

CONSUMER IMPACTS OF THE RENEWABLE FUEL STANDARD

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The ethanol industry in the United States is poised on the threshold of the most significant growth in more than three decades. The Renewable Fuel Standard provision of the comprehensive Energy Bill currently in Congress and the need to replace MTBE in the nation's motor fuel supply is expected to increase the demand for ethanol and other renewable fuels from current levels of about 1.9 billion gallons to more than five billion gallons over the next decade.

This outlook has given rise among critics to concerns that significantly higher levels of ethanol use would have adverse impacts on American consumers. The most frequently cited concerns are that increased use of ethanol will result in higher retail gasoline prices and that the diversion of grain to produce ethanol will increase consumer food prices, particularly for meat and poultry. The purpose of this paper is to explore these concerns.

A careful analysis of the recent gasoline and ethanol price environment and recent legislative activity indicates that ethanol use consistent with a Renewable Fuel Standard will provide significant potential benefits to American consumers. Specifically:

- Blending ethanol with gasoline at a 10 percent level will reduce the retail price of conventional regular gasoline by five percent, or 6.6 cents per gallon based on national average 2002 prices. This translates to an annual savings to consumers of \$3.3 billion.
- Using corn and other grains to produce the 5 billion gallons of ethanol stipulated by the RFS will have an insignificant impact on consumer food prices.
- The state of America's highways will be protected by proposed changes in the structure of the excise tax exemptions granted to ethanol.

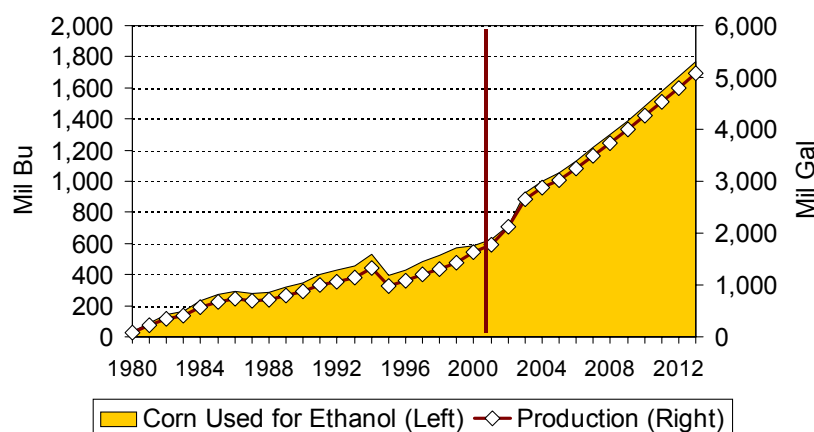
Background: The Renewable Fuel Standard

In April 2003 the House Energy and Commerce Committee approved a comprehensive energy bill that includes a provision that requires the use of at least five billion gallons of renewable fuels (ethanol, biodiesel, or any other liquid fuel produced from biomass or biogas) by 2015. Companion legislation introduced in the Senate would accelerate the renewable fuels target to 2012. Under this legislation, the current oxygenate standard for reformulated gasoline would be removed, air quality anti-backsliding provisions would be enhanced, and a renewable fuel standard (RFS) would be established. The renewable fuel standard has its genesis in concerns for energy security, environmental quality, and the health of the farm and rural economy, and it will help achieve each of these concerns.

It is expected that ethanol will account for the largest share of renewable fuel produced and used under the RFS, however the RFS also will stimulate the production of biodiesel. Ethanol is primarily produced by fermentation of sugars found in grains and other biomass. Ethanol can be produced from a diversity of feedstocks, including grains such as corn, wheat, barley, and sorghum. Corn is the feedstock for the vast majority of ethanol produced in the U.S. Figure 1 illustrates the growth of the ethanol industry since 1980 and expected growth under an RFS.

Typically ethanol is blended with gasoline to produce a product known as gasohol. This blend consists of 10 percent ethanol and 90 percent gasoline. Ethanol-blended fuels currently account for more than 1.4 percent of U.S. motor fuel sales. Ethanol is widely marketed across the United States as a high quality octane enhancer and oxygenate capable of reducing air pollution and improving automobile performance. In spark ignition engines, ethanol emits significantly less carbon monoxide and air toxic pollution than gasoline therefore reducing the amount of harmful emissions released into the atmosphere.

