

Editing the Truth

GENOME EDITING IS NOT A SOLUTION
TO CLIMATE CHANGE

BRIEFING | October 2021



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Friends of the Earth Europe is the largest grassroots environmental network in Europe, uniting more than 30 national organisations with thousands of local groups. We are the European arm of Friends of the Earth International which unites 74 national member organisations, some 5,000 local activist groups, and over two million supporters around the world. We campaign on today's most urgent environmental and social issues, challenging the current model of economic and corporate globalization, and promoting solutions that will help to create environmentally sustainable and socially just societies. We seek to increase public participation and democratic decision-making. We work towards environmental, social, economic and political justice and equal access to resources and opportunities on the local, national, regional and international levels.

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Introduction: Genome editing is NOT a solution to climate change



Agriculture is caught in a vicious loop. Industrial farming and especially industrial animal feed production is a major driver of greenhouse gas emissions and climate change, and the agricultural sector is struggling to cope with the consequences of that climate disruption.¹ Rising temperatures, extreme weather events and unpredictable conditions threaten agricultural production, which in turn jeopardises the food production.

Effective solutions must be two-pronged: to both reduce the environmental impact of agriculture, and to make the sector more resilient to climate impacts.

Biotech companies claim to have the answer: new genetically modified organisms (GMOs). For over twenty years, the biotech industry has promised silver bullets to production problems – plants more resilient to drought, crops less dependent on fertilisers, and other technologies that have never materialised.

Two decades later and there's been no sign of these technologies reaching the market. Now the same biotech corporations are promoting a new generation of GMOs, with a slew of new unsubstantiated promises. One example is CRISPR, a tool which they claim could edit DNA to add or suppress gene traits in plants or animals. The biotech lobbyists are asking the European Commission to deregulate these new GMOs, and reject all evidence of attached risks.

Even if successful, this unproven science offers only a potential short-term relief of the symptoms of an unsustainable farming industry. In the meantime, it is diverting time, investment and attention away from real and already-proven solutions like agroecology - and risks releasing genetic edits into nature which we can't control.

Agroecological farming techniques – which produce the majority of the world's food² – prioritise production adapted to local conditions and farming in balance with nature, and are the most efficient solutions to the climate crisis in the farming sector.³

SWISS ALLIANCE FOR A GMO-FREE AGRICULTURE (SAG) & FRIENDS OF THE EARTH EUROPE (FOEE) ARE CALLING ON THE EU TO:

- Recognise that biotech industry promises are not proven, and are simply research and marketing ideas with no evidence. Meanwhile, real solutions like agroecology are proven but lack support from policymakers.
- Support real solutions to climate change in public policies. Legislation in the areas of agriculture, research and environmental should be geared towards climate-resilient practices like agroecology.
- Regulate the new generation of GMOs under existing GMO laws to ensure freedom of choice for consumers, farmers and breeders, and require new technologies to go through stringent safety checks and labelling before being marketed.

Footnotes:

1 See page 34 Meat Atlas 2021 https://friendsoftheearth.eu/wp-content/uploads/2021/09/MeatAtlas2021_final_web.pdf

2 FAO, 2014. The state of food and agriculture – innovation in family farming. Rome. <http://www.fao.org/3/a-i4040e.pdf>

3 Leipert F, Darmaun M, Bernoux M and Mpheshea M. 2020. The potential of agroecology to build climate-resilient livelihoods and food systems. Rome. FAO and Biovision.

The problem with agriculture: how farming both drives climate change and suffers as a result

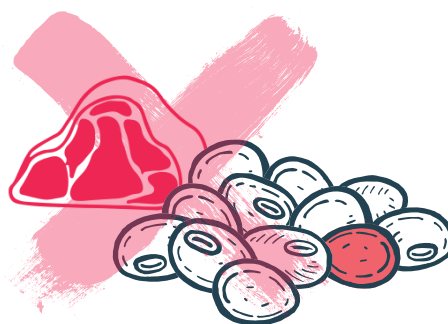
1

Agriculture and forestry contribute 20-25% of global greenhouse gas emissions. The vast majority of this is from industrial agriculture.⁴ At least three-quarters of deforestation is due to making space for cattle and the mass-production of animal feed.⁵ About half of this production is in South America, and transporting the feed to Europe generates even more emissions in an already high-emission industry.⁶

