The Green Food Project

A response to the Department for Environment Food and Rural Affairs

31st May 2012

The **Society of Biology** is a single unified voice for biology: advising Government and influencing policy; advancing education and professional development; supporting our members, and engaging and encouraging public interest in the life sciences. The Society of Biology is a charity, and seeks to champion the study and development of biology, and provide expert guidance and opinion. The Society represents a diverse membership of over 80,000 - including practising scientists, students and interested non-professionals - as individuals, or through the learned societies and other organisations listed in the Appendix.

We are committed to ensuring that we provide governments and other policy makers - including funders of biological education and research – with a distinct point of access to authoritative, independent, and evidence-based opinion, representative of the widest range of bioscience disciplines.

Headlines

1) **An ecosystem service based analysis would provide a robust framework to account for the environmental impact of food production, and would encourage the development of sustainable production and consumption in the UK.**

2) **It is important to develop a unified approval system for Genetically Modified crops and livestock that has the people's confidence, and does not inhibit the development of improved sustainability or small scale farming.**

3) **Education about agriculture and the promotion of careers in plant science and agriculture must start earlier. A review of the Biology A-level curriculum may be the best opportunity to enthuse a new generation about agriculture, the food industry and environmental management.**

4) **Agriculture should aim to supply a wide range of goods and services beyond the production of food and non-food commodities. Ecosystem service analysis at suitable scales will assist with proper planning and development decisions.**

5) **The embedded costs of foods to the consumer's health and the environment are not currently accounted for. Legislation restricting advertisement of fast food, taxation and subsidies are measures which are strongly supported by medical researchers.**

6) **Improved education of consumers on the strict definitions of "use-by" and "best-before" dates on supermarket food is needed to help further reduce food wastage. As significant sections of the public remain unfamiliar with the sources and processing of their food, it is important to separate concepts of 'quality' and 'safety' in people's minds.**

Question 1: The food system

Q Can the existing UK food system meet the challenge of increasing food production and improving the environment over the next 30 to 40 years? If not, what changes would need to be made?

A In terms of food production, improving access to food that is nutritious as well as sufficient (i.e. nutrition security)[1] is a key challenge for the UK to meet. Nutrition security must be achieved by ensuring that the allocation of resources is correctly balanced between crops and livestock, and by an urgent but considered approach from Government to deliver integrated policy to combat avoidable waste, unsustainable and unhealthy consumption and damaging agricultural practice. A recent report from the Royal Society on the interaction between people and their environment has highlighted the need to reduce consumption through sustainable use of resources[2].

In order to feed a growing world, a multi-disciplinary approach is needed to address challenges at the production and post-production stages of agriculture; to reduce waste throughout; ensure well-functioning global markets; enable risk management to reduce the effects of volatility, and improve education of consumers to reduce demand and combat unhealthy diets. Water stress, poverty, increasing oil prices, rising energy demands and perverse incentives drive agricultural unsustainability, and further compromise food security. An inclusive policy framework and implementation strategy addressing all these drivers is needed. Greater investment in scientific research throughout the farm to fork chain will be vital in the much-needed transformation of our food supply systems and in placing them on a more sustainable footing.
A sustainable intensification strategy is needed to increase production per hectare, without negatively impacting on the environment. Sustainable agricultural practices taking account of water and energy efficiency, nutrient efficiency, and the reduction of pesticide use, waste and greenhouse gas emissions, will help both low and high income countries to adapt to changes in global food supply and maintain affordable food prices. Existing practices that support this approach should be encouraged, and made more freely available, particularly in low income countries.

There should be thorough accounting for the environmental impact of food production to encourage and enable sustainable production and consumption to develop. **An ecosystem service based analysis would provide a robust framework for this accounting and subsequent planning and policy development, including pricing.**

Question 2: Innovation and technology

Q Producing more, from less is likely to require smarter science, new technologies and creative approaches. What are some good examples of this in action, and how can investment help to make progress in the future?

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[1] *Food safety is critical to nutrition security*, Science and Development Network, January 2010 (http://www.scidev.net/en/opinions/food-safety-is-critical-to-nutrition-security.html)
[2] *People and the planet*, Royal Society, April 2012 (http://royalsociety.org/policy/projects/people-planet/report/)

A Research into new technology at all stages of food production and distribution is needed. Innovative advances that increase productivity and resilience to pests and spoilage, and new methodologies for better soil management should be supported. Biotechnology has an increasingly important role in crop improvement and productivity. Reliable harvests depend upon resilient crops and maintaining the diversity of crop genetic resources is essential to build this resilience; crop research and breeding have a vital role to play in delivering this goal.

