Monitoring GMOs and New Genomic Techniques in European Online Media News

2024

European Commission

European Parliament

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JRC137057

Ispra: European Commission, 2024
Brussels: European Parliament, 2024

How to cite this report: Zsuzsanna Pásztor, Theresa Reitis-Münstermann, Vitalba Crivello, Monitoring GMOs and New Genomic Techniques in European Online Media News, European Commission, 2024, JRC137057.

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Key Findings

The purpose of this document is to illustrate, using Text Mining techniques, how Genetically Modified Organisms (GMOs) and the new proposal of the European Commission to regulate plants modified by New Genomic Techniques (NGTs) are discussed in the European online media landscape. We intend to provide an overview of the most recurrent viewpoints and to quantify reporting trends related to this topic. The sources of our analysis include the most important online mainstream media outlets in the 27 Member States.

The report summarises online media coverage on GMOs and NGTs, with a focus on the period between 1 January 2020 and 27 August 2023. A brief overview is provided on reporting trends about more recent development. The key findings are:

- According to an automated clustering algorithm, that we applied to understand the broader context in which GMO/NGT-related news appear, the biggest cluster contains reporting about the Nobel Prize given for the CRISPR/Cas9 technology. Other topics mainly revolve about agriculture and healthcare applications.

- Headlines of European online mainstream news about the NGT study and legislative proposal carry typically a negative tone and often convey fear, worries, anger and doubts. This is confirmed both by automated emotion and keyword detection algorithms.

- The rethorical distinction of NGTs from GMOs remains blurry in news, which often refers to "new GMOs".

- Mentions about the advantages of NGT plants are rare: they are not mentioned at all, or only around the end of the articles. Pro-NGT arguments are also often followed by counterarguments.

- Media reporting about NGTs is dominantly political, rather than scientific. A central element of criticism is the non-scientificness of the Commission's NGT proposal.

Background

Genetic modification of plants and the respective legislation have always been a highly conflictual issue that captures media interest. This is especially true in Europe, where very strict GMO legislation is currently in place. The issue has recently garnered renewed attention with the Commission's proposal on a new legislation for New Genomic Techniques (NGTs) on 5 July 2023. In essence, the legislation outlines two different pathways for the marketisation of different NGTs. For NGT plants with a lower risk profile (i.e. plants that could occur naturally or be bred conventionally), "no risk assessment has to be made and they can be labelled in the same way as conventional plants". However, for all other NGT plants, the requirements of the current GMO legislation would apply. This means that they can only be launched on the market following a risk assessment and an authorisation procedure[1]. The publication of the proposal stirred a debate, as not all the stakeholders agreed on the proposed changes.

In this report, we examine how issues related to GMO and NGT plants are portrayed in European mainstream media outlets. First, we provide an overview of media headlines covering topics related to genetic modification, then we present a more detailed content analysis of articles reporting about the European Commission proposal.

To perform the analysis we applied a combination of different tools and methodologies.

First, we used a clustering algorithm to explore groups of article headlines, which are semantically close to each other. This analysis helped to identify the main topics featured in European mainstream media news between Janaury 2020 and 27 August 2023.
Second, to better understand the trending news items over time, we performed an analysis of the reporting timeline of articles referring to the European Commission, with the main focus on the most significant reporting peaks.
Third, the analysis was completed by automated keywords and emotions analyses that helped to delineate more solid findings on how the Commission's proposal is portrayed in mainstream media.
Finally, we showcase critical and supportive arguments, including also a few country specific information, and we provide data about reporting trends in the aftermath of the publication of the European Commission proposal, including the day when the European Parliament approved the proposal.

The analysis presented in this report was performed on articles published by a list of 465 mainstream media outlets present in EU's 27 Member States, which are of Europea Media Monitor (EMM) and were manually curated to provide a good overview of the main topics discussed in mainstream European online media.

For further information on the methodology, see the Annex.

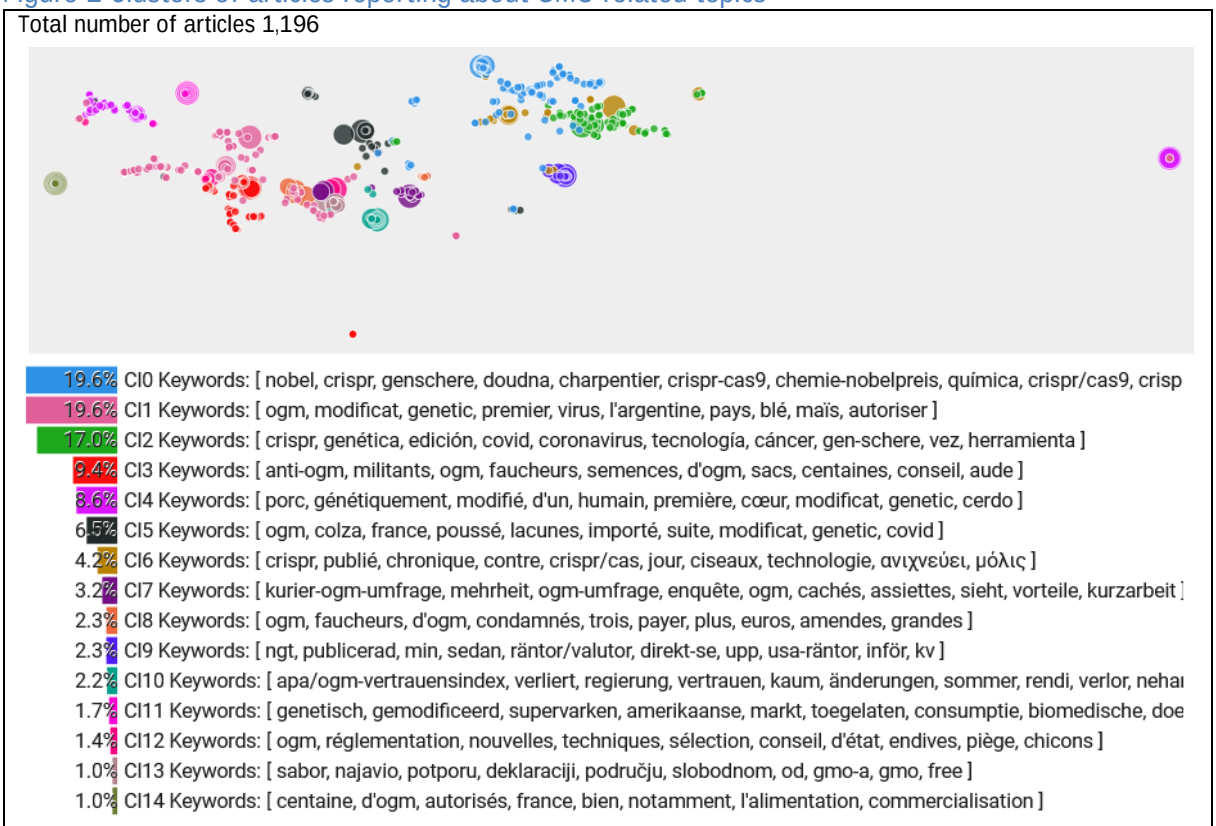
[1] European Commission Press Corner: Frequently Asked Questions: Proposal on New Genomic Techniques; European Commission Study on New Genomic Techniques

