Biodiesel: Is It Worth Considering?

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Risk and Profit Conference
Kansas State University
Holiday Inn, Manhattan, Kansas
August 15-16, 2002

Will biodiesel become an important renewable fuel across the United States? What feedstocks can be used to produce biodiesel? Is biodiesel a fuel for Kansas producers to use? Should Kansas producers consider investing in biodiesel processing plants? These questions and other important issues concerning biodiesel are addressed in this paper.

Rudolph Diesel invented the diesel engine over 100 years ago with vegetable oil as the fuel choice. As petroleum became the dominate low cost energy source, petroleum diesel was developed as the primary fuel for diesel engines.

Biodiesel is a biodegradable and cleaner burning diesel replacement fuel made from natural, renewable sources such as new and used vegetable oils and animal fats. These fats and oils are chemically reacted with an alcohol, usually methanol, to produce the technical term for biodiesel – fatty methyl esters. A by-product, glycerol, is also produced. The simplified production formula is 100 pounds of oil or fat plus 10 pounds alcohol equals 100 pounds biodiesel and 10 pounds glycerol.

Driving forces behind increasing biodiesel production include low commodity prices for feedstocks used to produce biodiesel, environmental concerns with continued diesel use, and national security concerns about increased usage of foreign crude oil. The national security issue was especially heightened after the September 11, 2001 terrorist attack. Foreign crude oil currently accounts for nearly 60 percent of the amount used in the U.S. In light of this, the federal government is considering a renewable fuels standard that will increase biofuels usage from 2 billion gallons in 2002 to 5 billion gallons by 2012.

How does diodiesel differ from conventional petroleum diesel? Biodiesel emissions are essentially free of sulfur and aromatics and have less hydrocarbons, carbon monoxide and particular matter. Biodiesel has a higher cetane number than diesel and about a five percent lower energy delivery. Both fuels require an additive to prevent jelling in cold temperatures. A B20 mixture is comparable to diesel in power, torque and fuel economy. The lubricity characteristics of biodiesel are much superior to diesel. In fact, refined diesel fuel must contain sulfur to help with lubricity. In the future, expectations are that government regulations will require refinery processes to reduce the sulfur content in diesel. These mandated reductions in allowable sulfur content could help increase the demand for using biodiesel.

Biodiesel can be used at a 100 percent level or mixed with diesel at any rate. The most common mixtures are B2 containing 2 percent biodiesel and B20 containing 20 percent biodiesel. A B2 mixture increases fuel lubricity to acceptable levels even if the current sulfur content of diesel is reduced. Over 200 major U.S. fleets already use biodiesel in their vehicles.[1]

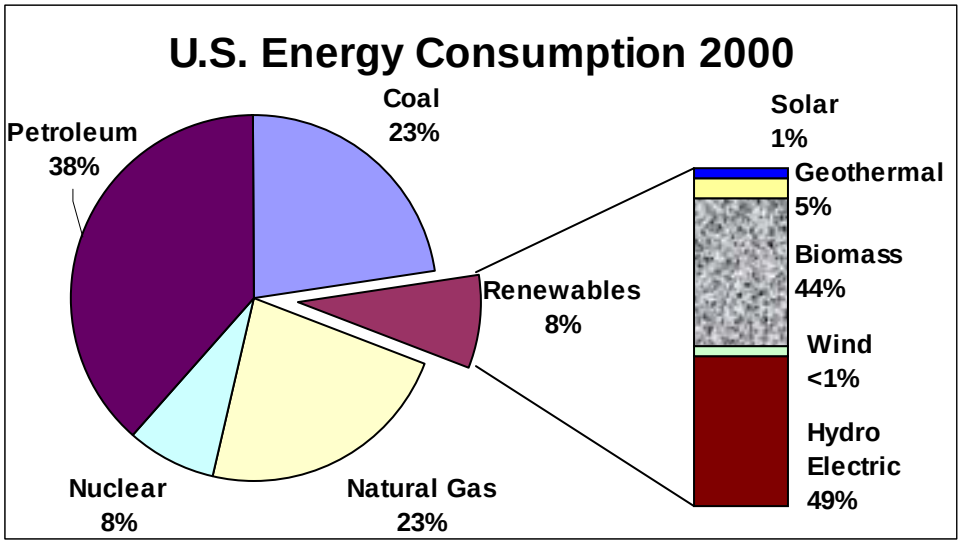
When compared with the other significant renewable fuel ethanol, biodiesel has two distinguishing important characteristics. First, biodiesel has a very positive net energy gain, in the 3-4 to 1 ratio, which is much higher than ethanol's. Second, using biodiesel in diesel engines has always been a very positive experience with no concerns expressed about engine problems. In contrast, ethanol use has not always received such a positive response. In addition, biodiesel has higher energy content per gallon than ethanol, 120,000 BTUs versus about 80,000 BTUs.

[1] "The Biofuels Boom" Hoovers Online. July 26, 2002.

Total Energy Consumption

How important is renewable energy in the total energy consumption in the U.S.? Figure 1 shows that in 2000, renewables accounted for eight percent of the total energy consumption. Looking specifically at the renewable section, hydro electric (49 percent) is the largest sector with biomass (44 percent) a close second. The other sectors together – geothermal, solar and wind – combine for seven percent of the renewable energy. Biodiesel production is currently a small part of the biomass sector.

Figure 1: U.S. Energy Consumption 2000



Source: National Renewable Energy Laboratory

Biodiesel Production

Currently, 17 plants in the U.S. are registered as biodiesel suppliers. These plants are scattered across the country because of the variety of feedstocks that are used in producing biodiesel. Dedicated production is estimated to be between 60 and 80 million gallons per year. Up to 200 million gallons of production capacity are available within the oleochemical industry.[2] Table 1 lists the names and locations of plants producing biodiesel that are participating in the USDA Bioenergy Program, which is discussed in the ***Subsidies*** section beginning on page 15. Generally, these plants also produce other products from fats and oils. As the demand for biodiesel increases, these plants could switch production to meet the increased demand.