Figure 1
Ethanol Production



Source: USDA, LECG forecast

Gasoline sold in the populous West Coast and Northeast markets is formulated to include an oxygenate because the oxygen makes gasoline burn cleaner thereby reducing ozone forming compounds and carbon monoxide. The Clean Air Act Amendments of 1990 mandated increased oxygen content for gasoline to meet ozone and CO standards. The most widely used oxygenate has been MTBE (methyl tertiary butyl ether), which is made from methanol. Legislation that would ban or restrict the use of MTBE has been passed in 16 states. Of these only five currently rely on MTBE (California, Connecticut, New York, Kentucky, and Missouri). These five states account for about 45 percent of total U.S. MTBE use. A California ban of MTBE originally set to go into effect in January 2003 was delayed for one year.¹ Despite the delay, many California refiners chose to switch from MTBE to ethanol in January. The petroleum industry fully expects MTBE to be completely removed from the nation's fuel supply within a five-year timeframe. Ethanol is the only commercially available alternative oxygenate. The RFS in the House bill and pending Senate version would remove the oxygenate standard for reformulated gasoline and enhance provisions that prevent

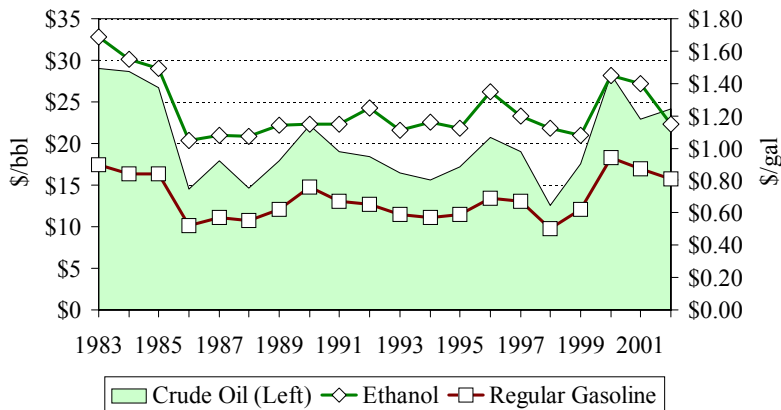
¹ 2003 California Gasoline Price Study: Preliminary Findings. Energy Information Agency. May 2003.

metropolitan areas now in compliance with carbon monoxide and ozone standards from backsliding, or falling out of compliance.

Blending ethanol with gasoline will not increase prices at the pump.

Historically it has been difficult for any alternative fuel to compete on price with gasoline refined from crude oil. The reasons for this are rooted in the maturity of the petroleum refining industry and economies of scale and scope of the industry. As shown in Figure 2, the price of regular gasoline is closely correlated with crude oil prices. This is to be expected since crude oil is the raw material for gasoline. Deviations in this pattern typically are due to production or inventory problems at the refinery.

Figure 2
Crude Oil, Regular Gasoline, and Ethanol Prices

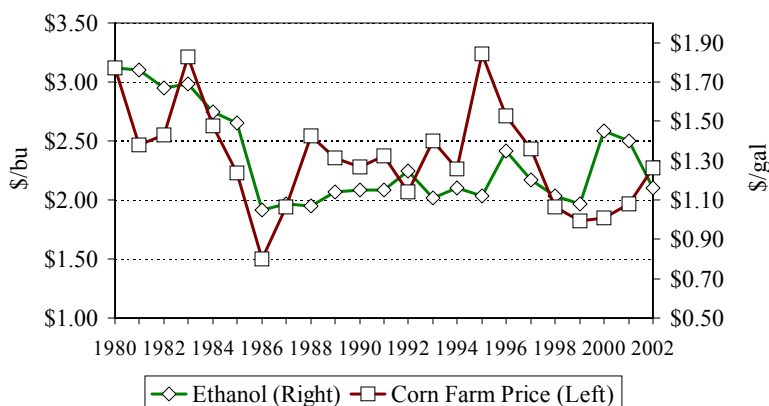


Data source: EIA; OXY-FUEL News, Hart Publications, Inc.

