

# **Biodiesel: Is It Worth Considering?**

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# **Biodiesel**

- **Increased biodiesel production is starting to become a hot topic**
- **Drivers behind this interest include:**
  - **Low commodity prices for biodiesel feedstocks**
  - **Environmental concerns with diesel use**
  - **National security concerns about using foreign crude oil**

# Questions to Address

- **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?**

# Overview

- **Background**
- **Important Economic Factors**
- **Summary and Implications**
- **Questions**

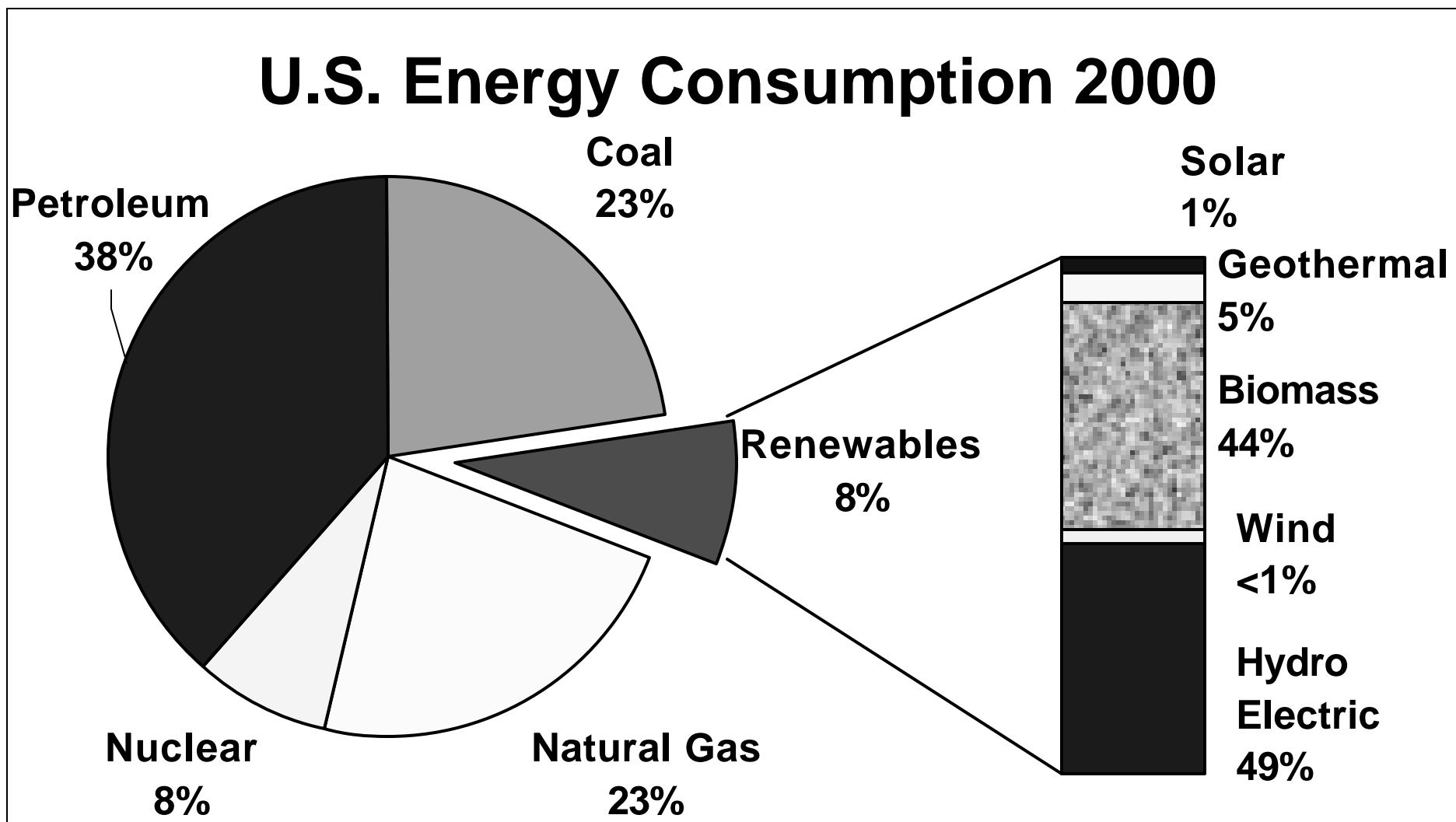
# What is Biodiesel?

- **Biodegradable and cleaner burning diesel replacement**
- **Made from new and used vegetable oils and animal fats.**
- **Simplified production formula:**  
**100 lbs oil or fat + 10 lbs alcohol =**  
**100 lbs biodiesel + 10 lbs glycerol**

# **Biodiesel Characteristics**

- **Very positive net energy gain, in the 3-4 to 1 ratio, much higher than ethanol's**
- **High energy content: 120,000 BTUs per gallon (ethanol has 80,000)**
- **Increases fuel lubricity, even in B2**
- **No concerns with engine performance**

# Background



Source: National Renewable Energy Laboratory

# **Biodiesel Production**

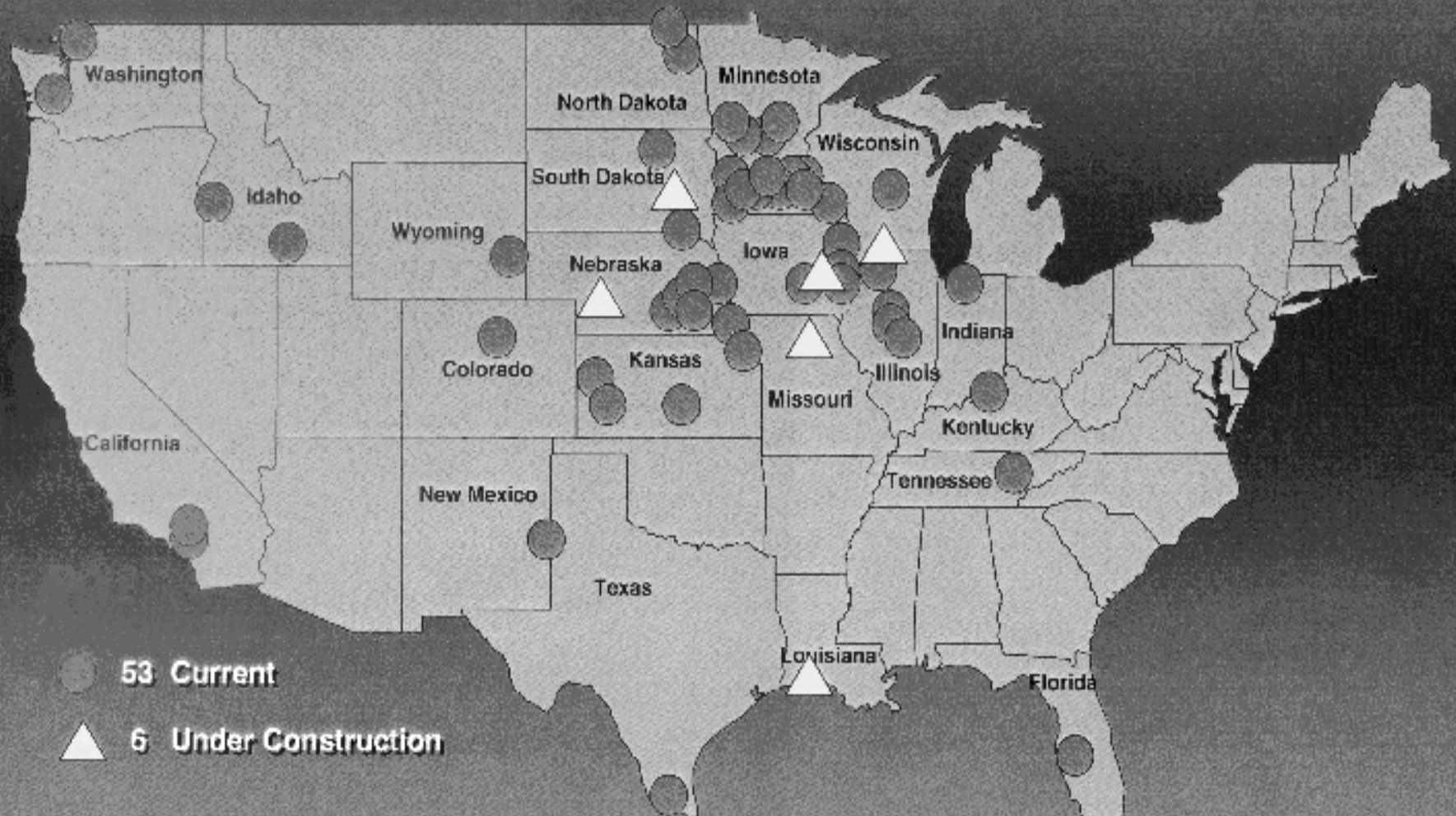
- **17 U.S. plants registered as biodiesel suppliers**
- **Dedicated production of 60-80 million gallons per year**
- **Up to 200 million gallons capacity available in oleochemical industry**
- **Biodiesel important in Europe**
  - **40% of cars have diesel engines**
  - **Germany big user, estimated 750 million gallons in 2002**
    - **Germany biodiesel mostly from rapeseed oil**

