000	0.0000	0.00

LEGEND:

(1) Adjusted dry matter

\* Source other than NRC



# *Dairy Update*

## ALTERNATIVE FEEDSTUFFS FOR DAIRY

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Vern Oraskovich  
Agriculture Extension Agent  
Carver County

James G. Linn  
Extension Animal Scientist  
Dairy Nutrition

As dairy herds get larger and feeding systems change, there is an increased interest in using alternative or by-product feedstuffs to improve ration quality, reduce cost, take advantage of local by-products, and provide for flexibility within the dairy feeding system. Producers, consultants, and educators must be knowledgeable in the characteristics of alternative feeds and know the availability, limitations, and recommendations of each product. This paper provides feeding guidelines for several alternative feeds. Nutrient content of the feeds shown in the table are average values. Analysis of an alternative feed is recommended before feeding as nutrient contents can be quite variable. Alternative feeds are listed alphabetically with no preference indicated for a particular feed.

### **Bakery By-Products**

- Consists of various combinations of bread, crackers, cookies, cakes, doughnuts, usually dried and ground together.
- Higher in energy than corn, but very low in fiber.
- Restrict to not more than 25% of grain ration or 8 pounds per head per day.
- Tends to depress fat when fed at high levels.
- Salt content variable, generally 1-3%.
- Highly palatable.

### **Barley Grain**

- 95% of the energy of corn.
- Should be ground or rolled for maximum utilization.
- Can vary in nutrient content depending on source and growing conditions.
- Protein may vary from 7 to 13%.
- Light weight barley is higher in fiber, less digestible, and lower in energy.
- Palatable but dry, ground or rolled barley can be floury, decreasing palatability.
- Safe to feed up to 50% of the grain portion of diets. May go higher with caution.

### **Beet Pulp**

- Residue from manufacturing sugar from sugar beets.
- Molasses sometimes mixed with pulp before drying.
- Available in shredded and pelleted form.
- Contains 80% energy in corn.
- Fiber ranges from 15 to 20%.
- Highly palatable.
- Can be fed up to 7 pounds per head per day.

### **Blood Meal**

- Very high protein - 80 to 85% CP.
- Good source of undegradable protein (80% of CP).
- Excellent source of amino acids lysine and methionine.
- Not highly palatable, best fed in a TMR.
- Limit to .5 pounds per head per day.
- Feed at high production levels.

### **Brewers Condensed Solubles**

- Condensed liquid by-product of brewing beer.
- Dry matter content varies from 20 to 50%.
- Protein content variable; as high as 25%.
- Not stable. Tends to ferment, expand rapidly.
- Use of propionic acid (3 pounds/ton) helps preserve.
- On DM basis is similar to corn in feed value.
- Low in fiber and calcium, moderately low in protein, high in energy.
- Very palatable.
- Feed at 10 to 20 pounds per head per day.
- Do not feed free choice.

### **Brewers Grains, Dried**

- By-product from brewing beer.
- Medium protein feed with 75% energy of corn.
- Source of undegradable intake protein (50% of CP).
- Rather bulky and dusty, reduces palatability.
- Should not make up more than 25% of concentrate fed.
- Can be fed up to 9 pounds per head per day -- milking cows.
- Low in sodium and potassium.

### **Brewers Grains, Wet**

- By-product of beer brewing.
- Medium energy, medium protein, high fiber.
- Can supply up to one-half of supplemental protein.
- Limit to less than 40 pounds per head per day -- milking cows.
- High moisture is limiting factor.
- Do not feed to calves less than four months of age.
- Limit to 20% of ration DM.
- Can be stored up to seven days in warm weather.
- Mineral balance of diet important.

### **Candy Products**

- By-products of the candy industry.
- Analysis will vary depending on source.
- Low in protein but high in energy and fat.
- Limit to 5 pounds per day; equivalent to one pound of supplemental fat.
- Highly palatable.

### **Corn Gluten Feed, Dry**

- By-product of corn starch and corn syrup processing.
- Medium protein feed.
- Energy level comparable to barley.
- Protein highly degradable (77% of CP).
- Medium palatability.
- Include up to 50% of grain mixture, or up to 12 pounds per cow per day.

### **Corn Gluten Feed, Wet**

- By-product of wet corn milling process for corn starch and corn syrup.
- On DM basis, medium protein feed; energy similar to barley.
- Palatable.
- Can be included in ration up to 25% of DM intake or 30 pounds per head per day.

### **Corn Gluten Meal**

- By-product of manufacture of corn starch and corn syrup.
- Very high in protein - 60%.
- Slightly more energy than corn.
- Source of undegradable intake protein (41% of CP).
- Not very palatable.
- Include in grain mixes up to 15%.
- Limit to not more than 5 pounds per cow per day.

### **Cottonseed Meal**

- By-product of extraction of oil from cottonseed.
- Alternative processes may result in varying oil content in meal.
- Palatable.

