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Alternative Energy and Protein Sources for Feeding Beef Cattle

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Sharp increases in the price of common feeds such as corn and soybean meal periodically push cattle feeders to consider less common alternatives for feedlot diets.

Besides local availability and price, other factors, including but not limited to, processing, maximum feeding rates, and nutrient composition, must be considered when deciding whether or not alternative feeds are a good buy.

The following are some less common feeds and a discussion of their characteristics that would affect their use in growing and finishing diets for cattle.

Grains

Millet

Millet grown for grain in the U.S. is principally of two varieties: pearl and proso. Pearl grows in the southeast, but proso is grown mostly in the Dakotas, Nebraska, and Colorado. Proso millet is also known as "common," "hog," and "broomcorn" millet.

Little is known about the feeding value of proso millet in cattle diets. It is typically higher in fiber and protein than corn. As with other grains, proso is almost devoid of calcium, but it has a moderate amount of phosphorus. Diets should be balanced to take these factors into account. For example, less supplemental protein is needed if replacing corn, but little alteration of the diet is necessary if replacing barley.

Studies from North Dakota showed that proso at 52 lb/bu is comparable to barley at 39 lb/bu in high-grain diets. Because of the low test weight of the barley, this would suggest that proso millet has about 85% of the energy of corn. Nebraska research found millet (presumably proso) was equal to corn in finishing diets when included at up to 50% of the grain. Energy value declined by about 10% when fed as 75 and 100% of the grain in the diet.

Grinding through a 1/4-inch screen appears to be adequate to achieve this level of digestibility. Proso would be poorly utilized without grinding.

Proso millet can be fed as the sole grain in growing diets, but limiting it to half of the grain in finishing diets will probably result in better performance.

Rye

Although relatively little rye is grown in the U.S., South Dakota produces more than any other state. As a result, feed grade rye is available at times for feeding to livestock.

Nutrient composition of rye is similar to that of wheat. Rye's higher protein content results in less supplemental protein being needed when fed in place of corn. Rye is low in calcium and moderate in phosphorus, similar to other grains.

It also contains a variety of compounds (e.g. resorcinols) that can reduce intake and cause digestive problems. Rye is especially susceptible to ergot infection during wet growing seasons. Ergot can reduce feed intake and weight gain of cattle at levels as low as .06% of the diet. More severe cases result in gangrene with ultimate loss of tail, ears, etc.

It is important to know what the ergot levels are and keep them low and to keep rye at or below 50% of the diet if problems are to be avoided.

Rolling or grinding is necessary for adequate digestion. However, despite starch and fiber contents like wheat, digestibility of rolled rye is closer to that of rolled barley.

Triticale

Triticale is a cross between durum wheat and rye, generally higher in protein than either parent grain but extremely variable (12 to 18%, avg. 15%). It is also higher in fiber. Calcium and phosphorus levels are similar to those of other grains (Ca .06%, P .33%).

Replacement of milo, barley, or corn with triticale has resulted in similar diet digestibilities. Feedlot growth studies, on the other hand, have been inconsistent.

When triticale has compared poorly to these grains, it has usually been associated with reduced intake. The reduced intake may have been due in some cases to ergot infection (triticale is almost as susceptible to infection as rye) but acidosis is also likely.

In studies from Texas and Alabama, abscesses were found in 50 to 65% of the livers of triticale fed cattle, compared to 42% when fed wheat and 0 to 15% when fed corn. This is also supported by research from Georgia which found significantly lower ruminal pH of triticale fed heifers compared to those fed corn diets. When feed intake was not depressed, triticale supported performance similar to that of corn, even when fed at up to 59% of the diet.

Triticale should be fed like wheat. Processing is necessary. It may be wise to limit triticale to half of the grain in a finishing diet to reduce the risk of acidosis. It can be used as the sole grain in growing diets.

With good feeding management the energy value of triticale will be comparable to corn. Diets should be formulated to take advantage of triticale's high protein content.

