The Jus Semper Global Alliance

In Pursuit of the People and Planet Paradigm

Sustainable Human Development

June 2023 COMMENTARY ON TRUE DEMOCRACY AND CAPITALISM

Genetic drivers or how to circumvent the laws of biological inheritance

The Biodiversity summit in Canada should decide on the use of the controversial technology

Isabel Bermejo

Despawning of a maize field. JAMES BALTZ | UNSPLASH

The Convention on Biological Diversity summit in Canada from 7-19 December is due to decide on a proposed moratorium on the use of gene drives, a controversial technology that is about to leap from the laboratory into the environment. Gene drives allow the laws of biological inheritance to be circumvented, forcing laboratory-created genetic modifications to spread rapidly in nature, even if they are lethal to a species. Their development and use are of enormous significance, as for the first time in history, humankind would have a tool that makes it possible to interfere with the evolutionary process of living organisms fundamentally and to permanently eliminate species.

A single GM trait - herbicide tolerance - is overwhelmingly dominant in this first generation of GM crops.

The first generation of GM crops has revealed the falseness of the great promises of genetic engineering controlled by the big agrochemical industry. Given that we are talking about almost 30 years of technological development, it is almost surprising that a single GM trait - herbicide tolerance - is overwhelmingly dominant in this first generation of GM crops. Of the approximately 190 million hectares of GM crops in the world in 2019, more than 166 million (88%) were herbicide-tolerant varieties. The advantage of these varieties is that they allow herbicides to be used without damaging the crop, making it easier to manage large monocultures, even if this means increasing dependence on agrochemicals. The next most important feature, far behind in terms of hectares, would be the

production of insecticides by the plants themselves, according to a report by the International Service for the Acquisition of Agricultural Biotechnology Applications.

A significant and growing proportion of GM crop hectares (45% in 2019) are varieties that tolerate 3 and 4 herbicides (glyphosate, glufosinate, dicamba and 2,4-D) and produce one or more insecticidal toxins. Over the last decade, we have witnessed a veritable rebellion by pests against GM crops. It is a rebellion that was predicted because the planting of large areas of crops resistant to the same herbicide or of varieties that produce an insecticidal toxin throughout the crop cycle inevitably leads to an evolutionary response from weeds and pests that become resistant and increasingly rebellious (i.e. difficult to control).

One of the main goals of the second generation of GMOs would be to transform - or eradicate - these unruly wild species that reduce the productivity of industrial agriculture. This eradication strategy, which was beyond the reach of genetic engineering in its early days, could become a reality in the near future with so-called gene drives.

This is a huge technological leap, as it would no longer be a matter of modifying seeds in the laboratory but of intervening drastically in ecosystems and the evolution of wild species. From incorporating desired traits into seeds that are marketed under patent licence and whose reproduction and spread are criminalised and prevented, we are now moving towards the creation of organisms specifically designed to actively spread genetic modifications, even if they prove lethal to the species. Genetically modified organisms (GTOs) allow laboratory-designed genetic modifications to be reproduced in nature. The aim is to replace or even exterminate populations of wild species with genetically modified organisms.

The aim is to replace or even exterminate populations of wild species with genetically modified organisms.

Although gene drives are almost exclusively promoted for their potential to eradicate disease vectors such as malaria, agriculture is likely to be the most important long-term application of this new technology. Patents describe hundreds of agricultural applications for gene drives. They include eliminating insect populations or modifying their behaviour to respond to certain agrochemicals, reversing the herbicide resistance developed by a growing number of weeds, or making weeds more susceptible to new compounds.

Some of these applications could also be used for hostile purposes. It is surely no coincidence that one of the biggest funders of this technology is the US Department of Defence's Defence Advanced Research Projects Agency (DARPA). The other major funder is the Bill and Melinda Gates Foundation, which has been aggressively promoting a new green revolution and the use of GMOs on the African continent for years.

It is relatively easy, quick and cheap to produce a gene drive in the laboratory, so the technology has high commercial expectations and fits perfectly into the prevailing economic model, which seeks a quick return on investment without worrying about the long-term consequences. So far, gene drive experiments have been conducted in confined conditions (in the laboratory or closed containers), but there are plans to release GDOs into the wild in the near future.

