

BIOFUELS: AT WHAT COST? Government Support for Ethanol and Biodiesel in the United States

EXECUTIVE SUMMARY

By Doug Koplow, Earth Track, Inc.

For the Global Subsidies Initiative of the International Institute for Sustainable Development

This study examines government support for ethanol and biodiesel within the United States. It surveys current support policies in place at the federal, the state, and to the extent possible, the local level. The study forms part of a multi-country effort by the Global Subsidies Initiative (GSI) to more thoroughly characterize and quantify subsidies to biofuels production, distribution, and consumption, as well as to producers providing key factor inputs. In the future, the GSI expects also to examine government subsidization to a range of other energy sources, including fossil fuels.

Subsidies for corn-based ethanol have a long history...

The report shows that subsidies for biofuel production, particularly corn-based ethanol (ethyl alcohol), have a long and enduring history in the United States. The federal government started supporting ethanol use in the late 1970s, through a reduction in the excise tax for gasohol, a blend of 10 percent ethanol and 90 percent gasoline. A secondary tariff of \$0.40 per gallon (since increased to \$0.54 per gallon) was imposed at about the same time on imported supplies of ethanol. Several states followed the federal government's lead shortly thereafter, reducing their own fuel taxes on gasohol. Subsidies per unit energy of ethanol produced were quite high throughout the 1980s, and during the years for which we have comparative data actually exceeded government support to all other forms of energy. Similar data were not available on support levels in the 1990s.

Over the years, through high oil prices and low, corn surpluses and droughts, the federal and state governments continued to support the industry. Over time, however, some states and then the federal government switched to providing direct payments (or, in the case of the federal government, tax credits) for ethanol production, in order to stem the losses in revenues to highway funds resulting from exempting tax on gasohol sales. Today, the federal government's main form of subsidy is a \$0.51 per gallon tax credit. Some states nonetheless continue to tax gasohol or other ethanol-gasoline blends more lightly than they do pure gasoline. In total, the United States produced around 3.9 billion gallons of fuel ethanol in 2005, which was less than 3% of total liquid fuel used in highway transportation.

...while incentives for biodiesel production are of more recent origin

The biodiesel industry is comparatively new. Production only surpassed one million gallons a year in 2000; by 2005 it had reached 75 million gallons. The first major federal production incentive for biodiesel producers was an excise-tax credit, created in 2004 under the American Jobs Creation Act. The tax credit, which is available through 2008 (though may be extended), pays \$0.50 per gallon of biodiesel made from waste-grease and \$1.00 for biodiesel made from

virgin vegetable oils or animal fats. As for ethanol, numerous state governments also charge lower fuel taxes on biodiesel, provide producer payments or tax credits, or both. The tariff on biodiesel is comparatively low, however, at 1.9 percent of the import value.

The result today is an expensive mix of subsidies.

The report finds that subsidies to biofuels are currently between \$5.5 billion and \$7.3 billion a year. The largest subsidies remain those provided under federal programs, but many state-level programs provide significant amounts of support to the industry.

Subsidies to ethanol and biodiesel: total and per gasoline gallon equivalent¹

	Notes	Units	Ethanol		Biodiesel	
			Low	High	Low	High
Total support						
Estimate for 2006	2	\$ billions	5.1	6.8	0.4	0.5
Annualized estimate, 2006-2012	3	\$ billions	6.3	8.7	1.7	2.3
Subsidy per gasoline gallon equivalent (gge)						
Estimate for 2006	2	\$/gge	1.42	1.87	1.69	2.15
Annualized estimate, 2006-2012	3	\$/gge	1.44	1.96	1.24	1.70

Notes:

1. The primary difference between high and low estimates is inclusion of outlay equivalent value for tax breaks where applicable in the high estimate.
2. To look at just 2006, production levels and number of facilities were set to expected values for 2006; funding that has been authorized but not appropriated was set to zero. For ethanol, a production is estimated at 4.9 billion gallons for 2006; this value is extrapolated from actual U.S. data through July compiled by the Renewable Fuels Association. For biodiesel, production is estimated at 245 million gallons for 2006, based on USDA estimates.
3. Annualized values provide a more accurate estimate of the multi-year level of support, as shifts in particular programs are averaged over time. The reference volume for ethanol is the average of the RFS mandate targets between 2006 and 2012 — i.e., roughly six billion gallons per year. This level of production is expected to be reached in 2009 via the RFS mandate targets, and in 2008 based on the EIA's *Annual Energy Outlook 2006*. For biodiesel, the reference volume is 1.4 billion gallons per year, which will be reached when existing and planned plants are operating at a 75 per cent capacity utilization. This is expected by 2008.