Buckwheat

Common buckwheat is grown mainly for human consumption. On occasion, rejected buckwheat may be available for livestock feeding. However, almost no research has been conducted on its feeding value for cattle.

Buckwheat is not a true cereal grain, but they have several characteristics in common. Buckwheat protein content varies between 11 and 14% of dry matter. Calcium is higher than that of other grains (.11%), while phosphorus is similar (.36%). Crude fiber content is comparable to that of oats (12 to 14%), but fat is very low (2.8%).

Buckwheat must be ground before feeding. It appears to be unpalatable and contains a compound, fagopyrin, that causes photosensitivity. Light colored areas of the skin on affected animals can become irritated and develop lesions. Consequently, buckwheat should be limited to 25% or less of the diet.

Canadian work showed that tartary buckwheat has about 85% the available energy of steam-rolled barley when fed to steers at about 25% of diet dry matter with the balance of the diet being corn silage. Although slightly lower in fiber, the energy value of common buckwheat typically grown in the northern plains is likely not any higher.

Emmer/spelt

Emmer and spelt are close relatives of wheat and are grown to a limited degree in the northern plains. They are comparable to wheat in protein (about 13.3% of dry matter) and phosphorus (.42%) but higher in calcium (.14%) and crude fiber (10.2%). Energy value is similar to that of oats. However, if much of the hull is removed during harvest, the energy value is closer to barley.

Emmer and spelt must be processed for adequate digestion. Apparently no work has been done to determine maximum level in cattle diets. Feeding guidelines appropriate for oats are probably applicable to emmer and spelt.

Grain screenings

Composition of screenings derived from grains during cleaning is highly variable. Screenings can contain materials such as light or broken grain seeds, weed seeds, hulls, chaff, and elevator dust. As a result, nutrient content is also highly variable.

While grain screenings can contain energy similar to that of oats or even barley, screenings could just as likely have an energy level that is closer to straw. Likewise, protein can vary from 5 to 15%.

Grain screenings can be an economical substitute for a portion of the grain in cattle diets. However, some caution is warranted. Intact weed seeds passing through the animal can increase weed problems when manure is applied to land. Storing manure at least 3 months prior to spreading should help reduce that problem. Processing will also reduce viable weed seed content.

Mold toxins also tend to be concentrated in screenings. Any mold problems (e.g. ergot, aflatoxin, etc.) that are noticed when the grains are being cleaned should make the screenings suspect.

Dustiness of the screenings can also reduce feed intake if included at high levels in the diet.

Grain screenings should be analyzed for protein, fiber, and ash. High fiber content usually means low energy content. Energy level of the screenings will generally determine how much grain or roughage they can replace.

For example, if neutral detergent fiber (NDF) is only 19%, 1 lb of screenings could replace 1 lb of barley; if NDF is 60% it would take about 2 lb). High ash (greater than 4%) will also dilute energy content.

Screenings consisting primarily of small, intact grain or weed seeds should be processed. Levels up to 25% of the diet dry matter should not reduce performance.

Oil Seeds

Canola

Canola is a variety of rape. It is grown in the northern plains and Canada primarily for its oil content. The remaining meal is marketed as a protein supplement for livestock. Full-fat canola seed can also be fed to cattle.

Full-fat canola seed is high in oil (about 40%) and protein, although the latter is variable (20 to 30%). Calcium and phosphorous levels are rather high as well (.43 and .89%, respectively).

Canola was genetically designed to contain lower levels of the anti-nutritional factors (erucic acid and glucosinolates) found in rape.

However, the high oil level limits the amount that can be included in the diet. Alberta research with dairy cows indicates that the optimum level of full-fat canola seed is around 5% of diet dry matter. Higher levels appear to depress digestion, especially of fiber.

Seeds should be cracked or crushed but not ground, minimizing this negative effect. It appears, from dairy cow performance data and nutrient composition, that full-fat canola has about 20% more energy than corn.

Flax (linseed)

Flax, like canola, is grown for its oil content, which represents about 38% of the seed weight. The meal has been fed to livestock, usually cattle and sheep.

