BEHIND THE SMOKESCREEN

Vested interests of EU scientists lobbying for GMO deregulation

THE GREENS/EFA in the European Parliament

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SUMMARY

In 2018 the European Court of Justice (ECJ) ruled that new gene-edited organisms are covered by the EU's GMO laws and are subject to the same safety assessments and labelling requirements as any other GMOs. The ruling galvanized a concerted lobbying response by promoters of new GM technology – for example, the biotechnology industry lobby group EuropaBio and the EU's seed industry association Euroseeds – to get these new GMOs exempted from the EU's GMO laws.

The lobbying effort appeared to pay off when in April 2021, the European Commission stated that it would "initiate a policy action" to exclude certain genetically modified (GM) crops from the EU's GMO legislation. The Commission said that the current GMO legislation is "not fit for purpose" for plants produced with certain "innovative technologies" and "needs adaptation to scientific and technological progress".

The Commission's announcement echoed earlier statements by the EU seed industry association Euroseeds, which represents agribusiness multinationals like Bayer, BASF and Corteva. Euroseeds cheered the announcement and warned that the Commission – and EU Member States – must act quickly.

Two organisations – the European Plant Science Organisation (EPSO) and the EU network for Sustainable Agriculture through Genome Editing (EU-SAGE) – also hailed the Commission's announcement, using almost the same words. Indeed, these organisations had lobbied intensively for legislative change from the time of the ECJ ruling.

What are these groups? Why would they promote a weakening of the EU's GMO legislation? And in what way do they represent "science"? This report answers this question by investigating three EU-level organisations – EPSO, EU-SAGE, and the European Federation of Academies of Sciences and Humanities (ALLEA). It looks at the interests and alliances of the most active individuals involved in these groups and the national organisations with which they are affiliated. It shows that overlaps in the positions of these scientist organisations and the seed industry association are not a coincidence, as members of both stand to benefit economically from a relaxation of the EU's GMO legislation, individually and/or via their institutions.

Findings include (figures for EPSO are from June 2022 and for EU-SAGE from May 2021):

A large number of people actively involved in the three EU level organisations have strong links with the seed industry and hold patents or patent applications in this area.

Sixty-four per cent of the members of the EPSO working group on Agricultural Technologies, which develops opinions in this field for EPSO as a whole, and 32% of EU-SAGE members have a vested interest in the commercialisation of GM plants, meaning they stand to benefit from it financially or in terms of career development, either personally or via their organisations. They are strong advocates for the deregulation of GM technologies without stating their economic interests in the context of these discussions.

- Thirty-eight per cent of EPSO Agricultural Technologies working group members and 23% of EU-SAGE network members hold one or more patents or patent applications related to GM processes or products. Fifty-three per cent of EPSO working group members and 15% of EU-SAGE members have been involved in one or more research projects with the industry. In a disturbing percentage of cases (21% for EPSO and 10% for EU-SAGE), individuals are involved in a seed or biotechnology company, by holding a position or shares in such companies.

- Ninety-eight per cent of EPSO working group members and 83% of EU-SAGE network members have a background in genetics and molecular biology. Expertise in areas relevant to assessing the potential negative consequences of using new GM techniques in agriculture, such as ecology, agroecology, socioeconomics, toxicology, and public health is not evident in these organisations.

- Certain public research institutions have strong links with one or more of the three lobby groups, as well as the agricultural biotechnology industry. For example, several employees of the VIB (Flemish Institute for Biotechnology) are highly active in the lobbying activities of all three groups. EU-SAGE is hosted at the VIB, as was EPSO in its early years. The lobby groups defend the same positions as the companies that the VIB works with in commercial ventures to "translate research findings into products". Companies like Bayer Bioscience, Bayer Cropscience, and CropDesign are represented in the general assembly of the VIB – its "most senior body".

- Other research institutions with strong links to both the three lobby groups and the agricultural biotechnology industry are INRAE, France; Luke Finland; Wageningen Plant Research, Netherlands; SLU Alnarp, Sweden; and CRAG, Spain. While these are public universities and research institutions, they are not simply the home of independent scientific thought, but are tightly enmeshed with commercial interests. This is also the result of government policies that have encouraged the institutions to seek funding from industry and income from the technology they develop. In this way, governments have turned research institutions into "cash cows".

These findings mean that the lobby groups and individual researchers identified in this report cannot be said to advocate "science-based" policies, let alone to represent "science". They represent a limited field of applied science with material interests in the commercial use of GM technology in agriculture.

Our analysis of individuals involved in EU level

lobbying via the three groups shows that the largest group (51) is from Germany – home to two of the world's largest seed companies, Bayer and BASF. Spain and Italy follow, with 19 individuals each.

Only information in the public domain was used in compiling this report (this includes information obtained via access-to-documents requests submitted by Corporate Europe Observatory, which they have subsequently made public), meaning that the results are conservative. In other words, the real level of vested interests may be far greater than is reported here. One reason is the confidential nature of some research agreements.

Having vested interests while participating in certain regulatory discussions may not be a problem in itself. However, a problem arises when these interests are not disclosed in contributions to the debate about GMO regulation and when the individuals present themselves as independent, disinterested scientists and the "voice of science". Advocacy is an acceptable part of democracy, but presenting stakeholders as neutral scientists is not.

While all voices are welcome in the EU debate on the regulation of GM organisms, the specific situation of scientists and organisations involved in the development of GM technology and agricultural applications must be considered. Most crucially, their interests should always be disclosed in discussions on EU GMO regulation.

Arguably, none of the above would matter if the messages given out by the lobby groups were scientifically accurate and could be relied upon to inform a sound and precautionary regulation for new GM crops. However, existing scientific evidence summarised in Annex I to this report (online) shows that their claims – that gene editing is precise, controllable, produces only changes that could happen in nature, and safe for the consumer and the environment – are false or highly misleading. Therefore their promotion of these messages misleads regulators and jeopardises public health and the environment.

Based on the findings of this report, we recommend that policymakers, regulators, and the public view the claims and recommendations of these lobby groups critically and instead seek expert input from genuinely independent scientists with no vested interests in the commercialisation of GM technologies and products. This should include scientists who are actively researching the risks of these technologies and who have authored the papers quoted in Annex I to this report.

INTRODUCTION

In recent years, large agricultural biotech companies like Bayer, Corteva, BASF, and Syngenta have been pushing hard to open the EU market for genetically modified (GM) crops. Their aim is to erode the European Union (EU) legislation for GM organisms (GMOs) that has enabled farmers, food producers and consumers to identify and avoid GM crops and food.

The companies aim to get GM seeds engineered with so-called gene editing (also called genome editing)[1] excluded from the EU GMO legislation. That would make it much easier for them to market these GM seeds, not only in the EU, but also in countries trading with the EU.

If this happens, these GM crops will no longer be subject to the EU obligations for GMO market authorisation, including a safety evaluation and requirements for traceability and GM labelling. Farmers, food producers and consumers would no longer know where GM crops and food are, and EU governments could no longer ban theircultivation. It would allow the agricultural biotech companies to circumvent public opposition to GM crops.

WHAT IS GENE EDITING?

Gene editing is a suite of genetic modification techniques in which the genetic material of a living organism is artificially manipulated, with the most frequently sought outcomes being deletion, replacement or insertion of DNA sequences. The most commonly used gene editing technique is the CRISPR-Cas system.

In order to bring about deletion, replacement or insertion of DNA sequences, most gene editing procedures involve introducing an enzyme called a site-directed nuclease (SDN for short; this is also known as “genetic scissors”) into the cell, which cuts both strands of the double DNA helix.[2] The term “site-directed” refers to the fact that these enzymes are designed to induce a DNA double-strand break at a predetermined location within the genome.

The application of SDNs is intended to bring about one of three possible outcomes, known as SDN-1, SDN-2, and SDN-3. All three begin with a double-strand break of the DNA helix, but from then on, there are differences:

- In SDN-1, the double-strand DNA break is repaired by the cell’s own repair machinery without the intentional addition of foreign DNA. This DNA repair process is not perfect and results in the deletion or insertion of DNA base

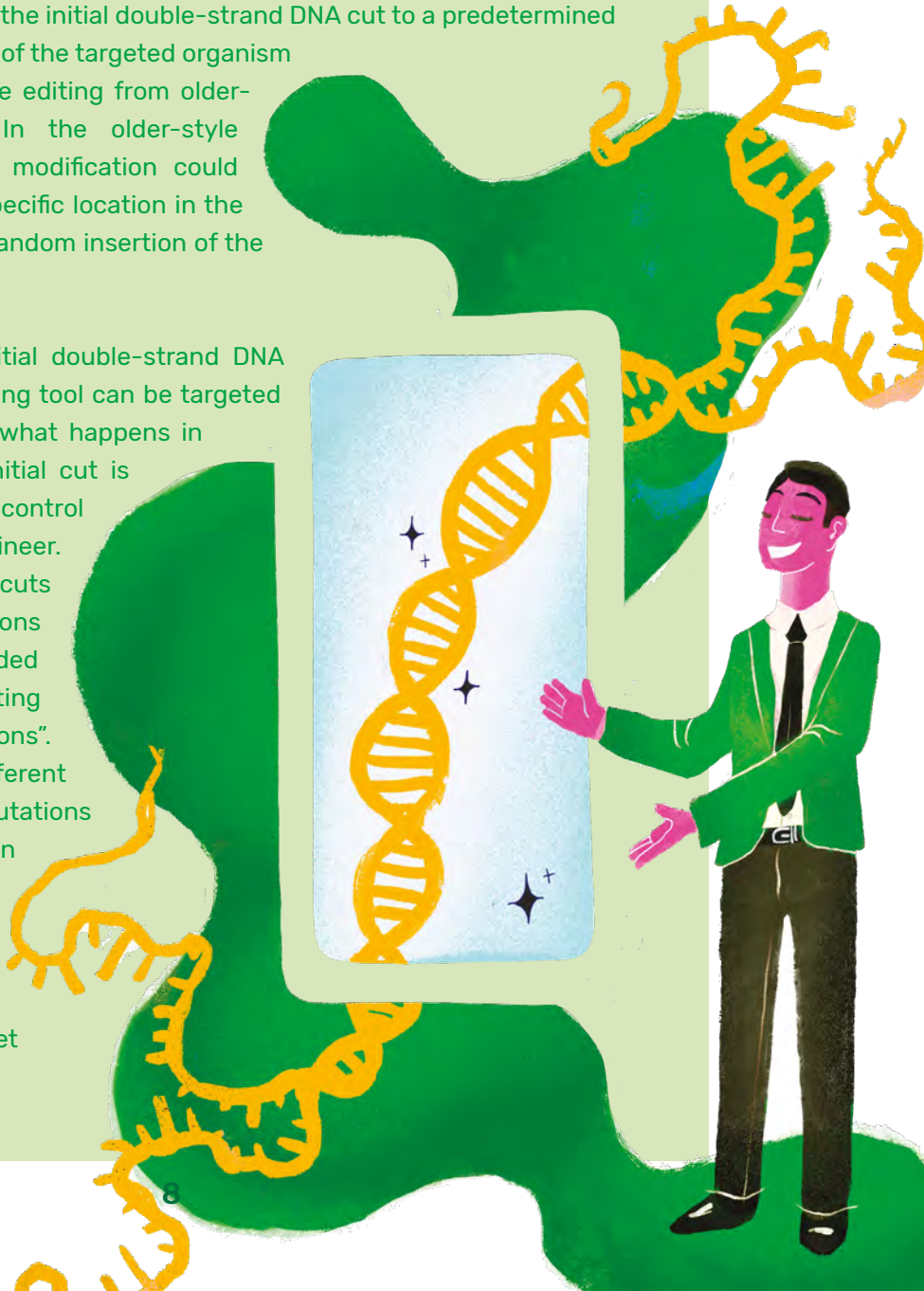
units of varying lengths. Therefore gene editors use this process to destroy or "silence" a gene's functioning.