These subsidies are the result of many independent decisions at different levels of government, resulting in policies that are often poorly coordinated and targeted. Hundreds of government programs have been created to support virtually every stage of production and consumption relating to ethanol and biodiesel, from the growing of the crops that are used for feedstock to the vehicles that consume the biofuels. In many locations, producers have been able to tap into multiple sources of subsidies.

Because the bulk of the subsidies — per-gallon payments, tax exemptions and tax credits — are tied to sales or output and output is increasing at double-digit rates of growth, the rate of subsidy growth is extremely high. Although there are proposals before Congress to create variable-rate subsidies that would decline as oil prices rise, the existing subsidies are still set at fixed rates. Production-linked subsidies distort product markets and trade more than any other form of support.

Subsidies to value-adding factors, particularly for capital investments in new plants, are much smaller on a subsidy-equivalent basis than output-related subsidies, and many are provided

under general programs. However, these government-intermediated loans and loan guarantees often shift the risk of default to the government body providing the assistance. In effect, a large number of communities have committed a significant amount of public money to the future of biofuels production. The amount of public capital used, the degree of risk being taken, and the implications in terms of future government dependence on the continuation of biofuels subsidies to keep their credit support from defaulting are all important issues to examine in greater depth.

The report estimates that by the end of this decade, assuming continuation of current policies, annual support for ethanol will be in the range of \$6.3 billion and \$8.7 billion a year. Subsidies to biodiesel are also increasing at a rapid rate of growth in output, albeit from a lower base, and could rise to between \$1.7 billion and \$2.3 billion within two or three years.

The subsidies are not only costly, they seriously distort markets

The absolute value of the subsidies is not the only, and perhaps not the main, indicator of the market-distorting potential of a set of support policies. Per unit of energy produced, the subsidies generated by policies supporting liquid biofuels have historically been higher than those going to most other fuels. Present estimates per gasoline gallon equivalents (gge) that adjust for differences in heat rates remain quite high — in the neighbourhood of \$1.40 to \$1.90 per gge for ethanol and \$1.70 to \$2.15 per gge for biodiesel.

Numerous examples are provided in the report which suggest that the current set of policies promoting liquid biofuels suffer from lack of coherence. The maintenance of a high tariff on imported ethanol, in particular, sits at odds with the professed policy of the U.S. Government to encourage the substitution of gasoline by ethanol, and trade with developing-countries.

The environmental benefits are small given the sums being expended...

While biofuels do provide some benefits both in terms of displacing petroleum and fossil fuels, and in terms of reducing greenhouse gas emissions, the gains are relatively small in comparison to their subsidy cost. For example, the roughly \$500 in state and federal subsidies per metric ton of CO₂-equivalent reduced through the production and use of ethanol could purchase more than 30 metric tons of CO₂-equivalent offsets on the European Climate Exchange, or nearly 140 metric tons on the Chicago Climate Exchange.

The subsidy cost per unit of petroleum displaced is also high: \$11-20 per MMBtu for biodiesel; \$16-18 per MMBtu for ethanol. Per unit of fossil fuel displaced, the costs are roughly double, as both supply chains use significant amounts of natural gas, and increasingly coal. These high values, in combination with the fact that many energy analysts expect biofuels to remain a complement to, rather than a substitute for, petroleum for many years to come indicate that biofuels subsidies may not be the most appropriate policy to address energy security concerns.

The displacement ratios for cellulosic feedstocks are markedly better than those for corn-based ethanol or biodiesel, and many existing subsidies are justified on the grounds that they are paving the way for a cellulosic ethanol industry. To test these claims, we developed a hypothetical case in which we assumed all existing production capacity was cellulosic rather than corn-based ethanol. Furthermore, we stripped out subsidies to corn and sorghum, assuming -- perhaps optimistically -- that cellulosic feedstocks would not receive agricultural subsidies. While support levels to cellulosic were lower than for corn-based ethanol and biodiesel, subsidy levels per unit of fossil- or petroleum-energy displaced remained about \$10 MMBtu in all scenarios. This is still well above support levels to other fuels evident from historical data.

Subsidies to ethanol and biodiesel per net MMBtu of liquid petroleum fuels and net fossil fuels displaced, and per metric ton of CO₂-equivalent avoided

	Units	Ethanol		Biodiesel		Cellulosic ethanol (hypothetical case) ¹	
		Low	High	Low	High	Low	High
Subsidy per net million Btu (MMBtu) of liquid petroleum fuels displaced							
Estimate for 2006	\$/MMBtu	15.90	17.00	15.40	19.60	11.10	13.90
Annualized estimate, 2006-2012	\$/MMBtu	16.10	17.90	11.40	15.50	11.70	15.40
Subsidy per net million Btu (MMBtu) of fossil fuels displaced							
Estimate for 2006	\$/MMBtu	30.90	41.00	27.20	34.70	10.70	13.40
Annualized estimate, 2006-2012	\$/MMBtu	31.40	42.90	20.10	27.40	11.30	14.90
Subsidy per metric ton of CO₂-equivalent emission reduced							
Estimate for 2006	\$/tonne	NA	520	NQ	NQ	118	147
Annualized estimate, 2006-2012	\$/tonne	NA	545	NQ	NQ	124	164

NA = not applicable.
NQ = not quantified.