To force crop production in intensively farmed land, synthetic fertilisers are used to stimulate plant growth. During production, these fertilisers release nitrous oxide emissions. In fact, half the total energy consumption in agriculture comes from the highly energy-intensive process of making the fertilisers.⁷ Once made, the damage doesn't stop: they are sprayed over large areas of crops and whatever is not absorbed is released into the air as further nitrous oxide.⁸

After deforestation, feed production and processing, and fertiliser use, another 39% of agricultural emissions come from the digestive processes of cattle, which release methane.⁹

As well as driving climate change, agriculture is suffering the consequences. Farmers around the world are struggling with increasingly extreme and unpredictable weather conditions including droughts, storms and flooding. These extreme events are leading to soil erosion, desertification and reduced soil fertility. People in the Global South that lack the capacities to adapt are hit particularly hard.



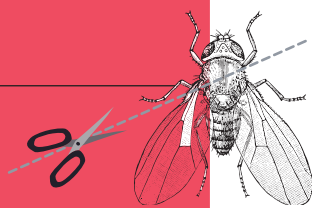
Footnotes:

- 4 Smith P, Bustamante M, Ahammad et al. 2014: Agriculture, Forestry and Other Land Use (AFOLU). In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer O, Pichs-Madruga R, Sokona Y et al. (eds.)]. Cambridge University Press, Cambridge, UK and NY. https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf
- 5 Hosonuma, N., Herold, M., De Sy, V. et al. 2012. An assessment of deforestation and forest degradation drivers in developing countries. <https://iopscience.iop.org/article/10.1088/1748-9326/7/4/044009>

- 6 Escobar, N., Tizado, E.J, Ermgassen E.K.H.J et al. 2020. Spatially-explicit footprints of agricultural commodities: Mapping carbon emissions embodied in Brazil's soy exports <https://www.sciencedirect.com/science/article/pii/S0959378019308623>
- 7 Woods J, Williams A, Hughes JK, Black M, Murphy R 2010 Energy and the food system. Philosophical Transactions of the Royal Society of London B Biological Sciences 365 (1554): 2991-3006. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2935130/>
- 8 Max Planck Institute for Biogeochemistry, 2011. Anthropogenic nitrogen plays a double role in climate change. https://www.mpg.de/4388722/nitrogen_climate_change
- 9 Gerber, P. J. et al. (2013) at xii and 20. <http://www.fao.org/3/a-i3437e.pdf>

Biotech false promises obstructing proven solutions

2



“GENE DRIVES”

Fruit fly
(*Drosophila suzukii*)



Agribusiness and biotech are promoting new GMOs as the key to maintaining food production in these new unstable climate conditions.

By using new genetic engineering methods to edit the genomes of plants, they claim they will develop plants that are able to produce stable yields under drought conditions or modify roots to store more atmospheric carbon.

They also point to complex unproven science as a silver bullet to tackle agricultural emissions. For example, biotechnologists want to modify the microorganisms in cows to produce less methane during digestion and ‘optimise’ cattle with molecular scissors.¹⁰

They’ve been claiming GMOs are the solution for over twenty years and have failed to deliver every time so far. Here’s why the new generation of GMOs is just another set of empty promises.

Firstly, plants and animals are not meant to be genetically manipulated.

The complex genetic codes of plants and animals have evolved over millennia and each part of their genetic code affects every other. Tweaking one gene will have knock-on impacts on the whole organism that are hard to predict and even harder to control.

Natural organisms are too complex and interdependent to simply edit and customise for human benefit. For example, the microorganisms that release methane also maintain the cow’s gut health, and tinkering with them could impact the health of the cattle and its offspring.

Secondly, the resilience of plants and arable farming lies in diversity.

GMO science relies on predictability: editing a plant to respond one specific way in one specific context, based on one specific gene make-up. But building resilience to climate change means preparing for the opposite: rapidly changing climates, different soil conditions, and maximising diversity to ensure crop survival in the face of disease and disruption.

Not only that, but some GMO practices like ‘gene drives’, where the modification is copied onto offspring, have unknown long-term effects on plant health and cannot be stopped once released into nature.

Thirdly, this scientific experimentation is diverting time, investment and attention away from real and already-proven solutions. They do not tackle the fundamental unsustainability of industrial farming and offer only at best short-term relief of the symptoms. Unproven solutions like these are like putting out a candle while ignoring the wildfire.