Ethanol prices also have generally followed the same pattern because ethanol has been used primarily as a gasoline additive. Between 1985 and 2001 the difference between the rack (wholesale) price of regular gasoline and ethanol has averaged 54 cents per gallon. In response to sharply higher ethanol production, this margin fell to 35 cents per gallon, the lowest level in more than 20 years.

In recent years ethanol prices have responded more to increases in ethanol production than to changes in corn prices. This is illustrated in Figure 3. Until 1999 ethanol prices closely tracked the farm-level price of corn, its major raw material. Ethanol prices spiked in 2000 in concert with oil and gasoline but declined in 2001 and 2002 despite increases in average corn prices.

Figure 3
Corn and Ethanol Prices



Data source: USDA; OXY-FUEL News, Hart Publications, Inc.

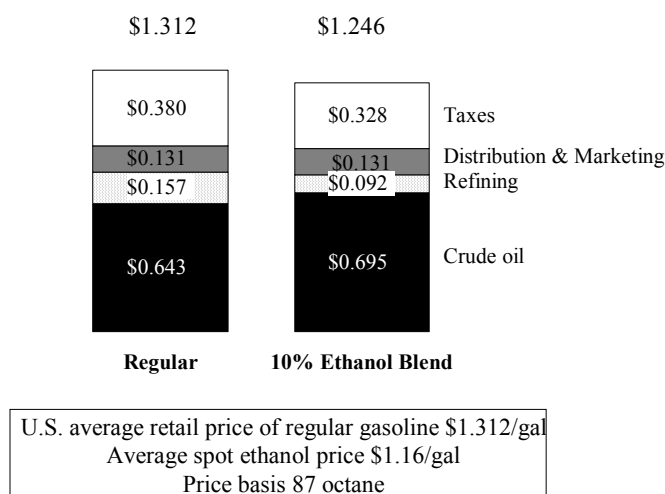
If ethanol is more expensive than gasoline, why then won't blending ethanol with gasoline increase prices for consumers? The answer lies in two key areas:

- Currently, ethanol receives 52 cents per gallon exemption from federal excise taxes on motor fuel. As a result ethanol-blended fuel is taxed at a lower rate than regular gasoline (5.2 cents on a 10 percent blend).
- Blending ethanol with gasoline improves octane. According to the Nebraska Ethanol Board, adding 10 percent ethanol boosts octane from 87 to 89.5. Consequently, when consumers buy regular grade gasoline blended with ethanol they actually get the equivalent of higher-octane midgrade. This represents a

savings to gasoline refiners that, if passed along to consumers, amounts to five cents per gallon.

As shown in Figure 4 adding 10 percent ethanol to a gallon of regular gas would reduce the retail price to consumers by almost seven cents per gallon, or five percent.

Figure 4
Impact of Blending Ethanol with Gasoline



A five billion-gallon RFS will blend 50 billion gallons of gasoline with ethanol. When the price reduction described above is applied to this volume of gasoline, at 2002 average prices, consumers would save \$3.3 billion at the pump.

The analysis shown in Figure 4 is based on 2002 average U.S. regular conventional retail gasoline price and the U.S. average price for ethanol. The savings come from two primary areas:

- **Taxes.** According to the Energy Information Administration, taxes accounted for 29 percent of retail gasoline prices in 2002. The 52 cents per gallon exemption for ethanol from the Federal excise tax on motor fuel is granted to the blender and amounts to a savings of 5.2 cents for a 10 percent ethanol blend. This

reduction directly offsets higher raw material costs caused by adding \$1.16 per gallon ethanol to \$0.64 per gallon gasoline.

- **Refining.** Blending 10 percent ethanol reduces the amount of gasoline in a blended gallon and results in a savings from refining costs for each gallon of blended fuel. Added to this is the “octane credit” of five cents per gallon for regular gasoline.

The price of crude oil has increased in 2003 in response to the war in Iraq and international tensions. Gasoline and ethanol prices have followed and these basic relationships appear to be holding.

Replacing MTBE with Ethanol

There has been much discussion of the implications of removing MTBE from reformulated gasoline, and the potential for further increases as more ethanol is used as a consequence of the RFS. These concerns have been accentuated by recent sharp price increases for gasoline in California. Both MTBE and ethanol are oxygenates, however since ethanol has about twice the oxygen content per unit volume as MTBE, only half as much ethanol is needed to reach the same oxygen standard. Typically refiners add 11 percent (by volume) of MTBE to meet the two percent Federal oxygen requirement. This same requirement can be met using 5.7 percent (by volume) ethanol.

