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BY-PRODUCT FEEDING IN CATTLE

Nontraditional feedstuffs used in rations are what most producers are referring to when discussing commodities. Commodities can be effective feeds from both cost and nutrition standpoints. Because these feedstuffs are nontraditional, a producer should closely evaluate any ration that contains commodities to insure that productivity of the cattle is optimized.

Most commodities are by-products of grain, mammalian, or aquatic sources. The nutrient content and feeding value of the commodity depends on its source and how it is processed. For example corn distillers dried grains w/solubles comes from corn that is fermented to make alcohol. Figure 1 illustrates the components of a kernel of corn. During the fermentation, the starch is removed. The residual material, consisting of the gluten, hull, and germ, has a decidedly different nutritional profile compared to corn (Table 1). Removing the starch concentrates protein, fiber, and minerals while reducing the nonstructural carbohydrate content. Each type of processing can result in a variety of by-products, each with different nutrient makeups and feeding characteristics. Figures 2 and 3 show the by-products of corn dry and wet milling processes.

TABLE 1

Nutrient	Corn	DDG/S
CP	9%	28%
NE_L	0.89	0.92
NE_g	0.7	0.68
NFC	77%	10%
NDF	9%	44%
Calcium	0.03%	0.15%
Phosphorus	0.32%	0.71%

The use of nontraditional commodities in cattle rations has become popular because the cost:benefit ratio is quite often much better than use of traditional commodities. Caution should be used when feeding commodities because of variability in nutrient content and quality.

Table 2 lists some of the more common commodities used in dairy and beef rations, along with a brief nutrient breakdown. Also included in this table is a list of thumb rules for typical inclusion rates, why the commodity would be used, and some of the precautions that should be considered.

When using nontraditional commodities or by-products in a ration, care must be taken to insure expected results. The ration formulator should consider:
- source of the commodity and how it will contribute to the ration,
- palatability and digestibility of the commodity,
- commodity handling and storage,
- does it make economic sense to use the commodity.

Brief Commodity Description

Beet Pulp: By-product of sugar beet processing. During the process, much of the carbohydrates have been removed for sugar production. Beet pulp should be limit fed because high levels may restrict DMI.

Blood Meal: By-product of the meat packing industry. Blood from slaughter plants is collected and dried. Blood meal should be limit fed because of palatability concerns.

Brewer's Grains, Dried or Wet: By-product of the brewing industry. A variety of grains are used in this industry. The grains are placed in fermentation vats from which alcoholic brews are harvested. The remaining grain residue has reduced total carbohydrates but is higher in other components than the original grain. Brewers grains should be limit fed because high levels may cause palatability problems.

Canola Meal: Product generated from the crushing and harvesting of oil from rapeseed.

Corn Gluten (Feed & Meal): By-product of wet corn milling where the primary products

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are starch, corn oil, and nutritive sweeteners. Gluten products have the potential to destroy the thiamin-producing capabilities in the rumen. Consequently, supplemental thiamin should be added to rations that contain high levels of gluten products. Gluten products should be limit fed because of a poor amino acid balance and it may limit DMI because of palatability concerns.

Cottonseed, Whole: By-product of the cotton industry. The cottonseed is removed intact from the cotton boll. Whole cottonseed should be limit fed because high oil content and the potential for gossypol toxicity.

Cottonseed Hulls: The seed coat of cottonseed.

Cottonseed Meal: Cottonseed minus the oil and hulls. Cottonseed meal is a good source of protein.

Distillers Grains, Dried and w/ Solubles: By-product of dry grain milling from which ethanol or other alcohols are harvested. The addition of thiamin to rations containing high levels of distillers grains is recommended. Dried distillers grains or DDG/S should be limit fed because of a poor amino acid balance.

Fish Meal: By-product of fish processing industry. Product is high in bypass protein. Unless the fish meal is specially processed, it can be highly variable in terms of quality. It should be limit fed due to palatability concerns.

Hominy Feed: By-product of dry grain milling process which manufactures cornstarch into pearl hominy, hominy grits, and table meal. Hominy feed is a mixture of bran, germ, and a portion of the starch. Hominy is a good source of energy. Hominy feed is a satisfactory replacement for corn and needs to be limited only if dietary fat is excessive. Fat in hominy may range from 2-12%.

