Nutritional Characteristics and Feeding Recommendations for Corn Distiller’s By-Products

Dr. Jerry Shurson
Professor
Dept. of Animal Science
University of Minnesota
What is DDGS?

- By-product of the dry-milling ethanol industry

- Nutrient composition is **different** between dry-mill, wet-mill and beverage alcohol by-products
  - DDGS – fuel ethanol
  - DDGS - whiskey distilleries
  - Corn gluten feed – wet mill
  - Corn gluten meal – wet mill
  - Brewer’s dried grains – beer manufacturing

- Nutrient content depends on the grain source used
  - **Corn DDGS - Midwestern US**
  - Wheat DDGS - Canada
  - Sorghum (milo) DDGS - Great Plains US
  - Barley DDGS
## Comparison of Nutrient Composition (Dry Matter Basis) of “New Generation” DDGS to Corn Gluten Feed, Corn Gluten Meal, Corn Germ Meal, and Brewer’s Dried Grains

<table>
<thead>
<tr>
<th></th>
<th>“New Generation” Corn DDGS (UM)</th>
<th>Corn Gluten Feed (NRC)</th>
<th>Corn Gluten Meal (NRC)</th>
<th>Corn Germ Meal (Feedstuffs)</th>
<th>Brewer’s Dried Grains (NRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein, %</td>
<td>30.6</td>
<td>23.9</td>
<td>66.9</td>
<td>22.2</td>
<td>28.8</td>
</tr>
<tr>
<td>Fat, %</td>
<td><strong>10.7</strong></td>
<td>3.3</td>
<td>3.2</td>
<td>1.1</td>
<td>7.9</td>
</tr>
<tr>
<td>NDF, %</td>
<td>43.6</td>
<td>37.0</td>
<td>9.7</td>
<td>No data</td>
<td>52.9</td>
</tr>
<tr>
<td>DE, kcal/kg</td>
<td><strong>4011</strong></td>
<td>3322</td>
<td>4694</td>
<td>No data</td>
<td>2283</td>
</tr>
<tr>
<td>ME, kcal/kg</td>
<td><strong>3827</strong></td>
<td>2894</td>
<td>4256</td>
<td>3222</td>
<td>2130</td>
</tr>
<tr>
<td>Lys, %</td>
<td>0.83</td>
<td>0.70</td>
<td>1.13</td>
<td>1.00</td>
<td>1.17</td>
</tr>
<tr>
<td>Met, %</td>
<td>0.55</td>
<td>0.39</td>
<td>1.59</td>
<td>0.67</td>
<td>0.49</td>
</tr>
<tr>
<td>Thr, %</td>
<td>1.13</td>
<td>0.82</td>
<td>2.31</td>
<td>1.22</td>
<td>1.03</td>
</tr>
<tr>
<td>Trp, %</td>
<td>0.24</td>
<td>0.08</td>
<td>0.34</td>
<td>0.22</td>
<td>0.28</td>
</tr>
<tr>
<td>Ca, %</td>
<td>0.06</td>
<td>0.24</td>
<td>0.06</td>
<td>0.33</td>
<td>0.35</td>
</tr>
<tr>
<td>Available P, %</td>
<td><strong>0.80</strong></td>
<td>0.54</td>
<td>0.08</td>
<td>0.17</td>
<td>0.21</td>
</tr>
</tbody>
</table>
By-Products from Dry-Mill Ethanol Plants

- Distiller’s grains
  - Wet – 30 to 35% DM
  - Dry – 90 to 92% DM

- Condensed distiller’s solubles
  - Wet – 30 to 32% DM (variable)
  - Dry – 99% DM (new spray drying process developed at U of M)

- Distiller’s dried grains with solubles
  - Wet – 30 to 35% DM
  - Dried – 88 to 90% DM (most common by-product)
Dry-Milling Average Ethanol Yield Per Bushel of Corn

- Ethanol 2.7 gal.
- DDGS 18 lbs.
- CO₂ 18 lbs.
Ethanol Plants in North America - June 16, 2004
U.S. DDGS Production

Source: Steve Markham – Commodity Specialists Company
U.S. DDGS Consumption

Estimate 2001
- Dairy: 6%
- Beef: 11%
- Poultry/Swine & Other: 4%

Estimate 2002
- Dairy: 5%
- Beef: 60%
- Poultry: 15%
- Swine: 45%

Estimate 2003
- Dairy: 4%
- Beef: 39%
- Poultry: 11%
- Swine: 46%
What Are the Challenges?

