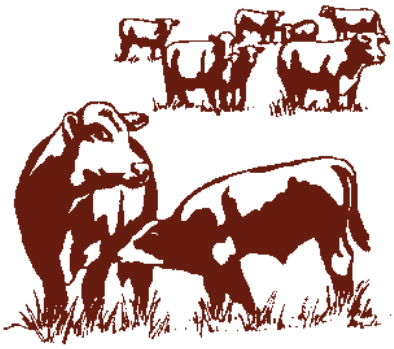
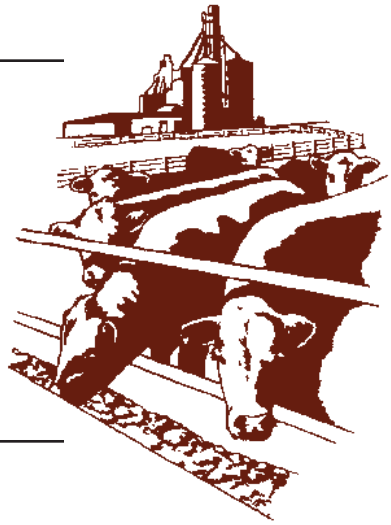


Beef Cattle Handbook



BCH-5056

Product of Extension Beef Cattle Resource Committee
Adapted from the Cattle Producer's Library

Value and Quality Assurance of Byproduct Feeds

Kathy H. Roy, Extension Educator, University of Idaho
Robert M. Kattnig, Assistant Livestock Specialist, University of Arizona

The beef cattle industry uses many nontraditional feeds, including byproducts from other agricultural industries. These feeds may provide important economic advantages in ration formulation. However, the nutritional quality of the feedstuff and freedom from harmful residues and toxins are also key components of the decision making process.

Cost

Actual byproduct cost is not the only factor to consider when feeding alternate feeds. There may be high labor, transportation, and storage costs associated with the feedstuff. Potatoes, for example, may have dry matter values as low as ten percent and be difficult and costly to transport. Many of the cull fruits and vegetables are difficult to store, resulting in a high rate of spoilage, which further increases the cost of the feed delivered to the feedbunk.

Factors Affecting Quality

Another difficulty associated with byproduct feeds is variation in composition, resulting in difficult ration quality control. Unlike traditional feeds, byproduct feeds do not have established nutrient values and other guidelines that can aid with assurance of a quality product. Therefore, it is important to have each feed periodically analyzed for its chemical composition. The analysis should include dry matter, protein, fiber, energy, minerals, harmful residues, and toxins.

A guaranteed analysis is sometimes provided by the seller. If it is not possible to obtain actual nutrient composition, tabulated data may prove a useful source of information. When using tabular values, keep in mind that feeds vary in their composition, sometimes by 10 - 15 percent.

All feedstuffs vary in the nutrient composition because of a variety of factors, including but not limited to year produced, source, moisture content, and milling and/or processing methods (Table 1). Of these factors, water content has the greatest effect on feed value. The amount of feed that can be ingested is limited by moisture content and rumen capacity among other factors. Beef cattle will consume about 1.5 - 3.0 percent of their body weight per day when feed is in a dry form.

Other factors affecting intake include feed quality, and the animal's sex, age, and physiological state. Thus, an animal may not be able to eat enough to fulfill its nutritional needs for growth and production. The result is poor performance and reduced production. The recommendation for producers is to limit high-moisture feeds to less than half of the total dry matter in the diet.

Chemical Residues

Another factor affecting quality of byproduct feeds is presence of chemical residues. Registered pesticides are often applied to crops that are sources of byproduct feeds. Some of these pesticides are explicitly labeled, stating that no part of the treated plant is to be used for livestock or human consumption. On the other hand, consumption of many feeds from pesticide-treated crops is allowed after a specified waiting period. If there are residues in the feed, there is a good possibility they will accumulate in animal tissues, making meat or milk unsalable.