Full-fat flax seed, however, has not commonly been used as feed. Little work has been done to evaluate its use in cattle diets.

In addition to being high in oil, full-fat flax seed is moderate in protein (25%), calcium (.23%), and phosphorus (.53%). It needs to be processed like canola before feeding and probably should be limited to no more than 5% of the diet dry matter because of its oil content.

Based on composition, available energy content of full-fat flax seed is probably about 35% greater than corn. This has apparently not been verified in cattle feeding studies.

Soybeans

Soybeans are grown throughout the midwest and, for a variety of reasons (e.g. immaturity, etc.), may at times be an economical feed for cattle.

Mature full-fat soybeans are lower in oil than canola or flax (18 to 20%). Immature beans are even lower (12 to 18%) which, in turn, reduces their energy content. Protein, on the other hand, does not change greatly with degree of maturity (about 36%). Calcium and phosphorus levels are moderate (.27 and .65%, respectively).

Because of their size, soybeans do not need to be processed before feeding to cattle. Chewing appears to be adequate. Although anti-nutritional factors (e.g. trypsin inhibitor) are still present, oil content is the first-limiter of full-fat soybean level in the diet. They should be kept at less than about 8% of the diet dry matter.

Mature full-fat soybeans have an available energy content similar to that of corn. South Dakota research suggests immature beans with lower oil content have about 84% the energy value of corn.

Pricing Alternative Feeds

There are several approaches that can be used to compare the economic value of alternative feeds. The simplest is to calculate the cost per unit of nutrient provided. For example, protein from soybean meal (44% protein) at $250/ton would cost $.28/pound.

2000 lb x .44 = 880 lb protein/ton SBM

$$\frac{\$250/\text{ton of SBM}}{880 \text{ lb protein/ton}} = \$.28/\text{lb. protein}$$

Therefore, if the alternative feed is 30% protein, its breakeven value per ton compared to soybean meal is $168.

2000 lb x .30 = 600 lb protein/ton alt. feed

600 lb protein x $.28/lb.protein = $168/ton of alt. feed

While this approach is quick and easy, it is appropriate only when the alternative feed is needed to fix an imbalance of a single nutrient. For example, dry cows in good condition, not cold stressed, and consuming mature hay containing 6% protein would be short of protein but consuming adequate energy once the protein deficiency is corrected. Extra energy would be of little benefit.

However, for dry cows coping with cold stress, lactating cows, and growing/finishing cattle, both energy and protein will be of value and should be considered when pricing alternative feeds. Attached are tables with breakeven prices (per cwt dry matter) for alternative feeds varying in protein and energy content. These values are equal to the cost of corn and soybean meal necessary to supply the same energy and protein as 100 lb (dry matter) of the alternative feed.

For example, to price an alternative feed containing 60 mcal NEg and 20% protein when corn and soybean meal cost $2.50/bu and $200 per ton, respectively:

1. Find the table containing the energy and protein content of the alternative feed to be priced (on the top of each table).

2. Follow the row representing $2.50 corn and $200 soybean meal (indicated at the left of the table) across to where it intersects with the column representing 20% protein (note: you will need to interpolate for prices, protein, and energy values not listed).

3. The price shown is $6.17/cwt of dry matter. This price must be corrected to an "as fed" basis by multiplying by its percent dry matter. Percent dry matter can be found in feed analysis tables such as the one here or from laboratory analyses. If the alternative feed is 86% dry matter, then:

$6.17 x .86 = $5.31 per cwt "as fed"

$5.31 per cwt is the most you could afford to pay for the alternative feed under these circumstances.

You should remember, however, that if the prices used for corn and soybean meal are "into the bunk" (including freight, shrink, processing, etc.), then what you could pay for the alternative feed must be corrected for these costs as well.

One limitation of the second approach is that the results are tied to the price of only corn and soybean meal.

For many situations this may not be a problem, and it certainly provides a good starting point for pricing alternative feeds. However, other competing feeds are often available and can affect the result.