Overview of main online media headlines

Cluster analysis

Titles are the first information readers meet and can significantly influence their first impression of an issue. To gain an overview of the primary messages delivered to readers, we performed an automated cluster analysis on European mainstream online articles containing GMO or NGT related keywords in their titles or initial sentences.[2] In order to understand the broader context in which news related to the new NGT regulation appear, we performed this first analysis on the time period since the beginning of 2020. Results are considered approximative, as clustering is performed on a randomly selected subset of articles. The clusters' estimated size, together with the most frequent related keywords, are listed under Figure 1. Articles are represented by the coloured bubbles, and the graphical distance represents the semantic similarity between the news items' titles. For an easier understanding, we summarised the main topic(s) for the first biggest clusters.

Figure 1 Clusters of articles reporting about GMO related topics



Overview of main themes per top 7 clusters:
CI0: Nobel prize in Chemistry for CRISPR/Cas9
CI1: GMO worldwide, including authorisation processes of GMO plants (E.g. Argentina, China, Kenya) and mosquito experiments in USA
CI2: CRISPR/Cas & health applications (including Coronavirus)
CI3: Anti-GMO activism and actions in Europe (agriculture)
CI4: Transplant of genetically-modified heart from pig to human
CI5: Forbidden GMO rapeseeds + coronavirus & GMO viruses
CI6: Gene-therapy and its application to cancer and rare diseases

[2] We refer to EMM "descriptions" that contain approximately the first 300 characters of an article.

We found that the announcement of the Nobel Prize in chemistry for the CRISPR/Cas9 technology (genetic scissors can change the DNA of animals, plants and microorganisms with extremely high precision) is among the most reported news items in this field. According to our estimation, 1 out of 5 articles (19.6%) belongs to this biggest cluster of articles.

Most of the other clusters revolve around two main themes: healthcare and agriculture.

Regarding healthcare, we found several articles about genetically modified organs transplanted from animals to humans (e.g. genetically modified pig heart transplant), gene theraphy and other human-related applications (e.g. China's "gene-edited babies") or the role of genetically modificied mosquitos, bacterias or viruses that could have a role in healthcare (clusters 1-2 and 4-5-6). This category also includes articles about the possibility of the Covid-19 virus being genetically manipulated.

Regarding agriculture and the food industry, the typical news items can be further characterised as:

a) Wordwide news about GMO regulation (cluster 1)
b) GMO actions in Europe (clusters 3 and 5)

For the first category of "worldwide news", we found significant reporting about the changing legal environment in Argentina (as the first country authorising GMO wheat production[3]) and sporadic reporting e.g. about Mexico banning GMO maize and glyphosate[4], or Kenya expecting resistence of small farmers in light of the re-authorisation of genetically modified maize[5]. The plants included in reporting were e.g. corn, soy, grain, marijuana, endives.
News in the second category, "GMO actions", primarily consisted of reporting about anti-GMO actions (e.g. Greenpeace), and about authorisation of GMO seeds or plants in France[6].

It is noteworthy that several news items discussing the new NGT study and the regulation proposal, which also mention the European Commission, were grouped together with news about anti-GMO activism. This may be because these types of news items are semantically similar to each other or perhaps because the proposal is perceived as strongly conflictual and contested by the anti-GMO community. To better understand the tone and the content, we further investigated Commission-related news by supplementary text mining tools. The results of this analysis are included in the subsequent chapter.

Reporting timeline and trending news items

The timeline depicted in Figure 2 shows trending news items on a given week, helping us to quantify media coverage and trending news items over the period. Similar to the cluster analysis described earlier, the analysis of reporting peaks also confirms that media attention

[3] See e.g. Reuters: https://www.reuters.com/article/argentina-wheat-gmo-idAFL2N2X428L

[4] See e.g. LeMonde: https://www.lemonde.fr/planete/article/2021/01/07/precurseur-en-amerique-latine-le-mexique-bannit-le-mais-genetiquement-modifie-et-le-glyphosate_6065495_3244.html

