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U.S. Grains Contribute To Animal Nutrition Globally

Successful livestock management is dependent in large part upon meeting the nutritional needs of animals by feeding properly formulated diets. [There are six basic classes of nutrients that must be considered in ration formulation: water, protein, carbohydrates, fats, vitamins and minerals.](#)

Developing an optimal and cost-effective feeding program is critical to meet livestock performance and profitability objectives, said University of Minnesota Professor Gerald Shurson, Ph.D.

“Regardless of species, animal production is a business, and farmers need to make the most of the rations they feed,” he said. As an example, in the United States, feed represents up to 70 percent of the total cost of livestock production.

According to Purdue University’s Applied Animal Management Program, it is important to keep in mind that most ingredients in animal diets contain more than one of the six basic nutrients. However, no single feed ingredient can supply all basic nutrients an animal needs, and the nutrient needs of an animal depends upon factors such as species, age, size, lifecycle stage and more.

The needs of different livestock species also differ considerably, so expert nutritionists are critical to creating appropriate animal diets.

Livestock Energy Needs Provided By Corn And DDGS

Corn (or maize, as it is known throughout much of the world) is the most widely-produced feed grain in the United States. In mid-July, the U.S. Department of Agriculture (USDA) estimated planted corn acreage at 88.897 million acres (35.9 million hectares), which translates to an estimated total corn supply of 13.7 billion bushels (348 million metric tons). Corn consistently makes its way into rations for beef and dairy cattle, poultry, swine, aquaculture and companion pets because of its high energy content and its availability.



Cattle eating a corn-based ration, including distiller’s dried grains with solubles (DDGS), in Japan.

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Distiller's dried grains with solubles (DDGS) is a co-product of dry-milled ethanol production. Its utilization as a feed ingredient is well documented as both an energy and protein supplement.

There are more than 200 ethanol plants in the United States that produce DDGS in addition to renewable fuels, with most located in the Corn Belt stretching across the states of South Dakota, North Dakota, Indiana, Ohio, Wisconsin, Michigan and Kentucky.

Almost all of DDGS produced in the United States derives from ethanol production using corn as a feedstock, with about 5 percent coming from ethanol production using sorghum as a feedstock.

"For beef and dairy cattle nutrition, corn, corn silage and corn by-products are a staple," said Alvaro Garcia, Ph.D., a professor at South Dakota State University.

DDGS can be used to match the nutrient requirements of corn to help balance costs.

"The corn market often dictates the usage of DDGS. It is an excellent source of energy and protein, and it is highly palatable and easily consumed by cattle," Garcia said.

Along with corn, DDGS is also an essential ingredient for poultry rations. It's an economical feedstuff for broiler and layer producers as it is easily digested and low in fiber, said Joe Hess, Ph.D., professor of poultry science at Auburn University.

Sorghum Provides Excellent Nutrition For Pork Production

Sorghum, also known as milo, represents the third-largest cereal grain grown in the United States. Even though grain sorghum is grown in a relatively small geographic area of the United States, production is on the rise because of increased demand. In its June acreage report, the U.S. Department of Agriculture's National Agricultural Statistics Service (USDA's NASS) estimated planted grain sorghum acres at 8.84 million (3.58 million hectares), an 11 percent increase from its March report and a 24 percent increase compared to 2014.



These swine are fed a grain-based diet often including sorghum. Photo courtesy National Pork Board

U.S. Farmers Monitor And Prepare For Harvest During August

For U.S. farmers, the month of August is harvest time for barley and a time to monitor corn and sorghum crops and prepare equipment for harvest.

Lacey Ridge Farms in Minnesota began harvesting barley July 21 and finished the first week of August. Once harvested, barley is stored in bins on the farm where the family can check moisture levels and dry it as needed.

Iowa corn farmer Jim Greif is preparing his on-farm drying and storage bins for the upcoming harvest. He is performing performance tests on the drying equipment and cleaning out the storage bins.

He monitors his corn crop and utilizes aerial application for fungicide as needed. One of Greif's cornfields can be viewed at www.corncamiowa.com.

Southwest Kansas farmer Brett Reiss' sorghum crop is mature enough to bloom and develop the grain head. Since sorghum pests thrive in the hot, dry August weather, Reiss monitors the crop and applies chemicals as needed with airplanes to avoid plant damage.

He also makes sure irrigation water is applied adequately and performs maintenance to prepare the harvesting.

For additional information on Reiss' farm, visit www.southwestff.com. ■

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Animal feeding is one of the most important markets for sorghum produced in the United States. Sorghum is utilized in dairy and beef cattle rations as well as in swine and poultry diets. The grain, stalks and leaves are all used in animal feeding. Producers may opt for sorghum based on market prices.

According to the U.S. Sorghum Checkoff Program (USCP), grain sorghum is an excellent nutritional source for swine. While sorghum has a slightly lower fat and energy value than corn, pigs fed sorghum deposit a firmer carcass fat – an advantage for bacon processors. Sorghum distiller's dried grains with solubles (DDGS) is also an excellent protein source.

