Survey

Citizen's Attitudes to Genome Editing in Food & Farming

September 2020

Contents

Methodology

The *Citizen's Attitudes to Genome Editing in Food and Farming* survey was an online survey undertaken (May to August 2020). The total survey population was 267, and all respondents were required to answer all questions.

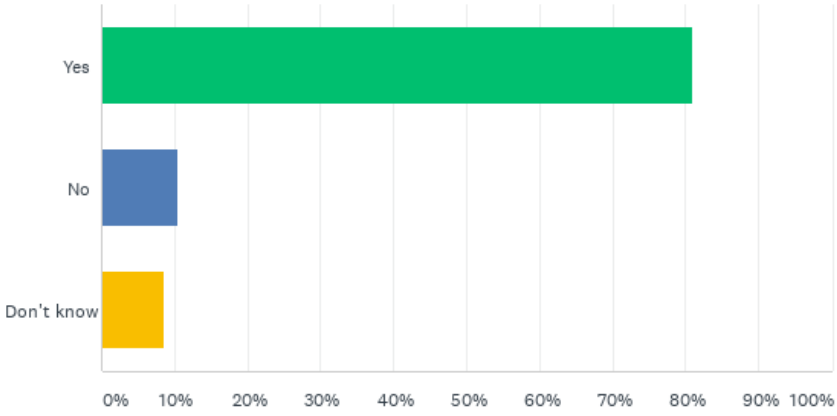
The survey population was drawn from readers of the online Ecologist magazine and newsletter, as well as from A Bigger Conversation and Beyond GM social media accounts. This was not a randomised sample of the British public, and hence cannot be said to be representative. Nevertheless, we felt, that it would reveal useful data on the perspectives of citizens who are likely to have some awareness of and engagement with the issue. This is evident from the survey results.

Participants were given the opportunity to leave comments and clarifications on most questions and many had 60+ comments. The sheer number of comments left (784 in total) suggests that this is an issue that the public is keen to engage with. Within the comments there was a great deal of repetition; some comments were just a few words, a few were incoherent, and sometimes answers given in one section make better sense considered in relation a different section.

We will be delving more deeply into the comments at a later stage. In this short report, we report on broad findings and have endeavoured to incorporate the general themes highlighted for each section in the conclusion.

Results

Q1 Do you have a 'position' on genome editing? If so, what is it?



Just over four fifths of the survey respondents (81% or 216 respondents) answered 'Yes' to this question, with the remainder responding 'No' or 'Don't know'.

As noted above, given how the survey population was constructed, the high percentage of respondents with an opinion on the issue is unsurprising. 202 respondents took the time to elaborate on their position, with some writing long considered paragraphs. Only a very few commented that they were uncertain of what 'genome editing' was (and this is reflected in answers to Q3).

The responses varied across the spectrum from *"an absolute no-go always"* to *"All impediments to their universal development and distribution should be immediately set aside"*.

Ninety-six comments raised clear concerns to the use of genome editing in food and farming.

These ranged from concern about the potential negative environmental impacts and off-target effects, to distrust in the big chemical and biotech companies and anxiety about ceding more control over food and seed production in the hands of global corporations.

A few comments opposed genome editing from a values-based, spiritual position, stating that it was not 'natural' or not what nature intended, while others felt that genome editing in food and farming was the wrong solution to a wrongly-framed problem. A few specifically mentioned opposition to genome-edited animals.

"It's a pseudo-scientific, commercial and reductionist fiasco to override thousands of years of selective breeding that does its best to follow millions – perhaps billions – of years of bioregional and ecological conditions. Genome editing ignores the fact that it doesn't and cannot – know all the functions and interrelationship of all the genes involved to provide a short term and quick fix commercial answer!"

Forty-two comments were unequivocally in favour. Where given, the reasons ranged from the fact that the technology is safe and equivalent to conventional plant breeding, it can improve sustainability through lower pesticide and antibiotic use, increase food production and eliminate plant diseases like blight.

"Positive and eager to see the technology improve the sustainability of farming and welfare of livestock"

Thirty-one comments offered a more nuanced perspective, focusing on the fact that technology can be used for good or ill and suggesting that who controls the technology is the key issue, especially the large corporations which may be motivated solely by profit.

This position tends to highlight the need for regulation and labelling while also acknowledging the urgency of finding solutions to big global challenges that genome editing appears to offer. Some comments implied that the 'genie is out the bottle' and we will have to live with the technology anyway, so we should do it as responsibly as possible. Some comments also supported genome editing for medical research but not for food and agriculture.

Examples of comments include:

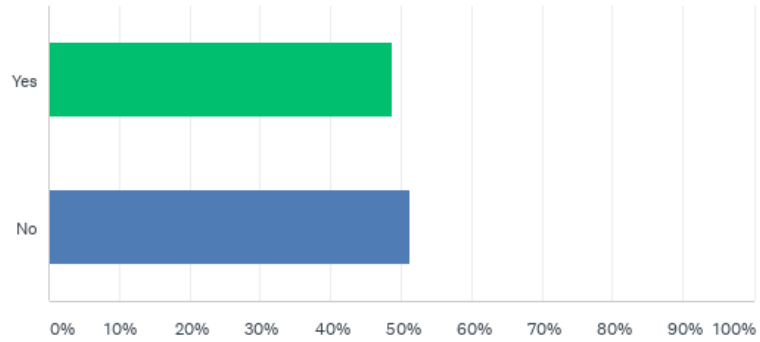
"It's coming whether we like it or not"

"I am neutral on it at the moment, but can see future benefits if regulatory concerns can be dealt with"

