

Soybean Meal — Demand



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How Will Soybean Meal Fare in the Future?

In the movie, “The Perfect Storm,” several seemingly unrelated factors came together to produce an unexpected “Storm of the Century.” Because of the combination of these factors, a massive storm raged in the North Atlantic, trapping and ultimately destroying the fishing boat, the Andrea Gail. Sometimes in life, combinations of seemingly unrelated factors can result in events that sometimes are beneficial and sometimes disastrous.

In the early 1950s, several seemingly unrelated events occurred that led to a beneficial “Perfect Storm” for both soybean producers and the poultry industry.

- The production of vitamin B12 supplements for use in animal feed, which eliminated the need for animal protein in the diet of monogastric animals.
- Increased post-war demand for soybean oil to replace lard as cooking oil and for margarine to replace expensive butter as consumers sought a healthier lifestyle. This led to increasing crush of soybeans and a growing supply of soybean meal for use in livestock feed.
- The development of integrated poultry producers who began mixing their own feed, with the shift away from feed produced by the giant flour millers who used poultry feed as an outlet for their milling byproducts.

- The introduction of linear programming and computer formulation was the final factor that tied these events together, as it pointed out the value of simplified corn-soybean meal diets with amino acid supplementation.

The combination of these events was serendipitous and the growth of the poultry industry and soybean meal production in the United States has followed a parallel trend since the 1950s (Figure 1). Both industries have benefited greatly from the other.

Soybean meal has become a staple in poultry diets, providing approximately 66 percent of the protein in a typical diet (Table 1). As consumers are becoming more concerned about the use of animal byproducts in poultry feeds, we may see even greater usage of soybean meal. In turn, the soybean industry benefits from poultry, as currently the poultry industry is by far the biggest user of soybean meal, consuming approximately 54 percent of all U.S. soybean meal.

Soybean meal is the world’s predominant protein source, and is highest in protein quality and highest in overall nutrient content of the commonly used plant proteins (Table 2). Soybean meal is high in protein, has a good amino acid balance, low in fiber, highest in energy of the common oilseeds, and has no anti-nutrient factors when properly processed. While nutritionists are well aware of the advantages of high protein, the higher energy of soybean meal compared to other

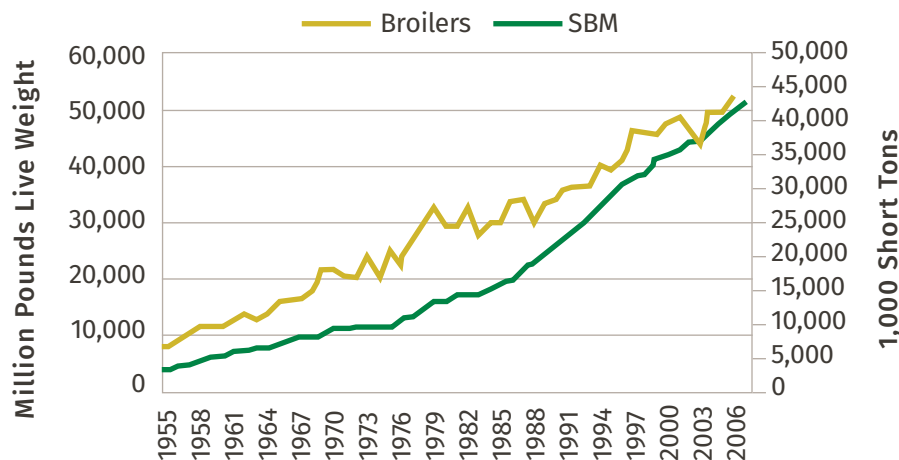
plant proteins is also extremely valuable as approximately 75 percent of the cost of a poultry diet is devoted to providing the energy needs of the chick. In addition, the overall digestibility of the essential amino acids in soybean meal is greater than that of the other common plant proteins (Table 3). This higher digestibility means that less protein is needed to satisfy the amino acid needs of the animal, with less nitrogen excreted into the environment. As a result, soybeans are the leading protein source worldwide, making up approximately 57 percent of the total supply of oilseed protein (Figure 2).

