

RSC Submission to the Government's draft strategy for non-food crops and uses in England

The Royal Society of Chemistry (RSC) welcomes the opportunity to comment on the draft strategy for non-food crops and uses in England.

This document represents the views of the RSC and has been put together by our Environment, Sustainability and Energy Forum. The RSC's Royal Charter obliges it to serve the public interest by acting in an independent advisory capacity, and we would therefore be very happy for this submission to be put into the public domain.

The document has been written from the perspective of the Royal Society of Chemistry consequently our comments relate to only parts of the consultation document. However, the chemical sciences and chemical scientists will play an essential role in driving forward technological breakthroughs in the use of non-food crops as chemical feedstocks and as a source of energy.

This response is derived from an RSC report *Benign and Sustainable Chemical Technologies*. See http://www.rsc.org/lap/polacts/benign_report.htm for a full copy of the report.

Summary

- The need for increased levels of funding in chemistry and the chemical science aspects of non-food crops research should be emphasised more explicitly
- High levels of innovation for the conversion of agricultural raw materials into chemical feedstocks and the conversion of biomass into a tailored range of gas and liquid fuels will only be achieved through continuous support of the chemical science base
- The chemical sciences underpin a broad range of life sciences; this critical contribution should be stressed so that the chemical science base in UK is sustained in the long term and thus maximum benefit derived from it
- The RSC takes the view that major developments in the use of non-food crops can only be achieved by a truly multidisciplinary effort and therefore this should be emphasised as a key priority action in future scientific funding

- Government must provide incentives to industry to stimulate the move from feedstocks based on petrochemicals to renewable feedstocks
- Cost effective and efficient use of biomass as an energy source will require the expertise of chemists and engineers. Continued and increased support for the chemical science base must be delivered to realise this change

Overview

Chemistry and the chemical sciences have a pivotal role to play in developing new chemical technologies based on the processing of agricultural raw materials as well as exploiting non-food crops as a source of energy. The Royal Society of Chemistry is pleased to see that the physical sciences are considered as playing a key role in developing applications for non-food crops. However, the RSC would like to see the need for funding in chemistry and the chemical science aspects of non-food crops research stressed more explicitly as a priority for increased research funding.

The RSC agrees with the concept that innovation will be a key cross-cutting theme which must be built into all strategic priorities. Petrochemical processes have provided low cost production routes for fuels, plastics and chemicals for well over 50 years but the escalating impact on the environment and the inevitable future depletion of fossil fuels make it essential that benign and sustainable alternatives be developed cost effectively in the future. High levels of innovation will only be achieved through continuous support of the chemical science base.

The biosciences will play a critically important role in the exploitation of non-food crops. However, the long term health of the life sciences will rely on the strength of physical sciences, and in particular chemistry. This critical contribution should be considered so that the chemical science base in the UK is sustained in the long term with maximum benefit derived from it.

The successful exploitation of plant-derived materials will also rely on the co-operation of numerous scientific disciplines: chemistry, agronomy, biology, biochemistry, biochemical/biomolecular engineering, materials science, process engineering, computer science and mathematics. Many of the key inventions of the next ten years will come about from a multidisciplinary approach. One way to foster multidisciplinary is through major, managed programmes, enhanced by a focused, government-led sustainable sciences strategy. Elements of this should be the

creation of a set of large multidisciplinary research centres (problem-oriented not subject-based). Major developments in the use of non-food crops will be driven by a truly multidisciplinary effort and this should be a key priority action in future scientific funding.

Chemical Feedstocks

Renewable raw materials can be used as chemical feedstocks using two approaches (i) valuable end products are extracted directly (most crops are, after all, rich and complex in terms of their chemistry) or (ii) the raw materials are broken down to relatively simple molecules from which desired end products can be synthesised. In practice both approaches will likely be used, often in combination. The technological challenges then become

- to optimise crops to produce specific end products
- to develop suitable benign and sustainable extraction processes
- to develop the chemistry necessary to synthesis familiar molecules (eg. ammonia) from a new raw material
- and/or develop a new set of chemistry based on the chemicals that are readily available.

Clearly chemistry permeates all of these major challenges. It will therefore be essential for government to initiate relevant research funding to enable ground-breaking research to overcome these technological challenges. The EPSRC's Green Chemical Technology programme is currently funding work in this area with ~ £7M available between 2002 - 2005 for speculative research leading to green chemical technologies which includes developing renewable raw materials as chemical feedstocks. However additional and significantly more support is required to enable major breakthroughs. In the United States, for example, The National Sustainable Fuels and Chemicals Act of 1999 authorised \$49M per year for six years in new Federal funds to "support research focused on improving the fundamental understanding of biomass conversion technologies and environmental impacts and lowering the processing costs by technology advances".

Government must provide incentives for industry to stimulate the move from feedstocks based on petrochemicals to renewable feedstocks. Furthermore, the

provision of these non-food crops need times to be established therefore an appropriate regulatory/subsidy framework should be setup to enable this transition.

Energy Use

Biomass can be used for energy production in heat and power generation and for transport fuels. As for the use of crops for chemical feedstocks, chemists will have a key role to play to allow the government's targets, for establishing biomass as a significant part of a diverse energy portfolio, to be met. We would therefore welcome an explicit commitment to increasing funding for the chemical sciences to enable these targets to be achieved.

Biomass can be converted into energy by three main routes: combustion, pyrolysis and gasification. Although these are established technologies, continual improvements in efficiency with concomitant reduction in costs can only be realised with the expertise of chemists and engineers. Co-firing plants, a means of introducing biomass to the energy sector, will require input from the chemical sciences to understand the effects on fuel performance and subsequently to provide solutions.

To achieve the ambitious targets set out by government, continued and increased support for the chemical science base must be delivered in the above areas. Government must encourage R&D on the use of non-food crops as an energy source and associated technologies by injecting funds and encouraging industry. Benefits include not only significantly reduced environmental impact but also new job opportunities and huge export potential.

The RSC is the largest organisation in Europe for advancing the chemical sciences. Supported by a network of 45,000 members worldwide and an internationally acclaimed publishing business, our activities span education and training, conferences and science policy, and the promotion of the chemical sciences to the public.

For further information please contact:

Dr Eimear Cotter
Manager, Environment, Sustainability & Energy
Royal Society of Chemistry
Burlington House

Piccadilly
London
W1J 0BA

Tel: 020 7440 3333
Email: cottare@rsc.org