

How Brexit will impact the future of farming, GMOs and gene editing in Britain and Europe

Now that the United Kingdom has voted to leave the European Union (commonly known as the Brexit), scientists in Britain and across Europe—as well as trade partners in the United States and around the world—are trying to assess the impact of Brexit on agricultural biotechnology.

Sentiments against GMOs and gene editing are strong across Europe. Although every major science organization in Europe, including the European Commission and the major science academies of every EU nation, have issued statements [endorsing the safety of GMO crops](#), European public opinion is decidedly negative, particularly in France, Belgium, and Germany. For many years, regulations in the European Union have stymied the development, import, and especially cultivation of crops classified as genetically modified (GM). The EU has granted only one license to grow a GM crop commercially—an insect resistant strain of corn grown in limited quantities in Spain and Portugal. That was 15 years ago.

Despite this, in many European countries, while [cultivation of GM crops is prohibited, imports are permitted](#). The heartland of European GM restriction is France, Germany, Italy, Greece, Belgium and Norway, but even these countries allow imports. Europe is the world's largest regional importer of GMO grain—used in animal feed. GMO corn is grown in Spain and Portugal.

More recently, views of the British people began trending towards supporting more crop biotechnology research and embracing more innovation. Did this growing divide play a role in the Brexit vote? Perhaps. Although British farmers strongly supported the 1975 referendum to become part of the common market, the opinion of Brussels has soured since. Pre-vote surveys indicated that UK farmers were [decidedly pro-leave](#)—more than 60%—in part because of what they saw as European politicians meddling in the way they farm.

“Distance from government in the end breeds contempt or distrust,” said Michael Seals, a beef and row crop farmer in Derbyshire and spokesman for the pro-Leave group Farmers for Britain. “We feel very, very remote from Brussels.”

British farmers point to political attempts by EU states to block the renewal of the widely used herbicide glyphosate and a previous EU decision to ban neonicotinoids despite evidence that their use has [not contributed to bee hive number declines](#), as activists have claimed.

UK officials were strongly in favor of reauthorizing glyphosate for 15 years—the European Commission decided on June 27 to back an 18-month reauthorization after a bitter political battle in which anti-GMO countries pushed for a complete ban. Britain was also not one of the roughly half of EU member countries who decided to ban the cultivation of GMOs.

“GM technology, the fact that it’s outlawed in the EU, is a complete anachronism; we need that to go forward,” Seals said. Crop production is about as efficient as it will get without the help of biotechnology, but “there is no limit on what we could achieve if we were given the freedom” to use GM crops, he added.

“It is certainly the case that European legislation ... is essentially blocking all biotechnology cultivation in Europe,” [said](#) Huw Jones, a geneticist at Rothamsted Research, based in Harpenden, Hertfordshire, who was instrumental in a series of GM wheat trials that sparked high-profile protests.

What does crop biotech establishment think about Brexit vote impact?

It may be tempting to think that the vote to leave may end up opening the door to approving more GM crops, but it’s not clear that that will necessarily be the case. Yes, GM-minded farmers in England and Wales may have voted for Brexit rationalizing that it might facilitate increased use of GM seeds, but the vote to leave appears not to have been the norm among the broader science and biotech communities. Their more cautious perspective is grounded in the harsh political realities of transnational research and trade: further advances, both scientific and economic, depend on global integration, which for the UK depends strongly on European integration.

The British science establishment is also not convinced that leaving the EU will meaningfully spur British GMO research or new crop introductions. Scientists, seed manufacturers, and the crop industry, much like industry in general, tend to dislike uncertainty. Trade differences, exacerbated by nativist political divisions, could end up freezing innovation even more.

The British science community in general has also benefitted from EU funding flows, which are now likely to dry up, at least in part. [According to the BBC](#), Britain’s science sector has received €8.8 billion in research funding from 2007-2013 versus the €5.4 billion it paid in over the same period. And, writes BBC, UK-based scientists have won about a fifth of all the grant dollars from the top-tier programs run by the European Research Council.

Scientists are also not one issue voters; many have had qualms about the EU’s position on GMOs or crop protection chemicals, but otherwise might have been wary of severing the long-standing political links because of other issues. Scientists tend to be liberal minded people with global perspectives and are wary of nativist sentiments. They may fault the EU for aligning with ideologically motivated NGOs on GM food policy, but the GM issue is just one of a plethora of their concerns.

To follow up on the BBC report, the Genetic Literacy Project talked with several UK scientists over the last few days and found that all were concerned about the Brexit vote and its still unclear impact. For a start Britain may now be unable to export any of the GM crops it might grow into Europe, its biggest trading partner. They also noted that the UK imports 40 percent or more of its food from the continent, so it will never be able to go alone on food related issues, and will almost certainly seek to harmonize its agricultural policies with continental Europe.

“If you’re growing potatoes then you want to be able to sell French fries and crisps throughout the EU and you wouldn’t be able to [if the UK is not part of the EU]”, noted plant scientist Professor Jonathan Jones of

the Sainsbury Laboratory.

The biotech-savvy people that we spoke with believe that with a 'separation' at least two years away, the intervening time could be marked by indecision and murkiness. Political parties in the UK are in disarray, which means that any moves on a controversial issue such as GMOs, a comparatively minor issue, would be put on the back burner.

In reaction to Brexit, EuropaBio, which promotes biotechnology to industry, politicians, regulators, NGOs and the public, issued the following statement:

While respecting the decision of British voters, EuropaBio and its members are deeply concerned with the result of the UK referendum to leave the European Union. As witnessed since this result became clear, we are entering a period of uncertainty and unpredictability for the EU economic and political system that may have effects both on the biotech industry in Europe, and on the broader European business community.

