Biodiesel Demand for Animal Fats and Tallow Generates an Additional Revenue Stream for the Livestock Industry

Updated September 2014 by Centrec Consulting Group, LLC for the National Biodiesel Board

Overview/Introduction

As the U.S. biodiesel industry has expanded and contracted over the last 7 years, the industry has adapted its feedstock utilization based on feedstock availability and cost, and processing costs of the feedstocks. In recent years, animal fats and tallow (mostly inedible tallow, choice white grease and some poultry fat) have been consistently used as a biodiesel feedstock. Traditionally, these by-products of animal slaughter have been used primarily as an ingredient for livestock and pet food and for oleochemical purposes. Therefore, as their use has shifted towards biodiesel production, it has drawn attention to the impact of the change in utilization and consequently prices on the livestock industry. The ultimate question has been "How has the biodiesel industry's use of animal fats and tallow affected the livestock industry?" This paper will report the utilization of animal fats and tallow for biodiesel production beginning in 2007, proffer reasons for the new demand, explore price relationships, and conclude with illustrations showing how the livestock industry has been impacted by the new demand.

Animal Fats and Tallow Uses

The uses of animal fats and tallow are different for each by-product, as shown in Table 1. While inedible tallow is used for all purposes listed except for human food, choice white grease (an inedible livestock by-product comprised primarily of pork fat but can contain fat from other species as well) historically has been used primarily in livestock feed. In recent years, animal fats and tallow exports have declined, in part due to import bans in the European Union and China. Concurrently, animal fats and tallow use, mostly inedible tallow, choice white grease and some poultry fat, as a biodiesel feedstock has increased (Figure 1).

Table 1. Animal Fats and Tallow Uses

Type	Livestock Feed[1]	Human Food	Pet Food	Oleo-chemical[2]	Biofuel	Exports
Beef						
Edible Tallow		✓	✓		Limited	✓
Inedible Tallow	✓		✓	✓	✓	✓
Pork						
Lard		✓			Limited	✓
Choice White Grease	✓				✓	Limited
Poultry Fat	✓		✓		✓	Limited

[1] Other key source of energy sourced from fat for livestock feed is corn.
[2] Other key source of fat for oleochemical products is palm and palm kernel oil.

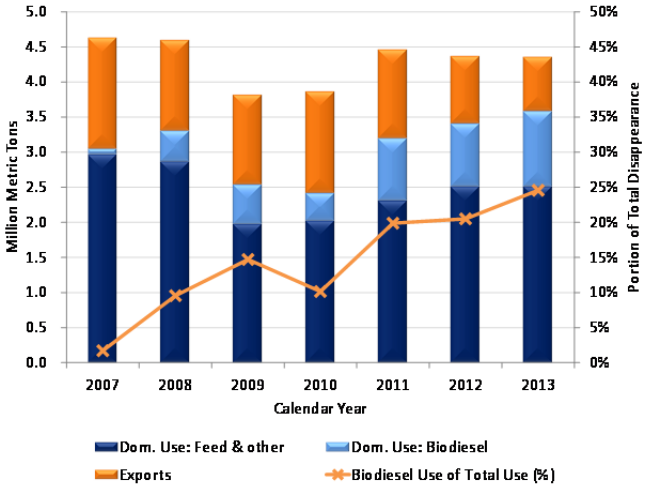

Figure 1. U.S. Animal Fats and Tallow Disappearance
Source: Census Bureau and Renderer Magazine

Animal Fats and Tallow Use as a Biodiesel Feedstock

The U.S. biodiesel industry has experienced significant growth beginning in 2007. While soybean oil has been the primary biodiesel feedstock and the feedstock of choice for U.S. markets, a diverse set of feedstock substitutes are now being used, which is a strength of the biodiesel industry. Animal fats and tallow have been consistent feedstocks since 2008. Figure 2 reports animal fats and tallow share of total biodiesel production. Animal fats and tallow use jumped from about 1% of the biodiesel produced in 2007 to about 26.2% in 2010, and then down to about 11% in 2013. Animal fats and tallow were around 13% of the biodiesel feedstocks the first 5 months in 2014.

