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# The Impact of Growing Ethanol Byproduct Production on Livestock Feed Markets

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# Byproducts of ethanol production vary according to production process

## ❖ Wet mill

- Corn gluten feed
- Corn gluten meal
- High protein products used as protein sources in competition with soybean meal.
- Largely exported to protein deficient livestock sectors.

## ❖ Dry mill

- Distillers dried grains
- Distillers dried grains with solubles
- Medium protein product used in U.S. as supplement in dairy and beef rations.
- Excellent source of bypass protein, deficient in amino acid balance.

# Byproducts of ethanol from the dry mill process.

## ❖ Distillers' Dried Grains (DDG)

- The dried coarse grain particles that remain from the fermentative conversion of starch to ethanol or alcohol using screening, pressing or centrifuging.

## ❖ Distillers' Dried Grains with Solubles (DDGS)

- After the starch portion of corn is converted to ethanol and CO<sub>2</sub>, the remaining components - proteins, fat, fiber, vitamins and minerals are concentrated and dried to produce DDGS.

# Historically, distiller's dried grains have been a simple alternative energy source when corn is in short supply or expensive.

- ❖ Even though the energy values of DDG are high, the economic value of distiller's by-products is at least twice as much when used as a protein source. This is because protein sources are more valuable than energy sources.
- ❖ When DDG is fed as an energy source, the protein is used as an energy source and therefore is economically underused.
- ❖ DDG is primarily used by animal feeders as a protein supplement for dairy and beef cattle, swine, and sheep rations because it is an economical source of protein compared to soybean meal.
- ❖ Several synthetic amino acids must be added to DDG for use in monogastric diets. This increased total dietary cost makes it more economical to feed DDG to growing calves, and dairy cows.

# Pros and cons of DDG

## Advantages

- ❖ High protein content
- ❖ High Bypass protein
- ❖ High available phosphorus
- ❖ High fiber content
- ❖ Substitutability

## Disadvantages

- ❖ Supplementation
- ❖ Higher nitrogen uptake
- ❖ Nutritional composition
- ❖ Production factors
  - Processing
  - Quality consistency
  - Transportation
  - Market volumes
  - Cost-competitiveness

# Swine: Distiller's dried grain by-products can be used as a protein/energy source in growing pigs and reproducing sows at limited inclusion rates.

- ❖ DDGS contain approximately 27 percent crude protein, but are low in lysine and to a lesser extent threonine, leucine, isoleucine, and tryptophan
- ❖ DDGS are relatively high in fiber, which tends to limit their use as an energy source in monogastric diets
- ❖ Research results have supported that DDGS is an excellent source of available phosphorus (15X more than corn) for growing swine.
- ❖ Distiller's dried grains apparently can furnish all of the supplementary dietary protein and portions of energy in diets fed to breeding hogs.

## **Poultry: Distiller's dried grain by-products can be used as a protein/energy source in broiler diets.**

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- ❖ Research results have supported that DDGS is an excellent source of available phosphorus for poultry.
- ❖ Similar inclusion rates to those for pigs have been looked at with poultry. Dietary concentrations of 20 percent or more may provide adequate growth performance if diets are formulated on a digestible amino acid basis.

