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RSC/IChemE Joint Submission to Food Standards Agency's approach to sustainable development in policy making

Memorandum by the Royal Society of Chemistry and the Institution of Chemical Engineers

We welcome the Food Standards Agency's timely consultation on sustainable development in policy making.

The FSA's draft approach to sustainable development in policy making is linked to its remit of 'protecting the interests of consumers in relation to food'. The Agency's Science Strategy identifies 'Choice' as one of six key themes under this remit. In an age of ever-increasing consumer awareness and concern for climate change, the FSA must recognise that food production and the sustainability of the food supply chain (from primary production through food ingredient and product manufacture, distribution and waste) are important factors affecting consumer choice. Whilst the promotion of sustainable food production may not be a primary concern for the Agency, it is important to recognise its impact on the primary objectives of the FSA.

The chemical sciences will contribute to sustainable development across all areas of the food supply chain, including food safety and nutrition. We encourage the FSA to consult more widely within the scientific community so that fundamental science and technology are represented. It is critical to recognise that science and technology both underpin and drive policy to create a sustainable future.

Absent within the 'List of Interested Parties' are the Research Councils, specialist institutes such as Rothamsted, the Knowledge Transfer Networks and Learned Societies (RSC and IChemE). In addition few universities and global players such as Syngenta, Bayer and Monsanto are included.

Currently the RSC and the Institution of Chemical Engineers (IChemE) are writing a report specifically outlining the science and technology requirements for food production and sustainability.

We hope that the first draft of this report will be available for consultation in mid June, with a full document available in September. Obviously this will not coincide with the period of your consultation, but I would like to send you a copy of the report when available.

I would like to register my interest in the FSA consultation, and submit a draft of the RSC/IChemE report: 'Chemical Science Priorities for Food Production and Sustainability' executive summary for consideration. This document should be regarded as a provisional draft and not the representative view of the RSC or IChemE.

The key messages of the document are that problems and solutions in sustainable development are global and that the chemical sciences have a large part to play in understanding the problems and in providing sustainable solutions that are trusted and accepted by consumers.

The RSC is the UK Professional Body for chemical scientists and an international Learned Society for advancing the chemical sciences. Supported by a network of over 44,000 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.

IChemE is the hub for 27,000 chemical, biochemical and process engineering professionals worldwide. We are the heart of the process community, promoting competence and a commitment to sustainable development, advancing the discipline for the benefit of society and supporting the professional development of members

If you would like further information or need anything in this document clarified, please do not hesitate to contact me.

Yours Sincerely

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Draft Chemical Science Priorities for Food Production and Sustainability

Draft Executive Summary

The world is facing a potential food crisis, relating to the sustainability of global food supply and its security.

Climate change and the resultant competition for land use between food and biomass for energy and industrial use balanced against the need for wilderness areas to preserve biodiversity is contributing to what is taking place. Population and economic growth are also major factors. The peoples of the developing world deserve no less an opportunity for food and nutrition security than their counterparts in the developed nations. This together with the new affluence of emerging middle classes in India and China, for example, challenge us to sustain adequate diets for all into the future.

Where will this extra food come from, and how will existing food production and distribution chains meet increased demand? In the short term, supply may fall short of demand but in the longer term, we believe global sustainability of food must come from the application of existing and advancing technology. Much of that technology will involve the chemical sciences.

The Food Chain

This report will consider the impact of the chemical sciences on the entire food chain. By this we mean a set of integrated activities beginning with primary production flowing through food ingredient and product manufacture, to retailer and finally to the eventual consumer[a].

The Chemical Sciences

In this report we define the chemical sciences to include chemistry, chemical engineering and biochemistry. While related disciplines, such as microbiology and genetics, make crucial contributions to the sustainability of the food supply, they are touched on only in relation to the implications they provide for the chemical sciences outlined above.

Sustainability

Sustainability has been defined in terms of meeting present requirements in a way that does not threaten the fulfilment of future need[b]. Currently, and with the demands outlined above, the world's food-supply is not sustainable without the adoption of new technology, business practice and consumer behaviour.

Without urgent action, there is a likelihood of food shortages within a few years. The chemical sciences have a key role in supplying the world's food today, and they have a crucial part to play in making food production sustainable for the future. Without the application of chemistry to agronomy the supply of food would be seriously restricted. For example pest insects, pathogens and weeds reduce crop yields and thereby reduce food and fibre supply. Despite the extensive yearly use of 2.5 million tonnes of pesticides and other control products worldwide, about 40% of all potential crop production is lost to pests[c].

Climate change presents a very great challenge today and in the immediate future, and the operation of the modern food chain is a contributor to the production of greenhouse gases. Understanding, measuring, controlling and reducing emissions from within the food supply-chain requires chemical, biochemical and chemical engineering solutions.

A consequence of global warming is a substantial alteration in the world's weather patterns, for example in the distribution of rainfall. Changing rainfall patterns will require shifts in agricultural practice.

In addition some intensive agricultural methods are detrimental to the capacity of the soil to grow food. This is exacerbated by increases in intensive livestock farming, to supply the increased demand for meat products in newly affluent economies. Meat represents poor value compared to crops in terms of energy conversion into food.

