Shaping a UK strategy for agri-tech: response form

The Department may, in accordance with the Code of Practice on Access to Government Information, make available, on public request, individual responses.

All comments are welcome but we particularly encourage submission of evidence from institutions, organisations and representative bodies with an interest in this topic.

The closing date for this call for evidence is Thursday 22 November 2012 by 14.00 hours.

Please return this completed form to:

Email: lsas@bis.gsi.gov.uk

Postal Address:

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Please describe the organisation that you represent and outline your reasons for responding to this call for evidence

Please tick the box from the below list that best describes you.

	Business representative organisation/trade body
	Central government
X	Charity or social enterprise
	Individual
	Large business (over 250 staff)
	Legal representative
	Local Government
	Medium business (50 to 250 staff)
	Micro business (up to 9 staff)
	Small business (10 to 49 staff)
	Trade union or staff association
	Other (please describe

Please write here your name/ the name of your organisation and contact details if you wish to. This would help us to contact you if we have further questions.

This response was prepared by the Society of Biology, and the Society's special interest group the UK Plant Sciences Federation.

Please contact Society of Biology Policy Officer Jackie Caine, or UK Plant Sciences Federation Executive Officer Dr Mimi Tanimoto for more information.

1. The aims and objectives of the Agri-Tech strategy are outlined above in the introduction to this call. Please give your views on:

    a. The need for and potential benefits of having such a strategy.

We agree that change is urgently needed to address the challenge of food security in a growing global population. A long-term, comprehensive, and sufficiently supported strategy will be crucial to best utilise the UK's world leading research base and provide sustainable solutions to these challenges.

A strategy is needed to provide a focus on agri-technology, coordinate and support research and innovation, link expertise and overcome barriers to the

commercialisation of research. Additional anticipated benefits would include preparedness for exceptional food security problems, and improved economic returns from the commercialisation of research. Sufficient support for research and development in this hugely important area of food security holds real opportunity to contribute significantly to economic growth in the UK.

A strategy involving BIS, Defra and DFID and the devolved administrations would assist in improved planning and avoid unintended policy outcomes.

b. The appropriateness of the objectives proposed.

We welcome the development of a strategy that encompasses the full agri-food research chain. However the proposed objectives begin at the research laboratory which is already some way along the pipeline. If UK agri-tech research is to maintain its current pre-eminence, the supply of skilled and knowledgeable researchers will also need attention, with training and recruitment as key.

Strategic investment into high priority training and research areas will be necessary to achieve the objectives. However a long term vision should also recognise the potential for innovation to stem from non-strategic research and that maintaining a broad fundamental research base in both universities and research institutes will be crucial to sustain knowledge transfer and expertise, and deal with new agricultural challenges as they arise.

c. Desired outcomes and indicators of success of the strategy, and the role for Government in enabling delivery of these.

Outcomes and measures of success:

- Growth of the UK agri-tech business sector, including more successful UK start-up enterprises and increased R&D activity in the UK from international companies.
- Improved knowledge exchange and more collaborative partnerships within the UK and internationally.
- More innovative and effective products of UK agri-research reaching application.
- Increased contribution from the agri-tech sector to UK economic growth.
- Increased agricultural outputs from less land with fewer harmful outputs and less waste, and the development of crop varieties with improved resistance to disease and environmental stresses.
- Improvement or at least maintenance of biodiversity and natural capital.

- Improved dialogue with the public resulting in the industry and academia understanding and addressing public priorities for, and concerns about, agri-tech.
- Securing the UK supply of food for reasons of national security.
- Growth in agri-related exports and inward investment in R&D.

Government Role:

- Investment to support basic research and knowledge transfer partnerships between academia, research institutes and industry.
- Ensuring the UK remains internationally recognised as a research location for excellence in agriculture R&D.
- Creating a business arena that supports UK agri-tech start-up enterprises and encourages international companies to have an active R&D base in the UK.
- Development of a long term funding strategy that reflects the realistic timeframe for research programmes, new enterprises and knowledge transfer partnerships to generate useful outputs.
- Providing an education and training strategy to build a skilled workforce across the agri-food chain. This must recognise areas of declining skills and realise that academic institutions and research institutes require stable funding across all their remit to maintain the skills needed to deliver a well-rounded education.
- Ensuring that regulation of GM and other technologies is proportionate to risk, evidence-based and addresses both public concerns and real-world challenges. Where appropriate, promoting the technology and ensuring it is seen in the context of the breadth of plant technologies.

d. Any potential drawbacks / unintended consequences associated with these outcomes and how these could be mitigated.

