

Guideline for Using Alternative Feedstuffs for Livestock¹

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Introduction

Feed is the single largest expense in livestock production. Traditionally, feeds for livestock production consist mainly of cereal grains (corn, grain sorghum, oats, barley), forage feeds (grass hay, legume hay), and oilseed meals (soybean meal, cottonseed meal). Many classes of livestock; however, can and have used a wide range of feedstuffs. Many of these “alternative” feedstuffs that can be used are by-products (or co-products) and edible waste products from the food processing, food preparation and food service industries, and the bio-fuels industry. Example of industries include grain milling, brewing and distillation, baking, fruit and vegetable processing, meat, milk and egg processing, seafood processing, prepared food manufacturing, and retail food outlets. Other alternatives include feedstuffs that are not commonly fed, such as wheat, may be a good choice during times of low prices, or during shortages of more traditional feedstuffs.

Most classes of livestock can successfully use alternative feedstuffs in their diets. Examples of the more common alternative feedstuffs include distillers grains, soy hulls, corn gluten feed, brewers grains,

citrus pulp, rice mill feed, molasses, and whole cottonseed. Examples could also include waste candy, cull peanuts, cull vegetables, bakery waste, cotton gin trash, and table scraps (restaurant food waste). These can provide a high quality alternative to conventional feedstuffs often at a lower cost. Many of the alternative feedstuffs are available to livestock producers in Florida and the southeastern USA, but due to traditional practices or a poor understanding of their value and limitations, usage can be, and often is limited.

In the future, the variety and quantity of by-products and edible wastes are expected to increase, and disposal options for many of these wastes, such as landfills, will become more limited and costly. Thus, the role of livestock in recycling and “adding value” to many of these by-products and wastes will become increasingly important as a viable waste management option.

Even though using alternative feedstuffs may be cost effective, cost is not the only factor to be considered. Variations in processing methods, availability, and form (pellet, meal, wet or dry) can impact the value of these feeds. Following is a list of considerations for producers who are currently using

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or plan to use alternative feedstuffs on their livestock operations.

Gross Composition and Quality

A visual gross appraisal of the potential alternative feedstuff should be done prior to delivery for identification purposes and to ensure consistency of composition. The Association of American Feed Control Officials (AAFCO) official publication gives detailed descriptions and nomenclature of many feedstuffs (www.aaeco.org).

Proper identification of the feedstuff is important as there is much information already published on many potential alternative feedstuffs (see references). This information could be useful in initial assessments of whether or not one may use an alternative feedstuff.

Nutrient Composition and Nutrient Availability

Alternative feedstuffs/co-products can be highly variable in quality and nutrient composition. Co-products are most often waste from processing, and often there are no quality control processes in place. Additionally, there can be considerable plant-to-plant variation in processing methods that will lead to an inconsistency in by-products sourced from different companies.

Periodically analyzing alternative feedstuffs for nutrient content is a good management practice, in particular for unusual feedstuffs that may be prone to large variation. Feedstuff composition tables such as those published by the National Research Council (i.e., NRC, 1982, 1996, 1998) can also be used but be aware that these tables generally report only averages based on information on hand at the time of their publication. Also, nutrient compositions of some feedstuffs have changed over time due to changes in the raw ingredients and (or) changes in processing methods.

The desired nutrient information needed depends on the type and class of livestock being fed. For ruminant livestock (cattle, sheep, goats) diets, total digestible nutrients (TDN), net energy (NE), and crude protein (CP), along with calcium and

phosphorous levels may suffice to correctly balance a diet. For non-ruminants livestock (pigs, poultry) metabolizable energy (ME) is the preferred measure for energy content rather than TDN and NE. Also for non-ruminants, an amino acid analysis is desirable. Other desirable nutrient information for an alternative feedstuff could include contents of fiber (ADF – acid detergent fiber and NDF – neutral detergent fiber), crude fat, and salt (NaCl). Analyzing for moisture content is also very important, especially for wet feedstuffs. Minimum information would include contents of CP (or lysine for non-ruminants), phosphorus and energy.

While it is best to do an amino acid analysis to obtain the lysine content, the content of this essential amino acid can be estimated from crude protein content by a professional animal nutritionist. Likewise, direct determination of energy content of a feedstuff is rather difficult, but it can be estimated from its composition. Most feed analysis labs; however, will report energy concentration of a feed/feedstuff that was calculated from composition. Relationships of protein and lysine content of many feedstuffs for pigs are given in NRC (1998). Equations are also given in NRC (1998) to predict energy (DE and ME) from chemical composition for pigs, and NRC (1996) to predict energy (TDN and NE) for beef cattle. Be aware that processing, especially heat processing, and/or the presence of ant-nutritional factors can decrease nutrient availability.

Suitability and Palatability

The suitability of an alternative feedstuff will depend on animal age and weight, production goal, production stage and feeding method. Many alternative feedstuffs that might be suitable for a mature animal may not be suitable for a young, growing animal. Some alternative feedstuffs may not be suitable for certain types of livestock. For instance, ruminant (cattle and sheep) can more readily utilize high-fiber feedstuffs (i.e. cottonseed hulls) than non-ruminants (pigs, poultry).

An alternative feedstuff may be nutritionally sound based on composition, but its feeding value is dependent upon how well livestock consume it. Various factors can influence feed intake (and

palatability) some of these include presence of molds and mycotoxins, contaminants, spoilage and/or rancidity, bulk density, physical form, moisture content, and inclusion level in the diet.