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

**Source: FY 2002 Bioenergy Program Participants**

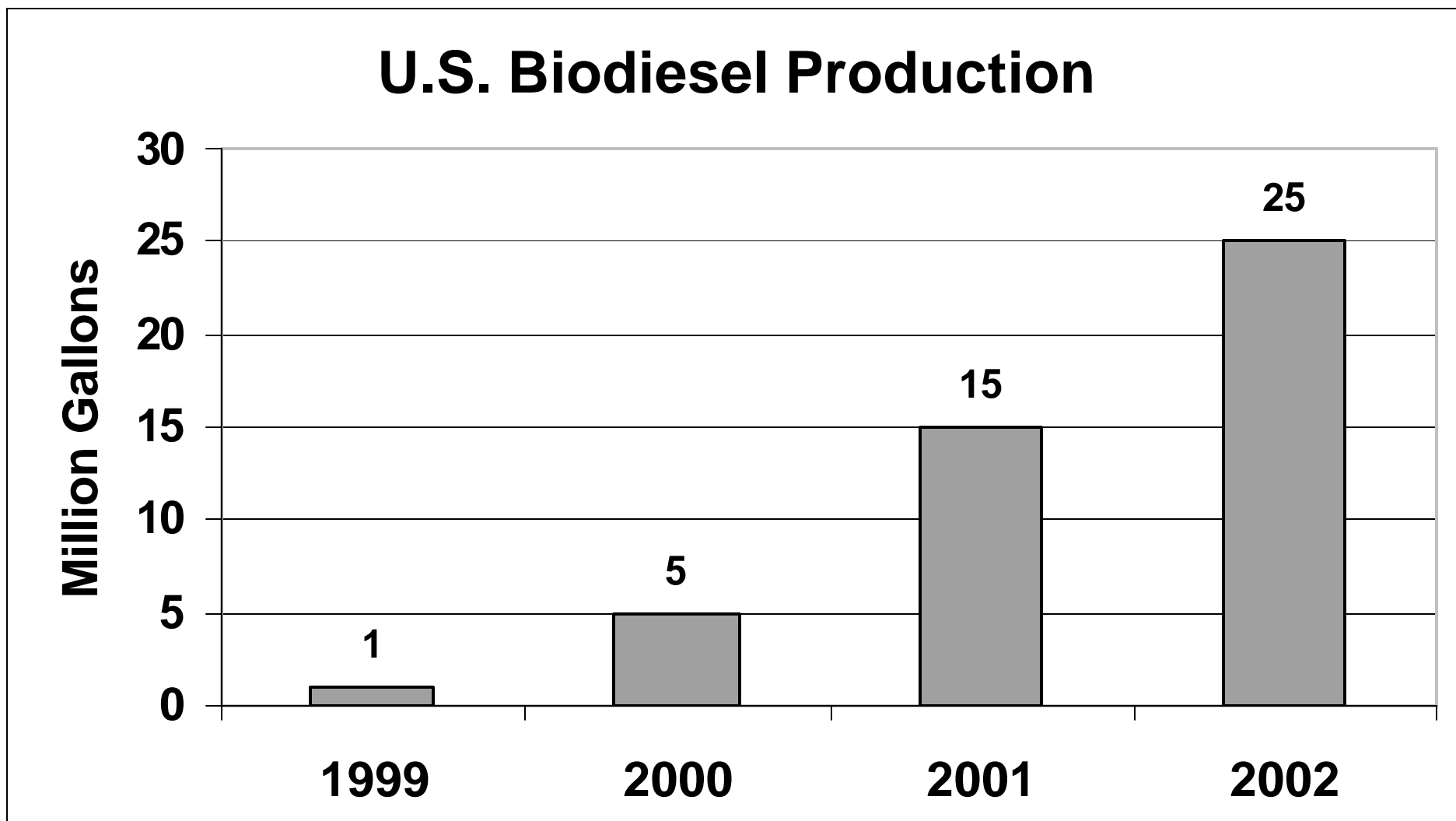
## Background

# Ethanol Plants (Current and Under Construction)



Source: Ethanol Producers And Consumers ([www.ethanolmt.org/](http://www.ethanolmt.org/))