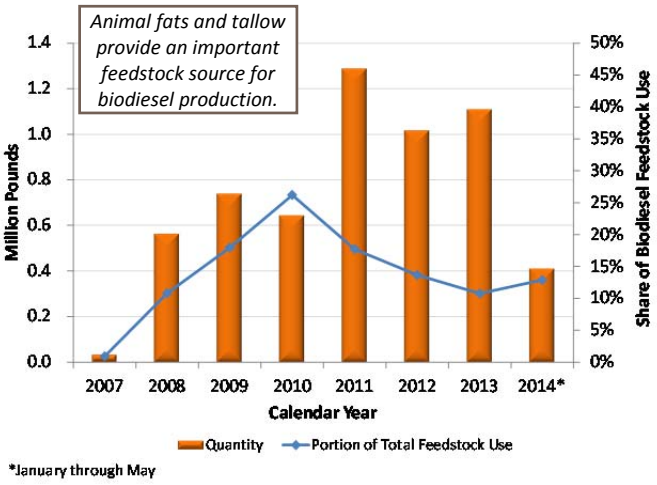

Figure 2. Animal Fats and Tallow Share of Biodiesel Production
Source: 2007 – 2009: Census Bureau
2010 – 2014: DOE/EIA

Biodiesel Feedstock Demand for Animal Fats and Tallow

There are multiple reasons for the increased use of animal fats and tallow in biodiesel production. These reasons include their availability, the fact that they qualify as biomass-based diesel fuel and generate RINs under the Renewable Fuel Standard, and importantly, their price advantage over vegetable oils for plants that have the capability of processing feedstocks with a high free fatty acid (FFA) content.

Biodiesel Feedstock Price Relationships

Figure 3 illustrates two points; the first observation is the confirmation of the consistent price advantage that animal fats and tallow have had over crude soybean oil averaging 7.3 to 11.1 cents per pound less than crude soybean oil. The second point is the closer tracking of soybean oil, animal fats and tallow prices beginning in 2007.

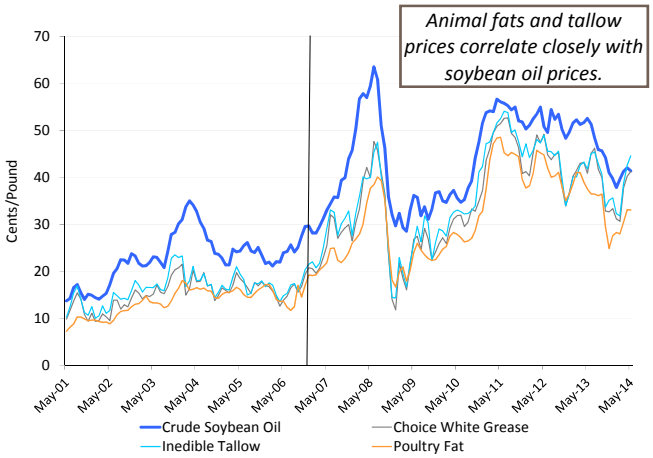

Figure 3. Biodiesel Feedstock Prices

The price correlations between crude soybean oil (SBO) and inedible tallow, choice white grease and poultry fat have all increased since January 2007 (Table 2). These more highly correlated price relationships hint at an increased alignment of utilization across these feedstocks (e.g., they are increasingly used for the same purpose such as biodiesel production as SBO) and that they are impacted by similar market forces such as changes in demand for biodiesel production.

