

# **Biodiesel in Kansas**

**Dr. Richard Nelson, Kansas State University Engineering Extension**

**Background Report Prepared for the  
Kansas Energy Council Biomass Committee**

**May 15, 2007**

## **Biodiesel in Kansas**

### **Introduction**

Biodiesel is a domestic, renewable fuel for use in diesel (compression ignition) engines that is derived from oils and fats such as soybeans and beef tallow and can be used with petroleum-based diesel fuel in existing diesel engines with little or no modification. Biodiesel is defined as a fuel made up of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100, and meeting the requirements of national fuel specification, American Society for Testing and Materials (ASTM) D 6751 (National Biodiesel Board, 2007e). Biodiesel blends are biodiesel fuel meeting the ASTM D 6751 specification blended with petroleum-based diesel fuel designated BXX, where XX is the volume percent of biodiesel (e.g., B20). Biodiesel is produced through a chemical engineering process referred to as transesterification, in which a fat or oil is combined with an alcohol and a catalyst to produce an ester (biodiesel, B100) and glycerol.

Neat (100 percent) biodiesel has been designated as an alternative fuel by the Department of Energy (DOE) and the U.S. Department of Transportation (DOT). Biodiesel has lower energy content (Btu/gallon), but significantly higher cetane and lubricity versus standard diesel fuel. Biodiesel contains no inherent nitrogen or aromatics and is virtually sulfur-free. Biodiesel is generally used in compression-ignition engines (up to a 20% blend), requires little or no modification to the engines, is registered as a fuel and fuel additive with the Environmental Protection Agency (EPA), and is approved as an Energy Policy Act (EPAct) compliance strategy.

### **Energy and Environmental Issues**

Given the present emphasis on sustainable alternatives to petroleum diesel, one of the biggest driving forces for promoting the production and utilization of biodiesel involves its superior energetic and environmental attributes, most notably its effect on air quality and human health. Research performed by the U.S. Departments of Energy and Agriculture showed the production processes for biodiesel and diesel are essentially identical in their efficiency of converting raw energy sources (soybean oil and petroleum) into a final useable fuel product. However, biodiesel derived from soybeans has an energy balance of 3.24 to 1 (compared to a 0.83 for diesel fuel) for every unit of fossil fuel consumed in the total production process). Biodiesel production from soybean oil results in a 78% life cycle reduction in CO<sub>2</sub> emissions versus petroleum-based diesel because of the low demand for fossil-based energy inputs and their associated carbon emissions (U.S. Department of Agriculture and Energy, 1998; National Biodiesel Board, 2007c). Biodiesel energy analyses from other feedstocks show energy balances in excess of 3 to 1, depending upon a number of factors (Nelson and Schrock, 2006).

Figure 1 lists reductions in emissions resulting from combustion of biodiesel at three blend levels compared to conventional petroleum diesel. In all cases, with the exception of NO<sub>x</sub>, emissions are always reduced through the use of biodiesel when compared to conventional diesel fuel. The NO<sub>x</sub> values vary slightly around zero depending upon a number of factors such as engine class and manufacturer and testing protocols. The EPA used an engine dynamometer test protocol and showed a slight increase of 2% in NO<sub>x</sub> for a B20 blend. However, the EPA tests were not adequately representative of on-highway engines. Using a different protocol of testing the entire

vehicle versus just the engine on B20 resulted in no net effect in NOx emissions (McCormick et al., 2006).

AVERAGE BIODIESEL EMISSIONS COMPARED TO CONVENTIONAL DIESEL, ACCORDING TO EPA		
Emission Type	B100	B20
<b>Regulated</b>		
Total Unburned Hydrocarbons	-67%	-20%
Carbon Monoxide	-48%	-12%
Particulate Matter	-47%	-12%
Nox	+10%	+2% to -2%
<b>Non-Regulated</b>		
Sulfates	-100%	-20%*
PAH (Polycyclic Aromatic Hydrocarbons)**	-80%	-13%
nPAH (nitrated PAH's)**	-90%	-50%***
Ozone potential of speciated HC	-50%	-10%

\* Estimated from B100 result  
 \*\* Average reduction across all compounds measured  
 \*\*\* 2-nitrofluorine results were within test method variability

