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Policybriefing

Current biofuels: bridge or obstacle to sustainable next generation technologies?

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Biofuel trouble – first generation technologies

Debates on the sustainability of biofuels are becoming increasingly polarised. Biofuels re-emerged on the policy agenda in the early 2000s. They are hailed by many as a simultaneous solution in developed and developing countries to the emerging problems of climate change, energy security, and persistent farming sector problems such as declining employment opportunities in the North and rural poverty in the South. The current or 'first generation' of biofuels, which use food crops such as corn, soybean, and oilseed crops as feedstocks, are portrayed by many as a major cause for rising food prices and biodiversity loss. The UN special rapporteur on the right to food, Jean Ziegler, recently even characterised biofuels as "a crime against humanity".

Key messages

1. The sustainability of next generation biofuels is far from self evident.
2. The development of next generation biofuels will be shaped by current government policy and by expectations concerning new technologies – it is therefore essential to get this policy right, now.
3. There is a danger that expectations for this technology will be unduly influenced by powerful vested interests.
4. A policy framework is required that assesses biofuels within a broader context of bioenergy and transport choices, including technical solutions such as electric or hydrogen-fuelled cars as well as demand management measures.
5. Policy must also ensure that current biofuels form a bridge as opposed to an obstacle to next generation biofuel technologies.

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The promise of next generation biofuels

Advanced 'next generation' technologies are being suggested as a sustainable solution to the problems of first generation biofuels. Public and private investments are being directed at research to bring about the technological breakthroughs necessary to make these new biofuels technologically and commercially viable. Research and development in biotechnology and crop science promises to allow conversion of ligno-cellulose (e.g. fast-growing wood or grass species, organic waste) or even algae into biofuels. This could increase productivity per unit of land area by several orders of magnitude as the whole plant, not only its sugary or starchy parts, could be used to produce biofuel. Moreover, the feedstocks could be grown on marginal land, and avoid competition with food crops.

However, it is uncertain whether and when these technologies could become commercially available, and the sustainability of next generation biofuels is far from self-evident.

Uncertainties with new technologies

Most experts expect next generation biofuels to become commercially available in 10-15 years from now. Even if this expectation becomes a reality, cellulose-based biofuel technologies in particular may face significant limitations. The marginal land on which new biofuel crops are to be grown may be marginal from the point of view of intensive agricultural production, but crucial for maintaining biodiversity or rural livelihoods. Next generation biofuels would also be likely to compete for the same feedstocks that would be needed for heat and electricity production to reach EU renewable energy targets. Finally, the costs and pollution associated with the extensive infrastructure required

to collect and transport the feedstock could make advanced biofuels economically unviable and offset their environmental benefits.

Next generation technologies tend to favour large-scale, capital-intensive solutions, hence calling into question their benefits for the rural poor. To be economically viable, schemes based on the exploitation of bulky cellulosic and waste materials require a steady supply of very large amounts of feedstocks. They would therefore be difficult to integrate into community-based bioenergy schemes aimed at poverty reduction and improvement of energy security in rural areas.

Further uncertainties relate to dynamics of innovation, the high political stakes involved, and the competition for public and private resources for research, development and demonstration (RD&D). Different industry and research representatives have vested interests in emphasising the potential and sustainability of their preferred advanced biofuel technologies. The direction of technological development is not decided on a solely 'rational' basis. Instead, conscious lobbying by interest groups and public debate guide choices concerning biofuel support policies and RD&D investments.

