Navdanya international

NOTHING NEW IN NEW GMOs

GATEWAY TO TOTAL CORPORATE CONTROL

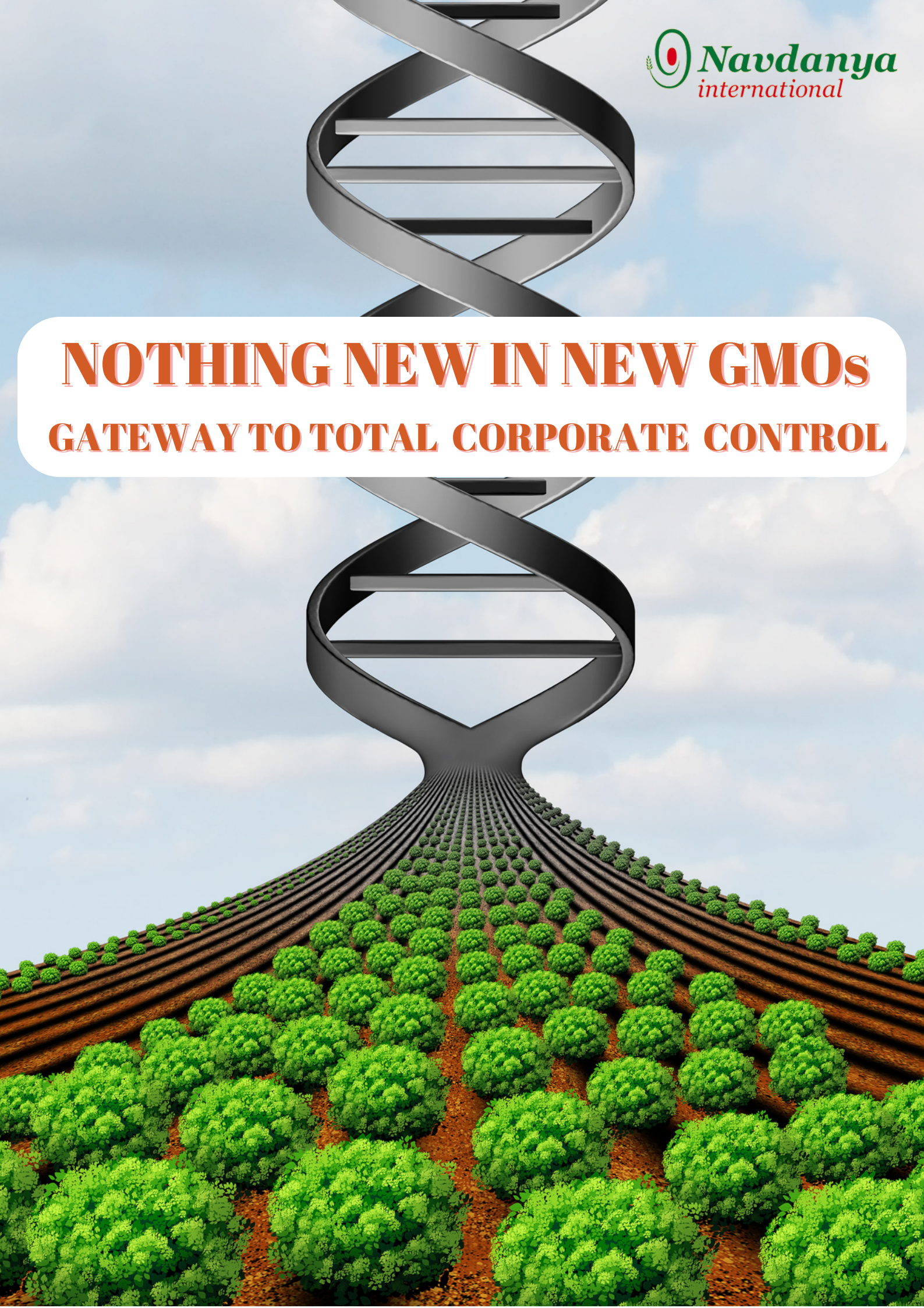


TABLE OF CONTENTS

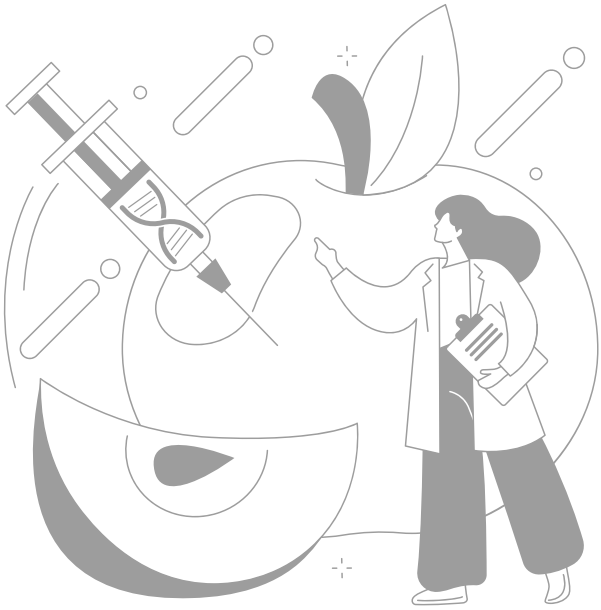
Introduction

For the last few years, agribusiness and biotech giants have been quietly making changes to GMO regulation around the world. New gene-edited technologies, denominated under an alphabet of new acronyms, from NBTs (New Breeding Techniques), NGTs (New Genomic Techniques), TEAs (Techniques of Assisted Evolution), have been silently dovetailing into different countries' existing agricultural legislation to by-pass any existing regulations and safety checks set in place for GMOs. Countries such as Paraguay, Argentina, Brazil, India, Australia, the United States, Canada, Japan and others now allow gene edited crops to be commercialized with no environmental or consumption safety testing, no labeling, little to no traceability, and no need for public disclosure of gene edited organisms. Effectively leaving farmers, and citizens completely in the dark as to what is now in their food.

The biotech industry has claimed that products, including seed, plants, microorganism, and animals, that have undergone gene editing are to be considered the same as their conventional counterparts, since gene editing allows these companies to do what nature does through conventional breeding practices, now only faster. Industry claims that because foreign DNA is supposedly not inserted into the organism being edited, they are not equivalent to the first generation of GMOs who have foreign DNA inserted through transgenesis. Therefore, they argue, these new technologies must be legislated as conventional. This is the deceptive logic that has been used all over the world to justify the mass deregulation of a highly dangerous, new generation of genetically modified organisms.

As has been revealed by numerous independent scientists, civil society reports and studies, corporate claims to the safety, effectiveness, conventional equivalence, as well as their necessity for sustainable development, are just elaborate ploys that are easily debunked. Considering the devastating consequences already caused by the industrial food system, pushed through the same false promises of food security, sustainability, and climate adaptation, there is little reason to believe this new era of gene editing organisms will be any different.

Lack of traceability, and independent testing leaves us completely uninformed as to what gene edited organisms are already released, how much they've spread, and what ecological, or health damage they may cause, directly violating citizen, farmer and nature's rights. This lack of transparency, along with the full green-light to release these modified organisms into the environment erases all liability for the creation of these organisms.



But upon closer inspection, the deregulation of gene editing around the world has opened the door for the ushering in of a new "bioeconomy", or a new method of economic production based on the manipulation of genetic information of microbes, plants and animals to "program biology" to be more economically productive. What is really at stake here is the next level of corporate takeover of not just our food system, but all living systems.

In this new “bioeconomy", the goal of bio and agritech companies is for gene editing and biological engineering to become the way that all natural material is either produced, or processed, and marketed all under patent exclusivity. From crop production, animal production, biofuel processing, food production and others, no part of the food system will be left untouched. Organic and GMO-free labeling would disappear in favor of ‘healthy’ or ‘sustainable’ labels, regardless of the process used to create the product. For these companies, man will now be in charge of “directing evolution”, and all nature will now be made to work for the perpetuation of corporate profit.

The European Union, along with a few other countries, until recently, stood as the last bastions against the imposition of these new technologies. These new genetically modified organisms must be labeled, subject to independent assessments, and the process by which they are created must be legislated, just as much as the final product. The agribusiness attempt to reduce the complexity of life to just mere genetics, and mechanistic outputs is only further putting in jeopardy the world’s biodiversity, ecological systems, and people’s health. The desire to control the basic constitution of living beings, is an erasure of uniqueness and diversity. Diversity is what creates ecological health and climate resilience. The solution to our multiple crises is not the mechanistic view of nature that seeks to further entrench itself through new technologies. The solution lies in ecologically integrated, biodiversity-based systems that understand the vast interconnections of life, and seek to work in tandem with nature.

The Last Stand at the EU

In June 2023, a draft proposal being discussed by the EU parliament was leaked, revealing an almost copy-paste legislation to what has now silently been passed all over the world. In July 2023, the legislation that deregulates this new generation of genetically modified organisms, created through a variety of gene editing technologies, was officially published. The proposal determines that one category of gene edited organisms be considered completely equivalent to conventionally bred crops. This category would allow up to 20 different internal genetic modifications, including deletions of genetic material, additions or insertions of genetic material from what is vaguely defined as a 'breeder's pool'. The only exception would be if edited for herbicide tolerance, which would then qualify it as a first generation GMO. According to the official document, the right of individual member countries to opt out is withdrawn. Meaning the right for individual countries to refuse these new technologies is not present. Any measures to prevent genetic contamination of non-gene edited organisms is left to member states.

After the EU court ruling in 2018, which stated that new gene edited organisms are to be considered GMOs and are to be regulated as such, the EU has been the site of an intense lobby attack by the agricultural and biotech industry. In an effort to create global hegemony on gene editing, the biotech lobby has since been slowly changing the discourse in Europe.

This became evident when the EU Commission issued a statement after a study and public consultation to claim that gene edited crops could be a part of the Farm to Fork policy, sustainable development and alleviate potential food shortage due to the war in Ukraine. In February 2023, the European Court of Justice gave the ruling that set the stage for full deregulation.