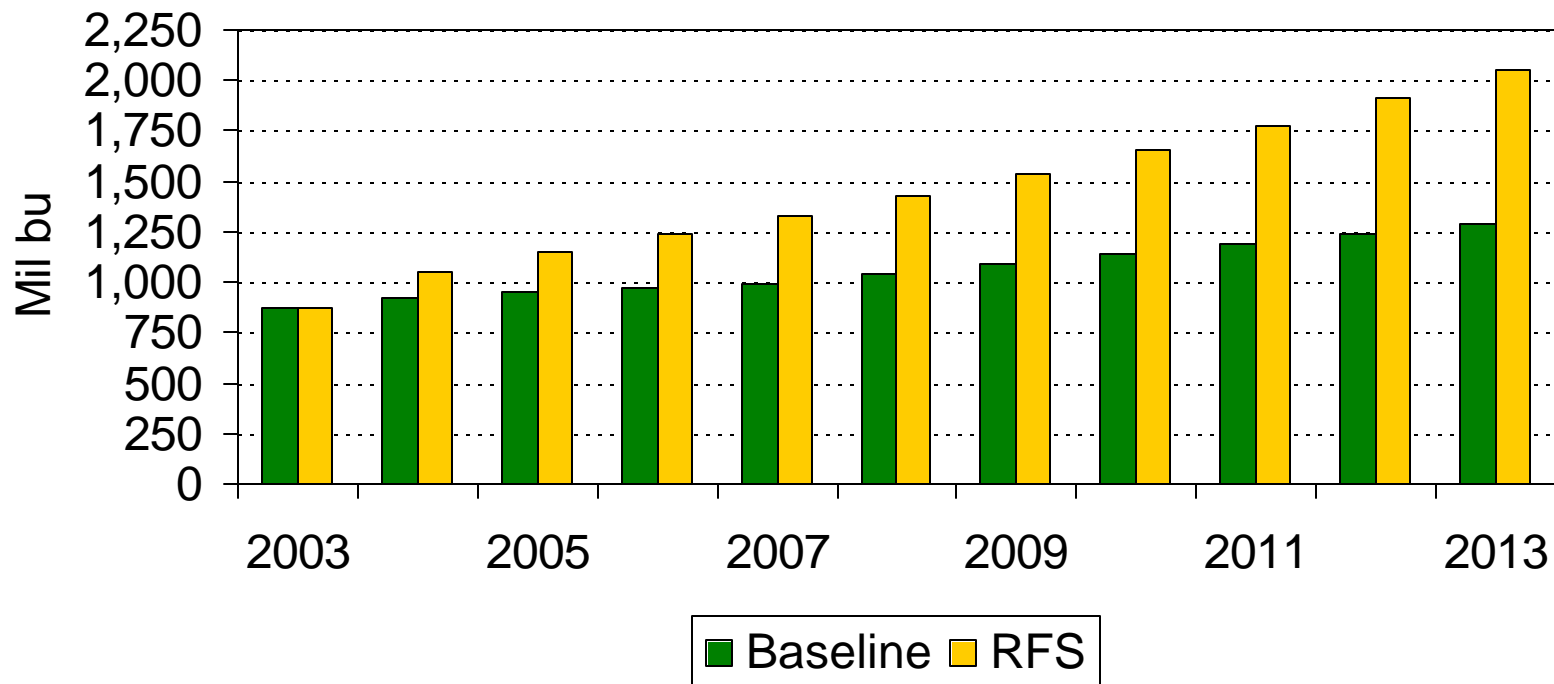


## **Dairy and Cattle: The combination of bypass protein, digestible fiber and fat in DDG make it a highly desirable feed for dairy cows, beef cattle, and other ruminants.**

- ❖ **DDG use in ruminant diets is often limited to 10% of dry matter intake due to the high moisture content. When fed at 30 percent, replacing corn, finishing cattle had an increase in final weight, daily gain, feed efficiency, fat thickness, and yield grade.**
- ❖ **DDG has a calculated intake protein of 43% making it a very effective replacement for soybean meal as a rumen by-pass protein necessary to achieve maximum gain or milk production. The dairy cow requires more bypass protein than beef cattle and also more digestible fiber is needed to maintain milk fat test.**
- ❖ **From an energy value perspective, DDG is superior to grain corn because of higher digestible fiber content, its protein is partially protected from rumen breakdown, and it contains three times as much fat as corn.**