Barley Supplies Crude Protein To Beef Cattle

Barley is a versatile and useful crop with applications ranging from feed and food production to beverage manufacturing. In the United States, it is grown mostly in the northern states of Idaho, Minnesota, Montana, North Dakota, Oregon and Washington. The U.S. Department of Agriculture (USDA) and barley farmers alike are reporting a successful 2015 crop based on favorable weather conditions in the growing region. USDA's July crop production forecast estimated total barley production at 4.5 million metric tons (206.7 million bushels).

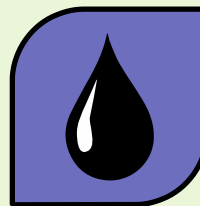
Balancing Animal Diets

Diets are made up of nutrients. A nutrient is any feed component or group of feed components with the same general chemical composition that aids in support of animal life. To meet an animal's needs, the ratio of ingredients must be formulated to include the proper amount and proportion of nutrients. These levels vary by species and specific purpose such as growth, maintenance, lactation or gestation. U.S. grains can contribute a combination of several nutrients to an overall balanced diet.

6 Basic Classes of Nutrients

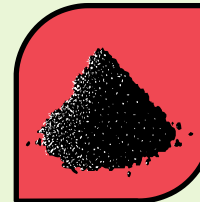
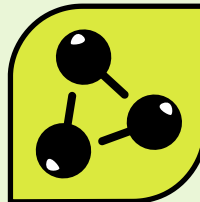
Water

- the most critical nutrient
- transports nutrients
- supports chemical reactions, temperature maintenance and lubrication within body



Vitamins

- most have multiple functions in the body involving metabolism, enzyme reactions, etc.



Carbohydrates

- provide energy
- building blocks for other nutrients
- dietary excess stored as fat

Minerals

- required for protein synthesis, oxygen transport, fluid and acid-base balance in body, enzyme reactions, building of bone
- requirements increase with animal's age
- both deficiencies and excesses can lead to disease



Fats (Lipids)

- high energy source
- insulates the body during cold
- cushions the body
- reduce dust in feed
- increase feed palatability



Proteins (Amino Acids)

- needed for muscle development, metabolism, hormone, antibody and DNA production
- most expensive part of diet
- need decreases as animal matures
- converted to energy and, if fed in excess, fat

Because of the premium it commands, most barley grown in the United States is intended for malting purposes. However, the grain does make its way into feed rations for livestock. When it is harvested as a grain or forage, barley serves a nutritional purpose for cattle.

According to North Dakota State University's Animal Science Department, barley is used primarily as an energy and protein source in beef cattle diets. The nutrient content of barley compares favorably with that of corn, sorghum and other grains. Although barley's energy content is lower than that of corn, it contains more crude protein than corn.

In order for cattle to use the grain most efficiently, barley must be processed for optimal utilization. Dry-rolling is the most common and least expensive processing method used to crush the kernels. ■

Animal Nutritionists Share Insights with USGC Customers

Animal nutritionists regularly contribute to U.S. Grains Council (USGC) programs and their research findings are often applied to international livestock production systems. The following leading nutritionists shared their insights for this month's edition of the *Grain News*.

Gerald Shurson, Ph.D., University of Minnesota



Gerald Shurson, Ph.D.,
University of Minnesota

Gerald Shurson, Ph.D., is a professor with the animal science department at the University of Minnesota specializing in swine nutrition. In June and July 2015, Shurson traveled to Japan, Vietnam, Thailand, Taiwan and Colombia for the U.S. Grains Council (USGC). He joined a group of experts to conduct a detailed evaluation and strategic program planning project in Vietnam and Thailand that focused on dairy and aquaculture sectors. The group also discussed enhancing opportunities to increase imports of U.S. distiller's dried grains with solubles (DDGS) in swine and poultry sectors. Shurson was also involved in technical programs in Japan and Taiwan related to increasing DDGS demand in these mature export markets.

Upcoming Research: At the University of Minnesota, one of Shurson's research projects is working on increasing the feed value of DDGS by developing more efficient production methods and minimizing its carbon footprint.

Thoughts for International Customers: When it comes to DDGS, Shurson urges buyers to obtain testing data related to any quality traits of importance, such as mycotoxin levels. Shurson also suggests that buyers work with USGC

offices to get information that will help to accurately assess nutrient content. Obtaining advice from qualified animal nutrition researchers and experts is also a good idea, Shurson said.

"U.S. nutritional knowledge allows international customers to adjust to modern formulation methods to increase feeding accuracy and capture more livestock value of U.S. grains and co-products," Shurson said.

Alvaro Garcia, DVM, South Dakota State University

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Alvaro Garcia, DVM, is a professor of dairy science at South Dakota State University (SDSU). Garcia also serves a role with SDSU extension working with local producers. As a contributor to USGC programs, he has addressed concerns of dairy producers and end-users in Japan about the use of low-oil DDGS in lactating dairy cow rations.