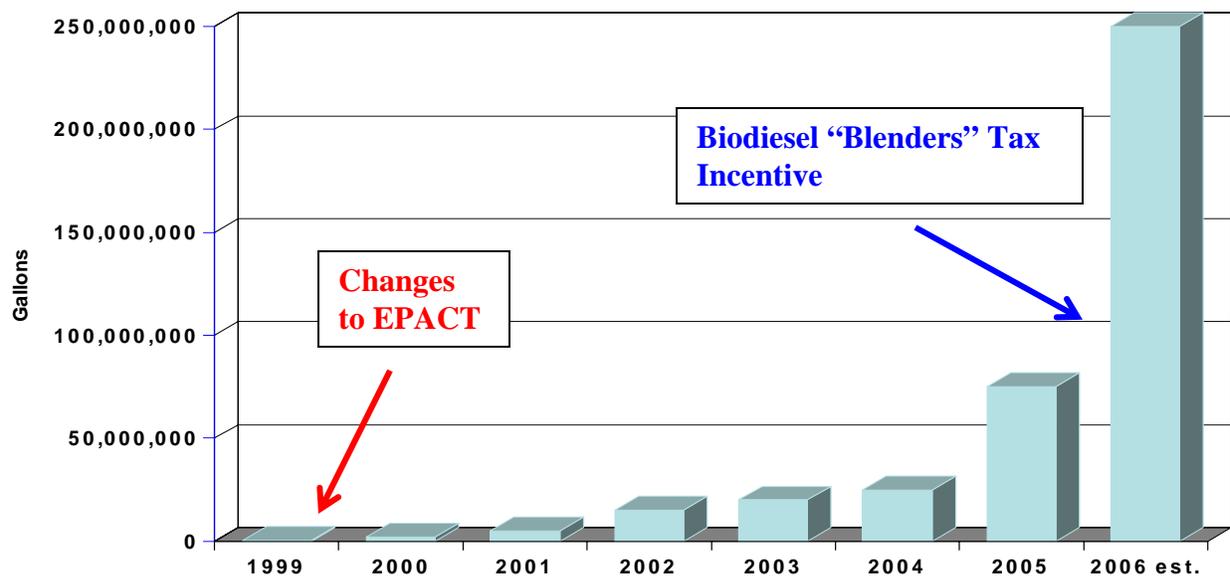
**Figure 1. Comparison of regulated and non-regulated emissions between biodiesel and standard #2 petrodiesel (National Biodiesel Board, 2007a).**

### Biodiesel Production and Markets

As Figure 2 illustrates, biodiesel production has increased markedly since the late 1990s. Current market drivers for biodiesel include:

- 1) Further compliance with the Energy Policy Act of 1992 (EPACT), of which biodiesel is the lowest cost alternative fuel;
- 2) Passage of the ‘blenders tax credit’ of 1 cent per gallon per percent biodiesel blended with diesel fuel;
- 3) State mandates of low-blends of biodiesel in Minnesota and Washington and an Illinois sales tax waiver for blends exceeding 10% biodiesel;
- 4) Passage of the Renewable Fuels Standard which currently sets alternative fuel production and use at 7.5 billion gallons;
- 5) A desire for energy security; and
- 6) Superior environmental benefits versus conventional diesel fuel.

Most of the current U.S. market for biodiesel is for blends of 1% to 20% used in the transportation /trucking sector. Demand for biodiesel in the trucking industry is likely to grow into the next decade primarily due to lubricity concerns associated with ultra-low sulfur diesel (ULSD). Use of biodiesel at a B2 or B5 blend translates into use of approximately 761 million to 1.9 billion gallons of biodiesel based on on-highway distillate consumption of approximately 38.05 billion gallons per year (8).



**Figure 2. Estimated U.S. biodiesel sales (National Biodiesel Board, 2007b).**

### Technical Considerations

The biodiesel production process (transesterification) is well established and is widely used by all current U.S. producers. Problems that have occurred across the U.S. with biodiesel can be traced to fuel quality—primarily out-of-specification fuel (not meeting the ASTM specification—or improper storage and handling of the biodiesel after blending. Attaining consistent fuel quality across the industry from production through end-use (given the number of producers and the variety of potential feedstocks that engine manufacturers will warranty) will be the top priority of the national biodiesel industry in the future.

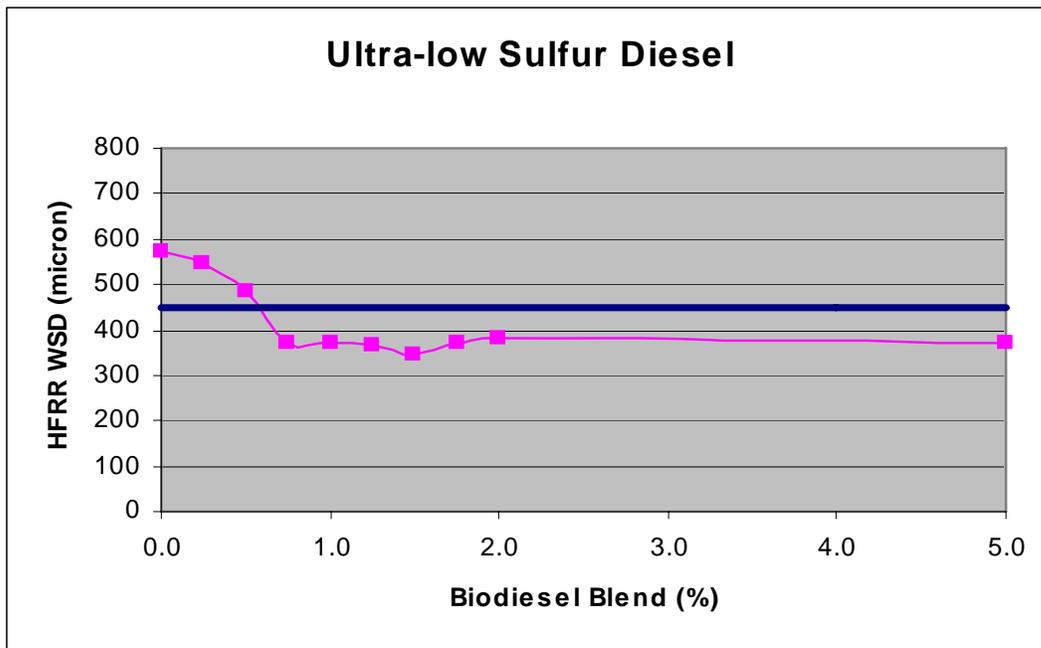
The acceptance of biodiesel as a viable replacement for petroleum diesel hinges on a number of factors: primarily feedstock availability and cost, cost of petrodiesel, fuel quality, and other renewable fuels that potentially have the ability to compete with biodiesel derived through a conventional transesterification process. Fuel quality and renewable diesels are covered here and feedstocks, the cost of producing biodiesel, and its relationship to petrodiesel are covered in later sections of this report.