Finally, in Italy, one of the EU member countries with the strongest historical stance against GMOs, after many attempts to deregulate these new and old GMOs, gene edited crops were approved in June 2023. The members of the Italian parliament were given a drought ordinance to pass in the face of the country's current drought. But snuck inside was the approval for the use of gene edited crops under the excuse of their supposed 'drought tolerance' potential.

Now, debate is underway as to how much to deregulate these new genomic techniques for agriculture. With corporate lobbying efforts having proved successful, with the EU Parliamentary ruling based on the leaked regulation draft having been accepted. Leaving countries with little rights to protect against potential ecological damage, while also being forced to implement a new and dangerous technology without democratic voice.

Global Deregulation

While the leaked draft proved quite shocking in its level of deregulation, it is a mere copy-paste version from similar norms that have now been accepted all over the world. In 2018, several global meetings took place which would go on to set the tone for global policy assimilation of these new GMOs later on that year.

In June 2018, the OECD hosted a global "Conference on Genome Editing: Applications in Agriculture" which brought together leaders and policy makers from OECD member countries to discuss regulation and applications of these new technologies. Earlier in the year, eighteen countries, including Argentina, Brazil, Canada, Paraguay, the US and Australia, attended a seminar organized by the Inter-American Institute for Cooperation on Agriculture (IICA) on "Genome Editing for Regulators". Following the seminar, these countries signed onto a WTO statement calling for the deregulation of gene editing to avoid regulatory roadblocks and guarantee international policy harmonization. The statement called for, "*governments to avoid arbitrary and unjustifiable distinctions between end products derived from precision biotechnology and similar end products obtained through other production methods.*"

From this letter, global policy would go on to emphasize the regulation of the final products created, and not the process of gene editing itself. This marks a big shift in the way these technologies are regulated, and essentially means that any systemic or ecosystemic effect caused by these genetic modifications, or potential hazards that could be caused by the gene editing process itself is outside government regulation and jurisdiction. The regulation of final products also leaves full responsibility in the hands of corporations for the safety of the gene editing process.

The IICA itself has initiated projects on technologies in agriculture and education in collaboration with big agriculture giants like Bayer, Corteva and digital giants like Microsoft. Corporations who historically have had little to no concern for the public or environmental health effects of their products.

All over the world, the legislation (or lack thereof) of the gene editing process itself and gene edited organisms is essentially the same. With equivalence being drawn between gene-edited organisms and their conventional counterparts on the basis of final product, they are all exempt from any national GMO regulation. Public disclosure of gene edited organisms is not necessary and is only done on a voluntary basis, with little to no traceability, and no labeling, even in countries where GMOs labeling is required. Lack of regulation of the gene editing process means no accountability for possible ecological or health effects that could be caused by unpredictable effects of the process.

This is made even more concerning, as in the cases of Canada and Brazil for example, public disclosure of gene edited crops is not required. Meaning there is little way to know what has been manipulated or released so far. One hint is provided by a voluntary reporting service in Canada, called the Canadian Variety Transparency Database which already logs 5,595 crop varieties that could have been gene edited and are not required to pass Canadian Health Inspection. As part of a government transparency initiative, four gene edited crops have been registered.

This mass deregulation also means that the goal is to replace all conventional breeding practices with gene editing for both plant crops and animals. This is due to its increased patent, and therefore profit, potential, as we'll see later on, and due the ability to no longer have to be subject to regulation, field trials and government safety checks. By not publicly disclosing gene edited crops, corporations will also no longer be subject to the same public backlash or public liability for their products, as was the case with the first generation of GMOs.

Biotech Language Games

Since the advent of CRISPR-Cas9, the agricultural and biotech industry has been lobbying for the global acceptance of gene edited products under the logic that they are essentially the same as organisms developed under naturally occurring and current, slower methods of cross-breeding. Now instead of selecting physical traits and cross-breeding, traits selections can be made at the genetic level through deletions of unwanted genes, additions from other genes in that species' gene pool, or through DNA rearrangement. Since supposedly no foreign DNA from another organism is added, as is done with the first generation of GMOs, the biotech industry argues that they should not be considered GMOs since this process is not the same as "trans-genesis". Instead this kind of "precision breeding", argues the industry, is just sped up evolution.

The equivalency of gene edited plants and seeds to their conventional non-genetically intervened counterpart is also an attempt to normalize this new deep and intimate intervention into nature and is based on lies. If one stops to think, and does not get roped into these circular arguments, the intervention of any organism at the genetic level to create changes is an organism that has been modified genetically.

It is GMO anyway!

For example, one way gene editing works is by inserting DNA foreign to the plant or animal, even if it is from another organism within its gene pool, which must be done through a delivery mechanism (plasmids) introduced by using a variety of different plant pathogenic bacteria or Agrobacterium.

The editing step is done through cutting the DNA with enzymes called Nucleases, inserting the wanted genes with different agrobacterium, which triggers the cell to repair the damage. This repair cannot be technically controlled by the genetic engineer, even if templates or other genetic material are inserted to be incorporated in the repair. This means that such a process could result in "chromosomal mayhem" or a series of unpredictable effects caused in the cell during its repair.

In sum, gene editing is inherently reliant on the use of foreign enzymes, and genetic material, meaning that external genetic inputs must be used in the gene editing process.

Agrobacterium are also the same bacteria that have traditionally been used for transgenesis, or the first generation of GMOs, making these gene edited varieties not much different from the first generation of GMOs. All gene editing techniques also change the biochemistry and genetic information of the plant- resulting in a genetically altered organism. Gene editing itself is also based on a series of false metaphors that equate cells, whole organisms and nature itself to machines or computers. As Johnathan Latham points out in, God's Red Pencil? CRISPR and The Three Myths of Precise Genome Editing, even the use of the term "editing" implies a false idea of computational simplicity. According to them, genes can just be cut and pasted, copied and rewritten precisely like computer code. Meaning the language being used is also a propaganda to falsely characterize these new technologies as simple and low risk.

This metaphorical language has also gone so far as to penetrate policy maker rationale. "We need to develop genetic engineering technologies and techniques to be able to write circuitry for cells and predictably program biology in the same way in which we write software and program computers; unlock the power of biological data, including through computing tools and artificial intelligence", states a United States executive order on the creation of a new "bioeconomy".

The equation of life to computers and machines, and the reduction of life to be "predictably programmed" through gene editing is the repeated logic that has caused the destruction of life on Earth. As is also reflected in the policy rationale for deregulation, these false characterizations of life, genes and nature as machines, is the peddling of a false science. Policy makers makers and corporations use terms like "science-driven policy", and "scientifically-based technical decision making", which attempts to give a scientific and moral high ground to highly risky technologies, by elevating these technologies above nature, ecosystem functions and the purview of farmer's contributions.

Scientific determinism inspires agriculture innovation based on reductionist observations made in a lab. Meaning that limited and controlled lab based data is chosen as evidence of success and innovation that are then proposed as solutions to global threats such as climate change, biodiversity loss and deteriorating health.

By that standard all other knowledge systems are considered non-scientific, thereby disregarding the ecological and local based knowledge systems that farming communities have been contributing to food and farming systems for centuries. In other words, terms such as these are now being weaponized to disqualify the highly complex nature of these crises as well as the knowledge that local farming communities, indigenous peoples and women have from facing these crises first hand. What is left as valid is then only highly abstract and out of touch corporate science.

By establishing all knowledge except the industry funded scientific knowledge as critical for the promotion of sustainable agriculture enables the industry to control the narrative of the “right and appropriate” solution. This logic, based in language games and propaganda smoke screens, is set to avoid any type of regulation, liability or corporate responsibility for the rolling out of these risky technologies. As corporations attempt to move us into this new bioeconomy, the erasure of process, traceability and technological accountability erases all liability for the consequences of dangerous decisions.

We won't know it's Gene Edited!

With the take-off of the concept of "sustainable diets", and the deregulation of labeling gene edited products, lobby groups have started to move to change overall regulations on labeling GMOs to instead outline what is 'healthy' or 'sustainable'. In the wake of several countries now having legislation in place to label the presence of GMO ingredients in foods, interest groups are seeking ways to by-pass or change these labels to better market their biotech products. Marking part of corporate groups' move to eliminate the consideration of process in food and agricultural regulation.

Citing "consumer confusion" and unclear standards around what constitutes something non-GMO or organic, interest groups are calling for the changing of labeling of food to the vague terms of "sustainable", "healthy", and do away with organic, and GMO-free labeling. The reasoning? Companies claim that gene edited foods can now affect nutritional components of crops. Labeling, they argue, should describe the characteristics of the final product, not the process in which it was produced.

To them, since it is irrelevant how certain foods came to have increased compounds considered 'healthy', as well as supposedly contribute to 'sustainability', consumers should be incentivised by positive labeling.

As the Federation of American Scientists states, "Under the current scheme, improving the efficiency of agricultural practices involving GMO processes is discouraged because of the stigma. Innovations such as PivotBio's enhanced nitrogen fixation organism (a GMO that reduces the amount of fertilizer needed) may be avoided by farmers because of a fully-justified fear of being labeled."

This would also include plant-based, lab-made foods made through gene editing to not be labeled as 'bioengineered' according to the current US and European regulations, but instead be labeled as "healthy".

This is an attempt to undo the mandatory GMO labeling in many countries, and to further keep consumers in the dark as to what is in their food and how their food was produced. Companies are attempting to distance themselves as much as possible from the public's rejection of GMO products and the growing critique of industrial food systems. Knowing the devastating consequences of their industrial food system, changing or deregulating GMO labeling is a blatant attempt to greenwash the products produced through these destructive systems by duping consumers into believing they're healthy and sustainable.

An attempt to dissociate from the failures of GMOs

In an attempt to steer clear of the bad press, and failures of the first generation of GMOs, corporations are also playing language games to disassociate these new technologies from their previous failures. All over the world GMOs have failed at delivering on their promise of increasing global food security, increasing yields, and dealing with pests.