Table 1. Composition of byproduct and unusual feedstuffs.*

Dry matter basis	As fed	TDN			CP	EE	CF	ADF	Ash	Ca	P
Feed name	%	%	Nem	Neg	%	%	%	%	%	%	%
Alfalfa seed screenings	90.0	86.0	0.94	0.63	34.4	10.9	12.3	15.0	5.6	-	-
Apple pomace, dried	89.0	69.0	0.72	0.44	4.9	5.1	17.0	26.0	2.2	0.13	0.12
Apple pulp silage	21.4	74.0	0.78	0.47	7.8	6.3	20.6	26.0	4.9	0.10	0.10
Apples	17.0	70.0	0.72	0.44	2.8	2.2	7.3	9.0	2.2	0.06	0.06
Apricots, dried	90.0	77.1	0.83	0.51	-	-	0.0	0.0	-	-	-
Asparagus butts, dried	91.0	49.0	0.45	0.13	15.6	1.0	31.9	40.0	7.7	-	-
Bakery waste, dried	92.0	89.0	0.99	0.65	11.9	14.9	1.0	1.0	1.7	0.07	0.11
Barley bran	91.0	59.0	0.57	0.29	12.5	4.3	21.3	27.0	7.0	-	-
Barley distillers dried grains	92.0	69.0	0.70	0.43	30.1	12.6	11.0	14.0	2.0	-	
Barley malt sprouts	92.0	68.0	0.69	0.42	28.0	1.6	15.6	20.0	-	0.26	0.84
Barley mill run	90.0	70.0	.071	0.44	11.7	2.8	15.7	20.0	4.6	-	-
Barley straw	90.0	39.0	0.33	0.00	4.1	1.8	41.8	52.0	6.6	0.37	0.11
Bean straw, green	89.0	51.0	0.47	0.15	20.5	1.7	24.0	30.0	14.5	1.44	0.27
Bean straw, kidney	86.0	55.0	0.53	0.22	9.9	1.6	34.7	43.0	10.4	-	-
Bean straw, lima	90.0	58.0	0.57	0.25	7.6	1.8	31.0	39.0	8.2	0.10	0.41
Beans, cannery residue	9.4	72.5	0.76	0.45	23.5	3.1	13.5	17.0	-	-	-
Beans, green	89.0	63.0	0.63	0.35	16.9	3.8	25.3	32.0	9.0	-	-
Beans, kidney	89.0	83.0	0.90	0.60	24.7	1.5	4.7	6.0	4.2	0.12	0.45
Beans, lima	90.0	83.0	0.90	0.60	23.1	1.5	5.1	6.0	-	0.09	0.42
Beans, pinto	90.0	83.0	0.90	0.60	25.2	1.4	4.5	6.0	4.8	0.16	0.39
Beet pulp, molasses dried	92.0	78.0	0.81	0.54	9.9	0.6	17.0	26.0	6.4	0.61	0.11
Beet pulp silage	11.1	75.0	0.80	0.52	13.5	1.9	31.9	40.0	4.0	-	-
Beet tops, sugar	17.0	58.0	0.56	0.27	15.1	1.1	11.2	14.0	22.9	1.01	0.22
Brewers grains, wet	24.0	67.0	0.66	0.40	26.0	7.2	16.0	23.0	4.1	0.29	0.54
Cactus, prickly pear	20.6	58.8	0.59	0.26	4.8	2.3	13.4	17.0	18.9	9.16	0.12
Carrot tops	16.0	74.0	0.77	0.49	13.1	3.8	18.1	23.0	15.0	1.94	0.19
Carrots	13.0	82.0	0.88	0.59	10.3	1.4	9.1	11.0	9.7	0.37	0.32
Cauliflower	9.0	70.0	0.73	0.42	30.0	2.2	11.1	14.0	-	0.22	0.67
Citrus pulp	18.3	82.5	0.90	0.72	6.6	3.3	12.6	16.0	7.7	-	-
Citrus pulp, dried	90.0	77.0	0.80	0.53	6.9	3.8	14.0	23.0	7.0	2.07	0.13
Clover seed screenings	88.1	68.8	0.72	0.40	33.1	7.7	13.1	16.0	13.0	-	-
Corn distillers dried grains	92.0	84.0	0.90	0.60	29.5	9.9	13.0	20.0	2.7	0.10	0.40
Corn ears, ground	87.0	80.0	0.86	0.55	9.3	3.5	8.9	11.0	1.5	0.05	0.26
Corn gluten meal	90.0	87.0	0.99	0.65	48.0	2.4	4.2	5.0	3.9	0.15	0.45
Corn stover	90.0	50.0	0.48	0.15	5.9	1.3	37.1	46.0	5.8	0.49	0.09
Corn cannery waste, silage	29.0	72.0	0.76	0.44	8.8	2.7	27.0	34.0	5.9	0.34	0.63
Cottonseed meal, 41% protein, solv-extd	92.0	75.0	0.77	0.50	44.8	2.3	13.0	20.0	6.9	0.17	1.31
Cottonseed, whole	93.0	98.0	1.17	0.73	24.9	21.1	18.0	29.0	3.9	0.15	0.73
Fat	95.0	200.0	2.14	1.34	0.0	100	0.0	0.0	-	-	-
Feather meal	90.0	63.0	0.63	0.35	87.4	2.9	0.6	1.0	3.8	0.20	0.75
Fish meal	88.0	67.0	0.68	0.40	67.2	6.3	1.1	1.0	20.8	6.20	3.77
Flax seed screenings	91.0	66.0	0.67	0.39	17.3	10.9	14.2	18.0	7.8	0.40	0.47
Grape pomace, dried	91.0	30.0	0.34	0.00	12.7	7.6	33.0	54.0	5.5	0.51	0.40
Hominy feed, 5% fat	91.0	92.0	1.05	0.68	11.8	7.2	6.0	12.0	3.0	0.06	0.58
Hops, spent, dried	93.0	32.0	0.24	0.00	24.8	5.1	24.3	30.0	6.0	-	-
Kale, aerial part	11.6	65.9	0.68	0.36	20.8	4.5	13.6	17.0	15.8	1.61	0.51
Lentil seeds	88.5	75.2	0.80	0.49	28.0	1.3	3.8	5.0	2.9	0.09	0.42
Lettuce	5.0	51.0	0.47	0.15	22.0	4.1	11.2	14.0	15.9	0.86	0.46
Linseed meal, 36% protein, solv-extd	90.0	82.0	0.81	0.54	40.7	1.1	10.3	13.0	6.4	0.43	0.95

