Jörg Peters and Manuel Frondel

BIODIESEL: A NEW OILDORADO?

RWI Essen, Hohenzollernstr. 1-3, 45128 Essen, Germany
Phone: +49 (0)201 8149-247, E-mail: peters@rwi-essen.de

Overview

Tax exemptions of biofuels triggered a dramatic increase in the demand for biodiesel in Germany. Within two years, the production of biodiesel doubled and exceeded the threshold of one million tons in 2004. In several other European countries the production of biodiesel has also been boosted through tax reductions and exemptions (EBB 2005).

Tax exemptions and reductions for biofuels intend to support the achievement of the indicative targets for biofuels set by Directive 2003/30/EC. This directive demands that the shares of biofuels — measured on an energy content basis — should reach 2 % by 2005 and, by 2010, 5.75 % of the overall amount of gasoline and fossil diesel used in the EU25 transport sector. These targets are justified on the basis of potentially positive environmental impacts, most notably the mitigation of climate change through greenhouse gas (GHG) abatement, of an increase of energy supply security, as well as through expected positive employment effects in the agricultural sector.

Method and Results

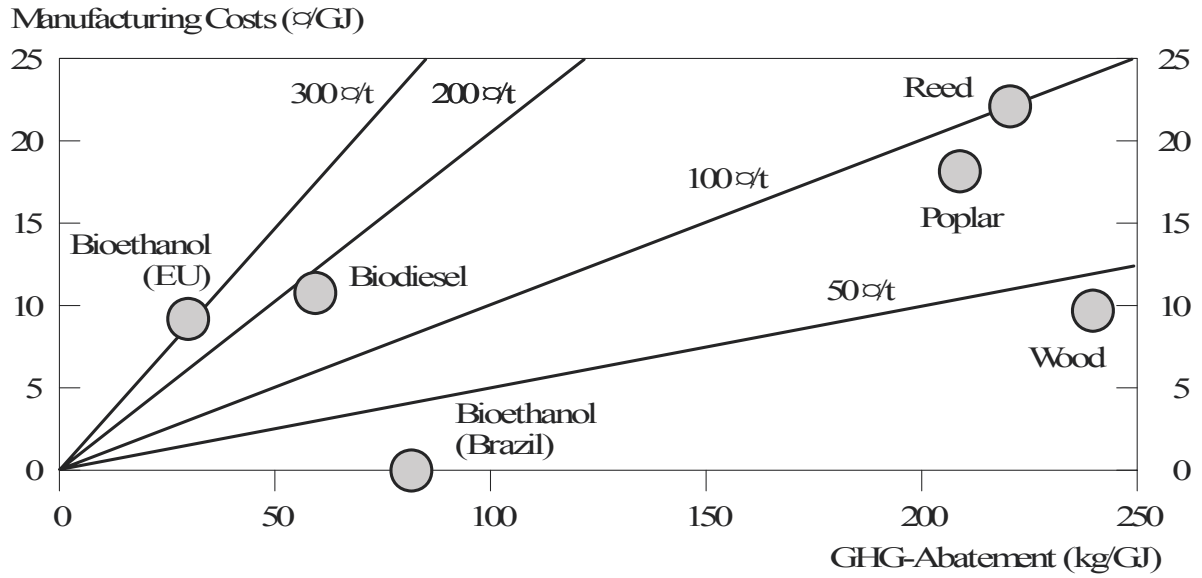
In this paper, we analyze the environmental and economic aspects of rapeseed-based biodiesel as a substitute for fossil diesel. A thorough greenhouse gas (GHG) balance based on a variety of recent empirical studies indicates that biodiesel *does* avoid part of the GHG emissions — but only around 60 %. In fact, policy makers' frequent positive assessment of biodiesel appears to be mainly the result of the strong emphasis on climate protection in today's environmental policy.

