CHAPTER 1

The Role of U.S. DDGS in Precision Animal Nutrition and Feeding the World Sustainably

WE LIVE IN A WORLD OF TREMENDOUS CHALLENGES. Perhaps one of the greatest of these challenges is to develop and implement new approaches and technologies to provide a growing global population of people with an adequate supply of nutritious, safe, affordable food while preserving natural resources and minimizing negative environmental impacts. The global demand for food is projected to increase by 60 percent by 2050, which will increase demand for meat, milk and eggs from the increasing global middle class of consumers (Alexandratos and Bruinsma, 2012). Fortunately, food animal production is expected to increase and represent 50 percent of global agricultural output value within the next 10 years (FAO, 2008). However, to meet this demand, everyone involved in the food production chain must develop and implement new technologies to increase the amount and efficiency of food produced. Many structural changes and new animal nutritional and production innovations have been developed and are being implemented in food animal production systems around the world. New "precision animal nutrition" innovations are increasing at an accelerating pace to meet the challenges of providing food security, food safety and environmental sustainability. The goal of "precision animal nutrition" is to improve the caloric and nutritional efficiency of converting energy and nutrients present in feed ingredients into high-quality, animal-derived food products.

The global feed industry plays a significant role in feeding the world sustainably. Nearly 1 billion tons of global annual feed production occurs in over 130 countries around the world (IFIF, 2016). While various feed grains such as corn, sorghum, wheat and barley represent major ingredients used in animal feeds, the vast majority of feed ingredients used by the global feed industry are by-products derived from various agricultural and food industries that are unfit for human consumption, but provide valuable energy and essential nutrients in animal feeds. Therefore, the feed industry plays a vital role in "recycling" nutrients, capturing economic value, improving food security and minimizing negative environmental impacts by using these nutrient sources to produce abundant amounts of high quality animal-derived foods.

One of the controversial topics associated with the ability of global agriculture to feed the world sustainably is the "food vs. fuel debate". This controversy involves the tradeoffs of using a portion of the grains and oilseeds produced for biofuels, rather than using this portion for animal feed and human food. However, only 6 percent of total global grain production is used to produce ethanol (Popp et al., 2016), and about 33 percent of the corn used to produce ethanol in the dry-grind ethanol industry is recovered as co-products for use in animal feeds. Therefore, although the demand for corn to produce ethanol has increased, all of the non-starch components are recovered and concentrated (by about three fold) in the co-products compared with concentrations of these nutrients in corn grain, and are being used to displace significant amounts of corn and soybean meal in animal feeds.

The global biofuels industry produces about 52 million tons of co-products for use in animal feed, and about 85 percent of these co-products are produced by the ethanol industry (Popp et al., 2016). The United States ethanol industry is the largest producer of corn co-products, with annual production of about 38 million tons. This amount of corn co-product production is comparable to the amount of soybean meal produced in the U.S. annually, and is being used in large quantities in animal feeds both domestically, as well as in over 30 countries around the world. In addition, DDGS has been the most extensively researched feed ingredient among all major feed ingredients used in the global feed industry in the past 20 years. Research has not only focused on improving caloric and nutritional efficiency, and identifying

benefits and limitations for optimal DDGS use in all animal feeds, but research efforts are becoming increasingly focused on characterizing the unique nutraceutical properties and environmental impacts of DDGS.

The high-energy, protein and phosphorus content of DDGS make it a very attractive partial replacement for some of the more expensive traditional energy (corn), protein (soybean meal) and phosphorus (mono- or dicalcium phosphate) ingredients used in animal feeds. When DDGS is added to animal feeds that are properly formulated, it provides excellent animal performance, health and food product quality. These attributes, and others, have made DDGS one of the most popular feed ingredients to use in animal feeds around the world.

Due to the large supply of U.S. DDGS currently being produced, the quantity available for export has continued to increase. Much of this increased demand is a direct result of end-users capturing significant diet cost savings compared to other competing ingredients available. However, even though U.S. DDGS has been used in animal feeds domestically for many decades, it is a relatively unfamiliar feed ingredient for many nutritionists, feed manufacturers and animal producers around the world. As with any new feed ingredient in the global market, there are many technical questions about the nutritional benefits, limitations and use of DDGS in animal feeds to capture the greatest economic value. Even for experienced end-users, the production of reduced-oil (seven to nine percent crude fat) DDGS has led to many questions about energy content and feeding value compared to traditional high-oil (greater than 10 percent crude fat) for various animal species.

This 4th revised edition of the *U.S. Grains Council DDGS User Handbook – Precision DDGS Nutrition*, was written to provide nutritionists, feed ingredient purchasers, feed manufacturers and animal producers with the most up to date, scientifically based information available related to developing precision nutrition animal feeding programs using DDGS.

The U.S. Grains Council (USGC) provides this comprehensive summary of nutritional information about DDGS to assist current and potential buyers in understanding its nutritional characteristics, recommended maximum dietary inclusion rates, and benefits and limitations for its use in animal feeds. As for any feed ingredient, end-users of DDGS should consult, and seek assistance and advice from a qualified nutritionist when formulating diets and developing feeding recommendations. The USGC has no control over the nutritional content of any specific ingredient selected for feeding. The USGC makes no warranties these recommendations are suitable for any particular herd, flock, or animal. The USGC disclaims any liability for itself or its members for any problems encountered in the use of these recommendations. By reviewing this material, buyers agree to these limitations and waive any claims against USGC for liability arising out of this information.

For more information, contact the U.S. Grains Council at 202-789-0789 or email grains@grains.org. Also visit www.grains.org.

References

Alexandratos, N., and J. Bruinsma. 2012. World agriculture towards 2030/2050: The 2012 revision. ESA Working Paper No. 12-03, June, Agriculture Development Economic Division, Food and Agricultural Organization of the United Nations (FAO), Rome, Italy.

Food and Agricultural Organization of the United Nations (FAO). 2008. The Global Livestock Sector – A Growth Engine, Rome, Italy ftp://ftp.fao.org/docrep/fao/010/ai554e/ai554c00.pdf

International Feed Industry Federation. 2016. The Global Feed Industry. Wiehl, Germany http://www.ifif.org/pages/t/The+global+feed+industry

Popp, J., M. Harangi-Rakos, Z. Gabnai, P. Balogh, G. Antal, and A. Bai. 2016. Review: Biofuels and their co-products as livestock feed: Global economic and environmental implications. Molecules 21:285. Doi:10.3390/molecules21030285