THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

DINNER/DISCUSSION SUMMARY

Can biofuels offer a significant contribution to low carbon energy supply?

Held at The Royal Society on 23rd May 2007

We are grateful to
Biotechnology and Biological Sciences Research Council, Department for Environment, Food and Rural Affairs and the Institute for Biology for supporting this meeting

Chair: **The Earl of Selborne KBE FRS**
Chairman, The Foundation for Science and Technology

Speakers: **The Lord Oxburgh KBE FRS**
Chairman, D1 Oils
Sir Howard Dalton FRS
Chief Scientific Adviser, Department for Environment, Food and Rural Affairs
Ingmar Juergens
Food and Agricultural Organisation (FAO), Rome

LORD OXBURGH stressed the disparate nature of biofuels - some were good, some bad and some not so bad. Their common qualities were that they should be able to provide energy with less CO2 units than fossil fuels; could add to security of supply and the environment; were odourless and biodegradable; and were the only alternative to fossil fuels for liquid fuels for transport (they blended well - 5%-10% acceptable in all engines; 85%-100% in modified engines.) But they differed markedly in cost, carbon output per unit of energy, environmental and social impacts, use of by-products and geographical spread. First generation biofuels, made through fermentation and distillation, or crushing oily seeds, all came from traded food crops; that from corn (ethanol) used almost as much energy to produce as it saved; cellulose ethanol used 1/10th of the energy). Second generation biofuels were much more environmentally friendly. They could be produced from non-food and waste sources - straw, forestry residues, Miscanthus and Jatropha trees - and by gasification of organic material. Jatropha, which grew on marginal land and gave local employment, was the most likely sustainable source. But the use of these fuels should be judged by their cash value, their carbon output and the social, economic and environmental problems they eased or created. At present the industry was immature and costs were high. But biofuels certainly offered a contribution to low carbon energy supply; whether it was significant depended on the definition, but, because of the differing nature and impact of biofuels, it would be more or less important in different areas and circumstances.

SIR HOWARD DALTON endorsed Lord Oxburgh's emphasis on the differing nature and impacts of various biofuels. He stressed the importance of reducing CO2 emissions, in the face of the deleterious impacts of climate change on food and water supplies and ecosystems. While the UK had reduced emissions because of the shift to gas in power generation, the increase in road traffic had given rise to greater fuel consumption. A 5% increase in the use of biofuels by 2010 was the equivalent of taking 1 million cars off the road. He emphasized the importance of life cycle analysis in calculating the carbon footprint of fuels - e.g. the need to use fertilizer and transport costs. Because of these impacts and the pressure on agricultural land, he did not consider the use of first generation biofuels to be sustainable in the long term. But second generation biofuels, with their lower demand for good land, fertilizers and water, and use of waste were promising. But processing costs were high and further work was needed on both research and development. Deployment was starting, with the EU renewable targets, but more work was needed on planning issues. Sustainability was key: new crops must reduce demand for nitrates and phosphates; be disease resistant and not produce waste. The UK was leading in research in these areas. GM crops could make a significant difference in these areas, as well as releasing higher quantities of fermentable sugars, and higher yields. But we had to be aware of the problems of seeking to meet renewable fuel targets by use of agricultural land in the UK - it could mean using 20% of agricultural land in the East Midlands, with dire effects on biodiversity.

MR. JUERGENS outlined the global position and trends in the use of bioenergy. He emphasized the wide differential between the developing and developed parts of the globe. 47% of Africa's energy came from biofuels; 29% of Asia's; 19% of Latin America's. The US and Europe's use was small in comparison. Of course, most of this biofuel was wood fuel, used for burning, and in many areas, with population growth, unsustainable. But there was considerable potential for the development of biofuels in particular areas, such as Africa and South America (see the growth in sugar cane based ethanol in Brazil). It was vital to look at the effects of increase in the production and use of biofuels in different countries. There would be some losers and some winners from growth in biofuels. Because energy was a much bigger market than agriculture, agricultural prices followed energy prices, and could not rise faster than them. Therefore, changes in energy prices could have marked effects on agricultural prices and output. The

effects on food security - availability, access and stability - were complex, but broadly, those countries which exported food products would gain, those who imported lose. The rural poor and urban dwellers would be more likely to lose. He was concerned that there might be over investment in first generation biofuels. It was important to have better business models and policies to understand the externalities of production of biofuels and their impacts on various societies.