### **Cottonseed Meal (continued)**

- Has about 90% energy of soybean meal.
- Contains gossypol but not in high enough levels to affect cows.
- Can replace all soybean meal in ration when economics dictate.

### **Cottonseed, Whole**

- Moderate protein, high fat, fiber, and energy.
- Linted cottonseed referred to as "fuzzy"; lint removed "delinted."
- Delinted slightly higher in fat and protein.
- Feeding of acid delinted cottonseed not recommended.
- Whole cottonseed may replace some forage fiber in milking cow diets.
- Feed at 3 to 7 pounds per head per day.

### **Distillers' Grains, Dried With Solubles**

- Fermentation by-product of alcohol production.
- Type of grain may vary but generally included in the name.
- Medium protein feed.
- Same energy value as corn.
- Crude protein, fat, color, texture highly variable.
- Crude protein normally varies between 26 and 32%.
- Fat varies between 3 and 11%.
- Source of undegradable intake protein.
- Very palatable.
- Safe to feed at relatively high levels; 15 to 40% of concentrate mix.
- Must be aware of potential heat damage (ADIN).
- Not recommended for usage in high corn silage-corn grain diets.

### **Fats**

- Source of concentrated energy--2.25 times the energy of carbohydrates.
- Unsaturated fats (vegetable oils) tend to lower milk fat test.
- Saturated fats--animal or animal vegetable blends.
- Increase calcium and magnesium levels in diet to 1.0 and .3% respectively.
- Several "dry fat" forms available commercially; referred to as inert fats.
- Generally feed up to one pound per head per day from each source, unsaturated, saturated and inert fats.

### **Feathers, Poultry, Hydrolyzed**

- By-product of hydrolyzing clean, undecomposed feathers from poultry slaughter.
- Hydrolyzation process affects protein availability.
- Source of undegradable intake protein (69% of CP).
- Not palatable.
- High in protein, moderate in energy.
- Introduce into ration gradually.
- May be fed up to 1.5 pounds per head per day.

### **Fish Meal**

- By-product of fish processing.
- Good amino acid balance.
- Excellent source of undegradable protein.
- Contains high levels of amino acids lysine and methionine.
- Introduce gradually into ration.
- Not highly palatable, best fed in TMR.
- Feed up to 1.0 pounds per head per day.
- Feed at high production levels.

### **Hominy Feed**

- By-product of manufacture of corn for human consumption.
- Slightly more energy and protein than corn.
- Fat content may vary depending on manufacturing process (5-12%).
- Very palatable.
- Can be included in ration at high levels, similar to corn.
- Source of undegradable intake protein (65% of CP).

### **Linseed Meal**

- By-product of extracting oil from flaxseed.
- High in protein.
- Contains somewhat less TDN than soybean meal.
- Good source of selenium.
- May be included in grain mix up to 25%.
- May be fed up to 9 pounds per day.

### **Lupin Seeds**

- Lupin is an oilseed from an annual cool season legume.
- Level of alkaloids determine bitterness of beans; above .5% are bitter.
- Sweet lupins (less than .03 percent alkaloids) preferred for feeding.
- Protein low in amino acids methionine and cystine.
- Highly degradable source of protein - 80% of CP.
- Do not use as only protein source. Best when fed with soybean meal; 50% lupins and 50% soybean meal.
- Feed at rate of up to 4 pounds per head per day.
- Should be rolled or ground before feeding.

### **Malt Sprouts**

- By-product of barley in the beer industry.
- Should contain at least 24% protein.
- Medium protein, medium energy, and high fiber feed.
- Has about 82% TDN of corn.
- Limit to not more than 20% of high producing cow rations.
- Product may be dusty, thus reducing palatability.

### **Meat and Bone Meal**

- Dried and rendered product from animal tissues.
- Source of undegradable protein.
- High in calcium and phosphorus.
- Good source of amino acid, lysine.
- May be included in grain mix up to 5%.
- Feed up to 1.5 pounds per head per day.
- Not palatable, best fed in TMR.
- Introduce gradually.
- High in protein - 50% CP.

### **Molasses, Cane**

- By-product of manufacture of sugar from sugar cane.
- Highly palatable.
- Used for flavor and control of dustiness in rations.

### **Rapeseed Meal (Canola Meal)**

- By-product produced during the extraction of oil from rapeseed.
- Canola meal can replace soybean meal in diets.
- Protein is highly degradable.
- Recommend feeding in combination with less degradable proteins in high producing cow rations.
- Full fat canola seeds can be fed up to 3.5 lbs. per cow per day or 12% of grain ration.

### **Soybean Meal**

- By-product remaining after extracting oil from soybeans.
- Depending on process (expeller or solvent), meal may be 44 or 48%.
- Protein from expeller process is less degradable than solvent process.
- High in protein and energy.
- Most commonly used protein source.
- Highly palatable.