Both the petroleum industry and the EIA agree that there will be a cost associated with phasing out and replacing MTBE in the nation’s motor fuel supply, and that this cost will occur with or without a RFS. A recently published study by the EIA reports that bans on MTBE use would increase average national motor gasoline prices by 1.8 cents per gallon by 2004. The impact on reformulated gasoline would be somewhat larger at 3.6 cents per gallon.² Importantly, these increases would occur regardless of whether or not an RFS is enacted. The savings realized from blending ethanol discussed earlier would offset the increased cost of a new gasoline blendstock, resulting in a net retail cost

² *Renewable Motor Fuel Production Capacity Under H.R. 4*. Energy Information Administration, September 2002. (<http://tonto.eia.doe.gov/FTP/ROOT/service/euqstion2.pdf>)

savings of 4.8 cents per gallon of conventional regular gasoline for an annual savings to consumers of \$2.4 billion by 2012.

California: A Case Study

California was the first state to enact a ban on MTBE. Governor Gray Davis has delayed the ban, which was originally scheduled to take effect in January 2003, by one year. Despite the delay, many California refiners have decided to switch from MTBE to ethanol as originally planned. As a result, the Energy Information Administration estimates that approximately 60 to 70 percent of California's gasoline will have been converted to ethanol blends by summer 2003.³ According to the California Energy Commission (CEC) nearly 80 percent of California's gasoline must contain some type of oxygenate. MTBE has been the primary oxygenate used in California. In 2002, CEC estimates that California refiners used more than 1.4 billion gallons of MTBE while about 100 million gallons of ethanol were used.⁴

California experienced the same run-up in gasoline prices in early 2003, as did the rest of the country, only to a greater extent. Statewide retail gasoline prices increased 36 percent between the first of the year and March 17, 2003 (\$1.58/gallon to a record \$2.15/gallon on March 17, 2003).⁵ The California Energy Commission (CEC) recently published the results of an extensive investigation of the causes of the significant increase in California retail gasoline prices during the first quarter of 2003. According to the CEC report, tight gasoline inventories and high world crude oil prices set the stage for price volatility. The CEC study reports that the transition to summer grade ethanol blends in California is not responsible for the price increases. The CEC indicates that most refiners are either already using ethanol or will be using ethanol ahead of the Governor's deadline for replacing MTBE and that the transition, which began in January 2003, is progressing without any major problems. "Earlier concerns about the adequacy of ethanol supplies have since diminished as the ethanol production industry has added

³ *2003 California Gasoline Price Study: Preliminary Findings*. Energy Information Administration. May 2003.

⁴ *Causes for Gasoline & Diesel Price Increases in California*. California Energy Commission. Sacramento. March 28, 2003.

⁵ EIA, p. 1; CEC p. I-5

significant capacity to meet California's annual demand of 565 to 660 million gallons of ethanol. Since the price of ethanol to refiners is currently at modest levels relative to gasoline, the recent increase in California's gasoline prices can not be attributable to the availability or cost of ethanol."⁶

Further illustrating the potential savings indicated earlier, the CEC reported that up to 90 percent of the ethanol currently used in California is being delivered under fixed price contracts in the range of \$1.12 to \$1.20 per gallon. CEC goes on to state "... when taking the gasoline blender's tax credit of 52 cents per gallon into account, the net cost of ethanol to the refiner (or blender) using these types of contracts will almost always yield an ethanol cost less than the price of wholesale gasoline."⁷

This price benefit provided by ethanol is illustrated in Figure 5, which compares the price of California Reformulated Gasoline Blendstock for Oxygen Blending (CARBOB) and reformulated gasoline blended with MTBE and ethanol to meet the two percent oxygen requirement.⁸

Since relatively little ethanol has been used in California, and ethanol typically is blended after the blendstock leaves the refinery (as opposed to MTBE blends which are manufactured during the refining process), there are no reliable rack, or wholesale, prices available for ethanol blends. Consequently, the prices shown in Figure 5 are weekly average spot prices for the first five months of 2003. The ethanol blend price was calculated as a weighted average of the CARBOB price and the average negotiated contract price for ethanol reported by the CEC, net of the 52 cents per gallon federal excise tax exemption.⁹

