Feedstuffs Reprint

Changes in DDGS composition over time can affect swine health

By **ROB MUSSER** and **MARK NEWCOMB***

IT is well known that the availability and application of dried distillers grains with solubles (DDGS) to global swine feeding have grown tremendously over the past 15 years.

However, it is also clear that the ethanol industry's ramp-up to meet fuel demand has stabilized to some extent, and there has been a shift in focus of distilleries toward optimization of processes to increase value from the byproduct streams.

Musser's article "Oil Extraction Affects DDGS Value" (*Feedstuffs*, Jan. 23, 2012) discussed some of the changes that were anticipated to occur in the DDGS supply complex as a function of refined management by distilleries and the advent of de-oiling technologies.

As noted in that article, one opportunity to optimize revenue for a distillery is to extract corn oil. For example, oil extraction can allow a 100 million gal. ethanol plant to generate an additional $9.9 million in income by extracting 33 million lb. of corn oil at a price of approximately 30 cents/lb. (assuming no decrease in DDGS value).

The application of this process to the industry can be seen by looking at the fat content of DDGS in the marketplace. As an update to the previous article, the percentage of ethanol plants whose DDGS had fat levels of less than 9% crude fat (as-is basis) has increased from 19% in January 2011 to 82% today, while the percentage whose DDGS fat levels were less than 7% has increased from 2% in 2011 to 34% today.

As illustrated in Figure 1, more than 75% of the DDGS samples in the NutriQuest Illuminate database had more than 9% fat in 2011, while more than 75% of the DDGS samples had less than 9% fat in 2017. Still, in 2017, about 25% of the samples contained more than 9% fat, which clearly shows that plants can extract more oil if the economic incentive is in place to do so.

Figure 2 shows the progression of de-oiling technology implementation using the fat percentage in DDGS as a metric over time. These data show that de-oiling was implemented fairly rapidly by the industry as the average fat content of DDGS dropped quickly and has been fairly stable since 2013. It is, however, important to recognize that, even today, only 34% of plants in the Illuminate database report fat content below 7%, suggesting that two-thirds of the industry could continue to evolve and remove more fat from DDGS if the economic incentives make that attractive.

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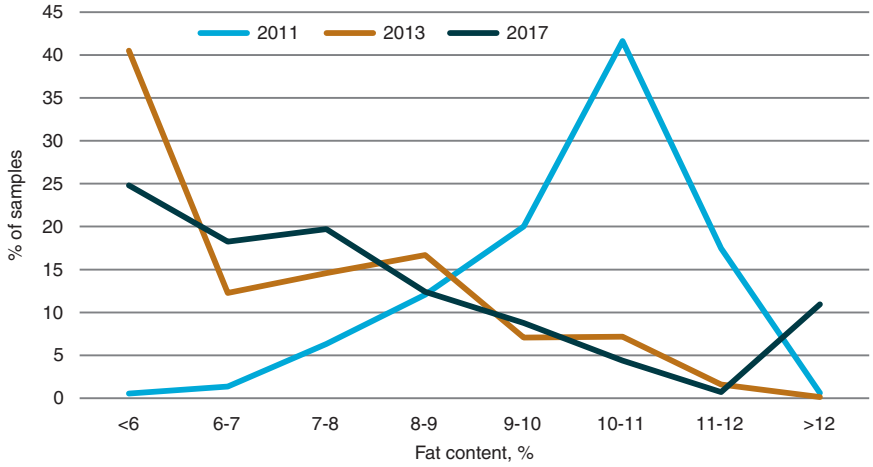
Bottom Line