Linseed Meal: By-product of linseed crushing process. Good source of protein.

Malt Sprouts: By-product of brewing industry. Much of the carbohydrates have been harvested, but malt sprouts are still a good source of energy and a moderate source of protein. This by-product should be limit fed because of palatability concerns.

Meat and Bone Meal: By-product of the meat packing industry. It contains meat and bone scraps prepared into a meal. It provides a good source of undegradable rumen protein. It should be limit fed due to palatability concerns. Meat and bone meal from ruminant sources cannot be fed to ruminants due to concerns of spreading bovine spongiform encephalopathy (BSE).

Peanut Hulls: By-product of the peanut shelling process and consists of the seed pod. The peanut hulls provide a moderately effective source of fiber.

Peanut Meal: By-product of the peanut crushing process. Peanut meal provides a good source of soluble protein.

Peanut Skins: By-product of peanut industry. Peanut skins are the outer coating of the peanut kernel. Peanut skins are moderate in protein and high in fat content. They are poorly digested. Peanut skins should be limit fed because high tannin levels may restrict protein digestibility.

Rice Bran: By-product of the rice milling process. Rice bran provides a readily digestible source of fiber and energy. Rice bran should be limit fed because of palatability concerns and high fat content.

Soybean Hulls: By-product of soybean crushing process. Soybean hulls provide a readily digestible source of fiber and energy. They should be limited to a maximum 50% of grain in the ration.

Soybean Meal: By-product of the soybean crushing process in which the oil and hulls are removed. Soybean meal provides a good source of degradable protein.

Soybeans, Heat Treated: Effective heat treatment of soybeans requires bringing raw soybeans to a specific temperature for a specific time period. Properly heated soybeans provide bypass protein and energy. Heat treated soybeans should be limit fed because high levels of oil in the product can interfere with fiber digestion in the rumen.

Soybeans, Raw: Raw soybeans are a source of soluble protein and energy. They should not be fed with urea. Urease contained in the raw soybeans can break down the urea and raise the levels of ammonia in the rumen. Raw soybeans should be limit fed because the high oil content of the soybeans could disrupt fiber digestion in the rumen.

Sunflower Meal: By-product of the sunflower crushing process in which the oil and

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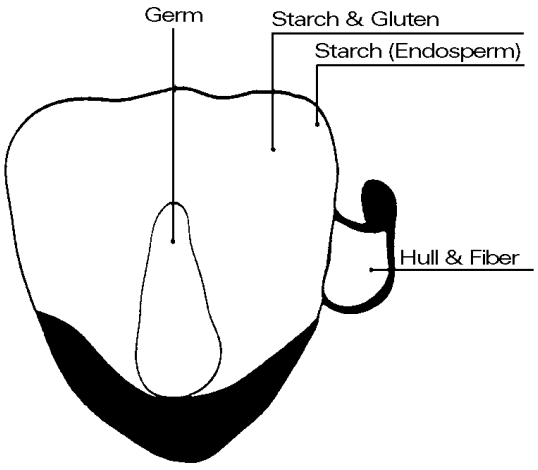
hulls are removed. Sunflower meal provides a good source of soluble protein.

Urea: Urea provides a source of soluble nitrogen for rumen microbes to use in conjunction with carbohydrates to build proteins. Urea should not be fed with raw soybeans because of the urease in the beans. Urea should be limit fed to 1% of the total DMI because of toxicity concerns with overfeeding.

Wheat: Wheat can be fed at inclusion rates up to 50% of the grain mix. Wheat provides an excellent source of energy. The protein level is higher than many other grains. It should be limit fed because the highly fermentable nature of the carbohydrates in wheat.

Wheat Middlings: By-product of flour producing process containing endosperm, bran, and germ. Even though much of the starch has been removed, wheat middlings still are used as an energy source. Wheat middlings should be limit fed because of the highly fermentable nature of the carbohydrates in the product.