"Genomic editing has the potential to open a Pandora's Box, but it also has the potential to be extraordinarily helpful for fighting diseases and pathogens. It would be wonderful if such manipulation could be used just for good. But such optimism seems hopelessly naïve"

"I believe it is now possible to do genome editing of food plants in a way with extremely low risk to health and the environment. And I believe the potential benefits, particularly to the environment and to feeding the world in a sustainable way through the climate breakdown, are considerable. Each case should be examined transparently by a panel of experts, and a decision taken on a cost/benefit analysis of human and planetary wellbeing. The decision must not be hijacked to make money for big companies"

Q2 Does your work involve food and farming in some way? If yes, please explain



Just under half of the respondents stated that they were involved with food and farming in some way (48.3%). This ranged from *"I work in R&D for a biotech seed company"* to *"I'm a biointensive, heirloom, agroecologically included gardener and bee-keeper"* to *"I am a No Dig organic gardener".*

Some also highlighted professions where they were would be familiar with genome editing e.g. *"I have worked for 4 decades as an expert in GMO risk assessment"* and *"…I have been a member of the Farm Animal Genetic Resources Committee (FAnGR)".*

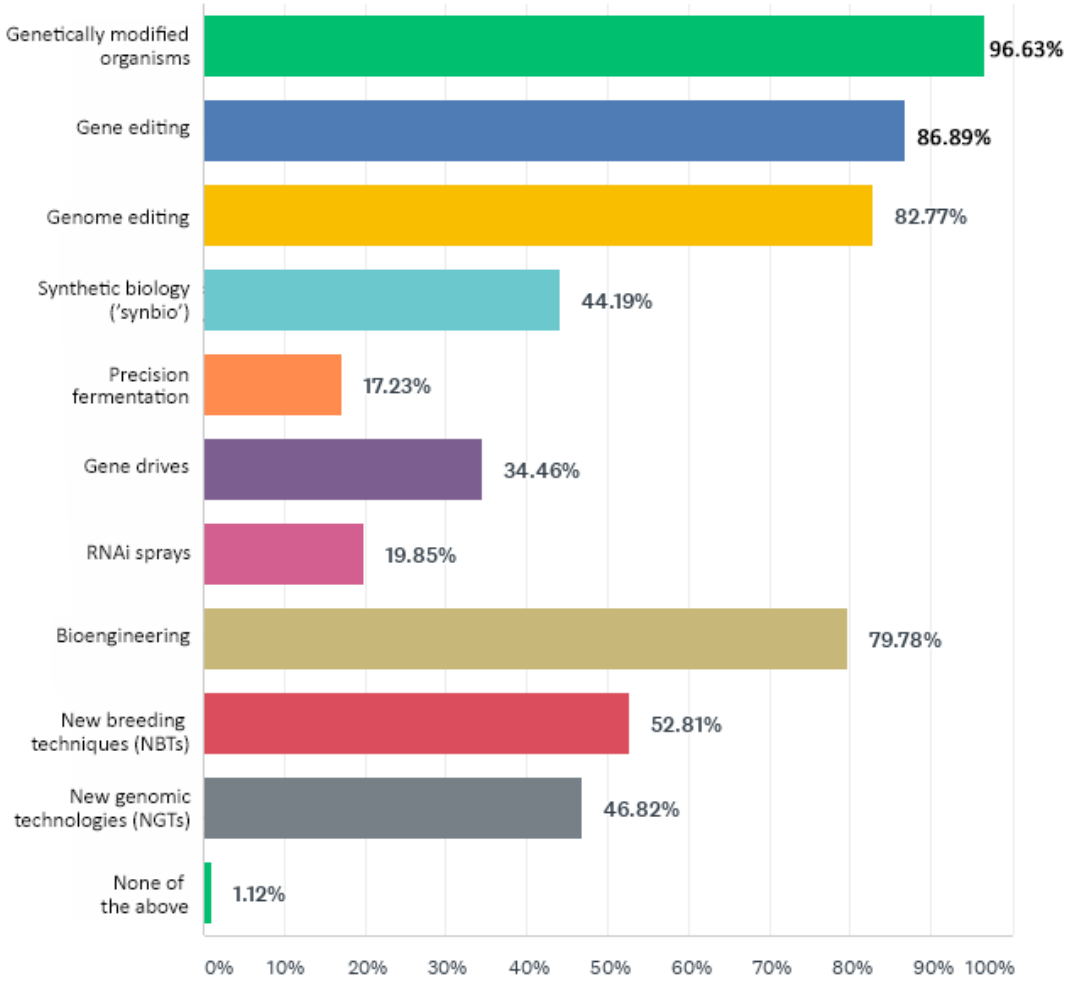
Only eight respondents explicitly stated that they worked in the biotech or genome editing.
In addition, 13 worked in the seed industry or in industry/academia researching aspects of plant breeding.

On the other hand, 13 respondents worked for NGOs or lobby groups critical of GE or in organic farming. It was not always clear from how other respondents described their professions whether their work in food and farming would make them pro- or anti-genome editing.

Overall, these results suggest that the self-selected survey respondents would be far better informed on the issue than a random sample of the general public.

The breakdown of answers to a later question (Q8) suggest that, in this sample, even those who were not specifically involved in biotech or genome editing had some positive feelings about the technology.

Q3 Have you heard of any of the following in relation to food and farming?



This graph highlights that survey respondents had a good knowledge of the more common terms used to describe genome editing, as well as some knowledge of the industry terms and specific techniques. This is unsurprising, given the demographic described above.