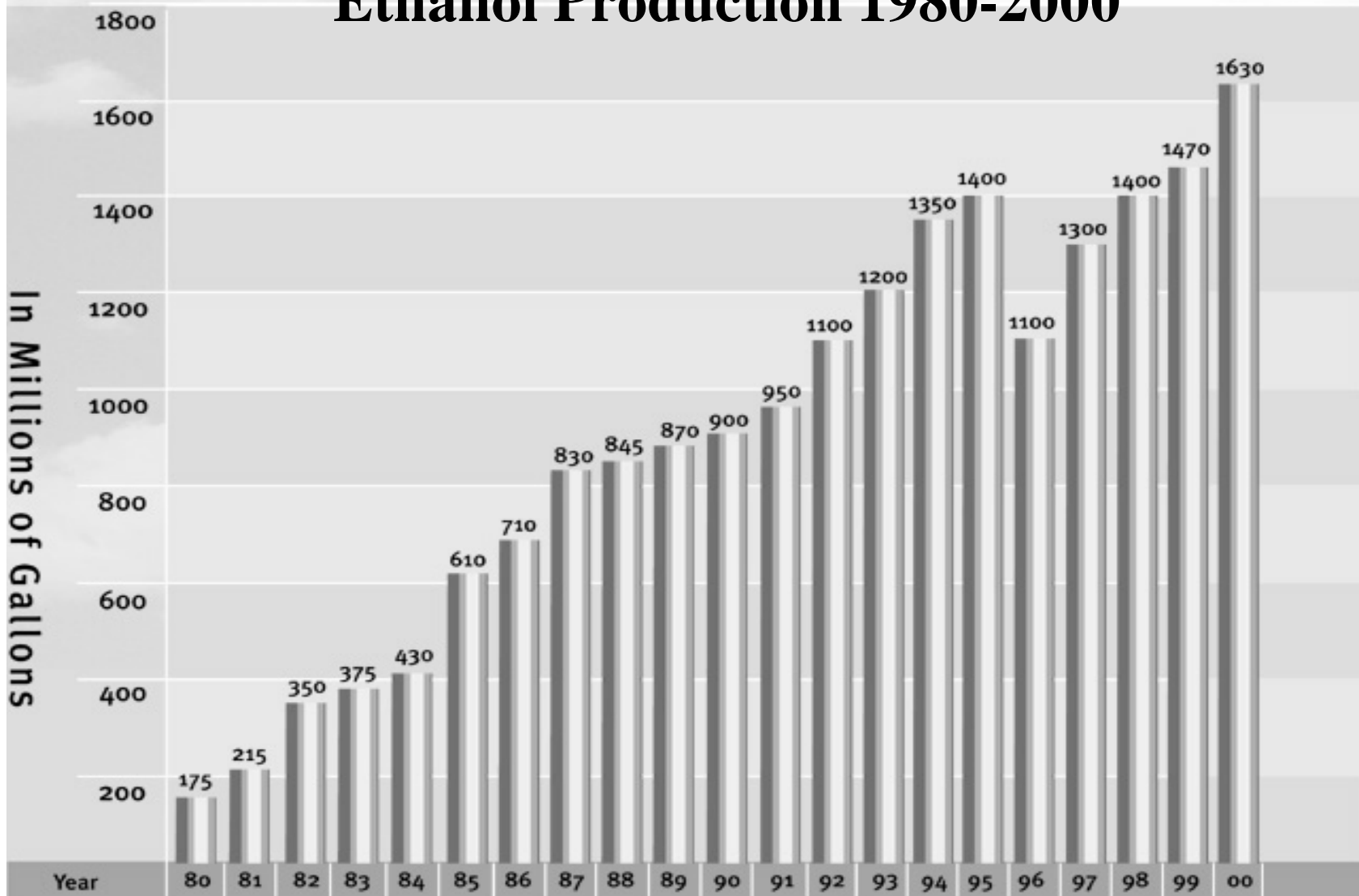
## Background



Source: National Biodiesel Board

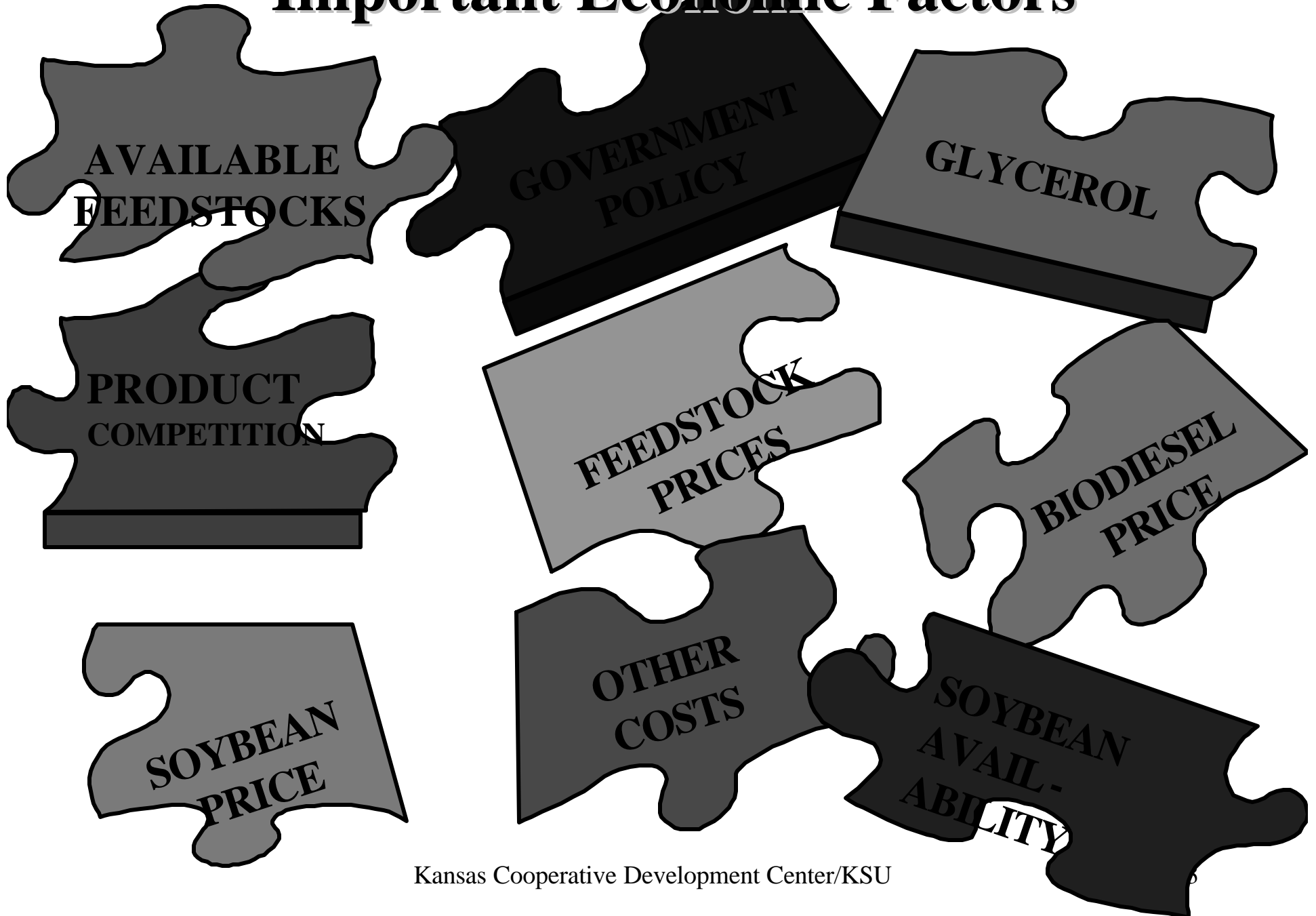
# Background

## Ethanol Production 1980-2000



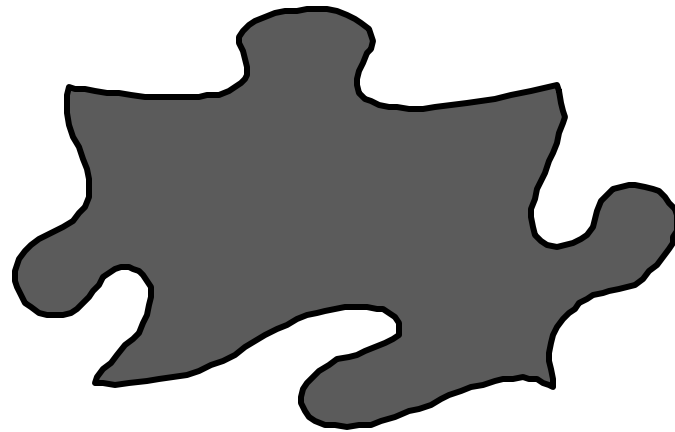
Source: Renewable Fuels Association

# Important Economic Factors



## Economic Factors

# **Available Feedstocks**

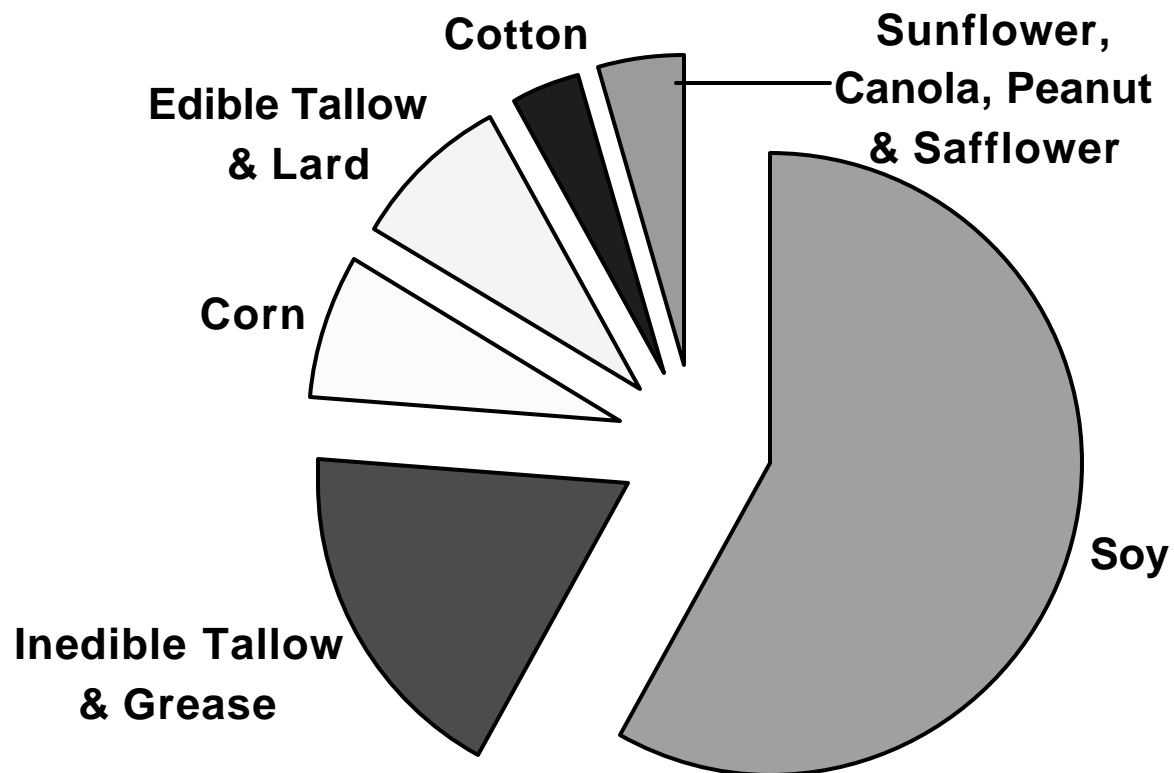


# **Biodiesel Feedstocks**

- **Any type of animal fats or plant oils**
  - **Total U.S. yearly production 3.8 billion gallons**
  - **If all used for biodiesel, about 3.5 billion gallons**
- **Total U.S. distillate fuel equals 57 billion gal.**
  - **Diesel fuel, industrial oils, heating oils**
  - **Diesel use is nearly 40 billion gallons**
  - **Agricultural production about 3 billion gallons**

## Economic Factors

# U.S. Oil and Fat Production (3.8 billion gallons)



Source: National Renewable Energy Laboratory

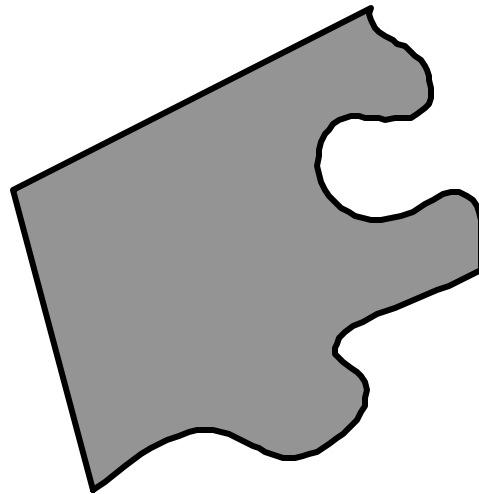
# U.S. Livestock Slaughter

- **2.5 million tons of cattle tallow**
- **0.5 million tons of hog lard**
- **3.0 million tons of animal fats could produce about 800 million gallons of biodiesel**
- **Total animal fats production from these top four states**

<b>Iowa</b>	<b>18%</b>	<b>Kansas</b>	<b>14%</b>
<b>Nebraska</b>	<b>16%</b>	<b>Texas</b>	<b>12%</b>

# Economic Factors

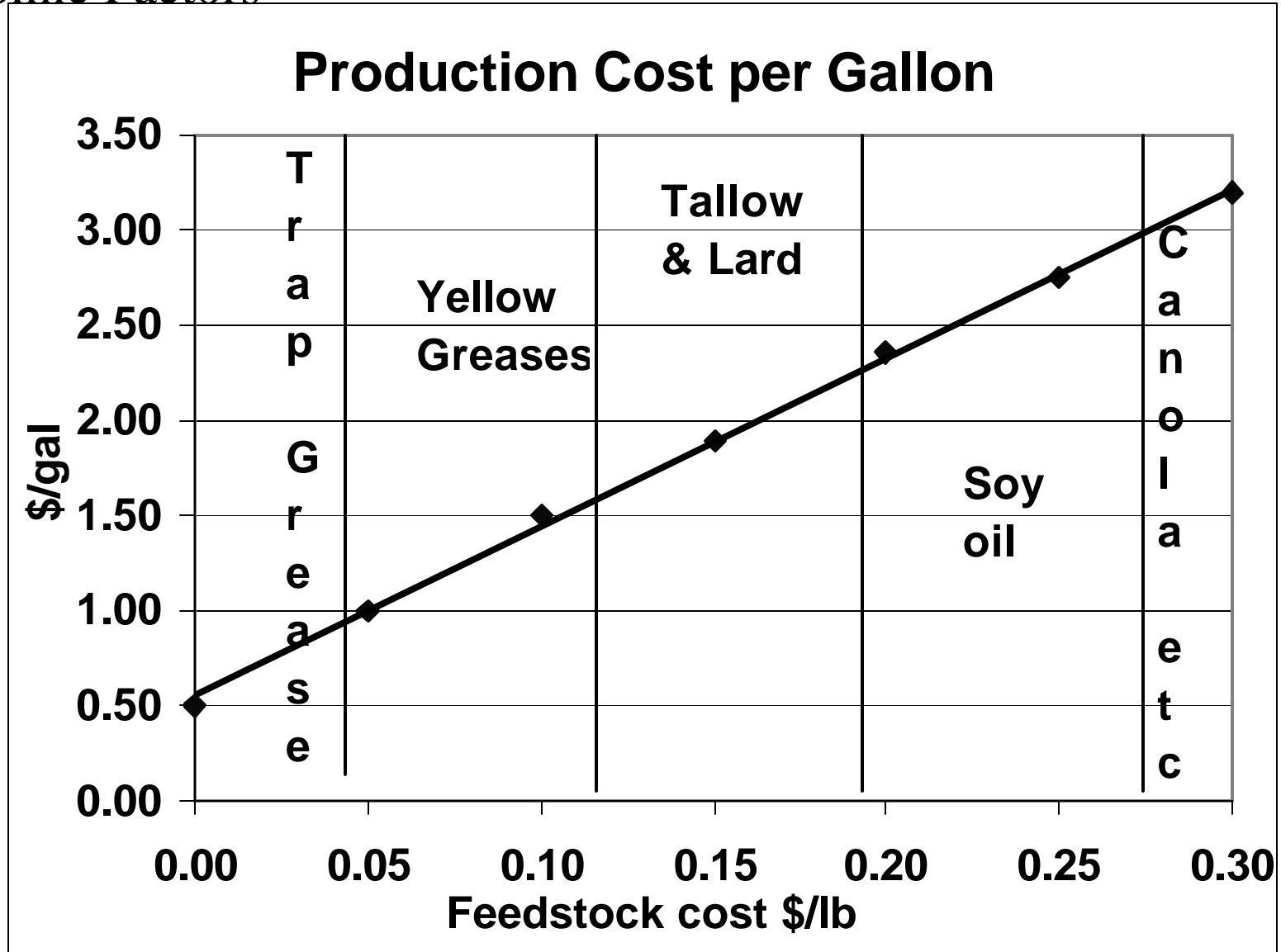
## **Feedstock Prices**



# **Feedstock Operating Costs**

- **Each gallon of biodiesel uses nearly 7.5 pounds of animal fats or plant oils.**
- **Feedstock prices of 20 cents per pound contribute \$1.50 per gallon for biodiesel without other operating costs**