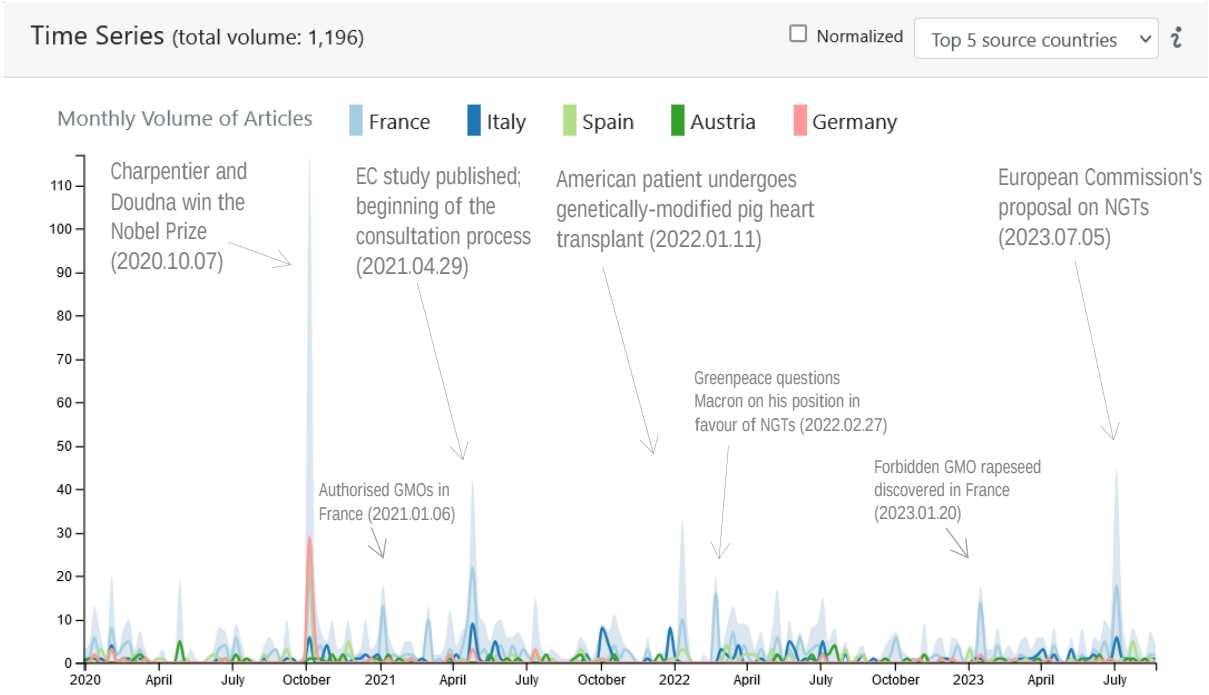
[5] See e.g. LeMonde: https://www.lemonde.fr/en/le-monde-africa/article/2022/12/26/kenya-looks-to-genetically-modified-maize-to-combat-food-crisis_6009121_124.html

[6] See e.g. Le Parisien https://www.leparisien.fr/societe/en-france-une-centaine-d-ogm-autorises-a-la-commercialisation-notamment-dans-l-alimentation-05-01-2021-8417490.php and Le Figaro https://www.lefigaro.fr/conjoncture/du-colza-ogm-importe-a-pousse-en-france-en-2022-a-la-suite-de-lacunes-20230120

to the Nobel Prize exceeds that of any other topic. The European Commission's new proposal on NGTs is also among the top items, first when the EC study on NGTs was published (29 April 2021), and more recently, when the proposal itself was made available (5 July 2023). Quantitatively, these two reporting peaks altogether can be roughly compared to news about the Nobel Prize in Chemistry for the CRISPR/Cas technology.

In addition, some smaller peaks can be observed. In 2022, we detected heightened media attention in relation to President Macron's opinion in favour of NGTs, and GMO rapeseeds discovered in France, but in these cases news came mainly from French sources and is expected to have less impact in other countries.

Figure 2 – Reporting on GMOs or NGTs in EU27 mainstream media headlines



Source: EMM "EU27Mainstream" index. Period: 2020.01.01-2023.08.27. Weekly aggregated data.

Examples for frequent headlines sorted by date of publication:

2020.10.07 Charpentier and Doudna win the Nobel price
2021.01.06 Authorised GMOs in the EU and France
2021.04.29 EC study on NGT released; beginning of the consultation process
2022.01.11 American patient undergoes genetically-modified pig heart transplant
2022.01.20 Genetically modified pig kidneys transplanted into human successfully for the first time
2022.02.27 Greenpeace questions Macron on his position in favour of NGTs
2022.03.09 Patient dies two months after pig-heart transplant
2022.03.16 Parliament announces support for the Declaration on Alps-Adria-Danube, an area free from GMOs
2022.03.24 The war in Ukraine: Emergency for the import of non-GMO maize and grain
2022.05.13 Argentina, the first country in the world to authorise the planting of genetically modified wheat"
2023.01.20 Forbidden GMO rapeseed discovered in France
2023.07.05 Release of European Commission proposal on NGTs

After reviewing the main online media topics on GMOs and NGTs, we further examined how media reports about the topic in relation to the European Commission.

Most frequent keywords and emotion analysis

Figure 3 illustrates the most frequently occuring keywords in the selected news items. It shows headlines related to the release of the European Commission Study on NGTs (29 April 2021) which are often negative, as words "risk", "concerns", "fears", "oppose" appear quite frequently in the titles. Furthermore, it unveils that headlines about the Commission's proposal for NGT regulation in their wording refer to "new GMOs" or simply GMOs and not NGTs. In this sense, the rethorical distinction of NGTs from GMOs remains blurry. This is, on the one hand, understandable, as NGTs still fall under the GMO legislation (they are in fact GMOs[7]). On the other hand, it is somewhat contrary to the Commission's intention to establish two distinct marketisation pathways of two different kinds of products, treating NGT plants "like conventional plants and therefore exempted from the requirements of the GMO legislation"[8]. It also opposes the opinions of scientists who argue that NGTs and GMOs are two distinct techniques and categories. Moreover, the use of the term "new GMO" could potentially strenghten the "traditional" anti-GMO arguments.