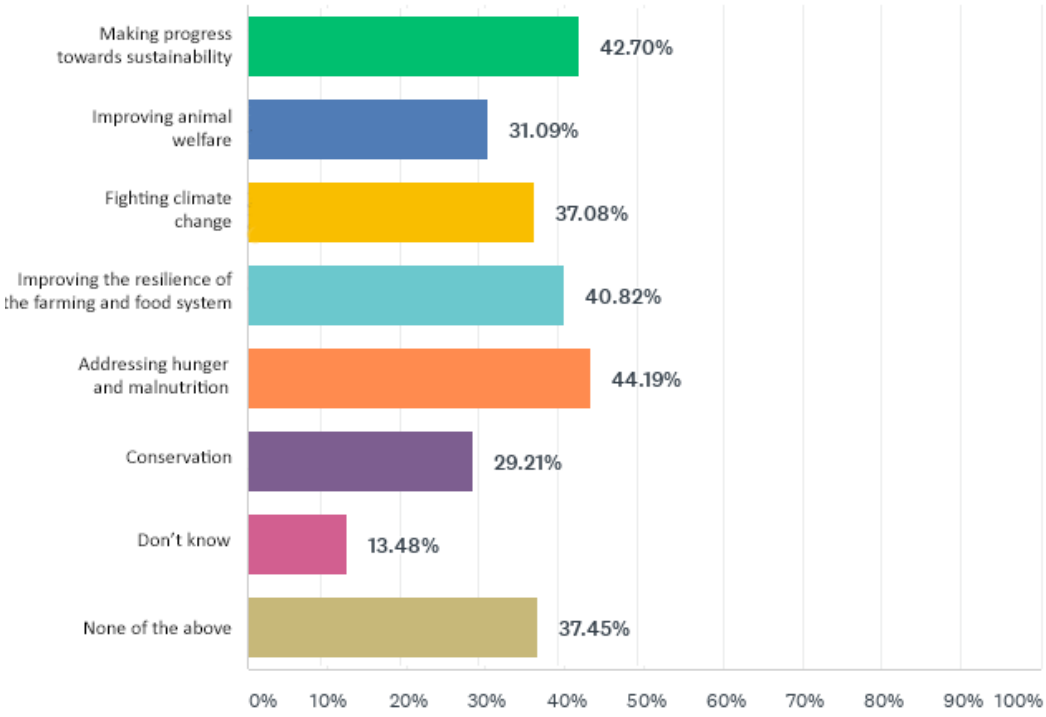
Almost all respondents (except nine) were familiar with the term 'genetically modified organisms'. This is not surprising given that level of media coverage of the issue in the late 1990s and early 2000s.

In addition, an overwhelming majority were familiar with the term 'gene editing' (87%), although slightly less with the synonymous term 'genome editing' (83%) and the more general term 'bioengineering' (80%). Considerably less (44%) were familiar with another newer kinds of genetic engineering technologies e.g. 'synthetic biology' (44%).

Around half of the respondents were also familiar with the 'neutral' terms given to these technologies by industry[1], such as 'new breeding techniques' (53%) and 'new genomic technologies' (47%).

[1] https://corporateeurope.org/en/food-and-agriculture/2018/05/embracingnature; see also https://theecologist.org/2017/apr/04/new-breeding-techniques-and-synthetic-biology-genetic-engineering-another-name

Q4 Do you think that genome editing has a role, or potential role, in any of the following?



Examining these results, it's important to note that nearly, 38% of respondents stated that they do not believe that genome editing has a role in addressing any of these challenges. In addition, around 13% stated 'Don't know'. Thus, the support for the six items reflects the views of just 49% of the total survey respondents. The percentage numbers for each of the six items (apart from 'Don't know' and 'None of the above') are boosted by the fact that each respondent could choose more than one item.

Given the 'eco' nature of the survey population, there was a surprisingly large degree of positivity for what genome editing could potentially achieve, particularly with regard to issues related to access to healthy food and sustainability. There was slightly less support for the view that it could help fight climate change or improve animal welfare or conservation. These views may reflect the fact that there has been less industry hype and public conversation about the role of genome editing in these areas.[2]

There were 96 comments accompanying responses to this question. Twelve of these go on to express qualified support for the claims that genome editing can address these significant global challenges, suggesting that the picture is not as straight forward as may appear (similar qualifications appeared in the comments for Q1). Arguments included the need to prove that the technology is beneficial and safe first, concern about who controls the technology, concern about lack of regulation as well as not addressing the root causes of these challenges.

"I am aware of certain benefits of plant engineering but am also conscious that the potential negative consequences for nature, the environment and the human population cannot be quantified/known and this aspect should be studied in more detail and put before commercial interests"

[2] https://abiggerconversation.org/new-report-brings-focus-to-gene-edited-farm-animals

"I can see some aspects of animal welfare improving with NBTs, I think this is not tackling the root of the animal welfare problem caused by intensive breeding"

There are also several comments expressing resigned acceptance of the technology, despite the risks. For example, "*it's the only way we can address both food security and climate change in the short time we have available.* "

Other comments qualified the 'None of the above' choice – predominantly that there was no quick techno-fix to these problems and that we should seek other less potentially dangerous solutions to these global challenges. Terms such as food sovereignty, agroecology and regenerative agriculture appeared several times.