* *The values in the table were taken from various sources, including WREP No. 39, Byproducts and unusual feedstuffs in livestock rations: Some effects of feeding cull domestic onions (Allium cepa) to sheep, by J. H. Kirk, DVM, MS, and M. S. Bulgin, DVM, UI Caine Teaching Center, Caldwell, ID; Nutrient requirements of beef cattle; and unpublished data.*

Table 1. (cont'd)*

Dry matter basis	As fed	TDN			CP	EE	CF	ADF	Ash	Ca	P
Feed name	%	%	Nem	Neg	%	%	%	%	%	%	%
Malt sprouts, 24% protein	92.0	68.0	0.69	0.42	28.0	1.6	15.6	20.0	6.7	0.26	0.84
Malt, barley, Northwest	91.0	77.0	0.82	0.51	32.2	7.2	18.0	24.0	4.0	3.22	0.57
Manure, cage layer, dried	90.0	52.0	0.49	0.17	28.0	2.0	12.7	16.0	-	8.80	2.50
Melons	4.1	70.7	0.74	0.43	11.5	3.3	23.0	29.0	6.6	-	-
Milk, cattle, whole, dried	94.0	130.0	1.64	0.91	26.9	27.1	0.0	0.0	5.6	0.89	0.72
Mint silage	23.2	-	-	-	13.6	1.4	31.9	9.2	-	1.2	0.54
Molasses, beet	75.0	75.0	0.87	0.55	11.2	0.0	0.0	0.0	13.5	0.07	0.03
Oat mill feed	92.9	33.7	0.26	.00	3.1	1.1	35.1	44.0	6.4	0.11	0.05
Oat straw	90.0	45.0	0.41	0.09	4.5	2.4	40.3	50.0	7.0	0.27	0.10
Onion waste, dried	89.4	61.2	0.62	0.30	9.7	4.9	22.1	28.0	6.4	-	-
Onions	10.0	63.0	0.57	0.25	12.6	2.0	22.6	28.0	8.0	1.80	0.21
Orange pulp, wet	25.0	77.0	0.83	0.51	8.9	1.8	13.0	16.0	3.8	0.21	0.28
Pea hay	88.0	58.0	0.56	0.27	13.6	2.5	30.2	38.0	7.6	1.39	0.28
Pea meal, dried	90.0	84.0	0.91	0.61	19.7	1.6	26.3	33.0	3.4	-	-
Pea vine silage	24.0	56.0	0.54	0.23	13.1	3.3	30.0	49.0	8.2	1.31	0.24
Peaches	10.0	80.0	0.86	0.55	8.7	3.7	10.3	13.0	-	-	-
Pears, cannery residue	15.2	69.3	0.72	0.41	3.9	1.3	17.1	21.0	2.0	-	-
Peas, cull, dried	90.0	83.0	0.89	0.59	26.5	1.2	6.0	9.0	3.1	0.13	0.47
Potato meal, dried	91.0	77.0	0.81	0.53	10.6	0.3	2.3	3.0	4.7	0.08	0.22
Potatoes	23.0	80.0	0.85	0.57	9.6	0.3	2.4	3.0	4.7	0.05	0.24
Potatoes, dried	90.0	77.0	0.80	0.53	8.7	0.3	2.0	3.0	4.8	0.07	0.21
Potatoes, silage	25.0	79.0	0.83	0.55	8.2	0.4	4.0	5.0	5.5	0.04	0.23
Potato waste, wet	14.0	82.0	0.89	0.59	7.0	1.5	9.0	11.0	3.0	0.16	0.25
Prunes, dried	90.0	77.8	0.83	0.52	-	-	0.0	0.0	-	-	-
Pumpkins	9.0	85.0	0.93	0.62	16.2	8.9	14.2	18.0	8.9	0.24	0.43
Raisins, cull	85.0	48.0	0.44	0.10	4.0	1.1	5.2	7.0	3.5	-	-