- In SDN-2, in addition to the SDN, a "repair template" DNA molecule is introduced into the cell at the same time. The aim of SDN-2 is to induce a different form of DNA repair whereby the host organism DNA is exchanged with the DNA of the repair template molecule, altering a host gene sequence and so changing the function of the gene's protein product.

- In SDN-3, a repair template DNA molecule is also introduced into cells along with the SDN as in SDN-2. However, the repair template DNA molecule in SDN-3 carries either a complete gene or genetic material with other functions (such as gene regulation). As with SDN-2, the aim in SDN-3 is to exchange the repair template DNA with that of the host DNA at the site of the double-strand break and thus insert a new gene or other types of genetic elements into the organism to confer a new trait or characteristic.

It is the ability to direct the initial double-strand DNA cut to a predetermined location in the genome of the targeted organism that distinguishes gene editing from older-style GM methods. In the older-style methods, the genetic modification could not be targeted to a specific location in the genome and involved random insertion of the GM gene (transgene).

However, while the initial double-strand DNA break by the gene editing tool can be targeted to a specific location, what happens in addition to that the initial cut is not fully under the control of the genetic engineer. Double-strand DNA cuts can be made at locations other than the intended gene edit site, resulting in "off-target mutations". In addition, many different types of unintended mutations (DNA damage) can also take place at the intended gene edit site ("on-target mutations"). Unintended off-target



and on-target mutations resulting from gene editing include small and large deletions, insertions, and rearrangements of DNA, which can result in the unintentional creation of new gene sequences encoding mutant proteins.

In gene-edited plants, this large spectrum of unintended DNA mutations can lead to alterations in the function of many genes, which in turn could lead to altered biochemistry of the plant, including the production of new toxins or allergens.[3] In gene-edited animals, these mutations could lead to ill health or abnormalities, creating welfare problems.[4]

In addition, gene editing can inadvertently lead to the insertion into the organism's genome of:

- foreign contaminating DNA

- the full (rather than the intended part) of the repair template DNA molecule (used in SDN-2 and SDN-3), or

- fragments of the plasmid DNA (circular molecules of DNA derived from bacteria), which encode for the gene-editing tool and are introduced into cells at the start of the gene editing process.

Such unintentional insertion of foreign DNA can happen even in SDN-1 gene editing, which does not aim to introduce foreign DNA, as well as in SDN-2 and SDN-3, in which foreign DNA is deliberately inserted. Smaller foreign DNA sections are added in SDN-2 compared with SDN-3. In all SDN applications, unintentionally inserted foreign DNA is then supposed to be removed through several backcrosses of the gene-edited organism to the non-GM parent variety, but developers usually do not use adequate screening methods to confirm that the final product is indeed free from foreign DNA or even entire foreign genes.[5] Developers also need to backcross to remove as many as possible of the mutations arising from tissue culture and GM transformation, which will be common to all SDN processes. Whether this will be done properly or not remains to be seen.

In the EU, organisms that have been genetically engineered with gene editing are regulated as GMOs. EU law defines a GMO as "an organism... in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination".[6] The law does not require that foreign DNA or foreign genes are inserted or present in order for a genetically modified product to qualify as a GMO and be subject to the requirements of the legislation.

After being on the receiving end of years of pro-GM lobbying – for example, from the biotechnology industry lobby group EuropaBio[7] and the seed industry association Euroseeds[8] – the European Commission announced plans to do exactly what the industry wants. In April 2021, it stated that it would "initiate a policy action" to exclude certain GM crops from the EU GMO legislation.[9] The Commission said that the current GMO legislation is "not fit for purpose" for plants produced with certain "innovative technologies" and "needs adaptation to scientific and technological progress".[10]

The Commission's announcement echoed earlier statements by Euroseeds, which said, "existing GMO legislation no longer reflects current knowledge and scientific evidence" and should be updated.[11] Unsurprisingly, Euroseeds, which represents agribusiness multinationals like Bayer, BASF and Corteva,[12] cheered the Commission's announcement and warned that the "Commission and Member States must act now and avoid undue lengthy processes".[13]

As well as the seed industry, some scientist organisations also hailed the Commission's announcement, using almost the same words. The European Plant Science Organisation (EPSO)[14] and the EU network for Sustainable Agriculture through Genome Editing (EU-SAGE)[15] both 'welcomed' the European Commission's findings and called for the EU's GMO legislation to be changed to enable plants developed with new GM techniques, notably gene editing, to enter the marketplace more easily.

What are these groups? Why would they promote a weakening of the EU's GMO legislation? In what way do they represent "science" – and do they genuinely advocate for "science-based policy"?[16]

This report answers these questions by investigating three EU-level organisations – the European Plant Science Organisation (EPSO), the European Federation of Academies of Sciences and Humanities (ALLEA), and EU-SAGE, a network that promotes "European Sustainable Agriculture through Genome Editing". It also looks at the interests, alliances, and lobbying activities of the most active individuals involved in these groups and the national organisations with which they are affiliated. It shows that overlaps in the positions of these organisations and Euroseeds are not a coincidence, as significant numbers of their respective individual members and their institutions stand to benefit economically from a relaxation of the EU's GMO legislation.

It is important to note that having vested interests while participating in certain regulatory discussions may not be a problem in itself. However, a problem arises when these interests are not disclosed in contributions to the debate about GMO regulation and when the individuals present themselves as independent, disinterested scientists. Advocacy is an acceptable part of democracy, but presenting stakeholders as neutral scientists is not.

METHODOLOGY

For this report, we investigated people involved in the three lobby organisations. For each person, we investigated their scientific background and their potential interest in facilitating market access for GM applications in agriculture.

Criteria considered for whether an individual has interests in the commercial exploitation of GM are whether they are or have been:

- involved in a research project with the support of or in collaboration with the seed industry or biotechnology industry

- involved in a publication with the partnership or support or funding of the seed or biotechnology industry in the fields of genetic engineering and/or plant breeding

- involved in speaking or another type of active engagement in conferences sponsored by the seed or biotechnology industry, or where only one-sided arguments were made for the promotion of GM technologies

- named as inventor or applicant on a patent (granted or applied for) linked to genetic engineering

- involved in a formal capacity or honorary position in a seed or biotechnology company, or have helped to create, or hold shares in, such companies.

Three criteria were considered to be especially important in analysing vested interests: whether the researcher is named on a patent linked to genetic engineering, has collaborated with industry on a research project, or has/has had a position or financial participation in a seed or biotechnology company. If an individual fulfils at least one of these criteria, they are defined as having a vested interest (a personal reason for involvement, especially an expectation of financial or other gain) in the deregulation of GM technologies.

In researching this report, only information in the public domain was used.

1. EU-LEVEL ORGANISATIONS LOBBYING FOR DEREGULATION OF GM CROPS

1.1 EPSO

The European Plant Science Organisation (EPSO) is a lobby organisation founded in 2000 "to represent the needs and interests of European plant science". It represents "70 institutional members bringing together more than 200 research institutes, departments and universities from 31 countries in Europe and beyond".[17] EPSO was originally hosted at the VIB (Flemish Institute for Biotechnology – Vlaams Instituut voor Biotechnologie) at the University of Ghent in Belgium.[18] Its executive director, Karin Metzlaff, formerly worked at the VIB-UGent Center for Plant Systems Biology (PSB–VIB).[19]

EPSO aims to influence EU science policy to ensure funding for basic and applied research in plant science. It says it wants "to improve the impact and visibility of plant science in Europe".[20] "Plant science" includes research into plant genomes as well as the genetic engineering of plants. But on the organisation's website, the promotion of agricultural GMOs is nowhere mentioned as a core objective.

The EPSO working group dealing with GM technology is called "Agricultural Technologies". The chairs of this group are Ralf Wilhelm, Frank Hartung, and Jens Sundstrom.[21] Members include EPSO board members Josef Gloessl, Antonio Leyva, Odd Arne Rognli, and Ulrich Schurr.[22] The working group has authored the EPSO positions on "Crop Genetic Improvement Technologies" and "New Plant Breeding Techniques (NPBT)", as well as advice on "Synthetic Biology".[23] All these are GM, but EPSO does not name them as such. More recently, EPSO has also set up a new working group on "Future Proofed Crops".[24] It can be expected that this also includes GM crops.

Strong links with seed industry corporations

According to our research, 98% of the EPSO working group members have a background in genetics and molecular biology, so they emerge from a narrow area of science. Scientists from other areas of expertise relevant to assessing the potential outcomes of using new GM techniques in agriculture, such as ecologists, agroecologists, socioeconomists, toxicologists, and public health experts, are not evident.

Many EPSO working group members have vested interests in commercial aspects of GMO development. Just over half (53%) have been involved in one or more research projects with the seed or biotechnology industry. Thirty-eight per cent are applicants on a patent, or are named as inventor on a granted or applied-for patent that has links to genetic engineering, whether a process or a product. Three per cent

are named on patents or patent applications directly linked to gene editing and 21% are involved in a seed or biotechnology company.[25]

Depending on the (generally confidential) agreement reached with an employing institution and/or a company, involvement in a patent can result in financial rewards. In some cases, there is no direct financial compensation to the individual but the individual's employing institution may benefit, so it is advantageous to the individual's career to be named on the patent because it adds to their status within their institution.

EPSO as an organisation is also formally linked to the agrochemicals and seed industry. Its "observers" include groups and companies dealing with agricultural biotechnology, including Dow/Corteva, Bayer, BASF, and Limagrain. As such, these major players in the global seed industry can be "involved in discussions and have the opportunity to give their input" into EPSO workshops, statements, and recommendations.[26]

Forceful lobbying on EU GMO policy

EPSO has long been involved in the EU regulatory discussion on gene editing. For example, the organisation said in 2015 that the "European Commission should create favourable regulatory conditions for the European plant breeding sector".[27] The reference to the "plant breeding sector" is also an admission that they are lobbying for the seed industry and not just for "plant science".

However, EPSO's involvement increased sharply after the European Court of Justice (ECJ) ruled in 2018 that gene-edited organisms are covered by the EU's GMO laws.[28] It became clear that EPSO was seeking to influence not only the EU's science policy, but specifically its GMO policy. In a "first reaction" to the ECJ ruling, EPSO called the ruling "contrary to scientific evidence" and offered to "collaborate with policy makers to develop an appropriate regulation".[29] Over the next years, EPSO published numerous other lobbying statements on gene editing in plants via its Agricultural Technologies working group, promoting the exclusion of gene-edited GM crops from the GMO regulations.[30]

Starting in September 2019, EPSO organised a series of meetings between biotechnology experts and a selection of hand-picked Member State officials on "improving legislation and starting flagships to better address climate, environmental, food and health challenges". Meetings were held in September 2019,[31] January 2020,[32] November 2020,[33] May 2021,[34] November 2021, and May 2022.[35] EPSO says it "offers to collaborate with policy makers to develop an appropriate future-ready regulation to enable the European public sector, small- and medium-sized companies and farmers to contribute more comprehensively to food and nutritional security and to use all available tools to reduce the environmental impact of agriculture."[36]

In 2020 EPSO participated in a European Commission stakeholder consultation on "new genomic techniques", both via its working group and via the Plants for the Future European Technology Platform (Plant ETP).[37] Plant ETP was set up by EPSO and EuropaBio in 2004. It is composed of agricultural biotech companies and Copa-Cogeca, the EU representation of national farmer associations.[38] It counts among its members EPSO, BASF, Bayer CropScience, KWS, Keygene, and Syngenta, as well as the John Innes Centre in the UK.[39]

In 2021 EPSO submitted a contribution to the Commission's first consultation on a separate

legislative framework for GM plants produced with certain "new genomic techniques". It said regulators should ignore the technology used to obtain a certain plant characteristic (or "trait"), and not require the risk assessment or labelling that applies to the products of these techniques.[40]

Among the EPSO people who have actively lobbied on EU GMO policy are Peter Rogowsky, Frank Hartung, and Ralf Wilhelm. They are listed as contacts for the EPSO statement "On the ECJ ruling regarding mutagenesis and the Genetically Modified Organisms Directive".[41] At the time of publication of this report, Peter Rogowsky was no longer active in EPSO.

