CHAPTER 2

The "Disconnect" Between DDGS Price and Economic Value

CAPTURING THE GREATEST ECONOMIC VALUE OF DDGS among sources, and using DDGS in precision nutrition feeding programs, requires a new way of thinking about how we determine value. One of the greatest challenges in capturing full economic value of feed ingredients is related to the types of nutritional analysis used to determine purchase price in the global commodity market compared with the actual nutritional measurements used to determine actual economic value in an animal diet. Energy, amino acids and phosphorus are the three most expensive nutritional components in animal diets. In the current feed ingredient commodity market, the purchase price of an ingredient is based on minimum guarantees for crude protein and crude fat. For some ingredients like DDGS, the purchase price is based on the combination of protein and crude fat content of DDGS, often referred to as the "Profat" content. Crude protein, crude fat, along with crude fiber, moisture, ash and nitrogen-free extract, are all components of the proximate analysis that has been used as a routine description of animal feed ingredients since it was first established in 1865 by Henneberg and Stohmann of the Weende Experiment Station in Germany. However, this system of generally characterizing the different chemical characteristics of feed ingredients is grossly inadequate for use in formulating animal diets today because it does not provide accurate information on the amount and proportion of energy used by different animal species, nor does it account for the amount and digestibility of specific nutrients such as amino acids, phosphorus and other essential nutrients required by animals. In fact, studies have shown the crude protein content of corn and DDGS is poorly correlated with lysine content (Cromwell et al., 1999). Furthermore, Fiene et al. showed that while some amino acids (isoleucine, leucine, methionine, threonine and valine) could be predicted with moderate accuracy from prediction equations including crude protein, crude fat and crude fiber, other amino acids (arginine, cystine, lysine and tryptophan) were poorly predicted. Therefore, although analysis of proximate components is relatively simple and inexpensive, animal nutritionists do not use crude protein and crude fat to formulate animal feeds because they are highly inaccurate indicators of usable energy and digestible amino acid content of feed ingredients.

Over the past several decades, major improvements have been made to develop highly accurate nutritional measurements that estimate the actual nutritional value of feed ingredients to animals. Today, animal feeds are formulated on a metabolizable energy (ME) or net energy (NE) basis, and a digestible protein or amino acid basis.

In addition, swine and poultry diets are formulated on a digestible or bioavailable phosphorus basis. Formulation of least-cost or best-cost animal diets is done by using accurate ME or NE, digestible amino acids, and digestible or available phosphorus values for the feed ingredients being fed, and placing constraints on minimum or maximum dietary concentrations of these essential and high-cost nutritional components. Therefore, the analytical methods used to determine price of DDGS are "disconnected" with the measurements used to formulate animal diets and determine economic value. This "disconnect," frequently results in undervaluing the true economic value of DDGS in animal feeds. Consequently, DDGS is often marketed at a lower price than the actual economic value it provides in complete animal diets.

As shown in **Table 1**, use of the common method of "Profat" content to assessing nutritional and economic value of DDGS sources would cause most DDGS purchasers to choose DDGS source A as the highest economic value among the five DDGS sources because of its combined high crude protein and crude fat content (37.1 percent). Furthermore, most DDGS purchasers would likely request a price discount for DDGS sources B (31.4 percent Profat) and C (32.4 percent Profat) because of perceived lower nutritional value. However, as shown in **Table 2**, DDGS source C actually had the greatest economic value ($279/ton) in a growing-finishing swine diet, followed by source A ($266/ton) and B ($252/ton). The DDGS sources E and D had the second (34.4 percent) and third (35.5 percent) highest Profat content, respectively, but these sources had

the lowest actual economic value among the five sources. These results provide a "real world" example of why **Profat specifications should not be used** when making pricing decisions for purchasing DDGS, especially now that accurate ME and SID amino acid prediction equations have been developed for DDGS use in swine and poultry diets (see **Chapters 19 and 22**).