### *Fuel quality*

Biodiesel fuel quality is absolutely key to maintaining and growing market share. The combination of the ASTM specification (ASTM D 6751) and offering a *voluntary* national fuel quality production and marketing program (BQ-9000) (National Biodiesel Accreditation Program, 2007) have served to drastically increase acceptance of biodiesel into the marketplace, primarily in the EPACT compliance and trucking sector. For biodiesel to increase its share in the total U.S. distillate market, producing biodiesel that adheres to both BQ-9000 quality controls and consistently meets the ASTM specification is paramount. Currently, about 40% of U.S.

biodiesel comes from plants that comply with BQ-9000 quality control standards. In the future, adherence to BQ-9000 will be the industry norm. Engine manufacturers will not warranty an engine in which failure can be attributed to biodiesel not meeting the ASTM specification.

The greatest opportunity for biodiesel in the near term involves its use as a lubricity component in conjunction with Ultra Low Sulfur Diesel (ULSD). The process used to make ULSD removes components necessary for satisfactory lubrication of moving parts within the engine, and small amounts ( $\leq 5\%$ ) of biodiesel have been proven to restore all the needed lubricity. As Figure 3 shows, small blends ( $< 5\%$ ) of biodiesel restore the lubricity lost in the production of ULSD.



**Figure 3. Impact of low-level biodiesel blends on engine lubricity, as measured by the parameter of wear scar diameter (WSD). When WSD is greater than 460 microns (see blue line), necessary lubricity in the fuel has been lost and excessive engine wear will occur (National Biodiesel Board, 2007d).**

### ***Renewable diesels***

Oils, greases, and other biomass can be converted into diesel fuel by chemical or thermochemical processes other than transesterification. Renewable diesel is a term that includes fuels that have some type of renewable resource feedstock, but use a wide variety of conversion processes to create a product potentially useable in standard compression-ignition engines. Examples include thermal depolymerization of turkey guts, oils/fats combined with crude oil at a petroleum refinery, processing oils/fats through a hydrotreater, gasification to synthesis gas to Fisher Tropsch, water emulsified diesel, and ethanol emulsified diesel.

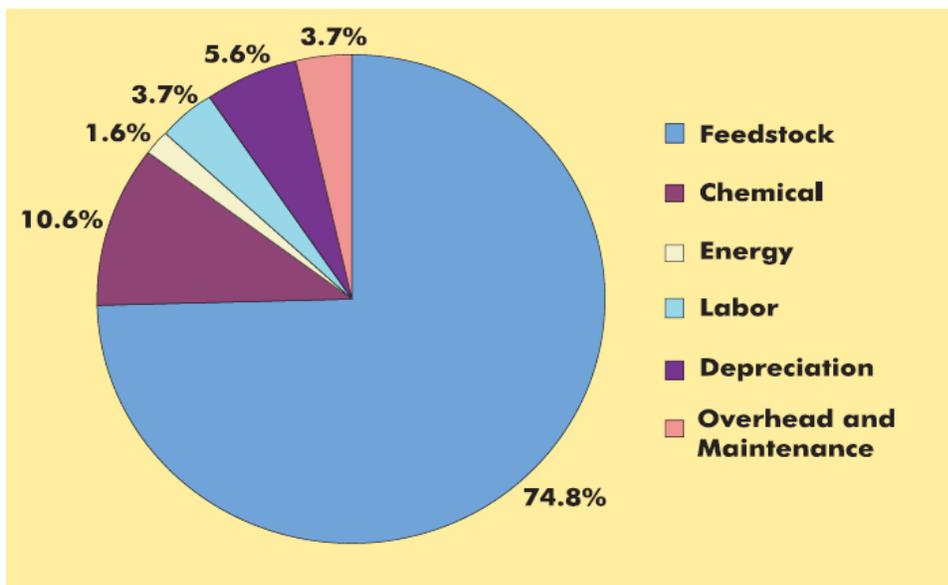
Biodiesel is a renewable diesel, but renewable diesels are not biodiesel. Since renewable diesels are manufactured from processes that do not meet the definition and properties contained in ASTM D 6751 (i.e., mono-alkyl esters of fats and oils), the fuel produced doesn't have the same life cycle energy balance, life cycle CO<sub>2</sub> reductions, lubricity advantages, cetane advantages, sulfur advantages, emissions advantages, economic development and job creation, and performance in the field. The properties of renewable diesel such as these are not known at this time. Original Equipment Manufacturers (OEMs) and engine companies *require the strict definition of what biodiesel is* (and isn't) and the ASTM specification was specifically designed to ensure new fuels, such as renewable diesels as they are defined above, do not cause problems.