Other members who have been particularly active include Alan Schulman and Jens Sundstrom, who have co-signed GMO-related EPSO statements.[42] Sundstrom said: "I am very committed to the public debate on genetic engineering by writing opinion articles, appearing on radio and TV and by writing about the subject... I am advisor for public authorities both in Sweden and at the EU level on issues of adopting modern biotechnology and novel breeding technologies in the agricultural sector."[43]

PETER ROGOWSKY

Peter Rogowsky, research director at INRAE (the French National Research Institute for Agriculture, Food and Environment) and former EPSO working group member, is a geneticist specialising in maize development.[44] He used to chair the operational arm of the French Scientific Group of Interest "Plant Biotechnologies" (GIS BV),[45] which brought together "public research institutes, seed companies, technical institutes, sector representatives, and competitive clusters" to "create innovative crop varieties".[46] He is now a member of the managing team of PlantAlliance,[47] the public-private successor to GIS BV.[48]

Rogowsky's work has partly been funded by seed producers and biotechnology companies. For example, he received funding from the biotechnology company Meiogenix[49] for research on the application of CRISPR-Cas9 technology in maize.[50] Meiogenix is a spin-off of the Institut Curie and INRA (the French National Research Institute for Agriculture[51]).[52] It has signed a cooperation deal with Bayer CropScience.[53]

He also received funding from the seed company Limagrain for the GIM bilateral research project of INRA and Limagrain.[54]

Rogowsky participated in the "Amaizing" research project, for which Limagrain and another seed company, Maïsadour, were official partners.[55] Within this project he was involved in work focusing on haploid induction in maize.[56] He has collaborated with MAS Seeds (a division of Maïsadour Group) and Limagrain in research on CRISPR-Cas applications in maize.[57]

He is named as applicant and/or inventor on several patents linked to genetic engineering and/or mutagenesis. Some of these patents are held together with private companies or with INRAE; one specifically mentions gene editing to produce haploid plants.[58]

As most of his work is generating commercial applications of GM technologies, including CRISPR-Cas, his active engagement in advocacy efforts to amend the GMO legislation in Europe must be seen in the light of his vested interest in the marketing success of these applications.

He has co-authored several EPSO statements on gene editing (for example, on the ECJ ruling and the EU Commission study),[59] as well as at least one article published in a scientific journal, advocating for deregulation of new GM techniques.[60] He has also spoken at conferences, such as an OECD event[61] on gene editing. His interests in plant biotechnology applications have not been disclosed in the context of these interventions.

FOCUS ON THE INSTITUTION

INRAE AND ITS LABORATORIES

The French National Research Institute for Agriculture, Food and Environment (INRAE) is a large institution with many research institutes, each with its own focus and approach. It may depend on individual laboratory directors to give a particular direction to research and partnerships.

INRAE participates in specific research projects in cooperation with industry, for example:

- 2014–2017: SeedEncode (with Selgen)[62]
- 2014–2016: MaizeREC (with Meiogenix)
- 2013–2015 GIM (with Limagrain Europe)
- 2012–2020 GENIUS (with Biogemma, Germicopa, Pépinières et Roseraies G. Delbard, Vilmorin & Cie)[63]

It also forms official partnerships with industry.[64] For example, INRAE has been a member of the Scientific Group of Interest "Plant Biotechnology" (GIS BV), a public-private interest group gathering public research institutes and seed companies, such as Syngenta, Biogemma, Vilmorin and Innolea.[65] It is now a member of its successor, PlantAlliance.[66]

THE GENIUS PROJECT

Between 2012 and 2020 the GENIUS project researched a variety of applications of the dominant gene-editing tool CRISPR-Cas. GENIUS stands for Genome ENgineering Improvement for Useful plants of a Sustainable agriculture.

The project was coordinated by the Plant Reproduction and Development joint research unit (UMR RDP) at INRA Lyons. The coordinator was Peter Rogowsky.[67] According to INRAE, the aim was to "provide French scientists and breeders with cutting-edge expertise, along with the corresponding biological material and intellectual property",[68] as well as to lead to "an easing of the regulatory burden for experts and applicants".[69]

For the project, researchers experimented with CRISPR-Cas applications in 12 plant species including nine cultivated crop species. Examples include virus resistant tomato, early flowering apple and low-amylose starch potato.[70] For the industry partners involved, the project provided public funding to amplify their own investment, as well as the use of publicly funded research expertise.

RALF WILHELM AND FRANK HARTUNG

Ralf Wilhelm is the head of the Institute for Biosafety in Plant Biotechnology at the Julius Kühn-Institut.[71] He has signed lobbying letters as EPSO working group chair[72] and Leopoldina[73] and is a contact person on EPSO reports on science policy meetings on genome editing.[74] He has participated in different research projects, such as CropBooster-P,[75] together with the seed industry.[76] In his declaration of interest as a "hearing expert" in the Plant Synbio working group of EFSA, he declared that he holds about 60 shares in the DWS Biotechnology Fund (which focuses on medical uses and is unrelated to the seed industry) but does not hold any patents.[77]

Based on his collaborative research with the seed industry, he has a vested interest in the commercialisation of GMOs. This interest is generally not disclosed in the context of discussions on the EU's GMO regulations.

Frank Hartung is actively involved in EPSO's activities on the deregulation of new GM techniques. He is deputy head of the Institute for Biosafety in Plant Biotechnology at the Julius Kühn-Institut, Germany.[78] His research includes work on new GM technologies (e.g. TALENs and CRISPR-Cas). Hartung was also involved in the German ELSA-GEA project,[79] which promoted gene editing and used common industry narratives to criticise the regulation of gene-edited products as GMOs.[80]

Hartung does not appear to have vested interests. However, as the Julius Kühn-Institut is a publicly owned body that assesses the risks of GMOs for agriculture, consumers, and the environment and thus attempts to prevent damage from their use, and Hartung plays a key role in these assessments, his advocacy for the deregulation of new GM techniques appears highly inappropriate.

FOCUS ON THE INSTITUTION

THE JULIUS KÜHN INSTITUTE (JKI)

The Julius Kühn Institute (JKI) is the Federal Research Centre for Cultivated Plants in Germany and is subordinated to the Federal Ministry of Food and Agriculture (BMEL). The JKI provides scientific advice to the Federal Government on issues related to cultivated plants and plant protection.[81]

The JKI has specific tasks set out in the German Genetic Engineering Act, so its Institute for Biosafety in Plant Biotechnology (one of the 17 institutes of JKI) is "involved in the approval procedure for the release and marketing of genetically modified organisms (GMO)".[82]

As far as our research could establish, the JKI has no patents or other commercial interests in supporting the development of genome editing. However, despite this, and despite the JKI's official role in the approval procedure for the release and marketing of GMOs, several employees of the Institute for Biosafety in Plant Biotechnology participate in strong

advocacy for the deregulation of gene-editing applications in agriculture. The most involved advocates within the JKI work at this Institute, which is directed by Ralf Wilhelm.[83] They express their opinions mainly through their publications,[84] one of which is co-authored by a JKI employee and a Bayer employee (among others).[85]

JKI employees Frank Hartung, Thorben Sprink, and Dominik Modrzejewski also actively participated in a 2019 symposium on gene editing for agriculture in Germany and Europe after the ECJ ruling. The symposium's report concludes with a clear statement in favour of deregulation of gene-editing techniques.[86]

ALAN SCHULMAN

Alan Schulman is current president of EPSO and a former member of its Agricultural Technologies working group. He is head of research at the Institute of Biotechnology Viikki Plant Science Centre (ViPS) at the University of Helsinki,[87] a board member of ViPS,[88] and a professor at the Natural Resources Institute (Luke) in Finland.[89] He has publicly lobbied against the ECJ ruling and in support of the deregulation of gene editing[90] – and has co-authored an opinion piece in an academic journal on the same theme.[91] Within EPSO, he has acted as a contact person for meetings with government officials as well as several EPSO statements.[92]

Schulman holds inventor status on a patent related to a stripe rust resistance gene. The patent also covers the transgenic plant using this gene.[93] He has been involved in research projects and publications with the Finnish company Boreal Plant Breeding.[94] He is named as applicant and inventor on a patent with Boreal regarding a method to demonstrate genetic identity.[95] He was a member of Boreal's scientific advisory board for four years, until 2005.[96] In his EPSO role, he was a member of a panel on plant gene editing in 2019 with Boreal, talking about the perceived need to change the EU GMO regulations.[97]

He fulfills all of the three criteria for vested interests used in this report: He is named on genetic engineering patents and has collaborated in research with Boreal, as well as holding a position at the company. He does not hide these interests but also generally does not mention them in the context of regulatory discussions.

FOCUS ON THE INSTITUTION

LUKE FINLAND

The Natural Resources Institute Finland (Luke) is a public-private research institute. In its own words, it engages in "co-funded research and customer-funded research" and offers "public-private partnerships as well as support in commercialisation of research results".[98] Luke's plant production research "produces information and methods for developing the cultivation of field

crops, horticultural plants, and greenhouse plants".[99] One of its research focuses is "profitable and responsible" plant production.[100] Luke collaborates closely with Boreal Plant Breeding, a Finnish breeding company.[101]

Other members of EPSO's Agricultural Technologies working group are also engaged in lobbying efforts, including in their own countries, as the following sections show.

MICHELE MORGANTE

Michele Morgante is professor of genetics at the University of Udine, Italy, and scientific director of the Institute of Applied Genomics, a private research organisation he co-founded in 2006.[102] While advocating for deregulation of gene editing via the EPSO Agricultural Technologies working group and in the media,[103] he is also a board member of the Trieste Area Science Park and of the genomics company, IGA Technology Services.[104]

He has a longstanding history of cooperation with the seed and biotechnology industry. He has worked with DowDupont,[105] gave an invited lecture at a "strategic research meeting" of the biotech company KeyGene[106] and has published an article with Pioneer.[107] He is named as applicant or inventor on patents held with Pioneer and DuPont[108] that are linked to genetic engineering. As a holder of 16 patents on genome analysis methods and the use of genes in plant breeding and transgenic applications,[109] including in grapevine varieties, it appears that he has vested interests in the commercialisation of GMOs that are not generally disclosed in discussions on the EU's GMO regulations.

ROBERTO DEFEZ

Roberto Defez is a senior researcher at the Institute of Biosciences and Bioresources (IBBR) in Italy[110] and a member of the EPSO working group on Agricultural Technologies. He has actively lobbied for a revision of the EU GMO regulations in favour of GMO developers, through the publication of opinion pieces in the media[111] and a scientific journal,[112] an intervention in a Senate hearing in Italy,[113] and comments made to the media.[114] He is named as applicant and/or inventor on five patents related to genetic engineering,[115] including a broad patent together with a private actor, the agricultural cooperative Ginestra Societa Consorti, on a method to control gene expression.[116]

Based on his being named on patents, he has a vested interest in the commercialisation of GMOs, which is generally not disclosed in the context of discussions on the EU's GMO regulations.