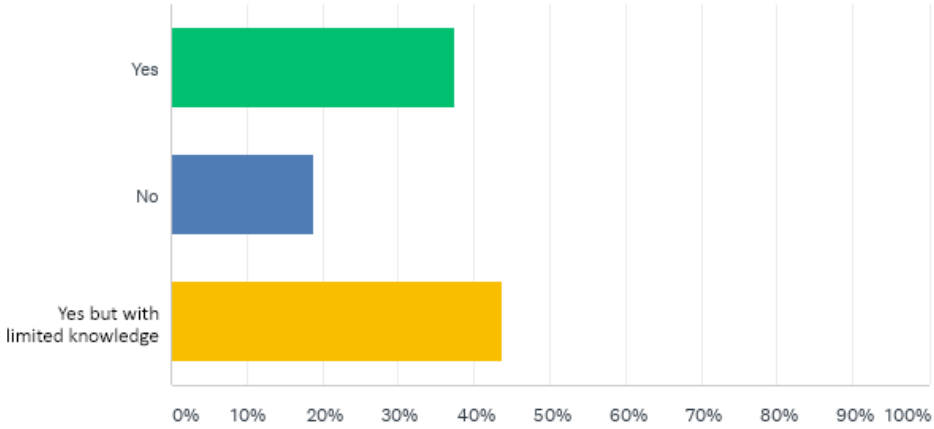
"…We cannot pretend to solve a problem with another problem without seeing the further consequences"

"Manipulating one or a few genes in a lab won't solve these problems. They are complex issues and demand system changes not gene changes"

"Resilience and sustainability is all about sovereignty, which corporate controlled industrial farming couldn't care less about. While agroecology based on local community farming guarantees"

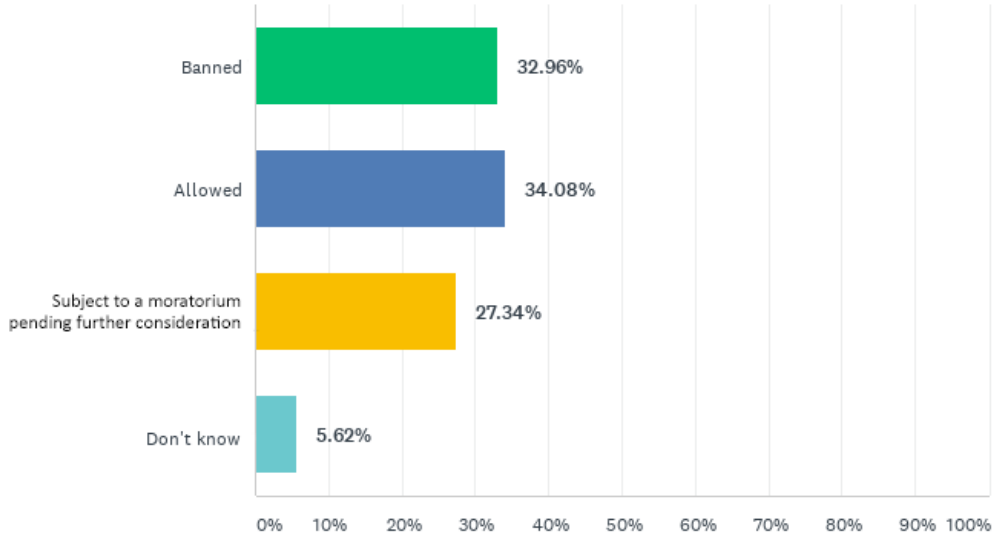
Four responses also expressed cynicism about even proposing genome editing as a solution for these global challenges. For example, *"I know the list above is what proponents of genome editing want the public to think. I'm not buying it."*

Q5 Are you aware that there are different methods of genome editing that claim different characteristics and different levels of benefit and risk?



A considerable 81% of respondents stated that there were aware that there were different methods of genome editing, although the majority of these (44% of total respondents and 54% of all those who acknowledged awareness), stated that they had only 'limited knowledge' of these.

Q6 Do you believe that genome editing in food and farming should be banned, allowed or subject to a moratorium?



The results for this question split fairly evenly into thirds – with 33% stating that it should be banned, 34% stating that it should be allowed and 27% stating that it should be subject to a moratorium pending further consideration. Six per cent chose the 'Don't know' option.

Once again, the 88 comments associated with this question show both polarisation of feeling on this issue, as well as more nuanced views, most likely associated with choosing the moratorium option.

"All or nothing is not a helpful or useful stance when there are some potential benefits to be had"

Other examples of qualified support included that genome editing should focus on *"plants first, then maybe animals"* and as with previous comments concerns around who controls the technology: *"this should be used for the benefit of the planet and not for corporations".* It should be *"strictly controlled and only tolerated for specific needs (and profit is not a need)".*

Some comments also proposed alternative regulatory structures. For example, that each case should be *"be subject to being judged on its merits under both precautionary principle and agroecological criteria".* Others called for each case to be referred to an ethics committee, or developed only with public money and ownership.[3]

There were several comments on the need for further research:

"We need to fully understand the long-term implications of genome editing before it is carried out on any kind of scale. But I do feel that the INDEPENDENT scientific research (sic) should be done. If we don't know the facts and assess the implications, then we can't progress in the right/best way for people and planet"

The comments in support of allowing genome editing again reiterated that the technology is inherently safe, necessary to solve important global challenges, as well as being inevitable.