As Navdanya has shown in the case of BT cotton in India, the illegal introduction of this GMO has wreaked havoc on farming communities and created new super pests resistant to pesticides.

In a 2018 survey by Food Insight, 47 percent of consumers in the United States stated they try to avoid GMOs in their food out of concern for human health. The greater awareness by consumers of the consequences of GMOs has triggered an alphabet of new acronyms and dissociations of these new technologies, to both steer clear of biosafety regulations, but also keep consumers in the dark on what they are consuming.

Gene editing is a corporate attempt to control every aspect of the food system by using commodification and monopoly of food for profit. In realizing this, the Indigenous people of countries like New Zealand have rejected the introduction of gene technology in their country based on the fact that the big agriculture biotech industry is yet again making an attempt to colonize their food culture and indigenous agrifood system.

Surveys have also shown that a third of livestock farmers in Bavaria, Germany rejected the technology, as many were not convinced of the possible unknown results of gene editing in their crops, food and livestock. The lack of traceability and labeling of these new gene edited foods mean consumers have no rights and no choice in what they eat. Today, under democratic governments, people's food rights are still being violated by this sweeping aside of public opinion and public choice.

If consumers have no clue and are purposefully kept in the dark of genetic interventions made to their food, to the soils and to ecosystems, where are their rights if something goes wrong? If consumers do not know -they are eating gene edited foods, if farmers do not know -they are planting gene
edited seeds, and if we do not know -what gene edited microorganisms have been released into our environment, and devastation occurs similar to the devastation already caused by these same corporations, how will we know who is responsible?

Deregulation means corporate profit without responsibility. A deeply concerning and dangerous proposition considering the true goal of these new technologies.

The Risk to Food Systems

Considering the devastating consequences already caused by the industrial food system in terms of environmental pollution, loss of biodiversity, climate destabilization and the destruction of small rural economies, there is little reason to believe that the scenario will be different for new genetic editing techniques. It is the deregulation of something that could potentially, radically change the genetic fabric of life, putting into direct risk a host of ecological and biological processes that we depend on.

Nature and her ecosystems are a complex interconnected web of processes and beings. When one being is affected, so is the entire web of life. When we still do not understand all of the mechanisms by which nature, genetics and genetic expression work, and to the extent that these processes are tied up with one another, it is dangerous arrogance to believe to have the power to be able to directly control and understand the effects of these manipulations.

The deregulations of gene editing is really a pandora's box that puts into direct jeopardy agrobiodiversity, farmers and peoples right to health, organic food, and to consumer transparency. Lack of traceability of gene edited organisms, the roping off of genetic material, puts into direct threat the survival of organic and agroecological agriculture, along with traditional and native agrodiversity.

In other words, this lack of transparency appears to absolve manufacturers of any responsibility and represents a further attack on food sovereignty, understood as the fundamental right of peoples to healthy and safe food produced by ecological methods and to adequate information on the origin and production methods of food.

The agribusiness industry's attempt to reduce the complexity, diversity and richness of life forms to a mere matter of genetics, treating food and crops as mechanical products, will only lead us to ever greater genetic and biological uniformity. The want to shift all animal and plant breeding to genetic manipulation is a direct attack on the millennia of farmer’s varieties and biodiversity that keep our food systems resilient, and are urgently needed in the face of accelerating climate chaos.

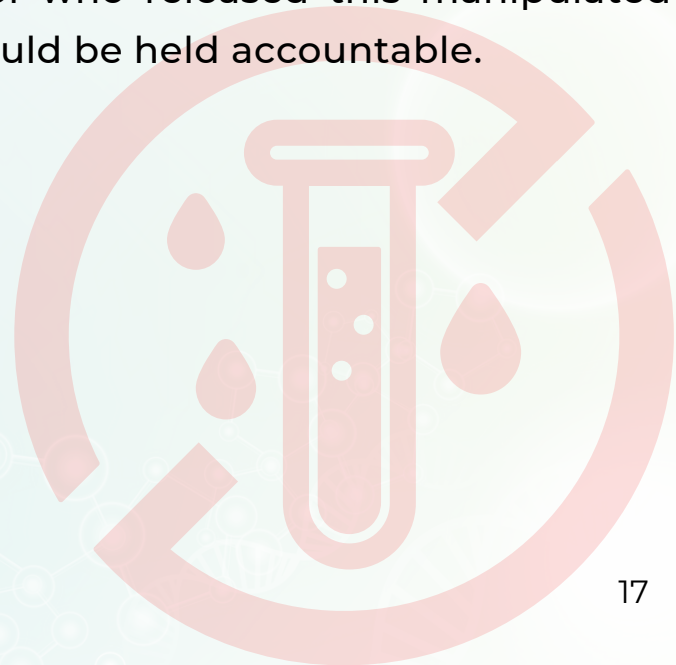
Farmers all over the world have been transitioning and/ or maintaining agroecological methods of food cultivation due to the climate, livelihood and ecological resilience these systems provide. We cannot have climate resilience without genetic biodiversity directly in small farmers' hands. Diversity is what creates ecological resilience, not agribusiness thinking it knows best what genes are the most useful, or not.

Genetic enclosures, corporate appropriation all risk food systems collapse, as has historically been the case with greater industrialization of the food system. The roll out of this next level of corporate control, risks even greater collapse of an already failing system.

Farmers have a right to be able to cultivate organic, healthy, diverse food that protects our health, biodiversity and local ecosystems. The imposition of these technologies puts that right in direct risk, along with their livelihood.

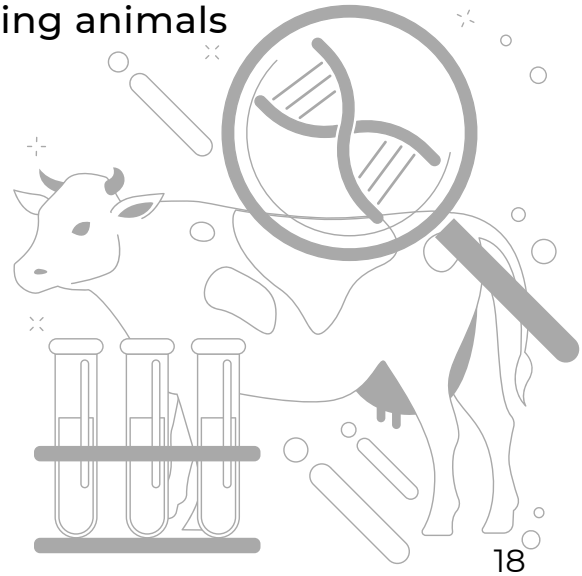
Genetic contamination

Full release of these organisms has the potential to directly contaminate biodiversity. As has already happened with cross contamination of open pollination GMOs such as corn. But now since that cross contamination could be potentially unknown, any genetic mayhem, or destruction that could happen due to an altered organism could quickly pass on to a wild or conventional counterpart. Leading to a domino effect of possible consequences. The clandestine release of these organisms will most likely directly contaminate native biodiversity, wild species, and other open pollinating compatible plant crops. This has been the case with genetic contamination of native and traditional corn varieties all over the world that have been contaminated by GM corn in neighboring fields. Once released, neither corporations, governments or scientists will be able to fully control the ecological effects of their products. Microbes, for example, spread the fastest around the globe, especially if they are tied to human activity. Meaning that if a genetic alteration went wrong or produced a deadly pathogen, it could quickly spread throughout the world, causing a major public health crisis. The lack of public disclosure of who released this manipulated microbe would mean no one could be held accountable.



This was exactly the fear with the failure of the gene edited hornless cow, developed by Recombinetics. Recombinetics followed the same rhetoric as the rest of the biotech industry around the safety, precision of their genetic intervention, and even claimed that they had, “all the scientific data that proves that there are no off-target effects.” But upon closer inspection by the Food and Drug Administration in the US, large swaths of antibiotic resistant bacteria were found in the GMO cow’s genome. Lack of detection by both the company and their partners at the University of California- Davis, led to the surprising news of the FDA’s find. The main risk of such a screw up, is the potential for horizontal transfer of these antibiotic resistant bacterial genes to other bacteria present in the GMO cow’s body. Resulting in unpredictable opportunities for this dangerous gene to spread.

This emblematic case proves the need to regulate both the process of gene editing, and not just the end products as equivalent to conventional. Had the FDA not double checked Recombinetics and UC Davis’ intervention,
who knows what consequences of genetic contamination could have occurred. Especially if these GMO cattle
had been approved for human consumption.
A real concern, especially as gene editing animals for ‘faster breeding’ is the next phase of this new technology. The lessons of such cases, of which there are many, means that these new technologies are not as ‘safe, predictable and precise’ as the industry would have us believe. Re-emphasizing the need for precaution and robust regulation.



Patents and Genomic Enclosures

The deregulation of gene editing biotechnologies is opening up a new, huge profit potential for the biggest players in global agriculture. Regardless of the regulatory definition of conventional equivalence of these products, companies are still filing for hundreds of patents by using these new technologies to widen the possible patent pool, and further entrench their control over global food systems. The new ability to patent plant genomes, whether derived from gene editing or not, has turned this biotech industry into a potential goldmine for companies, as technological applications are being made with little intention to solve climate or agricultural problems, but solely to increase profitability through market monopolization.

As of 2022, according to a series of reports by TestBioTech, the Big 4 of agribusiness, Corteva (former DuPont), Bayer-Monsanto, BASF and Syngenta have already successfully cornered the market for gene editing. As of 2022, Corteva filed for over 100 international patents for these new technologies, Bayer-Monsanto more than 60, BASF filed for 18, and Syngenta 6. Corteva is now the largest patent holder, and license holder for CRISPR technology in agriculture. This is concerning for several reasons. As opposed to previous GMO patenting strategies, the advent of these new technologies are allowing companies to widen patentable material, including individual genetic sequences, different gene editing methods, interventions, technologies and technological improvements, methods of recreating genetic material and storage, and the intervened organism and its subsequent generations or derivatives, meaning the individual seed, plant, animal or microbe.