### Economics

The economic feasibility of biodiesel primarily depends on the cost of the base feedstock (soybeans, tallow, etc.), the cost of petroleum/diesel fuel, and the value of the glycerin by-product.

#### *Relationship of biodiesel production cost to feedstock price*

Figure 4 presents typical, general, average cost information for a small biodiesel production facility (~ 5 million gallon per year, MGY) and the breakdown by specific cost category (11). A 30 MGY facility would have somewhat similar cost breakouts, but feedstock costs would be over 80% of total production cost. Since biodiesel cost is essentially 75-80% of total production cost, fluctuations in feedstock cost due to its competition in alternate markets (primarily edible foodstuffs and animal feed) have the potential to cause wide disruptions in the retail price of biodiesel.



**Figure 4. Average categorical cost for U.S. biodiesel production (Pruszko, 2006).**

***Economic feasibility utilizing various feedstocks***

Biodiesel production cost is highly correlated with feedstock cost, as well as plant capacity (million gallons per year, MGY). Table 1 provides a range of feedstock costs as a function of time. Table 2 presents general biodiesel production costs for each of these six feedstocks for a five-MGY and 30-MGY production facility (11).

**Table 1. Historical and projected costs (\$/pound) of six biodiesel feedstocks that have potential for Kansas (1995-2015) (Food and Agricultural Policy Research Institute, 2007).**

Biodiesel Feedstocks	Historical Low Prices	Historical High Prices	Projected Low Prices	Projected High Prices
Canola	\$0.171	\$0.337	\$0.346	\$0.378
Sunflower	\$0.159	\$0.437	\$0.333	\$0.355
Peanut	\$0.325	\$0.597	\$0.483	\$0.535
Cottonseed	\$0.160	\$0.378	\$0.220	\$0.252
Soybean	\$0.142	\$0.300	\$0.209	\$0.239
Beef tallow	\$0.09	\$0.25	Not projected	Not projected

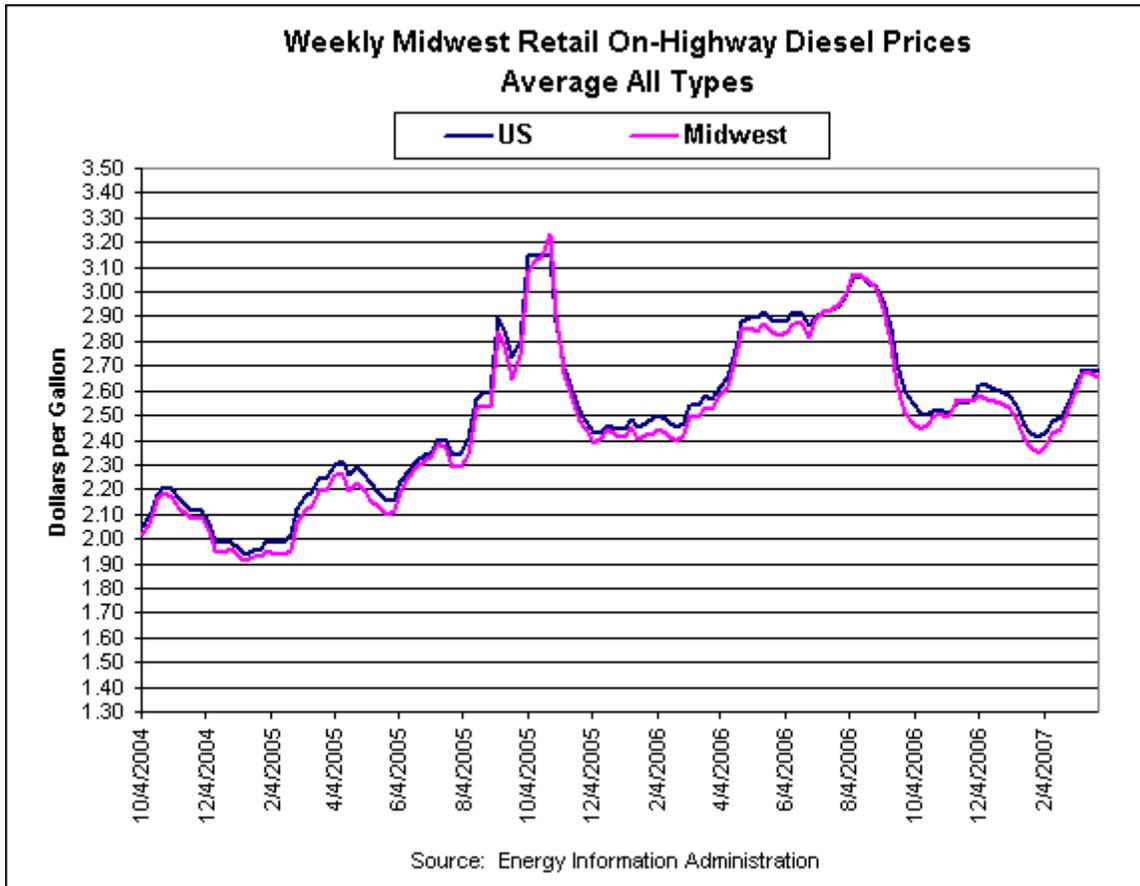
**Table 2. Variable cost (\$/gallon) of biodiesel production for six biodiesel feedstocks and low (5 MGY) and high (30 MGY) production scenarios (costs exclude interest on capital, and associated state and federal road taxes).**