[2] U.S. Biodiesel Production Capacity, National Biodiesel Board

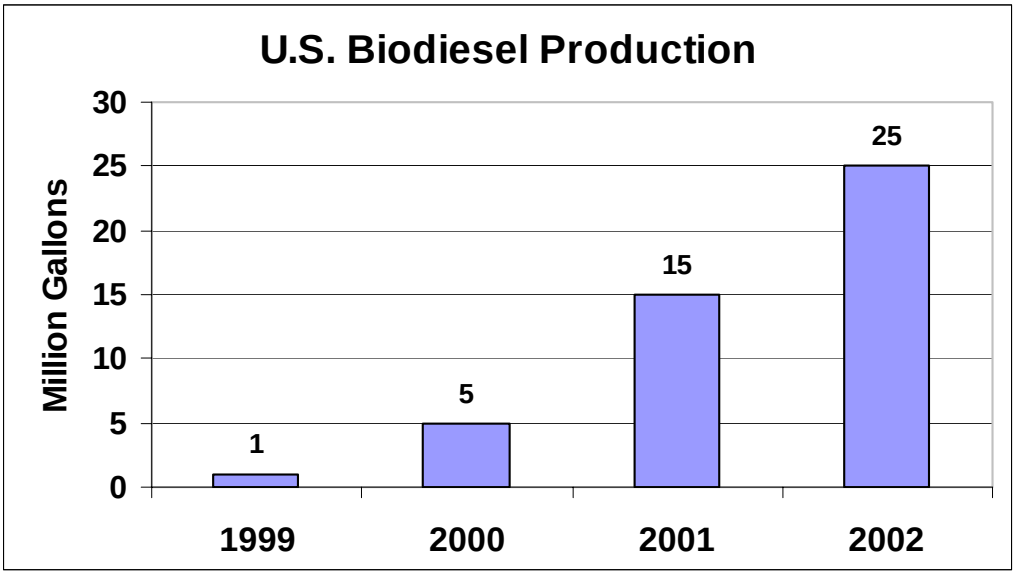
Table 1: Biodiesel Production Plants

Plant	Location
Ag Processing, Inc.	Omaha, Nebraska
American Bio-Fuels, LLC	Bonita, California
Columbus Foods Company	Chicago, Illinois
Filter Specialty, Inc.	Autryville, North Carolina
Griffin Industries	Cold Spring, Kentucky
Imperial Western Products, Inc.	Indio, California
Interwest, L.C.	Ralston, Iowa
Oceanair Environmental Fuels	Lakeland, Florida
Pacific NW Biodiesel LLC	Aloha, Oregon
Peter Cremer North America LP	Cincinnati, Ohio
Southern States Power Company, Inc.	Ontario, California
Stephan Company	Northfield, Illinois
Sustainable Systems LLC	Missoula, Montana
World Energy Alternatives, LLC	Chelsea, Massachusetts

Source: FY 2002 Bioenergy Program Participants

Figure 2 shows how biodiesel production has greatly expanded since 1999 when only one million gallons of biodiesel was produced. In 2002, 25 million gallons is projected as the production figure. Percentage wise, biodiesel is the fastest growing fuel.

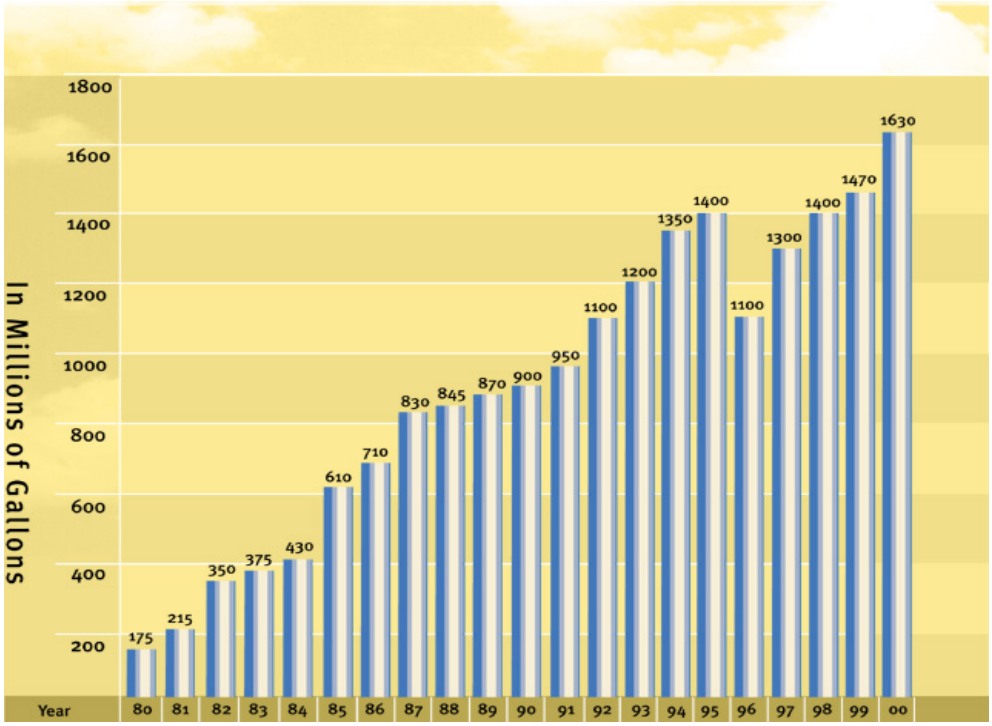
Figure 2: U.S. Biodiesel Production



Source: National Biodiesel Board

Is biodiesel in a similar position as ethanol was in the 1970's? Ethanol production in the mid 1970's was just a few million gallons each year. Figure 3 shows how ethanol production has steadily increased production from 175 million gallons produced in 1980 and is projected to reach two billion gallons in 2002.

Figure 3: Ethanol Production, 1980-2000



Source: Renewable Fuels Association

The main drivers of biodiesel production, low feedstock prices, environmental concerns, and national security issues, indicate that biodiesel has a very good chance to mirror what ethanol production has done in this country in the past 20 years.

An interesting note is that biodiesel is the renewable fuel of choice in the European Union. Nearly 40 percent of the cars in Europe have diesel engines. Some cars are even fueled by B100, pure biodiesel. Germany uses the most biodiesel, 200 million gallons in 1991, 500 million gallons in 2001 and an estimated 750 million gallons in 2002.[3] Most of Germany's biodiesel is made from rapeseed oil.

Economic Input Factors

The major economic factor to consider for input costs of biodiesel production is the feedstock, which is about 80 percent of the total operating cost. It takes around 7.5 pounds of fat or oil to produce a gallon of biodiesel. If a feedstock is 20 cents per pound, the feedstock cost

[3] "The Biofuels Boom" Hoovers Online. July 26, 2002.