This means the possibility to patent every step of this envisioned new paradigm for plant and animal breeding, along with the roping off of once publicly held genetic information necessary for small and medium scale plant breeders. Essentially guaranteeing complete control of the seed and agricultural market, which is already heavily monopolized.

Companies are also going so far as to just use gene editing as an excuse for patentability. For example, Testbiotech reveals a case of “second-hand GE” where the company Inari filed for a patent on the gene editing of no longer patent protected, first generation GMOs in which they ‘edited out’ the previously inserted Ht and Bt genes from the variety. Essentially making a "conventional plant" and taking out patents on the resulting organism and its derivatives. As also revealed by Test Biotech in the same report, companies are also using gene editing to just barely change the genetic composition of the plant to then be able to file a patent application and close off access to it. Or using the technology as a “technical topping” to be able to claim patents on naturally occurring gene variations, as was the case with Syngenta patent applications on naturally-occurring gene variants in wild relatives of soybeans. In the patent application, Syngenta just mentioned the need for possible gene editing to use these gene variants.

What seems to be happening is an attempt to rope off as much genetic material as possible under private patent protection to control the future use of genetic information, and future breeding resources by expanding patent monopolies into the non-technical areas of traditional breeding that were previously excluded.

This trend is nothing new, as the funneling of genetic material to private companies hands has been an ongoing threat since the development of Digital Sequence Information (DSI), which has allowed for the quick scanning and storage of the world's genetic biodiversity. As was described in Navdanya International's Gates to a Global Empire Report by Adelita San Vicente Tello and Aidé Jiménez-Martínez, delegates from the Mexican Ministry of the Environment and Natural Resources (SEMARNAT) to the CBD, since 2016 private interest in biodiversity has been on the rise due its importance in the new bioeconomy.

DSI has become a way to mass preserve and conserve genetic diversity, but since the take off of genetic biotechnologies, it has now become a valuable raw material for biotech companies. With synthetic biology technology, private companies and research institutions can now download the digitalized genetic information, and synthetically recreate the sequences in a lab, while effectively bypassing existing regulation on biodiversity access and violating the Convention on Biological Diversity and the Nagoya Protocol.

Companies like Ginkgo Bioworks and Editas, companies funded by Bill Gates, along with the Big 4 have been amassing huge digital genomic libraries through this digital scanning, and have been appropriating already scanned material from public databases. It is also no coincidence that Bill Gates became the largest donor of CCIAR, the largest conservator of biodiversity in the world, which subsequently began advocating for private-public partnerships to better store, use and develop plant breeding.

The appropriation of genetic material by corporations who then patent this material, or better known as biopiracy, is nothing new in the industry, and is in fact a common, albeit illegal, practice to secure exclusive rights of access to biodiversity for corporate benefit. The difference now is the extent to which they can now patent previously public genetic material, all thanks to these new technologies. In sum, gene editing technology has now allowed for the opening up of a new level of natural resource exploitation of previously inaccessible biological material.

Monopolies through common licensing platforms

As a way to manage third-party access to this genetic and breeding information, corporations are employing the new strategy of common licensing platforms to further extract profit from medium and small breeders, national breeding programs or anyone needing access to genetic information. Resulting in a multidimensional profit extraction mechanism.

As a way to manage third-party access to this genetic and breeding information, corporations are employing the new strategy of common licensing platforms to further extract profit from medium and small breeders, national breeding programs or anyone needing access to genetic information. Resulting in a multidimensional profit extraction mechanism.

In March 2023, Bayer- Monsanto, BASF, Syngenta, Corteva along with KWS, Limagrain, BNA, HZPC and Elsom Ackermann Barley launched the new European Agricultural Crop Licensing Platform.

Similar to a software subscription service, the Agricultural Crop Licensing Platform is essentially a paywall for anyone needing to access the patented information held by these companies. After paying fees, third-parties come into terms agreements with these companies for access to patent-protected traits and breeding tech, which can be defined wholly by the companies under private law. Together they control at least 180 patents on gene editing in the EU. The closed off nature of these licensing platforms means that genetic material illegally biopirated through DSI can be sold back to breeders without the need to publicly disclose through patent applications.

Licensing agreements are also being signed with individual country's national breeding programs, as is the case in Brazil where in 2020, the national breeding program EMBRAPA signed a partnership agreement with Corteva for the use of CRISPR/Cas technology. The partnership grants access to EMBRAPA to use CRISPR technology on plants, animals and microbes for use in agriculture, essentially funneling public money into corporate hands through licensing agreements and royalties. Such agreements also mean corporate interests can also now more directly determine the direction of national breeding programs and potentially capitalize on developed varieties.

Institution/ Patent holder	Surrogate company	Licensee	Field of application	Type of license*
Broad Institute, Harvard University & MIT (F. Zhang)	—	Bayer-Monsanto[12]	Agricultural applications (seed development)	Non-exclusive
		BASF[13]	Agricultural applications	
		Corteva Agriscience (DuPont Pioneer)[14]	Agricultural applications	
		Syngenta[15]	Agricultural applications	
	Pairwise[16]	—	Plant-based applications (fruits and vegetables)	
		Bayer-Monsanto[17]	Agricultural applications (in corn, soybean, cotton, wheat and canola)	Exclusive
University of California, Berkeley (J. Doudna)	Caribou Biosciences	Corteva Agriscience (DuPont Pioneer)[18]	Agricultural applications (major row crops) Other agricultural and industrial applications	Exclusive Non-exclusive
		Genus[19]	Livestock	Exclusive
		Regional Fish Institute[20]	Non-mammalian marine animals for agricultural purposes	Non-exclusive Asia Pacific
		TreeCo[21]	Trees	Exclusive
University of Vienna (E. Charpentier)	ERS Genomics	Evolva[21]	Food products (yeast and fungal engineering)	Non-exclusive
		Corteva Agriscience (DuPont Pioneer)[23]	All agricultural uses and applications in plants	Exclusive
Vilnius University	—	Corteva Agriscience (DuPont Pioneer)[24]	All applications, including agriculture	Exclusive

CRISPR-CAS9 Licensing agreements in food and agriculture.
https://cban.ca/wp-content/uploads/Patents-on-Genome-Editing-cban-March-2022.pdf.

Debunking the role of Gene Technology in the promotion of Sustainable Food Systems

Gene technology is another attempt to control and fix nature through science. It is the idea that science with profits is leading the way to a liberal democracy. We are witnessing the next attempt at concentrating decision making powers and centralisation over food and agriculture systems across the world through deregulation of gene editing laws that are being imposed across the world. The discourses that are being used to execute this deregulation are the same narratives that were used in the 1990s for the imposition of the first generation of GMOs. It is a series of false promises: the promise of increased climate sustainability, increased yield for greater food security, pest resistance, greater health and so on, that have all, with time, been proven completely false.

These false promises are summed up by the conclusions of the EU Commission's study on New Genomic Techniques, stating, "*In the agri-food sector, NGTs can make plants resistant to pests and diseases, needing less chemical pesticides (e.g. fungi-resistant maize or potato), or resistant to the effects of climate change (e.g. rain resistant wheat or drought-tolerant rice). NGTs can also improve the nutrient content of vegetables for healthier diets (e.g. soybean oil with healthier fatty acid content), or reduce the content of harmful substances such as toxins and allergens (e.g. potatoes with reduced acrylamide content).*"

The agritech industry is hiding behind the messiah complex by selling words like sustainability, climate resilience and food security to promote their failed technology. Convincing the world that gene technology is the solution to feed the world and alleviate poverty.

When given a closer look, these same narratives that are being used to push this new generation of gene technology, quickly crumbles. Leading us to the conclusion that the real interest behind these products is not to solve these interlocking crises.

False Promise 1. Reduced Pesticide Use and Sustainability

EU policy makers are citing the potential for new gene edited crops to contribute to the Farm to Fork policy, and a more sustainable agriculture due to them contributing to reducing pesticide use. This was the rationale behind the EU Commission's opinion, released in 2021, that began to change the narrative toward deregulation in Europe.

Nowhere in the agribusiness or policy makers' arguments have the reduction of monocultures, or reduction in industrial production been mentioned. Although the EU claims to be promoting the expansion of organic agriculture, the blurring of definitions of GE being compatible with organic production, gives little credence to their arguments. All food systems, whether industrial or agroecological, are interconnected systems dependent on key elements that all rely and work with each other. In the case of industrial agriculture systems, the initial creation of GMO monocultures was specifically for plants to be able to tolerate increasing amounts of herbicide and pesticide for increased production.

