Gene editing crops: Pros and cons

There are few food-related areas of discussion more emotive than that of genetically modified organisms (GMOs). Public debate often takes place at the extremes of the argument, where combatants on both sides are accused of playing fast and loose with the future of the planet and strong opinions are held on the morality of use, the independence of any research and the exact nature of any benefits or potential risks.

Follow the latest news and policy debates on sustainable agriculture, biomedicine, and other ‘disruptive’ innovations. Subscribe to our newsletter.
SIGN UP

Proponents of gene editing

The environmental argument

Wider use of the technology leads to a significant reduction in pesticide use. As the genetic change is designed to make crops more resistant to pests, the reliance on chemicals is reduced. Similarly, increasing yields will reduce land, water and fertiliser use. Less chemical use in production reduces the risk of eutrophication through chemicals leaching from the soil into water courses. As the fertiliser industry relies on fossil fuel, the additional benefit is in the reduction of carbon emissions.

The economic argument

Crops can be edited to become more resistant to climate change and disease, and increase yields. Overall production costs will reduce, allowing for more affordable food for consumers. Gene editing is a simpler technology than genetic modification, which will enable developing countries to enjoy advantages in crop production without reliance on multinational companies who dominate the GM market.

The health argument

Editing native DNA will enable adjustment of nutrients to produce a crop, for example, lower in fat or with increased levels of vitamins or amino acids to support local health initiatives. The technique can address and reduce the risks which arise in later processing (eg, the recent example of asparagine reduction in wheat, which is linked to acrylamide production during the baking process).

The food security argument

With a world population of approximately 10 billion predicted for 2050, a combination of traditional breeding techniques and gene editing is essential to ensure adequate food supply and nutritional security in the face of unpredictable climate change impacts. Gene editing addresses both genetic traits of yield

and stress tolerance to enable more food to grow in a wider range of environments.

…

The opposing corner

The unintended consequences argument

Gene-edited organisms are prone to unintended and unexpected effects. These include ‘off?target’ effects (changes to genes that were not a target), ‘on-target’ effects (the change is correctly made but with unexpected effects on plant proteins and allergenicity) and interference with gene regulation (the target organism has its own ability to manage other natural genes impaired). There has been insufficient research into how unintended consequences may affect other environmental factors.

The regulatory avoidance argument

In some countries gene editing is considered as equivalent to existing plant breeding techniques, thus it is not regulated or monitored to identify issues of safety to the public or the environment. There are risks to both in commercialisation without comprehensive mandatory safety assessment and oversight.

The chemical addiction argument

The number of herbicide-tolerant gene-edited plant proposals put forward implies that gene editing applications will simply entrench the reliance on chemicals in agriculture. Previous genetic modifications have been made specifically to make plants resistant to pesticides (eg, Roundup Ready) and advantages of pesticide reduction in pro gene?edited research are overestimated.

The irreversible damage argument

CRISPR technology has also been proposed for use in Gene Drives, where a specific genetic alteration spreads rapidly through an organism, avoiding the natural selection process. The process could be employed to permanently adjust the characteristics of, or eradicate, entire species, especially ‘nuisance’ species such as mosquitoes. The potential effects on broader ecosystems are unknown and could have significant environmental consequences.