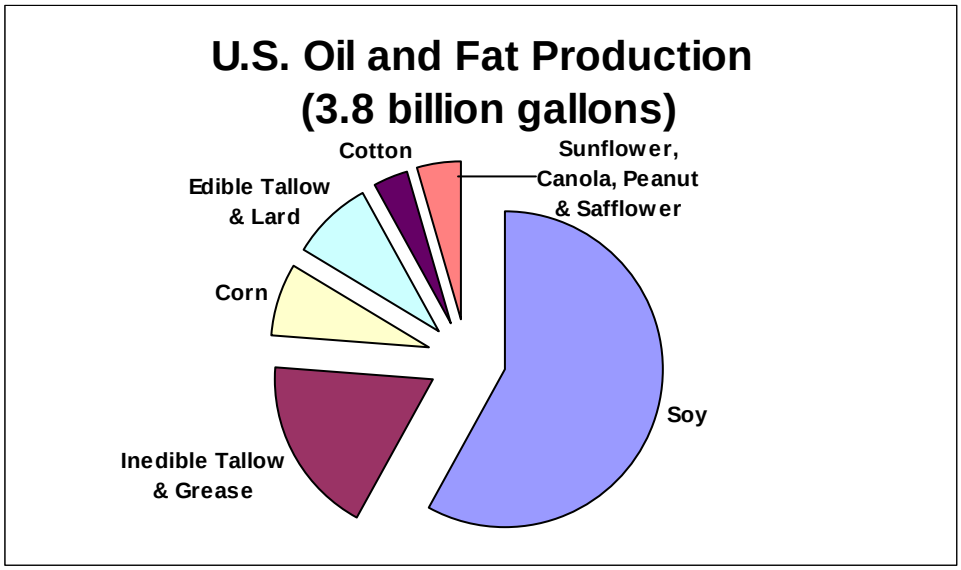
alone is nearly $1.50 per gallon. Other important costs including plant overhead, labor and methanol must be added to the feedstock cost to determine the total cost per gallon in biodiesel production.

Biodiesel Feedstocks

Biodiesel can be processed from any type of animal fats and plant oils. Figure 4 summarizes the sources of oils and fats produced in the U.S. The total oil and fat production is currently 3.8 billion gallons per year. This production amount implies that if all the yearly production is used to produce biodiesel, the U.S. currently has a maximum production near 3.5 billion gallons when factoring in the conversion aspect. To put this amount in perspective, American consumers purchased about 57 billion gallons of distillate fuel in 2000. Distillate fuel oil includes diesel fuel, industrial oils and heating oils. Diesel fuel use in 2000 was nearly 40 billion gallons. Agricultural production used slightly over 3 billion gallons of diesel fuel.[4]

Figure 4 illustrates that soy oil is by far the largest available product for biodiesel production with about 58 percent of the total oil and fat production. Much of the research and promotion for biodiesel production has come from national and state soybean associations. Thus, the term, soy diesel is often associated with biodiesel. However, remember biodiesel can be produced from any fat or oil. Another interesting aspect to remember is that while Figure 4 shows yearly production, biodiesel can also be produced from used and waste fat and oils.

Figure 4: Oil and Fat Production in the United States



Source: National Renewable Energy Laboratory

A more complete list of potential domestic resources for biodiesel include (1) food grade cooking oils: soy, canola, palm, peanut, sunflower, (2) off quality and rancid vegetable oils, (3) animal fats: lard, tallow, chicken fat, fish oils and (4) used cooking oils from restaurants.

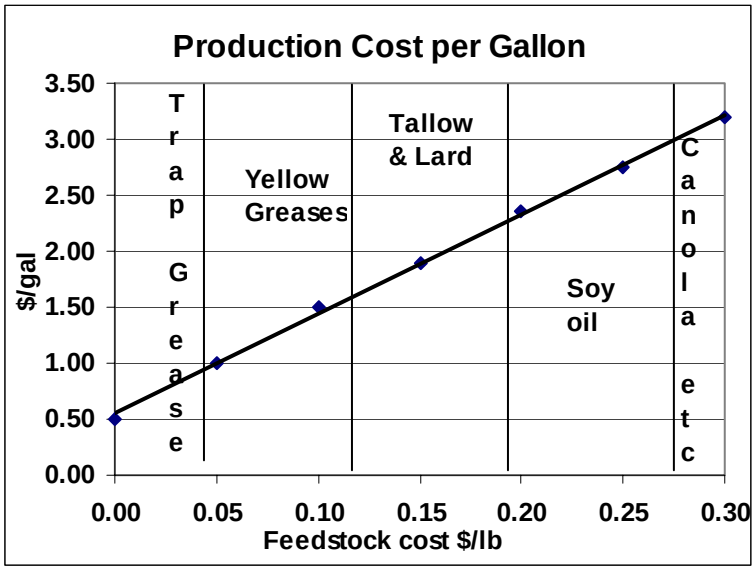
[4] Energy Information Administration

Each year, United States livestock slaughter facilities produce about 2.5 million tons of tallow from cattle and about 0.5 million tons of lard from hogs. This yearly total supply of animal fat could be processed into approximately 800 million gallons of biodiesel. The four largest producing states for the approximately 3.0 million tons of animal fats are Iowa 18 percent, Nebraska 16 percent, Kansas 14 percent and Texas 12 percent, respectively.[5]

Figure 5 shows the range of prices for feedstocks that can be used to produce biodiesel. The most abundant material, soy oil, normally is in the 20-25 cents per pound range. From 1978-1995, the average soybean oil price was 23 cents per pound.[6] The recent soy oil market has been closer to 15 cents per pound. Even at 15 cents per pound, soy oil is more expensive than other feedstocks, especially waste grease, which normally costs around 5 cents per pound. Remember, roughly 7.5 pounds of fat or oil produces one gallon of biodiesel.

Yellow grease is primarily refined cooking grease recycled from restaurants. High concentrations of yellow grease are subsequently located in high population areas. These high population areas are key locations for increased demand for biodiesel to address environmental concerns associated with dense population areas. Therefore, yellow grease will likely be an important biodiesel feedstock since it is relatively low cost and abundant in expected high demand areas.

Figure 5: Production Cost of Various Feedstocks



Source: National Renewable Energy Laboratory

Even without including other operating expenses, normal market prices for most plant oils and animal fats are higher than the current market price for diesel fuel. Lard, tallow and yellow grease are lower priced than plant oils. However, with operating expenses included, these

[5] Duffield, et.al. "U.S. Biodiesel Development: New Markets for Conventional and Genetically Modified Agricultural Products." Agricultural Economic Report No. 770, September, 1998.
[6] Duffield, et.al. ibid.

low priced animal fats would still produce biodiesel with higher costs than the historical price for diesel fuel.

Another potential feedstock is mustard oil. The Department of Energy is developing a low cost biodiesel fuel from mustard oil, which is a very low cost, inedible oil. Mustard meal is a high value pesticide for the organic market. Thus, the remaining mustard oil's value is projected at 10 cents per pound. Oil at this price could keep mustard biodiesel total production costs, including all operation expenses, around $1.00 per gallon.[7]

Soybeans as a Feedstock

Now that we have looked at many different possible feedstock sources for biodiesel, this section focuses specifically on using soybeans as the feedstock. Soybeans are crushed into meal and oil. The soy oil processed from one bushel ranges from 1-1.5 gallons, depending on which type of crushing procedure is used. At a minimum, each bushel of soybeans can be processed into one gallon of biodiesel.

