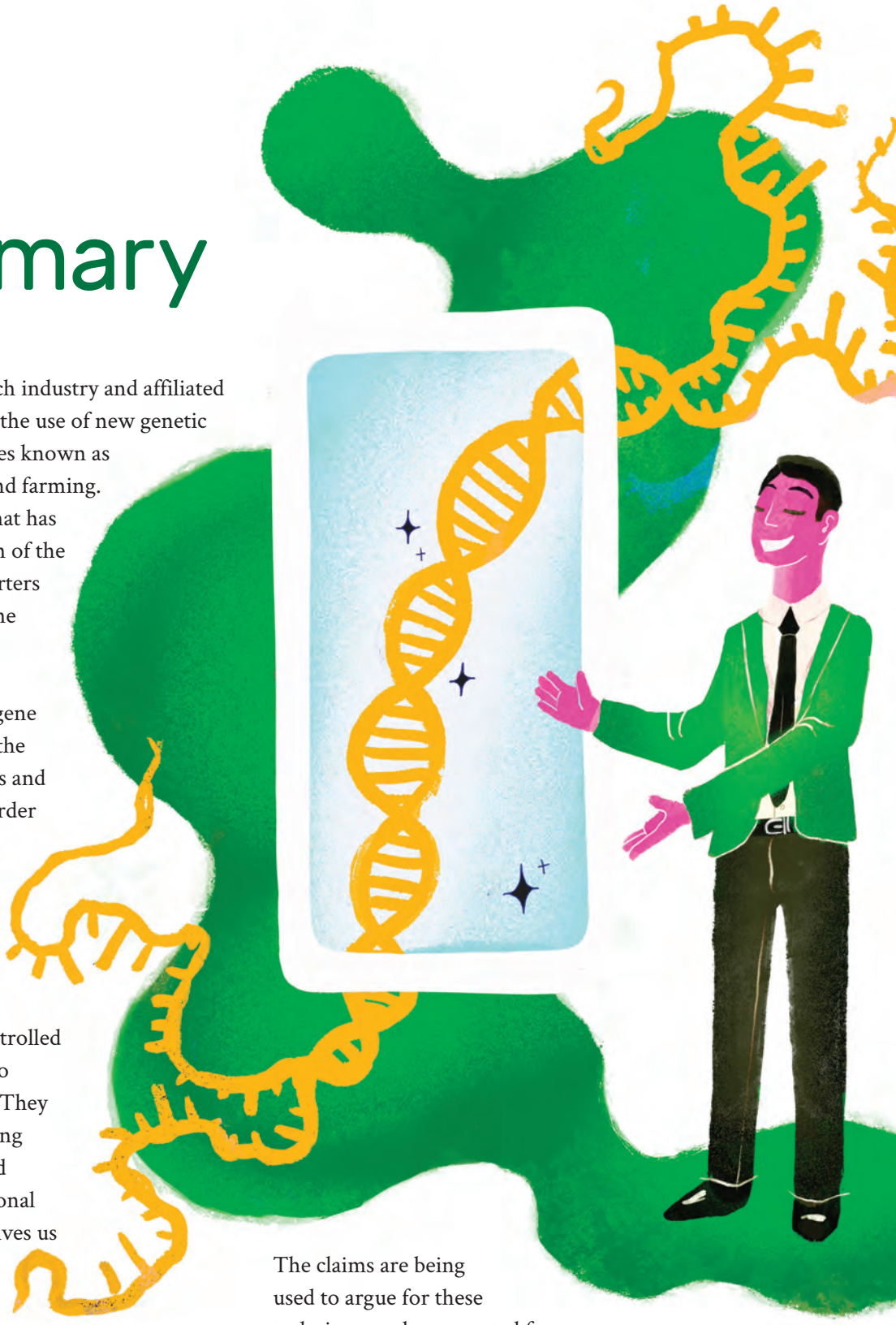
# Summary



The agricultural biotech industry and affiliated groups are promoting the use of new genetic modification techniques known as gene editing in food and farming. The main technique that has caught the imagination of the industry and its supporters is the CRISPR/Cas gene editing technique.

The industry is using gene editing to manipulate the genomes of crop plants and livestock animals, in order to confer new traits. They make a range of claims for these techniques – for example, that gene editing is precise, safe, and so highly controlled that it only gives rise to predictable outcomes. They also say that gene editing is widely accessible and quicker than conventional breeding, and that it gives us the tools to enable us to meet the challenges of environmental degradation and climate change.

However, none of these claims stand up to scrutiny, as shown by the evidence presented in this guide. All are exposed as false or misleading.