With advances in technology, there will be numerous approaches that can be put to use. Genomics assisted breeding currently makes a very important contribution to food production. For some applications, particularly for traits that are controlled by a few genes, Genetic Modification (GM) is likely to remain an important approach that we cannot afford to ignore[3]. While improved agricultural practice and farmland management are essential to increasing production and efficiency, GM biotechnology can also play a role in crop improvement. GM crops are being developed that have higher yields, can grow with less fertiliser, are tolerant to: increased drought, flooding, temperature extremes, pests and pathogens or reduced soil quality; or have more nutrients (biofortified crops with enhanced micronutrients to combat nutritional deficiencies), all of which have the potential to make a dramatic effect on food production in the developing world. The majority of GM crops currently grown have been modified to provide resistance to insect pests or tolerance to benign herbicides. This enables a more targeted and efficient use of agrochemicals together with the associated benefit of 'conservation tillage'.

Not all GM technology is employed for profit-driven applications in large-scale farming; there may be however, a general impression that GM and large-scale industrial food production are synonymous. However, when the technology is delivered in the seed, it can be considered as a 'scale-independent' way of delivering the benefits.

Whilst it is proper to maintain regulatory control, a wealth of experience and experimental data from national academies, governments and regulatory authorities has shown that the use of GM techniques presents no particular or novel hazards beyond those already encountered in agriculture[4].

GM can and should be used to improve the efficiency of large-scale production. It can also be employed to improve the climatic resilience and nutritional content of food produced in the developing world and by small scale farming. However, the current system for approval for GM crops is seen as being very expensive and cumbersome, in stark contrast to approval for conventionally bred produce which may have very similar properties. This restricts the types of food, the applications, and the organisations likely to deploy GM approaches. Switching to a product-based method of approval, rather than the current process-based approach would streamline the approval system. This would enable regulators to avoid problems with future-proofing the definition (the EU is facing difficulties with this now[5]), and provide greater clarity to those involved in GM research and development.

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[3] *"Genetically modified" crops, feed and food*, The Biochemical Society, (http://www.biochemistry.org/LinkClick.aspx?fileticket=qf3Zm6MDTmw%3d&tabid=491)

[4] *A decade of EU-funded GMO research*, European Commission, July 2010 (http://ec.europa.eu/research/biosociety/pdf/a_decade_of_eu-funded_gmo_research.pdf).

[5] *New plant breeding techniques. State-of-the-art and prospects for commercial development,* The Institute for Prospective Technological Studies, May 2011 (http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=4100)

The Advisory Committee on Releases to the Environment (ACRE) has discussed adopting a process-based approval system, and employing a more holistic approach to managing the footprint of agriculture[6]. We strongly endorse the findings of this report. **It is important to develop a unified approval system for crops and livestock that has the people's confidence, and does not inhibit the development of improved sustainability or small scale farming.**

While there are currently no GM livestock in the food chain, promising developments in GM animal research are emerging[7]. We support the development of risk assessment guidelines by European Food Safety Agency[8], as an important step towards evidence-based policy in food production. Additionally, non-GM approaches such as improved conventional breeding programs and the conservation and use of crop wild relatives will play an important role in ensuring long-term food security.

Question 3: Skills

Q How do we make sure we have a steady supply of skilled and entrepreneurial people entering careers in the agricultural, food manufacturing and environmental fields to make sure we are equipped for the future?

A Greater investment in all forms of agricultural training and research is needed. Currently there is an insufficient pull-through of suitably qualified and skilled young people to ensure a healthy pipeline. Research and the training of individuals directed towards delivering and monitoring sustainable agriculture, and translating research into evidence-based agricultural policy and practice are essential.

Establishing, implementing and achieving a sustainable agricultural policy will be entirely dependent upon skilled and trained people across all sectors from farm workers, agronomists, breeders and machinery producers to researchers and policy-makers.