Figure 3 Wordcloud and source countries of headlines reporting on the European Commission's study (left) and the proposal on NGTs (right)

EC study

Reporting period: between 28 April and 2 May 2021. Total volume of items: 41

EC proposal

Reporting period: between 4 and 8 July 2023. Total volume of items: 31

Headlines published around the release of the European Commission's proposal itself (5 July 2023) also carry a negative tone, often conveying fear (the European Commission's proposal

[7] Euraktiv: https://www.euractiv.com/section/agriculture-food/news/eu-executive-proposes-looser-rules-on-gene-edited-food/

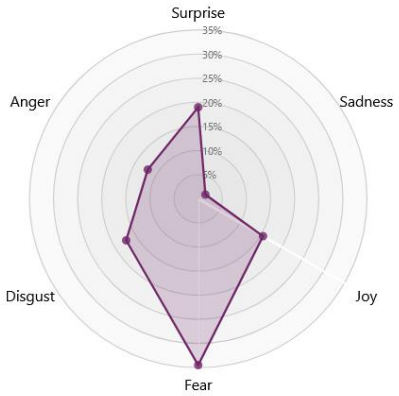
[8] EC Press Corner: https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_3568

about new GMOs is dangerous[9]), worries (consumers are afraid of GMOs[10]), anger (farmers urge the European Parliament and European Council to reject the proposal on GMOs[11]), or simply doubts (by questioning whether GMOs are dangerous[12]).

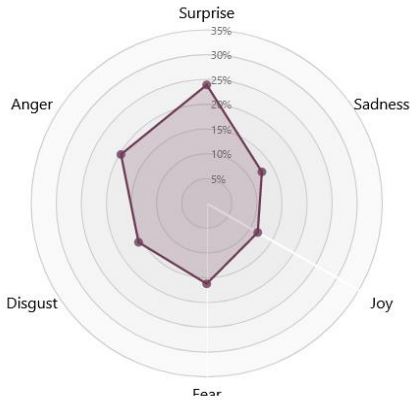
Titles pointing to the division of scientists on the subject[13] or to the alarmism of the "Greens"[14] are also spreading the sense of fear, doubts or insecurity. Only a few headlines are more reassuring ("EU assures NGTs will be distinct from GMOs"[15]), or offer more objective insights of the topic ("five questions to know about NGTs"[16]). Articles that highlight the positive aspects and emphasise the benefits of introducing NGTs on the food market (such as reduced water usage, enhanced competitiveness of European agriculture, more resilient plants, more nutritious food etc.) largely remain hidden in the dominantly negative media landscape. The prevalence of fear in European Commission related news, compared to the totality of GMO news is confirmed also by an emotion detection algorithm (Figure 4).

Figure 4 Emotion in GMO news vs EC related GMO news

EC related GMO headlines (Total: 145)



Generic GMO headlines (Total: 1,196)



Reporting period: between 1 January 2020 and 27 August 2023

[9] Are genetically modified foods dangerous? https://www.ilcambiamento.it/articoli/coalizione-italia-libera-da-ogm-pericolosa-la-proposta-della-commissione-ue-sui-nuovi-ogm 2023-07-10

[10] Sloboda Dalmacija: Most Croatian citizens do not want to consume GMO food, but if this decree passes – they won't even know what's on their plates. (2023-07-10) (Title translated with the help of automated translation)

[11] Observador: Farmers ask Parliament and European Council to reject proposal on GMOs (2023-07-07)

[12] Le Progrés: OGM dangereux ou procédé novateur : comprendre le débat autour des NBT (2021-04-30)

[13] Le Dauphiné libéré: OGM ou techniques révolutionnaires, les scientifiques sont partagés sur le sujet (2021-04-30)

[14] Corriere della sera: Ogm, l'Ue apre alla revisione delle norme. A favore gli agricoltori, l'allarme di Verdi e Slow Food (2021-04-30)

[15] Cibi super-restistenti, arrivano le Ntg. L'Ue assicura: "Vanno distinti da Ogm" (2023-07-08)

[16] Nouveaux OGM: cinq questions pour tout savoir sur les NGT (2023-07-07)
Que sont les NGT. (2023-07-07)

Criticism and supportive arguments

Coverage of the European Commission's proposal on NGT regulation is frequently intertwined with national politics. We showcase selected examples in various Member States druing the early reporting period and around the day of the proposal's publication. To complement the analysis provided in this report, we provide a brief overview of reporting trends following the publication of the European Commission proposal, including the day when the European Parlament adopted it.

The early period of reporting

Sporadic mentions about the future European legislation of NGTs go back to December 2021 when only very few articles dealt with the topic on different occasions. For instance, an Austrian article, covering the EU Environment Ministers' Council, discusses big corporations investing in lobbying efforts at the European Commission to deregulate the labelling of NGT plants[17]. Additionally, an article published in the Irish Times argues that the commercialisation of NGT plants would be beneficial in Europe[18]. A Hungarian article makes a political stocktaking about the ongoing debate of the European Nature Restoration Law and foresees a difficult and lengthy political debate about NGT food products and points to the study of the European Commission[19].

The first bigger cluster of articles that really put the EC proposal in the centre of the attention was published around the 16 June 2023, when the German Press Agency (DPA) reported on the "leaked" draft proposal[20]. Several German outlets reprinted this news item[21], and the media landscape was composed of mainly German articles up until the few days preceeding the proposal's publication on 5 July 2023. These early articles highlight that the European Commission intends to relax "genetic engineering" regulations in food, laying the groundwork for criticism. Several articles quote Karl Bär, a member of the Bundestag for the Greens, who believes that "Deregulation has no added value for society, while a few large corporations benefit from it". Tagesspiegel also features the perspective of Olaf Bandt, chairman of the German Federation for the Environment and Nature Conservation (BUND), who statesthat "80% of consumers refuses genetically engineered food on their plates".[22] In addition, other articles, such as the Berliner Zeitung[23], spread fears and worries by using subtitles that

[17] Oekonews: Recherche Neue Gentechnik: Lobby-Millionen und Patentmacht einzelner Agrarkonzerne (2021-12-21). The article makes reference to Global 2000 that later in 2023 March published a paper on "Revealed: How the agribusiness lobbyists ghost-write the EU's proposal on new GMOs".

