# Distiller Grains for Beef Cattle Feeding[1]

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## Introduction

Ethanol production for fuel has increased dramatically. Most ethanol is produced in the upper Midwest and Great Plains; however, production has expanded into the southern tier of the United States. Ethanol is predominantly produced from corn, but other grains such as grain sorghum can be and are utilized. The co-products of ethanol production are distillers grains and condensed distillers solubles, which are commonly blended together and sold as livestock feed. Distillers grains plus solubles (DGS) can be fed to cattle either wet (WDGS) or dry (DDGS) and can be used as a high quality protein supplement, as an energy and protein supplement, or as a main ingredient in growing and finishing diets.

## Nutrient Composition

In the production of corn ethanol, the starch portion of the kernel is converted to ethanol and the residual is the bran (fiber) and oil. The resulting co-product is high in energy, crude protein, and fiber. On average, DGS contains (dry matter basis) around 30% crude protein, 11% crude fat (oil), 0.10 % calcium (Ca), and 0.7% to 1.1% phosphorus (P). The energy content of DGS is comparable to corn. A summary of DGS composition is presented in Table 1.

The main source of feed energy in DGS differs from corn. Most of the energy in corn is metabolized from starch, whereas in DGS most of the energy is from digestible fiber and fat. The greater fiber content reduces the chance of digestive upsets that might occur when feeding high levels of corn and makes DGS an excellent complement or supplement to forage-based feeding programs. However, the increased concentration of fat can present problems when included in diets at high levels. High dietary fat can interfere with digestion of other diet components such as fiber.

## Feeding DGS

The nutrient composition of DGS can be quite variable (Table 1) and depends on source and production method. Because of this variability, it is important to know the actual analysis of DGS prior to feeding, especially when fed at high levels. Generally, DGS can replace other common concentrate feeds in beef cattle diets, as long as care is taken to account for the increased concentrations of a few key nutrients.

The sulfur (S) concentration of DGS can be very high, often exceeding the established toxicity levels for beef cattle, which is established at 0.4%. Sulfur levels in excess of 0.5% in DGS are not uncommon, and can range from 0.4% to 0.88%. Toxic S concentrations can result in polioencephalomalacia, or "brainer" disease, a neurological condition that if left untreated can result in death. Increased levels of dietary S can also increase the risk of copper deficiency. Excess S can "tie up" copper, and thus it is unavailable for the animal. Many ethanol production plants have modified their ethanol production procedures to minimize concentrations of S, but prudence dictates that the S concentration

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of DGS be known prior to inclusion at high levels (greater than 30% DM) of DGS in diets.

Phosphorus concentration in DGS is high, and when fed at high levels, excessive dietary concentration of P can be easily overlooked. When used as a supplement to high-forage diets, the additional P can disrupt the Ca to P ratio and result in an increased chance of urinary calculi. Simply using a Ca source free of or low in additional P, such as ground limestone or certain commercially available mineral supplements, can return the Ca:P ratio to acceptable levels of 2:1 to 1:1.

The color of DGS should be yellow to tan. Dark coloring along with a "burned" smell would indicate "scorching," which can have a negative effect on nutritional values, especially protein digestibility.

In general, wet DGS (WDGS) has a greater feed value, on a dry basis, than dry DGS (DDGS). Wet DGS averages about 10% greater TDN (total digestible nutrients) than DDGS. The difference is due to the heat required to dry the DGS, which "ties up" some of the nutrients. However, since WDGS is about 70% water, it can spoil rapidly, especially under hot, humid conditions common during summer in the southeastern US. Thus, WDGS would only be feasible for large cattle operations that are located near an ethanol production facility.

Ethanol production facilities are common in the mid-western United States, especially the northern portion. At present there is only one facility in the deep Southeast, located at Camilla in southwestern Georgia.

## Summary

In all, DGS is an excellent feed for beef cattle. This feed can provide both protein and energy in many beef cattle supplement feeding and backgrounding programs. With the increasing production of ethanol for fuel, the availability of DGS will only increase in the future. University research has indicated that DGS can be safely fed up to 40% of total diet (dry basis), and the possibility of greater inclusion rates does exist. With the increase in the availability of DGS, more research is currently being conducted at several institutions that will help to more clearly define acceptable feeding levels and feeding management practices for DGS.

## Links

Distillers Grains Technology Council—http://www.distillersgrains.org/

Extension.org—http://www.extension.org/pages/18990/distillers_grains

University of Minnesota Distillers Grains By-Products in Livestock Feed—http://www.ddgs.umn.edu/

Table 1. Composition (DM basis) of Dried Distillers Grains plus Solubles (DDGS) and corn.

| | DDGS[a] | | |
|---|---|---|---|
| **Item** | **Average** | **Range** | **Corn** |
| Dry matter, % | 89.0 | 83.7–95.0 | 88.7 |
| Crude protein, % | 31.3 | 27.1–35.5 | 8.9 |
| ADF[b], % | 16.5 | 13.1–19.9 | 3.7 |
| NDF[b], % | 34.0 | 29.5–38.5 | 10.0 |
| Crude fat, % | 11.6 | 8.4–14.9 | 4.2 |
| Ash, % | 6.3 | 5.0–7.6 | 1.6 |
| TDN[c], % | 81.8 | 76.7–86.8 | 88.0 |
| NEm[c], mcal/lb | 0.96 | 0.87–1.05 | 1.00 |
| Nel[c], mcal/lb | 0.92 | 0.85–0.99 | 0.94 |
| Neg[c], mcal/lb | 0.66 | 0.58–0.73 | 0.69 |
| Calcium, % | 0.09 | 0.00–0.29 | 0.04 |
| Phosphorus, % | 0.90 | 0.73–1.06 | 0.31 |
| Magnesium, % | 0.33 | 0.25–0.41 | 0.12 |
| Potassium, % | 1.10 | 0.83–1.36 | 0.41 |
| Sodium, % | 0.22 | 0.02–0.42 | 0.03 |
| Copper, ppm | 6.5 | 0.00–22.6 | 3.0 |
| Sulfur, % | 0.66 | 0.44–0.87 | 0.10 |

[a] From Dairy One Cooperative, Inc (n = 4,990 to 12,808); www.dairyone.com/Forage/FeedComp/MainLibrary.asp; accessed November 2018
[b] ADF=Acid Detergent Fiber, NDF=Neutral Detergent Fiber, TDN=Total Digestible Nutrients
[c] NEm=Net Energy of maintenance, NEl=Net Energy of lactation, NEg=Net Energy of gain.