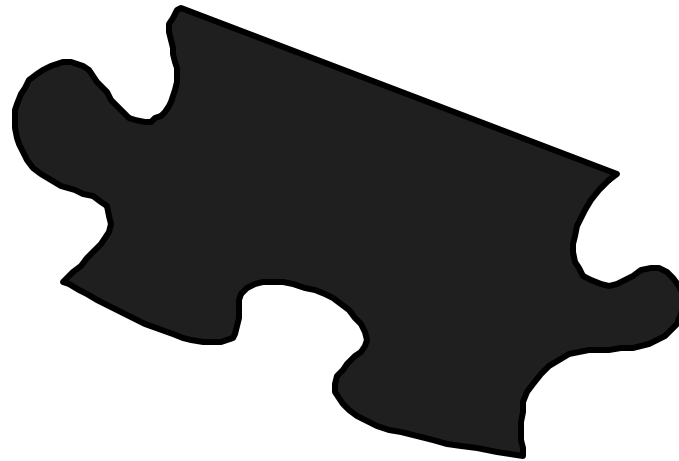
# Economic Factors



Source: National Renewable Energy Laboratory

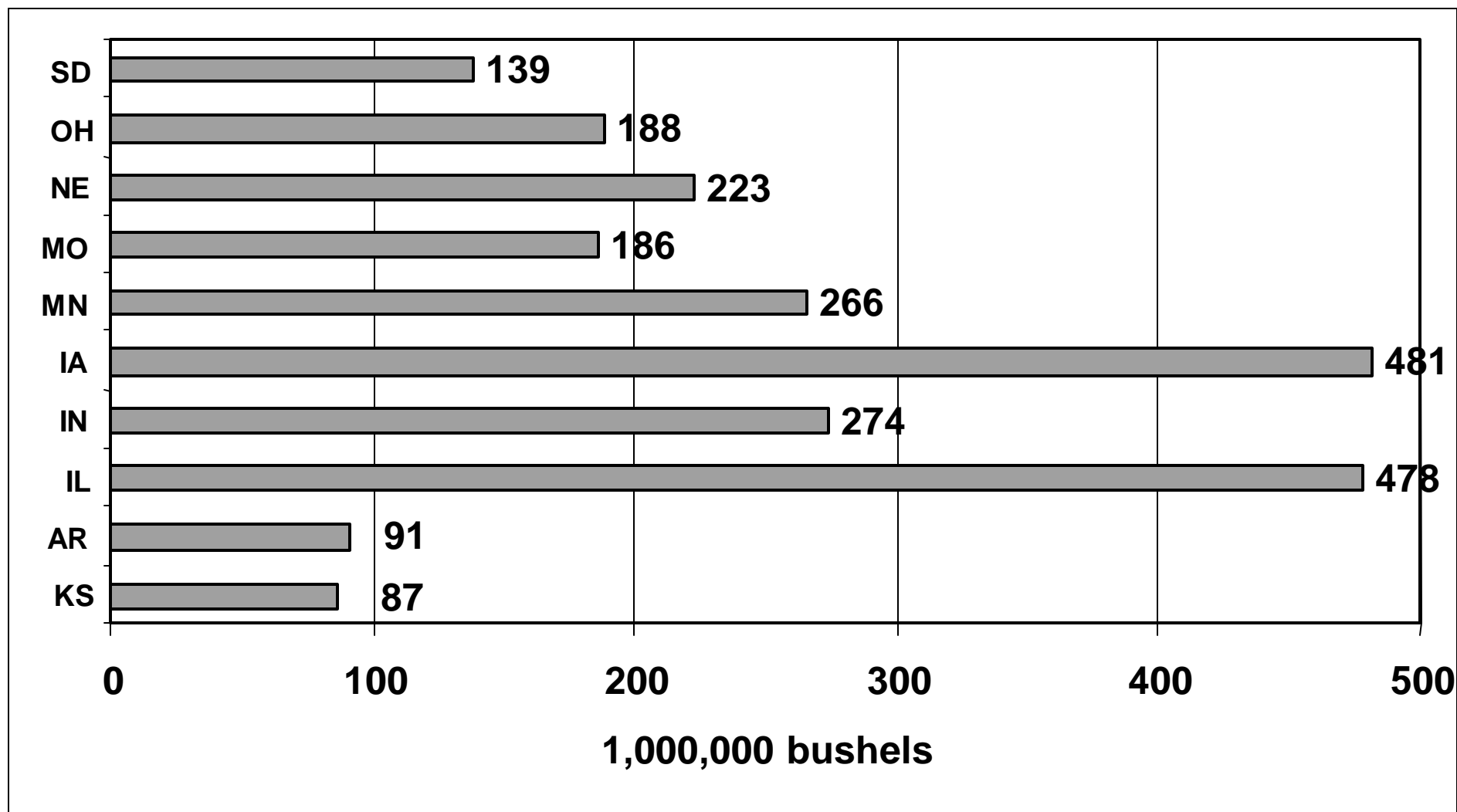
## Economic Factors

# **Soybean Availability**



## Economic Factors

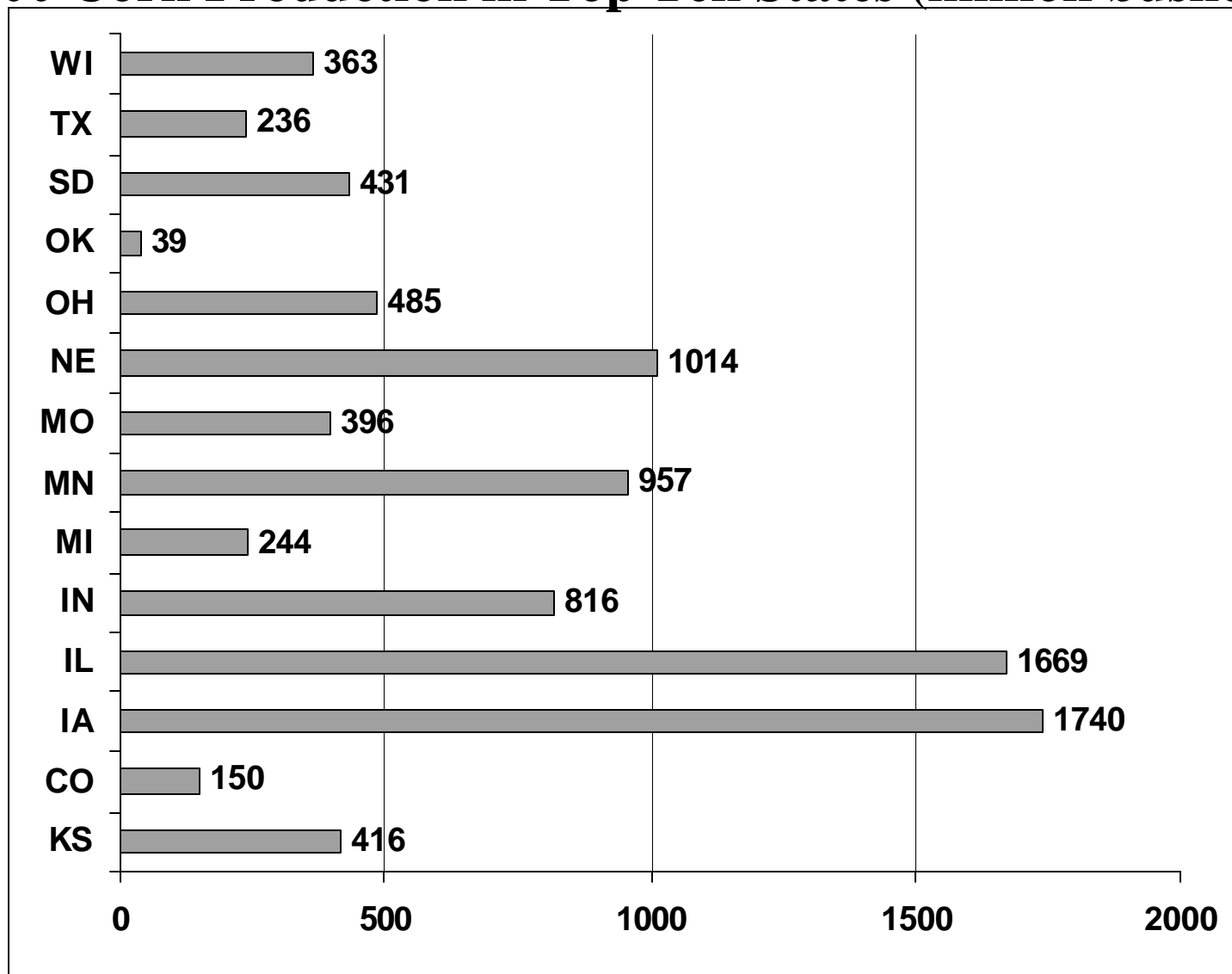
### 2000 Soybean Production in Top Ten States (million bushels)



Source: National Agricultural Statistics Service

# Economic Factors

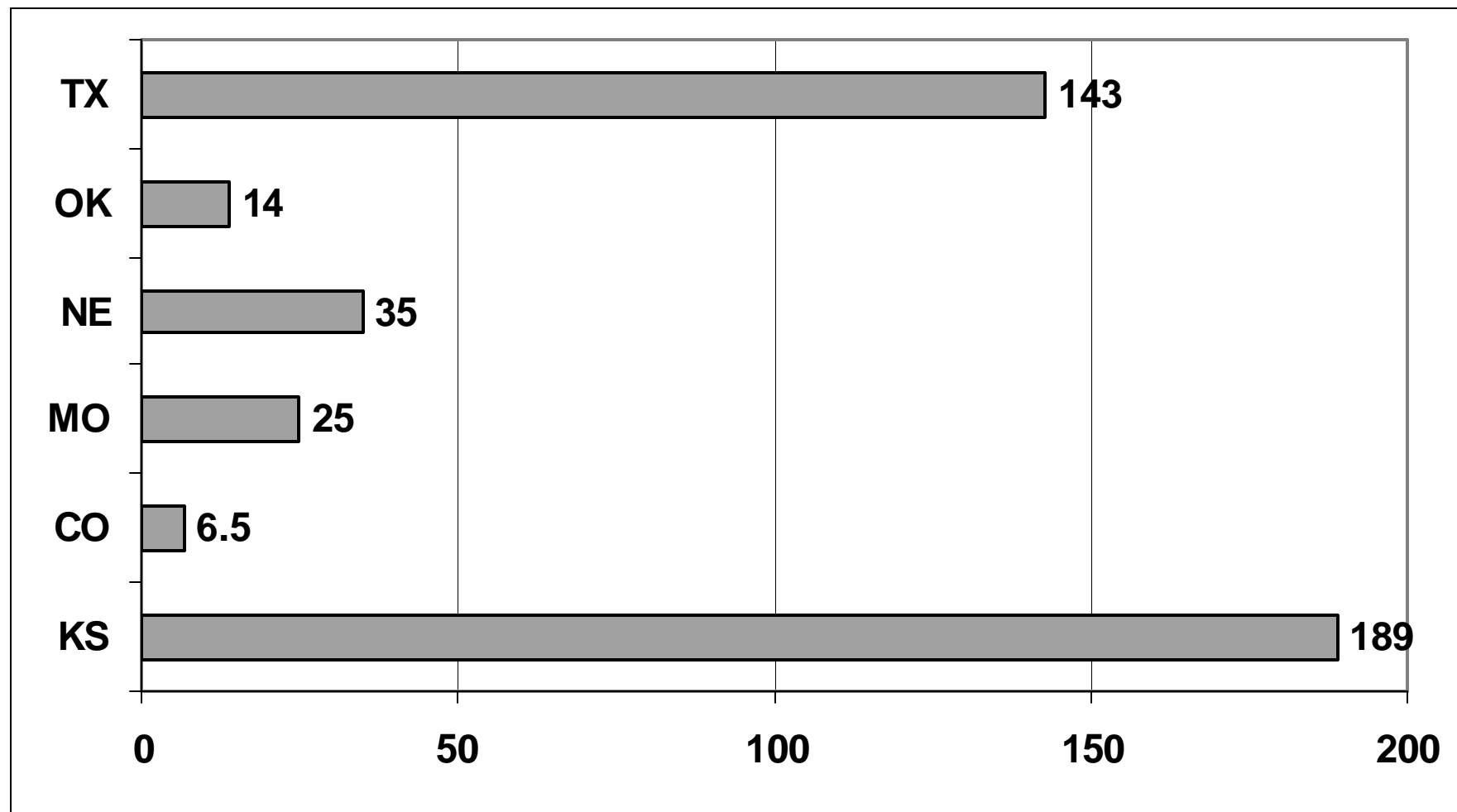
## 2000 Corn Production in Top Ten States (million bushels)



