



COUNCIL FOR
SCIENCE AND
TECHNOLOGY

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Dear Prime Minister

GM technologies

When you met your Council for Science and Technology (CST), you asked about: (i) the evidence relating to the risks and benefits of GM technologies, and (ii) what might be done to raise the quality of debate, decision-making and regulation at UK and European levels.

The evidence

In the UK we have limited agricultural land supply. We need to increase the productivity of the land to optimise crop production in a way that causes the least damage to the natural environment. We can currently afford to buy all the food we need on the open market. We cannot continue to take this for granted. The food security challenges facing the global population (one quarter of which is malnourished) are even more significant. The world population is projected to increase from about 7 billion people in 2012 to over 9 billion by 2050.¹ Climate disruption and population growth are increasing pressures on food supply. Staples such as rice and wheat are subject to rising costs and price volatility, with crop failures due to disease and erratic weather conditions. If we fail to get more from the land in a sustainable way, the world must face the alternatives: people will go unfed, or more wilderness land will need to be brought under cultivation.

Science, engineering and technology can help solve these challenges. This is illustrated dramatically by a series of continuous experiments that have been running at Rothamsted Research Institute for 170 years. Wheat provides about 20% of the calories consumed by humans. Wheat yields at Rothamsted have increased eightfold from about one tonne per hectare in 1843 to about 8.4 tonnes per hectare today. This improvement is due to the application of science: improving plant nutrition, soil mineral content, fertiliser use, the application of herbicides and the development of new varieties. Rothamsted research is now aiming to increase wheat production to 20 tonnes per hectare in the next 20 years.

¹ United Nations. Department of Economic and Social Affairs. Population Division. World Population Prospects The 2012 Revision, Highlights and Advance Tables. (2013).

GM technologies can play an important part by breeding plant characteristics that:

- help farmers of all kinds manage their land, or reduce costs by growing crops that resist insect attack, or are tolerant of specific weed killers, or extreme weather conditions, such as drought;
- enhance the nutritional value of foods for humans and animals, including maize and soya with increased levels of amino acids or improved oil composition, reducing the need for dietary supplements;
- provide a production base for renewable industrial compounds (eg biodegradable plastics) and pharmaceutical products (eg vaccines).

Examples of current research illustrate the extraordinary potential of GM technologies. Rothamsted is testing whether a GM wheat engineered to express an aphid alarm pheromone² will deter aphid infestation, reducing the need for pesticide application. Researchers at the John Innes Centre are developing crops that can access nitrogen from the air in order to improve yields: this could substantially reduce the cash and the carbon costs associated with providing nitrogen through artificial fertiliser.

The CST endorses the 2009 Royal Society report, “Reaping the Benefits” as a sound basis of evidence on GM in food production.³ We asked a team of experts led by the Chair of the group behind the report, Professor Sir David Baulcombe, for an up-to-date assessment of developments in the science related to GM crops. His team’s paper will be published shortly and early sight of the work has informed our comments here. The European Academies Science Advisory Council⁴ (EASAC, whose summary paper we attach) notes that, after over fifteen years of cultivation, there is no compelling evidence of any greater risk to humans, animals or the environment than that associated with conventional crops.

We should have confidence in the consensus on the scientific evidence which concludes that, when properly controlled, GM products are as safe as their conventional counterparts. Despite this growing body of evidence, the EU framework for the regulation of (i) field trials and (ii) commercial release of GM crops remains more stringent than that applied to conventionally bred plants. Furthermore, the approvals process for commercial cultivation has proved slow and inefficient. **We support the conclusion of the EASAC report that the EU regulatory process needs to be rebalanced to reflect the evidence.** It suggests that the regulatory framework should be reframed to focus on products rather than technologies, and on risk-benefit rather than risk alone.

The UK’s plant science is world class and we are well placed to develop tools that would enable the whole world to tackle the global challenges of food security. We should take every opportunity to reveal the strength of UK science and encourage inward investment. The EU is currently hostile to growing GM crops, but the UK can still benefit significantly in developing innovations that the rest of the world will use.

We need the right regulatory framework that will encourage continued research into solutions to current and future problems facing UK agriculture. GM may be the only solution to a particular problem (as with the disease “take-all” in wheat⁵) or one of several:

² A chemical signal produced by aphids, warning other aphids of danger.

³ *Reaping the Benefits: Science and the Sustainable Intensification of Agriculture*, Royal Society, 2009: <http://royalsociety.org/policy/publications/2009/reaping-benefits/>

⁴ *Planting the future*, 2013.

⁵ Take-all is a serious soil-borne fungal disease that affects cereals’ roots. It is estimated that half of UK wheat crops are affected and that they suffer average yield losses of 5-20%. Source: HGCA

either way, we need a well-regulated environment that encourages UK field trials to evaluate the efficacy of new GM crops.

