Feedstuffs for Beef Cattle

Mississippi beef cattle producers have an abundance of productive, high-quality forage systems available. Yet achieving a year-round supply of adequate forage yields with acceptable nutrient composition is challenging. Commodity feeds serve as a nutritional option for beef cattle operations to supplement grazing and stored forage.

A wide variety of commodity-derived feedstuffs are used in ruminant animal production systems. Whole cottonseed, cottonseed hulls, cottonseed meal, soybean meal, soybean hulls, corn gluten feed, hominy feed, dried distillers grains, and rice mill feed are examples of commodity feedstuffs common in Mississippi. Decisions about which feedstuffs to incorporate into a nutritional program and their appropriate dietary inclusion levels should be based on several key considerations.

Evaluating Feedstuffs

Supply

Practical and cost-effective availability of specific commodity feeds varies throughout Mississippi. Consider whether or not a reliable supply of a certain feedstuff is available. Feeding program modifications will be necessary if stored supplies of desired feedstuffs are depleted and cannot be replenished as needed. Developing working relationships with reliable suppliers is invaluable when relying on commodity feeds in beef cattle nutritional programs. Seasonality of feedstuff supplies impacts both availability and price. It is not uncommon for trucks to wait for extended periods (often half a day or more) in line to be loaded with commodity feeds during periods of tight supplies relative to demand.

Physical Characteristics

Handling capabilities and producer preferences for feedstuff handling may determine whether a particular feedstuff is a viable option for a particular beef cattle operation. Ability to flow through an auger is one important physical characteristic that affects the usefulness of a feedstuff. Fuzzy, whole cottonseed is a classic example of a feedstuff that does not flow readily through a typical feed auger. Coating cottonseed with cornstarch, however, can alleviate this problem.

Flow characteristics determine the type of truck necessary for hauling a specific feedstuff and the type of storage facilities needed. Some feedstuffs are conducive to storage in upright bins, whereas other feedstuffs require storage areas such as commodity shed bays. The bulkiness and associated storage space required for a given volume of feedstuff varies greatly among these products. Particle size and other mixing characteristics affect the flexibility of including a specific feedstuff as part of a mixed feed. On-farm feed delivery systems also determine the viability of using various feedstuffs. For example, if feedstuffs are likely to cake in self-feeders, then alternative feedstuffs must be selected or alternative feeding methods implemented. Mississippi State University Extension Service Publication 2570 *Feedstuff Handling, Storage, and Feeding Systems for Livestock* provides additional detail on this topic.

Storage life is another important consideration in feedstuff selection. Wet distillers grain is an example of a feedstuff with a relatively short effective storage life. The humid and often warm Mississippi environment is not conducive to lengthy storage of feeds that rapidly mold or spoil. Be aware of physical characteristics of feedstuffs, such as high moisture content, that increase risk of or accelerate the onset of quality losses, deterioration, or spoilage.

Value

The value of individual feedstuffs is best expressed in terms of price per quantity of nutrients delivered. Nutrients of interest in beef cattle nutritional programs include total digestible nutrients (TDN) or alternative energy values (net energy system, NE), crude protein (CP), fat (which ideally should not exceed 6 percent of the total diet in mature cattle or 4 percent in growing cattle), fiber (crude fiber, neutral detergent fiber, acid detergent fiber), and mineral levels (e.g., ratio of calcium to phosphorus, excessive levels of sulfur, etc.). Knowing the moisture content of a feedstuff and whether the nutrient levels

are specified on an as-fed (as-received, moisture content included) or dry matter (DM) basis is critical in assessing the feedstuff's value.

Although certain by-products may be cheap in terms of dollars, they may not necessarily be a good value. The nutritional makeup of feeds and what they contribute to beef cattle performance determine their true value (Table 1). Feedstuffs are generally classified as energy, protein, or roughage feeds based on nutrient content and intended use. Some feedstuffs, such as whole cottonseed, arguably fit well within multiple classifications.