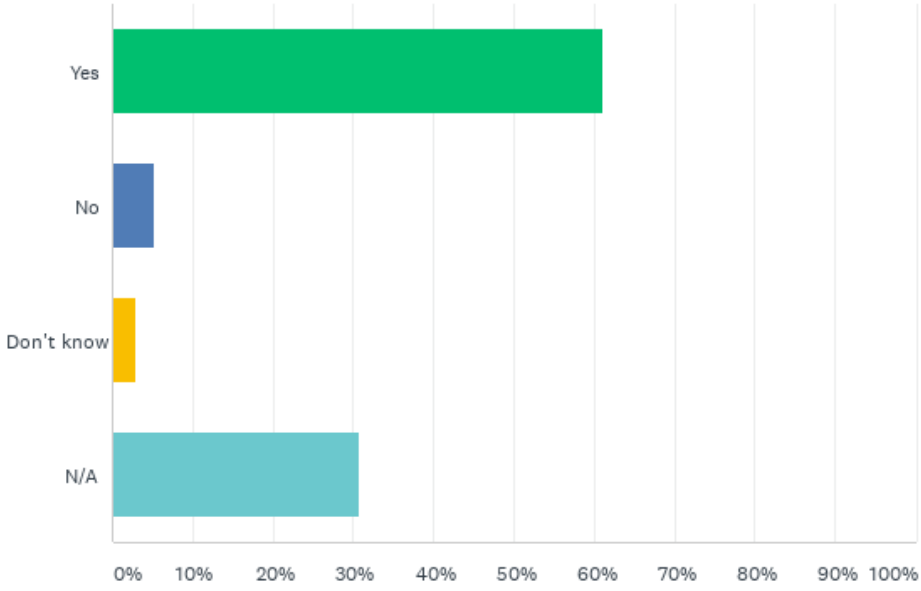
[3] Some of these issues are also discussed in the A Bigger Conversation report, The Boundaries of Pant Breeding, https://abiggerconversation.org/the-uncomfortable-truth-about-gmos-and-co-existence

"If there is no genetic difference between a plant, animal or human who has had gene silenced, then banning it would be stupid, as the technology is easy, cheap and beneficial…continued opposition will just drive the technology underground"

"Mother nature has been editing genes and making GMOs for more than a billion years. Why shouldn't we as well. It's only natural"

"GE is coming in other parts of the world. To stay in the conversation and to address welfare and climate issues, we need to utilise new technologies to drive the new green revolution"

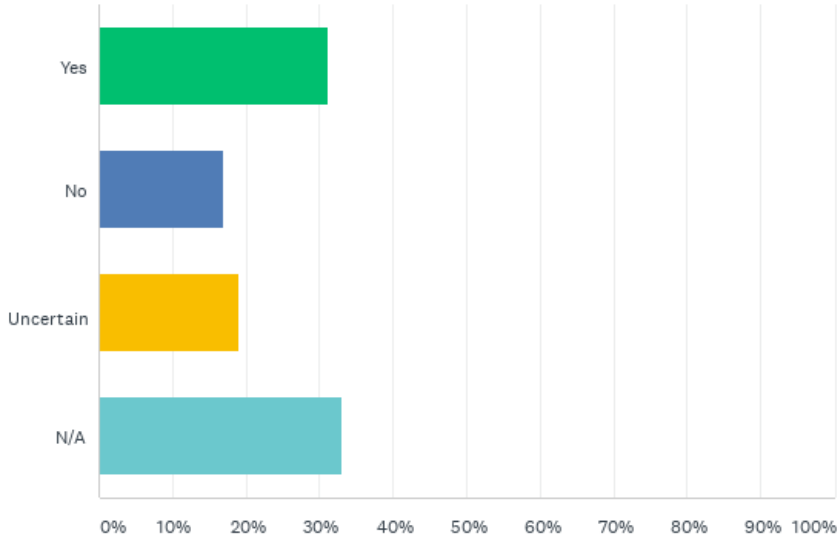
Q7 If you believe genome editing should be allowed, do you believe it should be regulated?



An overwhelming majority of those who stated that genome editing should either be allowed for food and farming or subject to a moratorium also believed that it should nevertheless be regulated. Disregarding the N/A and 'don't know' options, 92% were in favour of regulation and 8% were against it.

There were no comments here to understand why some opposed regulation completely. Given comments elsewhere, this perhaps relates to trusting in the free market or else the sense that genome-edited products are equivalent to conventional products and do not therefore, require additional regulation.

Q8 If you answered yes to Q5, would you support different types of regulation for different methods of genome editing, e.g. some banned and some allowed?



This question was aimed at those who stated that they were aware of different methods of genome editing, although only 67% of respondents answered the question, which is 14% less than the 81% who claimed awareness in Q5.

Of those that responded, a majority (31%) stated that there were in favour of different levels of regulation; 17% were not supportive of different types of regulation and 19% were uncertain.

There were 66 comments to this question. Eleven comments expressed hope that the regulation should be independent and 'evidence led' and not political.

"Regulation should be evidence led"

"For me it depends on the science – if it's independent. And how the science is communicated to those responsible for regulating, producing and buying the crops and the end-products"

"…Profit seeking corporations should be shorn of their decision-making powers"

"Regulation is important to ensure companies are properly testing their products…These decisions should be made by informed scientists and not by politicians"

"It depends on who is taking the decisions. If it is governments open to lobbying by the industries that will profit and exploit the fruits of it – then this is vast problem. If it was by citizens' assemblies involving a rich range of experts, NGOs and politicians, then maybe ok"

Another issue raised by ten respondents, was that regulation should not focus on the method or process of genome editing but rather on the result or product: *"Regulating the end product only, not the process is what is needed".* The 'product-versus-process' argument is a highly specialised one however, and we would not necessarily expect the general public to be engaged with/aware of it.