A computerized "least-cost" comparison has the advantage over the other two approaches of being able to give credit for multiple nutrients provided by a feed (e.g. protein, NPN, energy, minerals, etc.) and can compare many feeds simultaneously. Most Extension personnel, feed companies, and nutrition consultants use least-cost formulation software and can provide these services.

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Alternative feeds varying in protein and energy content with breakeven prices (per cwt dry matter).

NEg 50 Mcal/CWT DM

CORN $/BU	SBM $/TON	CRUDE PROTEIN % OF DM 10	15	20	25	30	35	40
2.00	150	3.21	3.79	4.37	4.96	5.54	6.12	6.76
	200	3.40	4.33	5.26	6.19	7.11	8.04	9.01
	250	3.60	4.87	6.14	7.42	8.69	9.96	11.26
	300	3.79	5.41	7.03	8.65	10.26	11.88	13.51
2.50	150	3.86	4.33	4.80	5.27	5.74	6.21	6.76
	200	4.06	4.87	5.69	6.50	7.32	8.13	9.01
	250	4.25	5.41	6.57	7.73	8.89	10.05	11.26
	300	4.45	5.95	7.46	8.96	10.47	11.97	13.51
3.00	150	4.52	4.88	5.23	5.59	5.94	6.30	6.76
	200	4.71	5.42	6.12	6.82	7.52	8.22	9.01
	250	4.91	5.96	7.00	8.05	9.09	10.14	11.26
	300	5.11	6.50	7.89	9.28	10.67	12.06	13.51
3.50	150	5.17	5.42	5.66	5.90	6.15	6.39	6.76
	200	5.37	5.96	6.55	7.13	7.72	8.31	9.01
	250	5.57	6.50	7.43	8.36	9.30	10.23	11.26
	300	5.76	7.04	8.32	9.59	10.87	12.15	13.51

NEg 55 Mcal/CWT DM

CORN $/BU	SBM $/TON	CRUDE PROTEIN % OF DM 10	15	20	25	30	35	40
2.00	150	3.41	3.99	4.58	5.16	5.74	6.32	6.91
	200	3.56	4.49	5.41	6.34	7.27	8.19	9.12
	250	3.71	4.98	6.25	7.52	8.79	10.06	11.34
	300	3.85	5.47	7.09	8.70	10.32	11.93	13.55
2.50	150	4.16	4.63	5.10	5.56	6.03	6.50	6.97
	200	4.30	5.12	5.93	6.74	7.56	8.37	9.19
	250	4.45	5.61	6.77	7.93	9.08	10.24	11.40
	300	4.60	6.10	7.60	9.11	10.61	12.11	13.62
3.00	150	4.90	5.26	5.61	5.97	6.32	6.68	7.04
	200	5.05	5.75	6.45	7.15	7.85	8.55	9.25
	250	5.19	6.24	7.28	8.33	9.38	10.42	11.47
	300	5.34	6.73	8.12	9.51	10.90	12.29	13.68
3.50	150	5.64	5.89	6.13	6.37	6.62	6.86	7.10
	200	5.79	6.38	6.97	7.55	8.14	8.73	9.32
	250	5.94	6.87	7.80	8.73	9.67	10.60	11.53
	300	6.08	7.36	8.64	9.91	11.19	12.47	13.75

NEg 60 Mcal/CWT DM

CORN $/BU	SBM $/TON	CRUDE PROTEIN % OF DM 10	15	20	25	30	35	40
2.00	150	3.62	4.20	4.78	5.36	5.95	6.53	7.11
	200	3.71	4.64	5.57	6.50	7.42	8.35	9.28
	250	3.81	5.08	6.36	7.63	8.90	10.17	11.44
	300	3.91	5.52	7.14	8.76	10.37	11.99	13.61
2.50	150	4.45	4.92	5.39	5.86	6.33	6.80	7.26
	200	4.55	5.36	6.17	6.99	7.80	8.62	9.43
	250	4.64	5.80	6.96	8.12	9.28	10.44	11.60
	300	4.74	6.24	7.75	9.25	10.75	12.26	13.76
3.00	150	5.28	5.64	5.99	6.35	6.71	7.06	7.42
	200	5.38	6.08	6.78	7.48	8.18	8.88	9.58
	250	5.48	6.52	7.57	8.61	9.66	10.70	11.75
	300	5.57	6.96	8.35	9.74	11.13	12.53	13.91
3.50	150	6.11	6.36	6.60	6.84	7.08	7.33	7.57
	200	6.21	6.80	7.39	7.97	8.56	9.15	9.74
	250	6.31	7.24	8.17	9.10	10.04	10.97	11.90
	300	6.40	7.68	8.96	10.24	11.51	12.79	14.07