Table 2. Feedstock Price Correlations

Feedstocks	Correlation Coefficients Apr '01 – Dec '06	Jan '07 – May '14
Crude Soybean Oil and Inedible Tallow	0.7942	0.8723
Crude Soybean Oil and Choice White Grease	0.8094	0.8855
Crude Soybean Oil and Poultry Fat	0.8172	0.8762

Impact of Biodiesel Use of Animal Fats and Tallow on the Livestock Industry

Basic economic principles state that when demand increases for a product, prices for that product increase. For products for which there is direct demand such as beef, increased demand stimulates increased supply. However, animal fats and tallow are by-products of livestock and poultry harvest, and increased demand does not stimulate increased supply due to their small share of the gross revenue of the animal carcass. While these by-products are not primary drivers in determining the prices paid for poultry, fed cattle and market hogs, they do affect the profit margins in these industries by increasing the by-product "drop value." As a result, the increased prices received for the animal fats and tallow have helped support or possibly increased the prices paid for the animals. These relationships are demonstrated through the positive price correlation between choice white grease and slaughter hogs of 0.734. This correlation does not imply that one price is causing the other price to increase, but simply indicates that the prices tend to increase or decrease together.

The potential economic benefit of increased animal fats and tallow prices to the livestock industry can be illustrated with a three-step analysis. The first step is to estimate the impact of biodiesel demand for animal fats and tallow on their prices. The second step is to translate the price impact to a per head basis for slaughter steers, market hogs and broilers in addition to a monthly basis. The last step is to estimate the annual impact at the industry level.

Estimating the Price Impact

The impact of biodiesel demand for animal fats and tallow on their prices is estimated for five products – inedible tallow, edible tallow, choice white grease, lard and poultry fat. While limited amounts of edible tallow and lard are used as a biodiesel feedstock, demand for inedible tallow and choice white grease impact the prices of edible tallow and lard, respectively, due to the interconnectedness of the products.

Demand factors expected to impact these feedstock prices are exports, biodiesel use, and their other uses. Export volume and biodiesel use data are available for the feedstocks, but information about these animal fats and tallow uses for the other purposes is no longer available. Therefore, prices of substitutes for the various uses are hypothesized to impact the use of animal fats and tallow for livestock and pet food, oleochemical uses, and human food. Prices for corn and palm stearin are considered to impact the price of the five animal fats and tallow products due to corn's substitutability as an energy source in livestock rations and palm's substitutability in various products in which animal fats and tallow are also used. Regressions are used to estimate the monthly impact of biodiesel use, exports, and substitutes on the animal fats and tallow prices from January 2009 through May 2014. The analysis shows that these factors, except exports, significantly impacted the five price series. The average monthly price impacts for the animal fats and tallow are summarized in Table 3 and illustrated in Figure 4 through Figure 8.

Table 3. Estimated Price Impact of Animal Fats and Tallow Use for Biodiesel From January 2009 to May 2014 (cents / lb)

Inedible Tallow	Edible Tallow	Choice White Grease	Lard	Poultry Fat
10.6	9.9	10.2	7.0	5.7

Biodiesel use of these feedstocks is estimated to have increased inedible tallow and choice white grease prices around 10 cents per pound during this timeframe and poultry fat about 5.7 cents per pound. Even though edible tallow and lard are not used a lot for biodiesel production, the use of all animal fats and tallow for biodiesel production indirectly increased edible tallow and lard prices by an estimated 10 and 7 cents per pound, respectively.