RICHARD VISSER

Richard Visser is chair and head of Plant Breeding at Wageningen University in the Netherlands.[117] He sits on the EPSO working group on Agricultural Technologies and is president of EUCARPIA, the European Association for Research on Plant Breeding, which has more than 30 corporate partners from the seed industry, including Bayer and Syngenta.[118] His links with the seed and biotechnology industry are numerous.[119] He sits on the board of the Wageningen Virtual Lab for Plant Breeding,[120] of which seed companies Nunhems and Rijk Zwaan have been clients.[121] He has collaborated extensively with the Avebe starch company in publications[122] and on numerous patent applications,[123] while also being named as inventor on a patent with seed companies Rijk Zwaan, Vilmorin, and Nunhems on disease-resistant lettuce plants.[124] As a holder of wide-ranging patents on genetic engineering with the University of Wageningen[125] and as a frequent collaborator with industry, he is likely to benefit economically from the deregulation of gene editing. He actively lobbies for deregulation in opinion pieces published in academic journals,[126] in addition to the activities carried out as a member of the EPSO working group.

FOCUS ON THE INSTITUTION

WAGENINGEN PLANT RESEARCH

Within the Wageningen Plant Research institute, which is divided into different "business units",[127] the Plant Breeding business unit collaborates regularly and closely with the seed industry in numerous projects on plant breeding. For example, the Sowing Seeds of Knowledge project focuses on public-private partnerships in plant breeding.[128]

Within the Plant Breeding business unit, the ornamentals, tissue culture and gene technology group "focuses on developing and implementing the latest plant breeding techniques", with primary (but not exclusive) emphasis on ornamentals. Control over recombination and gene editing with CRISPR-Cas9 are some of the main research targets. They are also "involved in preparing

science-based position papers for the government" on GM techniques like "cisgenesis and targeted mutagenesis by CRISPR-technology".[129]

The Wageningen Seed Science Centre, together with Plantum, ASP, Bayer CropScience, Bejo Zaden, Germains Seed, and Rijk Zwaan as collaborating parties,[130] set up the Seeds for the Future initiative,[131] which aims to "unlock potential impact in innovation to the seed industry".[132]

With regards to agricultural biotechnology, and gene editing in particular, Wageningen University & Research has followed a tradition of close collaboration with industry. For example, it hosted the CRISPRcon conference in 2019. With the participation of EU Commissioner Andriukaitis, the event was sponsored by Bayer, Ceplas, Syngenta, Corteva, KWS, Plantum, and VIB, among others.[133]

PER HOFVANDER

Per Hofvander is associate professor at the Department of Plant Breeding at the Swedish University of Agricultural Sciences (SLU) Alnarp in Sweden.[134] He is a member of the EPSO working group on Agricultural Technologies and has co-authored an opinion piece advocating for changing the EU GMO legal framework for gene-editing techniques and products.[135] His history of collaboration with the biotechnology industry is extensive. He developed the Amflora GM potato with BASF[136] and carried out a research project with starch company Lyckeby.[137] His commercial interest in the commercialisation of gene-edited products is evident in the numerous patents on genetic engineering on which he is named as inventor, including some held by BASF Plant Science,[138] starch company Sveriges Stärkelseprodukt Förening,[139] and Lyckeby,[140] the latter mentioning CRISPR-Cas gene editing technology in its description.

Hofvander is also chief science offer at SolEdits AB,[141] a company that applies CRISPR technology to potatoes.[142] The company, a member of the seed industry lobby group Euroseeds,[143] aims to provide GM potato lines to public institutes and private operators.[144]

FOCUS ON THE INSTITUTION

SLU ALNARP

The Swedish University of Agricultural Sciences (SLU) is actively engaged in commercial applications of genetic engineering, through extensive collaboration with the seed and biotechnology industry. SLU's plant breeding department is purposefully tied to the seed and biotechnology industries and has considerable direct interest in the commercial application of gene-

editing tools.

In 2016, a research group at SLU Alnarp in collaboration with the starch manufacturing company Lyckeby Starch AB, developed Sweden's first "CRISPR-Cas9 crop" – a potato developed for the starch industry.[145]

The Mistra biotechnology programme, led by SLU between 2012–2020, focused on biotechnology, including gene editing,[146] for "sustainable production systems, from an environmental, social, and economic perspective".[147] The agricultural cooperative Lantmännen, the plant breeding company Graminor, and Lyckeby Starch AB contributed with "additional support to specific subprojects" (it is not specified whether this support is financial).[148] Mistra researchers were co-authors on three opinion pieces in the journal Trends in Biotechnology, lobbying for reform of what they termed the "overly strict" EU GMO legislation.[149]

SLU's Centre for Breeding of Food Crops, launched in 2018, "join[s] forces from academia and the business sector to develop competence to secure access to plant varieties for a sustainable and competitive agricultural and horticultural production throughout Sweden".[150] The Centre's criterion for selecting projects is that "Activities must contribute to scientific development and development of new crop varieties but also to new patents and innovations".[151]

JOSEF GLOESSL

Josef Gloessl is a professor and former Vice Rector for Research at the University of Natural Resources and Life Sciences, Vienna (BOKU), Austria. As a member of the EPSO working group on Agricultural Technologies, he has endorsed documents and spoken out in the media regarding his "disappointment" with the ECJ ruling.[152] He has been involved in research projects with industry, such as:

1996–1999: EU FP4 project on assessing biodiversity in forest trees with KeyGene, Conrad Appel GmbH, and Qiagen Gmbh[153]

2003–2006: Genetic profiling of maize germplasm, with Maize Technologies Intl GmbH, funded by the Austrian Industrial Research Promotion Fund[154]

2001–2006: FUCOMYR, on tools for developing fusarium-resistant and toxin-free wheat for Europe, with Saatgut Donau GmbH.[155]

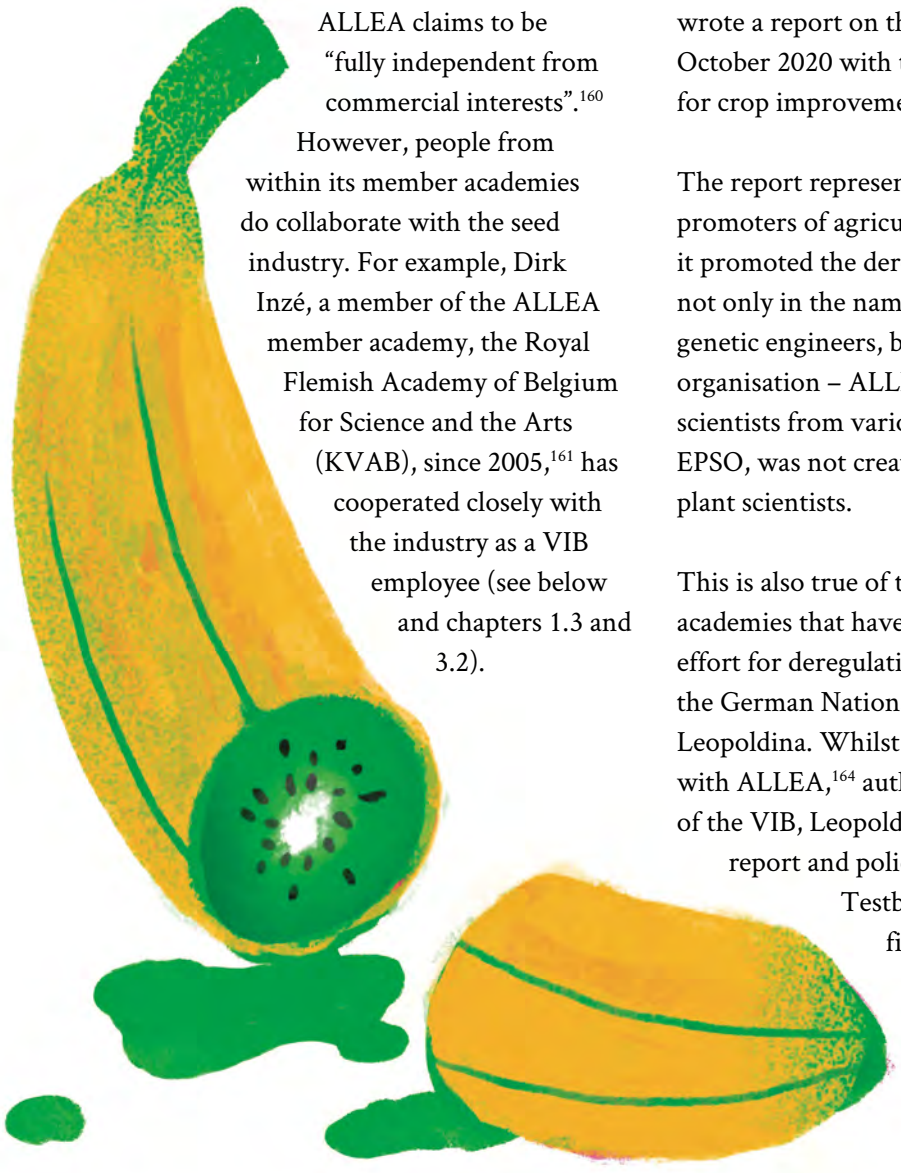
He published an article with Bayer BioScience on the production of pharmaceutical proteins in plants.[156] He is applicant and inventor on a broadly focused patent describing a transgenic (GM) approach to modifying the glycoproteins (proteins with sugar molecule add-ons) in organisms such as plants and insects.[157]

Based on his being named on a patent and his research collaboration with industry, he has vested interests in the commercialisation of GMOs. These interests are generally not disclosed in the context of discussions on the EU's GMO regulations.

In conclusion, EPSO working group members are closely involved in commercial applications of GM technology, including gene editing, personally and/or through their institutions. It is unsurprising, then, that EPSO does not limit itself to influencing EU science policy, as stated in its mandate, but also lobbies the EU on its GMO policies and regulations.

1.2 ALLEA

ALLEA is the European Federation of Academies of Sciences and Humanities. Founded in 1994, it is an umbrella group that represents more than 50 academies from over 40 EU and non-EU countries.[158] Its strategic objectives include shaping "European research policy" and offering member academies "pathways... to provide timely, independent, and interdisciplinary scientific advice to policymakers".[159]



ALLEA claims to be "fully independent from commercial interests".[160] However, people from within its member academies do collaborate with the seed industry. For example, Dirk Inzé, a member of the ALLEA member academy, the Royal Flemish Academy of Belgium for Science and the Arts (KVAB), since 2005,[161] has cooperated closely with the industry as a VIB employee (see below and chapters 1.3 and 3.2).

Translating plant scientists' wish lists into demands from "science"

ALLEA became involved in EU-level lobbying on gene editing via its Flemish member, KVAB. ALLEA and KVAB joined forces to organise an ALLEA-KVAB symposium in November 2019.[162] A group of scientists, including Pere Puigdomènech (board member, ALLEA) and Dirk Inzé (member, KVAB), subsequently wrote a report on the symposium, published in October 2020 with the title, "Genome editing for crop improvement".[163]

The report represented a major win for the promoters of agricultural biotechnology, in that it promoted the deregulation of gene editing not only in the name of plant scientists and genetic engineers, but also in the name of an organisation – ALLEA – that brings together scientists from various disciplines and unlike EPSO, was not created as a lobbying outfit for plant scientists.