Rapeseed meal, Canadian, solv-extd	92.0	70.9	0.74	0.43	44.0	1.2	10.1	13.0	7.8	0.72	1.01
Rapeseed meal, solv-extd	91.0	68.0	0.69	0.42	41.0	1.7	12.9	16.0	7.8	0.67	1.04
Rice straw	91.0	41.0	0.35	0.02	4.5	1.4	35.1	44.0	16.6	0.21	0.08
Rutabaga tops	10.9	68.4	0.71	0.40	18.6	4.6	14.1	18.0	19.9	-	-
Rye distillers dried grains	92.0	48.0	0.44	0.10	22.1	8.1	14.4	18.0	2.7	0.14	0.45
Safflower hulls	91.3	13.3	0.00	0.00	3.6	3.7	58.2	73.0	1.8	-	-
Safflower meal, 20% protein, solv-extd	92.0	55.0	0.53	0.22	23.9	1.1	34.0	43.0	4.3	0.37	0.80
Sagebrush, browse	50.5	49.9	0.47	0.14	12.9	9.2	24.8	31.0	9.7	1.01	0.25
Screenings, grain, good grade	90.0	70.0	0.70	0.44	14.2	5.2	13.1	16.0	9.8	0.48	0.43
Screenings, refuse	90.0	56.0	0.55	0.29	11.5	4.3	31.0	40.0	10.6	0.46	0.32
Sorghum silage, 30% DM	30.0	57.0	0.67	0.30	7.3	2.7	26.0	33.0	5.3	0.33	0.20
Sunflower meal, solv-extd	93.0	65.0	0.64	0.38	50.3	1.2	12.0	30.0	6.3	0.40	1.10
Sunflower seeds, whole	94.0	83.0	0.90	0.60	17.9	27.7	31.0	39.0	3.3	0.18	0.56
Sweet potatoes	31.0	80.0	0.85	0.57	5.0	1.3	6.0	8.0	3.6	0.09	0.13
Tomatoes	6.0	69.0	0.70	0.43	16.4	5.0	9.1	11.0	-	0.16	0.49
Turnip tops	13.0	67.0	0.68	0.40	21.8	2.6	10.3	13.0	16.8	2.92	0.51
Wheat bran	89.0	70.0	0.69	0.44	18.0	5.0	11.0	14.0	6.8	0.12	1.32
Wheat mill run	90.0	74.0	0.73	0.49	17.0	4.8	9.0	11.0	5.8	0.10	1.13
Wheat straw	90.0	41.0	0.35	0.02	3.6	0.0	41.5	52.0	7.2	0.19	0.09
Whey, dried	90.0	84.0	0.93	0.61	14.2	0.8	0.2	0.0	9.0	0.95	0.80
Whey, liquid	7.0	78.0	0.81	0.54	14.0	4.3	0.0	0.0	10.1	0.98	0.81
Yeast, brewers, dried	93.0	78.0	0.81	0.54	48.3	0.8	3.0	4.0	7.7	0.14	1.54

* *The values in the table were taken from various sources, including WREP No. 39, Byproducts and unusual feedstuffs in livestock rations: Some effects of feeding cull domestic onions (Allium cepa) to sheep, by J. H. Kirk, DVM, MS, and M. S. Bulgin, DVM, UI Caine Teaching Center, Caldwell, ID; Nutrient requirements of beef cattle; and unpublished data.*

When purchasing byproduct feeds, you should request that the seller disclose which, if any, pesticides have been used. If you are unable to obtain this information, you should have a chemical analysis performed on the feed to determine if there are any potentially harmful chemicals or heavy metals present.