Table 1 | **Typical U.S. Broiler Diet**

INGREDIENT	LBS/TONS
Yellow corn	1300.00
Soybean meal	500.00
Animal protein	100.00
Inedible fat	65.00
Defluorinated Phosphate	8.00
Limestone	10.00
Salt	8.00
Vitamin premix	2.00
Trace mineral mix	1.00
Methionine supplement	5.00
Lysine supplement	1.00

Source: AgriStats Final Summary 2007

Figure 1 | **Production of broiler meat and soybean meal have parallel history**



Source: National Chicken Council; USDA-ERS

Table 2 | **Typical Composition of Oilseed Meals**

SOURCE	CP%	MEK cal/kg	FIBER %
Soybean meal	48	2460	3.50
Canola meal	36	1790	11.00
Cottonseed meal	40	1570	13.50
Peanut meal	50	2180	10.00
Palm kernel meal	16	1340	15.00
Sunflower meal	34	1300	23.00

Source: Rhodimet Nutrition Guide

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Today, a new “perfect storm” is brewing that is markedly affecting the use of soybean meal for animal diets. In the past five years, increased production of ethanol from corn and biodiesel from vegetable oil has created a totally different feed ingredient scenario. Competition between the biofuels industry and animal agriculture has driven prices for feed ingredients to new highs and has markedly increased the cost of production of milk, meat and eggs. Byproducts of ethanol and biodiesel production are now competing with corn and soybean meal for their place in poultry feeds.

Most of the attention to biofuels byproducts has focused on distillers dried grain with solubles (DDGS). With almost 35 percent of the corn crop diverted to ethanol production in the United States today, this has generated considerable amounts of DDGS. It has been used extensively as a “wet” product in livestock feeds in the Midwest where most of the ethanol production is located, but is now being used more extensively as a dry product in other areas outside the Midwest. Although considered primarily as a replacement for corn, DDGS actually displaces more soybean meal than corn in a typical broiler diet.

The nutritional value of DDGS for poultry diets is often overestimated due to the tremendous variability encountered in samples of DDGS. The major concerns facing the use of DDGS include metabolizable energy, which has been reported to vary from 1127 to 1450 ME kcal/kg by various workers, and reduced content and digestibility of amino acids, especially lysine (Table 3). Surveys have shown considerable variation in nutrient content among and between DDGS suppliers.

Failure to account for the reduced digestibility of amino acids in DDGS can lead to formulas that are deficient in amino acids. As an example, broiler starter diets were formulated with and without 15 percent DDGS. In the first situation, diets were formulated on a total amino acid basis; in this situation it appeared that a diet with 15 percent DDGS with a protein content that was only 1 percent greater than that of a similar diet based on soybean meal was adequate (Figure 3).

Table 3 | True Digestibility of Amino Acids in Common Plant Proteins and DDGS

AMINO ACID	CANOLA	COTTONSEED	PALM KERNEL	PEANUT	SUNFLOWER	SOYBEAN	DDGS
Lys	78.6	62.8	58.9	78.1	80.4	90.6	57.3
Met	88.6	71.9	83.7	85.6	91.2	92.0	84.7
Cys	73.1	70.9	66.6	78.5	79.2	83.7	76.7
Thr	77.6	67.2	69.2	83.8	83.7	88.5	70.6
Trp	80.0	80.3	—	75.6	—	87.8	—
Arg	90.6	85.3	88.6	89.6	93.1	92.9	68.4
Ile	89.0	72.8	81.0	89.3	88.9	91.6	80.1
Val	87.8	76.3	80.1	88.9	85.8	90.9	79.3
Leu	94.1	74.8	85.0	89.7	88.7	92.0	88.9
His	88.5	64.1	80.3	85.4	86.1	89.7	74.0
Phe	91.6	84.0	85.3	92.3	90.8	92.3	86.1

Source: Ajinomoto Heartland Lysine LLC Revision 7

Figure 2 | Soybeans are the leading oilseed worldwide.