Source: National Agricultural Statistics Service

## Economic Factors

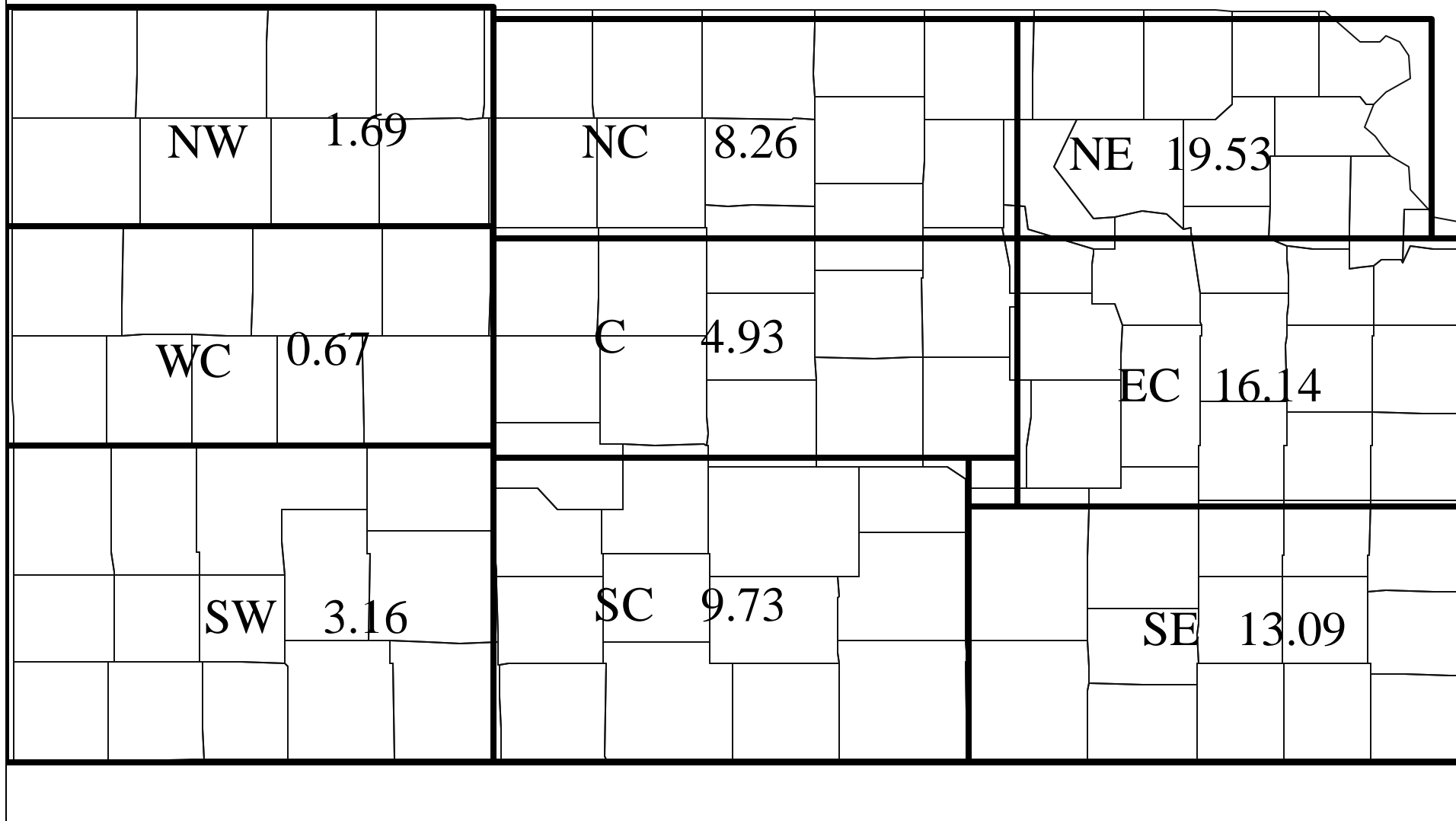
### 2000 Sorghum Production in Top Six States (million bushels)



Source: National Agricultural Statistics Service

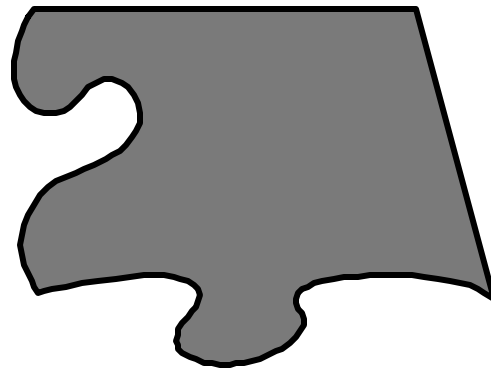
# Economic Factors

NASS District Soybean Production 1997-01 avg. (Millions of Bushels)



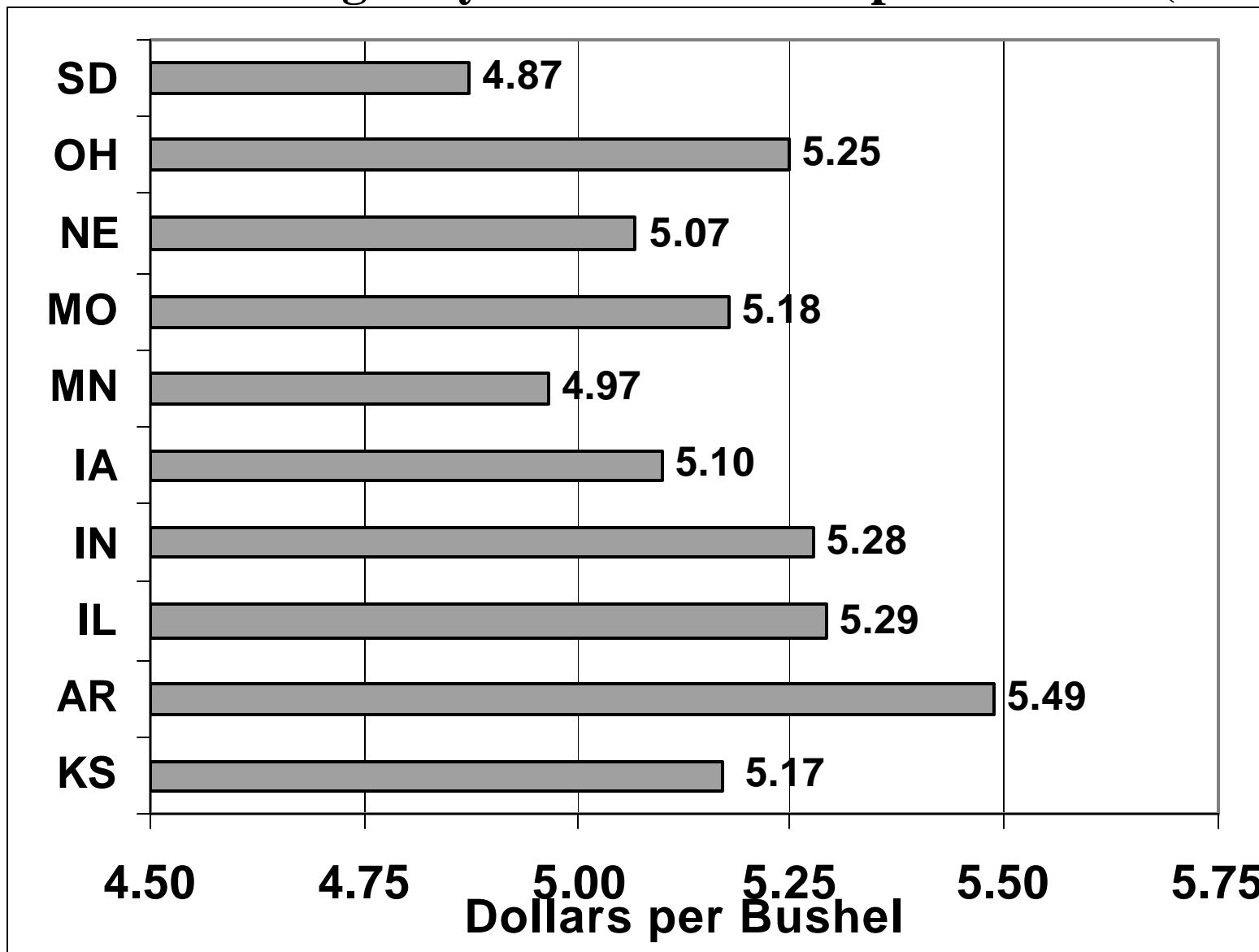
# Economic Factors

## **Soybean Price**



# Economic Factors

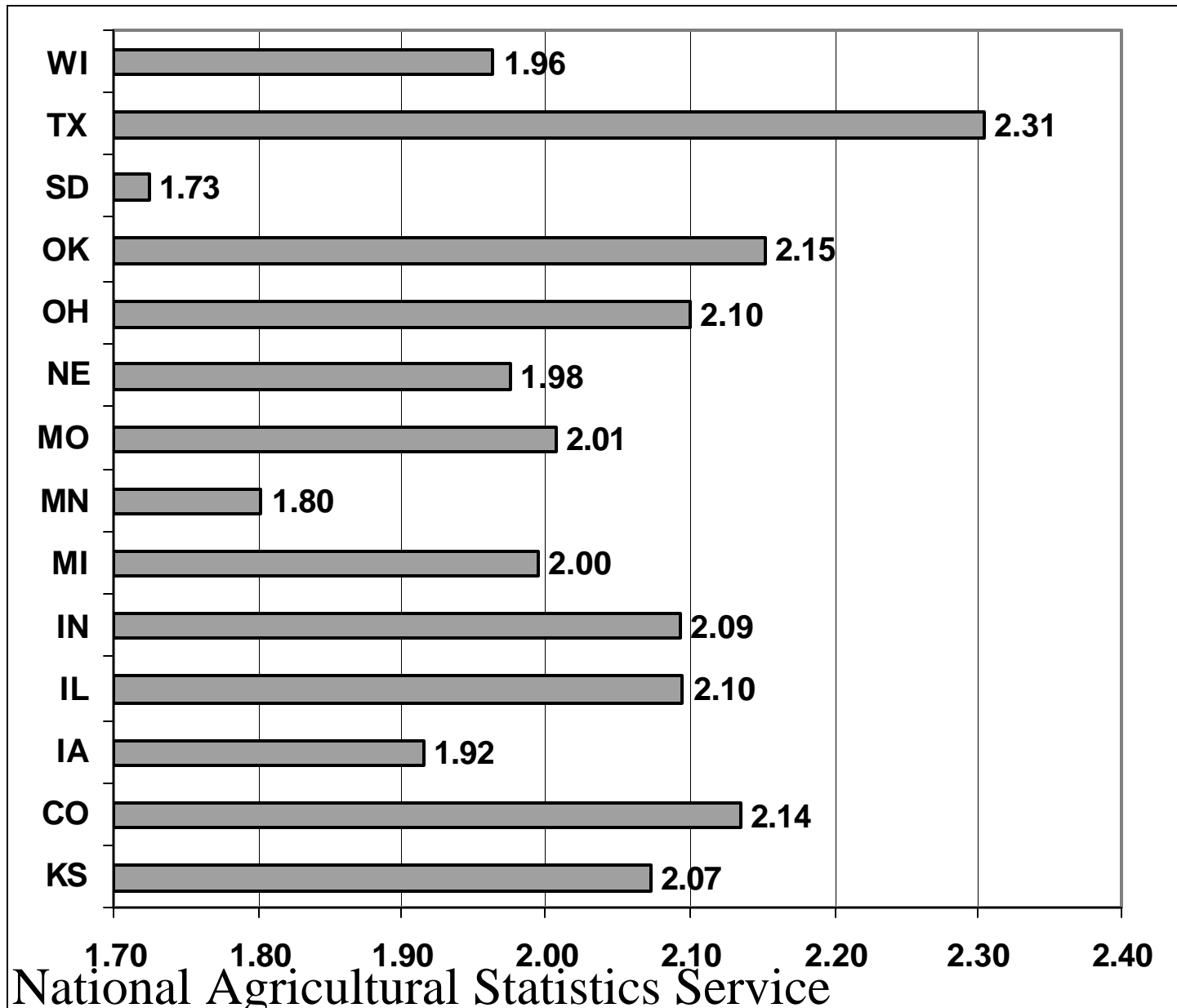
## 1997-2000 Average Soybean Prices in Top Ten States (\$/bushel)