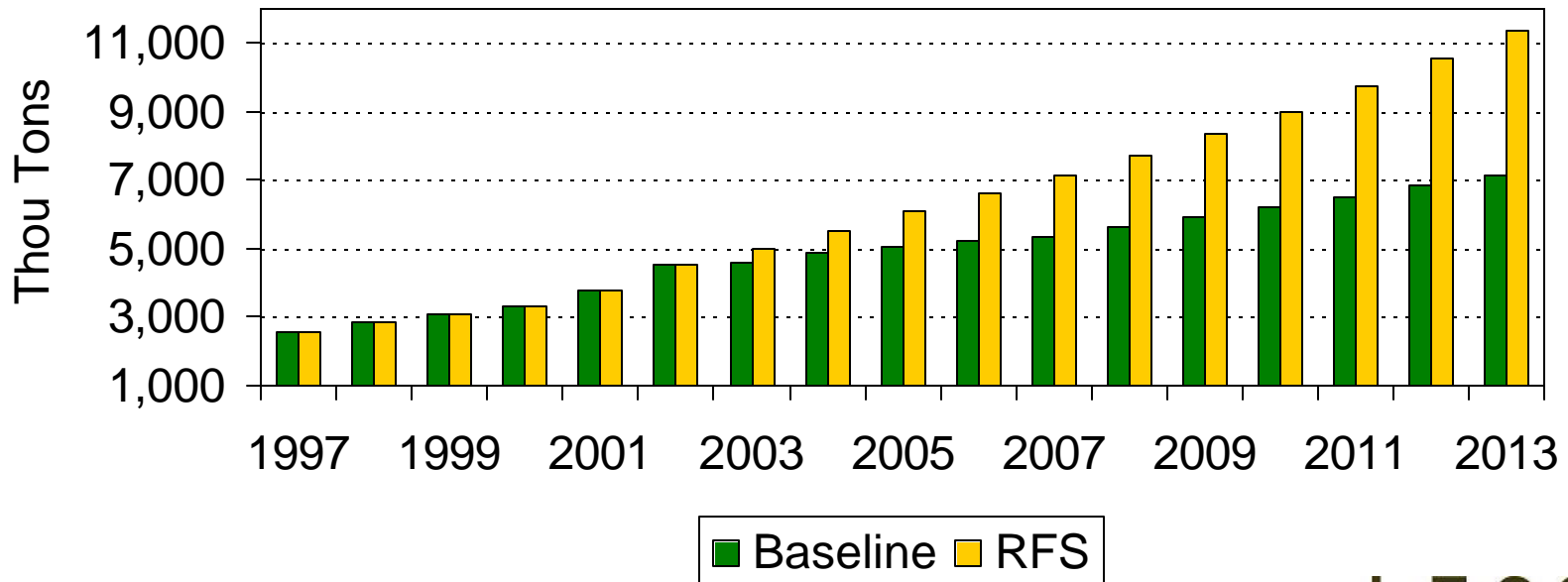
# An RFS will double the amount of corn needed to produce ethanol production over the next decade.

## Corn Utilization for Ethanol



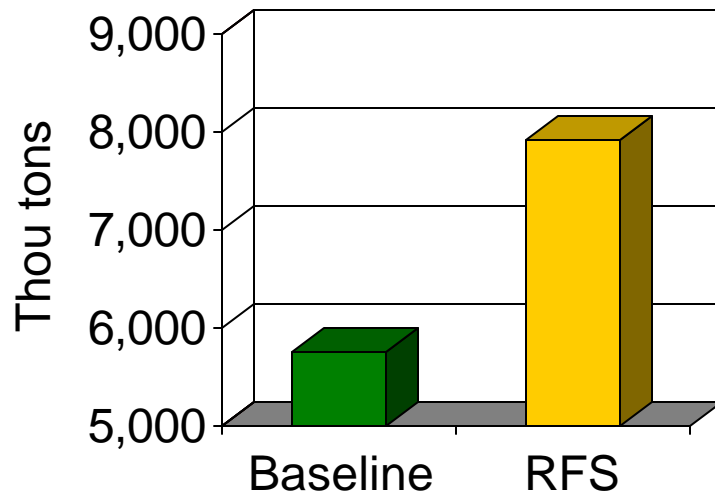
**This will be accompanied by a commensurate increase in Distillers dried grains production.**