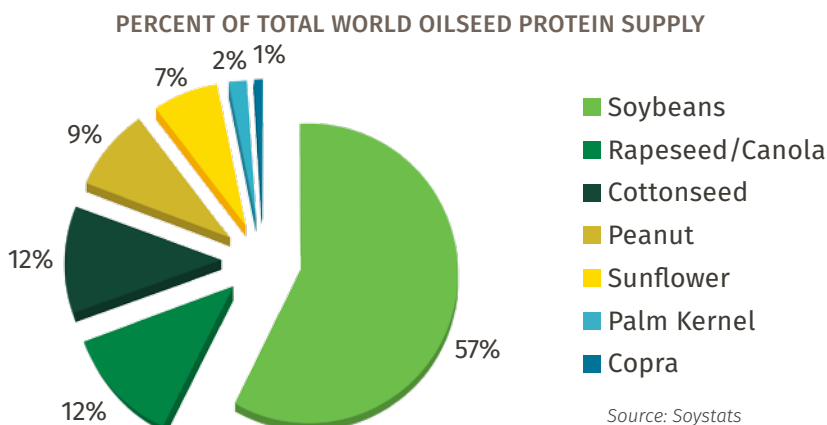
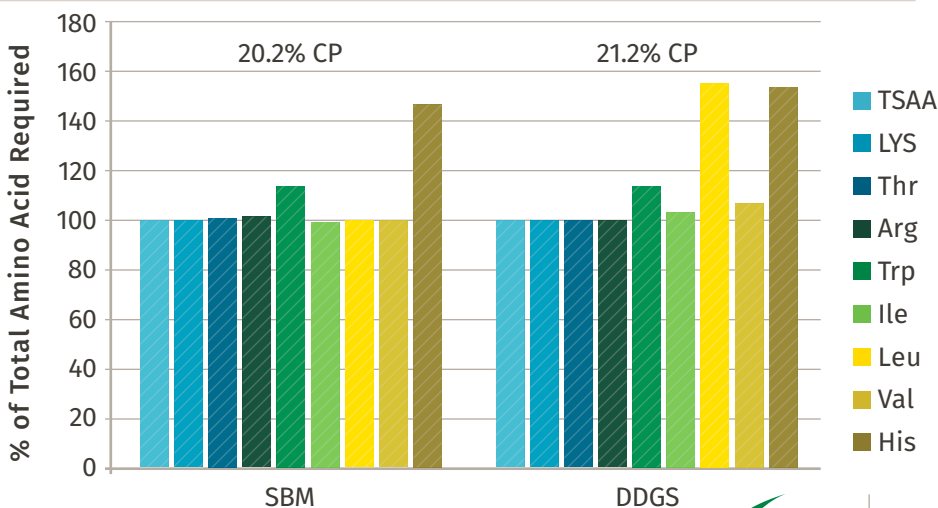


Figure 3 | When broiler starter diets were formulated on a total amino acid basis, a diet with a 15% DDGS needed only 1% more crude protein to provide the essential amino acids.



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However, when formulated on a digestible amino acid basis, it required 4 percent more CP in a diet with 15 percent DDGS to meet the requirements (Figure 4). In addition to the metabolic stress of increased protein on the chick, this would also result in considerably more N excretion into the environment.

While less attention has been focused on production of biodiesel, primarily from vegetable oils, it has had considerable impact on feed ingredient prices. The price of soybean oil has doubled in the last five years, resulting in increased price for feed grade fats, which are popular in high energy broiler diets. The increased demand for vegetable oil for biodiesel production may in turn reduce overall production of soybeans in favor of other oilseed crops that produce more oil per acre. Soybeans produce about 300 pounds of oil per acre compared to 600 to 700 pounds for safflower and sunflower seeds, while canola produces around 900 pounds of oil per acre. While the nutritional value of the byproduct meal from these alternate crops is not as nutritious as soybean meal, the increased value of the oil may shift production to these crops at the expense of soybeans.

Summary Comments

As the biofuels industry grows, there will be greater usage by the poultry industry of other feed ingredients such as DDGS or canola meal that will impact the usage of both corn and soybean meal, but these products have serious problems with inconsistency of nutrient content, reduced amino acid digestibility and presence of anti-nutrient factors. This will present a greater challenge to nutritionists to provide nutritionally sound diets. Because of its high protein quality, consistency of nutrient content, and lack of anti-nutrient factors when properly processed, soybean meal will continue to be the preferred protein supplement for poultry diets.

For more information, please contact:

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Figure 4 | *When broiler starter diets were formulated on a digestible amino acid basis, a diet with a 15% DDGS required 4% more crude protein to meet the requirements for essential amino acids.*