Comparing feedstuffs on nutrient makeup in terms of dollar value is accomplished using economic replacement values. The basic idea behind this concept is that the nutritional makeup of a feedstuff and what it contributes to beef cattle performance determines the feedstuff's true value. The relative value of feeds is compared in terms of dollar value for TDN and crude

Table 1. Nutrient content of selected beef cattle feedstuffs on a dry matter basis.[1]

Energy feeds

Feedstuff	Dry matter %	Total digestible nutrients %	Crude protein %	Crude fiber %	Crude fat %	Calcium %	Phosphorus %
Whole shelled corn	90	90	9	2	4	0.03	0.32
Hominy feed	90	91	11	7	8	0.06	0.58
Soybean hulls	91	77	12.1	40.1	2.1	0.49	0.21
Oats	89	75	13	12	5	0.05	0.35
Wheat middlings	89	69	18.4	8.2	4.9	0.13	0.99
Rice bran	90	70	16	12	15	0.10	1.73
Cane molasses	75	72	5.8	0	0.1	1	0.11
Grain screenings	88–90	70–91	14.2	9–13	5	0.48	0.43
Citrus pulp	90	80	6.5	13	4	1.90	0.13
Peanut skins	94	65	17.4	12.6	25.5	0.19	0.20
Beet pulp	91	78	9.7	19.8	0.6	0.69	0.10

Protein feeds

Feedstuff	Dry matter %	Total digestible nutrients %	Crude protein %	Crude fiber %	Crude fat %	Calcium %	Phosphorus %
Corn gluten feed	90	80	22	9	3.2	0.10	0.82
Whole cottonseed	92	96	23	24	20	0.21	0.64
Cottonseed meal	92	76	41	13	3	0.18	1.21
Soybean meal	90	84	49	7	1.5	0.30	0.68
Peanut meal	92	77	52.3	10.8	1.4	0.29	0.68
Dried distillers grains	92	86	27	12	10	0.26	0.83
Brewers grains	21	66	25.4	14.9	6.5	0.30	0.55

Roughages

Feedstuff	Dry matter %	Total digestible nutrients %	Crude protein %	Crude fiber %	Crude fat %	Calcium %	Phosphorus %
Cottonseed hulls	91	45	4.1	47.8	1.7	0.15	0.09
Cotton gin trash	90	44	7.4	36.7	1.7	0.65	0.12
Peanut hulls	91	22	8	63	1.5	0.20	0.07
Corn stalks	85	50	6.6	34	2	0.50	0.10
Soybean stubble	88	40	5	44	2	1.00	0.06
Wheat straw	89	44	3.6	41.6	1.8	0.18	0.50

[1]The nutrient values presented are intended as a general guide to nutrient qualities of feedstuffs. Significant variation in nutrient values exists among different feed sources. Laboratory analysis of a representative sample of a feedstuff is recommended to determine nutritive value.

protein content as compared to base feeds. Corn is often used as the base energy feedstuff and soybean meal as the base protein feedstuff for comparison purposes. This method does not account for roughage levels needed in the diet or other feeding considerations, but it is useful in quick, overall comparisons of feed prices and nutrient replacement values.

Economic replacement value calculators are available to assist in comparing feedstuffs for nutrient content and price. When ranking the value of individual feedstuffs in a nutritional program, consider the nutrient composition of each feedstuff. For instance, an inexpensive, high-fiber feedstuff with low TDN and CP levels may rank above other feedstuffs for economic replacement value calculated based on TDN and CP levels per unit price, but may not contain adequate concentrations of TDN or CP for the class of cattle to be fed at expected intake levels. Compare energy supplements to energy supplements and protein supplements to protein supplements.

Table 2 shows prices at which selected co-product feedstuffs are relatively equivalent to corn and soybean meal at the given prices. Being able to purchase feedstuffs for less than these relative values would be a good deal compared to feeding corn and soybean meal base diets at the given prices. Calculators are available from the Mississippi State University Extension Service to calculate economic replacement values.

Feeding Limitations and Restrictions

Both physical and chemical characteristics of feedstuffs determine their appropriateness for various classes of cattle. These traits also dictate appropriate feeding rates and risks, such as acidosis potential. Some feeds may be safely fed free-choice in self-feeders, whereas others

Table 2. Relative value ($/ton) of by-product feeds with selected corn and soybean meal prices.[1,2]