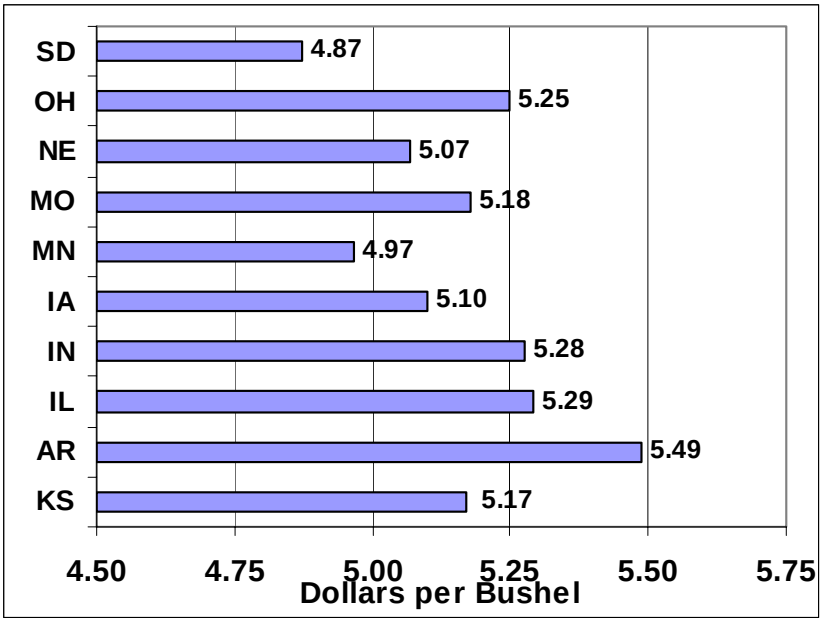
Soybean Price

The price of feedstock is by far the most important cost for biodiesel production. This is similar to ethanol production where the grain feedstock price contributes from 50-70 percent of the total expenses. For example, a $0.25 increase in the price of grain per bushel in a 30 million gallons per year ethanol facility increases yearly expenses by about $3 million.

Figure 6 shows the historical price for soybeans in the top ten producing states from 1997 to 2000. It should be noted that these are average prices across each state. Often the prices within the different state districts vary greatly. The average prices vary, but the range of 62 cents per bushel between the lowest and highest prices for South Dakota and Arkansas is not as large a percentage difference (11 percent) as that found in comparative corn prices shown in Figure 7. The percentage difference for corn is 18 percent even if the highest priced states of Texas, Oklahoma and Colorado are removed. Remember biodiesel only uses the oil, not the complete grain used in ethanol production. These facts suggest that soybean price differentials between states are not near as important for profitable biodiesel production as grain price differentials are for ethanol production.

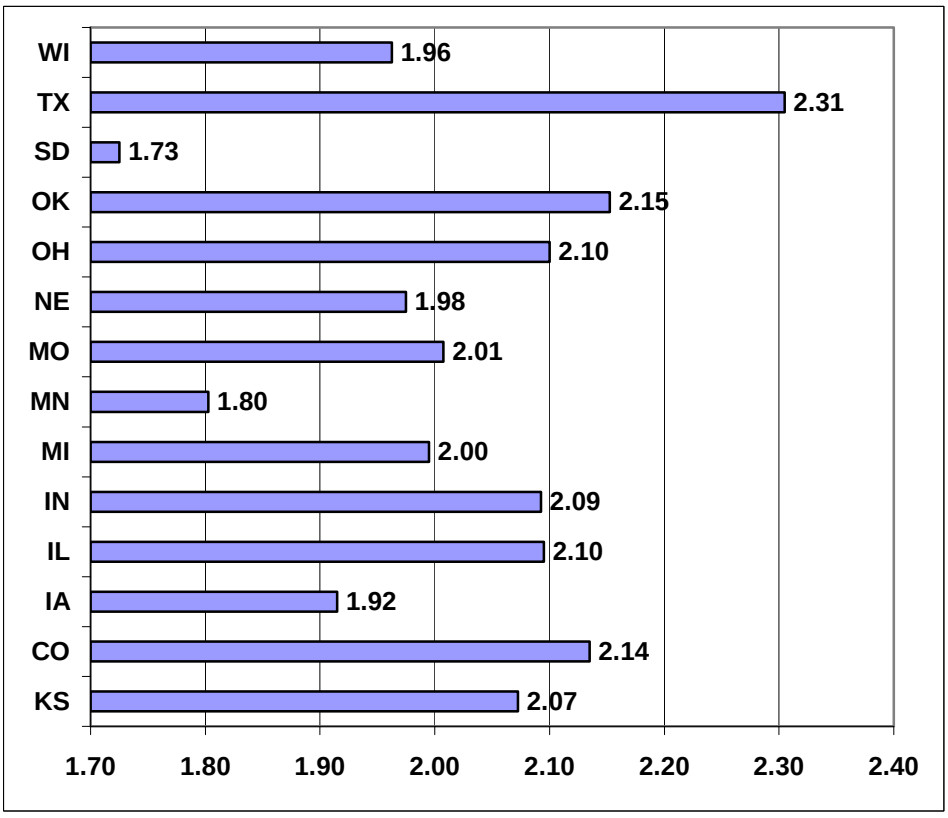
[7] "What is biodiesel?" Biodiesel General Information, Alternative Fuels Data Center. Online at http:www.afce.doe.gov/altfuel/bio_general.html

Figure 6: 1997-2000 Average Soybean Prices in Selected States ($/bu)



Source: National Agricultural Statistics Service

Figure 7: 1997-2000 Average Corn Prices in Selected States ($/bushel)

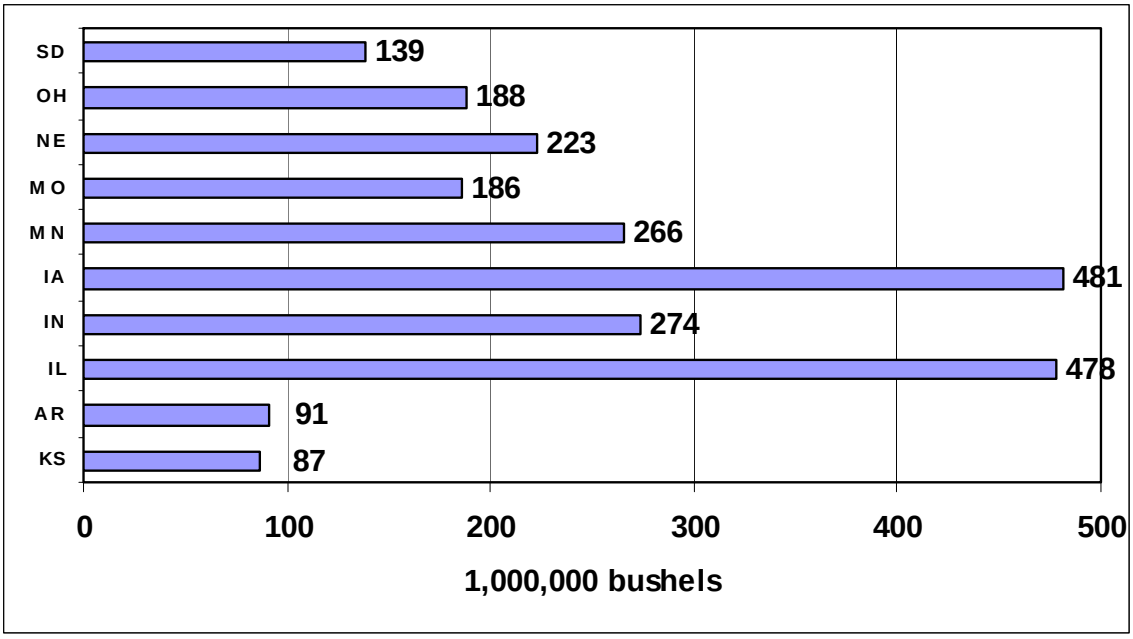


Source: National Agricultural Statistics Service

Soybean Availability

An adequate supply of soybeans must be available for soybean oil to be used as a feedstock for biodiesel production. Figure 8 lists the top ten soybean producing states in 2000. Kansas is normally the tenth leading state for soybean production.