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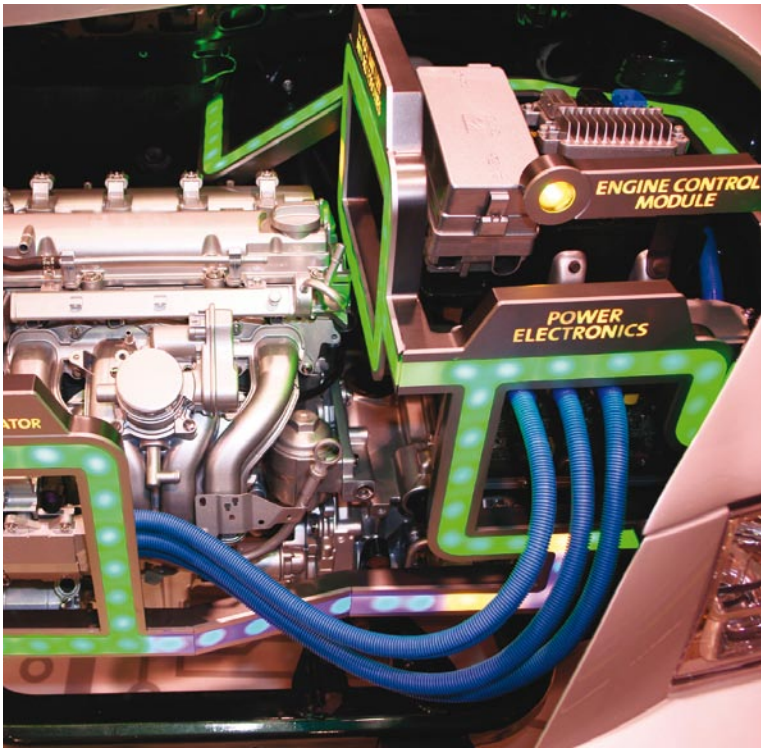
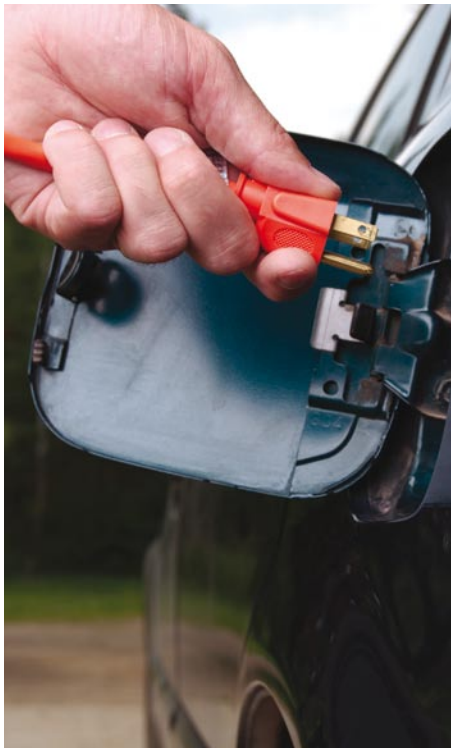
Key questions for assessing next generation technologies

To understand whether next generation biofuels are likely to be more sustainable than those produced using current technologies, it is essential to appraise them within a systemic framework. This must focus on issues such as competition between alternative uses of biomass, the availability of marginal land, and the infrastructure needs of alternative next generation biofuel systems. Since many of the harmful impacts of transport (e.g. congestion) depend on transport volumes, the relative merits of biofuel options must be assessed against alternative transport options, including technical solutions such as electric or hydrogen-fuelled cars, but also demand management measures and innovations in collective transport.

A crucial question relates to the choice of best policies to promote a transition from current technologies to more desirable future technologies. Today's policy decisions are informed by beliefs on whether the current biofuel options are deemed to constitute a bridge or an obstacle to new technologies. Should Government subsidise rapeseed biodiesel today in the hope of thereby accelerating technological progress? Or should all efforts instead be placed in RD&D funding into next generation technologies? Future biofuels are likely to require little change in distribution networks, as long as the final products remain the same – i.e. ethanol to replace petrol and biodiesel replacing oil-based diesel. In this perspective, current biofuels would constitute a 'bridge' by helping to construct the required distribution network. For the agricultural end of the supply chain, however, the situation is different – the plants cultivated for feedstock are not the same, and improving farming practices for today's biofuel crops could turn out to be a wasted investment.

The 'bridge' vs. 'obstacle' debate is strongly influenced by groups with vested interests in one or the other answer. Farmer lobbies frequently argue for continued subsidies for present biofuels, while industry





and researchers developing new technologies often advocate directing all resources into RD&D for next generation technologies.

Ultimately, the criteria by which the sustainability of next generation biofuels is judged largely depend on the power of the different actors to influence the debate. Different groups and individuals have widely varying resources and capabilities not only to shape expectations about future technologies, but also to define the criteria against which the sustainability of any given biofuel pathway should be judged. For example, human rights NGOs emphasising the social consequences of biofuel production may have high public credibility, but poor access to formal decision-making. An international organisation such as the OECD, in turn, is well placed to emphasise economic as opposed to other criteria and, at the same time, is better placed to directly shape government policy agendas. Fundamental differences in worldviews may lead to the sustainability of a given technology, say, large-scale harnessing of genetically manipulated grass species for biofuel production, being judged differently by different actors.

Conclusions

Next generation biofuel technologies are not self-evidently sustainable. Their sustainability depends on technological expectations and the varying ways in which different participants in the debate define sustainability. Public debate around biofuels shapes expectations and steers biofuel support and innovation policies. Ultimately,

these debates are about who has the power to frame the issues, and thereby steer innovation activities and funding, certification schemes, and subsidy policies. Sensible government policy in such a context would seek to keep different options open, and promote a diversity of new technologies. A moratorium on current biofuels would probably not be justified, given the backlash it could generate, the risk of killing the existing industry, and the socially regressive impacts it might have in at least some producing regions. Yet overly ambitious biofuel targets and indiscriminate support for all current biofuels would probably slow down the development of new technologies. There is an urgent need for greater understanding of the innovation dynamics and conditions under which present biofuel technologies could constitute a bridge as opposed to being an obstacle to new technologies.

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