Palatability

Palatability should also be considered when purchasing byproducts. Alternate feeds should be used with caution and introduced into the ration gradually, no matter how desirable the feed is. Generally, animals react unfavorably to sudden, radical changes in their feed. Byproduct feeds that are not very palatable should be fed in limited quantities and included only in a complete mixed diet.

Some feeds contain anti-nutritional factors or properties, or toxic substances that may affect performance. For example, cull onions contain a toxic alkaloid that results in anemia in beef cattle. Also, large amounts of cull fruits or vegetables can be very laxative to cattle and must be fed in limited quantities to prevent negative effects on digestion.

Pricing Feeds

Several methods will help producers evaluate byproduct feeds according to water content and/or nutrients provided. Examples of adjusting feeds for dry matter content and determining the cost per amount of nutrient are provided below. In these examples, conventional feeds along with alternate feeds will be used. The principles may be applied to all byproduct feeds and their constituents. An important concept is not to pay for water. This method should be used to compare prices for two or more feeds on the basis of nutrient composition on a dry basis.

Example 1:

The market value of 88 percent dry matter corn (DM#1) is $110 per ton (P#1) and you want to determine a comparable price (X) for high moisture corn that has 75 percent dry matter (DM#2).

Step 1. $\frac{P\#1}{DM\#1} = \frac{X}{DM\#2}$ or $\frac{\$110}{0.88} = \frac{X}{0.75}$

Step 2. Cross multiply.

$$(DM\#1)\,(X) = (P\#1)\,(DM\#2)$$

or

$$(0.88)\,(X) = (110)\,(0.75)$$

Step 3. Divide both sides of the equation by DM#1.

$$X = \frac{(P\#1)\,(DM\#2)}{DM\#1} \text{ or } X = \frac{(110)\,(0.75)}{0.88}$$

$$X = \$93.75$$

When dry corn is $110 per ton, high moisture corn should be $93.70 per ton.

Since byproduct feeds fluctuate in moisture content, it is important to determine the actual value so you can ensure that you are paying a fair price for the product. In most cases, feeds differ in both dry matter and nutrient content. Thus, to compare them economically, it is best to determine the cost per amount of nutrient each feed provides.

Example 2 demonstrates a comparison to determine if canola meal (CM) or safflower meal (SM) is the least expensive source of protein. The CM has 44.0 percent protein and 92 percent dry matter, and the SM has 25.4 percent protein and 90 percent dry matter. The cost for CM is $90.00 per ton and the cost for SM is $150 per ton, both on an as-fed basis.

Adjust the crude protein percentage to an as fed-basis because the price is expressed on an as-fed basis (CM = 92% DM, SM = 90% DM).

Canola meal:

Step 1: $\frac{\%\text{ protein}}{100\%\text{ DM}} = \frac{?}{92\%\text{ DM}}$ or $\frac{44}{100} = \frac{?}{92}$

Step 2: Cross multiply.

$(100)\,(?) = (44)\,(92)$ or $(100)\,(?) = 4{,}048$

Step 3: Divide both sides of the equation by 100.

$$? = \frac{4{,}048}{100} = 40.48\%$$

The canola meal contains 40.48 percent protein on an as-fed basis.

Safflower meal:

Repeat the steps above.

The safflower meal contains 22.86 percent protein on an as-fed basis.

Now it is necessary to determine the cost per amount of protein provided. Cost per unit of nutrient equals cost per ton divided by the nutrient content.

$$CM = \frac{\$150}{4048} = \$370.55 \text{ per ton protein}$$

$$SM = \frac{\$90}{2268} = \$393.70 \text{ per ton protein}$$

Canola meal provides protein at a lower cost than saffower meal. Without comparing the cost per unit of nutrient, a producer may have chosen safflower meal.

Authors:
Kathy H. Roy, Extension Educator, University of Idaho
Robert M. Kattnig, Assistant Livestock Specialist, University of Arizona
Adapted from the Cattle Producer's Library

This publication was prepared in cooperation with the Extension Beef Cattle Resource Committee and its member states and produced in an electronic format by the University of Wisconsin-Extension, Cooperative Extension. Issued in furtherance of Cooperative Extension work, ACTS of May 8 and June 30, 1914.

BCH-5056 Value and Quality Assurance of Byproduct Feeds