This is also true of the national level science academies that have engaged with the lobbying effort for deregulation, such as KVAB, and the German National Academy of Sciences Leopoldina. Whilst KVAB issued a joint report with ALLEA,[164] authored mainly by employees of the VIB, Leopoldina published its own report and policy recommendations.[165] Testbiotech has shown that five of the 16 authors of the Leopoldina statement either have connections

to the biotech industry or hold patents in gene editing technology.[166]

With the think tank Re-Imagine Europa, ALLEA helped to create a funding proposal to the Bill & Melinda Gates Foundation (BMGF) to enable it to continue work on the regulation of gene-edited products after the 2020 report.[167] The proposal succeeded: BMGF awarded Re-Imagine Europa $1.5 million "to engage with a broad set of European stakeholders on genome editing in the 21st century".[168] [169] ALLEA and EU-SAGE were co-beneficiaries and partners with Re-Imagine Europa in this project, which set up a new task force on "Sustainable Agriculture and Innovation". Re-Imagine Europa announced that the "first technology" they would examine in the context of the "coming transition" to sustainable agriculture would be "genome editing in agriculture".[170]

The Re-Imagine Europa task force took the EU lobbying to a new level by bringing in members of the European Parliament, the co-legislator with EU Member States. The MEPs on the steering committee are Prof Maria da Graça Carvalho, Prof Paolo De Castro, and Nils Torvalds.[171] The steering committee also includes Garlich von Essen, the secretary-general of the seed industry lobby association Euroseeds, as well as Dirk Inzé and Pere Puigdomènech. Among its expert committee members are lobbyists from Bayer, BASF, Euroseeds and the biotechnology industry group EuropaBio, alongside René Custers and Oana Dima from VIB.[172]

ALLEA submitted a contribution to the European Commission's 2021 consultation on "new genomic techniques" in which they asked for a legal framework based on the "features of the crop plant varieties, rather than the methods used to produce them" and "simplified procedures for approving new varieties that do not contain transgenes".[173]

However, the methods used to produce a GM plant are critical to inform regulators about where things can go wrong and what to look for, and thus put in place appropriate regulations to protect health and the environment from unintended outcomes.

DIRK INZÉ: SCIENTIST, ENTREPRENEUR AND LOBBYIST

Dirk Inzé, one of the authors of the ALLEA report based on the ALLEA-KVAB symposium, "Genome editing for crop improvement",[174] is particularly active in pro-GM lobbying at the EU level. A scientific director of the VIB-UGent Center for Plant Systems Biology, [175] he is coordinator of the EU-SAGE network[176] and represents the network in communications with the European Commission.[177]

Inzé is closely linked with BASF via CropDesign, the company he co-founded[178] as a VIB spinoff in 1998.[179] CropDesign, described as "an agricultural biotech company delivering agronomic traits for the global commercial seed markets",[180] was acquired by BASF in 2006.[181] In 2021 BASF announced that it had signed an agreement with VIB enabling VIB to acquire BASF's CropDesign site in Belgium. BASF explained, "VIB and CropDesign have had a close scientific relationship for more than 15 years. CropDesign, currently part of BASF's Agricultural Solutions division, was established in 1998 as a VIB spinoff and has grown into a biotech company specializing in plant phenotyping technology."[182]

Inzé is named as an applicant and/or inventor on 86 patents (related to plant genetics but not all specific to gene editing), alone or together with the VIB or the agricultural biotech company CropDesign.[183]

Together with René Custers and Oana Dima, Inzé defends not only his own interests but also those of the VIB as a research organisation with a specific profile.

Based on his being named on patents and his former role in founding a biotechnology company involved in GMO research and development, he has vested interests in the commercialisation of GMOs. These interests are generally not disclosed in discussions on the EU's GMO regulations.

FOCUS ON THE INSTITUTION

VIB

The stated mission of the VIB (Flemish Institute for Biotechnology) is to "conduct pioneering biomolecular research in life sciences to gain a better understanding of the mechanisms of life and to translate research findings into products and solutions that benefit society."[184]

The VIB is actively involved in gene editing research. Searching the Espacenet patents database[185] with "VIB and Crispr" gives 158 results (including agricultural and medical uses) for patent applications.[186]

The VIB actively encourages technology transfer and supports its researchers in converting their findings into potential products. According to the VIB, "collaboration with industry is the key to real life solutions".[187]To accommodate the needs of biotech start-ups, VIB has set up bio-incubators in Ghent and Leuven.[188]

To "translate research findings", the VIB cooperates strongly with private businesses. Companies like Bayer Bioscience, Bayer Cropscience, and CropDesign are represented in the general assembly – its "most senior body".[189]

The VIB is heavily involved in political lobbying, defending the same positions as are held by the companies it works with. Three VIB employees, including René Custers, are members of the EPSO working group on Agricultural Technologies.[190] Three are also involved in running the EU-SAGE network described below.[191] René Custers is also actively involved in the EPSO meetings with national officials.[192]

For the period 2017–2021 the Flemish government gave the VIB a grant of around 60 million euros per year, of which just over 1 million euros per year were specified for its lobbying and communications unit, to be increased to nearly 1.2 million euros if the unit was able to develop a sound communications plan.

Thus the Flemish government is using taxpayers' money to fund the VIB's lobbying.[193] René Custers is a member of the lobbying and communications team.[194]

PERE PUIGDOMÈNECH: INVOLVED IN ALL THREE LOBBY GROUPS

Puigdomènech is CSIC Research Professor at the Centre for Research in Agricultural Genomics (CRAG), Barcelona,[195] of which he was the first director (2003–2013).[196]

He is one of the authors of ALLEA's "Genome editing for crop improvement" document and is involved in all three EU-level organisations investigated in this report. He is a member of the EPSO working group on Agricultural Technologies[197] and of EU-SAGE,[198] as well as a board member of ALLEA.[199] Puigdomènech is also a member of the steering committee of the Re-Imagine Europa task force on Sustainable Agriculture and Innovation.[200]

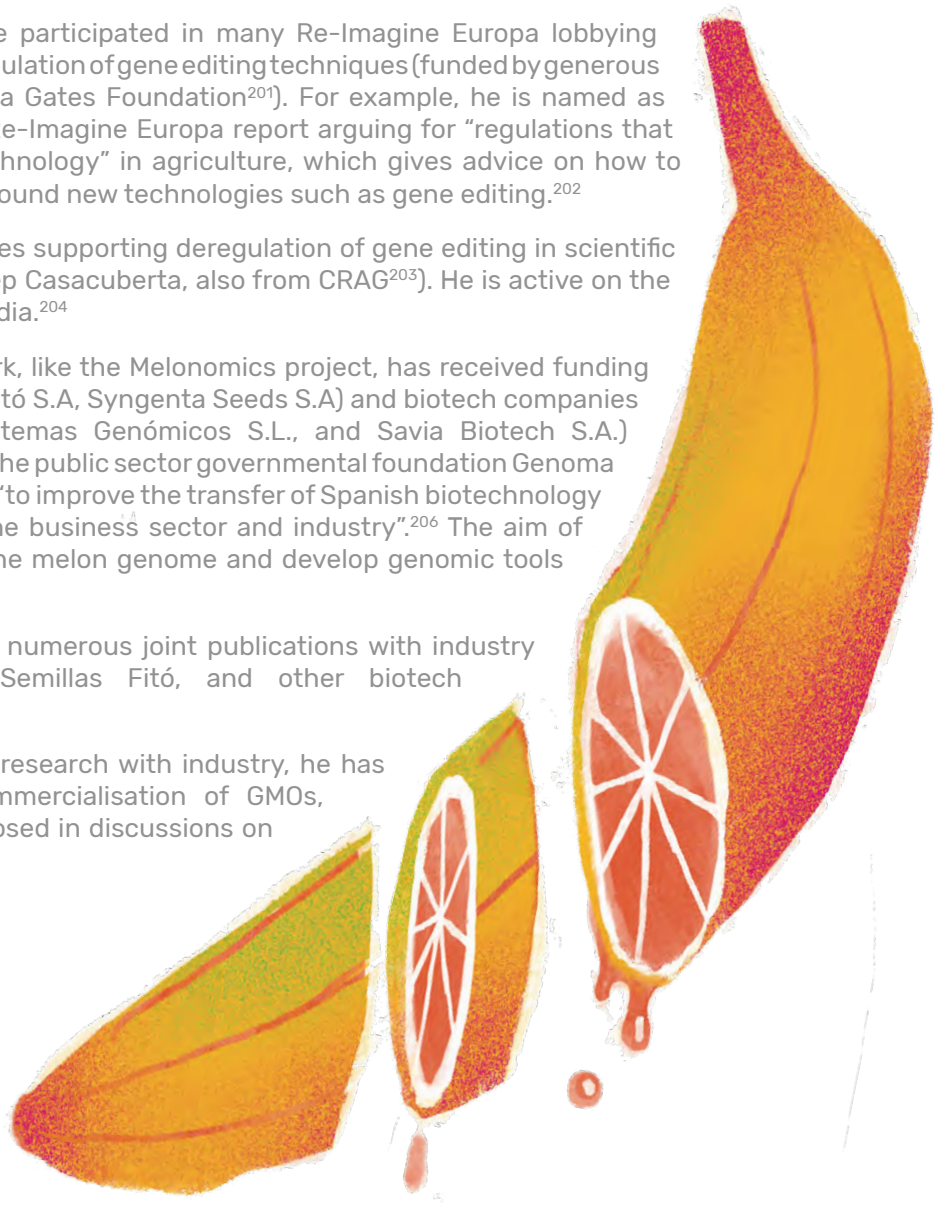
As part of this latter role, he participated in many Re-Imagine Europa lobbying activities supporting the deregulation of gene editing techniques (funded by generous grants from the Bill & Melinda Gates Foundation[201]). For example, he is named as a "knowledge partner" on a Re-Imagine Europa report arguing for "regulations that keep pace with changing technology" in agriculture, which gives advice on how to change hostile "narratives" around new technologies such as gene editing.[202]

He has authored opinion pieces supporting deregulation of gene editing in scientific journals (some with Prof Josep Casacuberta, also from CRAG[203]). He is active on the same topic in the Spanish media.[204]

Some of Puigdomènech's work, like the Melonomics project, has received funding from agribusiness (Semillas Fitó S.A, Syngenta Seeds S.A) and biotech companies (Roche Diagnostics S.L., Sistemas Genómicos S.L., and Savia Biotech S.A.) Melonomics is also funded by the public sector governmental foundation Genoma España,[205] the aim of which is "to improve the transfer of Spanish biotechnology from public laboratories to the business sector and industry".[206] The aim of Melonomics is to sequence the melon genome and develop genomic tools in this species.[207]

Puigdomènech has authored numerous joint publications with industry researchers (Bayer, KWS, Semillas Fitó, and other biotech companies).[208]

Based on his involvement in research with industry, he has vested interests in the commercialisation of GMOs, which are not generally disclosed in discussions on the EU's GMO regulations.



FOCUS ON THE INSTITUTION

CRAG

The Centre for Research in Agricultural Genomics (CRAG) is an institutional member of EU-E[209] CRAG states that it is "dedicated to cutting-edge research and technology development in the fields of plant sciences and agricultural and farm animal genetics and genomics", as well as "striving to translate research results into real-life improvements and innovation".

CRAG's Technology Transfer Office "supports researchers and the community at large in bridging the gap between scientific outputs and marketable knowledge and technology, through Intellectual Property Protection, Research Collaborations, Partnerships and New Ventures. CRAG is committed to working with industry, investors, philanthropy or its partners for the progression of research outcomes into tangible benefits and impacts. Working closely with our researchers, the goal is to build on CRAG research portfolio and together with our partners be a driving force for economic growth, more sustainable agri-food systems, new products or the attainment of the sustainable development goals."[210]

One example of such projects is Melonomics, which is funded by the public sector, represented by the government foundation Genoma España and five Autonomic Governments of Spain, and also by companies in the private sector.[211]

Widening support for deregulation

In conclusion, while ALLEA is not as prominent as EPSO, it has worked to widen the support for deregulation of gene-edited plants beyond the narrow domain of plant scientists and genetic engineers to the broader scientific establishment. Some key people involved in ALLEA and ALLEA-KVAB activities (Puigdomènech, Inzé, Custers, and Dima) are also involved in other EU level organisations lobbying for the same goal. Some ALLEA affiliates have clear economic interests in agricultural biotechnology, which, however, are not disclosed in their advocacy materials.