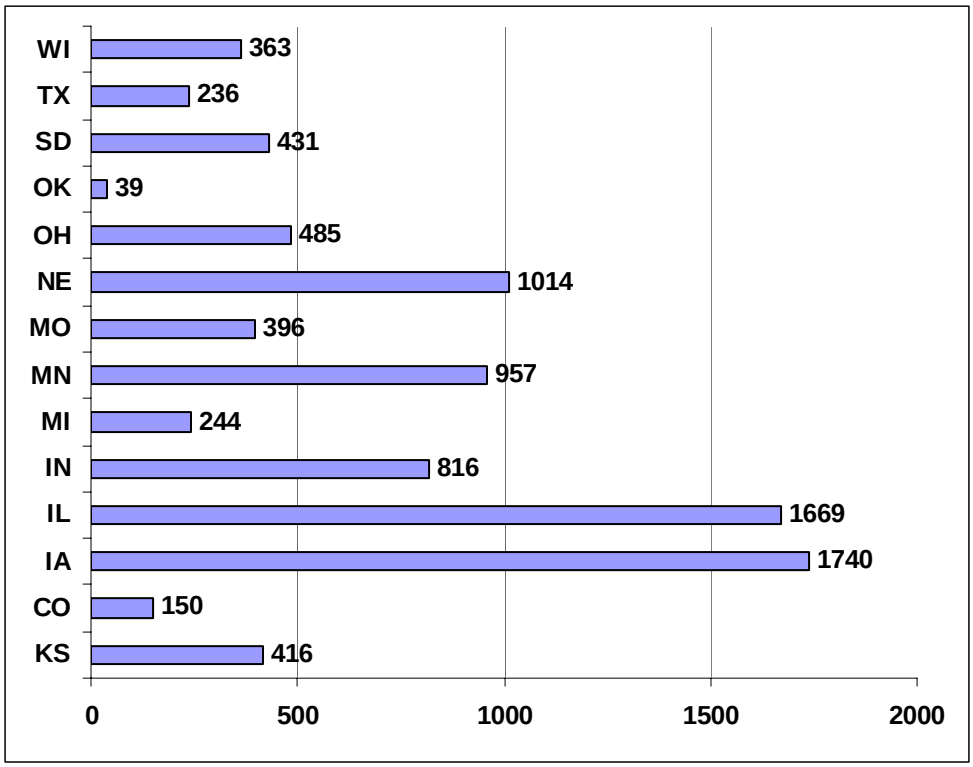
Figure 8: 2000 Soybean Production in the Top 10 States (million bushels)



Source: National Agricultural Statistics Service

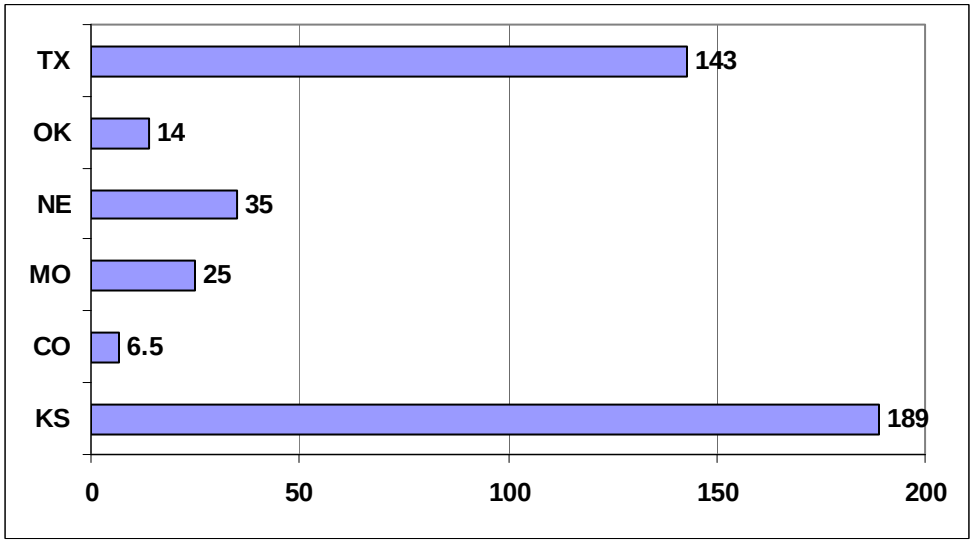
For comparison, Figure 9 shows how Kansas 2000 corn production compares with the top 15 producing states. Kansas produced 416 million bushels of corn and ranked eighth. Figure 10 shows 2000 grain sorghum production for the six top producing states. Kansas, with 189 million bushels produced, was the leading state in grain sorghum production.

Figure 9: 2000 Corn Production in the Top 15 States (million bushels)



Source: National Agricultural Statistics Service

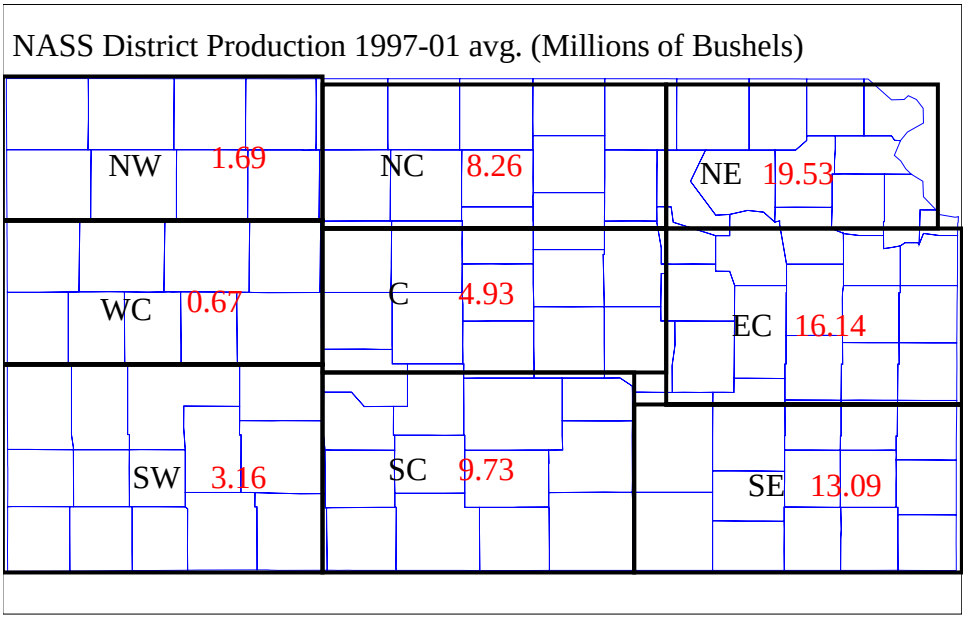
Figure 10: 2000 Grain Sorghum Production in the Top Six States (million bushels)