Implications for the Chemical Sciences in a Sustainable Food-Supply

Chemical sciences will be needed to ameliorate risks to supply, and to increase production efficiency in all stages of the food supply chain. The demands placed on the environment must be taken into account: use of land, sea and air; use of fresh water and energy; and the treatment of waste must be sustainable to secure a lasting supply of food – and this all requires new chemical technologies.

Chemistry can also contribute to the understanding of how an individual's physiology makes use of food when eaten, so that the requirements of personalised nutrition can be applied.

Consumption of alternative sources of protein to meat will be significant. For example fish and crustacea produced locally by aquaculture, together with alternative protein sources can be developed with the contribution of new chemical technology. This change in eating habits has to be part of a comprehensive restructuring of mankind's relationship with the planet if the food-supply is to be sustainable.

In summary, in all the sectors of the food chain, a broad spectrum of disciplines with a common theme of chemical science will need to come together – principally chemistry, chemical engineering and biochemistry, but also genetics, microbiology, and mathematics.

Barriers to Sustainability

There are two pressing issues for the future. The first relates to the problem of supply of food to the hungry, and the second to maintaining the safety of the food supply to those with enough.

Whilst food scarcity is a problem in the undeveloped world, the developed world sees issues arising that relate to excess production and consumption. Despite the increasing awareness of the consumer that diet and long term health are related, obesity and its deleterious effects on health are increasing.

In the developed world, there are barriers to the sustainable production of food, built by our own demands for increasing ‘quality’. For example in the developed world:

- The narrowing of specifications by major retailers generates a very large amount of waste in primary agriculture. Fruit and vegetables must look perfect, and the restricted choice of cuts of meat mean that some edible parts of animals are wasted.
- In current conditions of surplus supply and relatively cheap food, the cost of waste food is minimal in the modern household.
- With surpluses in production and distribution, the food industry is driven by competition for consumers' attention.
- Consumer mistrust of genetically-modified food in the EU has resulted in avoidance of a technology that may improve sustainability.
- Regulations are encouraged to ban substances on the basis of hazard. Intrinsic hazard is not a good measure of the actual threat that a substance poses to humans or the environment. Risk (which is a function of both hazard and exposure) is a better measure because it is based on the likelihood that an intrinsic hazard associated with a substance will cause actual harm.

The Future

There are many chemical technologies that can be harnessed and developed to improve food production and sustainability, but these will have to be applied within the broader context of climate change and careful planning for the future of the planet. Scientists will have to step back from the bench and learn to think in terms of population and policy. They will have to capture the imagination of teachers, children, and the public and to influence politicians into funding their work and adapting their policies.

Leadership should come from the learned institutions, which will need to work together to provide scientific authority and common guidance. Government should see its role as an enabler not an inhibitor of the virtuous circle, in which the need to maintain a choice of foods for a varied and healthy diet, drives industry to explore new sustainable technology and science to discover and create the necessary knowledge and solutions.

The structure of this report

This report outlines the implications for the chemical sciences in the sustainability of food production over the next 20 years. It takes a panoramic view, choosing breadth of coverage rather than depth of analysis. Many of the areas touched upon will benefit from detailed studies of their own, and it is hoped that this report will act as a stimulus for further research.

Objectives, Scope and Perspective of the Report

The objectives of the report are to:

- Define what is meant by sustainable food production;
- Identify where the chemical sciences can have a key role in ensuring sustainability of food production; and
- Contribute to the awareness of the importance of the chemical sciences in ensuring sustainable food production.

The scope of the report is global: it is focussed on the UK and EU to inform UK and EU policy in a global context.

The perspective is one of technology in the chemical sciences:

- Current technologies that presently contribute to the sustainability of food production;
- Emerging technologies that hold promise for continued sustainability; and
- Technologies, yet to be created, that we might we wish to see in 20 years' time for sustainability in the long term.

The Approach Adopted in this Report

The investigation of the sustainability of food production has taken the following form:

- Establishing a conceptual framework to represent food production in the context of sustainability;
- Developing the framework into categories of the food supply-chain, its inputs, outputs and external factors;
- Developing a questionnaire for use in structured interviews with experts in academia, industry and food industry associations;
- Structured interviews were carried out between January and March 2008, with contributions from 51 organisations. The interviews were structured to:
    - identify the issues relating to sustainability,
    - discover technologies that could apply,
    - analyse the implications for the chemical sciences;
- Desk-research was conducted in parallel with these interviews to support the findings.

Chemical science applications

Technologies applicable to each sector in the food supply chain can be found in Table 1 (available on request only). This table also identifies the underlying science and technology disciplines necessary to provide these applications.

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[a] Progress through Partnership: Food and Drink (1995), 7, HMSO ISBN 0 11 430121 2

[b] Brundtland, G. H. *et al.* (1987) Our Common Future: Report of the World Commission on Environment and Development. See www.worldinbalance.net/agreements/1987-brundtland.html.

[c] Pimentel D (1997) Techniques for Reducing Pesticides: Environmental and Economic Benefits. Chichester, UK: John Wiley.