In addition, continuing development opportunities and on-going training are needed in both policy and practice. For example, an extension service for farmers to help with ecosystem service-based analysis and practice has been proposed.[9]

Education about agriculture and the promotion of careers in plant science and agriculture must start earlier. A review of the Biology A-level curriculum may be the best opportunity to enthuse a new generation about agriculture, the food industry and environmental management.

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[6] *Managing the Footprint of Agriculture: Towards a Comparative Assessment of Risks and Benefits for Novel Agricultural Systems*, Report of the Advisory Committee on Releases to the Environment (ACRE), 2007 (http://webarchive.nationalarchives.gov.uk/20080727101330/http://www.defra.gov.uk/environment/acre/fsewiderissues/pdf/acre-wi-final.pdf)

[7] *Improving livestock*, Parliamentary Office of Science and Technology, October 2011 (www.parliament.uk/briefing-papers/POST-PN-393.pdf)

[8] *Genetically modified animals*, European Food Safety Authority, February 2012 (http://www.efsa.europa.eu/en/topics/topic/gmanimals.htm)

[9] Valuing our life support systems Symposium Report p28 Available at http://www.naturalcapitalinitiative.org.uk/valuing-our-life-support-systems

Question 4: Land Use

Q A number of important results – food production, climate change mitigation, renewable energy, biodiversity, natural resource protection and so on – depends on decisions we make about land. How should we manage and use land so we can achieve all these results? What are good ways of achieving consensus on land management and use?

A We should achieve a balance, where the most agriculturally productive land is used predominantly to generate saleable products, aiming at improved outputs with lower inputs (with due regard to animal welfare, and minimising pollution); and less productive land is managed to provide a greater range of public goods.

Agriculture should aim to supply a wide range of goods and services beyond the production of food and non-food commodities. These include social benefits such as employment and recreation in the rural environment, and environmental benefits including landscape management, increased biodiversity, water purification, flood protection, the maintenance of fertile soils, and sustainable cycling of carbon, nitrogen and phosphorous.

Ecosystem service analysis at suitable scales will assist with proper planning and development decisions. Ensuring land users and owners, key service providers (e.g. water and energy industries), and product consumers (e.g. business, retailers and end consumers) are fully aware of all the ecosystem service costs and benefits of their land use decisions is important. This will also serve to highlight where public goods are at risk, or should benefit.

Both incentives and regulations have a role to play in optimising land use decisions. There is a pressing need for greater awareness that almost none of the UK landscape is natural, rather it is managed for agricultural and conservation purposes. Better education at all levels is required to introduce an appreciation that good management of land is crucial, and can be part of an exciting and relevant career.

Question 5: Diet and consumption

Q The food we eat affects both our health and the environment. How can we encourage people to eat a diet that is balanced and sustainable?

A Obesity rates are predicted to rise from 25% to 40% by 2030 in the UK. Treating obesity-related illness currently costs the NHS £4 billion per year, and the projected cost of increasing obesity rates is an extra £2bn a year (the equivalent of 2% of the NHS budget).

Achieving healthy behaviour in consumers is a complex challenge but can be addressed in a number of ways through educational and financial measures. These measures must take into account external factors such as cultural, social and economic context and existing behavioural trends influencing producer and consumer behaviour.

Improved education about the negative effects of a poor diet on personal health and the wider environment is important. Early-stage intervention in schools can be effective, but must be sustained in order to prevent relapse into unhealthy eating[10]. Government and charity-backed educational initiatives would therefore need ongoing support.

A significant amount of meals consumed in the UK are supplied by caterers. We are pleased to see that the recommendation to provide nutritional information on catered food[11] has been implemented in the recent drive to cut calories from the national diet[12].

The embedded costs of foods high in salt and fat to the consumer's health and the environment are not currently accounted for but could be tackled either by voluntary measures, by regulating their production, through levies or taxation at market.

Legislation restricting advertisement of fast food, taxation and subsidies are measures which are strongly supported by medical researchers[13].

Question 6: Waste

Q We waste 15 million tonnes of food, worth £17bn, in the UK every year. How can we tackle this across the whole food chain?

A Globally, an estimated 30 - 50% of food grown is wasted in production processes, and after it reaches consumers. Food waste contributes to consumption of freshwater and fossil fuels, land and other essential resources.