Biodiesel Feedstocks	Historical Low Prices	Historical High Prices	Projected Low Feedstock Prices	Projected High Feedstock Prices
<i>5 million gallon per year biodiesel production facility</i>				
Canola	\$1.71	\$3.37	\$3.46	\$3.78
Sunflower	\$1.59	\$4.37	\$3.33	\$3.55
Peanut	\$3.26	\$5.99	\$4.84	\$5.36
Cottonseed	\$1.60	\$3.79	\$2.21	\$2.53
Soybean	\$1.42	\$3.01	\$2.10	\$2.40
Beef tallow	\$0.90	\$2.51	Not projected	Not projected
<i>30 million gallon per year biodiesel production facility</i>				
Canola	\$1.59	\$3.07	\$2.55	\$2.89
Sunflower	\$1.48	\$3.11	\$3.00	\$3.21
Peanut	\$3.02	\$5.56	\$4.49	\$4.98
Cottonseed	\$1.49	\$3.52	\$2.05	\$2.34
Soybean	\$1.32	\$2.79	\$1.94	\$2.22
Beef tallow	\$0.84	\$2.33	Not projected	Not projected

***Diesel fuel prices***

Historically, the price of petroleum diesel has been less than biodiesel, even though biodiesel has decreased significantly in the last five years. In some cases, biodiesel has been cheaper than petroleum diesel, but these occurred when Hurricane Katrina wiped out a majority of the diesel fuel refining capacity and the ‘blenders’ tax credit went into effect. Figure 5 shows national and midwestern retail #2 diesel prices from 2004 to the present that provide a standard by which biodiesel feedstock costs and biodiesel prices can be compared later in this paper. Average

national price per gallon was \$1.81 in 2004; \$2.40 in 2005; and \$2.70 in 2006, all inclusive of state and federal taxes.<sup>1</sup>



**Figure 5. National and Midwestern retail diesel and biodiesel prices for comparison to current and future biodiesel prices (EIA, 2007b).**

### *Economics of proper fuel distribution*

Proper blending of the biodiesel and insuring it stays properly mixed throughout the supply chain until it reaches the end user is vital. The most efficient means to accomplish this involves “in-line” blending at the terminal, but costs associated with the equipment and installation for biodiesel blends of 5-20% can be significant, sometimes \$500,000 or more depending upon a number of factors. Capital costs for these systems would need to be recovered through market share which is directly related to volumetric use of the fuel within Kansas and blend level. A portion of this cost has potentially been offset by other petroleum distributors nationwide from the blenders tax credit (see discussion of Existing Policies and Programs), which increases as higher biodiesel blends have been used. One critical component to helping recover these costs is

<sup>1</sup> Biodiesel prices are not tracked publicly on a weekly basis, but quarterly historical data can be found at [http://www.eere.energy.gov/afdc/resources/pricereport/price\\_report.html](http://www.eere.energy.gov/afdc/resources/pricereport/price_report.html).

educating potential biodiesel suppliers and users about blends of up to 20%, including proper storage, handling, and engine warranties.

## **Feedstocks**

Biodiesel can be produced from essentially any vegetable oil or animal fat. Feedstocks include soybeans, cotton, canola, palm oil, corn, peanuts, sunflower, beef tallow, pork lard, and recycled cooking oils and waste greases. Soybeans are the dominant biodiesel feedstock in the U.S. (~85-90%) and are expected to continue to dominate the market into the near future. However, soybeans will not be able to provide the feedstock base necessary to meet the growing demand for biodiesel in the distillate fuel market across all economic sectors due to agronomic and economic/market factors. Other oils, fats, and greases will need to be researched and developed if biodiesel is to make a significant impact on petroleum/distillate displacement. The choice of feedstocks for large-scale biodiesel production will be a function of many factors including: (1) competition for acreage from other crops; (2) competition for the oil in the edible consumption market; (3) availability of crush or ginning facilities within economical transportation distances; (4) oil exports, global trade, and international mandates and tariffs (e.g., European Union); (5) market demand for biodiesel; (6) chemical and physical properties of the feedstock, most notably the free fatty acid content; (7) research concerning the effect on engine performance and emissions at different blend levels; (8) biodiesel's role in CO<sub>2</sub> abatement and carbon offset payments; and (9) state and national policies, such as a permanent extension of the blenders tax credit, that incentivize the biodiesel market.