Although DDGS source C had the second highest NE content, it had the greatest standardized ileal digestible (SID) methionine, threonine and tryptophan content among the five sources, and the combination of these economically important nutritional components resulted in it having the greatest economic value. Furthermore, in this example, there was a $60/ton difference in economic value between the highest- and lowest-value DDGS sources. This difference represents a significant opportunity for DDGS buyers to capture the greatest value by adopting new "state-of-the-art" energy and digestible amino acid prediction equations to determine the true economic value of various DDGS sources. This can be accomplished by requesting laboratory analysis of the DDGS sources being considered for purchasing, working with nutritionists to use prediction equations to estimate the actual ME and SID content for swine and/or poultry, and using current prices of competing ingredients to do "shadow pricing" of DDGS sources.

Another important aspect of this comparison, is that the spot market price for DDGS at the time of conducting this "shadow pricing" comparison was $182/ton. When comparing the actual economic value for each DDGS source with the market price, all of these DDGS sources had between $37 to $92/tongreater economic value than the price that would have been paid to purchase these sources. These results show that DDGS is one of the best values in the global feed ingredient market today. In fact, the "disconnect" between market price and economic value of U.S. DDGS in swine diets can be as much as $100/ton greater actual economic value than the actual purchase price, depending

on market price conditions of competing ingredients. In addition, there can also be as much as a $90 difference in economic value per ton between the lowest and highest value U.S. DDGS sources in swine diets. Similar differences also exist when comparing the actual economic value of DDGS in diets for other ruminants, poultry, and aquaculture, with the greatest difference in economic value of DDGS in dairy and beef cattle diets. As a result, these dramatic differences in actual economic value among DDGS sources represent tremendous opportunity to reduce feed cost and improve profitability when using DDGS in animal feeds. However, these value differences can only be captured by using dynamic and accurate ME, NE, digestible protein and amino acids, and digestible phosphorus for the specific DDGS source used in diet formulations for each species.

Table 1. Proximate analysis of 5 commercially available U.S. corn DDGS sources

	A	B	C	D	E
dry matter, %	89.2	89.0	88.9	92.8	88.7
Crude protein, %	29.6	25.7	26.6	27.5	25.7
Crude fat, %	7.5	5.7	5.8	8.0	8.7
Profat, %	37.1	31.4	32.4	35.5	34.4
Crude fiber, %	6.9	6.7	6.7	7.2	7.1
Ash %	4.5	5.2	4.3	4.9	4.8

Source: Dr. Rob Musser, Nutriquest, Mason City, IA.

Table 2. Energy, standardized ileal digestible (SID) amino acid, and available phosphorus content of five commercially available DDGS sources in growing-finishing pig diets[1]

	A	B	C	D	E
ME, kcal/kg	3,237	3,073	3,180	3,182	3,001
NE kcal/kg	2,302	2,190	2,278	2,256	2,141
SID Lysine, %	0.58	0.65	0.63	0.60	0.45
SID Methionine, %	0.48	0.49	0.58	0.46	0.42
SID Threonine, %	0.79	0.80	0.86	0.76	0.62
SID Tryptophan, %	0.16	0.16	0.17	0.16	0.14
Available Phosphorus, %	0.60	0.69	0.65	0.70	0.66
Economic value[2], $/ton	266	252	279	240	219

[1]ME, NE, and SID amino acid content were determined using prediction equations based on chemical composition and were developed specifically for DDGS.

[2]Economic value was determined using "shadow pricing" in least-cost formulation software using the following ingredient prices (DDGS = $182/ton, Corn = $138/ton, Soybean meal - $343/ton)

Source: Dr. Rob Musser, Nutriquest, Mason City, IA.

Conclusions

Although the global commodity feed market continues to use crude protein and crude fat specifications to determine the price of feed ingredients, this system does not adequately capture the actual economic value of DDGS in animal feeds. In fact, because DDGS contains high amounts of a combination of energy, amino acids and phosphorus compared to most other feed ingredients, its economic value is often difficult to accurately determine because its price is determined by price competition in both the corn and soybean meal market. Therefore, it is usually undervalued by $40 to $100/metric ton depending on the species, phase of production, diet inclusion rate, and market conditions. Newly developed energy and digestible amino acid equations can be used to provide accurate values for nutritionists and feed formulators to use when determining "shadow prices" in various diet formulations. Purchasers should use this approach rather than relying on the inaccuracies of crude protein and fat content of DDGS to capture the greatest economic value, manage variability among DDGS sources, and avoid under- and over-feeding energy and nutrients by eliminating the "disconnect" between DDGS price and actual economic value.

References

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