As can be seen in Figure 5, the average price of CARBOB for the first five months of 2003 was 104.27 cents per gallon. The price of the MTBE blend that met the two percent oxygen requirement averaged 105.95 cents per gallon. However, blending

⁶ CEC, p. III-4

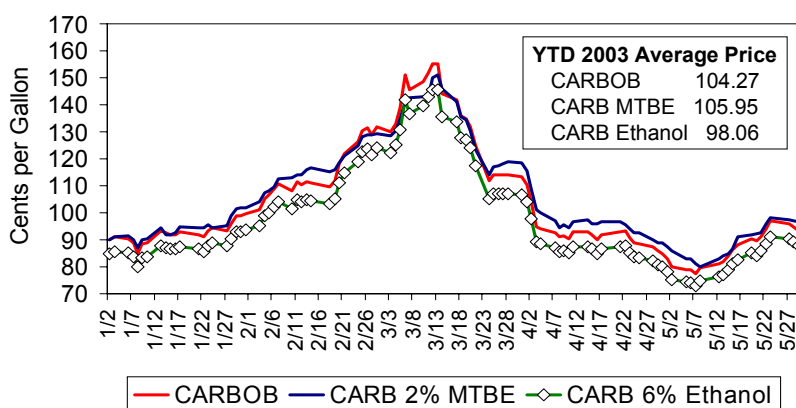
⁷ CEC, p. III-4

⁸ CARBOB is the basic blendstock that is produced before ethanol is added to create the finished oxygenated product.

⁹ The weighted average is $.94 \times \text{CARBOB} + .06 \times \text{net ethanol price}$. This reflects that six percent by volume ethanol will meet the two percent oxygen requirement.

ethanol at six percent volume with CARBOB would meet the two percent requirement at an average cost of 98.06 cents per gallon, a savings of 7.89 cents per gallon over the MTBE blend.

Figure 5
California Oxygenated Gasoline Prices, 2003
(Los Angeles Spot)



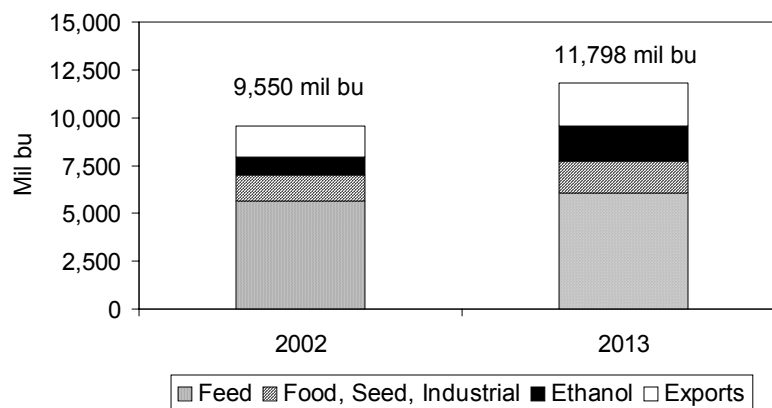
Source: Oil Price Information Service; RFA

Impact of the RFS on Farmers, Consumer Food Prices, and Taxpayers

Critics contend that diverting corn and other grains from livestock feeding to ethanol production will increase costs to livestock and poultry producers that will erode profitability and lead to either a reduction or slower growth in meat production. This, would lead to higher retail food prices and an acceleration of food inflation.

As shown in Figure 6, ethanol currently accounts for about nine percent of total U.S. corn utilization. A five billion gallon renewable fuel standard will increase corn use for ethanol production to 1.86 billion bushels fuel, or nearly 16 percent of total corn utilization.