Alternative feeds varying in protein and energy content with breakeven prices (per cwt dry matter).
Continued.

NEg 65 Mcal/CWT DM

CORN $/BU	SBM $/TON	10	15	20	25	30	35	40
		CRUDE PROTEIN % OF DM						
2.00	150	3.82	4.40	4.99	5.57	6.15	6.73	7.31
	200	3.87	4.80	5.72	6.65	7.58	8.50	9.43
	250	3.92	5.19	6.46	7.73	9.00	10.28	11.55
	300	3.96	5.58	7.20	8.81	10.43	12.05	13.66
2.50	150	4.74	5.21	5.68	6.15	6.62	7.09	7.56
	200	4.79	5.60	6.42	7.23	8.04	8.86	9.67
	250	4.84	5.99	7.15	8.31	9.47	10.63	11.79
	300	4.88	6.39	7.89	9.40	10.90	12.40	13.91
3.00	150	5.66	6.02	6.37	6.73	7.09	7.44	7.80
	200	5.71	6.41	7.11	7.81	8.51	9.21	9.91
	250	5.76	6.80	7.85	8.89	9.94	10.99	12.03
	300	5.80	7.19	8.59	9.98	11.37	12.76	14.15
3.50	150	6.58	6.82	7.07	7.31	7.55	7.80	8.04
	200	6.63	7.22	7.80	8.39	8.98	9.57	10.16
	250	6.68	7.61	8.54	9.47	10.41	11.34	12.27
	300	6.72	8.00	9.28	10.56	11.83	13.11	14.39

NEg 70 Mcal/CWT DM

CORN $/BU	SBM $/TON	10	15	20	25	30	35	40
		CRUDE PROTEIN % OF DM						
2.00	150	4.03	4.61	5.19	5.77	6.35	6.94	7.52
	200	4.03	4.95	5.88	6.81	7.73	8.66	9.59
	250	4.03	5.29	6.57	7.84	9.11	10.38	11.65
	300	4.03	5.64	7.25	8.87	10.49	12.10	13.72
2.50	150	5.04	5.50	5.97	6.44	6.91	7.38	7.85
	200	5.04	5.85	6.66	7.47	8.29	9.10	9.92
	250	5.04	6.19	7.35	8.51	9.67	10.82	11.98
	300	5.04	6.53	8.04	9.54	11.04	12.55	14.05
3.00	150	6.04	6.40	6.75	7.11	7.47	7.82	8.18
	200	6.04	6.74	7.44	8.14	8.84	9.54	10.25
	250	6.04	7.08	8.13	9.18	10.22	11.27	12.31
	300	6.04	7.43	8.82	10.21	11.60	12.99	14.38
3.50	150	7.05	7.29	7.54	7.78	8.02	8.27	8.51
	200	7.05	7.64	8.22	8.81	9.40	9.99	10.57
	250	7.05	7.98	8.91	9.84	10.78	11.71	12.64
	300	7.05	8.32	9.60	10.88	12.15	13.43	14.71