Globally, less than 5% of agricultural research funding currently targets post-harvest systems[14]. Addressing food waste 'from farm to fork' will involve finding sustainable solutions to: spoilage from pests and disease, spoilage during storage, distribution, marketing, product shelf-life and consumption patterns. Improved research in this area could reveal ethical and economically viable avenues to a sustainable food supply. Increased consumption supports increases in GDP which appear favourable but overconsumption and associated waste belie the true cost and create a false impression of economic activity. Behaviour change towards less wasteful practice, re-use and recycling can help with this.

For example, the *Love Food Hate Waste*[15] initiative from the Waste & Resources Action Programme (WRAP)[16] offers practical help and advice to consumers on reducing waste. Similar activities across the food chain may help drive down levels of waste.

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[10] James et al., *Preventing childhood obesity: two year follow-up results from the Christchurch obesity prevention programme in schools (CHOPPS),* BMJ, 2007 335:762
[11] *Review of Science in the Food Standards Agency*, Society of Biology, May 2008 (http://www.societyofbiology.org/policy/consultations/view/18)
[12] *Calories to be capped and cut*, Department of Health, March 2012 (http://nds.coi.gov.uk/content/detail.aspx?NewsAreaId=2&ReleaseID=423852&SubjectId=2)
[13] *The Obesity Series*, The Lancet, August 2011 (http://www.thelancet.com/series/obesity)
[14] Kader A, Perspective on postharvest horticulture, HortScience, 2003 38, 1004–1008
[15] Love Food Hate Waste (http://england.lovefoodhatewaste.com)
[16] Waste & Resources Action Programme (www.wrap.org.uk/wrap_corporate/about_wrap/index.html)

We strongly support Defra's scrapping of "sell-by" and "display until" labels on supermarket food. However, **improved education of consumers on the strict definitions of "use-by" and "best-before" dates on supermarket food is needed to help further reduce food wastage.** As significant sections of the public remain unfamiliar with the sources and processing of their food, it is **important to separate concepts of 'quality' and 'safety' in people's minds** with regard to such messages and we do not believe that this has yet been achieved.[17]

Question 7 – England's strengths

Q Where are England's key strengths in food production and where do we lead the way on environmental protection? Where might we have untapped potential that we could develop over the next 30 to 40 years?

A A key strength in England at present is the development of ecosystem service analysis and valuation. The National Ecosystem Assessment was a ground-breaking UK-wide study of ecosystem value and trends. Building on this foundation, and drawing on the underlying strengths of long-term environmental data collection in the UK could allow England to develop exemplar practices and policies.

Question 8 – Make a suggestion

Q What have we not covered here that you would like the Green Food Project to consider?

Food Security and Climate Change

The relationship between issues of food security and climate change is complex; agriculture both contributes to, and is affected by climate change. The carbon footprint of the food sector is higher than that of trains, planes and vehicles combined[18]. Agriculture and food production are also vulnerable to the effects of climate change. Increasing global temperatures, flooding, drought, pests and disease will decrease crop yields and agricultural productivity. Growing seasons will also change as regional climate patterns change, increasing yields in some regions and harming them in others.

The transition to a low carbon economy may also impact upon food security. Oil prices and competing demands for energy affect food prices through higher fertiliser and transport costs at a minimum. Non-fossil fuel energy alternatives such as biofuels compete with food crops for land use, and can significantly increase global food prices.

Given the inseparability of issues around climate change and food production, an ecosystem approach to agriculture is valuable[19]; it allows consideration of existing supporting, provisioning and regulating services

[17] *A response to the Government Office for Science review of the use of science in the Food Standards Agency*, Society of Biology, May 2008
[18] *Sustainable Food*, WasteWatch, (www.wastewatch.org.uk/pages/sustainable-food.html)
[19] *Valuing Our Life Support Systems*, Natural Capital Initiative, May 2009 (www.naturalcapitalinitiative.org.uk/sites/default/files/docs/090429/nci_summary_lo.pdf)

and accommodates robust species and habitat protection. An ecosystem approach[20] should be interdisciplinary and allow room for adaptive policy management to ensure maximum nutrition production alongside maintenance of the high nature value of managed habitats[21] for long-term productivity.

Reform of the Common Agricultural Policy (CAP)

We would like to highlight points made in The Society of Biology Position Statement on the Reform of the CAP[22]:

An effective Common Agricultural Policy (CAP) will allow Europe to maintain security of food production, viable rural communities, and the resilient ecosystems and natural resources upon which we depend for survival, without damaging economies and environments outside Europe. The Society of Biology believes that the current CAP does not meet these objectives effectively and should be reformed.