The overall environmental balance of the substitution of biodiesel for fossil diesel, however, is not unequivocally positive, most notably due to laughing gas emissions contributing to ozone depletion. In line with politicians' most important concern, we have focused on the issue of climate change mitigation: Our major finding is that biodiesel is far from being a cost-efficient emission abatement strategy. In fact, with current GHG abatement cost of about 200 €/t, biodiesel will not be fostered by the recently launched European Emission Trading System, the primary and widely accepted instrument for providing cost-efficient climate protection. Therefore, biodiesel needs promotion measures such as tax exemptions, which are perfectly in accord with Directive 2003/96/EC. In 2004, total tax losses due to tax exemptions for biodiesel in the EU25 were as high as 736 Mio €, with Germany contributing about 500 Mio €. We have gauged that the EU25 tax losses may easily increase up to 5 Bn € by 2010.

Furthermore, it is demonstrated that acreage requirements for biodiesel and bioethanol production clearly exceed the available amount of set-aside land in the EU25. The scarcity of arable land will inevitably lead to increased competition for acreage. It appears to be obvious that biofuel production will thus compete with agricultural feedstock cultivation for food purposes. As a consequence, prices of both rape oil and derived food products may rise if rapeseed supply does not accelerate accordingly.

Finally, we suggest a variety of more efficient alternatives for the abatement of greenhouse gases based on both renewable and conventional technologies. Electricity generation on the basis of fast-growing plants, such as poplar and reed grass, for example, seem to be both a relatively cheaper alternative in terms of abatement cost and an alternative income source and employment support measure for the agricultural sector.

Figure: Relationship between Manufacturing Costs and GHG-Abatement



Conclusion

The inefficiency of biodiesel as a GHG-abatement strategy causes tax losses, which we gauge to climb up to 5 Bn €. Governments would be well advised to leave GHG-abatement to the European Emission Trading System, to avoid these tax losses and rather spend parts of that money in the research and development (R&D) of future technologies, such as the Fischer-Tropsch synthesis. Eventually, successful R&D endeavors and high crude oil prices may render advanced biofuels (BtL) a serious and competitive option for Europe, whose CO2 emission reduction potential is also much higher than that of conventional biofuels (VIEWLS 2005:3). Moreover, due to higher rates of yield, there is the hope that BtL-based technologies alleviate the problem of land scarcity (DfT 2003: 60).

References

ADEME (2002) Energy and Greenhouse Gas Balances of Biofuels Production Chains in France. Direction of Agriculture and Bioenergies of the French Environment and Energy Management Agency (ADEME) and the French Direction of the Energy and Mineral Resources (DIREM), Paris.
www.ademe.fr/partenaires/agrice/publications/documents_anglais/synthesis_energy_and_greenhouse_english.pdf

Böhringer, C. and A. Löschel (2002) Assessing the Costs of Compliance: The Kyoto Protocol. European Environment 12, 1-16.

Defra (2003) Liquid Biofuels – Industry Support, Cost of Carbon Davings and Agricultural Implications. Prepared for the Department for Environment, Food and Rural Affairs (defra).
www.defra.gov.uk/farm/acu/research/reports/biofuels_industry.pdf

dena (2005) Energiewirtschaftliche Planung für die Netzintegration von Windenergie in Deutschland an Land und Offshore bis zum Jahr 2020. (Strategy for the Integration of On- and Offshore Wind Energy into the German Electricity Supply System by 2020.) German Energy Agency (dena), Berlin.

DLR (2000) Globale Umweltvorteile bei Nutzung von Elektroantrieben mit Brennstoffzellen und/oder Batterien im Vergleich zu Antrieben mit Verbrennungsmotor. (On the Global Environmental Benefits by Using Electric Drive with Fuel Cells, Battery Storage or Hybrid Systems as Compared to Advanced Conventional Vehicle Systems with IC Engine Drive.) German Aerospace Center (DLR), Stuttgart.

DfT (2003) Liquid Biofuels and Hydrogen from Renewable Resources in the UK to 2050: A Technical Analysis. An Assessment of the Implications of Achieving Ultra-low Carbon Road Transport. Carried out for the UK Department for Transport (DfT) by E4Tech UK Ltd, December 2003.

EBB (2005) European Biodiesel Board – Statistics, Brussels. www.ebb-eu.org/stats.php.