The promise of **new GMOs is being used to prop up the industrial agriculture monster** and draining more resources than they save.

For example, herbicide-resistant GM soya is now growing on millions of hectares of land¹¹ and the development of new genome-edited varieties is already at an advanced stage. Unfortunately, it is not the climate that benefits from such plants, not is it the smallholder farmers struggling to survive new climate conditions, but the agrochemical and seed companies eager to keep mass-producing cheap meat.

This will NOT solve the climate problem.

Footnotes:

¹⁰ Giddings LV, Rozansky R, Hart DM 2020 Gene editing for the climate: Biological solutions for curbing greenhouse emissions. Information Technology and Innovation Foundation. <http://www2.itif.org/2020-gene-edited-climate-solutions.pdf>

¹¹ Myazaki J, Bauer-Panskus A, Böhn T, Reichenbecher W, Then C 2019 Insufficient risk assessment of herbicide-tolerant genetically engineered soybeans intended for import into the EU. Environmental Sciences Europe 31: 92. <https://link.springer.com/article/10.1186/s12302-019-0274-1>

Urgent problems need proven solutions

3

The European Commission should support sustainable farming technologies like agroecology that already exist, are proven to work and could be implemented on a wide scale today. Not sink public money into GMO technologies that are seeking to maintain the status quo of agriculture, no matter the cost to the planet and public health.

Policymakers and scientists do not need to spend time and money reducing the methane impact of cows and creating GM-modified animal feed for mass production. They need to find ways to move away from unsustainable industrial farming. The question biotech is seeking to answer is, How do we maintain the same levels of overproduction and resource exploitation?, when it should be, How do we move away from an exploitative and environmentally damaging industry?

It is the industrial agriculture sector that is destabilising global food systems, disrupting climate conditions, and jeopardising the lives and livelihoods of people around the world. Now – without making any changes to this destructive and dangerous industry – it is positioning itself as the champion of sustainable food production through science.

This is an insult to the millions of smallholder farmers and family farmers who are already demonstrating sustainable practices that create more stable yields.

To increase farming resilience and reduce the sector's impact on the climate, governments and agribusiness can do better than relying on untested and undeveloped GMOs. There are already solutions that are being put into practise every day. Agro-biodiversity is known to protect against the negative consequences of climate change.¹² Diverse gene pools and diversified agricultural production creates more resilient and adaptable agricultural ecosystems that are less likely to be uniformly wiped out by extreme conditions.

Agroecology

Agroecological practices, which are based on agricultural diversity and the combination of scientific and traditional knowledge, have the power to:

- Slash greenhouse gas emissions¹³
- Generate more stable and resilient yields
- Support smallholder farmers
- Maintain soil fertility for long-term production
- Promote food democracy and a fair balance of power in the food chain.



Footnotes:

¹² Swiss Academy of Sciences (SCNAT) 2020 Variety is the source of life: Agrobiodiversity benefits, challenges and needs Fact sheet. https://scnat.ch/en/uuid/1/5505ae30-b2b3-56c9-abbd-21d2d0dd22d9-Variety_is_the_source_of_life

¹³ Lin H, Huber JA, Gerl G, Hülsbergen K-J 2016 Nitrogen balances and nitrogen-use efficiency of different organic and conventional farming systems. Nutrient Cycling in Agroecosystems. 105: 1–23. <https://doi.org/10.1007/s10705-016-9770-5>

Natural soil management

Conservation soil management practices are also effective at capturing CO₂ and increasing soil fertility.

The intensification of agriculture has led to the destruction of up to 75% of the organic matter in soil in arable land.^{14, 15}

Using agroecological and organic farming approaches that have worked for centuries, soil fertility can be restored and up to two-thirds of surplus CO₂ in the atmosphere can be sequestered into the soil again.¹⁶

Reduce meat consumption and production, and shorten the food chain

Industrial agriculture drives up demand for meat products and for animal feed production to match that demand. Shifting towards more plant-based diets slashes greenhouse gas emissions,¹⁷ frees up arable land for crops for human consumption, and avoids the calorie loss that happens when we get our energy from animal products rather than directly from the crops.¹⁸

In addition, when animal products are consumed, eating 'smarter' by sourcing meat from smaller and local farms that practise agroecology and organic farming drastically saves emissions compared to those of industrial farming, and avoids the emissions of transporting animal feed and animal products from overseas.