Major oilseed crops directly applicable to production within Kansas that can be used for supply biodiesel feedstock are soybeans, sunflowers, canola, cotton, and peanuts and each of these has been produced to at least some extent in Kansas. Other crops such as Camelina, Chinese tallow tree, and Kentucky coffee bean offer potentially higher oil yields compared to soybeans and may be applicable to some locations within the state dictated by climate, water availability, soil types/land base and geographic concerns, but have not been produced to any scale at this time in the U.S. Also, Kansas slaughters the greatest number of cattle in the United States and as such generates enormous volumes of edible and inedible beef tallow, which have been demonstrated in limited applications as a viable biodiesel feedstock.

## ***Sunflowers***

Oil-type sunflowers contain roughly 40% oil content making them attractive as a crop for biodiesel production and in some cases they compete relatively well with soybeans on a total oil production per acre basis. Total biodiesel production would have averaged 13 million gallons per year if all Kansas oil-type sunflowers from 1997 to 2006 had been used as a feedstock. However, the average price is \$0.35 per pound (\$3.50 per gallon biodiesel processing cost) and is expected to remain at this level or slightly higher in the coming years due to strong market demand related to its use as an edible oil product.

Acreage dedicated to sunflower production is limited by (1) the net return per acre of crops it competes against, such as irrigated corn, irrigated wheat, and soybeans, which have historically offered higher net returns; and (2) the national and world price for sunflower oil due to its health-related characteristics. In general, over the past 10 years, sunflowers have had lower net returns per acre than have corn or wheat in western Kansas and production of sunflowers for biodiesel

purposes is also limited by the availability of only one processing facility in the western part of the state. The combination of a strong competing market for the oil coupled with higher net returns for competing crops on the same acreage lessens the potential for sunflower production in Kansas to be a viable biodiesel feedstock option.

### ***Canola***

Canola also has a high oil content of approximately 40% and is generally rotated with winter wheat in Kansas. Potential limiting factors for expanded canola growth as a biodiesel feedstock are mainly concerned with a lack of knowledge associated with canola production and potential net returns that could possibly occur, a lack of adequate crushing facilities, the fact that canola is hard to establish compared with other commodity crops, such as corn and winter wheat, and competition with other crops.

### ***Cotton***

Acreage of cotton has increased significantly in Kansas in the past 10 years primarily due to national farm programs and the addition of two ginning operations in Moscow and Pratt. However, cotton is a perennial plant restricted by the number of heat growing days and a majority of the state (northern two-thirds) is not adequately suited for cotton production. Cotton requires intensive management and in addition, a majority of cotton produced is irrigated, which further adds to its production costs compared with other alternative crops. In the past 10 years, the average annual cotton production would have yielded just over 1.2 million gallons of biodiesel if all oil were converted. Limiting factors to growing and/or expanding current cotton production in Kansas are heat unit requirements, continuation of current farm programs, water availability, and markets for the crushed and whole seeds which can be used as a high source of protein in animal feed as they will compete against other meal rations such as soybean meal.

### ***Peanuts***

Peanuts have a typical oil content of about 50%, which makes them extremely attractive as far as a potential biodiesel feedstock. However, historical costs of peanut oil have been roughly \$0.46 per pound and are expected to average \$0.51 per pound in the future, making them infeasible for biodiesel production (\$5.00 per gallon at \$0.50 per pound). No biodiesel is currently being produced or is expected to be produced from peanut oil in the U.S. for this reason.

### ***Perennial Oilseed Crops***

Perennial crops such as Chinese tallow tree, Kentucky coffee bean, and castor have potential applicability in Kansas, especially on lands not typically classified as primary cropland. Also, perennial oilseeds appear to offer many energetic and environmental advantages (decreased soil erosion and decreased water requirements) over conventional oilseed commodity crops.

Kansas has approximately 21 and 10 million acres of land capability class III and IV (LCC III-IV) and LCC V-VIII lands respectively and if an oil yield of 24 gallons per acre (180 pounds per acre) could be realized on 10% of these lands, nearly 70 million gallons per year could potentially be produced. One advantage some perennials offer is the possibility for use of the lands for both grazing and oilseed production, thereby potentially increasing the total net return per acre.

### ***Camelina***

Camelina has been grown in very limited quantities in the U.S., but preliminary research indicates it can be grown as far south as the 32<sup>nd</sup> latitude, is adaptable to marginal agricultural lands and has low water requirements, all of which make it a potential crop within Kansas. Camelina generally has an oil content between 30-40%, which is twice the oil yield of soybeans. The fact that Camelina could potentially be produced on marginal (land capability classes III-VIII) acreage with increased oil content could potentially help increase present net returns to landowners, but this will depend upon competing uses of the marginal acreage and their overall net returns.

### ***Beef Tallow***

Edible and inedible tallow are biodiesel feedstocks that, due to their highly centralized generation in slaughter/processing facilities, may have energy, environmental, and economic advantages that could be exploited, especially in Kansas due to the large concentration of cattle slaughter facilities. The quantity of edible and inedible tallow generated by Kansas beef processors would have displaced nearly 20% of the state's 2000-2005 total distillate fuel consumption.

Edible tallow is used primarily in the baking and frying fats and margarine markets, while inedible tallow is most often used as a supplement for animal feed (majority of market share), followed by use in fatty acids, soap, and lubricants. Market prices are dictated by supply and demand in these areas. Edible and inedible tallow have higher free fatty acid values; therefore, additional processing would be needed in order to effectively transesterify them to meet the ASTM standard which will add to the overall production cost.