We can see no potential drawbacks; however Government should be prepared to address public concerns about GM and other technologies, and be aware of the need to ensure that a suitably informed dialogue can take place about the potential benefits, risks and needs. The strategy should support public engagement on this and other technological and ethical issues without compromising research.

2. What in your view are the current strengths and weaknesses of the UK agricultural technology sector? Please provide evidence in support of your responses.

The strength of the UK agricultural technology sector lies in its world leading

research and network of research institutions. However, our leadership position is threatened by the expanding number of researchers globally, particularly in emerging economies such as China, and by our relatively declining rate of national investment in research. Particularly important for the agri-tech strategy is the decline in the agricultural research over the last 20 years as a consequence of it being assigned a very low priority. This resource must be sufficiently supported to realise its significant economic potential.

The agri-tech sector is relatively small, and recent company and research institute site closures are concerning. The resulting lack of specialist expertise to provide training at the Higher Education level is very likely to become a serious weakness in the future. The strategy will need to address these long-term issues, which will be vital to attracting international business to the UK.

With regards to agri-tech, the narrow eligibility criteria for publicly-funded research, provides little opportunity for crop pre-breeding (i.e. the identification and integration of desirable traits into cultivars that breeders can use in breeding programmes) within academia. Within academic institutions and research institutes the relevant research assessment exercises give priority to high level academic publications, resulting in a disincentive to working on agricultural science and its application. Both approaches need to be equally valued.

One of the greatest weaknesses is the lack of support for translational research. Improved mechanisms are needed to link research in universities and research institutes to industry- and farmer-led work on practical applications. Moreover, demonstrating the impact of transitional research through the Research Excellence Framework is difficult due to the time scales involved and the risk of practical application turning out not to be viable.

Regulatory barriers in the UK (and Europe) along with GMO legislation mean that other countries are becoming attractive as sites for this type of research.

There are issues around business development expertise, academic recognition, Intellectual Property and early stage investment and risk that combine to create barriers to the commercialisation of research in the UK where pathways to production are long. These are discussed fully in the Society of Biology's response to the Government inquiry into improving the commercialisation of research, here: http://www.societyofbiology.org/policy/consultations/view/70 .

3. How do you think the ability of the agri-tech sector to bring growth to the UK economy could best be facilitated or supported by Government working with the industry? Please cite/suggest appropriate mechanisms and measures to attract new revenues to the agricultural technology sector, that are feasible, value for money and effective; while paying attention to UK, EU and global finance available for agricultural science.

It is important that financial support and incentives are made available to plant breeding initiatives that do not typically sit within SMEs, because of the high cost, long timescale and associated risks of breeding programmes.

Specific, significant investment should be introduced through the Common Agriculture Policy into research on and dissemination of methods for sustainable intensification across the UK, and the diverse farming systems and geographical variety of Europe.

To encourage agri-tech companies to invest in UK research, Government should work with researchers and industry to ensure that GM approaches are considered as one of the available tools alongside all other options for crop improvement.

Government should support appropriate intellectual property and patent strategies that are appropriate for the agri-tech sector, and set realistic funding terms for tech transfer. Government should also consider making VAT exemptions applied to medical research available for publicly funded research addressing food security issues.

4. What is the potential and what should be the role of technology in addressing the needs of UK farmers, and meeting the challenges of global food security and the increasing demand for non-food bio-renewable products and resources? This would include new technologies (such as nanotechnologies, robotics, remote sensing), modern biotechnology techniques (such as genomics analysis, cloning, GM) and engineering solutions. Please provide examples where technologies may be particularly transformative in their impact, and how research skills in these may be enhanced.

Investment in research and technology development should take into account the fact that different problems may be answered by different technologies and that a diversity of solutions is required to minimise risk and maximise effectiveness in the wide range of current and future environments. Agri-tech solutions need to be linked to whole farm system analyses to ensure that the correct limiting factors have been identified.

Plant breeding has a vast capacity to deliver higher yielding crop varieties that require less chemical application and have improved nutritional content, resistance to disease/pests and the ability to cope with adverse climatic conditions.

Advances in genomics allow rapid genome sequencing and high throughput, molecular screening for advantageous crop traits (marker assisted selection)

providing faster and more cost-effective methods for crop breeding.

