Issues and Opportunities Related to the Production and Marketing of Ethanol By-Products

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Introduction

- **Processes Used to Produce Ethanol**
  - **Dry-grind**
    - Fastest growing segment of the fuel ethanol industry
    - By-product is primarily distiller’s dried grains with solubles (DDGS)
  - **Wet mill**
    - Produces a variety of products including ethanol
      - e.g. starch, corn oil, high fructose corn syrup
  - **Beverage distilleries**
    - DDGS
  - **Breweries**
    - By-product is brewer’s dried grains
What Are the Issues/Challenges?

1. Product identity and definition
2. Product variability
   a. nutrient content
   b. nutrient digestibility
   c. physical characteristics
3. Lack of a quality grading system
   a. difficult sourcing to obtain desired quality and price
4. Lack of standardized testing procedures
5. Need for quality management and certification
6. Transportation
7. Need a high degree of
   a. research
   b. education
   c. technical support
8. International market challenges
9. Lack of a national distiller’s by-product organization
   a. lack of industry cooperation
1. Product Identity and Definition

- **A case of mistaken identity?**
  - Customers don’t …
    - always understand nutritional differences among ethanol by-products
    - always know what they are going to get

- **A few sellers …**
  - misrepresent quality and nutrient specifications
  - blend DDGS with other ingredients

- **AAFCO definitions need to be revised**
  - 15. Brewer’s products
    - e.g. brewer’s dried grains
  - 27. Distiller’s products
    - e.g. distiller’s dried grains with solubles
  - 48. Maize
    - e.g. corn gluten feed, corn gluten meal
2. Product Variability

- Nutrient content
- Nutrient digestibility
  - Color (amino acid digestibility)
- Physical characteristics
  - Particle size
  - Bulk density
DDGS Varies Nutrient Content and Digestibility, Color, and Particle Size Among U.S. Sources
<table>
<thead>
<tr>
<th>Nutrient</th>
<th>DDGS</th>
<th>Soybean Meal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude protein</td>
<td>4.5</td>
<td>2.3</td>
</tr>
<tr>
<td>Crude fat</td>
<td>17.1</td>
<td>30.9</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>18.9</td>
<td>9.5</td>
</tr>
<tr>
<td>Ash</td>
<td>27.2</td>
<td>6.6</td>
</tr>
<tr>
<td>Lysine</td>
<td>12.1</td>
<td>3.0</td>
</tr>
<tr>
<td>Methionine</td>
<td>8.5</td>
<td>5.3</td>
</tr>
<tr>
<td>Threonine</td>
<td>5.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>12.0</td>
<td>7.3</td>
</tr>
<tr>
<td>Calcium</td>
<td>117.5</td>
<td>25.8</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>19.4</td>
<td>9.1</td>
</tr>
</tbody>
</table>
Fig. 1. Regression of digestible lys (%) and color (L*, b*)

\[ R^2 = 0.71 \]

\[ R^2 = 0.74 \]

Lys (%)

L*, b* score

Source: Dr. Sally Noll (2003)
Variation in Particle Size Among DDGS Samples Representing 25 U.S. Ethanol Plants

1/05
Variation in Particle Size Among Soybean Meal Samples Representing 6 U.S. Plants 2003
Product Flowability

- Particle size is sometimes too fine
- Difficult and costly to pellet
- Minimal cooling or “curing” time before loading
  - Extensive damage to trucks and rail cars
3. Lack of a Quality Grading System

- Difficult for buyers to differentiate quality and price
- Can be as much as $20-$30/ton price differential due to quality in the market
- “What you want isn’t always what you get”
4. Lack of Standardized Testing Procedures

- Different labs may use different procedures
  - variable results

- No referee laboratories have been established

- DDGS is unique
  - use of ELISA tests for mycotoxins may give false positive results
5. Need for Quality Management and Certification

- Paradigm shift toward improved DDGS quality and consistency
- Many commercial feed mills are ISO Certified
- EU – International Feed Ingredient Standard
  - GMP Certification
- Minnesota DDGS certification program was not accepted by the MN ethanol industry
6. Transportation

- Railroads no longer allowing use of their cars to transport DDGS
  - DDGS marketers must use their own cars
  - Small ethanol plants don’t produce enough DDGS in a short time to use unit trains

- Limited rail capabilities in Ontario

- Concern over rail cars returning from Mexico

- Transloaders in PNW refuse to handle DDGS due to flowability problems
7. Need a High Degree of Research, Education, and Technical Support

- **Additional research** is needed to improve DDGS acceptance in the feed industry.

- **High degree of education and technical support** is required in the marketplace.
8. Export Market Challenges

- Availability of consistent supply
  - Need system to directly connect customers to suppliers
  - Poor customer service
  - Difficult to find reliable exporters that market high quality DDGS

- “Export market is a dumping ground” for low quality U.S. ingredients

- Tariffs, definitions, and specifications

- Regulatory concerns
  - GMO
  - GMP certification
  - Antimicrobial residues
9. No National Distiller’s By-Product Organization and Coordination

- The U.S. ethanol industry is comprised of a few large, and many small independent ethanol plants.

- No single national organization to coordinate and deal with by-product issues and opportunities
Opportunities

1. Develop a national DDGS organization
   - Assemble a national DDGS technical team
     - develop new definitions for distiller’s by-products
     - develop standardized laboratory testing procedures
     - develop quality standards
       - by-product vs co-product vs product
   - develop a voluntary national certification program
Potential Categories of Distiller’s By-Products

- **Dakota Gold**
  - Solulac
  - Corn DDGS < 75% solubles added to grains
- **Dried Distiller’s Grains**
  - Corn DDGS < 75% solubles added to grains
  - Corn Condensed Distiller’s Solubles
  - Corn/Wheat Blends
  - Corn/Sorghum Blends
- **Corn - Beverage Distilleries**
  - Corn DDGS > 75% solubles added to grains
- **Wet Distiller’s Grains**
  - High ADF and Ca, Reduced Energy DDGS for Monogastrics
  - High Protein DDGS
  - Golden Lix
  - Spray Dried Distiller’s Solubles
- **DDGS/Soy Hull Blends**
8 Million MT of DDGS Produced in the U.S. Would Disappear If...

- Every broiler, layer, and turkey ate 0.10 lbs/day

OR

- Every beef steer, cow, and calf ate 4.8 lbs/day

OR

- Every dairy cow ate 8 lbs/day

OR

- Every hog ate 0.84 lbs/day
What Does the U.S. Ethanol Industry Need to Do?

- Determine the commitment to export DDGS
- Correctly define its products
- Know your products and how customers can optimize their use
- Improve customer support and technical assistance
- Fund research to support current domestic and export market development efforts
- Implement quality standards to help customers differentiate among sources and prices
- Implement a national DDGS certification program