1. **No grading system** to differentiate quality and price
2. **Inconsistent quality**
   - nutrient content
   - color
   - particle size
3. System to directly **connect customers to suppliers**
4. **Misrepresenting** quality and nutrient specifications and **blending DDGS** with other ingredients
5. **Flowability**
DDGS Varies Nutrient Content and Digestibility, Color, and Particle Size Among U.S. Sources
Samples of Golden Corn DDGS from Various Midwestern U.S. Ethanol Plants

VeraSun - Aurora, SD  CVEC - Benson, MN  Al-Corn - Claremont, MN  MGP – Lakota, IA
CMEC - Little Falls, MN  Agri-Energy - Luverne, MN  LSCP - Marcus, IA  Denco – Morris, MN
# Comparison of Nutrient Composition (Dry Matter Basis) of “New Generation” DDGS to Other “DDGS Sources”

<table>
<thead>
<tr>
<th></th>
<th>“New Generation” Corn DDGS</th>
<th>Solulac</th>
<th>Badger State Ethanol</th>
<th>ADM - Peoria</th>
<th>Extruded DDGS/Soy (XDS Plus)</th>
<th>AGP Pelleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein, %</td>
<td>31.82</td>
<td>29.32</td>
<td>31.62</td>
<td>30.12</td>
<td>34.44</td>
<td>27.0</td>
</tr>
<tr>
<td>Fat, %</td>
<td>11.32</td>
<td>3.52</td>
<td>15.25</td>
<td>8.96</td>
<td>13.33</td>
<td>9.00</td>
</tr>
<tr>
<td>Crude fiber, %</td>
<td>6.25</td>
<td>7.90</td>
<td>No data</td>
<td>7.77</td>
<td>7.78</td>
<td>15.10</td>
</tr>
<tr>
<td>ADF, %</td>
<td>12.37</td>
<td>11.80</td>
<td>17.91</td>
<td>20.95</td>
<td>14.44</td>
<td>No data</td>
</tr>
<tr>
<td>Ash, %</td>
<td>6.93</td>
<td>5.29</td>
<td>4.58</td>
<td>7.30</td>
<td>5.56</td>
<td>4.28</td>
</tr>
<tr>
<td>DE, kcal/kg*</td>
<td>4053</td>
<td>3808</td>
<td>No data</td>
<td>3796</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>ME, kcal/kg*</td>
<td>3781</td>
<td>3577</td>
<td>No data</td>
<td>3560</td>
<td>3749</td>
<td>No data</td>
</tr>
<tr>
<td>Lys, %</td>
<td>0.92</td>
<td>0.61</td>
<td>0.90</td>
<td>0.83</td>
<td>1.67</td>
<td>No data</td>
</tr>
<tr>
<td>Met, %</td>
<td>0.62</td>
<td>0.54</td>
<td>0.54</td>
<td>0.66</td>
<td>0.61</td>
<td>No data</td>
</tr>
<tr>
<td>Thr, %</td>
<td>1.17</td>
<td>1.01</td>
<td>1.04</td>
<td>1.13</td>
<td>2.50</td>
<td>No data</td>
</tr>
<tr>
<td>Trp, %</td>
<td>0.25</td>
<td>0.18</td>
<td>0.23</td>
<td>0.25</td>
<td>0.39</td>
<td>No data</td>
</tr>
<tr>
<td>Ca, %</td>
<td>0.07</td>
<td>0.12</td>
<td>0.06</td>
<td>0.51</td>
<td>0.22</td>
<td>0.17</td>
</tr>
<tr>
<td>P, %</td>
<td>0.77</td>
<td>0.78</td>
<td>0.89</td>
<td>0.68</td>
<td>0.72</td>
<td>0.62</td>
</tr>
</tbody>
</table>