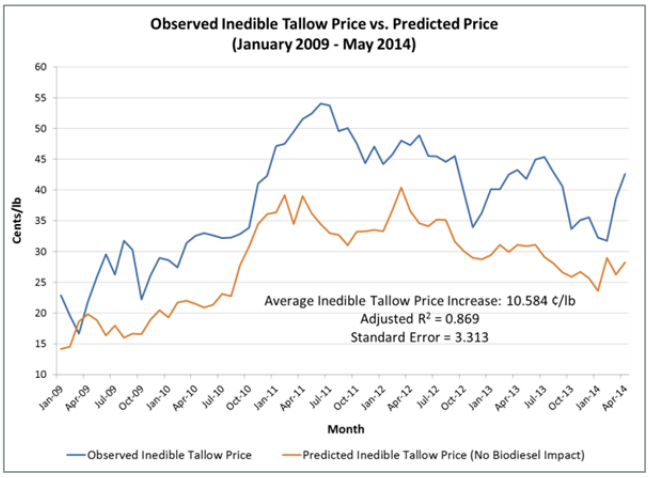

Figure 4. Estimated Biodiesel Impact on Inedible Tallow Prices

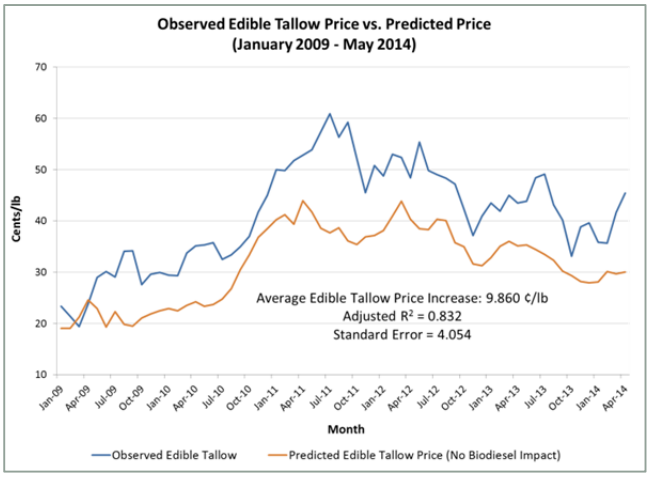

Figure 5. Estimated Biodiesel Impact on Edible Tallow Prices

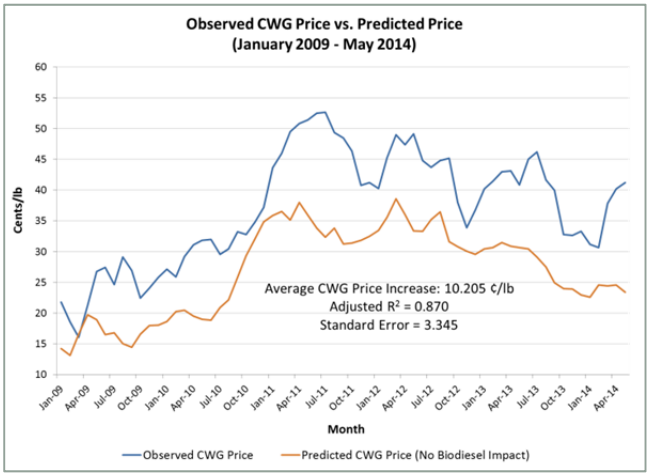

Figure 6. Estimated Biodiesel Impact on Choice White Grease Prices

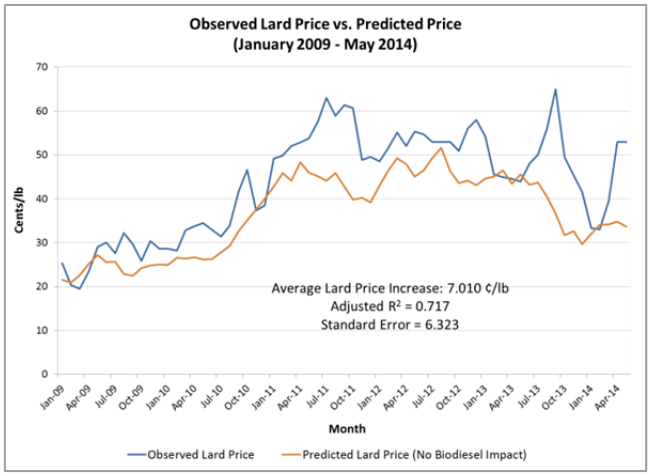

Figure 7. Estimated Biodiesel Impact on Lard Prices

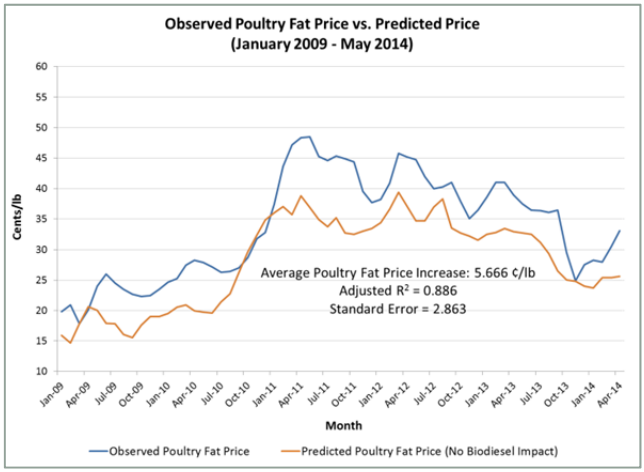

Figure 8. Estimated Biodiesel Impact on Poultry Fat Prices

Valuing the Price Impact on a Per Head and Monthly Basis

The second step of the analysis is to translate the price impact to a per head basis for slaughter steers, market hogs and broilers and on monthly basis. Table 4 through Table 6 summarize the *weighted average* slaughter weight, yield per head, increased value per head, and total biodiesel contribution on a monthly basis using the estimated price impacts from January 2009 through May 2014.

Table 4. Beef Drop Value

Tallow	Yield (lbs/cwt)	Slaughter Wt (lbs)	Yield (lbs/Head)	Biodiesel Contribution ($/lb of Fat)	Increased Value ($/Head)	Monthly Head Slaughtered (MM)	Monthly Biodiesel Contribution ($MM)
Inedible Tallow	7.50	1,295	97.12	$0.11	$10.32	2.76	$28.52
Edible Tallow	4.50	1,295	58.27	$0.10	$5.76	2.76	$15.93
Total Tallow Drop Value					$16.08		$44.45

Yields: Combination of Derived Yields from Historical Census Bureau Data and Consultation with Industry Experts
Slaughter weights and numbers: USDA

Table 5. Pork Drop Value

Pork Fat	Yield (lbs/cwt)	Slaughter Wt (lbs)	Yield (lbs/Head)	Biodiesel Contribution ($/lb of Fat)	Increased Value ($/Head)	Monthly Head Slaughtered (MM)	Monthly Biodiesel Contribution ($MM)
Choice White Grease	3.76	275	10.33	$0.10	$1.04	9.30	$9.71
Lard	1.00	275	2.75	$0.07	$0.20	9.30	$1.82
Total Pork Drop Value					$1.24		$11.53

