

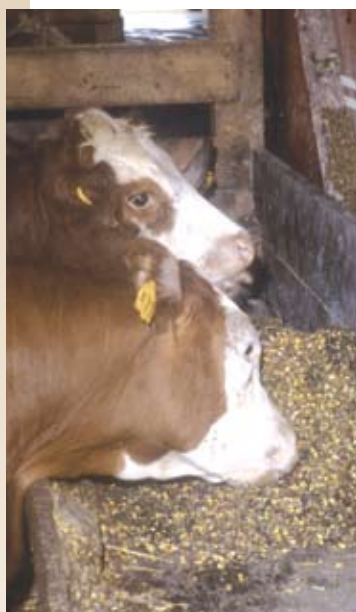
BioEnergy

Fueling America Through Renewable Resources

The Value of Distillers' Grains as a Livestock Feed

R. Lemenager, T. Applegate, M. Claeys, S. Donkin, T. Johnson, S. Lake, M. Neary, S. Radcliffe,
B. Richert, A. Schinckel, M. Schutz, and A. Sutton

Department of Animal Sciences
Purdue University



Introduction

Proper production and use of distillers' co-products as a feed ingredient have the potential to significantly increase their value and reduce any negative impact on the environment. (The terms "co-products" and "by-products" are often used interchangeably, but "co-product" is the preferred terminology.) Such a development could also make Indiana's livestock industry more attractive and competitive in both the domestic and global marketplaces as the price of corn increases to meet the ethanol demand.

An estimated 1.4 to 1.9 million tons of dry distillers' grains with solubles (DDGS) could result from the proposed Indiana ethanol plants. The typical levels of DDGS (dry matter basis) that can be added to the diet have been approximately 20% for beef and dairy, 10% for swine, and 5% for poultry. Based on these inclusion levels and the Indiana

livestock inventory (USDA Agricultural Statistics, 2006), Indiana producers could use a maximum 1.33 million tons (70 to 90.5%) of the projected DDGS production.

However, currently there are several challenges associated with feeding DDGS, and the realistic usage would be closer to 30-50% of the available supply. There is an opportunity to increase the livestock industry in the state using ethanol co-products, with beef and dairy having the most potential, if processing methods were more consistent.

The challenges to adding DDGS to livestock and poultry feeds can be divided into four main areas: 1) variation in nutrient content and nutrient availability between batches (within and between plants); 2) co-product handling, storage, and transportation; 3) effect on animal performance, end-product quality, and nutrient management; and 4) producer education.

Table 1. Variation in DDGS Nutrient Digestibility and Availability

Nutrient/Component ^a	Corn	Distillers' Dry Grains + Solubles ^b		
	Reference	Range	Digestibility, % ^c	Availability, % ^c
Crude protein, %	8.5 - 9.9	28 - 32	60 - 90	16.8 - 28.8
Lysine, %	0.20 - 0.28	0.85 - 0.90	50 - 90	0.42 - 0.81
Methionine, %	0.16 - 0.20	0.40 - 0.55	50 - 90	0.20 - 0.50
Crude fiber, %	1.5 - 3.3	5 - 14	---	5 - 14
Fat, %	3.5 - 4.7	3 - 12	85 - 90	3 - 12
Phosphorus, %	0.28 - 0.34	0.7 - 1.3	80 - 90	0.56 - 1.17
Sodium, %	0.00 - 0.02	0.05 - 0.17	100	0.05 - 0.17
Sulfur, %	0.12	0.4 - 0.8	100	0.4 - 0.8
	---	<400 - >600	---	---

^a Nutrient values are reported as a percent of total dry matter.

^b All things being equal, the value of DDGS (85% DM) is ≤ \$110/t when corn is \$2.20/bu and SBM is \$175/t. When product variation, transportation, handling, and storage are considered, DDGS value is realistically worth <\$70/t.

^c Values include variation between animal species.

Variation in Nutrient Content and Nutrient Availability

Table 1 (page 1) illustrates the variation in composition and availability of various nutrients and components of DDGS. Much of the variation in nutrient content, digestibility, and availability is related to the drying process and the amount of solubles added back to the distillers' grains. Salt (sodium) is used as a drying agent, and sulfuric acid (sulfur) is added during the processing to adjust pH. Both of these minerals can create nutritional challenges when included in some animal diets. Heat damage caused during the drying process can bind nutrients (especially proteins and amino acids) that can reduce nutrient availability. We need more information to determine the effect of drying rates and drying temperatures on nutrient digestibility, as well as a rapid test (such as an enzyme assay) to determine amino acid availability.

Co-Product Handling, Storage, and Transportation

Daily or frequent delivery of wet co-product directly from the plant to the livestock operation may be the best system, but the economics of transporting water any great distance become prohibitive. The "shelf life" of wet co-products is related to environmental temperature, but it is typically 3 to 7 days, and it requires a sizeable operation to use a semi-load quantity before spoilage occurs. Ensiling wet distillers' grains with corn stalks, corn silage, straw, etc., has been effective, but this only uses co-product at the time of harvest.

In the dried form, DDGS can bridge in bins and rail cars, as well as create separation/settling issues when stored either alone or when mixed with other feeds. With the dry grind process, corn is finely ground (<400 microns) to improve ethanol yield/bu of corn, but this small particle size can contribute to gastric ulcers in swine. Pelletting of feeds containing DDGS levels above 5-7% can reduce pellet throughput, pellet durability, and feed efficiency potential.

Animal Performance, End-Product Quality, and Nutrient Management

Historically, distillers' grains have been used efficiently by the beef feedlot industry. However, the effect of DDGS on performance (gain, feed efficiency, reproduction, and

longevity) and end-product quality (carcass composition, marbling, and fatty acid content) across different species is very limited and needs scientific evaluation. The high oil content of distillers' grains has the potential to affect fiber digestibility, milk quality, immune function, end-product quality (carcass composition, fatty acid profile, fat firmness, and shelf life), reproductive function (ovarian activity, embryo survival), and human health by changing the end-product fatty acid profile.

Rations containing DDGS can easily exceed the animal's requirement for nitrogen (because of amino acid imbalance and availability), phosphorus, sodium, and sulfur. This can result in increased nutrient excretion and environmental implications, especially for producers with a restricted land base for manure application. If plants could economically separate corn into its major component parts (starch, fat, phosphorus, and fiber), the resulting co-products could be incorporated into diets that more precisely meet animal requirements.

Producer Education

As ethanol plants come on-line, producers will be seeking science-based information about how to efficiently, effectively, and profitably use the distillers' co-products in livestock and poultry rations. Many questions remain that need to be addressed by research so that producers can use these co-products in the most efficient, environmentally sound, and economical manner.

Conclusion

Indiana does not have a large cattle feeding industry located near existing or proposed ethanol plants. This makes us different from many states and creates challenges for the livestock industry in the areas of co-product distribution, transportation, and storage. For the benefits of the ethanol industry in Indiana to be completely realized, we need more research on how the variation in nutrient digestibility and availability of ethanol co-products can be efficiently, effectively, and profitably managed and incorporated into not only swine and poultry diets, but also cow (both beef and dairy) diets.

Visit <<http://www.ces.purdue.edu/bioenergy>> for free, downloadable copies of all of the publications in the Purdue Extension BioEnergy series.