1. This scenario assumes that all of the existing subsidization of ethanol (with the exception of support to crop feedstocks), would benefit cellulosic ethanol, and that it had successfully built an infrastructure with the current profile of our starch-based production system. We then evaluate subsidy intensity metrics to assess whether the incremental benefits from cellulosic ethanol are sufficient to significantly change the resultant subsidy cost per unit of fossil fuel or greenhouse gas displacement.

See also notes to previous table.

...while the potential for unintended consequences is large.

Meanwhile, the potential for unintended consequences is huge. Subsidies to liquid biofuels are being injected into an already distorted agricultural economy — one through which billions of dollars in support are channelled each year — and an energy market that is itself distorted by subsidies and special tax breaks, and subject to considerable volatility. Corn in particular is a crop that requires lots of water, and the current trend in the expansion of corn-based ethanol is westward, into areas that are more dependent on overstretched water sources, like the Ogallala Aquifer, than is corn produced in the central Midwest. It is not unreasonable to ask if that trend is sustainable. By stimulating domestic biofuel production based on corn and soybeans, the country is, in effect, promoting “renewable” fuels that require lots of non-renewable inputs.

Subsidies related to the supply and use of E85 — a blend of 85% ethanol and 15% gasoline — seem of particularly dubious value. To the extent that there are any benefits for national security, regional economies, and greenhouse-gas emissions from consuming biofuels, it matters not in what blends a biofuel is consumed, but rather its overall contribution to displacing petroleum fuels. Because of a legal loophole that enables manufacturers of flex-fuel vehicles (FFVs) to obtain generous credits towards meeting their CAFE standards, the FFVs currently on the highway are predominantly large, and optimized to use gasoline. Their inefficiency when running on E85 means that keeping one FFV filled with E85 costs around \$500 a year, just in federal tax credits associated with the production of the ethanol contained in the fuel. Yet a huge effort is now being mounted, at great public expense, to increase the availability of E85 for these vehicles — which will require yet more subsidies.

Much better information is still needed before any more money should be spent

Data and resource limitations prevented identifying and quantifying all the subsidies now supporting the biofuel industries, especially subsidies provided by State and local governments. The GSI hopes that other researchers will build on this study, provide useful feedback to help improve its numbers, and continue the process of quantifying support to the industry. An important complement to this process would be for governments at all levels to more directly promote transparency in their own subsidy programs.

Political support for subsidies to biofuels has been described as a perfect storm, combining the powerful interests of agriculture, the national security community, and a significant portion of the environmental community. Such extensive and deep support has surrounded liquid biofuels with an aura of inevitability. Yet there has never been a more-urgent need to examine the claimed benefits from biofuel subsidies, and to compare them with the costs of meeting the same goals in other ways.

With oil prices recently at record levels, one would expect that federal and state policymakers would be looking to reduce or eliminate subsidies to biofuels. Instead, they are proposing to extend or increase them. Considering how much effort was taken to assemble subsidy information for the purpose of this study, it can be surmised that policymakers do not have a clear understanding of the full gamut of support already provided by the different levels of government. Nor is it likely that they have a good idea of the potential impact that government support for biofuels is having on the environment and the economy. Policymakers need complete, not partial information.

The report recommends that, rather than proposing yet more subsidies, the U.S. Congress and the States should declare a moratorium on all proposals for increasing or extending subsidies to liquid biofuels, or to their petroleum counterparts. The ad hoc system that has characterized subsidies to transport fuels for too long should be replaced with one that starts by removing existing subsidies, and forces recipients to compete for those that remain.

For further information, please contact:

**Javed Ahmad,
Communication Director
Global Subsidies Initiative**

j.ahmad@globalsubsidies.org

U.S. Cell phone (valid until 28/10/06): 703-389-6664

The GSI is a programme of:

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International
Institute for
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Development
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international du
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durable

www.globalsubsidies.org

info@globalsubsidies.org
Tel.: +41 22 917 88 56
Fax: +41 22 917 80 54

International Environment House 2
IISD, Chemin de Balexert 9
1219 Châtelaine, Geneva
Switzerland