*Calculated energy values for swine
Potential Categories of Distiller’s By-Products

Distiller’s By-Products

- Corn DDGS
  - > 75% solubles added to grains
  - < 75% solubles added to grains

- Wet Distiller’s Grains
  - High ADF and Ca, Reduced Energy for Monogastrics
  - High Fat/High Protein DDGS
  - Spray Dried Distiller’s Solubles
  - DDGS/Soy Hull Blends

- DDGS Blends
  - Corn DDGS
  - Corn Condensed Distiller’s Solubles

- Corn/Wheat Blends
  - Corn/Sorghum Blends

- Golden Lix
  - Dakota Gold
  - Solulac
### Proximate Analysis of “New Generation” DDGS (100% Dry Matter Basis)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>“New Generation” DDGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter, %</td>
<td>89.2</td>
</tr>
<tr>
<td>Crude protein, %</td>
<td>31.6</td>
</tr>
<tr>
<td>Fat, %</td>
<td>11.5</td>
</tr>
<tr>
<td>Crude fiber, %</td>
<td>6.2</td>
</tr>
<tr>
<td>Ash, %</td>
<td>7.8</td>
</tr>
<tr>
<td>NFE, %</td>
<td>42.8</td>
</tr>
<tr>
<td>ADF, %</td>
<td>11.2</td>
</tr>
</tbody>
</table>
Comparison of Amino Acid Composition of DDGS (88% dry matter basis)

<table>
<thead>
<tr>
<th></th>
<th>“New” DDGS</th>
<th>“Old” DDGS</th>
<th>DDGS (NRC, 1998)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysine, %</td>
<td>0.75 (17.3)</td>
<td>0.47 (26.5)</td>
<td>0.59</td>
</tr>
<tr>
<td>Methionine, %</td>
<td>0.63 (13.6)</td>
<td>0.44 (4.5)</td>
<td>0.48</td>
</tr>
<tr>
<td>Threonine, %</td>
<td>0.99 (6.4)</td>
<td>0.86 (7.3)</td>
<td>0.89</td>
</tr>
<tr>
<td>Tryptophan, %</td>
<td>0.22 (6.7)</td>
<td>0.17 (19.8)</td>
<td>0.24</td>
</tr>
<tr>
<td>Valine, %</td>
<td>1.32 (7.2)</td>
<td>1.22 (2.3)</td>
<td>1.23</td>
</tr>
<tr>
<td>Arginine, %</td>
<td>1.06 (9.1)</td>
<td>0.81 (18.7)</td>
<td>1.07</td>
</tr>
<tr>
<td>Histidine, %</td>
<td>0.67 (7.8)</td>
<td>0.54 (15.2)</td>
<td>0.65</td>
</tr>
<tr>
<td>Leucine, %</td>
<td>3.12 (6.4)</td>
<td>2.61 (12.4)</td>
<td>2.43</td>
</tr>
<tr>
<td>Isoleucine, %</td>
<td>0.99 (8.7)</td>
<td>0.88 (9.1)</td>
<td>0.98</td>
</tr>
<tr>
<td>Phenylalanine, %</td>
<td>1.29 (6.6)</td>
<td>1.12 (8.1)</td>
<td>1.27</td>
</tr>
</tbody>
</table>

Values in ( ) are CV’s among plants
## Composition of Distiller’s Grains for Cattle

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>% of DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Protein</td>
<td>30-36</td>
</tr>
<tr>
<td>RUP, % of CP</td>
<td>47-57</td>
</tr>
<tr>
<td>NE_L, Mcal/lb</td>
<td>1.00</td>
</tr>
<tr>
<td>Fat, %</td>
<td>9.8</td>
</tr>
<tr>
<td>ADF, %</td>
<td>19.0</td>
</tr>
<tr>
<td>NDF, %</td>
<td>38.0</td>
</tr>
<tr>
<td>Ca, %</td>
<td>0.15</td>
</tr>
<tr>
<td>P, %</td>
<td>0.83</td>
</tr>
</tbody>
</table>
Energy Value of DDGS for Ruminants