GM applications promise a range of strategic economic, environmental and international development benefits. There are potential competitive benefits for the UK in tackling some of the obstacles to their development. **Government, industry, NGOs and the research community should tackle the barriers preventing properly sanctioned field trials from taking place.**

Building trust: improving the quality of debate

There remains public concern regarding the implementation of GM technologies in crop production, in stark contrast to the use of GM technology for drug development, which has been implemented globally with minimal opposition. The scientific evidence will only go so far: We recognise that some sections of the public are either unconvinced by the scientific evidence they have seen, or doubt the motives behind it. Building trust must be a priority; this leads us to highlight five factors.

First, there needs to be clear benefit and use to the consumer or citizen. It is difficult to talk of food shortages in the western world, when the average consumer sees supermarkets with shelves loaded with foods from every part of the globe. **Most consumers of food are unaware of the challenges of food production and distribution. It would help if food producers and retailers were more open about these challenges.** The case must be made that food developed from GM is the product of sustainable agriculture, is of the highest nutritional quality, and can meet the needs of communities in different parts of the world.

Second, it is not accurate or helpful to talk about GM generically. Advocates and opponents have both, at times, been guilty of over-generalisation. The message must be that each genetically modified plant needs to be considered specifically. "GM" is neither intrinsically safe nor unsafe. The questions are always: what plant? what genetic modification? for what purpose?

Third, effective regulatory frameworks must ensure and be seen to ensure that there has been a proper consideration of the hazards, risks, uncertainties and benefits in each case. The transparency and consistency of the way in which these issues are handled and communicated in pharmaceuticals regulation may help explain the wide acceptance of GM-based technologies in this non-food context.⁶

Fourth, we must not overclaim. GM is just one of many technologies that we need to apply alongside good governance and regulation to achieve the combined aims of feeding global populations and good stewardship of our planetary environment. Other key approaches include the application of genomics for more effective plant breeding, the development of selective herbicides and pesticides, better fertilisers, improving our soil science, and more efficient and effective irrigation.

Our final point is that the quality of debate is substantially enhanced if we acknowledge the different ways in which citizens very properly approach complex issues. Questions of value are at the centre of the debate. Fairness in the distribution of risks and benefits is critical to the acceptability of any new technology and a key factor in persuading many opponents will be reassurance that the benefits of GM will flow to those that need them, as well as to the companies who own the intellectual property. Many opponents are not in fact concerned by GM in itself, but by corporate control of the food chain. An automatic association of the

⁶ Claire Marris, 'Public views on GMOs: deconstructing the myths', *EMBO Reports*, 2011, vol. 2, no. 7.

concept of GM with multinational corporations needs to be challenged: the application of philanthropic funding by the Gates Foundation for GM research of direct benefit to small farmers is a case in point.

These are important issues, and we should not allow debate on the science to obscure them. Equally, we need to avoid technical issues becoming vehicles for social concerns.

Government, industry and the scientific community each have a role to play in explaining the technology, its benefits and how it is regulated. Others, including retailers, NGOs and the media, all have a duty to ensure that the debate reflects the evidence accurately. Wider concerns, which go beyond the scientific evidence, need to be acknowledged and addressed.

Debate and decision-making within Europe present a particular challenge. Current EU regulatory and market access problems are hampering the development of crops for EU markets and farmers. The recent withdrawal by BASF of EU applications relating to the use of a GM product (a blight resistant potato which would have been of value to British farmers) is a stark illustration of the problem. This risks denying us access to innovations we will need, now and in the future, and the export of intellectual and commercial capital away from the EU, including UK scientists, damaging the UK research sector.

We know from the example of soya that when deployed successfully, GM crops can lead to the exclusion of their non-GM counterparts from the global market. The longer the EU continues to oppose GM whilst the rest of the world adopts it, the greater the risk that EU agriculture will become uncompetitive, especially as more GM crops and traits are commercialised successfully elsewhere. **The UK should continue to call loudly for science- and evidence-based decision making on this issue.**

Other Relevant Initiatives

The Royal Society is now considering a thematic programme on the intensification of agriculture. Topics being considered include: "feeding the planet", "biofuels", "plant health - learning from public health", and the use of risk-based approaches. This could include events involving partners across Europe. As part of the UK's G8 Presidency, David Willetts and Paul Nurse co-chaired a successful meeting of Science Ministers and heads of national science academies. One area of follow up is a further event to exchange insights from science-based horizon scanning between G8 members on food security and food system policy, including the role of major positive "game changer" technologies such as GM.

We will continue to work on this topic, which is important for security, well-being and growth. We are, of course, happy to provide further briefing. (If you have an opportunity in the future, the researchers at Rothamsted would, of course, be delighted to show you their world-leading and historic research).

We are copying this letter to the Deputy Prime Minister, Owen Paterson, Vince Cable, Justine Greening, David Willetts, and Sir Jeremy Heywood.

Yours sincerely
MW

Sir Mark Walport
Co-Chair

Nancy Rothwell

Professor Dame Nancy Rothwell
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