**DDG Production**  
(Assumes 60% of ethanol produced in dry mills)

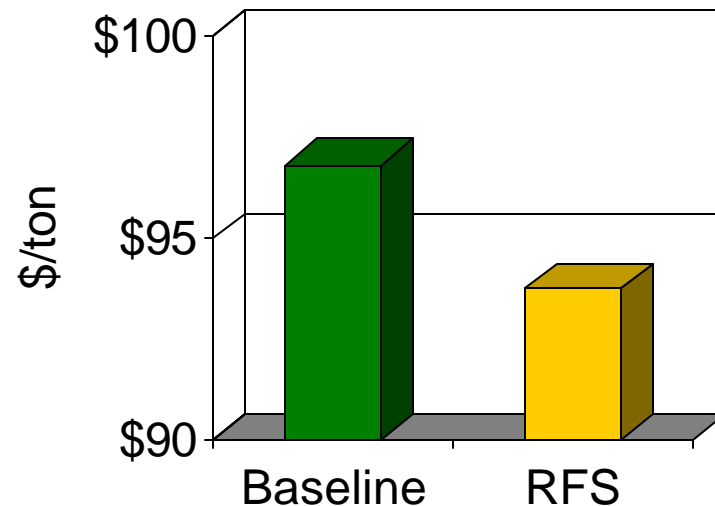


# An RFS will impact DDG production and prices.

**Production  
2003-13**

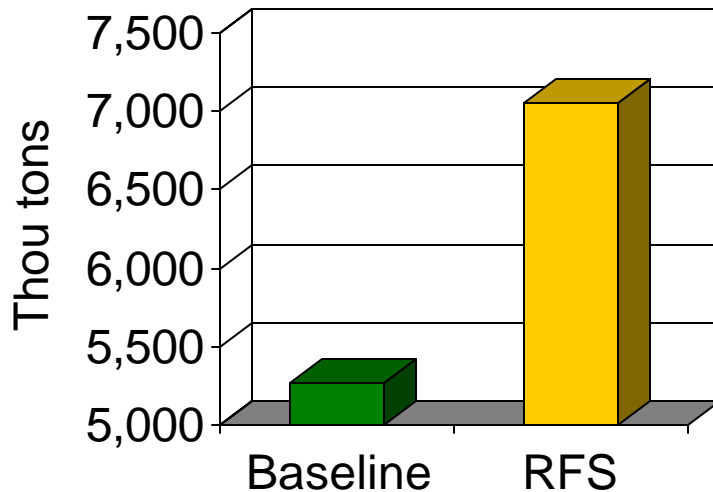


**Lawrenceburg Price  
2003-13**

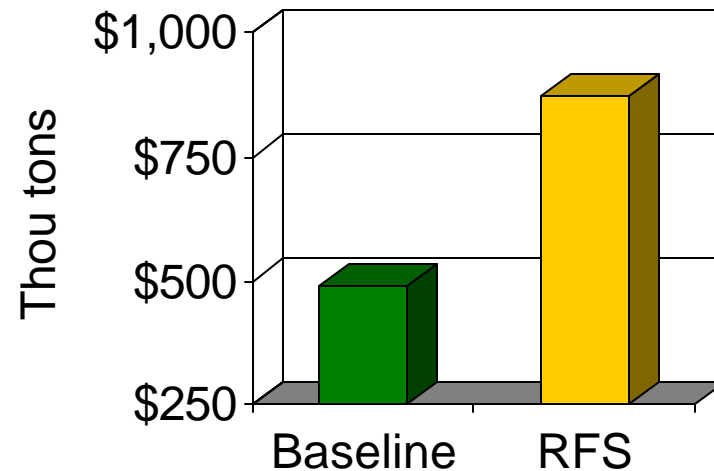


# If production increases 38% why does price fall only 4%? Increased demand!

**Domestic Utilization  
2003-13**

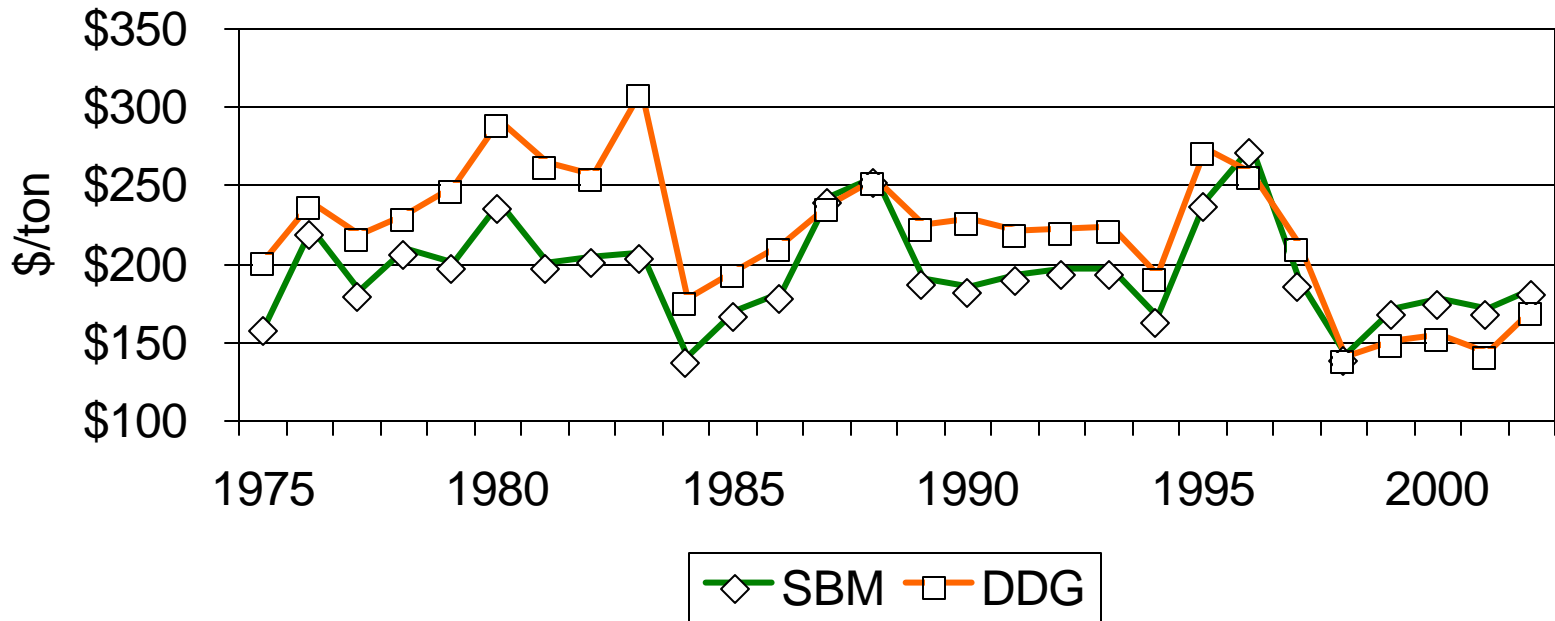