[18] The Irish Times: Crop failures: Ireland and EU left behind as gene editing marches on (2021-12-23 01:00)

[19] Magyar Nemzet: Példátlan kihívás az élelmiszerreform (2022-02-14 11:15)

[20] See e.g. in Stirile TV: Comisia Europeană intenționează să relaxeze legile privind alimentele modificate genetic (2023-06-16 14:19)

[21] Examples of German articles published on 16 June 2023. See also references n.13-16.
Nordbayern: Gentechnik in Lebensmitteln: Deutliche Lockerung geplant (2023-06-16 10:38)
Saarbruecker Zeitung: Gentechnik in Lebensmitteln: Deutliche Lockerung geplant (2023-06-16 10:34)
Stern: Agrar: Gentechnik in Lebensmitteln: Deutliche Lockerung geplant (2023-06-16 10:32)
Die Rheinpfalz: Politik Gentechnik in Lebensmitteln: Deutliche Lockerung geplant Im Juli wird die EU-Kommission voraussichtlich ihre Pläne für eine Überarbeitung der Gentechnikregeln vorstellen. (2023-06-16 10:31)
Wirtschafts Woche: Agrar: Gentechnik in Lebensmitteln: EU plant deutliche Lockerung (2023-06-16 02:42)

[22] Tagesspiegel: Gentechnik in Lebensmitteln: EU-Kommission plant deutliche Lockerung (2023-06-16 14:28)

[23] Berliner Zeitung: Genmodifizierte Lebensmittel: EU plant Lockerungen (2023-06-16 12:00)

suggest the proposal would mean the "end of organic farming" (due to the difficulties of protecting organic farms from contamination, such as seeds being carried by the wind). These articles also mention that the proposal would not allow EU Member States to restrict or prohibit NGT plants. Regarding German politics, journalists point to the fact that it is unclear whether the Federal government will oppose or support the proposal (the Federal Ministry for the Environment, led by the Greens, had in the past expressed skepticism, but the Federal Ministry of Research led by the FDP signalled fundamental support). The agricultural policy spokesman for the Greens in the EU Parliament, Martin Häusling, condemned the proposal as consumer deception, labelling it as "completely unscientific and arbitrary". He expressed concerns that "genetically modified organisms are equated with natural or conventionally bred ones," and added that these claims are "fairy tales from the genetic engineering industry". Furthermore, the short message "Their social benefit is often claimed in theory, but in practice genetic engineering aims at patents and profits" was published on the X account (former Twitter) of Federal Minister for Environment Steffi Lenke. At the same time, a positive counter-narrative, supported by the German Farmers' Association, claimed that despite environmetalists' warnings, many farmers consider genetic engineering as an opportunity, as it is expected to enhance plant resilience to extreme weather conditions, such as drought or excessive rain.[24]

A Hungarian news outlet raises criticism even earlier in June, and already shed some light about the proposal and the related EP debate by stating that the Commission wanted to publish the proposal already in June but it postponed it due to the political debate and disagreement between EP groups about the Nature Restoration Law[25]. Some of the reasons for not supporting the document include food security and the lack of assurance regarding the control over the scientific method. Furthermore, Hungary is positioning itself as a GMO-free country which is one of the driving factors behind the strong criticism[26].

Reporting related to the publication of the legislative proposal

The publication of the proposal sparked both criticism and supportive viewpoints on online media. Critical voices often came from small and organic farmers and consumers, but these opinions were not always coordinated or homogeneous.

For instance, criticism from European Coordination Via Campesina – ECVC (which positions itself as "the collective voice of peasant farmers in Europe") deems the European Commissions' proposal unacceptable and outrageous, and urges the European Parliament and the European Council to reject it.[27] In Sweden, an article points out that in the proposal the European Commission is not paying attention to ecological organisations and organic farmers.[28] Furthermore, Green Action in Croatia calls the relevant institutions to reject the proposal. At the same time, other farmer organisations welcomed the relaxation of the rules.

[24] Stuttgarter Zeitung: https://www.stuttgarter-zeitung.de/inhalt.landwirtschaft-bauern-fordern-neue-gentechnik.a116b048-624d-43f5-b857-7fb5507554e7.html
[25] Napi.hu: https://www.napi.hu/gazdasag/klimavaltozas-brusszel-termeszet-torveny-elelmiszer.772455.html (2023-06-10 21:03)
[26] Hungary Today: https://hungarytoday.hu/ministry-continues-to-insist-on-gmo-free-agriculture/ (2023-06-10 21:03)
[27] Via Campesina: European Commission proposal on new GMOs favours biopiracy over rights of farmers and citizens (2023-07-10)
[28] Dagens Nyheter: https://www.dn.se/debatt/eu-lagger-sig-platt-for-jordbrukets-bakatstravare/

For instance, Italian news report that *Confagricoltura* and *Coldiretti* consider this an important measure to combat climate change[29].

The most criticised central elements are the removal of the obligation of labelling that leads to the loss of traceability. The lack of control appears as a "loss" compared to the current legislation. For example,. farmers' organisations highlight the loss of "freedom of choice/sovereignity" and the "right" of farmers to use, select and exchange seeds, while consumers' organisation highlight the loss of consumers "to choose what to eat"[30]. Other arguments against the proposal are:

- GMOs and NGTs have not been proven to be safe;
- The proposal is not scientific and too complex;
- The lack of labelling favours biopiracy and the privatisation of seeds;
- The population is against and would avoid GMOs if given the choice;
- The decision is based on the interest of "Big Agri" companies.