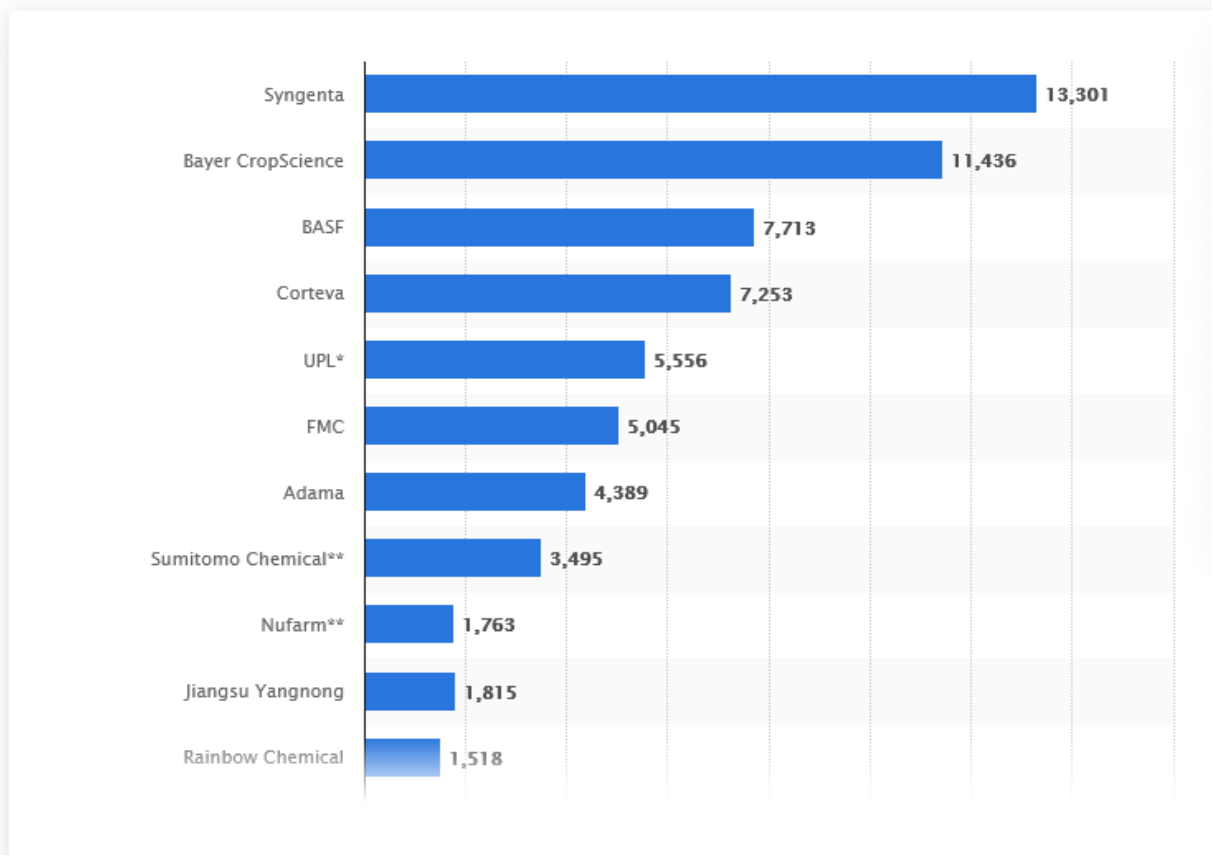
Although agribusiness would like us to think of these two technologies as entirely separate, the fact of the matter is, GMOs are entirely dependent on monoculture planting and the use of agrichemicals. In other words, GMOs go hand in hand with herbicides, pesticides and artificial fertilizers. Reduction in one would have to mean reduction of the industrial agriculture system as a whole.

Considering the fact that the biggest patent holders of these new breeding techniques are also the world's largest pesticide producers, there is little to no reason to believe that they would have any interest in reducing global pesticide consumption. In fact, a report by the Joint Research Center of the EU shows that the gene edited crops being developed are mainly constituted by herbicide resistant varieties.

Historically the world has seen an increasing use of pesticides, with a large uptick after the introduction of GMOs. There is little to no evidence to suggest that an expansion of GM technology would therefore lead to reduced pesticide use. On the contrary, the most likely scenario would be for these new GE crops to seamlessly insert themselves into the already existing industrial model. Especially considering that these new technologies are incompatible with agroecological and organic methods.

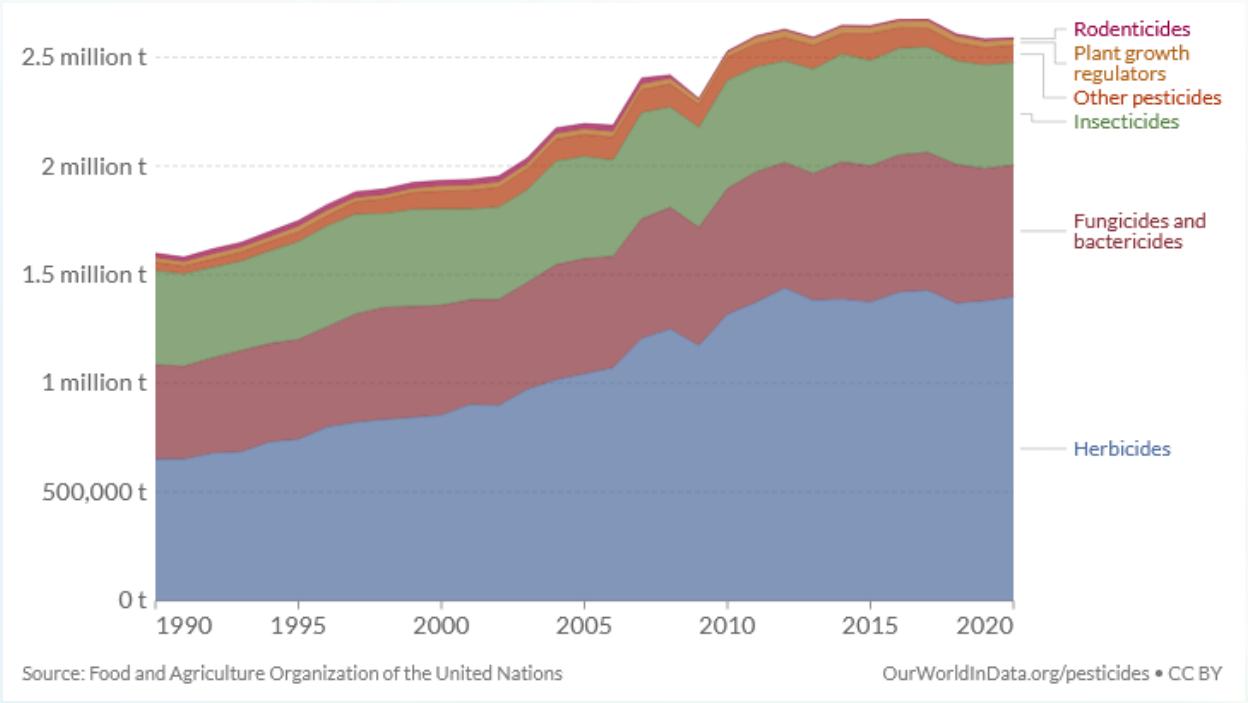
True sustainability and disease and pest reduction can only come from biodiversity. Disease and pest outbreaks are nature's signals of ecosystemic balance. Outbreaks are routinely prevented or taken care of through the cultivation of biodiversity and fortifying plant health through care for the soil. Considering that these new technologies would only serve to further entrench a system reliant on monocultures, destruction of biodiversity and agrochemicals, these new technologies are the antithesis to sustainability. If gene editing is meant to replace all forms of plant and animal breeding, the reduction of agrodiversity is most likely. As it would continue to lock in low diversity in fields.

Possibilities of cross-contamination also directly undermine organic, and agroecological cultivation systems, especially when there is no labeling or regulation. Biocontamination would make it impossible to reach the EU_Farm to Fork objective of at least 25% of EU agricultural land being farmed organically by 2030, for example.



Leading pesticide companies worldwide based on sales in 2021 (in million U.S Dollars)

https://www.statista.com/statistics/257489/ranking-of-leading-agrochemical-companies-worldwide-by-revenue



Pesticide breakdown by type, world, 1990-2020

'https://ourworldindata.org/pesticides.'

False Promise 2. Gene Editing as Solution to the Health Crises

The gene editing promise to improve nutrition comes from using CRISPR-CAS technology to produce biofortified crops with the objective of enhancing the nutritional properties of food crops.

Improved nutrition

Corporations are claiming that through gene editing, carbohydrates, proteins, fatty acids, antioxidants, vitamins and minerals can be edited in or out of food crops to increase health benefits, as well as to introduce disease and stress resistance. For example, in Golden Rice, Kitaake variety, maize genes are inserted to increase Vitamin A. Similarly through gene manipulation, crops can be biofortified with minerals and vitamins like iron, zinc, Vitamin E, increased fiber and so on. Genome editing technology is flawed and has potential for generating unintended changes. The technology is rife with biosafety and environmental concerns.

A key question is, why are the same monoculture commodity crops, like wheat, rice, barley proposed for biofortification? Especially since ecological, biodiversity-based food and farming systems have given the world a rich diversity of vegetables, fruits, legumes and pulses, herbs, and medicinal plants that have provided a variety of nutrients we need. True nutrition does not just come from isolated vitamins, minerals, proteins, carbohydrates and fats. Nutrition is a synergistic process between all of these elements, achieved through a diverse diet. The reduction of nutrients to functional components that work in isolation is a misunderstanding of the complexity of food and health.

Chemical based industrial farming systems are a known cause for nutrition depletion, comprising immune systems and an overall catalyst for food related disorders like allergies. The same industrial agriculture/ biotech industry has dipped their hands into gene editing food grains to edit out allergies caused by industry produced chemically enhanced foods. Today, gene editing technology is applied to modify, delete, edit genes, which the biotech industry calls maintaining food-technological quality of foods. The science is based on knocking off genes to: say reduce the starch in potatoes, reduce sugar content in strawberries and worst of all is the deliberate attempt to edit out naturally occurring cellular processes of foods. This attempt by the industry comes at the cost of the consumer's food safety rights. For highly sensitive patients, the lack of regulations and labeling of GE foods becomes a cause for concern. Since at the moment, ingredient information related to gene editing elements are proposed to not be disclosed. The argument of the industry is that gene edited foods are natural foods but just mutated at a higher pace.

The digestive system is incredibly essential in maintaining a body's immune system, since 70% of human immunity lies in the digestive tract. Whatever the quality or composition of food we eat, it is absorbed by the body, leaving one vulnerable to food allergies and autoimmune diseases. In the case of gene edited foods, that are manipulated at the genetic level at an almost cancer-like pace of mutation, one can only wonder the extent of the unintended effects these foods can have on the body.

The biotech industry is yet again forcing on people new GMOs in the name of healthier foods. Primary motive of the industry is to entirely change the concept of how foods should be labeled. The goal being to label foods as industry defined healthy and unhealthy foods, in this case guaranteeing the inclusion of gene edited foods as healthy foods without declaring information pertaining to gene editing.

The calming tomato sham

The silicon rogue tomato was the first genome edited food made by CRISPR- Cas9 technology to enter the Japanese market. Genetically edited to contain high amounts of Gamma-aminobutyric acid (GABA), a common inhibitory chemical messenger in the central nervous system that affects the brain. Ordinarily, GABA in the body is responsible for maintaining blood pressure, preventing muscle spasms and managing moods.