Nutritional value

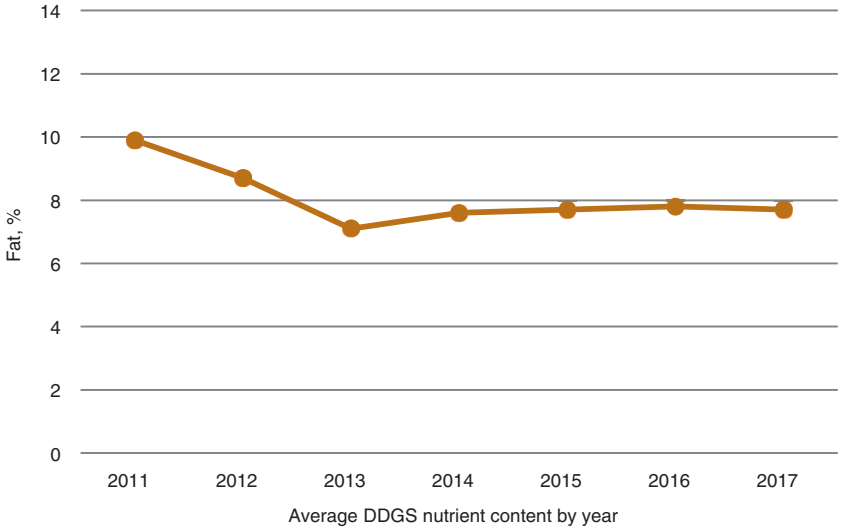
With the increase in de-oiling, many U.S. ethanol plants now have altered the nutrient profile of DDGS. This clearly presents a challenge for nutritionists and purchasers to identify the appropriate nutritional value for this raw material.

Evaluating the value of DDGS to the formula is a complex process and is managed differently across the

1. DDGS samples by fat content, %



2. Fat content of DDGS by year (as is)



Source for Figures: NutriQuest.

swine production industry. The Table summarizes nutrient changes in DDGS tracked in the Illuminate system.

It is unfair to judge the formulation value of a raw material by a change in the concentration of one nutrient, such as fat content. Clearly, when fat is removed, this affects other nutrients, which can be seen in the data set where crude protein, ash, acid detergent fiber (ADF) and neutral detergent fiber (NDF) are also commensurately affected as the fat content changes.

We have included one estimation of how metabolizable energy changes by applying the NutriQuest proprietary calculation of metabolizable energy across all of the DDGS samples in the database. Overall, the change in metabolizable energy and net energy for the de-oiled DDGS is 89% and 87% of the traditional high-oil DDGS sources, respectively.

Clearly, one would also apply a similar approach to amino acid content and standardized ileal digestible (SID) amino acid values.

In any case, with updated matrix values for the concentration of protein and other fiber and mineral components of the ingredient, one can formulate for the shadow price that the product needs to meet versus other ingredient options.

The impact of these energy and SID amino acid value changes to a formula will be different depending on the energy demand the animal might have in different periods of production. As an example, these compositional changes would have a greater impact in a lactation diet and a lower impact in a gestation diet.

As an industry, swine nutritionists have conducted a tremendous amount of research to develop an understanding of the most appropriate use and application of DDGS, so it is important that one considers the question of how to implement de-oiled DDGS relative to the research that has driven previous decisions on DDGS use.

When determining how to reconcile research with practical application, one needs to consider the composition of the DDGS used in the study and evaluate how available sources of DDGS might or might not differ from those used in the research while also, of course, considering implementation to ensure that accurate raw material matrix loadings are used.

Average composition of DDGS from Illuminate database, by year

Item, %	2011	2012	2013	2014	2015	2016	2017
Moisture	10.6	10.8	11.2	10.8	10.7	11.1	10.6
Protein	26.2	27.8	28.9	27.5	26.9	27.5	27.5
Fat	9.9	8.7	7.1	7.6	7.7	7.8	7.7
Ash	4.0	4.5	4.3	4.5	4.6	4.5	4.6
ADF	10.3	10.3	10.0	10.9	11.3	11.4	10.5
NDF	26.7	25	24.3	26.9	28.9	26.2	26.7

The Bottom Line

While, in the past, general loadings published as a reference may have been adequate to represent the DDGS found across the industry, with the de-oiling rates that occur in the ethanol industry today, the range in the potential nutrient content of DDGS is much larger, which makes it imperative to have a robust system to monitor and implement nutrient matrix values in formulation.

Without such an update, the nutrient profiles in a swine feed formulation system could result in substantial impairment to animal performance. ■