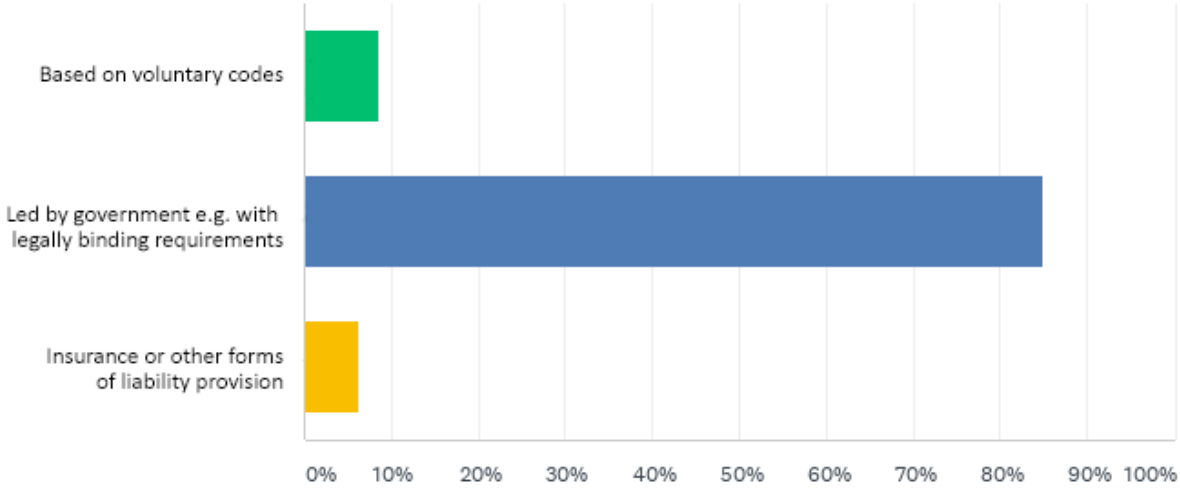
Several of those in favour of a case-by-case approach to regulation also felt that no regulation was necessary for those products that *"only introduce changes of the type that occur in Nature and of*

exactly the same types are introduced using unregulated technologies that have been used for many decades". Or else *"less precise methods should be under stronger regulation".*

Two comments also addressed plant breeding techniques that were/are currently used, arguing that the regulation should be rethought on these too, otherwise there would be double standards e.g., *"CRISPR/CAS is judged similar to EMS mutagenesis*" and *"chemical and radiation blasting done in the 1960s… is far more uncertain than today's precision breeding".*

"All new crops should go through the same regulatory pipeline, regardless of the method used, including crops developed using organic -compatible methods. The novelty and impact of the trait should determine whether the crop should be deregulated, regulated or not approved"

Q9 If genome editing is to be regulated, would you prefer this to be:



An overwhelming majority of respondents (85%) agreed that if genome editing is to be regulated, then it should be led by government e.g. with legal binding requirements.

(***Note*** *– since this question was asked to all respondents, the value is also likely to include all those who believe it should banned. Nine percent stated that regulation should be based on voluntary codes and 6% stated that it should be based on insurance or other forms of liability provision*).

There were 68 comments. The key theme (23 comments) was that, despite agreeing that government was best place to regulate, there was a widespread lack of trust in government independence. A number of comments also proposed that *"regulation should be via an independent scientific committee with no politicians or advisors present".*

Five respondents proposed that the public should play a role in assessing and regulating the technology, including through consultation or citizen's assembly. One proposal for a novel form of regulating genome editing *"televised citizen's evaluation like a trial to be repeated every few years".* Five respondents suggested international or UN oversight.

There were only a couple of comments in favour of voluntary codes or liability and even these were qualified.

"Simple edits should have voluntary codes, but the more risky edits should have government oversight. Insurance could be interesting for edits with modest risk"

Some comments opposed any kind of oversight:

"What unique hazards do products of gene editing present to justify special regulation?"

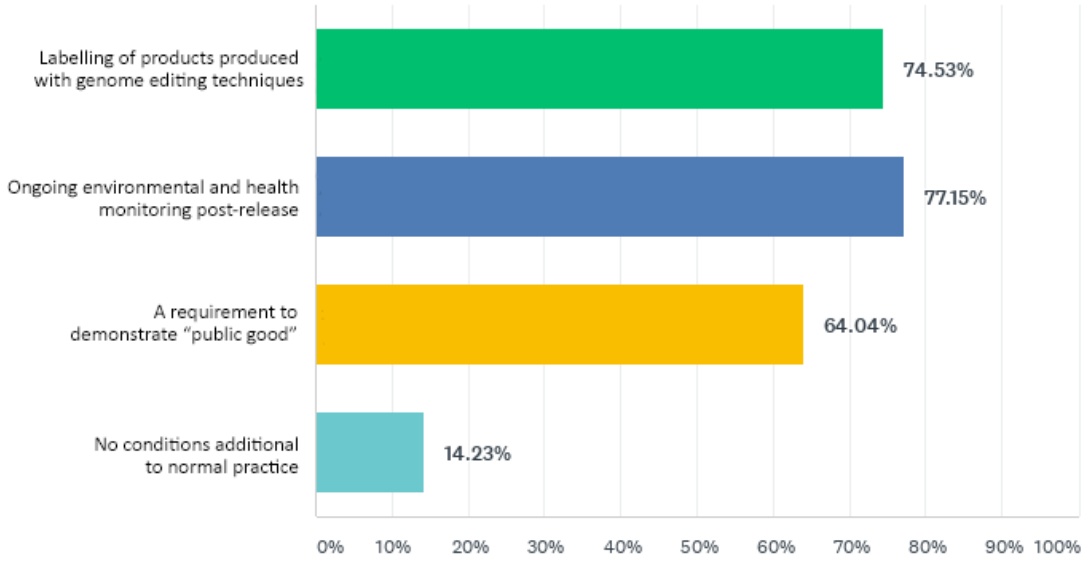
"Plant breeders already have great tools for mitigating risk in the plant breeding pipeline in bringing new varieties to market. I think some types of GE could be regulated in this way"

Others are highly critical of voluntary codes and the idea of liability provision,

"I don't believe that any industry can be trusted to implement voluntary codes, instead they will simply seek ways in which they can subvert the code when it impacts on their profits"

"You cannot trust…liability provision to pay up after the event, when it will be too late anyway!"