### **Soy Hulls**

- By-product of soybean processing for oil and meal.
- Palatable, but tends to be bulky limiting DM intake.
- Contains high level of very digestible fiber.
- Slightly more TDN than beet pulp or oats, 88% of corn.
- Can be included up to 45% of grain mix.
- Can be fed up to 14 pounds per cow per day.
- Used in rations to replace carbohydrates from starch.
- High in ADF and NDF.

### **Soybeans**

- High protein, high energy, high fat feed.
- Feed up to 5 pounds per head per day.
- May be included in grain mix up to 20%.
- Recommend grinding or rolling before feeding.

### **Soybeans (continued)**

- Do not store ground or rolled bean more than one week--rancidity.
- Do not feed with urea source unless beans are heat treated. Heating destroys urease.
- Properly heat-treated beans are excellent source of undegradable intake protein.

### **Sunflower Meal**

- By-product remaining after extraction of oil from seeds.
- Fiber may vary depending on amount of hull in the meal.
- Increased hulls reduces protein and energy and increases fiber.
- Somewhat less palatable than soybean meal.
- May be used as major protein supplement.

### **Sunflower Seeds, Whole**

- Two varieties: oil seed and confectionery.
- Oil seeds contain about 40% fat, confectionery about 20%.
- Quite palatable.
- Can be included up to 15% of grain mix.
- Feed at a rate equaling 1 pound of fat intake.
- Excellent energy and fiber source.

### **Whey**

- Liquid portion of milk separated from curd during cheese making.
- Sweet whey (from cheddar and mozzarella process) has pH of 6.0.
- Acid whey (from process of cottage cheese) has pH of 4.6.
- Acid levels of both whey products drops to about 3.5 in two days.
- Corrosive--store in suitable holding tank.
- Should be delivered fresh daily.
- Whey over 36 hours old and of low pH is not as palatable as fresh product.
- Cows adapt to product slowly.
- Once accustomed, cows will consume about 2/3 of their normal water intake as whey.
- On DM basis whey is similar to corn in TDN; contains 1/3 more protein.
- Feeding whey increases urine output.

Combinations of alternative feedstuffs can work well in the diets of lactating cows. Nutrient requirements of the cow, economics of using alternative feeds, availability, quality of product, and acceptance by the cow must be primary concerns. Diets must be formulated based on contributions of individual feeds, forage source, and limiting factors within feedstuffs. Listed below are nutrient components of various feedstuffs.

### ALTERNATIVE FEEDSTUFFS\*

Feed	Nutrient Content, Dry Matter Basis					
	NEL Mcal/lb	CP %	UIP % CP	EE %	NDF %	ADF %
Bakery By-product	.94	10.7	20		13	18
Barley, Grain	.88	13.0	21	2.2	19	7
Beet Pulp	.81	9.7	30	.6	54	33
Blood Meal	.68	87.2	82	1.4		
Brewers Condensed Sol.	.89	9.0		1.0	1	1
Brewers Grains, Dried	.68	25.4	49	6.5	46	24
Brewers Grains, Wet	.70	26.0	34	5.0	42	23
Candy Product	1.00	8.5		24.4	11	6
Corn Gluten Feed, Dry	.87	25.6	23	2.4	45	12
Corn Gluten Feed, Wet	.87	21.1		3.8	44	16
Corn Gluten Meal (60%)	.94	67.2	55	2.4	14	5
Cottonseed Meal	.74	44.8	41	1.7	28	21
Cottonseeds, Fuzzy	1.01	23.0	45	20.0	44	34
Distillers Grains w/Sol.	.93	25.0	62	10.3	44	18
Fat (Animal)	2.65			99.5		
Feather Meal, Hydrolyzed	.70	92.4	69	3.2		18
Fish Meal	.76	66.7	80	10.5		
Hominy Feed	.91	11.5	65	7.7	55	13
Linseed Meal	.79	37.4	44	1.6	25	19
Lupin Seeds	.86	35.5	20	10.0	24	20
Malt Sprouts	.72	27.6		1.5	46	18
Meat and Bone Meal	.76	54.1	60	13.7		
Molasses, Cane	.74	4.0	0	0	0	0
Rape Seed Meal (Canola)	.71	40.6	22	1.8	27	16
Soybean Meal	.88	49.9	30	1.5	14	10
Soy Hulls	.80	12.1	30	2.1	67	50
Soybean Seeds	.96	42.8	20	18.8	13	10
Sunflower Meal	.67	49.8	26	3.1	39	21
Sunflowers, Whole	1.25	19.8		44.0		38
Whey (dehyd)	.85	14.2	10	0.7	0	0

\*Abbreviations: NE = Net Energy-lactation; CP = Crude Protein; UIP = Undegraded Intake Protein; % of CP, EE = Ether Extract or fat; NDF = Neutral Detergent Fiber; ADF = Acid Detergent Fiber.

Adapted from Alternative Feeds for Dairy and Beef, Feeds and Feed Ingredients, and Bypass Protein in Dairy Rations, 1989 NRC Requirements for Dairy Cattle