Feed	175 (corn price, $/ton)	200 (corn price, $/ton)	225 (corn price, $/ton)	250 (corn price, $/ton)	275 (corn price, $/ton)	300 (corn price, $/ton)
Whole cottonseed	207 220 233	225 238 251	243 256 269	261 274 288	280 293 306	298 311 324
Cottonseed hulls	82 83 83	94 94 94	105 106 106	117 117 117	128 129 129	140 140 140
Soybean hulls	149 153 157	167 171 175	185 189 193	203 207 211	221 225 229	239 243 247
Corn gluten feed	182 197 211	196 210 225	210 224 239	224 238 252	238 252 266	251 266 280
Hominy feed	166 167 169	188 189 191	210 212 213	232 234 235	254 256 258	276 278 280
Dried distillers grains	209 227 245	223 241 259	237 255 273	251 269 288	265 283 302	279 298 316
Wheat middlings	172 182 191	189 198 208	205 215 224	222 231 241	238 248 257	255 264 274
Rice bran	142 149 155	156 163 170	170 177 184	185 192 198	199 206 213	213 220 227
Cane molasses	104 103 102	120 119 117	136 134 133	152 150 149	168 166 165	184 182 181

[1]Top, middle, and bottom values are estimated based on soybean meal costing $450/ton, $500/ton, and $550/ton, respectively.
[2]These comparisons consider only feedstuff moisture, total digestible nutrients, and crude protein concentrations and do not account for differences in fat, fiber, minerals, etc.

require daily hand-feeding. Because each feed has its own unique feeding advantages and limitations, it is worthwhile to visit with someone who is competent in formulating beef cattle diets to reduce the risk of nutritional problems or disorders in the herd.

Appropriate feeding levels of specific feedstuffs are limited by certain nutrient levels. For example, feeding levels of feedstuffs with high fat content may be limited by maximum recommended fat levels in the diet. High fat levels in cattle diets cause scouring (diarrhea) and feed intake fluctuations. Avoid feeding more than 1 pound of added fat per mature cow per day. Also avoid using feedstuffs at feeding levels at which toxic or performance-reducing levels of minerals, chemicals, or other components within the feedstuffs are reached. Also impose feed intake limitations when using feedstuffs known to induce bloat, acidosis, or other nutritional disorders. When initiating changes in cattle diets, it is critical to adapt cattle slowly to dietary changes in small increments over several weeks. Do not change diet composition and/or feed quantities on consecutive days or in large steps.

Always stay informed of current legal restrictions on feedstuff use. The federal ban on ruminant by-products in ruminant diets is a well-known legal restriction that directly impacts beef cattle operations. If commodity production results in chemical residues in by-product or co-product feedstuffs, then follow label-specified feeding restrictions. Stay informed of feeding restrictions, and always adhere to label restrictions on all feedstuffs.

Ruminant animals are capable of using a wide variety of feedstuffs, and many different feedstuffs are available to livestock operations in Mississippi. These feedstuffs offer the option of a broad range of feeding program possibilities for beef cattle operations. With nutritional costs representing significant proportions of both cow-calf and stocker cattle operating budgets in the region, it is worthwhile to investigate commodity feeds as a source of supplemental nutrients for both effective and cost-effective feeding programs on traditional forage-based diets.

Concentrate Feedstuffs

Concentrate feedstuffs are generally the non-roughage component of animal feed. They are grain-based products and co-products of grain production. These feedstuffs usually contribute notable energy and protein to the ration, as energy and protein are "concentrated" in these feedstuffs. The following sections give attributes of commonly encountered concentrate feedstuffs.

Corn

Corn is typically considered the gold standard energy feed for beef cattle and is heavily used in beef cattle diets, particularly in finishing diets. Corn is a relatively high-energy feed due to its high starch content. It has roughly 9 percent CP and 88 percent TDN. Because of its high starch content, cattle must be adapted slowly to corn or rations containing high levels of corn. Because starch is rapidly digestible in the rumen, too much corn at one feeding can result in acidosis and, in some cases, death. Processing (cracking, grinding, steam-flaking) corn can further enhance the digestibility of starch and result in greater potential for acidosis. Due to these limitations, it is recommended that corn never be used as a sole feed source.


Whole corn


Cracked corn

Corn is very palatable to cattle. It contains low calcium and high phosphorus levels like most feed grains. Feeding high levels of corn (greater than 0.5 percent of bodyweight) can cause some depression of forage digestibility. In a situation where a producer is trying to maximize forage use, low levels of corn are suggested.

