

# Planting the future: opportunities and challenges for using crop genetic improvement technologies for sustainable agriculture

Agriculture faces major challenges to deliver food security at a time of increasing pressures from climate change, social and economic inequity and instability, and the continuing need to avoid further loss in ecosystem biodiversity. The introduction of new European Union (EU) legislation requiring farmers to reduce reliance on crop protection chemicals creates additional challenges for maintaining levels of crop productivity. The production of more food, more sustainably, requires the development of crops that can make better use of limited resources and must harness the potential of biotechnology in all its facets.

In this report, the European Academies Science Advisory Council (EASAC) explores some of the issues associated with the genetic modification of crops, where the EU has fallen behind in its adoption of the technology, compared with many other regions of the world. There is concern that a time-consuming and expensive regulatory framework in the EU, compounded by politicisation of decision-making by Member States and other policy inconsistencies, has tended to act as an impediment to the sustainable intensification of agriculture. Previous work by member academies of EASAC has documented where there is excellent, relevant science to be nurtured and used, and the problems that have arisen because of the failure to use science to inform the modernisation of regulatory approaches to benefit-risk assessment. The goal of the present report is to clarify the implications for policy-makers of alternative strategic choices in using the tools for delivering sustainable agriculture. Our analysis of international evidence draws on (1) a case study comparison of several countries in the Americas and Asia who have taken a different path by their decision to adopt genetically modified (GM) crops more actively, and (2) a collaboration with the Network of African Science Academies to assess the evidence that European influences have sometimes constrained the use of crop genetic improvement technologies in Africa.

The EASAC Working Group also provided detailed evaluation of a broad range of current issues within the EU, relating to regulatory reform, consequences for the science base and new technology development (particularly, the New Breeding Techniques), public engagement, intellectual property and open innovation, increasing environmental

challenges, the potential food crop pipeline and new applications for the bioeconomy. The EASAC Working Group reached four main conclusions, with extensive implications for ascertaining greater coherence in policy-making. These are described below.

**1. Land use and innovation:** the EU needs to increase its production and productivity of plant-derived biomass for food, feed and other applications, thereby decreasing dependency on imports and reducing the regional and global environmental impact. Biotechnology for crop improvement must be part of the response to societal challenges. The EU is falling behind new international competitors in agricultural innovation and this has implications for EU goals for science and innovation, and for the environment as well as for agriculture. There is need to improve public awareness of the scientific, environmental, economic and strategic issues to help support better informed individual choices, national political debate and EU priority-setting.

**2. Regulation:** in common with other sectors, the aim should be to regulate the trait and/or the product but not the technology in agriculture. There is no validated evidence that GM crops have greater adverse impact on health and the environment than any other crops developed by alternative technologies used in plant breeding. There is compelling evidence that GM crops can contribute to sustainable development goals with benefits to farmers, consumers, the environment and the economy. Action is needed to unify and harmonise the regulatory and innovation-enabling roles of the EU policy-making institutions and to ensure that regulation of the outputs of all the crop genetic improvement technologies has a firm foundation in sound science.

**3. Promoting competition:** the current slow and expensive regulatory situation surrounding GM crops in the EU encourages monopolies. It is important to explore ways to stimulate open innovation and reformulate the regulatory framework to encourage smaller companies and public sector activities, to create the desired flexible and dynamic competition within the EU. Plant breeding regulations should not hamper the interchange of science and technology nor stifle innovation and entrepreneurship in small- and medium-sized companies and in the public sector.

**4. The global context:** EU policy actions influence the developing world and the wider consequences need to be taken into account when assessing EU strategic options. Establishing the necessary policy coherence between EU domestic objectives and a development agenda based on partnership and innovation is important for the developing world as well as for Member States.

EASAC judges that the potential benefits of crop genetic improvement technologies are very significant and capturing these benefits should be a matter for urgent attention by EU policy-makers. EASAC stands ready to continue playing its part in stimulating further debate. Our recommendations identify the need for action across a broad front, as follows.

**Regulatory framework:** GM crop breeding objectives must be better integrated with other current strategies, for example Integrated Pest Management strategies. The regulatory framework for crop genetic improvement technologies must be reformulated appropriately to be science-based, transparent, proportionate and predictable, taking into account the extensive experience gained and good practice implemented worldwide. There is need for urgent action to agree the status and regulation of New Breeding Techniques

and, in particular, to confirm which products do not fall within the scope of legislation on genetically modified organisms.

**Public engagement:** the scientific community must clearly articulate the consequences of research findings and the opportunities for agricultural innovation.

**Research and development:** opportunities created by Horizon 2020, the European Research Council and European Research area are extremely valuable for pursuing priorities in plant sciences and related disciplines. Additional, infrastructural issues to tackle in support of innovation include the support for skill provision and researcher career development, collaboration between the public and private research sectors and between the EU and developing countries.

**International partnership:** the EU can learn from the rest of the world in characterising and implementing good regulatory practice, while it must also acknowledge the impact of its policies and perspectives on the rest of the world.

**The full report is available from the EASAC website:** [www.easac.eu](http://www.easac.eu).

## EASAC

EASAC – the European Academies Science Advisory Council – is formed by the national science academies of the EU Member States to enable them to collaborate with each other in providing advice to European policy-makers. It thus provides a means for the collective voice of European science to be heard.

Its mission reflects the view of academies that science is central to many aspects of modern life and that an appreciation of the scientific dimension is a pre-requisite to wise policy-making. This view already underpins the work of many academies at national level. With the growing importance of the European Union as an arena for policy, academies recognise that the scope of their advisory functions needs to extend beyond the national to cover also the European level. Here it is often the case that a trans-European grouping can be more effective than a body from a single country. The academies of Europe have therefore formed EASAC so that they can speak with a common voice with the goal of building science into policy at EU level.

Through EASAC, the academies work together to provide independent, expert, evidence-based advice about the scientific aspects of public policy to those who make or influence policy within the European institutions. Drawing on the memberships and networks of the academies, EASAC accesses the best of European science in carrying out its work. Its views are vigorously independent of commercial or political bias, and it is open and transparent in its processes. EASAC aims to deliver advice that is comprehensible, relevant and timely.

For more information about EASAC and for copies of all our previous publications, please visit our website [www.easac.eu](http://www.easac.eu).