In articles taking a prevalently negative viewpoint, mentions about the advantages of NGT plants (less use of pesticides and plants more resilient against extreme weather conditions or more competitive European agriculture to name a few) are rare, or the positive aspects are mentioned only around the end of the articles. This is important as people's opinions may already being shaped by the first part of the article.

Furthermore, in some countries the topic, and especially criticism appearing in online media is embedded in the political context, as green activists or political actors express their opinion against the introduction of NGTs.

For instance, in Hungarian media the legislative proposal is often framed as a loss of national sovereignity, as it is often criticised for not allowing Member States the choice to remain a GMO-free country. Articles often ensure that the government will advocate for the country to remain GMO-free. Dramatic terms, such as "scandal", "leaked proposal", "trick", "deeply worrying"[31] are frequently used to report about the legislative proposal, and accusations that the European Commisison protects big corporations, such as Bayer, Syngenta and Corteva, instead of citizens are not uncommon[32]. Another example comes from Slovakia, where Jozef Bíreš, Minister of Agriculture and Rural Development, stirred a debate. Political parties Smer, SNS and Hlas criticised him for supporting the authorisation of the cultivation of genetically modified (GMO) crops and their use for food production at the July meeting of the European

[29] https://www.ilfattoquotidiano.it/2023/07/05/la-deregulation-ue-sullagricoltura-e-servita-sdoganate-le-tecniche-di-evoluzione-assistita-e-2-categorie-a-parte-di-ogm-rischio-sicurezza/7219374/

[30] "Many genetically modified foods could eventually end up unlabelled on the shelves of European supermarkets, according to a European Commission legislative proposal". http://stiri.tvr.ro/comisia-europeana-intentioneaza-sa-relaxeze-legile-privind-alimentele-modificate-genetic_933195.html

[31] Demokrata: https://demokrata.hu/magyarorszag/magyarorszag-kiall-a-sajat-mezogazdasaganak-gmo-mentessege-mellett-705585/

[32] E.g. Magyar Nemzet: https://magyarnemzet.hu/belfold/2023/07/eu-javaslat-nem-tilthatjak-meg-a-kormanyok-a-gmo-k-termeszteset; HVG: https://hvg.hu/gazdasag/20230704_Brusszel_enyhiteni_akar_a_genmodositas_tilalman

Union Council for Agriculture and Fisheries, despite previously stating that he would not support such a decision.[33]

While we idenitied a strong negative tone and significant criticism, supportive arguments that echo the Commission's viewpoint. Supportive news usually highlight some of the advantages of NGT plants versus traditional farming, among the others the resistance of NGT plants to drought that require less chemical fertilisers, or they could result in higher nutritional value and partially solve hunger as a response to the lack of arable lands.[34] The European Commission's effort to protect consumers' health and produce healthier food are portrayed in a positive light.

While the lack of understanding could be of the reasons why people are against genetic engineering, the scientific arguments surfacing in media usually end with the somewhat abstract explanation of the difference between NGTs and GMOs (e.g. modify the plants' genome without introducing external genetic material). Explanations easier to understand for lay people, e.g. "the purpose of such processes, is to make already existing processes to change certain characteristics of the plants faster"[35] or a more in-depth analysis that demonstrates based on very concrete examples, that science and the CRIPRS technique have already provided a solution to many problems[36], are sporadic.

Furthermore, positive narratives are often counterargued. Especially representatives and supporters of the the green/ecologic movement blame the agri-food industry behind the new generation of GMOs. They highlight that positive narratives, such as GMOs and NGT plants being safe and capable of solving global problems like ecological, climate and economic crises, are controlled by the industry and are false and unscientific. They propose alternative ways for an ecological regeneration and biodiversity.[37]

Reporting in the aftermath of the publication of the legislative proposal

As the European Parliament adopted its position for negotiations with Member States on the Commission proposal on NGTs (with 307 votes to 263 and 41 abstentions), NGTs made the headlines again on 7 February.

Figure 5 quantifies on a timelinethe volume of articles mentioning GMOs or NGTs in their title or text after the release of the European Commission proposal on NGTs. It shows that the EP

[33] https://index-sme-sk.translate.goog/c/23201603/bires-za-gmo-potraviny-nehlasoval-suhlasil-s-inou-technologiou.html?_x_tr_sl=sk&_x_tr_tl=en&_x_tr_hl=en-US&_x_tr_pto=wapp 04-08-2023

[34] E.g. of supportive articles: https://www.euronews.com/my-europe/2023/07/05/brussels-wants-to-relax-rules-for-gene-edited-crops; https://www.euractiv.com/section/agriculture-food/news/eu-executive-proposes-looser-rules-on-gene-edited-food/ ; https://www.euractiv.com/section/agriculture-food/news/eu-commission-takes-more-time-on-patentability-of-gene-edited-plants/; https://www.ilgiornale.it/news/europa/cibi-super-restistenti-arrivano-ntg-lue-assicura-vanno-2178835.html; https://www.huffingtonpost.it/blog/2023/07/07/news/ripristino_della_natura-12599536/

[35] E.g. Lithuania Professor Rolandas Meškis in a radio show says people are against genetic engineering because "they do not fully understand what this concept means in general", and he adds that "the purpose of such processes, is to make already existing processes to change certain characteristics of the plants faster". https://www.lrt.lt/naujienos/mokslas-ir-it/11/2053835/profesorius-ragina-nesibaiminti-genetiskai-modifikuotu-augalu-visos-lietuvoje-auginamos-kulturos-ir-taip-yra-mutantes