Grain Sorghum (Milo)


Milo

Grain sorghum is a cereal grain that is sometimes used as cattle feed. It contains slightly less energy than corn and slightly more protein in percentage terms. Grain sorghum is a palatable feed that is typically grown in areas too dry for corn production. Due to its physical nature (hard endosperm), it often requires processing (cracking, rolling, steaming) before its total nutrient content can be used. As with feeding corn, use caution when feeding grain sorghum. Adapt cattle slowly to high-starch diets to prevent acidosis.

Corn Gluten Feed


Corn gluten feed pellets

Corn gluten feed is a co-product of the corn milling process, which produces high-fructose corn syrup used as a sweetener. It consists primarily of the bran and meal remains from the grain after starch removal. Corn gluten has good protein content, but protein quality is considered subpar for poultry and swine diets. Due to the nature of the extraction process, the protein content of corn gluten feed is highly digestible and rapidly degraded in the rumen. When fed as the bulk of a ration, rumen undegradable (bypass) protein may be deficient. At feeding levels of 0.5 percent of body weight or less on high-forage diets, the TDN value is about equal to corn's. Because of its relatively high nutrient levels, corn gluten feed works as both a protein and energy supplement in beef cattle diets and often prices in as a cost-effective feed ingredient.

As a general guideline, corn gluten feed should not make up more than 50 percent of daily dry matter intake. Like other grain-based feedstuffs, it is relatively low in calcium. Corn gluten feed can contain high sulfur levels that necessitate mixing it with other feeds to dilute sulfur concentrations in the overall diet to avoid problems with polioencephalomalacia, particularly in growing calves.

Corn gluten feed is sometimes fed in self-feeders along with hay or pasture; however, caking is possible in humid conditions. Excessive processing or heating lowers corn gluten's feed value and palatability and darkens its color. Use of the wet form is only practical in areas relatively close to corn mills.

Grain Screenings


Grain dust pellets

Grain screenings are a co-product of grain processing. They are typically available from elevators or mills that handle whole grains. This feedstuff includes the chaff and smaller particles that were "cleaned" off of the final grain product. Due to the nature of the screening process, where the fibrous hull of the grain is most readily abraded off, grain screenings typically contain greater concentrations of fiber and lesser concentrations of energy and protein than whole grains. This means that grain screenings are usually poorer in nutritive value than the grains themselves.

If coming from a plant that processes a variety of grains, grain screenings may lack consistency in nutrient content because their make-up varies even daily. Due to inconsistent quality, it is not recommended to use grain screenings if a desired rate of gain or specific nutrient target is required unless each lot is analyzed for nutritive value. They often come in pelleted form and are sometimes referred to as "grain dust pellets." Grain screenings are useful to help supplement mature cattle rations, but if not managed properly, there is a high risk of acidosis.

Distillers Grains

Distillers grains are a co-product from the fermentation of grain to produce alcohol (e.g., ethanol). They are an excellent source of rumen bypass protein and energy for beef cattle and can be fed as a majority of the total diet for mature beef cattle. They are relatively high in digestible fiber concentration and so are a relatively safe feed from a rumen health standpoint. However, due to the excessive sulfur content from the distillation process, take care when feeding distillers grains. Stocker diets may benefit from inclusion levels of up to 15 to 25 percent of the total diet. Levels greater than 50 percent of the diet may result in sulfur toxicity. Also, because of the relatively high level of phosphorus in distillers grains, it is recommended that a mineral supplement with an adequate level of calcium be offered along with distillers grains.

Drying aids in storage, transportation, and handling of distillers grains. The wet form is roughly 75 percent water and has a limited storage life in Mississippi, particularly during hot conditions. Depending on the time of year and the physical location of the plant, the grain used (typically corn or sorghum) may vary. This leads to some changes in the nutrient content of the feed, as well as physical properties such as color. Most plants provide purchasers with a nutrient analysis of the current product leaving the plant.


Dried distillers grains with solubles


Spray-dried distillers syrup

Hominy Feed


Hominy feed

Hominy feed is made up of the corn bran, germ, and part of the starchy portion of the corn kernel from degermed corn meal production. It is roughly equal to ground corn in energy feeding value and is very palatable. Hominy feed typically contains greater protein levels than corn grains. The fat content is usually 6 percent or more, and the low-fat form provides less energy. It is a finely ground product suitable for mixing with other feeds. Hominy feed is stored, handled, and fed similarly to ground corn. It is best to use up hominy feed supplies in 1 month or less to avoid a stale smell.