... The priority for our industry is that once the decision to leave the EU is confirmed, the negotiation period is completed with a focused eye on limiting detrimental effects on the competitiveness and regulatory ecosystem of the biotech industry and of innovation on both sides of the Channel.

As a European industry association, EuropaBio is also concerned about any knock-on effect on the focus on European competitiveness and on the unity of the European Union as a whole. In the context of calls for similar referendums and upcoming national elections in a number of European Member States, we would like to reiterate the positive value of European unity in terms of economy, political stability, competitiveness and integration.

British GMO innovation prospects

Public opinion in the British Isles over the last decade [has been softening on GM and genetic editing technology](#). Fewer people are focused purely on potential risks and more are seeing benefits. In 2003, 42 percent of Brits saw the risks of GMOs as being greater than the benefits, but by 2011 this [opposition had decreased](#) to 27 percent. Former UK Environment Minister Owen Paterson and Prime Minister David Cameron have been vocally supportive of GMOs since 2012 and were responsible for helping to develop the new EU compromise that goes into effect this spring. In 2013, a [letter](#) to the prime minister signed by UK chief scientific advisor Mark Walport and co-chair Nancy Rothwell of the Council for Science and Technology, noted Britain's split from the continent's anti-GMO views:

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.

Another sign: in 2015, Lord John Krebs, son of the famous Hans Adolf Krebs—a giant in the history of biochemistry, for whom the Krebs Cycle is named—[advised that GM crops could be more sustainable](#), more green, less provocative of climate change, partly because of the potential for more efficient land use, but also because of GMO crops are often grown without tilling. [No till farming](#) results in dramatically less carbon dioxide released into the air compared with tillage agriculture, including organic farming.

Not all parts of the UK are equally as embracing of GMOs, however. Outside of England—in Northern Ireland, Scotland, and Wales—there are strong objections to GM crops.

Even before English public opinion and public policy had begun to shift, scientists had been developing various home grown GM crops, although they recognized that they might never be grown commercially inside the country. The [John Innes Centre](#), for instance, has been on the forefront of wheat research, creating new crops capable of absorbing large amounts of atmospheric nitrogen thereby avoiding the need for nitrogen fertilizer. This type of research has made the Centre one of world's top biotech incubators. The Rothamsted Institute is testing a [wheat variety](#) genetically engineered to express a pheromone that will deter aphid infestation and reduce the use of pesticides.

The idea that Brexit would either facilitate work at UK agricultural research centers like John Innes or Rothamsted, or help farmers wishing to grow and sell more GM crops, is offset by the fact that the UK had already begun going its own way on GM and GE technologies, despite its membership in the EU. The EU passed legislation in 2015 that allowed Britain to tack differently than the anti-GMO continent on some issues. The agreement permitted any member country to decide on its own whether to grow GM crops as long as the European Food Safety Authority approved. That had given UK scientists, farmers, and food suppliers some degree of leeway to introduce GM foods. After the split is negotiated, they can proceed without Brussels looking over their shoulders.

The UK government could also decide to expand support for biotechnology research. Scientists may find it easier than it is currently to conduct trials and work with industry. However, a [recent analysis in the UK's INews](#) suggests that the difference from the current situation are not likely to be significant, because research is regulated mostly on the national level, not the EU level in the current system.

Penny Maplestone, chief executive of the British Society of Plant Breeders, also pointed out that it is unlikely that Britain would ever become a powerhouse in the kind of commodity crop production of soybeans, corn, and cotton that have propelled North American and South American growers.

“Our major crop here is wheat, predominately winter wheat and that is not really a GM product in the rest of the world,” Maplestone [said](#). GM crops are highly specialized, with researchers going to considerable

lengths to tailor them to the local climate and growing conditions. This means that UK, or English, farmers would not simply be able to take a variety from North or South America—the main areas where GM isn't banned but with completely different climates and pests to worry about—off the shelf and use those.

“Because of our maritime climate, we grow wheat really well but the varieties are actually quite specific to the UK—maybe with a little bit of a crossover with northern France and a little in Germany. We're not growing hybrid corn, we're not growing soya beans, or cotton—none of those big global biotech crops.”

Brexit and gene editing

Brexit is unfolding at a time when Europe and many other countries are debating how or whether to regulate CRISPR gene editing and other [New Breeding Technologies](#) (NBT). Newer breeding techniques offer scientists an easier way to do cisgenic breeding—involving no “foreign” DNA being introduced into the crop, which has long been the chief concern of GMO critics. NBTs do not fit neatly into any of the GMO definitions crafted by the various regulatory agencies around the world. Its proponents say gene editing is similar to mutagenesis, which is not regulated in the US or Europe (there are hundreds of mutagenized crops sold as organic), but faster and more precise.

The regulatory process remains fluid. The US Department of Agriculture determined in April 2016 that it would not regulate a [mushroom](#) and a [new type of corn](#) genetically modified with the gene-editing tool CRISPR–Cas9, making them the first gene edited crops to be approved by the US government. The British and European science establishments hope their regulatory agencies will take the same flexible approach.

“[The prospect for genetic modification] can potentially get better or potentially get worse [in Europe],” said Maurice Moloney of the Global Institute for Food Security earlier in June. “Probably, the test case is going to be genome editing.”

NBT innovations could mute the vitriolic debate over GMOs. If regulators decide that NBTs are not GMOs, new genetically modified plant and animal varieties could begin appearing within a few years in many countries, including in the EU states opposed to GMO crops, as these technologies are far more efficient than classic transgenic breeding.

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