Good Quality DDGS contains:

- 7-11% more energy than “book values”
- 10-20% more energy than corn

- $N_E_L = 1.00 \text{ Mcal/lb}$
- $N_E_M = 1.06 \text{ Mcal/lb}$
- $N_E_G = 0.73 \text{ Mcal/lb}$
- $TDN = 94\%$
- $DE = 1.84 \text{ Mcal/lb}$
- $ME = 1.64 \text{ Mcal/lb}$
Protein in Distiller’s Grains

> 30% of DM and more than old “book values”
  - Similar for DDG & DDGS

Good source of Ruminally Undegradable Protein (~55% RUP)
  - RUP is slightly less for wet vs. dried DDG

Protein quality
  - Fairly good quality
  - Lysine is the first limiting amino acid
“Old Generation” vs. “New Generation” DDGS

Lower Quality, Less Digestible DDGS

High Quality, Highly Digestible DDGS
Corn DDGS Color and Smell are Indicators of Digestibility for Monogastrics

- **Color varies among sources**
  - ranges from dark to golden (Cromwell et al., 1993)
  - golden color of corn DDGS is correlated with higher amino acid digestibility in swine and poultry

- **Smell varies among sources**
  - ranges from burnt or smoky to sweet and fermented (Cromwell et al., 1993)
  - golden DDGS has a sweet, fermented smell
  - smell may affect palatability
Fig. 1. Regression of digestible lys (%) and color (L*, b*)

$R^2 = 0.71$

$R^2 = 0.74$
The Use of DDGS in Swine Diets
DDGS Feeding Value for Swine

- Energy value of golden sources comparable to corn
- High available P – reduces manure P
- Adding 10% DDGS to finishing diets reduces the length, severity, and prevalence of ileitis lesions in a moderate disease challenge
- Feeding a 50% DDGS diet in gestation and 20% DDGS diet in lactation may increase litter size
Maximum Inclusion Rates of “New Generation” DDGS in Swine Diets
(Based Upon University of Minnesota Performance Trials)

- Nursery pigs (> 7 kg)
  - Up to 25 %

- Grow-finish pigs
  - Up to 20% (higher levels may reduce pork fat quality)

- Gestating sows
  - Up to 50%

- Lactating sows
  - Up to 20%

Assumptions: no mycotoxins
formulate on a digestible amino acid and available phosphorus basis
### Comparison of DE and ME Estimates of DDGS (88% DM)

<table>
<thead>
<tr>
<th>Source</th>
<th>DE, Mcal/kg</th>
<th>ME, Mcal/kg</th>
<th>NE, Mcal/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>U of M – Old Generation (1999)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>3.41</td>
<td>3.10</td>
<td>No data</td>
</tr>
<tr>
<td>KSU – New Generation (2004)&lt;sup&gt;2&lt;/sup&gt;</td>
<td>3.87</td>
<td>3.49 – 3.70</td>
<td>2.61</td>
</tr>
<tr>
<td>Hanor-Hubbard-Ajinomoto (2004)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>No data</td>
<td>3.25</td>
<td>2.42</td>
</tr>
<tr>
<td>NRC (1998)</td>
<td>3.45</td>
<td>2.67</td>
<td>No data</td>
</tr>
</tbody>
</table>

---

1. Calculated values  
2. Determined by growth and metabolism trials (source Dakota Gold)  
3. Not DDGS but corn gluten from a NE ethanol plant  
4. Determined by growth trials (source Dakota Gold)
G-F Trial Procedures (Fu et al. 2004)

- DDGS source – Dakota Gold
- Used 256 barrows (initial wt.= 28.5 kg)
- 92 d feeding period
- 5 phase feeding program
- Diets contained 0, 10, 20, or 30% DDGS
  - Formulated on a equivalent ileal digestible lysine and isocaloric basis
  - Contained 0.15% (phase 1-4) or 0.10% (phase 5) L-lysine HCl to keep digestible threonine, tryptophan, and sulfur amino acids ≥ the control diets
Effect of DDGS Inclusion Rate on ADG, ADFI, and G/F for 92-d Grow-Finish Period