**IF AGROFORESTRY
WERE INTRODUCED ON 9%
OF EUROPEAN AGRICULTURAL LAND, UP TO 43%
OF GREENHOUSE GAS EMISSIONS
FROM AGRICULTURE COULD BE REDUCED**

EU COMMISSION ON WRONG TRACK

Biotech lobbying has already taken hold of EU policy-making. In July 2018 the highest European Court reaffirmed that new GMO techniques should be regulated under existing safety laws and must undergo safety checks, pre-market authorisation and be labelled as GMOs. This decision surprised the biotech lobby groups and they are campaigning to circumvent the ruling.

In April 2021, the health branch of the European Commission published a study on new GMOs, calling them 'new genomic techniques'. The report concluded that they "have the potential to contribute to sustainable food systems with plants more resistant to diseases, environmental conditions and climate change effects"¹⁹ and 'can make plants ... resistant to the effects of climate change (e.g. rain resistant wheat or drought-tolerant rice)'.²⁰

This is based on information fed by the biotechnology corporations and their lobby groups (REF JRC). Publicly available information gives clear evidence that most new GMOs are far from being ready for the market.^{21, 22}

The report is a worrying reflection of how the biotech industry is presenting its products as solutions – but without tangible solutions. The European Commission should not base its regulations for new GMOs on promises of biotech lobbyists.

Footnotes:

- 14 Milgroom J, Florin, GRAIN 2017 Agroecology getting to the root causes of climate change. Editorial. Farming Matters 33.1. <https://www.ileia.org/2017/06/26/agroecology-getting-root-causes-climate-change/>
- 15 <https://blog.whiteoakpastures.com/hubfs/WOP-LCA-Quantis-2019.pdf>
- 16 Woods J, Williams A, Hughes JK, Black M, Murphy R 2010 Energy and the food system. Philosophical Transactions of the Royal Society of London B Biological Sciences 365 (1554): 2991-3006. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2935130/>
- 17 Poore J, Nemecek T 2018 Reducing food's environmental impacts through producers and consumers. Science 360 (6392): 987-992. <https://josephpoore.com/Science%20360%206392%20987%20-%20Accepted%20Manuscript.pdf>
- 18 https://eatforum.org/content/uploads/2019/07/EAT-Lancet_Commission_Summary_Report.pdf

- 19 European Commission, 2021. Biotechnologies: Commission seeks open debate on New Genomic Techniques as study shows potential for sustainable agriculture and need for new policy. https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1985
- 20 European Commission, 2021. Questions and Answers: Study on New Genomic Techniques. https://ec.europa.eu/food/plants/genetically-modified-organisms/new-techniques-biotechnology/ec-study-new-genomic-1_en
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- 22 Testbiotech, 2021. Deregulation of New GE: Reasonable? Proportional? <https://www.testbiotech.org/en/node/2746>

CONCLUSIONS

The recent IPCC report left no room for doubt that the climate crisis is here now.²³ Equally, action to tackle it must happen now. Looking to gene technology for magical innovations that may or may not be developed in the future wastes time that we don't have and just raises more questions and risks than it resolves.

We don't know the long-term impact of modifying genes of plants and animals through technologies like CRISPR. We don't know when or if the technologies promised by biotech corporations will be ready or scaleable. We don't know how GM-modified crops cope in different weather and soil conditions.

And crucially, the efforts to develop these innovations are diverting the conversation away from the huge climate-destroying elephants in the room: intensive agriculture and unsustainable mass production and consumption. An industry based on driving demand for environmentally-damaging animal products can never be sustainable no matter how many genes are edited or cows are 'optimised.'

What we do know is that agroecological and organic farming practices already work to drastically cut emissions, build crop resilience, and stabilise yields. They are practices that have worked for centuries and can continue to work in the future.

The European Commission must recognise that the solution to agriculture's struggle lies not in the boardrooms of GMO lobby groups but right under its feet. And it must take action, quickly, to support the real solutions and secure sustainable food and a liveable future.

Footnotes:

²³ IPCC, 2021. AR6 Climate Change 2021: The Physical Science Basis. <https://www.ipcc.ch/report/ar6/wg1/>



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