What would happen if a modification designed to increase sterility in a species considered harmful were transferred to other species that pollinate crops or are a source of food?

The deliberate modification and/or elimination of species poses a threat to ecosystem stability, sustainable agriculture and human health. For example, what would happen if a modification designed to increase sterility in a

species considered harmful were transferred to other species that pollinate crops or are a source of food for amphibians, birds or even humans? What would happen if important beneficial genes were inadvertently silenced or a particular genetic modification increased disease incidence? The release of gene drive organisms (GDOs) is an ecosystem-scale experiment with enormous risks.

Additional risks

- Uncontrollability: Once released into the environment, a gene drive organism (GDO) actively spreads in wild populations and can disperse rapidly over long distances. The diversity of ecosystems affected makes it much more difficult to anticipate and control potential risks.
- Irreversibility: A gene drive results in a permanent change in the genome that is passed on to all subsequent generations.
- Cross-breeding with other species: gene drives are designed to be inserted into the genome of a single species, but in many cases, it will be impossible to avoid cross-breeding with evolutionarily close species, thus crossing the species barrier.
- Unpredictable effects of the technology: Many gene drives use the genetic engineering tool CRISPR/Cas9, which can alter the activity of the target gene in unpredictable ways and/or cause genomic mutations. In addition, the emergence of potential resistance in the modified organisms could alter the functioning of this tool with unpredictable effects.

Decisive summit

On the other hand, it is illusory and risky to believe that a technological solution can solve complex problems such as hunger without addressing their root causes or the growing inequalities and injustices of the global agri-food system. As with the first generation of GMOs, one of the problems with GDOs is that they underpin environmentally and socially unsustainable industrial agriculture without seeking solutions to its serious underlying problems.

December could be decisive on this issue, which is crucial for the future of food and agriculture, human health and biodiversity conservation, as the Convention on Biological Diversity summit is due to decide on international rules for the use of gene drives.[1] Despite many voices from the public, scientific community and NGOs around the world calling for a moratorium on this technology and repeated recommendations from the European Parliament to the same effect, the EU's negotiating position is limited to stressing the need for a precautionary approach. Despite this, and the growing pressure from major lobbies to stop the moratorium, we hope that the international community will decide to pause the development of gene drives and give societies the time and space they need to discuss real solutions and alternatives.

[1] David Obura: The Kunming-Montreal Global Biodiversity Framework: Business as usual or a turning point? —17 February 2023.

Related links:

- The Jus Semper Global Alliance
- Elizabeth Kolbert – Olaf Bruns: "No Good Choices Left": Our Dilemma Under a White Sky
- Unai Pascual y Gorka Castillo: GDP as a real indicator of progress is one of the biggest fallacies in our society
- Rakhyun E Kim: Taming Gaia 2.0: Earth System Law in the Ruptured Anthropocene

- **About Jus Semper:** The Jus Semper Global Alliance aims to contribute to achieving a sustainable ethos of social justice in the world, where all communities live in truly democratic environments that provide full enjoyment of human rights and sustainable living standards in accordance with human dignity. To accomplish this, it contributes to the liberalisation of the democratic institutions of society that have been captured by the owners of the market. With that purpose, it is devoted to research and analysis to provoke the awareness and critical thinking to generate ideas for a transformative vision to materialise the truly democratic and sustainable paradigm of People and Planet and NOT of the market.

- **About the author: Isabel Bermejo** belongs to the Agroecology area of Ecologistas en Acción.

- **About this Brief:** Genetic drivers or how to circumvent the laws of biological inheritance was originally published in Spanish by CTXT in December 2022. This paper has been published under Creative Commons, CC-BY-NC 4.0. You are welcome to reproduce the material for non-commercial use, crediting the author and the original publisher.

- **Quote this paper as:** Isabel Bermejo: Genetic drivers or how to circumvent the laws of biological inheritance — The Jus Semper Global Alliance, June 2023.

- **Tags:** capitalism, democracy, GMOs, GDOs, biodiversity, Convention on Biological Diversity (COP15), technological hubris.

- The responsibility for opinions expressed in this work rests only with the author(s), and its publication does not necessarily constitute an endorsement by The Jus Semper Global Alliance.

Portal on the net: https://www.jussemper.org/
e-mail: informa@jussemper.org