1. The CAP should achieve a balance between the economic, social and environmental benefits of agriculture.
2. There should be no public subsidy without public goods.
3. Valuation of ecosystem services and natural capital is essential, so that their protection and management can be properly supported by the policy.
4. Only if farming is economically sustainable can we expect farmers to deliver the non-costed ecosystem services upon which our survival relies.
5. Research, knowledge and trained people are vital to define, develop and deliver sustainable agriculture and effective agricultural policy.
6. The CAP needs to enable investment and incentivise resource-use efficiency.

Threats to food security

There is a high likelihood of continuing threat to food security from infectious disease of livestock. Recent viral and vector-borne diseases such as Foot and Mouth Disease, Bluetongue, Bovine TB and Schmallenberg have highlighted the potential threats facing UK livestock. The prevalence of these issues is likely to increase with climate change. Meanwhile, the balance of Defra's funding portfolio has relatively under-resourced the basic research needed to deal with these problems[23]. **Defra should seek to increase basic research funding in its Evidence Investment Strategy to ensure the capability of the UK to respond effectively to the food and economic security threat posed by livestock disease.**

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[20] *Managing the Footprint of Agriculture: Towards a Comparative Assessment of Risks and Benefits for Novel Agricultural Systems*, Report of the Advisory Committee on Releases to the Environment (ACRE), 2007 (http://webarchive.nationalarchives.gov.uk/20080727101330/http://www.defra.gov.uk/environment/acre/fsewiderissues/pdf/acre-wi-final.pdf)

[21] *Opportunities in agriculture research*, The Millennium Ecosystem Assessment, 2006 (www.fao.org/docs/eims/upload/218977/Rudgard-MApresGFAR.pdf)

[22] *Reform of the Common Agricultural Policy (CAP),* Society of Biology, 2011 (http://www.societyofbiology.org/policy/consultations/view/44)

[23] Society of Biology Comments on Defra R&D Cuts, May 2001 (http://www.societyofbiology.org/newsandevents/news/view/309)

This consultation response was developed through contributions from members and Member Organisation representatives as well as specific written comments from The Biochemical Society, The Genetics Society, and individual contributions from Professors John Brookfield, Pat Goodwin, Keith Gull, Rosemary Hails, Ottoline Leyser, and Graham Seymour.

We are pleased for this response to be publicly available and will place a version on www.societyofbiology.org. For any queries, please contact policy@societyofbiology.org

Appendix

Member Organisations represented by the Society of Biology

Full Members

Agriculture and Horticulture Development Board
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Association for the Study of Animal Behaviour
Association of Applied Biologists
Biochemical Society
Biosciences KTN
Breakspear Hospital
British Andrology Society
British Association for Lung Research
British Association for Psychopharmacology
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British Ecological Society
British Lichen Society
British Microcirculation Society
British Mycological Society
British Neuroscience Association
British Pharmacological Society
British Phycological Society
British Society for Immunology
British Society for Matrix Biology
British Society for Medical Mycology
British Society for Neuroendocrinology
British Society for Parasitology
BSPB – British Society of Plant Breeders
British Society for Plant Pathology
British Society for Proteome Research
British Society for Research on Ageing
British Society for Soil Science
British Society of Animal Science
British Toxicology Society
Experimental Psychology Society
Fisheries Society of the British Isles
GARNet
Gatsby Plants
Genetics Society
Heads of University Centres of Biomedical Science
Institute of Animal Technology
Institute of Horticulture
International Biometric Society
Laboratory Animal Science Association
Linnean Society of London
Marine Biological Association
MONOGRAM – Cereal and Grasses Research Community
Nutrition Society
The Rosaceae Network
Royal Entomological Society
Royal Microscopical Society
Science and Plants for Schools
Scottish Association for Marine Science
Society for Applied Microbiology
Society for Endocrinology
Society for Experimental Biology
Society for General Microbiology
Society for Reproduction and Fertility
Society for the Study of Human Biology
SCI Horticulture Group
The Physiological Society
Tropical Agriculture Association
UK Environmental Mutagen Society
UK-BRC – Brassica Research Community
UK-SOL – Solanacea Research Community
University Bioscience Managers' Association
VEGIN – Vegetable Genetic Improvement Network
Zoological Society of London

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