**Average Exports  
(2003-13)**



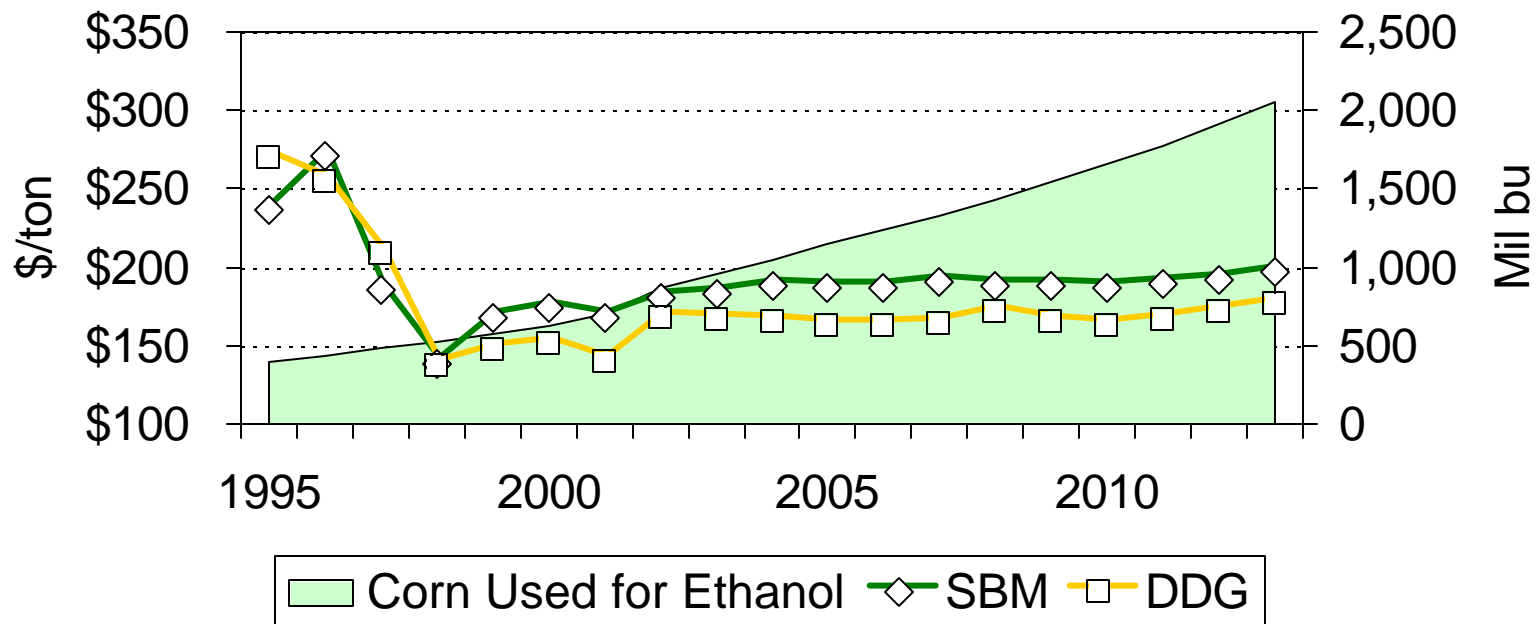
**The protein in DDG has less quality than soybean meal. Consequently DDG had to be priced below SBM to be competitive in monogastric rations.**

**Soybean Meal and DDG Prices  
Equivalent 48% Protein Basis**



The historic price relationship between DDG and SBM inverted is 1999 as ethanol production surged and is projected to remain favorably priced.