1.3 EU-SAGE

Formally established in 2020, EU-SAGE is the youngest of the EU level organisations investigated in this report. It is hosted at the VIB,[212] as was EPSO in its early years.[213] The VIB states that its employee Dirk Inzé is the founder of EU-SAGE.[214] In fact, all three contact persons listed on the EU-SAGE website are VIB employees: scientific director Inzé, regulatory and responsible research manager René Custers, and postdoc researcher/science policy manager Oana Dima.[215]

The sole stated objective of EU-SAGE is a regulatory framework at EU level to facilitate gene editing in plants. Members of the network are like-minded individuals and research organisations from around Europe. EU-SAGE no longer lists its individual members on its website. We analysed its membership in March 2021[216] and summarise the results here.

In 2021 four out of five members (83%[217]) had a background in genetics and molecular biology. Roughly half were directors of research institutions or departments, another half were individual researchers, and a few were neither.

EU-SAGE has strong links with the seed and biotechnology industry via the people and organisations comprising the network.

A number of EU-SAGE members have vested interests in the deregulation of GMOs. One in five (23%) is an applicant on a patent, or is named as an inventor on a granted patent or in a patent application which has links to genetic engineering, whether a process or a product. Six per cent are involved in patents on gene editing specifically. Around 15% have been involved in one or more research projects with the seed or biotechnology industry and 10% have been involved in a seed or biotechnology company.

These figures are significant because these vested interests are generally not disclosed in EU-SAGE's lobbying activities

on the regulations governing GMOs, which are presented as coming from the disinterested "science" community. If they really were disinterested, none of these people should have vested interests in the commercialisation of GMOs.

Compared to the other organisations investigated in this report, EU-SAGE has a broader reach than EPSO, which is limited to plant scientists, and is more agile than ALLEA, which has more complex structures.

In 2020 EU-SAGE participated in the Commission's first stakeholder consultation on "new genomic techniques".[218] In its second contribution to a Commission consultation, EU-SAGE argued that "the use of a particular breeding technology is not related to the impacts of the product in terms of health, environment and/or sustainability" and that "labelling of products obtained by NGTs is uninformative". In EU-SAGE's view, certain types of GM plants should be allowed to be marketed without any other requirements than products of conventional breeding.[219]

EU-SAGE is also associated with the Re-imagine Europa task force on "Sustainable Agriculture and Innovation", via the presence of Dirk Inzé in both organisations.[220]

Overstating scientific backing for deregulation

The initiators of what later became EU-SAGE, based at the VIB–UGent Center for Plant Systems Biology, were among the first to respond – and object – to the ECJ ruling. Their response took the form of a lobbying position statement, coordinated in 2018 and at that time signed by 85 individual plant biotechnology researchers across the EU. The statement demanded that the EU's GMO regulations should be changed to exempt gene-edited products.[221]

In January 2019 the VIB sent this position statement to the then president of the European Commission, Jean-Claude Juncker.[222] Claiming to represent the now "98 European research centres" that the plant biotech researchers suggested had supported the statement, the accompanying letter called on the outgoing Commission to prepare policy proposals that would exempt gene-edited GMOs "which do not contain foreign genes" from the existing GMO legislation.[223]

In January 2020 this lobby initiative was renamed as the EU-SAGE network,[224] which was registered in the EU lobbying transparency register. The two people listed as running the network are VIB employees: Scientific director Dirk Inzé and René Custers. The organisation's head office is given as the VIB.[225]

In the same month, EU-SAGE sent a letter to new Commission president Ursula von der Leyen calling on her to "safeguard gene editing for sustainable agriculture". As the lobbying position statement had gained additional signatories since its inception, EU-SAGE at this point claimed to represent "129 plant science institutes and societies".[226]

However, according to research by Corporate Europe Observatory, in at least 49 cases, support for the lobbying position statement came from one or a few individual researchers, or from a head of faculty or department – not from someone who could represent the institute as a whole.

In some instances, the institutions commented on this misuse of institutional branding. According to Corporate Europe Observatory, "The legal department of the Université Libre de Bruxelles (ULB) wrote a letter emphasizing that the use of its logo in this case was 'potentially misleading' because it 'falsely gives the impression that the position enjoys broad support from a range of universities, including

ours, which in the case of the ULB is certainly not the case'. The head of the Université catholique de Louvain (UCL) too indicated that this form of communication leads to confusion."[227]

Following the publication of the research by Corporate Europe Observatory, in March 2021 the CNRS said it would ask to have its logo withdrawn from the EU-SAGE website.[228] However, on 31 July 2021 the logo still appeared there, together with the name of research director Marcel Kuntz.[229] As of July 2022 all the logos had been removed. The EU-SAGE website now shows that only individual CNRS employees are affiliated with the network.[230]

After this controversy and perhaps as a result of it, EU-SAGE toned down its self-description to the more accurate "network representing plant scientists at 134 European plant science institutes and societies" (our emphasis).[231].

PHILIPPE DUMONT

Philippe Dumont of AFBV (Association Française des Biotechnologies Végétales) in France[232] is not a plant scientist but a retired lawyer[233] who is active in the promotion of GMOs. He is a member of the board of directors and responsible for international relations at AFBV,[234] one of the most active organisations promoting GMOs in France. He could be said to represent the interests of AFBV in EU-SAGE.

Dumont is a member of the board of directors at Calyxt,[235] a US company that commercialised a gene-edited soybean.[236] He previously held positions in Bayer and Aventis. He is a member of the expert committee of the Re-Imagine Europa task force on Sustainable Agriculture.[237] In a media article, Dumont and two other authors "offer their vision and recommendations for adapting current legislation to issues of genomic editing".[238]

Based on his positions in biotechnology companies, he has vested interests in the commercialisation of GMOs. These interests are not generally disclosed in the context of discussions on the EU's GMO regulations.

FOCUS ON THE INSTITUTION

AFBV

AFBV is a lobby group that actively promotes and defends GMOs.[239] It put forward proposals to amend the EU GMO legislation to enable the development of gene editing in agriculture in France and Europe.[240]

AFBV's founding members include representatives of French seed companies Limagrain, Aventis CropScience, RAGT, Maisadour, and the French farming lobby FNSEA.[241]

AFBV members from the seed industry and its associations include Philippe Aymard (administrator, Limagrain), Luc Esprit (director, Maiz Europ), Régis Fournier (director general, Maisadour and president, SEPROMA), Bernard Le Buanec (former secretary general and honorary life member, International Seed Trade Federation – ISF[242]), as well as others from farmer cooperative Euralis, agricultural research organisation Arvalis, and seed company RAGT.[243]

JORDI GARCÍA-MAS

Jordi García-Mas is scientific director, IRTA (Catalan Institute for Food and Agricultural Research and Technology, part of the Centre for Research in Agricultural Genomics, CRAG).[244] He is part of the EU-SAGE network[245] and the Agricultural Technologies working group of EPSO.[246]

As CRAG's website states: "[Jordi Garcia-Mas] has a long track record collaborating with plant breeding companies in projects oriented to provide genetic and genomic tools".[247] Some of his work, like the Melonomics project,[248] is directly funded by agribusiness and biotech companies.[249] He has authored numerous joint publications with industry researchers from Bayer, Semillas Fitó, KWS, and other biotech companies.[250] He is inventor on a patent related to genetic modification of tomatoes that has Semillas Fito SA as assignee.[251] He has intervened in the media to push for the deregulation of gene-editing techniques, without, however, disclosing his strong links with the seed and biotechnology industry.[252]

Based on his being named on a patent and his research carried out with the biotechnology industry, he has vested interests in the commercialisation of GMOs.

JOSÉ PÍO BELTRAN PORTER

José Pío Beltran Porter is Professor at CSIC, Institute of Plant Molecular and Cell Biology (IBMCP), Valencia Polytechnic University (Universidad Politécnica de Valencia, UPV).[253] He is

part of the EU-SAGE network and EPSO,[254] for which he was a board member from 2012 and president from 2014[255] to 2018.[256]

Together with others working directly for the agro-industry, including KWS and Bayer, Beltran Porter is one of the contributors to a report published by Plants for the Future/European Technology Platform, which advocates "lowering barriers to market access" for "plant-based innovation" via "innovation-friendly" regulation.[257] Through the Triptolemos Foundation (of which he is current president[258]), he co-authored with Pere Puigdomènech and others a report lobbying for wider acceptance of gene editing techniques.[259] He is regularly quoted in media articles supporting industry messages on the claimed need for GM plants and has contributed as a speaker to videos produced by the Spanish Fundacion Antama, which aims "to promote new technologies applied to agriculture, the environment and food".[260]

He is an inventor on GMO-related patents (one assigned to Newbiotechnic SA).[261] He represents the region of Valencia in the Spanish Society of Biotechnology (Sociedad Española de Biotecnología – SEBIOT),[262] which is the regional branch office of the European Federation of Biotechnology.[263]

Based on his being named on patents, he has vested interests in the commercialisation of GMOs. These interests are not generally disclosed in the context of discussions on the EU's GMO regulations.

KIRSI-MARJA OKSMAN-CALDENTY

Kirsi-Marja Oksman-Caldenty is senior advisor at VTT Technical Research Centre of Finland Ltd., a Finnish state-owned company that partners with industry.[264] Until May 2021 she was research manager for industrial biotechnology and food solutions at VTT. [265] She is applicant and/or inventor on several patents, mostly with potential relevance to plant genetic engineering. Some patents are shared with UGent, Dirk Inzé, VIB, VTT, or Lumene, a cosmetics company.[266]

She has been active on various European platforms (for example, as an EPSO board member and co-chair of the working group on Molecular Farming[267]) and at EU level as an expert and evaluator of 7th Framework projects.[268]

She is co-author of an opinion piece in an academic journal lobbying for the deregulation of gene-edited crops.[269] Alongside Michiel de Both of Keygene, Alan Schulman of EPSO and Luke, and Outi Manninen of Boreal, she participated in a panel discussion, "Genome editing for plant improvement – prospects and challenges", highlighting "strong concerns in the Finnish plant science community" about the 2018 ECJ ruling.[270]

Based on her being named on patents, she has vested interests in the commercialisation of GMOs. These interests are generally not disclosed in the context of discussions on the EU's GMO regulations.

DETLEF WEIGEL

Detlef Weigel is director of the Max Planck Institute for Developmental Biology in Tübingen.[271] He is a former adviser to Bayer CropSciences,[272] the Sainsbury Laboratory in the UK (a plant biotechnology institute), and Computomics, a company offering services to the seed industry.[273] He received the Otto Bayer Award from the Bayer Foundation in 2010.[274] He co-founded, and is a shareholder in, several biotechnology start-ups,[275] including the bioinformatics service provider Computomics and the human metagenomics company CeMeT.[276] He holds several biotechnology patents[277] and is an applicant on numerous such patents.[278]

Weigel is an active advocate for agricultural GM technology. He has taken part in conferences and interviews promoting GM technology.[279] He was a speaker at "The Forefront of Plant Research", an event sponsored by Bayer, KWS, Pioneer, and E-Life.[280] He co-authored a statement by German science academy Leopoldina,[281] advocating for the deregulation of new GM techniques,[282] which was criticised by the European Network of Scientists for Social and Environmental Responsibility (ENSSER).[283] He is co-author of an article in a scientific journal arguing for the deregulation of new GM techniques.[284]

Based on his roles in biotechnology companies and his being named on patents, he has vested interests in the commercialisation of GMOs. These interests are generally not disclosed in discussions on the EU's GMO regulations.