### ***Waste Greases***

Waste greases have potential as biodiesel feedstocks due to their relatively low price and attractiveness of centralized collection. However they contain high levels of free fatty acids that would require additional processing, which will add to the overall production cost. A preliminary assessment based on average per capita waste grease generation indicates biodiesel produced from yellow grease (restaurant grease) in Wichita, Topeka, and Kansas City proper would yield 0.44, 0.16, and 0.38 million gallons per year.

## **Existing Policies and Programs**

### ***Federal Level***

#### ***Energy Policy Act***

Biodiesel is also approved as an Energy Policy Act (EPAct) compliance strategy. EPAct-covered fleets (federal, state and public utility fleets) can meet their alternative fuel vehicle purchase requirements simply by buying 450 gallons of pure biodiesel and burning it in new or existing diesel vehicles in at least a 20% blend with diesel fuel. In addition, the Congressional Budget Office and the U.S. Department of Agriculture have confirmed biodiesel is the least-cost alternative fuel option for meeting the Federal government's EPAct compliance requirements.

### *Renewable Fuels Standard*

The Renewable Fuels Standard (RFS) calls for a mandate of 7.5 billion gallons of renewable fuels, defined as any fuel derived from plant or animal wastes as opposed to fossil sources and which biodiesel can be any part, to be sold by 2012.

### *Blenders Tax Credit*

This federal tax credit states that for biodiesel blends produced from first-use vegetable oils and animal fats (all feedstocks except waste/recycled greases), a certified blender of biodiesel and petroleum diesel can receive an excise tax abatement of \$0.01 per percent biodiesel blended.<sup>2</sup>

### *Small Agri-Biodiesel Producer Credit*

This is an income tax credit that was established as part of the Energy Policy Act of 2005 and is a volumetric-based income tax credit for the production of agri-biodiesel (biodiesel made from first-use vegetable oils and first-use animal fats). The credit is available for biodiesel producers who produce agri-biodiesel (biodiesel from first-use vegetable oils and animal fats), and have agri-biodiesel production capacity that does not exceed 60 million gallons. The value of this credit is 10 cents for each gallon of qualified agri-biodiesel produced in a tax year and the credit is applicable to those gallons produced in a tax year and sold by the producer to another person: for use by that person in the production of a qualified biodiesel mixture as part of their trade or business; for use by that person as a fuel in a trade or business; or who sells the agri-biodiesel at retail to another person and places the fuel in that person's fuel tank. No more than 15 million gallons of qualified agri-biodiesel production in a tax year is eligible, and the credit sunsets December 31, 2008 (unless extended).<sup>3</sup>

### *State Level*

#### *Qualified Biodiesel Fuel Use Incentive Fund*

Created by Kansas SB 388 (2006). Provides a production incentive in the amount of \$0.30/gallon. This fund can provide up to \$875,000 per quarter (up to \$3,500,000 per year) to producers in Kansas. The fund will expire in 2016.

#### *Alternative Fuel Tax Credit*

Provides for a 40% tax credit for investment in alternative fuel stations. The maximum amount that can be claimed per taxpayer is \$100,000.

#### *Other Tax Incentives*

HB 2038 (2007 Legislation): Provides income tax incentives for investment in fuel storage and blending equipment used for biofuels. The tax credit is equal to 10% of the taxpayer's qualified investment for the first \$10 million invested and 5% of the investment in excess of \$10 million. In order to be eligible, the taxpayer is required to maintain operation of the equipment for at least

---

<sup>2</sup>For more information on the blender's tax credit, see <http://www.biodiesel.org/news/taxincentive/Biodiesel%20Tax%20Credit%20NBB%20Issue%20Brief.pdf>.

<sup>3</sup> For additional information, see <http://www.biodiesel.org/news/taxincentive/Memo-Small%20AgriBD%20Producer%20Credit%20FAQ.pdf>.

10 years during the term of the tax credit. This bill also provides for an income tax deduction based on accelerated depreciation for storage and blending equipment. This income tax deduction extends over a ten year period and is equal to 55% the first year, 5% for each of the nine subsequent years. Expands tax credits and incentives to cellulosic alcohol production plants to include other forms of biomass-to-energy plants. The law that was extended by the bill to biomass-to-energy plants provides: (a) eligibility for KDFRA financing assistance; (b) A ten-year property tax exemption; (c) an investment tax credit of 10 percent of the first \$250,000,000 invested and 5 percent of the amount over \$250,000,000 (prior law also was amended to make those tax credits available only until the end of tax year 2010); and (d) accelerated depreciation over 10 years (55 percent the first year and 5 percent for the succeeding nine years).

HB 2145 (2007 Legislation): Provides renewable fuels and biodiesel tax credits for retail dealers of motor fuels. Receiving the tax credit depends on the renewable fuels/biodiesel distribution percentage which is the total sales of renewable fuels/biodiesel distribution expressed as a percentage of total gasoline sold. The renewable fuels/biodiesel threshold increases every year and is effective until 2026.