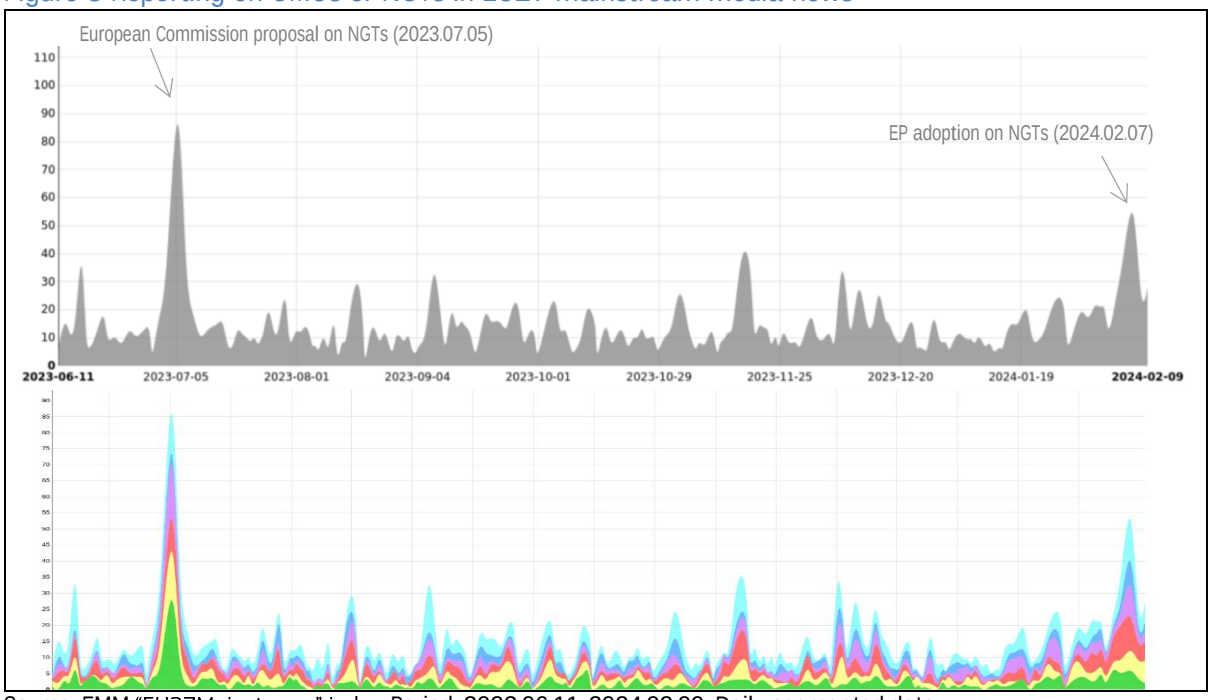
[36] E.g. https://www.ilfoglio.it/scienza/2023/07/05/news/con-le-piogge-tornano-i-parassiti-ma-l-odio-per-gli-ogm-blocca-le-possibili-soluzioni-5469655/

[37] https://www.ilcambiamento.it/articoli/navdanya-le-strategie-dell-industria-agroalimentare-dietro-la-nuova-generazione-di-ogm

adoption of the NGT regulation is comparable in volume to the publication of the EC proposal, nevertheless the daily peak is lower.

We found also differences of automated emotion tags. On the day of the publication of the Commission proposal, fear accounts for 34.5% of the total of identified emotions, the same value drops to 10.3% on the day of the EP adoption. This may be due to the fact, that the EP adopted its position with significant modifications: MEPs want to keep mandatory labelling of products from both NGT 1 and NGT 2 plants and ask for a full ban on patents for all NGT plants. Furthermore, "MEPs also agree that all NGT plants should remain prohibited in organic production as their compatibility requires further consideration and want the Commission to report on how consumers and producers' perception of the new techniques is evolving, seven years after its entry into force". Moreover, a "report is requested by June 2025 on the impact of patents on breeders' and farmers' access to varied plant reproductive material as well as a legislative proposal to update EU rules on intellectual property rights accordingly"[38].

Figure 5 Reporting on GMOs or NGTs in EU27 mainstream media news



Source: EMM "EU27Mainstream" index. Period: 2023.06.11-2024.02.09. Daily aggregated data.

[38] https://www.europarl.europa.eu/news/en/press-room/20240202IPR17320/new-genomic-techniques-meps-back-rules-to-support-green-transition-of-farmers

Annex

About the authors

The technical tools to obtain the data were developed by TMACC - JRC.T.5 Unit, Text and Data Mining. The analysts developed a query related to the media intelligence brief's topic and the workflow to apply it to news media, retrieved the information and presented relevant insights and comparisons. The data findings were assessed with domain knowledge and conclusions drawn.

Text Mining & Analysis Competence Centre (TMA-CC)

The Text Mining & Analysis Competence Centre (TMA-CC) is specialised in making sense of vast amounts of text through computing and analytics. It is an in-house consultancy and innovation service supporting EU Institution's policymakers, investigators and analysts in their knowledge-intensive tasks by providing consultancy and advanced analytical tools in the field of text mining.

The TMA-CC aims to be an incubator for text mining ideas and solutions within the European Commission - a single focal point where expertise is concentrated, then shared and applied to the benefit of its clients.

For more information on TMA-CC, check https://knowledge4policy.ec.europa.eu/text-mining_en.

European Science and Media Hub

The European Science-Media Hub (ESMH), operating under the political responsibility of the European Parliament Panel for the Future of Science and Technology (STOA), is a platform to promote networking, training and knowledge sharing between the European Parliament, the scientific community and the media.

The ESMH creates a network among policy-makers, scientists and media involving science, academia, educational and research entities, and professional associations of journalists and scientists. For journalists and media representatives, the ESMH organises training sessions and workshops on current technological developments, both as subjects of their reporting and as means of facilitating their work. Via media monitoring and media intelligence tools, the ESMH follows the most popular topics in the field of science and technology on different platforms including journals, newspapers and social media.

The ESMH makes information available to journalists, other media and citizens about new scientific developments, as well as about scientific topics that attract media attention, and promotes information based on evidence.

Check https://sciencemediahub.eu/ for more information, methodology and technology.