Soybean Meal and DDG Prices  
Equivalent 48% Protein Basis



# DDG will become competitive for monogastric rations under an RFS.

Economic Value of DDG in a Grow-finish Pig Ration  
(Assumes a 10% inclusion rate)

SBM Price (\$/ton)

	\$150	\$200	\$250
Corn Price (\$/bu)			
\$2.00	\$81	\$84	\$87
\$2.50	\$98	\$100	\$113
\$3.00	\$114	\$117	\$120



# DDG can be successfully substituted for both corn and SBM in livestock rations

## Substitution Ratios for DDGS (lbs/ton)

<b>Animal (% inclusion)</b>	<b>Remove Corn</b>	<b>Remove SBM</b>	<b>Remove Dical</b>	<b>Add DDGS</b>
<b>Dairy (20%)</b>	<b>40</b>	<b>360</b>	<b>0</b>	<b>400</b>
<b>Beef (25%)</b>	<b>50</b>	<b>450</b>	<b>0</b>	<b>500</b>
<b>Swine (10%)</b>	<b>177</b>	<b>20</b>	<b>3</b>	<b>200</b>
<b>Poultry (10%)</b>	<b>177</b>	<b>20</b>	<b>3</b>	<b>200</b>
<b>Sheep (25%)</b>	<b>50</b>	<b>450</b>	<b>0</b>	<b>500</b>

# What more needs to be done to increase DDG use?

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## ❖ Research

- More work on monogastric diets

## ❖ Development

- Improved nutritional content of corn (better amino acid profiles)

## ❖ Education

- American farmers haven't used DDG widely because there wasn't a reason to.
- Economics now are providing a reason.

# The outlook for ethanol byproduct feeds looks bright

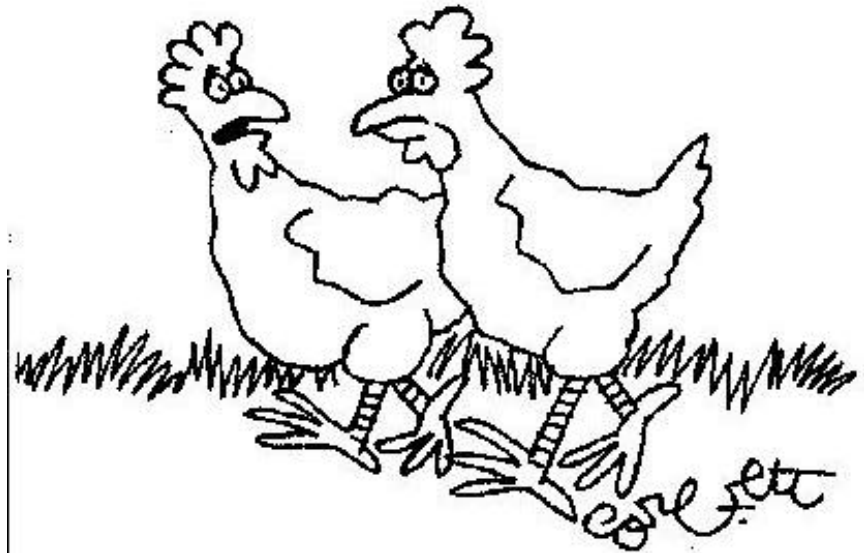
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- ❖ The RFS will result in a significant increase in ethanol byproduct feeds.
- ❖ The relationship between protein feeds (SBM versus DDG) will remain inverted, providing an economic incentive for higher use.
- ❖ DDG can be used effectively both in monogastric and ruminant feed rations.
- ❖ Livestock and poultry growers will have an opportunity to improve profitability through reduced feed costs.

# In conclusion

- ❖ Special thanks to Dr. Marcia Taylor of the University of Missouri, Columbia.

THE WALL STREET JOURNAL



“Here, you’re either great, or you’re  
finger lickin’ good.”