Figure 6
U.S. Corn Utilization Under a RFS



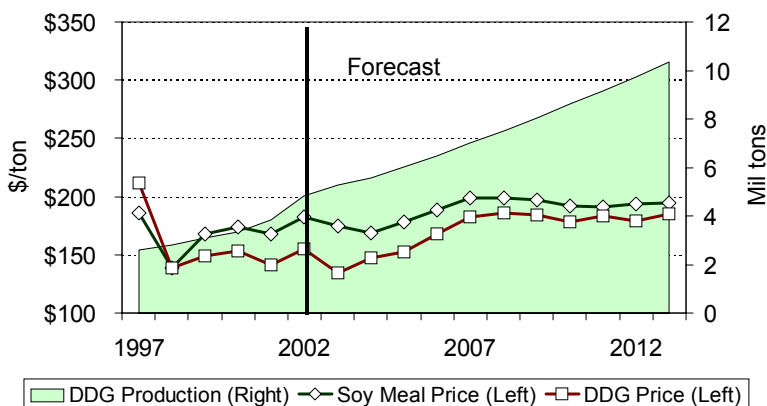
Data source: USDA; LECG forecast

While the amount of corn used for ethanol is projected to increase over the next decade due to the RFS, the amount of corn used for livestock and poultry feeding is expected to remain relatively unchanged. The important element here is that using corn and other grains to produce ethanol does not eliminate the feed value of the grain. In fact, under a RFS, the amount of feed available to the livestock and poultry industry will increase.

According to the Renewable Fuels Association, dry milling corn and other grains currently produces more than half of all ethanol, and virtually all new ethanol facilities coming on line are dry mills. The dry mill process produces ethanol as the main product and Distillers dried grains (DDG) and carbon dioxide as co-products. Ethanol production involves converting the starch content of the grain to sugar and alcohol. This process leaves the nutritional content of the grain -- including protein, vitamins, and fiber -- largely intact. Consequently, the co-products of ethanol production can be used for livestock feeding and are used by animal feeders as a protein supplement for dairy and beef cattle, swine, and sheep feed rations because they are an economical source of protein. Several factors affect the decision to use feed co-products such as DDG including the relative price of the feed component, palatability and efficiency gains, and

transportation costs from plant to feeding location. Since most livestock and poultry diets are least-cost formulated, delivered price is a major consideration. As shown in Figure 6, expansion of ethanol production under the RFS is expected to increase the supply of DDG significantly over the next decade and keep its price favorable relative to grain and soybean meal.

Figure 7
DDG and Soybean Meal Prices
(Equivalent 48% Protein Basis)

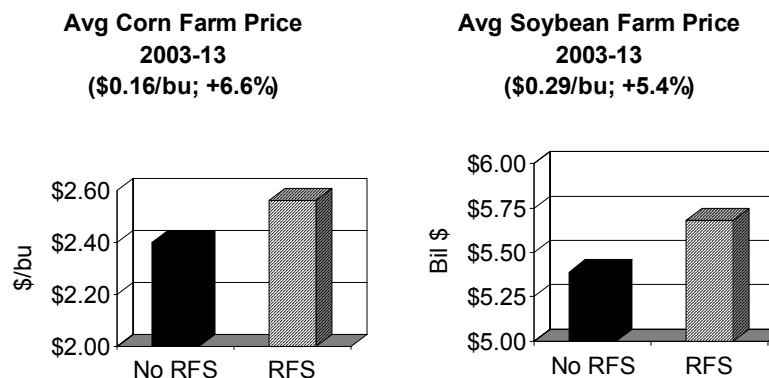


As a result of the increased supply of DDG, the relationship between protein feeds (SBM versus DDG) will remain inverted, providing an economic incentive for higher use. Since DDG can be used effectively both in ruminant (beef and dairy cattle) and monogastric (swine and poultry) feed rations, livestock and poultry growers will have an opportunity to improve profitability through reduced feed costs. The effects of increased supply of DDG will offset the impact of modestly higher corn prices over the next decade.

Increased demand for corn to produce ethanol and soybeans and soybean oil to produce biodiesel will have little or no impact on livestock and poultry producers but will have a positive benefit for farmers and taxpayers.

As shown in Figure 8 the RFS is expected to increase farm-level corn prices by \$0.16 per bushel on average over the next decade (or 6.6 percent) compared to a non-RFS baseline. Over this same period farm-level soybean prices are expected to average \$0.29 per bushel (or 5.4 percent) more than would be the case without an RFS.

