The Impact of Distillers Feed Products in Global Feed Markets

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Meat Consumption

160
140
120
100
80
60
40
20
0

Ibs. / Person / Year

SHEEP/GOAT  BEEF  PORK  WILD FISH  FARMED FISH  POULTRY

FAO, 2018
U.S. Animal Feed Business is Very Important

The U.S. by Numbers:

- **Total Sales**: $297.1 billion
- **Value-Added**: $102 billion
- **Labor Income**: $55.9 billion
- **Jobs**: 944,227
- **Taxes**: $22.5 billion

AFIA, 2018
DDGS Market Share by Species

- Poultry
- Swine
- Dairy
- Beef

RFA, 2018
Are DDGS Nutritionally Perfect?

- **EXCESSIVE PROTEIN**
  - BEEF CATTLE
- **TOO HIGH IN FAT**
  - DAIRY COWS
- **OIL CONTENT PRODUCES SOFTER BACON FAT**
  - HOGS
- **TOO HIGH IN FIBER**
  - POULTRY

Feed ration ingredients  •  Feed products flexibility  •  Market expansion

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U.S. Fuel Ethanol Feed Products – Trend

U.S. ETHANOL INDUSTRY CO-PRODUCT ANIMAL FEED OUTPUT

- Distillers Grains
- Corn Gluten Feed
- Corn Gluten Meal

Source: RFA and U.S. Dept. of Agriculture
Note: All co-products converted to 10% moisture basis
*Estimated

RFA, 2018
DDGS Compared to Other Feed Ingredients

Top 5 Feed Ingredients:

- Corn: 118,767,563 tons
- Soybean Meal: 30,103,264 tons
- DDGS: 29,777,439 tons
- Wheat Products: 4,003,061 tons
- Animal Proteins: 1,335,551 tons

2016 U.S. usage by all protein producing animals (AFIA)
Protein in Feed Ingredients

Corn
118,767,563 tons total* ➔ 9 million tons of protein

Soybean Meal
30,103,264 tons total* ➔ 14 million tons of protein

DDGS
29,777,439 tons total* ➔ 8 million tons of protein

*2016 U.S. usage by all protein producing animals (AFIA)
Scale of Nutrients – Corn Compared to DDGS

1 pound in

0.27 pounds out

CORN AS RECEIVED
- WATER: 15.5%
- FIBER: 8.1%
- CRUDE PROTEIN: 7.5%
- CORN OIL: 3.5%
- ASH: 3%
- STARCH: 62.4%

DDGS (88% DRY MATTER)
- WATER: 12%
- CRUDE PROTEIN: 27%
- CORN OIL: 7%
- ASH: 7%
- FIBER: 40%
- YEAST: 4%
- OTHER: 2%
In 2016, over 236 million tons of animal food were consumed by nine animal species.
Price.....Value....Risk

• DDGS value in a swine ration is $250/ton
• DDGS market price is $145/ton
• This price is 40% under value. Why?
• Price=Value-Risk
  • Risk takes many forms
• 43 million tons of DDGS=$2.4 billion between value and price
• Goal of Ethanol Plant: Bring price closer to value
• Goal of Animal Feeder: Get most economy out of feed ingredients
Value-Added Feed Products

PROTEIN INGREDIENT PRICES

- Yeast Value Range
- Fish Meal
- Linear Value of Protein
- Corn Gluten Meal
- Yeast Enriched DDGS
- FST™ Hi-Pro DDG
- Soybean Meal
- DDGS

Price Per Ton

- $0
- $200
- $400
- $600
- $800
- $1,000
- $1,200
- $1,400
- $1,600

Crude Protein

0%  20%  40%  60%  80%  100%

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What Nutrients Do Animals Need Most Urgently?

- WATER
- ENERGY
- PROTEIN
What Matters to Nutritionists?

- They consider all nutrients
  - Not ingredients
- There is another dimension to products like yeast
  - Vitamins
  - Unique carbohydrates
  - Phospholipids
Amino Acids are Protein Building Blocks

- Glutamic Acid
- Glycine
- Histidine
- Isoleucine
- Leucine
- Lysine
- Methionine
- Phenylalanine
- Proline
- Serine
- Threonine
- Tryptophan
What Are Amino Acids? How Do They Make Protein?

**Primary Structure**
The sequence of amino acids

**Secondary Structure**
The amino acids are linked by hydrogen bonds to create alpha helices and beta sheets

**Tertiary Structure**
The helices and sheets fold to create the overall three-dimensional shape of a protein
How Do We Stop Overfeeding Protein?

- There are 40+ million metric tons of distillers grains made in the U.S. annually.
- 80% of this is fed to cattle.
- Cattle are fed distillers grains for both protein and energy.
- Not all protein available from distillers grains is retained by cattle.
- Therefore, approximately 4 million tons of excess distillers grain protein is effectively wasted every year by being fed with the energy source.
- How to solve this?
• The ruminal environment contains a variety of bacteria, protozoa, fungi, etc.

• Crude Protein has two parts:
  1. Ruminal Degradable Protein (RDP)
     • Utilized by ruminal population
     • Ex. Forages, fiber
  2. Ruminal Undegradable Protein (RUP)
     • Not utilized in the rumen; absorbed in the small intestine (bypass protein)
     • Ex. Distillers grains, corn
Bacteria attack and use the RDP, breaking it down into its simplest forms: amino acids and Nitrogen.

The Nitrogen is used to digest starch.

The starch breaks down into volatile fatty acids (VFAs) which are used for energy in the rumen.

Amino Acids pass from the rumen with RUP to be absorbed in the small intestine.
According to a recent report, each additional percentage point of neutral detergent fiber (NDF) in a swine finishing diet costs swine producers $2 per pig (Kline, 2017 Midwest ASAS meeting).
Ruminant (Cattle) vs Non-Ruminant (Swine)

Rumen: Fermentation vat with specific microbial environment

Abomasum: Simple stomach like we all have

Reticulum and Omasum: Aid in material handling and water balance

Ruminants: We feed the microbes to feed the animal
Ruminant (Cattle) vs Non-Ruminant (Swine)

**Non-Ruminants** (Monogastric or ‘simple stomach’): We feed the animal via meeting specific nutrient requirements like amino acids.

**Abomasum**: Primary digestive breakdown of protein, fiber and starch structures
No microbial fermentation capabilities means no ability to digest fiber and starch.

For non-ruminant animals (monogastric), feed intake does not mean energy digestibility.

Most digestion and absorption takes place in the small intestine.
Non-Ruminant Nutrition 101

Non-ruminant diets must be formulated to directly meet energy and nutritional needs.

The protein value of a feed ingredient to pigs is determined by the composition and digestibility of the essential Amino Acids (AA) in that ingredient.

Essential AA are those required by the animal that must be supplied in their diet.
Non-Ruminant Nutrition 101

- Lysine is the first-limiting amino acid for swine
  - Without enough lysine, pigs are unable to utilize the diet to full performance potential.
- All other amino acids are balanced based on Lysine:AA ratio
Non-Ruminant Nutrition 101

• Meeting Lysine with DDGS will present challenges
  • Soybean Meal:
    • 1:1 Lysine to Leucine ratio
  • DDGS:
    • 1:3-3.5 Lysine to Leucine
    • Oversupplies Leucine to meet Lysine requirement
• DDGS may not replace all of soybean meal, but could be a cost effective option
Diversified Feed Products

DDGS

FST™ High Protein DDG

FST™ Fiber + Syrup
Separate Value to Maximize Nutrition

By separating corn into its most valuable components, the nutritional needs of animals can be better met.
THANK YOU
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