Fu et al. (2004)
Effect of Adding 10% DDGS to Grow-Finish Diets on ADG, ADFI, and F/G for a 64 d Grow-Finish Period

Lawrence (2003) – Hubbard Milling Commercial Feeding Trial
Effect of DDGS Inclusion Rate on Carcass Characteristics (Fu et al. 2004)

- Increasing dietary DDGS level:
  - Linearly decreased carcass weight
  - No effect on backfat
  - No effect on loin depth
  - No effect on % carcass lean
  - No effect on carcass yield
Typical Grow-Finish Pig Performance in a 1000 Head Commercial Finishing Barn

<table>
<thead>
<tr>
<th>Grow-Finish Pigs Fed Diets Containing DDGS</th>
<th>No DDGS</th>
<th>10% DDGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigs in</td>
<td>993</td>
<td>988</td>
</tr>
<tr>
<td>Pigs Out</td>
<td>979</td>
<td>971</td>
</tr>
<tr>
<td>Daily Gain, lb</td>
<td>1.63</td>
<td>1.62</td>
</tr>
<tr>
<td>Feed:Gain</td>
<td>2.75</td>
<td>2.74</td>
</tr>
<tr>
<td>Feed cost, $/hd</td>
<td>$32.69</td>
<td>$32.53</td>
</tr>
</tbody>
</table>

Source: Land O’Lakes Farmland Feed
### Actual Close-Outs on Commercial Swine Finishing Operations

<table>
<thead>
<tr>
<th></th>
<th># in</th>
<th># out</th>
<th>Wt in</th>
<th>Wt out</th>
<th>DL</th>
<th>ADG</th>
<th>F/G</th>
<th>ADC</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farm 1:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Averages</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total head</td>
<td>24,676</td>
<td>23,852</td>
<td>58.7</td>
<td>253.0</td>
<td>3.35</td>
<td>1.71</td>
<td>2.79</td>
<td>4.79</td>
<td>113</td>
</tr>
<tr>
<td><strong>Farm 2:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Averages</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total head</td>
<td>8,798</td>
<td>8,545</td>
<td>47.2</td>
<td>265.2</td>
<td>2.88</td>
<td>1.75</td>
<td>2.86</td>
<td>5.00</td>
<td>124</td>
</tr>
<tr>
<td><strong>Farm 3:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Averages</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total head</td>
<td>13,887</td>
<td>13,563</td>
<td>51.5</td>
<td>259.2</td>
<td>2.33</td>
<td>1.74</td>
<td>2.76</td>
<td>4.82</td>
<td>119</td>
</tr>
</tbody>
</table>

Source: Land O’Lakes Farmland Feed
Carcass Yield and % Lean of Pigs Fed 10% DDGS Diets on a Commercial Swine Operation in 2002

(10% DDGS was added to diets mid-year)

Source: Land O’ Lakes
Are There Components of Corn Distiller’s Solubles that Are Responsible for Enteric Health Benefits?
Materials and Methods

- 7 dietary treatments fed from day 0 to 10 post-weaning

  - **NC** = negative control
  - **DS** = spray dried distiller’s solubles
    - 15% of the diet
  - **YC** = spray dried yeast cream
    - 7.5% of the diet
    - replaced animal fat
  - **RS** = spray dried residual solubles
    - 15% of the diet
  - **AB** = carbadox
    - 50 g/ton
  - **PP** = spray dried porcine plasma
    - 6% of the diet
  - **PC** = spray dried porcine plasma + carbadox
    - 6% PP + 50 g/ton AB
Villi Height and Crypt Depth in the Upper 25% of the Small Intestine