Whole Cottonseed

Whole cottonseed is a major co-product of the cotton ginning process. It is an excellent beef cattle feed with relatively good energy and protein levels. Two pounds of cottonseed roughly equals 1 pound each of corn and cottonseed meal for nutritive value. Whole cottonseed is readily available in cotton-producing areas such as the Mississippi Delta. The gossypol and relatively high fat content limits its use levels to 25 percent or less of total dry matter intake. Feed no more than 0.5 percent of body weight per head per day (about 5 to 6 pounds per head per day) to mature cattle, and no more than 0.33 percent of body weight per head per day (about 1.5 to 3 pounds per head per day) to weaned calves. Do not feed it at inclusion levels of more than 20 percent of the diet for cattle in stocker or finishing programs.

There is some evidence of temporary fertility problems in bulls fed whole cottonseed due to its free gossypol content. This may be less of a concern with upland cotton, the type of cotton predominating production in Mississippi and other Southeastern states, compared with pima cotton, which is more commonly grown in the western United States. A precautionary approach to preventing gossypol-induced fertility problems is to avoid feeding whole cottonseed to bulls 60 to 90 days before the start of the breeding season.


Fuzzy, whole cottonseed


EasiFlo whole cottonseed


Delinted whole cottonseed

Cottonseed must be hand-fed and not used in self-feeders. Whole, fuzzy cottonseed has flow limitations in feeding bins and equipment and is difficult to auger or gravity flow. EasiFlo cottonseed is coated lightly with cornstarch and flows freely and augers through traditional grain handling equipment. Acid delinted cottonseed is also available.

Cottonseed Meal


Cottonseed meal

Cottonseed meal is a co-product of the cottonseed oil milling process. It is an excellent locally available protein source that is high in quality and is often substituted for soybean meal. Cottonseed meal works well in what is commonly referred to as a "hot mix" or "range meal," in which it is mixed with salt and possibly corn and offered free-choice.

Free gossypol content is usually much less in cottonseed meal than whole cottonseed and varies by processing method. In many instances, feeding 3 to 5 pounds of cottonseed meal per day to bulls is not likely to expose them to enough gossypol to cause reproductive problems, but this depends upon the free gossypol level of the cottonseed meal. There is potential for enough free gossypol in cottonseed meal to limit this maximum feeding recommendation to 0.5 pound per bull per day. Some producers may choose to err on the side of caution and feed bulls a protein source other than cottonseed meal in the 2 to 3 months leading up to the breeding season.

Cottonseed Hulls


Cottonseed hulls

Cottonseed hulls are another co-product of the cotton industry. They are extremely palatable and may be added to rations to improve consumption. Cottonseed hulls are relatively high in crude fiber concentration, have low digestibility, and can be used as the sole roughage source in cattle diets. Cottonseed hulls make a good hay replacer diet ingredient or alternative to chopped hay in mixed feeds. They are bulky with excellent mixing qualities at low levels in concentrate diets. The bulkiness of cottonseed hulls means that more space is needed for their storage compared with less bulky

feedstuffs. Cottonseed hull feeding levels should not exceed 10 to 25 percent of the diet for growing or finishing cattle. They are often an expensive but useful ingredient for cattle diets.

Cotton Gin Trash

Cotton gin trash is a co-product of the cotton ginning process. Gin trash contains boll residues, leaves, stems, and lint. Its composition varies depending on whether it is a product of picker or stripper cotton harvesting methods. Cotton gin trash is a relatively bulky, dusty, lowly palatable, high-fiber, and low-energy feedstuff. It is typically an inexpensive feed, but it has limited uses. The most practical use is in hay-replacer diets when mixed with other feeds. Due to its inexpensive nature, it can also be used as a filler to cheapen rations. However, both poor nutritive value (typically very poor TDN and variable CP concentrations) and physical properties limit its use. Beware of metal fragments or other "trash" that may harm cattle consuming cotton gin trash.

Cotton Gin Mote


Cotton gin mote

Cotton gin mote is the cotton extracted by a gin's lint cleaner during the cotton ginning process. It is similar to cotton gin trash in that it is a relatively high-fiber, low-energy feed; however, palatability is usually not a problem. It is typically offered in loose form or as 4-by-4-by-5-foot bales. The baled form is handled and fed with the same equipment used for moving large, round hay bales. Dust is a major concern when handling and feeding. The most practical use for cotton gin mote is in hay replacer diets with other supplemental feeds. Although it is used to stretch hay supplies, cotton gin mote should not be used as the sole roughage source in cattle diets and should be limited in proportion of the total diet so that it does not dilute overall nutrient levels below cattle requirements.