Source: National Agricultural Statistics Service

Where are soybeans grown in Kansas? Figure 11 shows that the three eastern Kansas districts have the largest production. The northeast district leads with nearly 20 million bushels average production from 1997-2001.

Figure 11: Kansas District Soybean Average Production 1997-2001 (millions of bushels)



Source: National Agricultural Statistics Service

Other Operating Costs

While feedstock cost is the major component in producing biodiesel, other operating costs will occur. One study estimated that the transesterification costs are about 58 cents per gallon and overhead cost are 33 cents per gallon. If the co-product glycerol is credited at 39 cents per gallon, the total cost for processing biodiesel is 52 cents per gallon.[8] Other studies have estimated total operating costs of 30-60 cents per gallon.[9] The total operating cost for converting fats and oils to biodiesel ranges from $1.39 to $2.52 per gallon, depending on which feedstocks are used.[10]

Transportation

The cost of transporting biodiesel is related to the type of markets that biodiesel production plants could reach. Local biodiesel markets could use trucks and have transportation costs of about two cents per gallon. Marketing regionally typically has transportation costs of

[8] Wither, R.V., and M. Noordam. "Biodiesel From Canola: An Economic Feasibility Analysis," Liquid Fuels Conference, September 1996, Nashville, Tennessee.
[9] Bender, M. "Feasibility Study for Farmers' Biodiesel Cooperative," The Land Institute, April 1997.
[10] Duffield, et.al. "U.S. Biodiesel Development: New Markets for Conventional and Genetically Modified Agricultural Products." Agricultural Economic Report No. 770, September, 1998.

about seven cents per gallon. If biodiesel is shipped to either the East or West coasts, the transportation costs would be about 17 cents per gallon.

Economic Output Factors

The important output factors for biodiesel production are biodiesel and glycerol. Technically, a few other products are produced, but are insignificant in the overall economic picture. Much of the biodiesel produced today is manufactured at plants that purchase oils or fats as commodities and produce various products. Some biodiesel is produced at plants that start with a complete oilseed like soybeans. A soybean processing facility that crushes soybeans into meal and soy oil has many similarities to ethanol plants that produce ethanol from feed grains.

Currently, nearly all ethanol plants process feed grains into ethanol and various co-products. Ethanol wet mills have an array of products that can be produced, while dry mill ethanol plants produce ethanol and distillers grain, which can be marketed dry or wet. The amount of ethanol and distillers grain produced is similar in volume and weight. However, ethanol is a much higher priced product than distillers grains, ranging from four to six times higher depending on their respective prices.

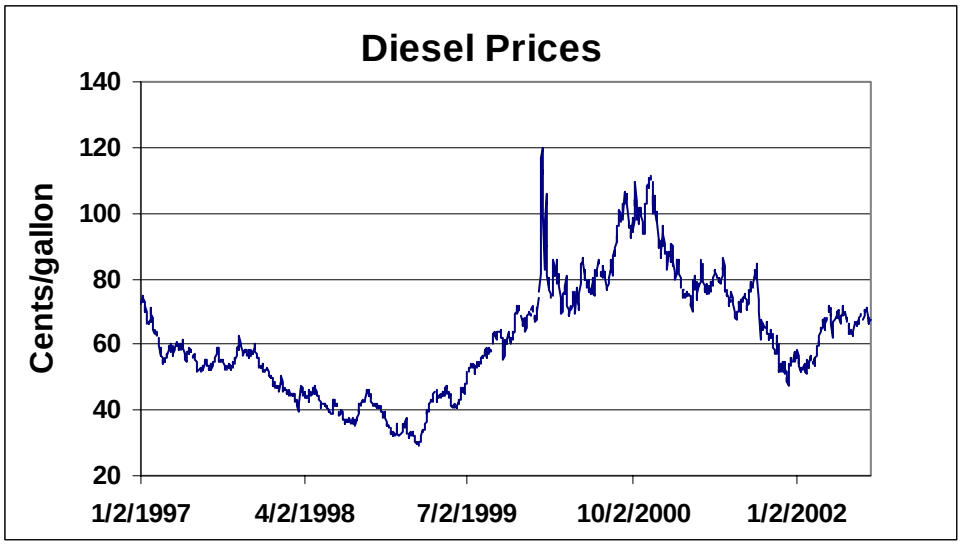
Now let's look at biodiesel production that starts with the complete soybean and compare it to a dry mill ethanol production that starts with grain feedstock and produces ethanol and a co-product, distillers grains. Soybean processing plants separate the meal and oil. Soybean meal is the most valuable product derived in processing, ranging from 50-75 percent of the total value.[11] Soybean meal is also the larger product by weight, around 44 pounds per bushel. All of the soybean oil in a bushel weighs about 12 pounds. Different processing techniques produce oil in a range of 7-12 pounds. Since soybean meal is the higher valued product and is produced at greater volumes, soy oil can be considered a residual product.

Biodiesel

Ethanol can be thought of as an equal price substitute for gasoline and its market normally reflects this fact. Biodiesel does not have this relationship with diesel. Without any type of federal subsidy, biodiesel is relatively higher priced than diesel. Now if diesel fuel prices increase and low cost animal fats and plant oils are used, biodiesel could become a price substitute for diesel. Figure 12 shows that diesel prices are generally increasing. In fact, diesel was over $1.00 per gallon for much of 2000. At this price and with a proposed government subsidy, biodiesel could become quite competitive with diesel.

[11] Duffield, et.al. "U.S. Biodiesel Development: New Markets for Conventional and Genetically Modified Agricultural Products." Agricultural Economic Report No. 770, September, 1998.