NC = negative control
DS = spray dried distiller’s solubles
YC = spray dried yeast cream
RS = spray dried residual solubles
AB = carbadox
PP = spray dried porcine plasma
PC = spray dried porcine plasma + carbadox

a, b = Least squares means with different superscripts are different (P < .05)
Villi Height:Crypt Depth Ratio in the Upper 25% of the Small Intestine

NC = negative control
DS = spray dried distiller’s solubles
YC = spray dried yeast cream
RS = spray dried residual solubles
AB = carbadox
PP = spray dried porcine plasma
PC = spray dried porcine plasma + carbadox

a, b = Least squares means with different superscripts are different (P < .05)
Villi Measurements from the Upper 25% of the Small Intestine from a Pig Fed the Residual Solubles Diet (10X)
Villi Measurements from the Upper 25% of the Small Intestine from a Pig Fed the Carbadox Diet (10X)
The Use of DDGS in Dairy Rations
Is There a Difference When Feeding Whiskey or Fuel Ethanol Distillers Grains?

When milk production was compared between feeding DDGS from whiskey or fuel ethanol plants:

* Similar milk production
* Higher production than when fed SBM
* If DDGS was dark (heat damaged?):
  - production was the same as when fed SBM

Florida Research (1995)
Wet vs. Dried Distiller’s Grains

Nutrient content of DM is the same for both

Considerations for Wet Distiller’s Grains:

- Can usually store only 5-7 days
- May need preservatives (e.g. propionic acid or other organic acids, etc.)
- Limited economical hauling distances
- Rations may be too wet
  - limit total DM intake, especially if ensiled forages are also fed
Production Response of Dairy Cows When Fed Distiller’s Grains

The same as, or greater than when fed SBM

Increased or no change when supplemented with protected lysine & methionine

Similar to when fed a blend of protein supplements (SBM, FM, DG)
How Much Distiller’s Grains Can be Fed to Dairy Cows?

Recommend max. of ~ 20% of ration DM
- 10-13 lb/d of dried
- 30-40 lb/d of wet

Usually no palatability problems

At 30% of DM:
- May decrease DMI, especially if Wet CDG
- May feed excess protein
Example Ration Considerations for Dairy Cattle

Diets containing 50:50 forage:concentrate
- If equal proportions of alfalfa & corn silage
  * DG can replace most or all protein supplement

- If mostly corn silage
  * More DG can be fed but may need some other protein supplement (check Lysine and P levels)

- If mostly alfalfa
  * Less DG likely needed to supply diet CP
The Use of DDGS in Beef Rations
Nutritional Value of DDGS for Beef Cattle

- Excellent protein source (28% crude protein)
- High by-pass protein
- Excellent source of essential minerals (P and K)
- Improves rumen health
- Very palatable
- 1.8 times more value compared to soybean meal
Distiller’s Grains for Beef Cattle

As protein source
- 6-15% of ration DM

As an energy source
- when fed at >15% of DM
- may reduce acidosis because highly digestible fiber in place of starch

ADG and F/G usually better than with corn

Klopfenstein et al., University of Nebraska
Value of Nutrients in DDGS for Finishing Cattle

- **Energy**
  - Wet distiller’s grains – 110 to 125% energy of corn (DM basis)
  - DDGS – 100% of corn (DM basis)

- **Protein**
  - By-pass > soybean meal
  - Wet = Dry is properly dried

- **Fiber**
  - High fiber and low starch reduces fermentation rate
    - Safe ingredient to start cattle on finishing diets
    - Reduces subacute acidosis

- **Fat**
  - Oil content limits the quantity fed (<40%)

- **Phosphorus**
  - No value in corn-based finishing diets
  - Value as a supplement to low P forages
How Much Distiller’s By-Products Can Be Fed to Beef Cattle?