As expected, the safety in external consumption of the chemical messenger remains unknown. With the uncertainty related to introducing such potent chemicals, how is safety of the farmer or the consumer guaranteed by the biotech industry? How can the biotech industry decide whether such products are safe without public consensus?

Why do we need fake tomatoes, rice, wheat or other genetically edited fruits when all parts of the world are home to a diversity of vegetables, plants, fruits that are rich in nutrition. Ecological and regenerative food and farming systems based on biodiversity have proven to provide healthy and safe foods that are considered nourishing and medicinal in many cultures across the world.

False Promise 3. Gene Editing as a Climate Change Solution

Gene editing technology is presented as the answer to all threats that humans and the earth faces, including anthropocentric caused climate change. Their promise comes from deleting and inserting genes of crops such as wheat, sugarcane, rice, barley, tomato, papaya, cotton, cassava and even in cattle. The technology is based on the premise that all living things are machines and their performance can be assessed and directly manipulated. Editing plants and animals to better adapt to stressors like salinity, drought, heat, disease and to prevent the reduction in the biomass of the plant. However, gene editing technology, as with its first generation counterpart genetically modified organisms, are unethical in its science, contradict nature and are the same.

The gene editing of these commodity crops holds the risk of switching off other functional mechanisms of the plants and animals on manipulating the genes. What is worse is that the results and extent of such technologies remain undisclosed. It is expected that farmers and consumers accept the science without full exposure to the risks and repercussions. Worst of all is that the agritech industry is not legally liable in any way to the consumers and farmers, in cases of failure of any kind. To top it off, the deregulation of gene technology and not labeling the gene manipulation puts the onus on the farmers in cases of contamination. This means that the agritech companies gain from patent royalties plus are geared up with all the arsenal to sue farmers from across the world at their whim and fancy.

In nature, plants and animals build their adaptation and mitigation mechanism to climate change through a biodiversity-based response. For instance, India is known to have 200,000 races of native rice varieties, which include drought tolerant and salt tolerant varieties. These varieties have been multiplied and bred by participatory breeding methods by small farmers. Similarly, many countries are home to millets that are water prudent and nutrition dense, like finger millet and barnyard millet. Nature and people have used natural selection methods that are scientific and localized to the climate and geographical conditions of a specific region to improve climate resilience in their food and farming systems. All within the principles of ecological, regenerative and biodiversity based agriculture models.

“Made in Italy” or is it “Made in Lab”?

Genus	Species	Trait	Modified Gene(s)	Approach
Citrus	*C. sinensis*	Resistance to *Citrus* canker disease	Loss of function of *CsNPR3* that represses *NPR1*	CRISPR/Cas9; Protoplast transfection with Lipofectamine
	C. paradisi		Mutation of an EBE in the promoter of *LOB1*	CRISPR/Cas9; *A. tumefaciens* infection of grapefruit epicotyls
	C. sinensis		Mutation of an EBE in the promoter of *LOB1*	CRISPR/Cas9; *A. tumefaciens* infection of epicotyls and protoplast transfection. Improved binary vector
	C. paradisi *C. sinensis* × *Poncirus trifoliata*		Loss of function of *DMR6*	CRISPR/Cas9; *A. tumefaciens* infection of epicotyls
	V. vinifera	Resistance to *Botrytis cinerea*	Loss of function of *VvWRKY52*	CRISPR/Cas9; *A. tumefaciens* infection of embryogenic callus
	V. vinifera	Tolerance to downy mildew caused by *Plasmopara viticola*	Loss of function of *PR4*	CRISPR/Cas9; *A. tumefaciens* infection of embryogenic callus

The application of genetic engineering in Italy in the modification of genes.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9861864/

Italy prides itself over its food and cultural heritage. But the “Made in Italy” campaign is using digital technology, precision agriculture and gene technologies to manipulate the Italian food and agriculture system. In Italy specifically, New Genome Technologies are called “technologies for assisted evolution”, the reason being that gene editing is packaged as an expedited version of natural evolution. But gene edited foods are GMOs that are genetically edited in laboratories. In Italy the emphasis is on gene edited fruits, especially citrus fruits. Editing the genome to make them “healthier” and to make the plants climate adaptive. For instance, extending fruit shelf-life, and the development of resistance and tolerance to biotic and/or environmental stresses. Since 2015, Italy has initiated the genetic improvement program for fungi resistant wine varieties, and the creation of seedless varieties. Both specifically to respond to drought. Some other examples of fruit include, pear, apple, strawberry, chestnut, kiwifruit. But many of these fruits are exotic and alien to Italy’s climate and geography.

Case of the mutant golden rice

Rice is a food commodity that is eaten by 3.5 billion people and a majority of the rice eating population are in Asia. The Agritech industry is yet again using rice, as a gene editing experiment as a solution to climate change, increased crop yield, biofortification and food security. By knocking out genes from rice to create herbicide, cold, drought and salt tolerance for crop improvement. The industry is gene editing all aspects of rice. Companies like Ark Invest claim that by using gene technology it would only take 18 months to take gene edited rice from the laboratory to the field. It would only take another 6 months for agriculture giants to pick it up and to sell the seeds to farmers. The proposed technology targets engineering and directing the evolution of the crop. It is a forced technology that uses transgenes like GMOs that are developed isolated from nature's various cycles, thus suspected to show signs of off-target effects, unintended mutations and unknown results.

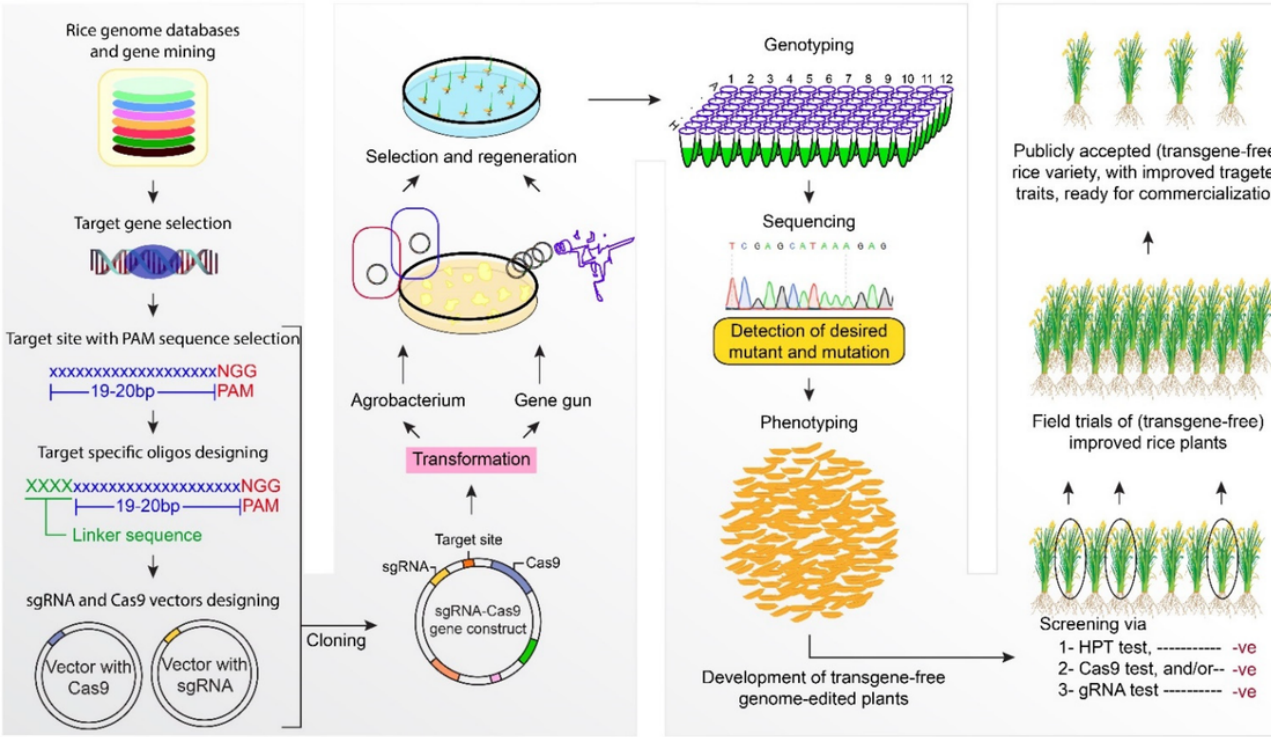
The world has already witnessed the forceful imposition of Golden Rice on Asian countries under the pretext of improving women's health and nutrition security. Recently the Philippines rejected Golden rice, as it failed to meet the safety concerns of human consumption. Crop diversity and biodiversity in any given farm is the real insurance against climate change.

Both elements in an agriculture system incorporate essential principles of adaptation, diversity and plurality and promote mitigation of environmental stresses. Farmers' innovation and climate adaptive strategies through plant breeding is central to adapting agriculture to rapidly changing climates. Farmers have evolved salt and drought tolerant and high biomass varieties of rice such as Bhundi, Kalambank, Lunabakada, Sankarchin.

Any kind of gene manipulation is genetic modification and not naturally occurring foods that the biotech companies are claiming gene editing to be.

Species	Trait category	Trait targeted	Gene(s) Edited*	Method	Year published
Banana	Abiotic stress	Semi-dwarfed	Ma04g15900 Ma06g27710 Ma08g32850 Ma11g10500 Ma11g17210	CRISPR/Cas9	2019
Maize	Abiotic stress	Drought tolerance	ARGOS8	CRISPR/Cas9	2016
Rice	Abiotic stress	Drought Tolerance	EPFL9	CRISPR/Cas9, CRISPR/Cpf1	2017
Rice	Abiotic stress	Early flowering	Hd2, Hd4, Hd5	CRISPR/Cas9	2017
Rice	Abiotic stress	Salt tolerance	OsRR22	CRISPR/Cas9	2019
Cattle	Abiotic stress	Thermotolerance	SLICK	CRISPR/Cas9	2018

Different kinds of gene manipulation of food crops and livestock.
https://www.frontiersin.org/articles/10.3389/fsufs.2021.685801



Development of gene edited rice
https://www.mdpi.com/2073-4395/11/7/1359

False Promise 4. Food Security in the Hands of Big Science

Both elements in an agriculture system incorporate essential principles of adaptation, diversity and plurality and promote mitigation of environmental stresses. Farmers' innovation and climate adaptive strategies through plant breeding is central to adapting agriculture to rapidly changing climates. Farmers have evolved salt and drought tolerant and high biomass varieties of rice such as *Bhundi, Kalambank, Lunabakada, Sankarchin*.