Oats


Whole oats

Oats are a cereal grain used primarily as an energy source in cattle diets, but their low production levels and high cost often limit their use in cattle feeds. They are not produced in as large quantities as corn or sorghum. Oats have the least digestible energy concentrations of these grains, as well as the lightest weight per volume. Many "sweet feeds" for livestock are mixtures containing oats coated with molasses for additional palatability. Demand for oats for horse feed often drives the price to uneconomical levels for cattle feed. Weaned calf diets, in which palatability and nutrient concentrations are of great importance, are a reasonable use for oats in cattle nutritional programs.

Brewers Grains


Brewers grains

Brewers grains are the co-products or used grains from the fermentation of grains for alcohol (typically beer) production. Barley is most commonly used, but some corn, rice, and other grains may be in the mix depending upon the brewery. The nutrient concentrations of this product vary slightly, especially if a brewery makes several different types of beer. It is recommended that a sample of brewers grains be submitted for nutrient analysis prior to use.

Brewers grains are a relatively good source of rumen bypass protein. Phosphorus and protein concentrations are similar to that found in distillers grains. But, due to the makeup of the grains used, brewers grains typically have less energy and slightly greater calcium concentrations than the whole grains. Still, they tend to contain lower calcium and greater phosphorus percentages than animal requirements, so it is recommended that a mineral with an adequate level of calcium be incorporated into cattle diets that include significant quantities of brewers grains. Additionally, because brewing beer does not involve the harsh chemical used to produce ethanol, brewers grains contain lower sulfur percentages than distillers grains. As the product of the brewery is "thrown away," brewers grains are typically sold "as is," and often availability is not widespread. The materials can be fed wet or dried, with a similar nutrient content between the two, as long as the wet product is fed shortly after production.

Peanut Hulls

Peanut hulls are co-products of the peanut-shelling process. They are extremely bulky and difficult to handle. Peanut hulls are relatively high in fiber concentration but extremely low in energy and protein concentrations. This limits their reasonable inclusion rates in livestock diets to avoid diluting energy concentrations below acceptable levels. The availability of peanut hulls depends upon proximity to a peanut-shelling plant. Practical uses for

peanut hulls include being an ingredient in hay-replacer diets and an extender in stocker concentrate diets.

Make sure that any peanut hulls fed to livestock are whole. Finely ground or pelleted peanut hulls lose their effectiveness as a fiber source and can irritate the digestive tract and pose a health risk to cattle. Feeding these processed forms can damage the rumen wall of cattle over time.


Peanut hulls


Peanut hull pellets

Peanut Meal


Peanut meal

Peanut meal is the ground portion of shelled peanuts. This includes the kernel, hull, and some oil. Peanut meal is very high in protein concentration compared to other feedstuffs, even exceeding that of soybean meal. Another advantage to peanut meal is that it is very palatable to cattle. However, it is usually expensive compared to other feedstuffs. Peanut meal use in cattle diets is not widespread because of cost concerns.

Peanut Skins


Peanut skins

Peanut skins are removed from the peanut kernel. They have very limited potential in beef cattle diets. Peanut skins are difficult to handle because they are lightweight, bulky, and easily blown by wind. This can lead to flow problems in augers and machinery. Peanut skins have moderate protein and energy levels compared to other concentrate feedstuffs. They also have relatively greater tannin levels that reduce protein digestibility and decrease palatability. Do not use peanut skins at levels of more than 10 percent of dietary dry matter.

Raw Peanuts

Raw, whole peanuts are a relatively high-quality feed source in terms of nutritive value. Despite this, they are not often included in livestock diets because they are more valuable in foods for human consumption. Peanuts have very good energy and protein levels, but their high fat content limits feeding levels. Feed mature cattle a maximum of 4 pounds per head per day, and introduce peanuts to cattle gradually to avoid digestive problems. Check aflatoxin levels in peanuts before feeding. Do not exceed 300 parts per billion of aflatoxin in finishing cattle diets, 100 parts per billion in breeding cattle diets, or 20 parts per billion in dairy or immature cattle diets.

