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Revamp of UK CRISPR regulation needs public trust

The United Kingdom is considering innovative ways of regulating gene editing in food and farming. Robust processes and public confidence will be vital for success.

Thirty years ago, few would have dreamed of Nigel Halford's wheat.

On 26 February, the plant biologist at Rothamsted Research in Harpenden, UK, and his colleagues unveiled a line of wheat plants that produce less of an amino acid, known as free asparagine, that can serve as the precursor for acrylamide. This is a chemical that has been linked to cancer and is formed when some foods are fried, baked or toasted (S. Raffan *et al. Plant Biotechnol. J.* https://doi.org/10.1111/pbi.13573; 2021). So far, the wheat has not been tested in the field, but the hope is that flour made from it could be used to bake breads that produce less acrylamide when toasted.

To create their low-asparagine wheat, the researchers used the genome-editing technology CRISPR to do something comparatively simple: they created small changes – often deleting a snippet of DNA – in the gene responsible for asparagine synthesis.

Did Halford and his colleagues modify the wheat genome? Technically, yes, because they changed the plant's DNA. But should the wheat be called 'genetically modified', or 'GM wheat'? The European Union thinks so, but many geneticists say that, with the advent of tools such as CRISPR, gene editing should no longer be synonymous with GM.

Historically, definitions of GM technology in agriculture have referred to transgenics, the insertion of foreign genes into plant cells, often with no control over where those genes land in the genome. These are among the reasons why commercialization of GM technology is effectively banned in the EU. But many researchers say that most current applications of gene editing using CRISPR produce the kinds of change that could have been achieved by conventional breeding, just much more efficiently.

The UK government is broadly in agreement with this view. And now, because of Brexit, it has an opportunity to diverge from EU regulations. In a consultation that ends on 17 March, the UK government's Department for Environment, Food and Rural Affairs (DEFRA) is proposing that gene-editing technology should not be regulated in the same way as GM, if it yields a result that could have been produced by conventional breeding.

In seeking to reclassify gene editing, the United Kingdom must also learn from its own past experiences. One reason why Europe has, so far, resisted commercializing gene technologies in food and farming is because such technologies have evoked public concern around safety and environmental impact. At the very least, the UK government must avoid a narrative that the change is about cutting red tape or de-regulation – because that could suggest that safety and other concerns are not being taken seriously. Such a narrative could, in turn, impede research and development of an important new technology.

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The United Kingdom is not alone in proposing to change its laws in this way. Other countries have been updating regulations to accommodate agricultural products created using genome-editing tools. Some, such as Argentina, Brazil and Japan, have developed a system in which gene-edited products are categorized on the basis of how they were modified, and decisions are made on a case-by-case basis.

Before regulations are changed, the UK government should consider a number of actions. First, it should consider commissioning independent evaluations of the safety and environmental impact of using CRISPR technology in agriculture and food. These could be farm-scale studies of gene-edited crops, similar to those that DEFRA's predecessor department carried out in the late 1990s on GM crops (A. M. Dewar *et al. Outlooks Pest Mgmt* **16**, 164–173; 2005). The department then was not promoting new technologies, as DEFRA is now. To avoid any perceived conflict of interest, it would be better for such studies on gene editing to be commissioned by a separate body, such as the UK Food Standards Agency – which is linked to the Department of Health and Social Care – working with researchers from universities or independent research institutes. Such actions will help to reassure people that their concerns are being taken seriously.

If the United Kingdom does decide to change its regulatory approach to gene-edited crops, it should work constructively with the relevant EU authorities and share knowledge of its assessments, so that other countries and authorities can benefit from these insights. Low- and middle-income countries, for example, will be less able to research or commercialize gene-editing technology – as is the case with GM – unless the EU, one of the largest markets for their exports, similarly changes its approach.

The United Kingdom must consult thoroughly and globally, and researchers and regulators must dive deep into the urgent questions being asked. In addition to consumers, there are organic farmers who might have concerns about cross-pollination of their crops; there are concerns about animal welfare – whether, for example, the development of gene-edited, disease-resistant animals could lead to more agricultural intensification. At the same time, food producers need to know whether or what kind of labelling will be needed; and UK exporters will need to know how any changes to UK regulations will affect trade with Europe and countries elsewhere.

The UK government has an opportunity to create an innovative new system for regulating gene editing in food and agriculture that is scientifically sound. It must do so in a way that respects the independence of the regulatory process, because, among other things, that will be key to bringing the public with it.