FIGURE 1. Components Of Corn



Starch	-	Approximately 60%
Gluten	-	Dark portion of illustration Where most of the protein is found
Hull	-	Is part of gluten feed
Water	-	12-14% of the kernel
Germ	-	Where the oil is found Oil represents 4% of the kernel

FIGURE 2. Dry Grain Refining/Milling

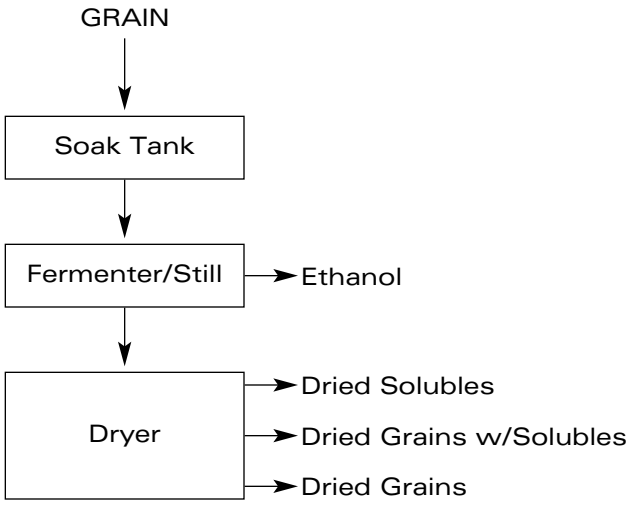


FIGURE 3. Wet Corn Milling

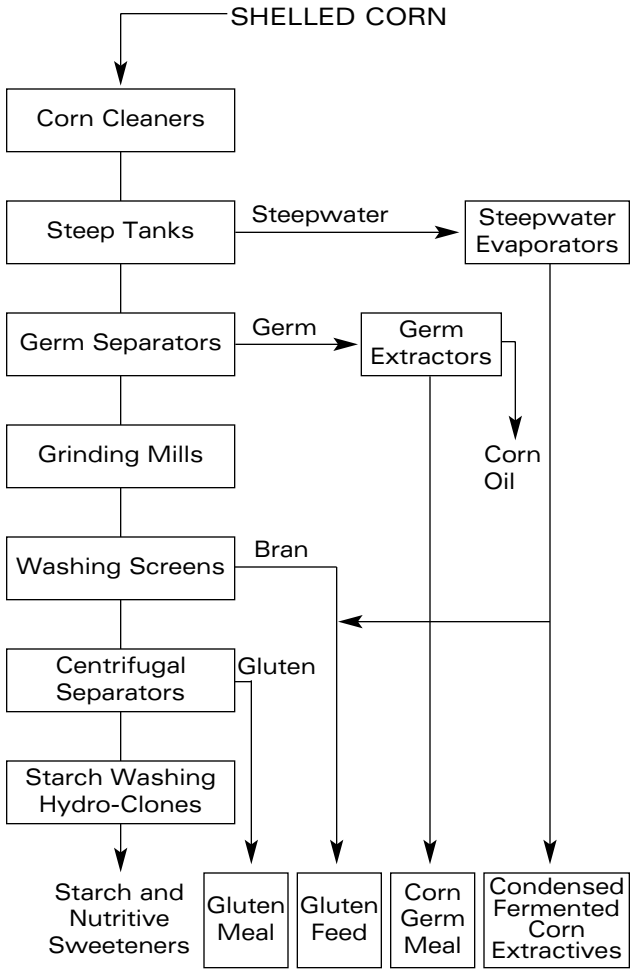


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TABLE 2.