Any kind of gene manipulation is genetic modification and not naturally occurring foods that the biotech companies are claiming gene editing to be.

The big controlling powers of the world are using the very real threats as a backstop to enforce gene technology as the innovative and scientific solution. There is a lack of transparency that is proposed in the forced deregulation of gene technology in agriculture and for livestock.

The industry by law is demanding for no labeling of the process by which the food crops, seeds, plants or livestock are made. Removing all transparency between developers and consumers and farmers, thereby violating the basic right to knowledge for all being involved in the chain of consumption and production. When there is denial to information and freedom, there is no question of food security.

Gene Editing: the Gateway to Bioeconomy

The global deregulation of gene editing, coupled with securing and closing off access to such a vast amount of genetic material through patents, licensing agreements and royalties, has now opened the door for the development of an entirely new economic sector, deemed by the US and Silicon Valley advocates as the "bioeconomy". The bioeconomy is the convergence of life sciences, biology, computation and information sciences, engineering and biotechnology. In this new "bioeconomy," the goal of biotech and agritech companies is to make gene editing and biological engineering the main tool for producing and processing all natural material, reducing agribusiness production to an artificial system of exclusive patents and licensing.

It directly relies on the manipulation of nature's genetics to "program" biology to become more economically productive. This includes the expansion of synthetic biology, or the genetic engineering or editing of microbes to produce new chemical compounds, the gene editing of animals, or animal products like lab-made meat, and expansion into sectors like energy, health, and industrial chemicals. Biotech enthusiasts see this new economic sector as the panacea that could solve all our ecological, climate and economic crises. Thanks to gene editing technology they can now mobilize a previously inaccessible part of nature to produce economic output on their behalf. As of 2022, the global gene editing market was valued at $6.35 billion and is expected to increase to $7.44 billion in 2023, growing 17.3% annually.

But this is just a drop in the bucket in comparison to market value estimates for this new bioeconomy sector. Currently the bioeconomy is valued at over $1 trillion USD with expectation of market value growing to well over $30 trillion in the next two decades.

While philanthrocapitalist and Silicon valley tech billionaires appropriate the language of using the bioeconomy to “work with nature”, and the concept of “circular economy”, behind the facade we see the real intention of this economic expansion to keep industrial business as usual. These new technologies have now empowered the very people who have destroyed our planet’s ecology to double-down on their already failed strategies. Now just with a new greenwashed rebranding, and a next generation of potentially even more destructive technologies.

In the world giving the green light to these new technologies, and therefore the expansion of the bioeconomy, under conditions that violate rights, are unethical and give no regard to independent science, it is evident that the real objective was never to truly shift toward a sustainable regenerative economy and agrifood systems.

Conclusion:
Let's End the Gene Editing Trap

The way we are currently producing food, through industrial, chemical driven agriculture is the very thing that has created climate chaos, biodiversity extinction, mass pollution, farmer suicides, and global ill-health. Corporations are looking for ways to have us constantly question or forget this fact. But the way we produce our food is perhaps even more important than the final products, as food systems are deeply intertwined with natural systems, as well as with culture and local economies. The attempt to erase the ways in which food is produced, is a play to erase the consequences of this industrial paradigm. This is exactly the aim with the deregulation of this next generation of GMOs. In order to maintain business as usual and not lose profit by allowing the real solutions to come to the forefront, a new iteration of the same failed technologies are being pushed globally.

In order to control as much of the agricultural market as possible, corporations have been responsible for systematically destroying the food and agriculture memory that belongs to local and indigenous communities. This next genetic enclosure, the desire to control everything living, and the very constitution of living things, is an the next attack on diversity and life. Diversity is the basis of life on the planet and is the only antidote we have to create ecological, health and climate resilience. Each food culture in our world is rich in a diversity of vegetables, food grains, pulses, fruits, animals, cuisines and knowledge systems.

Cultures across the globe have nuanced farming systems that have been conserving and promoting the biodiversity and ecological food systems of their region. There by maintaining the fragile web of life that is running through the soil, air and waters networks of our planet.

New gene editing technologies continue to shift attention away from these real alternatives that can drive ecological regeneration. There is nothing new or natural about gene editing. All things that come from a lab to defy nature's laws are simply not natural. In reality all policies, laws, treaties are a continued attempt at erasing all the natural biodiversity and indigenous owned knowledge systems. Just as in the past, it is an attack on the rights of consumers, farmers and all people and beings that are linked to the food and agriculture systems. The renewed attempt to completely take over our food and agriculture system is the ultimate objective of the industry; from nature, seed, food, labeling, market, trade, economy, profits and health.

Now it is more important than ever to protect our food and seed sovereignty. To demand that our democratic governments actually listen to the will of the people, and protect farmers and citizens from the risks of these new technologies, as well as hold corporations responsible for the destruction they've caused. The real solutions lie in the creation of ecologically integrated systems based on biodiversity, care and a science that understands and respects the interconnections between life and nature.

BIBLIOGRAPHY

"Agricultural Biotechnology Annual." Brazil: United States Department of Agriculture: Foreign Agricultural Service, December 9, 2021. https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Agricultural%20Biotechnology%20Annual_Brasilia_Brazil_10-20-2021.pdf.

Ann Arbor Holistic Health. "Food Allergies and Industrial Agriculture," July 16, 2012. https://annarborholistichealth.com/2012-7-16-food-allergies-and-industrial-agriculture-html-3834t/.

ARC. "Leak - Draft NGT Regulation and Impact Assessment Revealed." Agricultural and Rural Convention, June 15, 2023. https://www.arc2020.eu/leak-draft-ngt-regulation-and-impact-assessment-revealed/.

"Assisted Evolution Technologies (AET) to Improve Citrus Fruit Quality," February 2, 2023. https://www.freshplaza.com/europe/article/9500182/assisted-evolution-technologies-aet-to-improve-citrus-fruit-quality/.

Bloomberg.com. "This Genetics Company Is Editing Horns Off Milk Cows." October 12, 2017. https://www.bloomberg.com/news/articles/2017-10-12/this-genetics-company-is-editing-horns-off-milk-cows.

Burbaum, Jonathan. "Protecting Consumers by Reforming Food Labeling Regulations." Federation of American Scientists (blog), June 29, 2023. https://fas.org/publication/protecting-consumers-by-reforming-food-labeling-regulations/.

Canada, Health. "List of Non-Novel Products of Plant Breeding for Food Use." Guidance, May 18, 2022. https://www.canada.ca/en/health-canada/services/food-nutrition/genetically-modified-foods-other-novel-foods/transparency-initiative/list-non-novel-products-plant-breeding-food-use.html.

Canadian Biotechnology Action Network. "Patents on Genome Editing in Canda." CBAN, March 2022. https://cban.ca/wp-content/uploads/Patents-on-Genome-Editing-cban-March-2022.pdf.

Chu, Philomena, and Sarah Agapito-Tenfen. "Unintended Genomic Outcomes in Current and Next Generation GM Techniques: A Systematic Review." Plants 11 (November 7, 2022): 2997. https://doi.org/10.3390/plants11212997.

Chu, Philomena, and Sarah Zanon Agapito-Tenfen. "Unintended Genomic Outcomes in Current and Next Generation GM Techniques: A Systematic Review." Plants (Basel, Switzerland) 11, no. 21 (November 7, 2022): 2997. https://doi.org/10.3390/plants11212997.

CROCEVIA. "Vita Privata COME I BREVETTI SUI NUOVI OGM MINACCIANO LA BIODIVERSITÀ DEL CIBO E I DIRITTI DEGLI AGRICOLTORI." Italy: CROCEVIA. Accessed July 28, 2023. https://www.croceviaterra.it/wp/wp-content/uploads/2023/06/Report-NGT_Crocevia2023.pdf.

Cumbers, John. "White House Unveils Strategy To Grow Trillion Dollar U.S. Bioeconomy." Forbes. Accessed July 28, 2023. https://www.forbes.com/sites/johncumbers/2022/09/12/white-house-inks-strategy-to-grow-trillion-dollar-us-bioeconomy/.

"Digital Sequence Info – BICSBAG." Accessed December 1, 2022. https://www.synbiogovernance.org/category/digital-sequence/.

European Commission. “Study on the Status of New Genomic Techniques under Union Law and in Light of the Court of Justice Ruling in Case C-528/16.” European Commission, April 29, 2021. https://food.ec.europa.eu/system/files/2021-04/gmo_mod-bio_ngt_eu-study.pdf.

European Commission - European Commission. “European Green Deal: Sustainable Use of Natural Resources.” Text, July 5, 2023. https://ec.europa.eu/commission/presscorner/detail/en/ip_23_3565.

Gallo, Marcy. “The Bioeconomy: A Primer.” Washington DC: US Congressional Research Service, September 19, 2022. https://crsreports.congress.gov/product/pdf/R/R46881.

Global Gene Editing Regulation Tracker. “Global Gene Editing Regulation Tracker.” Accessed June 27, 2023. https://crispr-gene-editing-regs-tracker.geneticliteracyproject.org.

GM Watch. “Gene Editing Is Not ‘Precision Breeding’ – International Scientists and Policy Experts.” GM Watch, September 8, 2022. https://gmwatch.org/en/106-news/latest-news/20092-gene-editing-is-not-precision-breeding-international-scientists-and-policy-experts.