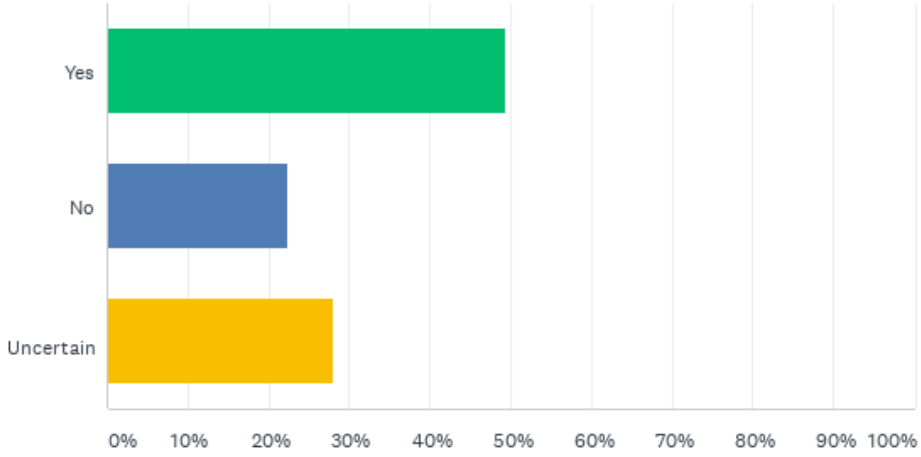
Q10 If genome editing techniques are to be used more widely in food and farming would you like to see (you may tick more than one box):



It is evident that a majority of respondents wanted oversight with regard to the use of genome-editing, and especially oversight of the products produced by this method. This was primarily through *'ongoing environmental and health monitoring post-release'* (77%) but also through labelling (74%) and to a slightly lesser extent *'a requirement to demonstrate 'public good'* (64%), perhaps because this kind of oversight is less familiar and also open to industry lobbying.

There are not additional comments here to explain why 14% would like to see no additional conditions, although some positions are well outlined in previous comments – primarily the argument that the products are not substantially different from seeds bred from other 'conventional' methods.

Q11 Do you believe citizens should have more of a role in the monitoring and regulation of genome-edited crops and foods? Please use the space below to suggest what that role might be.



Almost half of the respondents (49%) agreed that citizens should have more of a role in the monitoring and regulation of genome-edited crops and foods. However, 22% opposed the involvement of citizens and 28% were uncertain or undecided. There were 135 comments on this question, which accounts for half of the total survey population.

The major theme of the comments supporting the inclusion of citizen's voices was that this would only work if they were given access to impartial scientific information, *"Given unbiased information, the public should be the final arbiter".*

Those opposing this idea make a similar argument – that citizens are generally ignorant on these issues and possibly given to the worst impulses, especially given biased social media.

"Having uneducated citizens monitor and regulate scientific areas is reminiscent of China's barefoot doctors"

Those who generally support genome editing were particularly suspicious of citizen involvement, given the long history of public opposition.

"Considerable level of misinformation prevails, mostly a hangover from decades old environmental pressure group marketing. It's backward, anti-science and operates in a completely parallel universe"

"Only citizens who show a demonstrated interest and learning ability and willingness in biotechnology. NO FUNDAMENTALIST SILLINESS PLEASE"

"I believe there is an innate aversion to such technologies in the wider public without a real understanding of the pros and cons"

Of course, some opposed to genome editing, saw this as exactly the point of involving citizens:

"The negative attitude of the population towards genetic engineering should be taken into account in the decision for/against new genetic engineering"

Several specifically mentioned the notion of a citizen's assembly, or working with an educated body of citizens: *"Through something like a Citizen's Assembly who would be able to make informed recommendations to a regulatory body that has real teeth".*

Others stated:

"Citizens should be trained to become educators and activists in their communities and beyond these issues" and noted the importance of *"public comment periods before adoption of new technologies and before adoption of rules. The public comment periods should be accompanied by thorough educational materials"*

Another proposal highlighted that *"some bodies like auditing and ethics standard-setters for accountants have a requirement to have a proportion of lay people."*

One spoke of a negative experience around being a 'member of the public' in a community consultation on genetic engineering in Melbourne: *"I was surprised and very disappointed… I was sometimes talked down to and/or talked over."*

Other's felt that engaging in the monitoring and regulation of genome editing was exactly the reason for experts, and expressly not the role of citizens.

"I would expect that members of the general public, like myself, have insufficient understanding of the issues. However, I would definitely hope that independent scientific bodies other than government and industry (both untrustworthy) would have input into and oversee any developments in this area"

Still others felt that this was the role of government:

"Elected officials who appoint expert regulators and pass responsible laws are FAR superior to 'google educated' mass publics manipulated by advocacy and fear profiteering marketing campaigns"

Conclusion

The *Citizen's Attitudes to Genome Editing in Food and Farming* survey examined the attitudes on genome editing in food and farming – and in particular issues around regulation – in a self-selected and for the most part informed general public in the UK.