Yields: Combination of Derived Yields from Historical Census Bureau Data and Consultation with Industry Experts
Slaughter weights and numbers: USDA

Table 6. Poultry Drop Value

Poultry Fat	Yield (% Live Basis)	Slaughter Wt (lbs)	Yield (lbs/Head)	Biodiesel Contribution ($/lb of Fat)	Increased Value ($/Head)	Monthly Head Slaughtered (MM)	Monthly Biodiesel Contribution ($MM)
Chicken Poultry Fat	1.80	5.8	0.10	$0.06	$0.01	721.55	$4.28

Yields: Consultation with Industry Experts
Slaughter weights and numbers: USDA

Beef Drop Value
Analysis indicates an average increase of about $16 per head between January 2009 through May 2014 due to biodiesel use of animal fats and tallow.

Pork Drop Value
Analysis indicates an average increase of about $1.24 per head between January 2009 through May 2014 due to biodiesel use of animal fats and tallow.

Poultry Drop Value
Analysis indicates an average increase of about $0.01 per head between January 2009 through May 2014 due to biodiesel use of animal fats and tallow.

Measuring the Annual Impact of Increased Drop Value to the Livestock Industry

The last step is to estimate the annual impact of these price benefits at the industry level. Figure 9 through Figure 11 illustrate the annual impact of the increased drop value to the beef, pork and poultry industries, respectively. The average estimated annual impact to the beef industry for 2009 through 2013 was $530 MM while the greatest estimated increase in beef drop value occurred in 2011. The pork industry's average estimated annual impact was $136 MM; this industry also experienced the largest benefit due to use of its fat by-products as a biodiesel feedstock in 2011. The poultry industry benefitted an average of about $51 MM annually from 2009 through 2013. As with the other species, the benefit to this industry was the greatest in 2011.