Figure 8
Impact of the RFS on Corn and Soybean Prices



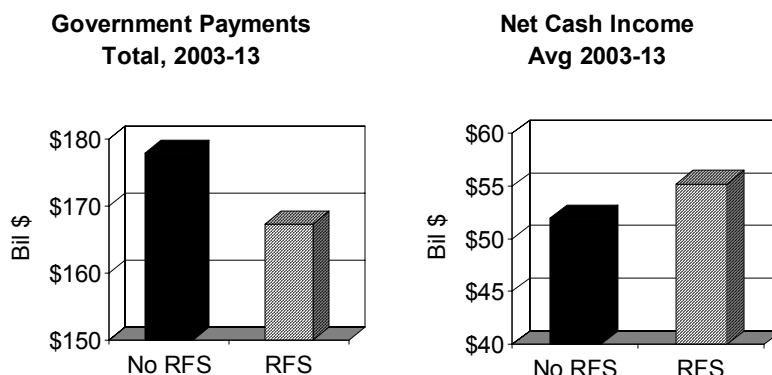
Increased supplies and lower prices for DDG and soybean meal will largely offset the impact of higher grain prices for the livestock sector. Consequently, no adverse impact on animal numbers and meat production is anticipated as a direct result of the RFS, and consumer food prices will not increase.

Taxpayers also will benefit from higher grain and oilseed prices as the cost of government programs to support agriculture is reduced. As illustrated in Figure 9, the RFS will reduce the amount of money the Federal government will pay for farm programs by \$10.6 billion over the next decade for an average savings of more than \$1 billion annually.

Reflecting that under an RFS farmers will receive a greater share of their income from the market instead of the government, net cash farm income is expected to average

\$55.2 billion over the next decade, more than six percent more than would be the case without an RFS.

Figure 9
Impact of the RFS on Government Payments
and Net Cash Farm Income



The RFS and Highway Trust Funds

Critics contend that the exemption from Federal excise taxes on motor fuels provided to the ethanol industry directly reduces the amount of funding for the Highway Trust Fund, and jeopardizes the health of the nation's highway system.

On April 2, 2003 The Senate Finance Committee passed an energy tax bill, *The Energy Tax Incentives Act of 2003*, that transfers 2.5 cents of the excise tax on ethanol-blended gasoline from the government's general fund back into the Highway Trust Fund and reshapes the ethanol excise tax exemption so that ethanol-blended fuels make the same contribution to the HTF as regular gasoline while at the same time retaining an important incentive to promote the use of domestic, renewable fuels.

As indicated earlier, ethanol currently receives 52 cents per gallon exemption from federal excise taxes on motor fuel. As a result ethanol-blended fuel is taxed at a lower

rate than regular gasoline (5.2 cents on a 10 percent blend). If the Senate bill were enacted, the existing ethanol excise tax exemption would be eliminated, thereby allowing the full federal excise tax of 18.4 cents per gallon of gasoline to be collected and allocated to the HTF. This would add an estimated \$1.4 billion to HTF revenue annually.

In place of the current exemption, the Senate bill would create a new volumetric ethanol excise tax credit (VEETC) of 5.2 cents on a 10 percent ethanol blend. Refiners and gasoline blenders would apply for this credit on the same tax form as before only it would be a credit from general revenues, not the HTF. Ethanol would still receive a tax incentive important for the development of the industry to fully compete head-on-head with the petroleum industry and the financial integrity of the Highway Trust Fund would be protected.

Conclusion

Consumers, farmers, and taxpayers will directly benefit from a renewable fuel standard.

- Consumers will realize potential savings of up to five percent per gallon on the retail price of gasoline amounting to \$3.3 billion annually. In addition, all Americans will benefit as domestically produced renewable fuels displace imported crude oil thereby reducing America's dependence on imports from an increasingly unstable region of the world. Producing and using renewable fuels can displace expensive imported oil thereby reducing America's dependency on imports from an increasingly unstable region of the world.
- Consumers will see little or no increase in retail food prices from enactment of a renewable fuel standard.
- Farmers will benefit from the development and steady growth of a significant base of domestic demand for grains, oilseeds, and other crops that would result in higher prices and revenues from marketings.
- Taxpayers will benefit because improved demand and prices for grains will reduce the amount of taxpayer dollars needed for direct government payments to farmers.

- Finally, financing to maintain and improve the nations highways will be protected by changes in the tax code for ethanol and other renewable fuels.