NEg 75 Mcal/CWT DM

CORN $/BU	SBM $/TON	10	15	20	25	30	35	40
		CRUDE PROTEIN % OF DM						
2.00	150	4.32	4.81	5.40	5.98	6.56	7.14	7.72
	200	4.32	5.11	6.03	6.96	7.89	8.81	9.74
	250	4.32	5.40	6.67	7.94	9.21	10.49	11.76
	300	4.32	5.69	7.31	8.93	10.54	12.16	13.78
2.50	150	5.40	5.80	6.27	6.73	7.20	7.67	8.14
	200	5.40	6.09	6.90	7.72	8.53	9.35	10.16
	250	5.40	6.38	7.54	8.70	9.86	11.02	12.18
	300	5.40	6.68	8.18	9.68	11.19	12.69	14.20
3.00	150	6.48	6.78	7.14	7.49	7.85	8.20	8.56
	200	6.48	7.07	7.77	8.47	9.18	9.88	10.58
	250	6.48	7.37	8.41	9.46	10.50	11.55	12.60
	300	6.48	7.66	9.05	10.44	11.83	13.22	14.61
3.50	150	7.56	7.76	8.01	8.25	8.49	8.73	8.98
	200	7.56	8.06	8.64	9.23	9.82	10.41	11.00
	250	7.56	8.35	9.28	10.21	11.15	12.08	13.01
	300	7.56	8.64	9.92	11.20	12.47	13.75	15.03

Alternative feeds varying in protein and energy content with breakeven prices (per cwt dry matter). *Continued.*

NEg 80 Mcal/CWT DM

CORN $/BU	SBM $/TON	CRUDE PROTEIN % OF DM 10	15	20	25	30	35	40
2.00	150	4.61	5.02	5.60	6.18	6.76	7.35	7.93
	200	4.61	5.26	6.19	7.12	8.04	8.97	9.90
	250	4.61	5.51	6.78	8.05	9.32	10.59	11.87
	300	4.61	5.75	7.37	8.98	10.60	12.22	13.83
2.50	150	5.76	6.09	6.56	7.03	7.50	7.97	8.43
	200	5.76	6.33	7.15	7.96	8.78	9.59	10.40
	250	5.76	6.58	7.73	8.89	10.05	11.21	12.37
	300	5.76	6.82	8.32	9.83	11.33	12.83	14.34
3.00	150	6.91	7.16	7.52	7.87	8.23	8.58	8.94
	200	6.91	7.40	8.10	8.81	9.51	10.21	10.91
	250	6.91	7.65	8.69	9.74	10.79	11.83	12.88
	300	6.91	7.89	9.28	10.67	12.06	13.45	14.85
3.50	150	8.06	8.23	8.47	8.72	8.96	9.20	9.45
	200	8.06	8.48	9.06	9.65	10.24	10.83	11.41
	250	8.06	8.72	9.65	10.58	11.52	12.45	13.38
	300	8.06	8.96	10.24	11.52	12.80	14.07	15.35

NEg 85 Mcal/CWT DM

CORN $/BU	SBM $/TON	CRUDE PROTEIN % OF DM 10	15	20	25	30	35	40
2.00	150	4.89	5.22	5.80	6.39	6.97	7.55	8.16
	200	4.89	5.42	6.34	7.27	8.20	9.12	10.09
	250	4.89	5.61	6.88	8.15	9.43	10.70	12.01
	300	4.89	5.81	7.42	9.04	10.66	12.27	13.94
2.50	150	6.12	6.38	6.85	7.32	7.79	8.26	8.75
	200	6.12	6.58	7.39	8.20	9.02	9.83	10.68
	250	6.12	6.77	7.93	9.09	10.25	11.41	12.61
	300	6.12	6.97	8.47	9.97	11.48	12.98	14.53
3.00	150	7.34	7.54	7.90	8.25	8.61	8.96	9.35
	200	7.34	7.74	8.44	9.14	9.84	10.54	11.27
	250	7.34	7.93	8.98	10.02	11.07	12.11	13.20
	300	7.34	8.12	9.52	10.91	12.30	13.69	15.13
3.50	150	8.56	8.70	8.94	9.19	9.43	9.67	9.94
	200	8.56	8.90	9.48	10.07	10.66	11.25	11.87
	250	8.56	9.09	10.02	10.95	11.89	12.82	13.80
	300	8.56	9.28	10.56	11.84	13.12	14.39	15.72