Freedom from Potential Health Hazards

Many feedstuffs may contain toxic substances (i.e., mycotoxins from molds, high sulfur level, high nitrates), disease organisms and/or anti-nutritional factors. If toxic substances are present, the alternative feedstuff should not be considered unless the deleterious factor(s) can be eliminated or neutralized inexpensively. Many commercial feed analysis laboratories can screen for mycotoxins such as aflatoxins and for potentially harmful bacteria, and can analyze for sulfur content, etc.

Special Handling, Processing, and Storage Requirements

Many alternative feedstuffs may require special transport, handling, storage, processing, mixing and feeding compared to traditional feedstuffs. These additional requirements may inhibit the use of the alternative feedstuff due to the cost, or the lack of special equipment to store, process, etc.

Availability and Consistency

The supply and quality of many alternative feeds is inconsistent and this should be taken into consideration before using. In general, alternative feedstuffs are more variable in composition and quality than traditional feedstuffs like corn or soybean meal.

Perishability

Various factors can influence shelf-life and nutrient stability. These factors can include moisture content, fat content and type, physical form, storage method, storage management, storage time, and level of inclusion in mixed feed (feed stability).

Effect on End Product

The alternative feedstuff when included in the diet should not harm the end product by, for instance, affecting the taste and quality of the meat or compromise food safety. For example, a feedstuff

high in unsaturated fat (i.e., peanut kernels) when fed at a high level in the diet to pigs can result in carcasses with soft, oily fat.

Storage Space

An alternative feedstuff will usually require separate storage and/or special storage facilities.

Cost

Added costs associated with the use of the alternative feedstuff (i.e., extra storage, special processing, transportation) must also be evaluated.

Legality

Be aware that some potential alternative feedstuffs may be illegal to feed or may require special processing and licensing in order to feed (i.e., restaurant food wastes that contain meat or meat byproducts to be fed to pigs). Some feedstuffs are illegal to feed to certain classes of livestock (i.e. meat and bone meal of ruminant origin cannot be fed to ruminant livestock). Also, feedstuffs adulterated with potentially toxic substance (i.e. pesticide residues) may also be illegal to feed.

Public Perception

Be aware that the feeding of some alternatives, while legal, may not “set well” with the general public (i.e. feeding poultry litter to cattle).

Determining the Value of an Alternative Feedstuff

The major costs in a typical livestock diet are ingredients that provide energy, protein (or lysine for non-ruminants) and/or phosphorus. An alternative feedstuff should supply one or more of these nutrients.

The economic value of the alternative feedstuff can be calculated based on its ability to supply energy and/or protein in the diet. In order to do this, price must be established for the alternative feed and a nutritional composition of the alternative feed should be known. Values should be calculated on a moisture free/dry matter (DM) basis.

Calculating nutrient cost is as simple as taking the cost of the alternative feedstuff and dividing it by content of the nutrient in question. For example, dried distiller's grains plus soluble (DDGS) is a good feed for beef cattle and is relatively high in crude protein, averaging 26% CP (DM basis). Thus DDGS could provide supplemental protein for cattle. If the cost of DDGS is \$175 per ton, the cost of CP in DDGS would be \$673 per ton (\$175 divided by 0.26). Soybean meal is a common supplemental protein source in many livestock diets, so it would be useful to know the cost of protein in soybean meal for comparison. Soybean meal averages 47% CP (DM basis) and if, for example, the cost is \$275 per ton, the cost of CP for soybean meal would be \$275 divided by 0.47 or \$585.10 per ton. Therefore in this example, soybean meal would be a cheaper source of supplemental CP than DDGS. However, DDGS is also a good source of supplemental energy whereas soybean meal is not. For example, the cost of TDN (total digestible nutrients) for DDGS would be \$175 divided by 0.80 (DDGS averages 80% TDN) which equals \$218.75 per ton, and for soybean meal (\$275 divided by 0.75; soybean meal averages 75% TDN) \$366.67 per ton. In this case DDGS would be the better buy, and since it contains a relatively high amount of CP, it may also meet the CP requirement. However, all things must be considered, including inclusion rates and how the alternative feedstuff might affect intake, and mineral and vitamin needs.

Related EDIS publication

AN142: *Average Nutrient Content and Bulk Price of Byproduct Feeds Commonly Available to Florida Cattle Producers*,
<http://edis.ifas.ufl.edu/AN142>

AN128: *Alternative Feeds for Beef Cattle*,
<http://edis.ifas.ufl.edu/AN128>

AN092: *Feeding Food Wastes to Livestock*,
<http://edis.ifas.ufl.edu/AN092>

AN101: *Using By-Product Feeds in Beef Supplementation Programs*,
<http://edis.ifas.ufl.edu/AN101>

AN143: *Feeding Food Wastes to Swine*,
<http://edis.ifas.ufl.edu/AN143>

AN108: *Estimating the Value of Wet Citrus Pulp for Florida Cattlemen*, <http://edis.ifas.ufl.edu/AN108>

AN201: *Corn Gluten Feed for Beef Cattle*,
<http://edis.ifas.ufl.edu/AN201>

AN134: *Whole Cottonseed for Beef Cattle Rations*, <http://edis.ifas.ufl.edu/AN134>

AN177: *Cotton Gin Trash: Alternative Roughage Feed for Beef Cattle*,
<http://edis.ifas.ufl.edu/AN177>

AN050: *Molasses-Based Feeds and Their Use as Supplements for Brood Cows*,
<http://edis.ifas.ufl.edu/AN050>

AN027: *Feeding Wheat to Swine*,
<http://edis.ifas.ufl.edu/AN027>

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