Source: National Agricultural Statistics Service

Kansas Cooperative Development Center/KSU

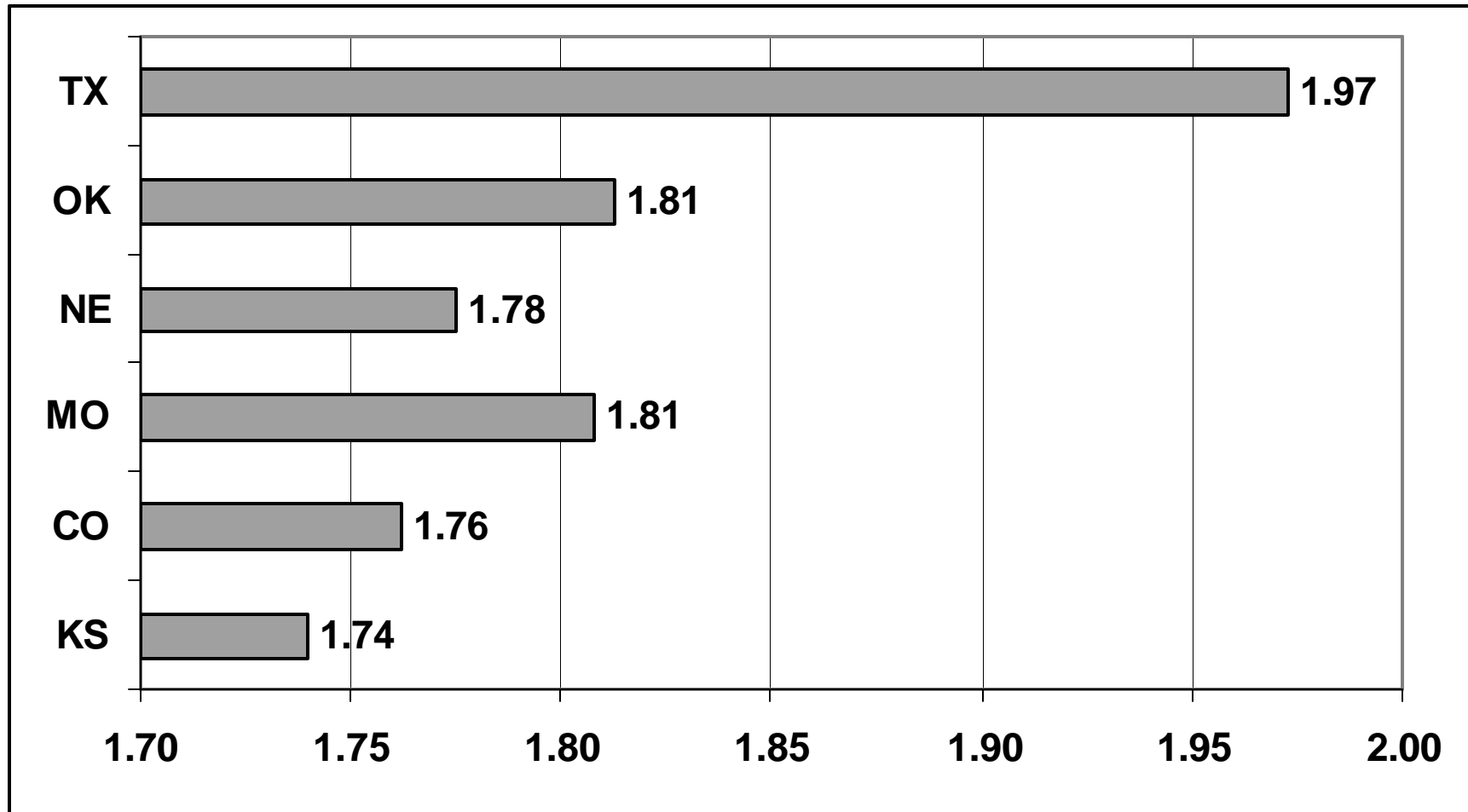
# 1997-2000 Average Corn Prices in Top 15 States (\$/bushel)



Source: National Agricultural Statistics Service

## Economic Factors

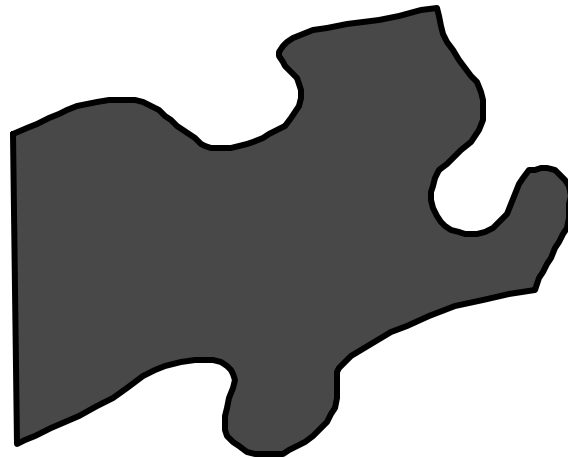
### 1997-2000 Average Grain Sorghum Prices in Top Six States (\$/bu)



Source: National Agricultural Statistics Service

## Economic Factors

# Other Operating Costs

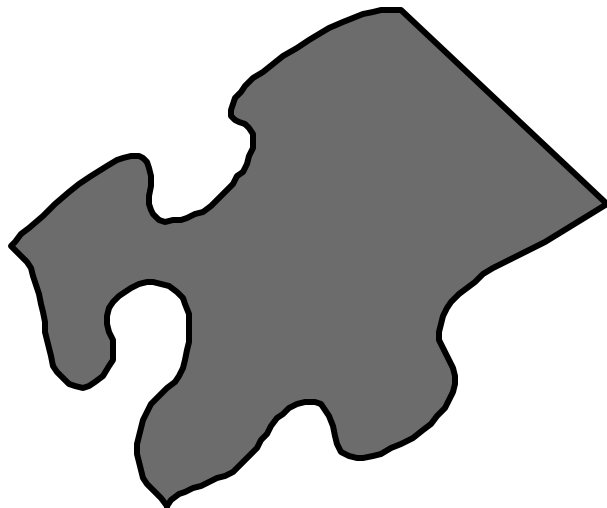


# Other Operating Costs

- **Estimated total operating costs without feedstock ranges from 30-60 cents per gallon**
- **For example, one study concluded 52 cents per gallon**
  - **Transesterification 58 cents**
  - **Overhead 33 cents**
  - **Glycerol credit of 39 cents**