Just under half of the respondents stated that they worked/or were active in some way in the food and farming sector, with a number also stating that they held professional positions either actively working in plant biotech or else for a critical NGO.

As a result, some of the more detailed responses were fairly sophisticated addressing issues such as concern about gene transfer or responding to the 2018 European Court of Justice ruling[4] on genome editing. In addition, there was relatively high awareness of the synonymous terms for genome editing, although less awareness of the industry terms and specific techniques such as synthetic biology (synbio).

[4] https://beyond-gm.org/vicEuropeantory-european-court-says-new-gmo-tech-must-be-fully-regulated

Over 80% of respondents stated from the outset that they held a 'position' on genome editing, and these positions became apparent in the responses to survey questions. Even so there was also evidence of a willingness to consider other views and, given the 'eco' pool from which respondents were drawn, a stronger than expected support for some potential uses of genome editing.

Differing perspectives

The key themes underlying concern or support for genome editing, and how and whether it should be regulated were apparent in the answers to all the questions.

Those sceptical about and opposed to genome editing tended to express some or all of the following positions:

a) Values – it's not natural or tinkering with nature;
b) Noting the lack of understanding of how the genome functions;
c) Concern about the health and environmental impacts of off-target effects;
d) Concerns about who controls the technology i.e. lack of trust in government, corporations and industry lobby groups;
e) Concern about techno-fixes – the world is complex and global challenges cannot be solved by a simple and potentially dangerous techno-fix. The root causes need to be addressed.

That said, some of those who expressed these concerns (apart from those opposed from a values perspective) also felt that the technology in and of itself could have some merit and should therefore not be rejected out of hand. Only 38% of respondents stated that genome editing could play no part in addressing significant global challenges, such as hunger and malnutrition, and only 33% stated that it should be banned outright, with 27% stating that it should be subject to a moratorium pending further consideration.

Qualified support for genome editing was contingent on resolving the food and environmental safety issues or truly independent scientific research and oversight (although some acknowledged that this may be naively optimistic). Others also expressed resigned support – that it is inevitable or that it's the only way that we can solve major global challenges in time.

Those in favour of genome editing tended to take the following positions:

a) It is tested and safe;
b) It is equivalent to conventional plant breeding methods that have been used safety for 50 years, or it's just speeding up a natural process that has been happening for billions of years;
c) It can play a part in solving significantly global challenges ranging from climate change to ending hunger, eliminating plant disease and lowering pesticide use.

Regulation – who, what, how?

When it came to the oversight and regulation of genome editing in food and farming, only 14% felt that no oversight was necessary beyond what is 'normal practice'. Most agreed that product labelling (74%) and ongoing environmental and health monitoring post-release (77%) was necessary.

A key theme here related to *who* would oversee new breeding technologies, and *what criteria* would be used. Some respondents raised the Precautionary Principle as a guiding approach, while others stressed the importance of those involved in oversight being independent from industry. The United Nations was referred to several times as a trusted body for oversight as were citizen's assemblies (see also below).

Despite the fact that 85% of respondents preferred government regulation over voluntary codes, and insurance liability provision, the lack of trust in government and corporate lobbyists was evident in repeated comments throughout the survey. That said, there was also strong opposition to voluntary approaches, with corporations driven solely by the profit motive seen as totally untrustworthy to 'self-regulate'.

Some 31% of respondents supported regulating some methods of genome editing and not others. Here comments tended to focus on the need for evidence-based research and taking a 'case by case approach' rather than specific examples. A clear 'industry' line focused on the need to regulate and assess the end product rather than the processes used.

The 'right' citizens?

Given the lack of trust in government and corporations, it is nevertheless surprising that only 50% agreed that citizens should play a greater role in the monitoring and regulation of genome-edited crops and food, with 22% opposing more citizen involvement.

The reason that there was not greater support for this approach is possibly related to the perception of the public as ignorant and easily swayed by social media. This view came especially from those who generally support the adoption of genome editing and who expressed suspicion towards 'environmental pressure group marketing'. There would probably have been greater support if the question had been framed as "*citizens who had been given impartial scientific information*".

That genome editing should be regulated did not seem to be in dispute though, as already noted, there were many qualifications to this around *how* and *who*. Some felt only scientists should have a say. Others respondents were familiar with the notion of citizen's assemblies or public consultations and supported that integrated approach.

Most of these comments about citizens versus scientists fell along the familiar fault lines of the genetically engineered food debate, i.e. only the 'right' citizens should be involved in regulatory discussions.

Those who objected to citizen input focused on the necessity for citizens to understand complex laboratory-based genetic science. But citizens have other concerns, other knowledge and other ways of understanding – for instance through health, consumer choice and social impacts. Because of this early citizen engagement could substantially change the discussion around genome editing, moving it in a direction that acknowledged complexity and social responsibility. This, of course, could also change the way we look at research and regulation.

This is the case in Norway, the first country to include broader issues of societal utility (public good) and sustainable development in its GMO regulations.[5] As part of the regulatory process, socio-economic considerations of genetically engineered products are evaluated, in part, through public participation in the decision making process.

The issue of how we regulate genome editing in food and farming will be coming into the fore in the next few years in countries all over the world. Most of the respondents to this survey, whatever position they held, showed a more nuanced awareness than is often seen and a willingness to engage in deeper discussion. Policymakers should be encouraged by this since it seems clear that genome editing is a multi-layered issue and its regulation will likely require this kind of commitment to greater nuance.

[5] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2750045