- **DDGS (90% DM)**
  - Feed to supply protein to meet requirement
  - < 20 % ration dry matter

- **Wet DGS (30% DM)**
  - Feed to supply protein and energy
    - Commonly fed at < 25% of ration dry matter
    - Greatest value at 15 to 20% of ration dry matter
  - Can feed up to 40% of ration dry matter
    - Overfeed protein and phosphorus

- **Wet Condensed Distiller’s Solubles (30% DM)**
  - Feed to supply protein and energy
    - Limit to < 10% of ration dry matter
## Value of By-Products for Beef

<table>
<thead>
<tr>
<th>Commodity</th>
<th>DM %</th>
<th>NEg</th>
<th>CP %</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn per bushel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hi Pro Soybean Meal per ton</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed Grade Urea per ton</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>DM%</td>
<td>NEg</td>
<td>CP%</td>
<td>Ratio</td>
</tr>
<tr>
<td>$3.05</td>
<td>88.0</td>
<td>66</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>$320</td>
<td>89.0</td>
<td>65</td>
<td>53.4</td>
<td>25%</td>
</tr>
<tr>
<td>$490</td>
<td>99.0</td>
<td>0</td>
<td>286</td>
<td>75%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Commodity</th>
<th>DM %</th>
<th>NEg</th>
<th>CP %</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn Screenings</td>
<td>86</td>
<td>52</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Corn Gluten Feed, Dry</td>
<td>90</td>
<td>63</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Corn Gluten Feed, Wet</td>
<td>40</td>
<td>63</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Cottonseed, Whole</td>
<td>91</td>
<td>72</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Distillers Grains, Dry</td>
<td>88</td>
<td>66</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Distillers Grains, Wet</td>
<td>30</td>
<td>66</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Distillers Syrup</td>
<td>30</td>
<td>80</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Commodity</th>
<th>DM %</th>
<th>NEg</th>
<th>CP %</th>
<th>Energy Value/ton</th>
<th>Protein Value/ton</th>
<th>Total Value/ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn Screenings</td>
<td>86</td>
<td>52</td>
<td>9.5</td>
<td>$67</td>
<td>$21</td>
<td>$88</td>
</tr>
<tr>
<td>Corn Gluten Feed, Dry</td>
<td>90</td>
<td>63</td>
<td>20</td>
<td>$85</td>
<td>$47</td>
<td>$132</td>
</tr>
<tr>
<td>Corn Gluten Feed, Wet</td>
<td>40</td>
<td>63</td>
<td>20</td>
<td>$38</td>
<td>$21</td>
<td>$59</td>
</tr>
<tr>
<td>Cottonseed, Whole</td>
<td>91</td>
<td>72</td>
<td>23</td>
<td>$98</td>
<td>$54</td>
<td>$153</td>
</tr>
<tr>
<td>Distillers Grains, Dry</td>
<td>88</td>
<td>66</td>
<td>28</td>
<td>$87</td>
<td>$64</td>
<td>$151</td>
</tr>
<tr>
<td>Distillers Grains, Wet</td>
<td>30</td>
<td>66</td>
<td>30</td>
<td>$30</td>
<td>$23</td>
<td>$53</td>
</tr>
<tr>
<td>Distillers Syrup</td>
<td>30</td>
<td>80</td>
<td>30</td>
<td>$36</td>
<td>$23</td>
<td>$59</td>
</tr>
</tbody>
</table>
DDGS Relative Value Differs Depending on Species

<table>
<thead>
<tr>
<th>Feed</th>
<th>Dollars/tan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Lactation</td>
<td>$114.24</td>
</tr>
<tr>
<td>Poultry Finisher</td>
<td>$100.09</td>
</tr>
<tr>
<td>Layer Diet</td>
<td>$104.66</td>
</tr>
<tr>
<td>Swine G-F Diet</td>
<td>$96.34</td>
</tr>
<tr>
<td>Beef Feedlot</td>
<td>$108.00</td>
</tr>
</tbody>
</table>

**Assumptions:**
- Corn $2.00/ bu
- SBM $175.00/ ton
- Urea $360.00/ ton
- Non-ruminant diets corn/SBM
- Ruminant diets typical diets with competing by-products.

Source: Tilstra, Land O’ Lakes
We have developed a DDGS web site featuring:
  * research summaries
    - swine, poultry, dairy, & beef
    - DDGS quality
  * presentations given
  * links to other DDGS related web sites
  * international audiences