———. “Bayer Lobbying ‘Very Strongly’ to Change EU’s GMO Regulations to Exempt Gene Editing.” GM Watch, November 17, 2020. https://www.gmwatch.org/en/main-menu/news-menu-title/archive/100-2020/19598-bayer-lobbying-very-strongly-to-change-eu-s-gmo-regulations-to-exempt-gene-editing.

———. “Gene Editing: Unexpected Outcomes and Risks.” Accessed November 24, 2022. https://gmwatch.org/en/news/archive/67-uncategorised/19499-gene-editing-unexpected-outcomes-and-risks.

House, The White. “Executive Order on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy.” The White House, September 12, 2022. https://www.whitehouse.gov/briefing-room/presidential-actions/2022/09/12/executive-order-on-advancing-biotechnology-and-biomanufacturing-innovation-for-a-sustainable-safe-and-secure-american-bioeconomy/.

IICA. “Eighteen Countries of the Hemisphere Boost Expertise in New Techniques in Biotechnology Application.” IICA.INT, April 2018. https://iica.int/en/press/news/eighteen-countries-hemisphere-boost-expertise-new-techniques-biotechnology-application.

Insight, Food. “Survey: Nearly Half of U.S. Consumers Avoid GMO Foods; Large Majority Primarily Concerned About Human Health Impact.” Food Insight (blog), June 27, 2018. https://foodinsight.org/survey-nearly-half-of-u-s-consumers-avoid-gmo-foods-large-majority-primarily-concerned-about-human-health-impact/.

“International Statement on Agricultural Applications of Precision Biotechnology.” World Trade Organization, January 1, 2018. https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-DP.aspx?language=E&CatalogueIdList=250406,249838,249823,249748,249641,249507,249371,249321,249324,249267&CurrentCatalogueIdIndex=7&FullTextHash=&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=Tru.

Jouanin, Aurelie, Luud J. W. J. Gilissen, Jan G. Schaart, Fiona J. Leigh, James Cockram, Emma J. Wallington, Lesley A. Boyd, et al. “CRISPR/Cas9 Gene Editing of Gluten in Wheat to Reduce Gluten Content and Exposure—Reviewing Methods to Screen for Coeliac Safety.” Frontiers in Nutrition 7 (2020). https://www.frontiersin.org/articles/10.3389/fnut.2020.00051.

Karavolias, Nicholas G., Wilson Horner, Modesta N. Abugu, and Sarah N. Evanega. “Application of Gene Editing for Climate Change in Agriculture.” Frontiers in Sustainable Food Systems 5 (2021). https://www.frontiersin.org/articles/10.3389/fsufs.2021.685801.

Latham, Jonathan. “God’s Red Pencil? CRISPR and The Three Myths of Precise Genome Editing.” CounterPunch.org, April 27, 2016. https://www.counterpunch.org/2016/04/27/gods-red-pencil-crispr-and-the-three-myths-of-precise-genome-editing/.

Louca, Stilianos. “The Rates of Global Bacterial and Archaeal Dispersal.” The ISME Journal 16, no. 1 (January 2022): 159–67. https://doi.org/10.1038/s41396-021-01069-8.

Maina, Joseph. “5 Ways Gene Editing Is Making Crops Climate-Resilient.” Alliance for Science, January 11, 2022. https://allianceforscience.org/blog/2022/01/5-ways-gene-editing-is-making-crops-climate-resilient/.

Masipag.org. “Supreme Court Issues Writ of Kalikasan on Golden Rice and Bt Eggplant, MASIPAG Continues to Call for Action to End Commercialization,” April 19, 2023. https://masipag.org/2023/04/supreme-court-issues-writ-of-kalikasan-on-golden-rice-and-bt-eggplant-masipag-continues-to-call-for-action-to-end-commercialization/.

Medina, Gabe. “Schmidt Futures Publishes Groundbreaking New Bioeconomy Strategy, Calls for Strategic Investment, Workforce Development, and Infrastructure to Bring Innovations from Lab to Market.” Schmidt Futures, April 14, 2022. https://www.schmidtfutures.com/schmidt-futures-publishes-groundbreaking-new-bioeconomy-strategy-calls-for-strategic-investment-workforce-development-and-infrastructure-to-bring-innovations-from-lab-to-market/.

Montenegro de Wit, Maywa. “Democratizing CRISPR? Stories, Practices, and Politics of Science and Governance on the Agricultural Gene Editing Frontier.” Edited by Anne R. Kapuscinski and Elizabeth Fitting. Elementa: Science of the Anthropocene 8 (February 25, 2020): 9. https://doi.org/10.1525/elementa.405.

Müller, Ruth, Amy Clare, Julia Feiler, and Ninow Marco. “Between a Rock and a Hard Place: Farmers’ Perspectives on Gene Editing in Livestock Agriculture in Bavaria.” EMBO Reports 22 (June 17, 2021). https://doi.org/10.15252/embr.202153205.

Navdanya international. “The Failure of GMO Bt Cotton and the Continued Success of Native Indigenous Cotton in India,” July 20, 2022. https://navdanyainternational.org/the-failure-of-gmo-bt-cotton-and-the-continued-success-of-native-indigenous-cotton-in-india/.

Nerva, Luca, Lorenza Dalla Costa, Angelo Ciacciulli, Silvia Sabbadini, Vera Pavese, Luca Dondini, Elisa Vendramin, et al. “The Role of Italy in the Use of Advanced Plant Genomic Techniques on Fruit Trees: State of the Art and Future Perspectives.” International Journal of Molecular Sciences 24, no. 2 (January 4, 2023): 977. https://doi.org/10.3390/ijms24020977
.

Perry, James. “GMO a Treaty Issue, Not for Governments Alone - Māori Organics Authority.” News. Te Ao Māori News, June 16, 2023. https://www.teaonews.co.nz/2023/06/16/gmo-a-treaty-issue-not-for-governments-alone-maori-organics-authority/.

Pixley, Kevin V., Jose B. Falck-Zepeda, Robert L. Paarlberg, Peter W. B. Phillips, Inez H. Slamet-Loedin, Kanwarpal S. Dhugga, Hugo Campos, and Neal Gutterson. “Genome-Edited Crops for Improved Food Security of Smallholder Farmers.” Nature Genetics 54, no. 4 (April 2022): 364–67. https://doi.org/10.1038/s41588-022-01046-7.

Regalado, Antonio. “Gene-Edited Cattle Have a Major Screwup in Their DNA.” MIT Technology Review, August 29, 2019. https://www.technologyreview.com/2019/08/29/65364/recombinetics-gene-edited-hornless-cattle-major-dna-screwup/.

Robinson, Claire, and The Greens/ EFA. “Gene Editing Myths and Realty: A Guide through the Smoke Screen,” February 2021. https://extranet.greens-efa.eu/public/media/file/9065/6768.

Rodrigues, Savio D., Mansour Karimi, Lennert Impens, Els Van Lerberge, Griet Coussens, Stijn Aesaert, Debbie Rombaut, et al. “Efficient CRISPR-Mediated Base Editing in Agrobacterium Spp.” Proceedings of the National Academy of Sciences 118, no. 2 (January 12, 2021): e2013338118. https://doi.org/10.1073/pnas.2013338118.

Schmidt Futures. “‘Turning the Carbon We Have Into the Carbon We Want.’” Accessed July 28, 2023. https://www.schmidtfutures.com/perspective/biomade/.

Shroff, Ruchi, and Carla Ramos Cortés. “The Biodiversity Paradigm: Building Resilience for Human and Environmental Health.” *Development (Society for International Development)* 63, no. 2–4 (2020): 172–80. https://doi.org/10.1057/s41301-020-00260-2.

TestBioTech. “‘Gene Scissors’ Cause Chaotic Disturbance in Plant Genome.” nstitute for Independent Impact Assessment of Biotechnology, June 20, 2023. https://www.testbiotech.org/sites/default/files/Chromothripsis%20in%20plants.pdf.

———. “‘Gene Scissors’ Cause Chaotic Disturbance in Plant Genome,” June 20, 2023. https://www.testbiotech.org/en/content/gene-scissors-cause-chaotic-disturbance-plant-genome.

———. “New GE Patents 2022: ‘Second-Hand GE’ Plants Claimed as Inventions,” May 7, 2023. https://www.testbiotech.org/sites/default/files/Testbiotech_%202023%20_%20CRISPR%20Patents.pdf.

University of Cambridge. “Researchers Call for Greater Awareness of Unintended Consequences of CRISPR Gene Editing.” University of Cambridge, April 12, 2021. https://www.cam.ac.uk/research/news/researchers-call-for-greater-awareness-of-unintended-consequences-of-crispr-gene-editing-0.

USDA. “Technology and Science-Based Solutions.” Accessed July 28, 2023. https://www.usda.gov/sites/default/files/documents/SPG-Coalition-science-solutions.pdf.

Waltz, Emily. “GABA-Enriched Tomato Is First CRISPR-Edited Food to Enter Market.” *Nature Biotechnology* 40, no. 1 (December 14, 2021): 9–11. https://doi.org/10.1038/d41587-021-00026-2.

World Business Council For Sustainable Development. “Food Labeling: Principles to Support the Uptake of Healthy and Sustainable Diets.” Geneva, Beijing, Delhi, London, New York, Singapore: World Business Council For Sustainable Development, November 2021. https://www.wbcsd.org/contentwbc/download/13275/194329/1.

Zafar, Kashaf, Khalid E. M. Sedeek, Gundra Sivakrishna Rao, Muhammad Zuhaib Khan, Imran Amin, Radwa Kamel, Zahid Mukhtar, Mehak Zafar, Shahid Mansoor, and Magdy M. Mahfouz. “Genome Editing Technologies for Rice Improvement: Progress, Prospects, and Safety Concerns.” *Frontiers in Genome Editing* 2 (2020). https://www.frontiersin.org/articles/10.3389/fgeed.2020.00005.

NOTHING NEW IN NEW GMOs
HOODWINKED BY CORPORATE AGENDA

info@navdanyainternational.org

www.navdanyainternational.org