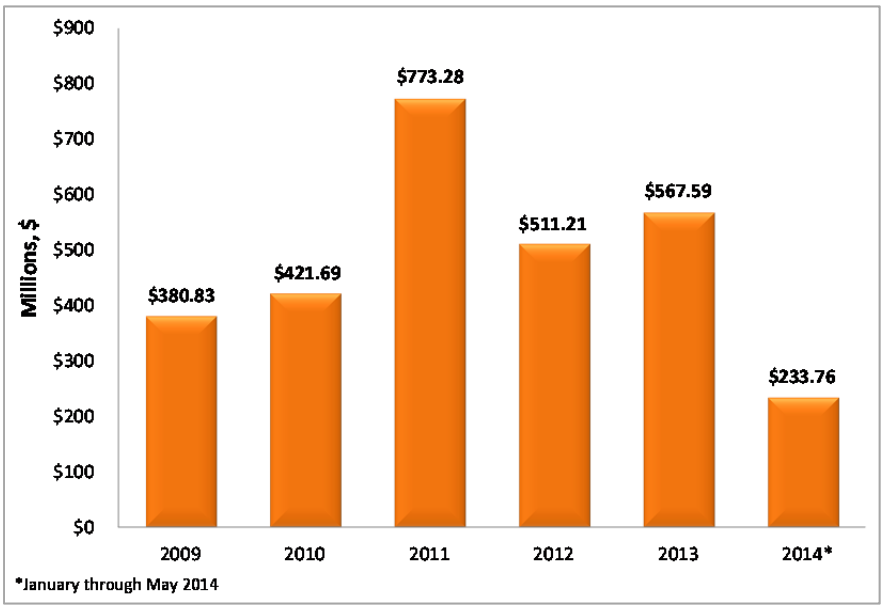

Figure 9. Annual Biodiesel Contribution to the Beef Industry

Beef Industry Average Annual Benefit of Increased Drop Value for 2009 through 2013: $530.2 MM

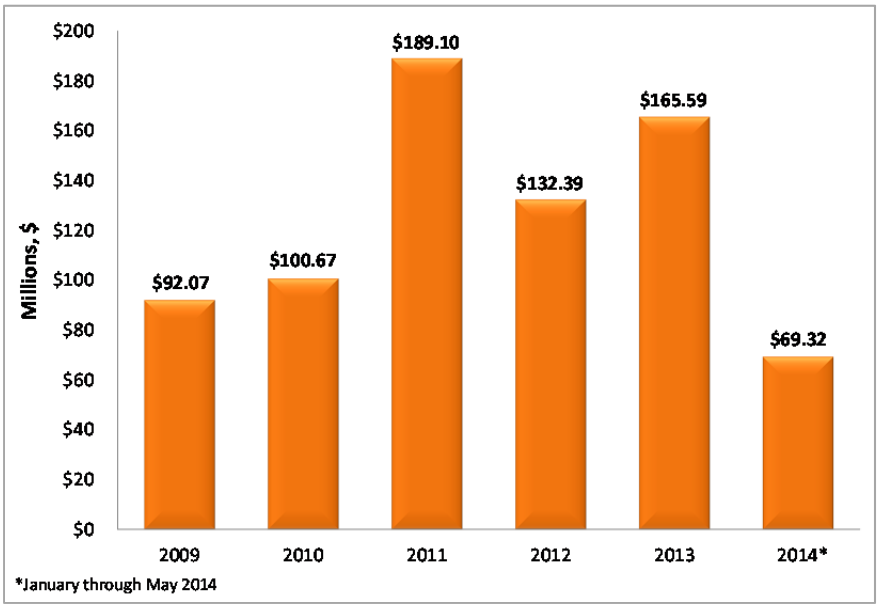

Figure 10. Annual Biodiesel Contribution to the Pork Industry

Pork Industry Average Annual Benefit of Increased Drop Value for 2009 through 2013: $136 MM

Figure 11. Annual Biodiesel Contribution to the Poultry Industry

Poultry Industry Average Annual Benefit of Increased Drop Value for 2009 through 2013: $51 MM