HOLGER PUCHTA

Holger Puchta is director of the Botanical Institute and chair of Plant Molecular Biology and Biochemistry at the Karlsruhe Institute of Technology (KIT) in Germany. He has worked on adapting CRISPR-Cas gene-editing technology to plants. He has inventor status on several plant biotechnology patents, including one held with BASF.[285] He has participated in Newcotiana, an EU research project involving the VIB and various industry partners,[286] which uses gene editing to genetically engineer tobacco plants to produce substances for the pharmaceutical and cosmetics industry.[287]

Despite this close cooperation with the biotechnology industry, Puchta claimed in 2017, in a statement arguing for deregulation of CRISPR-Cas-edited GM plants, that he had no commercial interests in breeding or biotechnology companies.[288] He has contributed to conferences sponsored by Bayer[289] and the VIB[290] and promotes deregulation through scientific articles.[291] He has given interviews promoting genetic engineering, and more specifically gene editing, in newspaper articles, a podcast,[292] and even an autobiographical article published in a scientific journal, "Breaking DNA in plants: how I almost missed my personal breakthrough".[293]

Based on his being named on patents and his research with the biotechnology industry, he has vested interests in the commercialisation of GMOs. These interests are not usually mentioned in the context of discussions on the EU's GMO regulations.

JOHN VAN DER OOST

John van der Oost is a molecular biologist and a professor at Wageningen University & Research.[294] He was named one of the "heroes of CRISPR" for his work on unravelling the mechanism of CRISPR-Cas-based immunity in bacteria. [295] His work on CRISPR-Cas has led him to hold several patents, including patents with the University of Wageningen, Caribou Biosciences (an important CRISPR patent holder[296]), and the company Total Marketing Services.[297] He participates in conferences and promotes gene editing in articles in newspapers and radio interviews,[298] where he does not hesitate to advocate for deregulation. Using his "CRISPR-Cas discoverer" status, he makes strong statements such as: "The EU's current policy is both implausible and unsustainable."[299] His material interest in CRISPR-Cas applications is not usually mentioned in these contexts.

TOMASZ TWARDOWSKI

Tomasz Twardowski is a molecular biologist and a researcher at the Institute of Bioorganic

Chemistry at the Polish Academy of Sciences,[300] where he is president of the Academy's Biotechnology Committee.[301] This committee has the role of issuing opinions on scientific policy.[302] He holds several patents related to genetic engineering (not directly linked to gene editing).[303] He is strongly engaged in promoting biotechnologies, for instance, as a member of the Action Core Group of the EU project PlantEd.[304]

He is an organiser of the Eurobiotech Congress in Poland, which has been sponsored by biotech companies, including Bayer.[305] He has published articles and taken part in conferences, in which he actively promotes GM technologies and argues for deregulation.[306]

Based on his being named on patents, he has vested interests in the commercialisation of GMOs, which are not generally disclosed in discussions on the EU's GMO regulations.

PAUL CHRISTOU

Paul Christou is ICREA (Catalan Institution for Research and Advanced Studies) research professor and head of the Applied Plant Biotechnology Laboratory at the University of Lleida.[307] His career reveals a profound link with applied biotechnologies and agribusiness.

He was founding director of the Agrotecnio Center for Food and Agriculture Research. His employment at Agracetus Inc., USA (1982–1994) led his group to develop genetic engineering technologies to generate the first commercial crop sold by Monsanto (Roundup Ready soybean). He is named as an applicant and/or inventor on numerous patents (some are active and others not; some are held with Monsanto and other biotech companies).[308] He is part of EU-SAGE[309] and was a panel member of the Technical Advisory Board of the Agricultural Biotechnology Support Project (ABSP) (1993–1997).[310] The ABSP, which is still active, pushes for the adoption of GM crops in "developing" countries.[311]

He is an extremely active advocate of gene editing and other GM techniques: He regularly authors opinion pieces in scientific journals calling for deregulation and regulatory "harmonization".[312] He engages in frequent collaborations with the Spanish Fundación Antama, which has as its aim the "promotion of new technologies applied to agri-food and the environment", and promotes agricultural GMOs in the media.[313]

Based on his being named on patents and his role in a biotechnology company, as well as his research with the biotechnology industry, he has vested interests in the commercialisation of GMOs. These interests are generally not disclosed in discussions on the EU's GMO regulations.

MARCEL KUNTZ

Marcel Kuntz is a French plant biotechnologist who is research director at the Laboratoire de Physiologie Cellulaire Végétale (Laboratory of Plant and Cell Physiology) at the Centre National de la Recherche Scientifique (CNRS, National Centre for Scientific Research) in Grenoble, France.[314] He is a member of the Re-Imagine Europa task force on Sustainable Agriculture.[315]

He is named as applicant or inventor on patents, mostly on genetic engineering, including one with the company Zeneca.[316] Examples of his lobbying activities include his authorship of a scientific publication criticising the regulatory "restrictions" on GMOs in the EU[317] and giving an interview supporting the deregulation of New GMOs.[318] In 2014 he co-authored an article, "Mr Juncker, do not scrap science!", in which he complained about the EU policy framework enabling the "political" rejection of GMOs.[319]

Kuntz regularly posts articles promoting GMOs and glyphosate on the pro-GMO website

Genetic Literacy Project,[320] which the transparency group US Right to Know called a "PR front for Monsanto, Bayer and the chemical industry".[321] He is, or was, a member of AgBioChatter, which US Right to Know termed a "private email listserver used by the agrichemical industry and its allies to coordinate messaging and lobbying activities".[322]

Based on his being named on patents and his research with the biotechnology company Zeneca, he has vested interests in the commercialisation of GMOs, which are generally not disclosed in discussions on the EU's GMO regulations.

In conclusion, many individuals involved in the EU-SAGE network are heavily invested in agricultural GM technology applications. They are strong advocates for the deregulation of such applications without disclosing their vested interests.

2. UNDISCLOSED INTERESTS

A large number of people actively involved in the three EU-level organisations are also involved with the seed industry and hold patents or patent applications in this area. These interests are generally not disclosed in the context of their lobbying activities.

Sixty-four per cent of the members of the EPSO working group and 32% of EU-SAGE members have a vested interest in the commercialisation of GM plants,[323] meaning they stand to benefit from it financially or in terms of career development, either personally, or via their organisations, or both. In many cases, they hold one or more patents or patent applications related to GM processes or products, or have been involved in one or more research projects with the industry. In a few cases, these individuals are also involved in a seed or biotechnology company, by holding a position or shares in such companies.

This means that these scientists and their EU-level organisations do not simply represent "science". They also represent material interests in the commercial application of GM technology in agriculture.

While their voice is welcome in the EU debate on the regulation of GM organisms, their specific situations must be considered. Crucially, their interests should always be disclosed in the context of their lobbying activities.

This is particularly important in that there seems to be a correlation between vested interests and lobbying activity, in that the EPSO working group has more members with vested interests than EU-SAGE, and also more members that are engaged in lobbying and media activities promoting a weakening of the EU GMO legislation. Fourty per cent of EPSO working group members have signed lobbying statements, or authored opinion pieces in scientific journals arguing for the deregulation of gene editing; the figure is 13% for EU-SAGE members, beyond the EU-SAGE position statement itself. EPSO working group members also appear to be more present in the media, overall.

	EPSO working group (June 2022)	EU-SAGE (May 2021)
Patents or patent applications of GM processes or products	38%	23%
Research projects with the seed or biotechnology industry	53%	15%
Involved in a seed or biotechnology company, by holding or position or shares in such companies	21%	10%
At least one of the above	64%	32%

Table 1. Vested interests of EPSO working group and EU-SAGE members

3. THE LOBBY OFFENSIVE

3.1 THE GREAT GAMBLE

Judging by their shocked responses to the ECJ ruling (see analysis below), GMO-developing researchers and institutes appear to have expected that, in line with lobbying efforts, the EU would consider gene-edited plants that carry no foreign DNA as outside the scope of the EU GMO legislation. This expectation was apparently not supported by an understanding of the law, since the EU GMO legislation clearly covers all organisms "in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination" and that do not have a long history of safe use.[324]

When the ECJ confirmed that plants obtained with gene editing are covered by the EU GMO legislation, this upset some GMO developers and GMO-developing institutes. Some saw their funding reduced, while others feared that this would happen. This is understandable in the light of their profile of working towards commercial products in close cooperation with private companies.

As a December 2018 paper by the Swedish Board of Agriculture, based on canvassing the views of the country's researchers, states: "It is... likely that the ruling will entail a loss of interest from the industry regarding involvement and financing. This probably also applies to other financiers, similar to what is the case with projects involving traditional genetic modification." According to the paper, an unnamed research group had excluded gene editing from some project proposals to increase chances of funding. The reason they point out is that financiers, including from industry, "increasingly require a direct and apparent social relevance and practical application of proposed projects".[325]

Perhaps unsurprisingly, EU plant biotechnology researchers and their organisations turned into active lobbyists for deregulation, in order to keep and recover funding sources.[326] The agricultural biotechnology industry, including major investors in gene editing, such as Corteva, Bayer and BASF, could conveniently hide behind the researchers and let them take the front seat in the lobby campaign. Their Brussels organisation, Euroseeds, would just promote the scientists' statements in its public communications.[327]

This has long been a deliberate tactic of agribusiness corporations. In 2018 the Wall Street Journal (WSJ) reported that DowDupont hired a consulting firm "to bring together executives, plant scientists, organic farmers and others in 2015 and 2016 for roundtable discussions that included gene editing". The WSJ also noted that Bayer had set up an "Ambassador Program" to coach crop scientists and other employees for public speaking and talking to consumers.[328]

Public universities and research institutes are no longer solely the home of objective scientific thought but are tightly enmeshed with commercial interests, in accord with the policies of governments that have driven and encouraged the institutions to seek funding from industry and income from the technology

they develop. Governments have turned many research institutions into "cash cows". Public funds, mixed with private funds, go into GMO research, development, and promotion, whereas the commercial gain is only for the private companies, which will benefit from marketable products.[329] The benefit to the taxpayer is not obvious.

Arguably, if the funding for academic research were not so tightly linked to "practical application" of the results, and if links between research and industry were not so close, researchers and their institutions may not feel so compelled to participate in the debate about the EU regulation of GM technology, or they may be able to approach this topic differently, in a way that is less guided by economic interests. Perhaps they would also involve scientists from outside their own narrow field – for example, ecologists, toxicologists, and public health experts.

Indeed, scientists who are not involved in the development of commercial GM products have taken very different views towards new GM technology. Rather than advocating for the deregulation of GM crops, they have warned that gene-edited organisms should be regulated at least as strictly as existing GM crop plants.[330]

3.2 THE ECHO CHAMBER EFFECT

So far, the voice of scientists actively involved in commercial GM applications has been heard far more loudly than that of independent scientists, or scientists from related, but not as commercially intertwined, fields, such as ecology. This is partly because these scientists and their organisations have active networking and outreach programmes, involving many different fora and research projects, and always project the same messages – messages that are also promoted by companies and industry associations.

As we have seen, some of the individuals involved in the lobby campaign are active across different EU level organisations, as well as national level organisations. This is true for Pere Puigdomènech, who is a member of the EPSO working group and the EU-SAGE network, co-authored the gene editing report for ALLEA, and is part of the Gates-funded Re-Imagine Europa task force on Sustainable Agriculture. Similarly, René Custers is a member of the EPSO working group, worked on the ALLEA report, collaborates with Dirk Inzé in the EU-SAGE network, and participates in the task force.