The claims are being used to argue for these techniques to be exempted from the EU's GMO regulations. This would mean that products of these techniques would not be subjected to safety testing, traceability, or GMO labeling, and EU countries could not ban their cultivation. As a result, these GMOs would end up on our fields and plates

untested and unlabelled, and farmers and food producers – including those operating under organic systems – would have no way of avoiding them.

The misrepresentation begins with the terminology used to describe them. Contrary to industry claims, gene-editing techniques are not breeding techniques, but are genetic modification techniques that share some of the same methods as old-style genetic modification.

Also contrary to the claims made, these techniques are not precise or controlled, nor do they have predictable outcomes.
In addition to the intended genetic change, gene editing causes many unintended changes and genetic errors. This can include the inadvertent addition of foreign DNA from other species, or even entire foreign genes, into the genome of gene-edited organisms, even when the intention is specifically to avoid this.

The effects of these changes on the composition of gene-edited crops, foods, and animals, as well as the consequences to health and the environment, have not been investigated and remain unknown. In food crops, they could include the production of unexpected toxins and allergens, or altered levels of existing toxins and allergens.
The industry says that the changes made by gene editing in crops and livestock animals are small and the same as could happen in nature. But this claim is proven false by the worrying surprises that have already come to light. For example, the company that developed gene-edited hornless cattle claimed they were free from unintended effects of the gene editing. But the cattle were revealed by US regulators to contain bacterial DNA and foreign genes that confer resistance to antibiotics.

Also, CRISPR gene editing of rice plants was shown to cause a wide range of unintended mutations, both at the intended editing site and at other locations in the genome.

## Gene editing causes many unintended changes and genetic errors

The researchers who made this discovery warned that CRISPR gene editing ”may be not as precise as expected in rice”. They added, ”early and accurate molecular characterization and screening must be carried out for generations before transitioning of CRISPR/Cas9 system from lab to field” – something that is not generally done by developers.

Given the inherent inaccuracy of gene-editing techniques and the challenges of producing gene-edited plants or animals that perform as expected, claims that gene editing can produce useful traits far more quickly than conventional breeding are highly questionable. Even if the time taken to gain regulatory approval is excluded, it is unlikely that the time needed to commercialize gene-edited crops will be significantly shorter than with conventional breeding. Moreover, achieving useful traits in crops or animals is not just a matter of speed – it is a question of using the best tools for the job, and GM approaches are not an efficient route.

Despite years of research and permissive regulatory regimes in some countries, only three gene-edited crops have successfully made it to market and only one of them was produced with the much-hyped CRISPR/Cas tool.

The claim that gene editing, in particular through CRISPR/Cas, will make agricultural innovation accessible to publicly funded breeding programmes is disproven by the fact that the technology is already owned and controlled by a very few large corporations, led by Corteva and Monsanto/Bayer. While evaluation and research licences can be obtained cheaply or free of charge, commercial licences and associated royalty payments on product sales will remain too expensive for anyone apart from large multinationals. Gene-edited products are also patented: in crop plants, patents cover seeds, plants, and often the harvest, raising issues of consolidated control of the food supply, farmers' autonomy, and loss of food sovereignty.

A form of emotional blackmail is being used to convince policymakers of the moral imperative to embrace new GM technologies. The promise is that these technologies will enable the development of crops that require less pesticide and are adapted to climate change.

A form of emotional blackmail is being used to convince policymakers of the moral imperative to embrace new GM technologies

However, the same promises were also made for first-generation GM crops and proved false. New GM techniques are unlikely to succeed where "old GM" failed, because desirable traits such as pest and disease resistance and adaptation to climatic changes are genetically complex traits that cannot be achieved by manipulating one or a few genes.

Conventional breeding, in contrast, continues to be highly successful in achieving such traits and far outstrips GM approaches.

It is not enough to focus on genetics as the solution to agricultural problems – whole systems approaches are needed. This would entail a large-scale shift to proven-successful agroecological systems of farming, which include low-input, genuinely sustainable, and regenerative methods. These methods are already available and only need to be properly supported to enable broader rollout

## Gene editing is a costly distraction from real, systems-based solutions

Gene editing is a costly distraction from these systems-based solutions. Its exclusion from EU GMO regulations would serve to boost a questionable experiment with unknown consequences for people, animals and the environment. It would also deprive European consumers, farmers and breeders of the right to know where these GMOs are and impede advances in non-GM approaches, including organic and agroecological systems. It would represent a significant weakening of EU health and environmental protections and undermine the rollout of proven effective and sustainable solutions to our food and farming challenges.