Feedstuffs	DM %	CP %	RUP % of CP	NEm Mcal/lb	NEg Mcal/lb	NE_L Mcal/lb	Fat %	ADF %	NDF %	CA %	P %	Feeding Guidelines (Max lbs as fed) Dairy	Feedlot	Source Of
Beet Pulp	91	9.7	45	.86	.57	.81	0.6	33	54	.69	.10	10 lb	8 lb	NE/NFC
Blood Meal[1]	92	87.2	82	.69	.42	.68	1.4	—	—	.32	.26	1 lb	1 lb	RUP
Brewers Grains, Dried[2]	92	25.4	49	.69	.41	.68	6.5	24	46	.33	.55	8 lb	4 lb	CP
Brewers Grains, Wet[2]	21	25.4	49	.69	.41	.68	6.5	23	42	.33	.55	30 lb	15 lb	CP
Canola Meal	94	37.4	28	.81	.53	.77	7.4	16	18	.76	1.15	No Max	No Max	CP
Corn Gluten Feed, Dry[1]	90	25.6	25	.92	.62	.87	2.4	12	45	.36	.82	10 lb	10 lb	NE/CP
Corn Gluten Feed, Wet[1]	43	20.0	25	.92	.62	.87	2.4	12	45	.36	.82	30 lb	20 lb	CP/NE
Corn Gluten Meal, Dry[1]	91	46.8	55	1.0	.69	.90	2.4	9	37	.16	.50	3 lb	1.5 lb	RUP
Cottonseed, Whole[3]	92	23.0	40	1.1	.77	1.01	20.0	34	44	.21	.64	8 lb	4 lb	NE/NDF
Cottonseed, Hulls[3]	91	4.1	50	.35	.11	.44	1.7	73	90	.15	.09	No Max	No Max	NDF
Cottonseed Meal[3]	91	45.6	43	.83	.55	.79	1.3	19	26	.22	1.21	No Max	No Max	CP
Distillers Grains, Dried[4]	94	23.0	54	.96	.66	.90	9.8	12	43	.11	.43	8 lb	8 lb	RUP/NE
Distillers Grains w/Solubles[4]	92	25.0	47	.99	.68	.92	10.3	14	44	.15	.71	8 lb	8 lb	RUP/NE
Fish Meal[1]	92	66.7	60	.79	.50	.76	10.5	—	—	5.65	3.16	1 lb	1 lb	RUP
Hominy Feed[5]	90	11.5	45	.98	.67	.91	7.7	13	55	.05	.57	No Max	8 lb	NE/NFC
Linseed Meal	91	38	35	.85	.56	.81	1.5	17	25	.43	.89	No Max	No Max	CP
Malt Sprouts[1]	94	28.1	50	.76	.48	.74	1.4	18	47	.23	.75	8 lb	4 lb	NFC
Meat and Bone Meal, porcine[1]	93	50.2	49	.76	.45	.70	13.7	—	—	12.01	5.82	2 lb	1 lb	RUP
Peanut Meal	93	52.0	25	.92	.62	.87	6.3	6	14	.20	.61	No Max	No Max	CP
Peanut Skins[6]	94	17.4	8.7	.88	.68	.87	25.5	16	28	.19	20	4 lb	—	NFC
Peanut Hulls	91	7.8	1.9	.35	—	.19	20	65	74	.26	.07	No Max	No Max	NDF
Rice Bran[1]	91	14.1	35	.74	.47	.73	15.1	18	33	.08	1.7	8 lb	6 lb	NE
Soybean Hulls	91	12.1	11	.85	.55	.80	2.1	50	67	.49	.21	10 lb	8 lb	NFC
Soybean Meal (48%)	90	55.1	35	.98	.67	.91	1.0	6	8	.29	.70	No Max	No Max	CP
Soybean, Heat Treated	90	42	48	.94	.64	.98	20.0	11	12	.28	.66	5 lb	2 lb	NE
Soybean, Raw[7]	92	42	26	1.03	.74	.96	18.8	10	15	.27	.65	5 lb	2 lb	NE
Sunflower Meal, w/o Hulls	93	44.6	26	.80	.51	.77	8.7	18	30	.42	1.14	No Max	No Max	CP
Urea (46%)[8]	100	287	0	0	0	0	0	0	0	0	0	1% of DM	2 oz	RDP
Wheat	89	16.0	22	1.0	.69	.93	2.0	8	14	.04	.42	25-50% of grain	50% of grain	NFC/NE
Wheat Middlings[1]	89	18.4	21	.79	.50	.71	4.9	10	37	.13	.99	8 lb	8 lb	NDF/NCF/NE

Feeding Precautions:
[1]Palatability concern
[2]Spoilage during storage
[3]Gossypol toxicity
[4]Occasional bound protein due to processing
[5]Fat content variability
[6]High in tannin/can tie up protein
[7]Do not feed w/urea
[8]Toxic when overfed/do not use in haylage diets or w/raw soybean