New high throughput methods for analysing physical plant traits (phenomics) allow researchers to rapidly screen large populations of plants for desirable characteristics to incorporate into crop breeding programmes. The National Phenomics Centre at Aberystwyth University is the UK's first centralised plant phenomics platform, which provides an important resource for overcoming one of the main bottlenecks in crop breeding and pre-breeding. The UK's investment in Systems Biology should be exploited to analyse complex traits in crop species and be linked to genetic and phenotypic resources. Innovation in bioinformatics resources for crop scientists to rapidly and fully exploit available information using entry points that suite the user (plant breeder, molecular biologist, ecologist, systems biologist, etc.) is a key opportunity.

GM approaches can offer advantages over other breeding methods – particularly in cases where an agronomically important trait (e.g. disease resistance) cannot be introduced into a crop variety by conventional breeding techniques, or whereby the desired outcome is not be achievable within a suitable time frame.

An increasing number of novel plant breeding techniques including accelerated breeding, gene replacement and targeted mutagenesis, present potentially useful tools for breeders to develop new crop varieties with improved characteristics under a shorter timescale. However, as with GM, the extent to which the UK is able to capitalise on these methods will rely on appropriate regulatory measures that provide a low risk, economically feasible route to commercialisation.

The efficiency of breeding programmes could be facilitated by the development of publically available genetic and genomic resources for widely used UK crop varieties, avoiding duplication of research between different breeding companies. Resources could include germplasm collections (including mutant and transgenic populations), and annotated genomic sequence, transcriptome, mapping and phenotypic data.

However, this topic is far wider than plant (and animal) breeding. Synthetic biology offers scope for producing a wide variety of innovative bioproducts including foodstuffs for humans and livestock, pharmaceuticals, oils, plastics and bioenergy from a range of feedstocks including current wastes and algae in addition to conventional materials. Anaerobic digestion is an important technique for processing wastes and generating energy but further research is required. Improved biocontrols such as biopesticides, novel synthetic fertilisers, inoculants and soil conditioners such as biochar all offer potential for sustainably increasing crop yields or enhancing the resilience of farming systems.

5. What do you think are the main barriers to the achievement of the proposed strategic objectives and how do you think they might be overcome?

Indirect impacts of agri-tech policy must be considered. These include health outcomes (e.g. food nutrition vs. food bulk) and other outputs of agricultural activity, for example biodiversity impacts, soil and air quality impacts, carbon sequestration, marine and freshwater quality implications. These could be helpfully assessed under an ecosystem services analysis framework.

There is also a need to facilitate conversations across the agri-tech industry and end users, and to better engage the public about the need for sustainable food production processes and the potential of appropriately regulated GM research.

The UK Plant Sciences Federation has started to address these issues, bringing together the plant science community in the UK and aiming to create a coordinated approach to research, industry, funding, education and outreach in this vital sector of the biosciences.

This community-led initiative has real value for the realisation of the agri-tech strategy objectives, and we would be pleased to meet with Government to discuss how we can work together.

For more information, see: http://plantsci.org.uk

Please let us know if you/your organisation would like to be considered to take part in future activities that may arise as a result of the implementation of this strategy

Yes

If so, please write here your name/ the name of your organisation and your contact details

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Glossary

Genomics analysis

Genomic analysis involves looking for differences in the DNA that makes up the genes of different organisms. It enables the identification and selection through conventional breeding of genes that are associated with beneficial features of an organism e.g. disease resistance in crops or in an animal.

GM
GM normally involves the insertion of genes carrying a specific trait (eg pest resistance) from one organism into another. This introduction can be novel genes from the same species (cisgenics), or from another species (transgenics), individually or in small groups.

Cloning
The production of genetically identical organisms.

Remote sensing
The observation and analysis of agricultural land or livestock without the need for manual handling. For agricultural land this can be done from aircraft or satellite to assess and map features such as crop yield or diseases. Information from remote sensing can be used to increase farm management practices and animal welfare.

Nanotechnology
Nanotechnologies can be thought of as any technology which either incorporates or employs nanomaterials (e.g. carbon nanotubes) or involves processes performed at the nanometre scale. A nanometre is one billionth of a metre, around 80,000 times smaller than the diameter of a human hair.

Robotics
The engineering of machines to perform farming tasks automatically and autonomously e.g. GPS guided crop spraying, detection and mechanical removal of weeds or crop pests, automated milking of cows.

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