Figure 12: Diesel Prices 1997-2002



Source: Energy Information Administration

Biodiesel Price

The production costs for biodiesel is determined by which feedstock is used. This price typically ranges from $1.40 to $2.40 per gallon. Biodiesel normally is priced at about $1.00-$1.50 per gallon higher than diesel. Roughly, for every percent of biodiesel in the fuel mixture, the additional cost for the fuel mixture is higher by one or two cents. A blend of B5 costs about 5-10 cents more per gallon than straight diesel. Biodiesel users are willing to pay this additional price because they like the results. The ***Subsidies*** section looks at how government policies could help lower the cost of biodiesel to consumers and make it cost competitive with diesel.

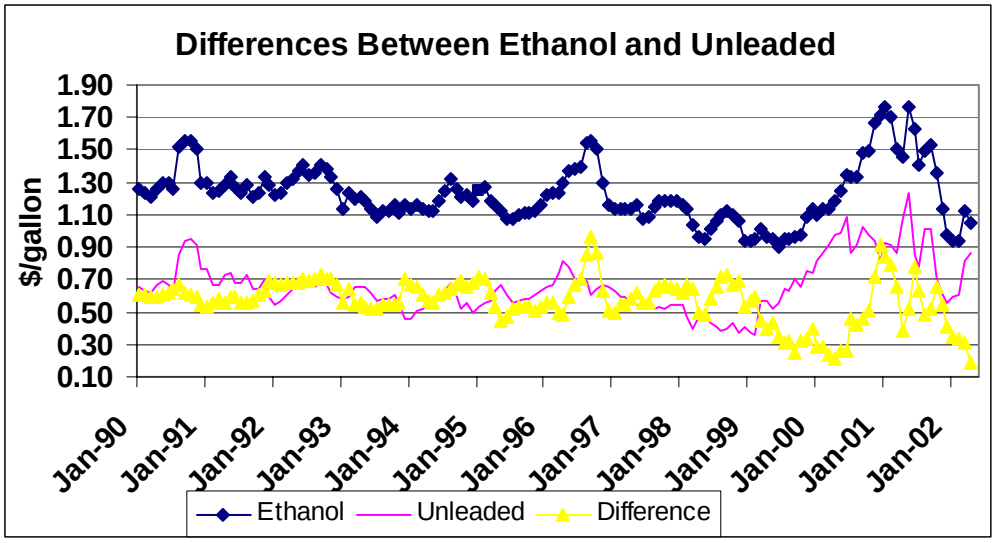
Price Relationship of Ethanol

The price of ethanol typically increases and decreases as it follows after the wholesale price swings of wholesale unleaded gasoline. Ethanol has a federal excise tax exemption that amounts to about 50 cents per gallon of ethanol produced. The tax exemption for using ethanol is a credit fuel blenders receive for using ethanol in gasoline. The wholesale price of ethanol is usually about 50 cents above the wholesale price of gasoline. Figure 13 shows the average monthly price differences between ethanol and gasoline.

For most of the 1990's, the price difference between ethanol and unleaded gasoline stayed near the 50 cents per gallon range. A spike occurred in 1996 because many ethanol plants stopped production when the corn price skyrocketed up to $5.00 per bushel. The market price for ethanol is usually based on the gasoline price plus the blender's credit. Figure 14 shows how volatile the ethanol market has been since 1999. During late 1999 and early 2000, the price difference dropped to about 30 cents per gallon. Then in early 2001, a record large difference

was reached of about 90 cents per gallon. Then in 2002, the difference was back down to a low record monthly difference of 19 cents. This volatility is very hard to explain.

Figure 13: Price Differences Between Ethanol and Wholesale Unleaded Gasoline



Source: Nebraska Ethanol Board

Glycerol

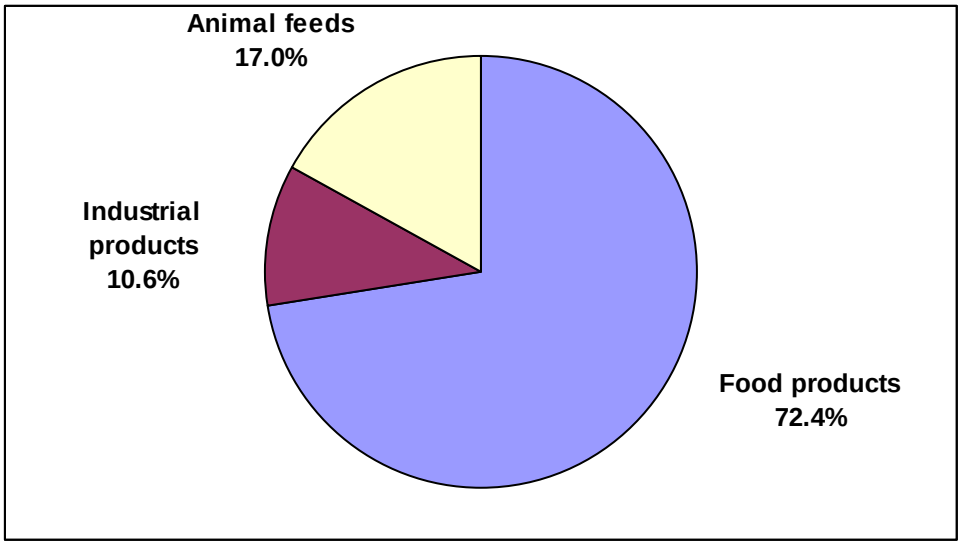
Glycerol is a co-product produced in the transesterification process of producing biodiesel. Glycerol is used in pharmaceuticals, cosmetics, toothpaste, paints and other commercial products.[12] The market for glycerol has been volatile in the past. Extensive biodiesel production could flood the glycerol market and lower the glycerol price.

Product Competition

Biodiesel production will compete with established markets for fats and oils. Vegetable or plant oils and animal fats are currently used for food products, animal feeds and industrial products. Figure 12 shows that food products account for 72 percent of the fats and oils currently used. About 97 percent of U.S. soybean oil is used for edible purposes.[13] Generally, the markets for fats and oils used in food products will be higher priced than what the market can bear for fats and oils used to produce fuels.

[12] Duffield, et.al. "U.S. Biodiesel Development: New Markets for Conventional and Genetically Modified Agricultural Products." Agricultural Economic Report No. 770, September, 1998.
[13] Duffield, et.al. "U.S. Biodiesel Development: New Markets for Conventional and Genetically Modified Agricultural Products." Agricultural Economic Report No. 770, September, 1998.

Figure 12: Domestic Use of Fats and Oils, 1995



Source: USDA Economic Research Service, Oil Crops Yearbook, 1997

Other Important Economic Factors

The 2002 Energy Bill has the potential to greatly influence biodiesel production. The Senate and House of Representatives are working on the Energy Bill in a conference committee and is expected to finalize the bill this fall.

Subsidies

Government subsidies from both the federal government and individual state governments are a major driving force in ethanol production. The ethanol industry has survived in the past because of these government subsidies and the biodiesel industry could also be impacted by government policy.

