ISSUES FOR THE 1990'S

Technology
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Alternative Fuels: Ethanol

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Issue. Alternative fuels such as ethanol contribute to at least two U.S. policy goals: improving environmental quality and enhancing farm income. Using ethanol-blended fuels reduces carbon monoxide emissions in motor vehicles. Ethanol also creates markets for farm commodities, particularly corn. But, ethanol is costly to produce and depends on Federal and State incentives to compete with its nonrenewable competitors. The issue involves the tradeoff between the current and future cost of incentives and the value of alternative fuels toward meeting policy goals.

Context. The Clean Air Act Amendments of 1990 (CAA) create an opportunity for expanding the use of alternative fuels. However, alternative fuels are relatively costly to produce, so they represent less than 1 percent of U.S. transportation fuel use. The demand for the best known alternative fuel, ethanol, is enhanced by a mix of Federal and State incentives. While currently producing about 900 million gallons of ethanol per year, the ethanol industry continues to depend on Federal and State incentives to remain viable. An income tax credit of 54 cents per gallon of alcohol is allowed to blenders of alcohol and gasoline for use as a fuel. Or, a 5.4-cent-per-gallon exemption from the Federal excise tax on gasoline is allowed on the sale of 10-percent alcohol and 90-percent motor fuel blends. The 10-percent blend requirement translates into an incentive equal to 54 cents per gallon of ethanol. In addition, a "Small Producers Credit" equal to 10 cents per gallon is available to producers with annual production capacity of up to 30 million gallons.

At Stake. Using ethanol-blended fuels rather than conventional gasoline can reduce air pollutants like carbon monoxide, creating economic benefits by cutting health care costs. While use of 10-percent ethanol blends, which are more volatile than gasoline, may contribute to the ozone problem, there is limited information regarding the effects of different ethanol blends on fuel volatility. For example, neat ethanol (100-percent ethanol) is less volatile than gasoline. Blending ETBE (ethyl tertiary butyl ether), manufactured from ethanol, with gasoline also reduces fuel volatility and ozone problems.

Increasing ethanol production also creates markets for farmers and can increase farm income. Ethanol production, expanding from an expected 1.2 billion gallons per year to 2 billion gallons per year in 1995, could increase farm income by about $170 million. A 5-billion-gallon per year production level could increase farm income by $1 billion or about 2 percent of 1991 net farm income. When government set-aside requirements are relaxed to soften the effects on corn prices, an increase of ethanol production to 2 billion and 5 billion gallons per year could reduce annual government deficiency payments by $7 million and $900 million, respectively. The $7 million decrease in deficiency payments reflects the smaller corn price impacts due to relaxed set-aside requirements.

Added ethanol production could also increase U.S. exports. Over 90 percent of all U.S. corn gluten feed (CGF), an ethanol byproduct livestock feed, is exported to the European Community. Total 1991 CGF exports exceeded 6 million tons with a value in excess of $800 million. Ethanol production climbing from 1.2 billion gallons to 2 billion gallons per year could spur CGF exports by 2 million tons per year, increasing the total value of U.S. CGF exports by $200 million, which was 0.5 percent of total U.S. agricultural exports in 1991.
However, tax exemptions also distort the allocation of resources throughout an economy. If markets reflected all costs, these distortions would create a burden to society, with no economic justification for supporting Federal assistance to ethanol. However, market failures do exist. For example, the price of gasoline does not fully reflect the true costs to society, including air pollution, of petroleum use. In addition, farm commodity programs distort agricultural production decisions. Because such distortions exist, incentives for ethanol may improve the overall welfare of society, depending upon true costs and benefits of gasoline and its alternatives.

**Alternatives.** Several public policy choices relate to ethanol production:

**Relax minimum blend requirements.** The minimum 10-percent blend requirement for receiving the Federal excise tax exemption could be relaxed to provide the flexibility required to meet regional demands under the Clean Air Act. While the use of 10-percent ethanol blends is more volatile than gasoline and may contribute to the ozone problem, there is limited information regarding the effects of different ethanol blends on fuel volatility. The national energy strategy bill provides added, but still limited, flexibility in the tax treatment of ethanol-blended fuels.

**Relax set-aside requirements.** Increases in the cost of producing ethanol or increases in consumer food costs because of higher corn prices could be mitigated if the set-aside requirements associated with current farm programs were relaxed. In 1991, for example, almost 30 million acres of cropland were idled under annual Federal acreage reduction programs, about 7.5 million of them idled under the corn program. The idled corn acres alone represent almost 2 billion gallons of potential ethanol.

**Encourage research and development of ethanol byproducts.** Development of ethanol byproducts is the most potentially profitable area of research. The price of ethanol is tied to other energy sources, feedstock (corn) costs are dictated by alternative uses, and production cost reductions are limited by the physical process involved in ethanol production. Byproduct revenues are not bound by these restrictions. High-value, low-volume ethanol byproducts, such as citric acid or sorbitol, may be removed as technology becomes available. Converting carbon dioxide, currently a low-value ethanol byproduct, into acetic acid could considerably reduce ethanol production costs.

**Expand current levels of research and development in biomass conversion.** Near- and long-term ethanol research and development have a different focus. While near-term efforts have focused on the ethanol production facility itself, in the long term, the industry must adopt technologies that use a broader set of feedstocks. An active research area involves breaking down a variety of biomass materials into sugars that can then be fermented into ethanol. Breakthroughs in biomass pretreatment and conversion allow higher ethanol yields from grains by converting the fiber portion of the grain into ethanol. Crops such as energy sorghum and switchgrass, as well as cellulosic material such as bagasse, corn stover, or wheat straw, may be converted into ethanol. These technologies could reduce operating and capital costs to less than 80 cents per gallon.

**Agenda.** The CAA creates an opportunity for expanding the use of alternative fuels. Questions remain about the role of ethanol in meeting CAA requirements and whether alternative fuels can compete in price with nonrenewable alternatives. The future of renewable alternative fuels depends on policy initiatives that encourage the research and development of technologies that can reduce production costs and the cost of Federal and State incentives.