NEg 90 Mcal/CWT DM

CORN $/BU	SBM $/TON	CRUDE PROTEIN % OF DM 10	15	20	25	30	35	40
2.00	150	5.18	5.43	6.01	6.59	7.17	7.75	8.34
	200	5.18	5.57	6.50	7.43	8.35	9.28	10.21
	250	5.18	5.72	6.99	8.26	9.53	10.80	12.08
	300	5.18	5.86	7.48	9.10	10.71	12.33	13.95
2.50	150	6.48	6.67	7.14	7.61	8.08	8.55	9.02
	200	6.48	6.82	7.63	8.45	9.26	10.07	10.89
	250	6.48	6.96	8.12	9.28	10.44	11.60	12.76
	300	6.48	7.11	8.61	10.12	11.62	13.12	14.63
3.00	150	7.77	7.92	8.28	8.63	8.99	9.35	9.70
	200	7.77	8.07	8.77	9.47	10.17	10.87	11.57
	250	7.77	8.21	9.26	10.30	11.35	12.39	13.44
	300	7.77	8.36	9.75	11.14	12.53	13.92	15.31
3.50	150	9.07	9.17	9.41	9.66	9.90	10.14	10.38
	200	9.07	9.31	9.90	10.49	11.08	11.67	12.25
	250	9.07	9.46	10.39	11.32	12.26	13.19	14.12
	300	9.07	9.60	10.88	12.16	13.44	14.71	15.99

Alternative feeds varying in protein and energy content with breakeven prices (per cwt dry matter). *Continued.*

NEg 95 Mcal/CWT DM

CORN $/BU	SBM $/TON	CRUDE PROTEIN % OF DM 10	15	20	25	30	35	40
2.00	150	5.47	5.63	6.21	6.79	7.38	7.96	8.54
	200	5.47	5.73	6.65	7.58	8.51	9.44	10.36
	250	5.47	5.82	7.09	8.37	9.64	10.91	12.18
	300	5.47	5.92	7.54	9.15	10.77	12.39	14.00
2.50	150	6.84	6.97	7.44	7.90	8.37	8.84	9.31
	200	6.84	7.06	7.88	8.69	9.50	10.32	11.13
	250	6.84	7.16	8.32	9.48	10.63	11.79	12.95
	300	6.84	7.25	8.76	10.26	11.76	13.27	14.77
3.00	150	8.20	8.30	8.66	9.01	9.37	9.73	10.08
	200	8.20	8.40	9.10	9.80	10.50	11.20	11.90
	250	8.20	8.49	9.54	10.59	11.63	12.68	13.72
	300	8.20	8.59	9.98	11.37	12.76	14.15	15.54
3.50	150	9.57	9.64	9.88	10.12	10.37	10.61	10.85
	200	9.57	9.73	10.32	10.91	11.50	12.09	12.67
	250	9.57	9.83	10.76	11.69	12.63	13.56	14.49
	300	9.57	9.92	11.20	12.48	13.76	15.04	16.31

Average composition and energy values for selected feeds (dry matter basis)

Feed	*Dry Matter*	*Protein*	*Fat*	*Ca*	*P*	*TDN*	*NE_m*	*NE_g*
	%						Mcal/cwt	
Buckwheat	88	12.5	2.8	.11	.36	76	82.8	54.2
Canolaseed	93	25.0	40.0	.43	.89	104	120.0	85.4
Corn	88	10.1	4.2	.02	.35	90	101.8	70.5
Flaxseed	91	25.0	38.0	.23	.53	114	132.6	95.5
Millet, Proso	90	12.9	3.9	.03	.34	84	93.6	63.6
Rye	88	13.8	1.7	.07	.37	84	93.6	63.6
Soybeans, Immature	92	35.6	15.9	.27	.65	80	88.3	59.0
Spelt	90	13.3	2.1	.13	.42	75	81.4	52.9
Triticale	90	15.0	1.7	.06	.33	90	101.8	70.5