In the course of the discussion, a number of speakers were critical of the little emphasis in the presentations on the use of domestic and commercial waste for energy production. If the overriding aim was to mitigate the impact of climate change by reducing emissions, then the government seemed to be failing to use an essential mechanism; in particular why had no speaker mentioned the process of anaerobic digestion, in waste water plants? Large quantities of methane and other gases were produced which, if properly harnessed could be fuel effective. But the water companies would not invest without government pressure. There had been no government commitment to building more power plants for burning waste, because of fears of local opposition. This was a clear area where sensible and informed media discussion could help; but any such proposals were seen by journalists as opportunities to write up alarmist predictions. Assistance could also be given to micro biofuel processing, such as small scale waste food oil reuse.

Speakers, more generally, felt that the government had no clear energy policy, although it was admitted that the publication of the Energy White Paper, which had only been published today, might make matters clearer. It was valuable that there was a section on biofuels, but it was a matter of turning words into effect. This would mean some sort of regulation or market mechanism. But here was a central question of government organization. If biofuels were to be an important source of energy, then there must be one person in government who could design and lead a policy which took into account the economic, social, food security, and land use issues. There was no indication that the government had seen the need to encompass all these issues together. Apparently OFGEM was to decide what fuels power stations were to use, but this was only a small part of the picture. If sustainability was to be a key element in the production of biofuels then there would need to be standards set which would define what that meant - even if it were only minimal standards. Of course, the price of carbon would be a major influence on the use of biofuels, but, however high it went, it would not, on its own, lead to sustainable products.

It was artificial to consider biofuel use and production in the UK on its own. It was obvious that the best place for biofuel sources was likely to be in developing countries, where jobs could be provided and poor land used. The planting of Jatropha trees in Swaziland was a good example (although there was some scepticism about the welcome that locals might give to what they might see as just another land grab by international companies). But if that production was to take place, investors needed to have some certainty about policy over a decade. But neither national nor international policies could be predicted for such periods. The way ahead seemed to be to exert pressure to remove perverse subsidies which hinder sustainable biofuel use, and prioritized carbon heavy fuels; to maintain carbon prices through emission trading and restriction of certification; and to set stretching but attainable and realistic targets for biomass use. Over time, public behaviour would change, if sufficient productive and positive media coverage could be obtained so that individuals looked at the source, as well as the amount of energy they used. The photo shot of the Minister in his biofuel Saab was a useful publicity exercise.

Although it was questioned, the emphasis placed on developing biofuels for liquid fuel for transport was understandable given the significant impact of fuel use in transport, and the fact that, at present, the internal combustion engine was the only really effective means of power for transport. Burning biofuels for power generation was less expensive and gave rise to less carbon emission than if they were converted by expensive processes into liquid fuel. It was important, therefore, that while developing biofuels for transport must continue to receive support, the use of biofuels for burning should not be overlooked. Reluctantly it had to be accepted that no democratic government was going to try to stop people using their cars, or try to put all freight traffic on rail; so, if transport was to play its role in reducing emissions, biofuels had to play an important role in transport fuel policy.

Sir Geoffrey Chipperfield KCB

The presentations are on the Foundation website at www.foundation.org.uk.

Useful web links:

Biotechnology and Biological Sciences Research Council:
www.bbrsc.ac.uk
BP/Dupont Biofuels Partnership:
www2.dupont.com/biofuels/en_us
Cargill:
www.cargill.com
Co-operative Insurance Society:
www.cis.co.uk/policyinpractice
D1 Oils:
www.d1plc.com
Department for Environment, Food and Rural Affairs:
www.defra.gov.uk
Energy Biosciences Centre, UK Berkeley:
www.berkeley.edu/news/media/releases/2007/02/01_ebi.shtml
Food and Agriculture Organisation of the United Nations:
www.fao.org
The Foundation for Science and Technology
www.foundation.org.uk
Institute of Biology:
www.iob.org
Natural Environment Research Council:
www.nerc.ac.uk
Shell Biofuels:
www.shell.com/biofuels
UK Research Councils:
www.rcuk.ac.uk

Registered Charity No. 274727
Company No. 1327814