## Economic Factors

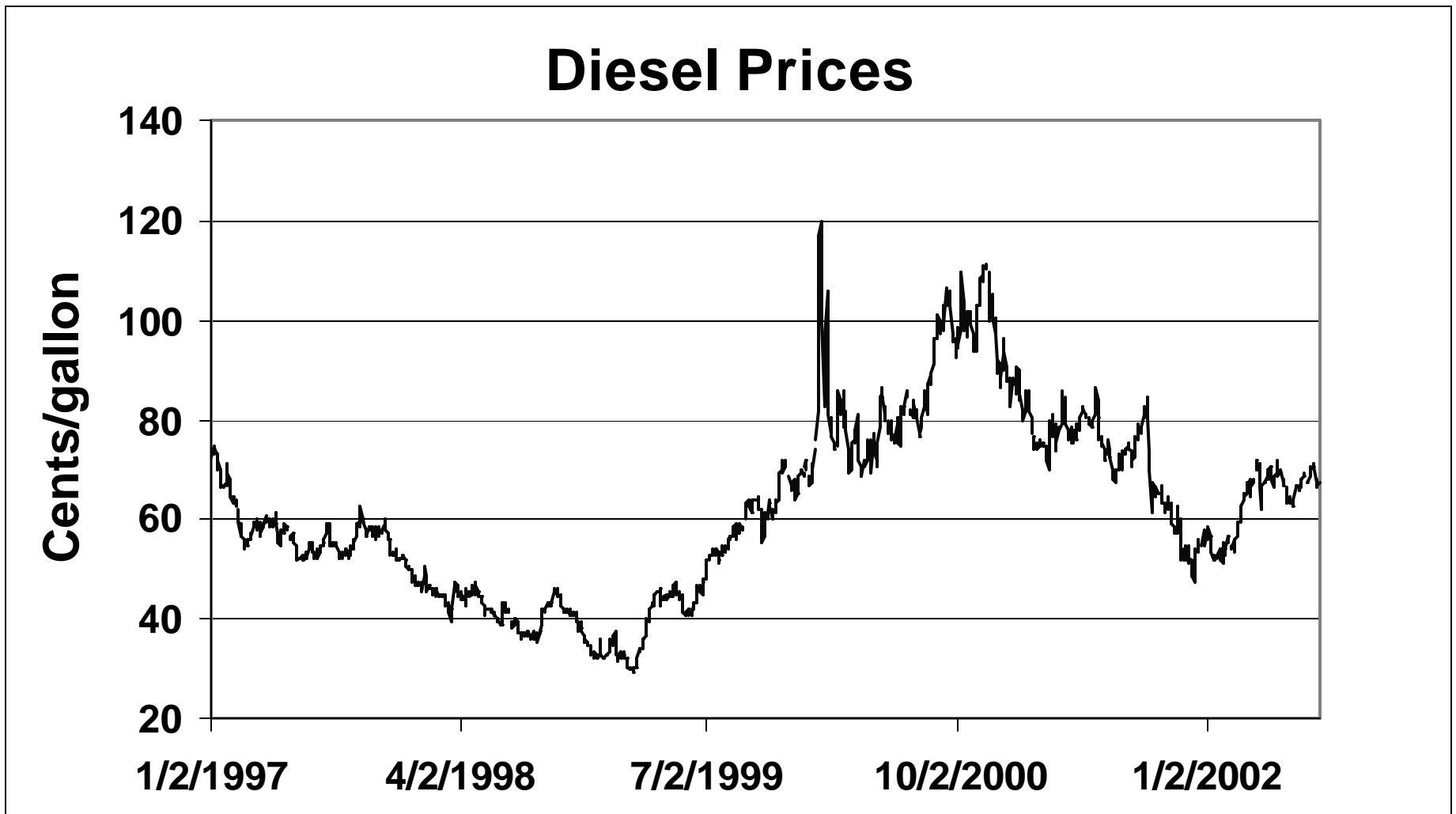
# **Biodiesel Price vs. Diesel Price**



## **Biodiesel Price**

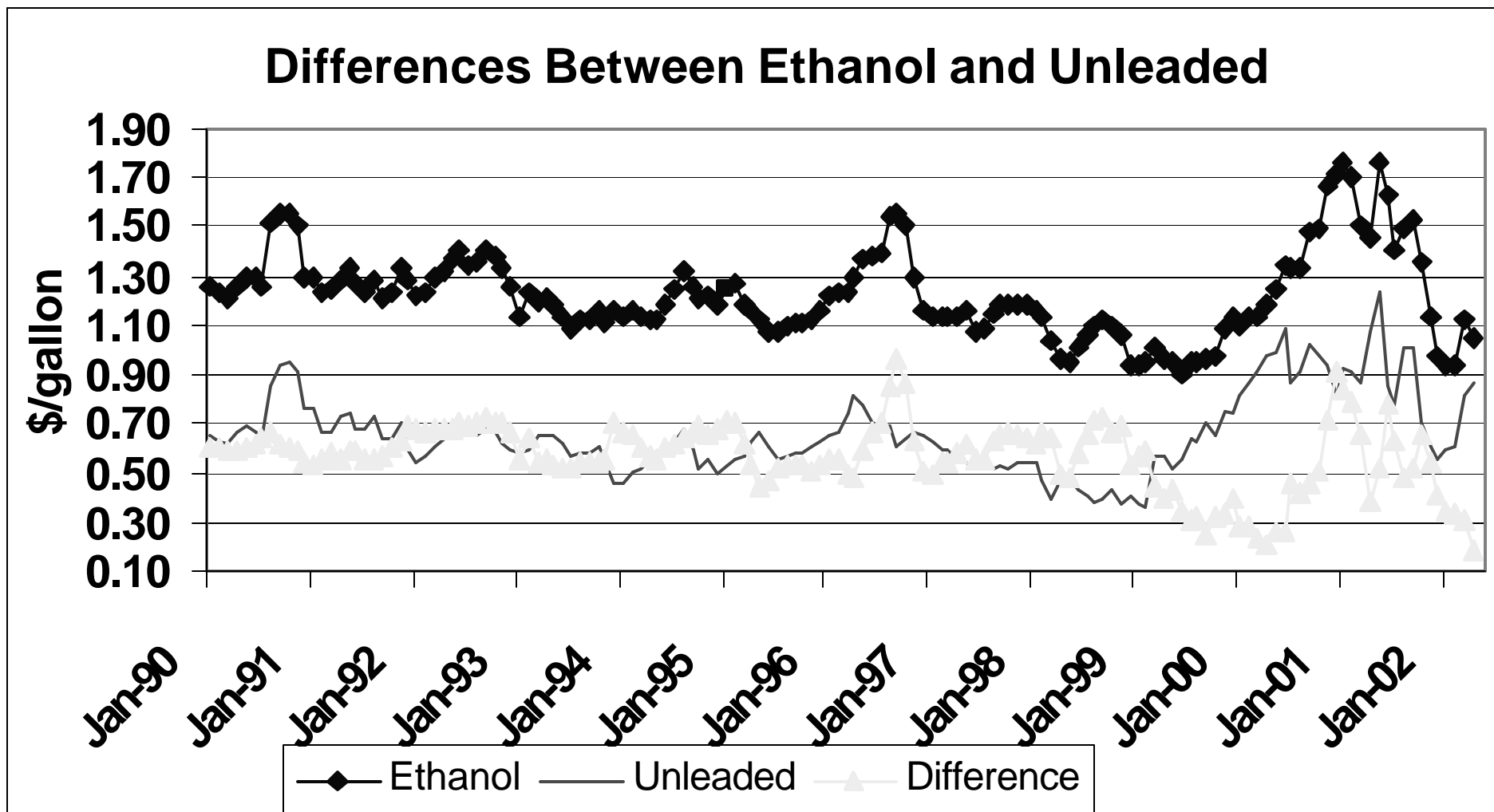
- **Estimated total operating cost ranges from \$1.39 to \$2.52 per gallon depending on feedstock used.**
- **Biodiesel price typically ranges from \$1.40-\$2.40 per gallon, \$1.00-\$1.50 per gallon higher than diesel**
- **Blend of B5 costs about 5-10 cents more than straight diesel**

# Economic Factors



Source: Energy Information Administration

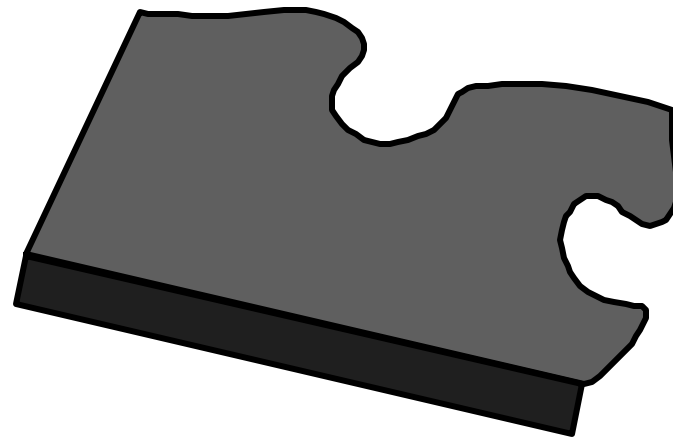
# Economic Factors



Source: Nebraska Ethanol Board

# Economic Factors

## Glycerol



# **Glycerol or Glycerine**

- **Co-product from biodiesel production**
- **Used in pharmaceuticals, cosmetics, toothpaste, paints and other commercial products**
- **Market has been volatile in the past**
- **Extensive biodiesel production could flood the glycerol market and lower the glycerol price**

## Economic Factors

# Product Competition

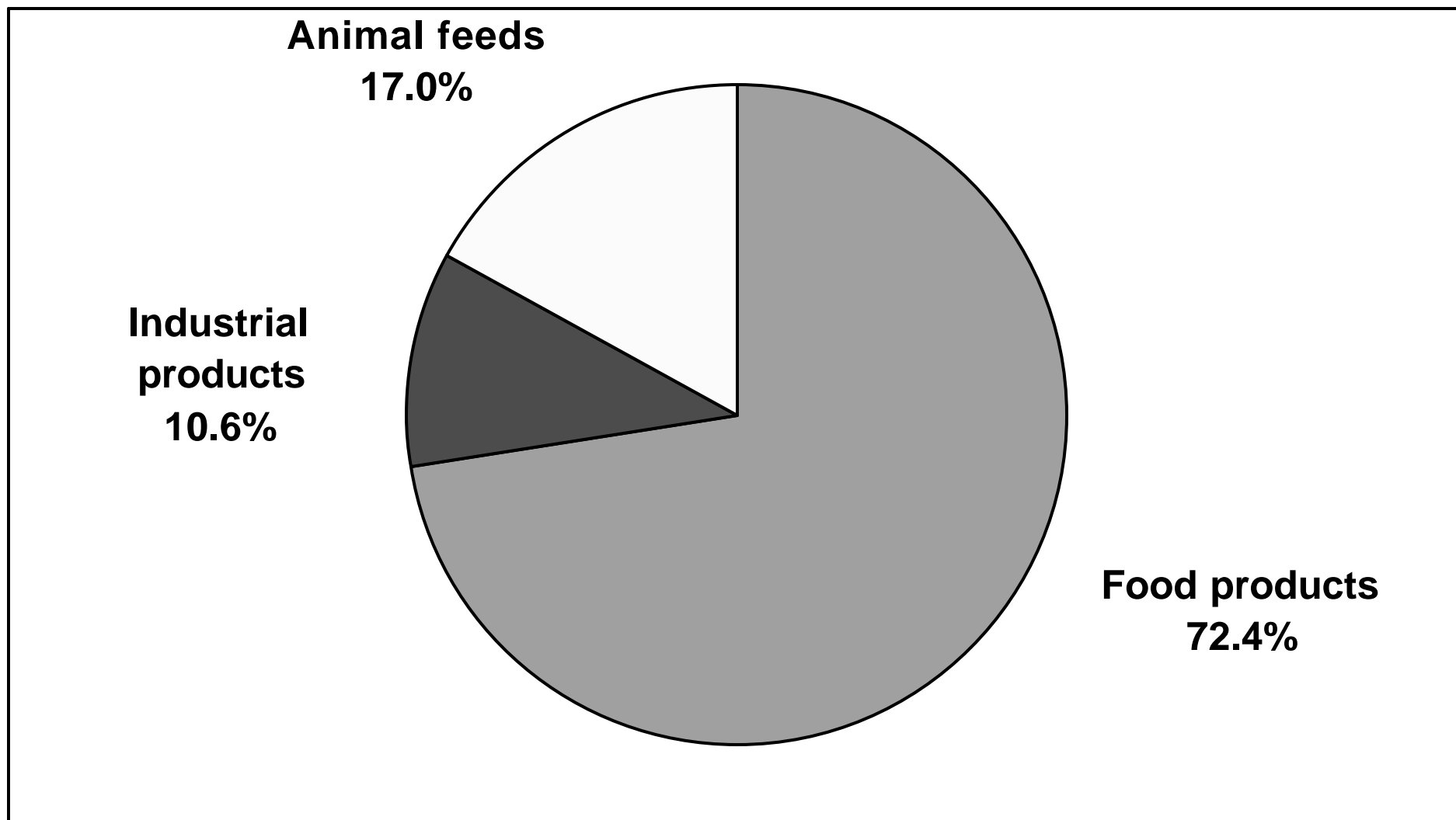


# Product Competition

- **Biodiesel will compete with established markets for fats and oils**
- **97% U.S. soybean oil used for edible purposes**
- **Markets for fats and oils used in food products will be higher priced than fuel markets**