The biodiessel industry is positioned to have a similar impact if the renewable fuels standard is passed and a biodiesel partial tax exemption becomes law. The proposed tax exemption will be different than the ethanol excise tax exemption. For each percent of biodiesel used in a blend with diesel the fuel tax rate will be reduced by an equal amount of cents, up to a maximum of 20 cents. For example, a 5 percent blend of biodiesel will equal 5 cents reduction in the fuel tax. This figure is significant because then the market price of biodiesel would be similar to diesel's market price.

A significant difference occurs when comparing the subsidy for ethanol and biodiesel. The ethanol subsidy allows the federal highway fund to receive fewer dollars because the excise tax exemption lowers the amount received. The proposed biodiesel exemption program has the

Commodity Credit Corporation reimburse the National Highway Trust Fund according to the amount of biodiesel that is exempted.[14]

A recent incentive by the USDA has been a $300 million biofuels effort to increase ethanol production and other renewable biofuels such as biodiesel. This incentive provides payment to renewable fuels plants that increase the amount of fuels produced from the preceding year. This program started in 2001 and was extended in the 2002 Farm Bill through 2008. This payment goes directly to renewable fuels plants that increase production. A conversion factor for each feedstock determines the payment amount. The maximum payment is capped at $7.5 million each year. Some new ethanol plants could receive this maximum amount, as well as established biodiesel plants that greatly expand production. For biodiesel producing plants, each gallon of increased production is worth about $1.25.

State subsidies are another important part of ethanol production. Many states encourage production with different incentives for ethanol plants. For example, Minnesota has a state incentive program of 20 cents per gallon of ethanol produced and requires all gasoline to contain an oxygenate such as ethanol. This program allows Minnesota to use almost 300 million gallons of ethanol per year. In comparison, Kansas uses about 5 million gallons. These incentives usually are distributed directly to ethanol plants that meet the various requirements instead of increasing the market price of ethanol like the federal excise exemption. These state subsidies vary greatly across the country and are subject to change.

State subsidies and incentives could also influence the biodiesel industry. Minnesota recently passed a law mandating the use of biodiesel in diesel fuel. Legislators in Minnesota must believe the special ethanol legislation passed during the 1990's was invaluable to their ethanol industry and could also assist the biodiesel industry in their state.

Summary and Implications

Important drivers for biodiesel production are in place for the industry to boom in the coming years. Low feedstock prices, environmental concerns with diesel fuel, and reducing dependence on foreign oil are all important concerns that increased biodiesel production could address. The soon to be completed federal energy bill will help show what government policies and regulations will be established to deal with these issues.

A biodiesel industry in the U.S. has these potential benefits: (1) increased feedstock prices for oilseeds, animal fats and yellow grease, (2) increased number of jobs, (3) increased tax base from plant operations and income taxes and (4) investments in plants and equipment.[15]

One of the contributing factors to depressed global agricultural commodity prices is a surplus of vegetable oils and animal fats. Biodiesel supporters believe that increased biodiesel use will lower this surplus and contribute to savings in the USDA soybean marketing loan program by increasing soybean prices and lowering outlays in the loan program.[16] A 1996

[14] "The Biofuels Boom" Hoovers Online. July 26, 2002.
[15] Howell, S.A., and J.A. Weber. "U.S. Biodiesel Overview," National Biodiesel Board.
[16] "The Biofuels Boom" Hoovers Online. July 26, 2002.

economic study published by the USDA Office on Energy predicted an annual market of 100 million gallons of biodiesel per year would contribute about seven cents per bushel for each bushel of soybeans produced in the U.S.[17]

An Iowa State University economic study in 1995 concluded that the total incremental cost of operating the entire Iowa state fleet on B20 would be more than offset by the predicted increase in tax revenues realized by the construction and operation of a 5 million gallons a year biodiesel facility.[18]

Two economists at the University of Missouri proposed an interesting concept on biodiesel production. They modeled their idea from a similar type of operation used in Europe. They proposed that producers who both grow soybeans and feed soybean meal to livestock are positioned to form a New Generation Cooperative that processes the soybeans into meal and biodiesel. The producer owners save normal transaction costs involved in selling soybeans and buying soybean meal. The market prices for soybeans and soybean meal were calculated from 1998 prices of $6.44 per bushel for soybeans and nearly $214 per ton for soybean meal. Using these prices and including regular processing costs, the residual biodiesel price was then calculated at $1.36 per gallon. The authors admit that producer owners would incur opportunity costs by producing biodiesel instead of selling the soybean oil at its higher market value.[19]

Some of the soybean processing plants in Kansas could potentially produce biodiesel at a profitable margin, especially if the soy oil market price is low and the energy bill passes with the proposed government subsidy. A farmer owned cooperative, West Central Cooperative that owns Interwest, L.C. in Ralston, Iowa, has recently expanded their biodiesel processing facilities to a capacity of 10 million gallons of biodiesel per year. This cooperative produces a high quality soybean meal and is positioned as an important player if the biodiesel industry expands.

Agricultural producers can help support the biodiesel industry by using biodiesel mixtures in their equipment. About 3 billion gallons of diesel are used each year in agricultural production, nearly 6 percent of the total distillate fuel used in the U.S. So increased biodiesel production could affect the demand for plant oils and animal fats and contribute to higher prices.

One of the reasons biodiesel use has increased is that diesel fleets are willing to pay a premium price for biodiesel blends because they perceive biodiesel is cleaner, healthier and better for the environment than diesel fuels. If government mandates help enforce this perception and pass regulations that encourage biodiesel use, the demand for biodiesel could dramatically increase.

The two renewable fuels, ethanol and biodiesel, are connected together in the overall picture. Ethanol production is definitely increasing in the foreseeable future, probably close to

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[17] "Industrial Uses Agricultural Materials/Situation and Outlook Report," Economic Research Service, USDA November 1996.
[18] Hayes, D.J. "Biodiesel: Potential Economic Benefits to Iowa and Iowa Soybean Producers," Center for Agricultural and Rural Development, Iowa State University, September 1995.
[19] Van Dyne, D.L. and M.G. Blasé. "Cheaper Biodiesel Through a Reduction in Transactions Costs.' BioEnergy '98: Expanding BioEnergy Partnerships.

five billion gallons by 2008. Most of the ethanol will be processed in dry mills so the supply of distillers grain will greatly increase. Soybean meal and distillers grains are not perfect substitutes, but realistically, an increased supply of distillers grains probably will be detrimental to the soybean meal market. Potentially, that suggests shifting production from soybeans to corn or grain sorghum. Less soybean production means less soy oil produced, which increases its price. All of this speculation points to biodiesel production coming from the lowest priced feedstocks available, which might be animal fats and plant oils besides soy oil.

Yes, biodiesel is worth considering. Definitely, the completed federal Energy Bill will shed some light on what to expect in the future about how fast the biodiesel industry grows. This next fact is certain. The most profitable biodiesel plants will be located where cost of feedstocks and other production costs are relatively low and biodiesel demand and subsidies are relatively high.