## **Summary and Recommendations**

Kansas does have significant potential to utilize its natural resource base for production of biodiesel feedstocks, but biodiesel production and eventual utilization as an alternate fuel is a function of many inter-related factors involving agricultural policy, land utilization, petroleum markets and global oils and fats trade, and emerging environmental mandates and markets. Global, national, and state biofuels markets will be mainly shaped by supply and demand for applicable oilseeds and/or fats in a number of specific markets. In addition, energy and environmental legislation and mandates on a global, national, and state basis/level are currently playing a role in dictating price and supply of oils and fats that are or can be diverted into all biofuels markets and this will have a definite impact on biodiesel production, development, and expansion in Kansas.

Much is definitely unknown concerning a number of key and critical areas associated with biodiesel feedstock production in Kansas for utilization on a large-scale. Additional research is needed to better understand the following:

- 1) Optimum uses of the Kansas land base for the production of sustainable biodiesel feedstocks (annual or perennial) from the standpoints of: energy-profit ratio, environmental quality (air, soil and water), and economics of biodiesel feedstock production and markets.
- 2) The true resource base of animal fats and waste greases in Kansas and any technical and/or economic barriers associated with their use as biodiesel feedstocks, and large-scale markets given the geographic location of their generation.
- 3) Extent of Kansas and national markets for low-blend biodiesel (B2 – B5), B5 – B20, and high-blend levels and all barriers related to utilizing biodiesel in these markets.
- 4) The impact of the expanded national Renewable Fuels Standard (RFS) and what contribution Kansas will make to the RFS.

In addition, educational outreach directed at all aspects of biodiesel production, distribution, and use are needed.

## References

- EIA (U.S. Department of Energy, Energy Information Administration), 2007a, U.S. Adjusted Sales of Distillate Fuel Oil by End Use:  
[http://tonto.eia.doe.gov/dnav/pet/pet\\_cons\\_821dsta\\_dcu\\_nus\\_a.htm](http://tonto.eia.doe.gov/dnav/pet/pet_cons_821dsta_dcu_nus_a.htm).
- EIA (U.S. Department of Energy, Energy Information Administration), 2007b, Weekly Retail On-highway Diesel Prices: [http://tonto.eia.doe.gov/oog/info/wohdp/diesel.asp#graph\\_buttons](http://tonto.eia.doe.gov/oog/info/wohdp/diesel.asp#graph_buttons)
- Food and Agricultural Policy Research Institute, 2007, Commodities Databases:  
<http://www.fapri.org/tools/outlook.aspx>.
- McCormick, R.L., A. Williams, J. Ireland, M. Brimhall, and R.R. Hayes, 2006, Effects of Biodiesel Blends on Vehicle Emissions, National Renewable Energy Laboratory:  
<http://www.nrel.gov/docs/fy07osti/40554.pdf>
- National Biodiesel Accreditation Program, 2007, BQ-9000 Quality Management Program:  
<http://www.bq-9000.org/>.
- National Biodiesel Board, 2007a, Biodiesel Emissions:  
[http://www.biodiesel.org/pdf\\_files/fuelfactsheets/emissions.pdf](http://www.biodiesel.org/pdf_files/fuelfactsheets/emissions.pdf).
- National Biodiesel Board, 2007b, Estimated U.S. Biodiesel Sales:  
[http://www.biodiesel.org/pdf\\_files/fuelfactsheets/Biodiesel\\_Sales\\_Graph.pdf](http://www.biodiesel.org/pdf_files/fuelfactsheets/Biodiesel_Sales_Graph.pdf).
- National Biodiesel Board, 2007c, Lifecycle Summary.”  
[http://www.biodiesel.org/pdf\\_files/fuelfactsheets/LifeCycle\\_Summary.PDF](http://www.biodiesel.org/pdf_files/fuelfactsheets/LifeCycle_Summary.PDF).
- National Biodiesel Board, 2007d, Lubricity Benefits:  
[http://www.biodiesel.org/pdf\\_files/fuelfactsheets/Lubricity.PDF](http://www.biodiesel.org/pdf_files/fuelfactsheets/Lubricity.PDF).
- National Biodiesel Board, 2007e, Specification for Biodiesel (B100)—ASTM D6751-06b:  
[http://www.biodiesel.org/pdf\\_files/fuelfactsheets/BDSpec.PDF](http://www.biodiesel.org/pdf_files/fuelfactsheets/BDSpec.PDF).
- Nelson, R.G., and Mark D. Schrock. “Energetic and Economic Feasibility Associated with the Production, Processing, and Conversion of Beef Tallow to a Substitute Diesel Fuel.” *Biomass and Bioenergy*, Volume 30, Issue 6, June 2006, 584-591.
- Pruszko, Rudy, 2006, Rendered Fats and Oils as a Biodiesel Feedstock, Center for Industrial Research and Service, Iowa State University Extension:  
<http://www.rendermagazine.com/February2006/RenderedFatsandOils.pdf>.
- U.S. Department of Agriculture and U.S. Department of Energy, 1998, An Overview of Biodiesel and Petroleum Diesel Life Cycles:  
<http://www.biodiesel.com/PDF/Biodiesel%20Life%20Cycle.pdf>