Upcoming Research: Garcia is planning a future research project that measures the effects of DDGS and high forage rations on methane emissions from cattle. Reducing these emissions so that food and fiber production systems are more environmentally sustainable is the reason for this project, and Garcia and the other researchers hope it leads to practices that result in methane emission reductions.

Thoughts for International Customers: Sourcing DDGS from the United States has advantages, said Garcia. In 95 percent of United States ethanol plants, corn is used as a feedstock exclusively. In the European Union and Canada, however, corn is used as a feedstock exclusively by only 34.6 and 50 percent of the plants, respectively. When more than one grain is used, the product's nutrients will be affected, particularly in the amino acid profile and digestibility of the protein itself, which will compromise animal performance. Analyzing for amino acids is an expensive and lengthy process.

Garcia reminds international buyers that DDGS is sold on a PROFAT basis, which combines protein and fat values. Buyers should also pay close attention to the color of DDGS. Darker DDGS can be the result of overheating during the drying process that diminishes protein content and energy values and can reduce animal performance, particularly in swine and poultry.

Mycotoxins are not destroyed during ethanol fermentation or DDGS production. Instead, their concentration is increased. Inadequate storage conditions may also increase the concentration of mycotoxins due to inoculation by mold spores present in the environment. Therefore, it is important to monitor mycotoxin levels and store DDGS under conditions that minimize mycotoxin growth.

The risk of mycotoxin contamination in U.S. DDGS is very low because most ethanol plants monitor grain quality and reject sources that are contaminated with mycotoxins. If mycotoxins are present, concentrations fall below harmful levels when the DDGS is blended with other feed ingredients to make up the overall animal diet.

Garcia believes it is critical when working with international buyers to have a clear understanding of the culture, climate and livestock goals in their area or country.

"U.S. grains are an excellent source of nutrition for domestic and international livestock producers. It is paramount that other countries have access to these products," Garcia said.

Joseph Hess, Ph.D., Auburn University, Alabama

Joseph Hess is a professor of poultry science and extension specialist at Auburn University in Alabama. He also helps formulate rations used by poultry farmers in the United States. In addition to his teaching responsibilities, Hess works with poultry producers and consumers in Alabama.



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Upcoming Research: Hess is researching the benefits of organic mineral supplements in poultry. This is important because of the increased interest in organic poultry by consumers. He is also involved in a study to see if various animal handling methods affect meat quality, which could help increase demand for poultry worldwide.

Thoughts for International Customers: Knowing the nutritional composition of the ingredients used to make feeds is fundamental for poultry productivity, Hess said. As poultry farmers develop rations, they must weigh the value of ingredients to get the best results. Using U.S. grains because of their nutritional quality “allows international producers to meet their goals and become more efficient,” Hess said. ■

Aquaculture: Potential New Market For DDGS

Aquaculture is a growing sector of agriculture worldwide, with nearly 1 billion people depending on fish as their primary protein source. Even though concerns over sustainability, overfishing and cost of production have complicated the development of more commercial aquaculture operations, the industry continues to look forward.

To help meet the growing demand for fish worldwide, in March 2015 the U.S. Grains Council (USGC) began two independent aquaculture feeding trials using distiller’s dried grains with solubles (DDGS) in Vietnam.

Historically, Peruvian fishmeal is the typical protein source in Vietnamese aquaculture. Because of recent product shortages and increasing prices, fish farmers are seeking a replacement. The combination of DDGS and soybean meal is currently being researched. In the two USGC studies, DDGS is being fed at 5, 10 and 15 percent inclusions in the diets, as well as a control.

Kevin Roepke, USGC regional director for South and Southeast Asia, said all diets with DDGS are more cost effective than the control diet.

“The goal of this project is to show the industry you can feasibly utilize plant-based proteins, both DDGS and soybean meal, as combined sources of protein in fish diets,” Roepke said. “The two ingredients complement each other very well and can at least partially replace expensive fishmeal.”

The studies are using Pangasius, a medium- to large-sized shark catfish native to South and Southeast Asia. A mild white-flesh fish, Pangasius is popular in the Asian and U.S. markets.

Another aspect of the study will assess any changes in flesh color, addressing concerns that the xanthophyll, a yellow or brown plant pigment, in DDGS may cause a yellow color. The fish in this trial will be harvested, hopefully in September 2015, and analysis of the filet colors will determine what impact xanthophyll has on the finished, frozen product.

Additionally, Roepke hopes the study will be a starting point for introducing corn to Vietnamese fish feeders as an energy source. If the initial trials with DDGS are positive, corn could be used in their rations in the future.

“These studies are being done on a commercial scale, simulating real world conditions,” Roepke said. “Once fish producers realize DDGS can save them money in their formulations without sacrificing quality, increasing the inclusion rates of DDGS and corn will quickly follow.” ■



U.S. Grains Council representatives look in on a Vietnamese Pangasius trial using DDGS.