Rice Bran


Rice bran

Rice bran is a co-product of the rice milling process. It is a finely ground material, which makes handling and storage in bins challenging. Blending rice bran with other feed ingredients can improve flow through machinery and augers. Rice bran has moderate protein levels and is high in fat concentration, unless defatted. Rice bran has a relatively high phosphorus content compared with forages, as is the case with most other feed grain products, which means calcium supplementation is necessary. Rice bran has substantially less energy than soybean hulls, even with its high fat levels. Full fat rice bran is more susceptible to rancidity in warm weather and less palatable than defatted rice bran. Limit rice bran to no more than one-third of the total diet for beef cattle.

Rice Hulls

Rice hulls are a co-product of the rice milling process and may contain floor sweepings. They are extremely low in nutritional value for beef cattle diets but are sometimes included in least-cost formulations as a filler ingredient. The high silica content in rice hulls can lead to digestive tract irritation and bloody stools in cattle, particularly calves. Rice hulls are not recommended in large quantities for beef cattle.


Whole rice hulls


Ground rice hulls

Rice Millfeed


Rice millfeed

Rice millfeed is a co-product of the rice milling process. It consists of a finely ground material that is a combination of rice hulls and rice bran. The nutritive value of rice millfeed is intermediate to its two component ingredients. Rice millfeed is often highly variable in composition and nutritive value. Founder is possible when feeding rice millfeed at high levels. Rice millfeed has handling characteristics similar to rice bran, but it is typically less expensive and has a longer storage life.

Soybean Meal


Soybean meal

Soybean meal is a co-product of the soybean oil milling process. It serves as an excellent protein source for beef cattle diets and is often the "gold standard" protein supplement to which other supplements are compared. It can be mixed with salt (and sometimes corn) in a "hot mix" or "range meal" for limit feeding. Soybean meal is a major ingredient in poultry and swine diets, so ruminant producers must compete for this input.

Soybean Hulls

Soybean hulls are a co-product of the soybean oil milling process and are a very palatable, digestible feedstuff. They are widely used in Mississippi beef cattle diets. Soybean hulls are a relatively good energy source, particularly on forage-based diets. At feeding levels of 0.5 percent of body weight or less on high-forage diets, soybean hulls are roughly equal to corn as a supplement in terms of nutritive value. Protein concentration of soybean hulls varies widely from load to load. The high fiber content in soybean hulls is considered digestible fiber and not effective fiber. This means that an adequate roughage source is also needed when feeding soybean hulls. They are a good source of calcium but low in phosphorus concentration as noted for other grain-based feedstuffs.


Loose soybean hulls


Soybean hull pellets

When fed in self-feeders along with hay or pasture, it is important to monitor soybean hull intake. Soybean hulls are conducive to bloat when fed at high levels (over 7 pounds per head per day) or to cattle with a tendency to bloat. Cattle have also been known to choke on pelleted soybean hulls when consuming them rapidly. Soybean hulls are bulky and dusty, so they are best used pelleted or mixed with silage or molasses to reduce dust.

Wheat

Wheat is a highly fermentable feedstuff and should be mixed with other ingredients to reduce the risk of acidosis. Feed wheat at no more than 0.5 percent of animal body weight (5 pounds per day for a 1,000-pound cow, 6 pounds per day for a 1,200-pound cow, etc.). Coarsely cracked or rolled wheat is more digestible than whole grain wheat. Wheat is not commonly used as a feed grain in Mississippi.

Wheat Middlings


Wheat middlings

Wheat middlings (midds) result from the wheat milling process. They generally have good energy and protein concentrations and are moderately palatable. Like most grain-based feedstuffs, wheat midds have high phosphorus levels relative to calcium levels.

Wheat midds are available as loose meal or pellets. The pelleted form cannot be stored for any extended length of time during hot, humid weather. Practical use of wheat midds in Mississippi is only during winter. Wheat midds are readily fermented upon consumption by livestock, so they should be combined with other ingredients to reduce the risk of acidosis, founder, and bloat. Limit wheat midd feeding amounts to 50 percent or less of total dietary dry matter intake.

Beet Pulp


Dried sugar beet pulp

Sugar beet pulp is a co-product of the process used to extract sugar from sugar beets. The most common use for beet pulp is in show cattle diets or in horse feeds. Beet pulp is a good source of highly digestible fiber. It can be used as a source of supplemental energy in beef cow diets or as a fiber source in backgrounding and finishing rations.