Economic Factors

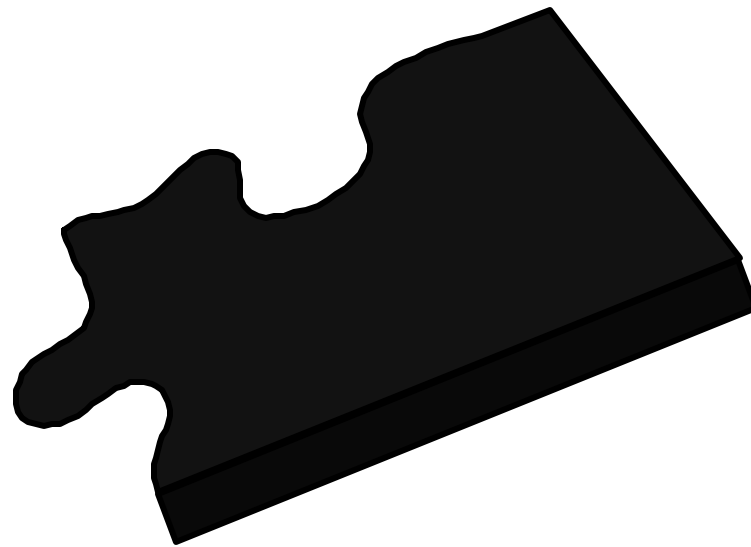
# Domestic Use of Fats and Oils, 1995



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

Economic Factors

# **Government Policy**



## **Government Policy**

- **2002 Energy Bill has great potential to influence biodiesel production**
- **Potential proposals**
  - **Renewable Fuels Standard**
  - **Biodiesel fuel tax exemption**
    - **Each % of biodiesel in blend, fuel tax rate reduced by equal amount of cents per gallon**
    - **CCC will reimburse National Highway Fund instead of NFC losing dollars like happens with ethanol**

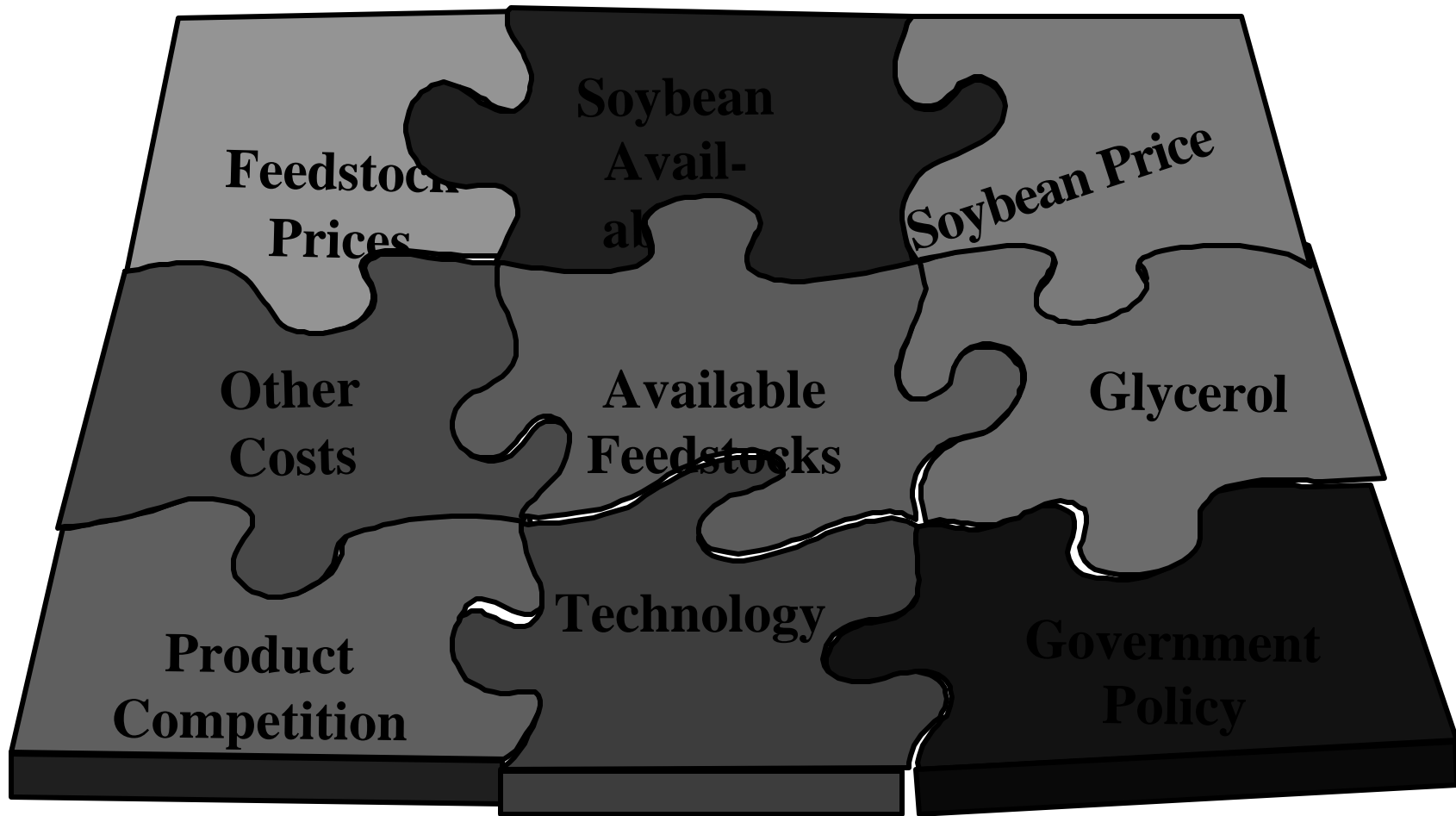
# **Government Policy, Continued**

- **USDA Biofuels Effort**
  - **Started in 2001-2002, extended through 2008**
  - **Increase ethanol and other biofuels production**
  - **Conversion factor for feedstocks to determine payment**
  - **\$7.5 million maximum cap per plant each year**
  - **Biodiesel payment amounts to about \$1.25 for each gallon of increased production (ethanol \$0.25)**

# **Government Policy, Continued**

- **State subsidies vary greatly**
  - **Minnesota recently passed a law mandating the use of biodiesel in diesel fuel**
  - **Minnesota's ethanol subsidy**
    - **20 cents/gallon and requires all gasoline to contain oxygenate like ethanol**
  - **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



## **General Conclusions**

- **Important drivers are in place for the biodiesel industry to boom**
  - **Relatively low feedstock prices**
  - **Environmental concerns with diesel fuel**
  - **Reducing dependence on foreign oil**
- **Federal energy bill will help show what government policies and regulations will be established to deal with these issues**

# **General Conclusions, Continued**

## **Biodiesel industry 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**
- (4) Investments in plants and equipment**

## **General Conclusions, Continued**

- **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.**

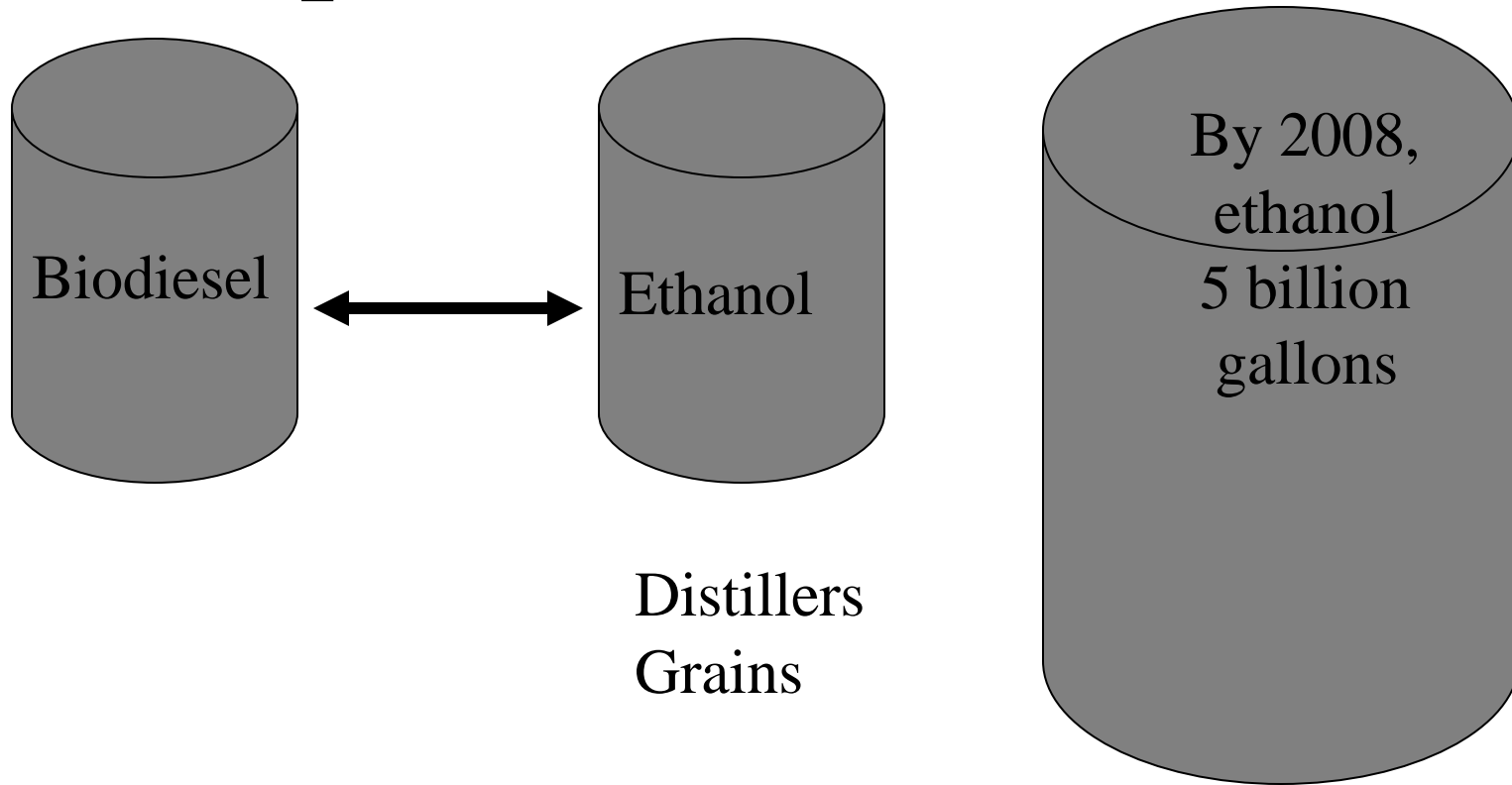
# Implications

- **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.**

# Implications, Continued

- **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 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.**

# Implications, Continued



## **Implications, Continued**

- **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.**
- **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.**

# Discussion and Questions