Several other members of the EPSO working group are also part of EU-SAGE:

- Gintaras Brazauskas, director of the Lithuanian Research Centre for Agriculture and Forestry, Lithuania

- Ralph Bock, managing director of the Max Planck Institute of Molecular Plant Physiology, Germany

- Josep Casacuberta, CSIC Associate Professor at the Centre for Research in Agricultural Genomics, Spain

- Andreas Graner, director at the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Germany

- Jonathan Jones, group leader at the Sainsbury Laboratory, Norwich, UK

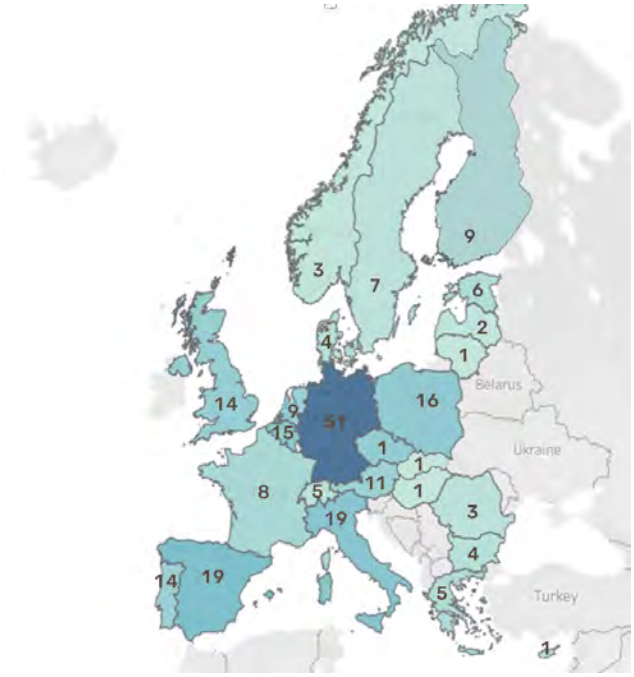
- Jordi Garcia Mas, scientific director at CRAG, Spain

- Andrea Schubert, president of the Italian Society of Plant Biology (SIBV)

• Sjef Smeekens, Professor at Utrecht University, Netherlands.

Many of the people involved come from the same organisations, such as VIB, JKI, CRAG, SLU, and WUR. By acting via different organisations, they create the impression that many organisations are independently making the same demands – the classic echo chamber effect. The lobby initiatives appear to be driven by public interest organisations, but in reality the individuals and organisations involved share the same interests as the GMO seed industry corporations that they work with.

Our analysis of individuals involved in EU level lobbying via the three groups shows that the largest group (51) is from Germany – home to two of the world's largest seed companies, Bayer and BASF. Spain and Italy follow, with 19 individuals each.



Stakeholders' distribution by country (EPSO and EU-SAGE)

These results partly correlate with countries that are most involved in developing new GM technology applications. Research by the European Commission's Joint Research Centre shows that most such applications are being developed in Germany (49 applications), compared to 23 in France and 17 in Spain and Italy, respectively.[331]

3.3 LOBBYING SUCCESS

These organisations' lobbying has borne fruit. The European Commission and many national governments refer to the "missed opportunity for EU research" as an argument in favour of deregulation. The Commission wrote: "Following the ruling of the Court of Justice of the European Union (CJEU), there have been reports of negative impacts on public and private research on new genomic techniques in the EU due to the current regulatory framework."[332]

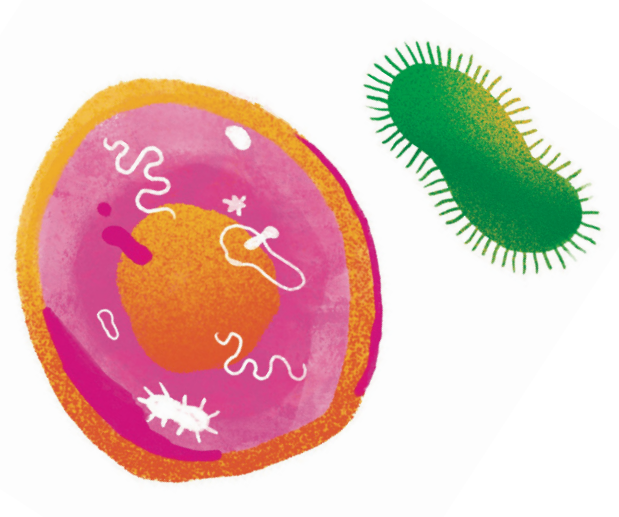
According to the Commission, stakeholders "reported negative impacts (projects stopped or postponed, reduced private funding interest, research moving outside the EU) and highlight this as a serious challenge for NGT [new genomic techniques, a euphemism for new genetic engineering techniques] research in the agri-food and industrial sectors, affecting private companies, public institutions and academics".[333]

The "missed opportunity" narrative is also reflected in national governments' submissions to the Commission. Belgium stated: "In the agricultural field there is a risk that R&D to develop NGT engineered crops and foods in Belgium could slow down, as observed in recent years with R&D to develop transgenic plants."[334]

France wrote: "Research is... needed to maintain competitiveness in genomic research and to foster innovation in agriculture, keep researchers in France, avoid brain drain and preserve sufficient sovereignty and autonomy in this sector, particularly in the area of patents."[335]

Spain and Sweden also argued the perspective of the "science sector". Spain wrote: "Some of the NGT-related research activities to be performed by the public R&D groups will require the approval from the Spanish biosafety authorities, since they are currently considered under the GMO legal frame, and this process of authorization will delay their implementation and the competitiveness of some R&D groups in comparison to other international groups. Also, the technology transfer to enterprises of the innovations generated using NGT-related research activities is expected to be affected since the commercialization legal frame for these technologies has several uncertainties. This could also negatively affect Intellectual Property Rights (IPR) and patent applications, that could be reduced based on the difficulties of transferring the IPRs to the productive sectors".[336]

Sweden warned: "When it comes to genetically modified plants, public research and research in plant breeding companies may move to countries outside of the EU to avoid fulfilling equirements in Directive 2001/18/EC."[337]



CONCLUSION

This report found that a large number of people actively involved in the three EU-level lobbying organisations are also involved with the seed or biotechnology industries and hold patents or patent applications linked to genetic engineering. They are strong advocates for the deregulation of GM technologies without stating their economic interests.

Findings include:

- Sixty-four per cent of the members of the EPSO working group on Agricultural Technologies and 32% of EU-SAGE members have a vested interest in the commercialisation of GM plants, meaning they stand to benefit from it financially or in terms of career development, either personally or via their organisations.

- Thirty-eight per cent of EPSO working group members and 23% of EU-SAGE network members) hold one or more patents or patent applications related to GM processes or products, or have been involved in one or more research projects with the industry. In a disturbing percentage of cases (21% for EPSO and 10% for EU-SAGE), individuals are involved in a seed or biotechnology company, by holding a position or shares in such companies.

- Ninety-eight per cent of EPSO working group members and 83% of EU-SAGE network members have a background in genetics and molecular biology. Expertise in areas relevant to assessing the potential negative consequences of using new GM techniques in agriculture, such as ecology, agroecology, socioeconomics, toxicology, and public health is not evident.

- Certain public research institutions have strong links with one or more of the three lobby groups as well as the agricultural biotechnology industry. For example, several employees of the VIB (Flemish Institute for Biotechnology) are highly active in the lobbying activities of all three groups. EU-SAGE is hosted at the VIB, as was EPSO in its early years. The lobby groups defend the same positions as the companies that the VIB works with in commercial ventures to "translate research findings into products". Companies like Bayer Bioscience, Bayer Cropscience, and CropDesign are represented in the general assembly of the VIB.

- Other research institutions with strong links to both the three lobby groups and the agricultural biotechnology industry are INRAE, France; Luke Finland; Wageningen Plant Research, Netherlands; SLU Alnarp, Sweden; and CRAG, Spain. While these are public universities and research institutions, they are not simply the home of independent scientific thought, but are tightly enmeshed with commercial interests. This is also the result of government policies that have encouraged the institutions to seek funding from industry and income from the technology they develop. In this way, governments have turned research institutions into "cash cows".

These findings mean that the lobby groups and individual researchers identified in this report cannot be said to advocate "science-based" policies, let alone to represent "science". They represent a limited field of applied science with material interests in the commercial uses of GM technology in agriculture.

Only information in the public domain was

used in compiling this report, meaning that the results are conservative. In other words, the real level of vested interests may be far greater than is reported here.

In conclusion, while all voices are welcome in the EU debate on the regulation of GM organisms, the specific situation of scientists and organisations involved in the development of GM technology and agricultural applications must be considered. Most crucially, their interests should always be disclosed in discussions on EU GMO regulation.

Arguably, none of the above would matter if the messages given out by the lobby groups were scientifically accurate and could be relied upon to inform a sound and precautionary regulation for new GM crops. However, existing scientific evidence summarised in Annex I to this report (online) shows that their claims – that gene editing is precise, controllable, produces only changes that could happen in nature, and safe for the consumer and the environment – are false or highly misleading. Therefore their promotion of these messages misleads regulators and jeopardises public health and the environment.

Based on the findings of this report, we recommend that policymakers, regulators, and the public view the claims and recommendations of these lobby groups critically and instead seek expert input from genuinely independent scientists with no vested interests in the commercialisation of GM technologies and products – and from a variety of relevant areas of expertise. This should include scientists who are actively researching the risks of these technologies and who have authored the papers quoted in this report.

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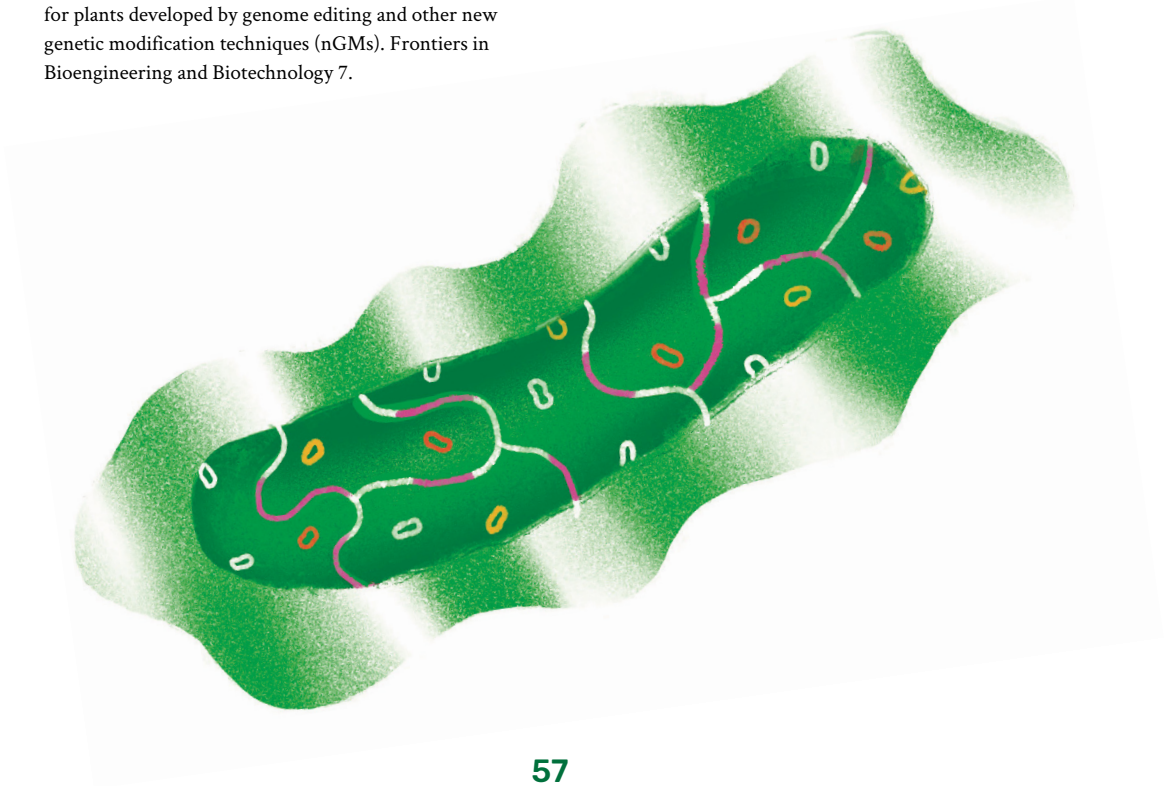

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