Citrus Pulp


Citrus pulp

Citrus pulp is made by shredding, liming, pressing, and drying the peel, pulp, and seed residues from citrus fruit. Citrus pulp is an excellent feedstuff, but availability and cost-effectiveness is limited in Mississippi. Citrus pulp is a good energy supplement. It is a relatively digestible, low-protein, high-fiber feedstuff. The best deals on citrus pulp usually occur midwinter. Limit citrus pulp to one-third or less of dietary dry matter for growing beef cattle. Initial palatability problems with calves are generally quickly overcome. Citrus pulp is often pelleted to facilitate transportation. Darkening toward a black color indicates product overheating.

Cane Molasses


Dried molasses

Cane molasses is a co-product of sugar manufacturing. It is extremely palatable to cattle and an excellent energy source. Cane molasses is commonly blended with vitamins and minerals. However, cane molasses is relatively low in protein concentration and should not be used as the sole feedstuff. It does work as an effective treatment for poor-quality hay to improve intake. It is commonly used to cut down on dustiness and improve palatability of stocker cattle diets.

Bakery Products


Chips co-product

Some human food waste can be incorporated into cattle diets. Bakery meal (bakery waste) is an example. It consists of various combinations of breads, crackers, chips, cookies, cakes, and doughnuts that are usually dried and ground together. Bakery waste is quite palatable to cattle. It is generally higher in energy (TDN) and crude protein than corn but very low in fiber concentration. Bakery waste is classified as energy feed, but not as a protein or roughage feed. Therefore, protein and roughage need to be supplied to cattle from other feeds and forages when feeding bakery waste.

The energy in bakery waste is primarily in the forms of starch and fat. Starches are rapidly digested by cattle and can drop the pH of the rumen leading to acidosis. The fat level in bakery waste is 10 percent on a dry matter basis, which is comparable to the fat level in dried distillers grains. Bakery waste also tends to depress milk fat content when fed at high levels.

Due to acidosis risk, scouring, and feed intake concerns with high-fat feeds, restrict bakery waste feeding levels to no more than 20 to 25 percent of a grain ration on forage-based feeding programs (grazing cattle or cattle supplied with free-choice hay), 10 percent of the total diet (including forage), or 6 pounds per head per day (introduced slowly) for mature cattle. If stockers (growing bulls, steers, or heifers) are fed bakery meal, limit intake of it to 2 to 3 pounds per head per day. Do not allow free-choice intake of bakery waste, and do not double the feeding amounts listed here to feed every other day.


Cereal co-product

Cereal co-product is another example of one of the many bakery industry co-products that are potential feedstuffs for beef cattle. Cereal co-products are generally available out of Memphis, Tennessee. They are a highly variable product with a high starch content that may promote acidosis or founder in cattle. This product should, therefore, be blended with other feeds and fed at low dietary inclusion rates, not to exceed 10 percent of total dietary dry matter intake.

Candy

Candies used for cattle feed are those that did not make the grade for human consumption or were pulled from retail shelves for passing product expiration dates. They vary from hard candies to chocolates to gums and sometimes include packaging materials such as aluminum foil, paper, or plastic wraps. Feedstuff nutritive value varies considerably depending on the candy used. Although they generally provide an excellent energy source (sugar), they are not typically adequate in protein content to meet cattle needs alone.

Often, candies are “special deals” that occur infrequently. Therefore, it is not recommended that a feeding program be based upon candy availability. As with other human food waste products turned livestock feedstuffs, use a conservative approach. Incorporate candy into no more than 10 percent of the total cattle diet on a dry matter intake basis. More specifically, large quantities of chocolate are not recommended for cattle because of the theophylline and theobromine content. In addition, milk chocolate may contain up to 28 percent fat, so limit the amount fed to cattle.

Conclusions

A wide variety of feedstuffs are available for use in cattle diets. This includes both forages and grain-based feeds. Evaluate feedstuff characteristics when considering them for inclusion in cattle diets. Adhere to appropriate feeding guidelines to achieve desired animal performance and avoid digestive problems. Consult a qualified cattle nutritionist for specific feedstuff questions and diet formulation instructions. For more information on feedstuffs for beef cattle or related topics, contact your local MSU Extension office or visit http://extension.msstate.edu/agriculture/livestock/beef.

Reference

National Research Council. (2000). *Nutrient requirements of beef cattle* (7th edition). National Academy Press.

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