Europe Media Monitor

Europe Media Monitor (EMM) is a tool developed and maintained by the Text and Data Mining Unit of the Joint Research Centre (JRC) of the European Commission. The main purpose of EMM is to provide monitoring of a large set of online media, reducing the information flow to manageable proportions by clustering related news, categorising articles and applying Language Technology tools to derive further metadata, such as recognising and disambiguating entities in the text, extracting quotes by and about people, applying sentiment/tonality analysis and more. Since 2018, EMM can also grab content from live Twitter streams.

A lot of EMM's functionalities are freely available. To access the tool that best fits your need, please check https://knowledge4policy.ec.europa.eu/online-resource/europe-media-monitor-emm_en.

Political Intelligence source index

The Political Intelligence index (PI) was created by the JRC T.5 (TMA-CC and Misinfo). For this, two types of source lists were manually crosschecked, cleaned and completed. The first list was prepared by Kantar with the help of country experts and includes both online and printed media outlets that best represent the mainstream media landscape of the given country. We crosschecked this list with already existing EMM online sources. For printed press, we included the equivalent online versions in this index if available. To adapt our list to the changing media environment, we also added new online sources, or removed discontinued sources, based on suggestions of country expert. The manually curated PI list of media outlets is composed of 465 EMM sources present in EU's 27 Member States.

Table 1 lists the number of PI sources per country and the indication of over or underrepresentation, in relation to the total population. All values detected as outliers using the interquartile range method are highlighted green for overrepresentation or red for underrepresentation.

Table 1 – Total number of sources per country in Political Intelligence EU27 Mainstream

Country	Population (Eurostat, 2022)	PI sources (total)	PI sources /population (per 100,000)	Difference (from EU average)	Under/Over-represented
Austria	8,978,929	13	0.14	-0.19	↓
Belgium	11,617,623	13	0.11	-0.22	↓
Bulgaria	6,838,937	13	0.19	-0.14	↓
Croatia	3,862,305	14	0.36	0.03	↑
Cyprus	904,705	8	0.88	0.55	↑
Czechia	10,516,707	16	0.15	-0.18	↓
Denmark	5,873,420	14	0.24	-0.09	↓
Estonia	1,331,796	16	1.20	0.87	↑
Finland	5,548,241	14	0.25	-0.08	↓
France	67,871,925	28	0.04	-0.29	↓
Germany	83,237,124	34	0.04	-0.29	↓
Greece	10,459,782	29	0.28	-0.06	↓
Hungary	9,689,010	21	0.22	-0.12	↓
Ireland	5,060,004	9	0.18	-0.15	↓
Italy	59,030,133	36	0.06	-0.27	↓
Latvia	1,875,757	12	0.64	0.31	↑
Lithuania	2,805,998	15	0.53	0.20	↑
Luxembourg	645,397	6	0.93	0.60	↑
Malta	520,971	6	1.15	0.82	↑
Netherlands	17,590,672	13	0.07	-0.26	↓
Poland	37,654,247	22	0.06	-0.27	↓
Portugal	10,352,042	23	0.22	-0.11	↓
Romania	19,042,455	22	0.12	-0.22	↓
Slovakia	5,434,712	11	0.20	-0.13	↓
Slovenia	2,107,180	10	0.47	0.14	↑
Spain	47,432,893	30	0.06	-0.27	↓
Sweden	10,452,326	17	0.16	-0.17	↓
EU MS	446,735,291	465	0.33		

Automated sentiment and emotion detection

The EMM system contains automatically classified sentiment (negative, positive, neutral) and emotion (fear, anger, joy, disgust, surprise, sadness) for each of the articles. EMM classifies each article with one label, indicating the most strongly expressed sentiment. More specifically, the analysed data obtained through classical supervised Machine Learning (ML) models. A "support vector machine" (SVM) model is used for obtaining separately sentiment and emotion data. Data is obtained through two distinct models that have been used in previously released (EC internal) reports produced by JRC's Competence Centre on Text Mining and Analysis (TMACC) and Disinfo Team at JRC T.5.

There are two phases in the algorithm. The first one is to transform the text data into a high dimensional vector. The second one is an optimisation of the parameters of a mapping function between the high dimensional vector representing the text data, and a low dimensional (L dimensions if there are L labels) vector representing the likelihood or probability of each label for the input text. E.g. in our case the vector is 3 dimensional for sentiment (neutral, negative, positive). The algorithm assigns weights to some string in the text. To understand the meaning, the algorithm splits the text into small group of words. In our case the text is split in unigrams (when single words are considered) or bigrams (when each two adjacent words are considered), and if these strings are appearing in the text, then they will have an impact on the output probabilities. For example, if the string 'I love' appears in a text, the likelihood for this text to be positive will be a bit higher. The process ends when the system is outputting a distribution of probability, meaning that for each label we get a probability value between 0 and 1, with the sum of the probabilities equal to 1. As a final step, the algorithm will take the sentiment label that has the highest value (the value is its probability) as output.

How accurate is this model?

The systems performing sentiment vary in accuracy depending on text types and languages. The classical Machine Learning model currently implemented in EMM covers five languages (EN, FR, DE, ES and IT), while for other languages, the model is applied on the English translated text. While automated machine translation is an efficient way to get timely results in a multi-lingual context, its performance is dependent on the use of the languages: for widely spoken languages, the performance may be much better than for those that are spoken less widely.

For the five languages covered during the training of the model, benchmarks suggest the EMM Sentiment model accuracy is between 60% and 70%, which is comparable to state-of-the art performance. For other languages, the sentiment analysis are performed on the text translation to English, which may lead to up to 5% loss in performance.

The lack of transparency of automated machine learning algorithms is a well-known issue. Knowing which piece of text is attributed to a specific label (e.g. negative) could significantly improve the explainability and the interpretability of the models, but this function is not yet integrated in EMM.

For the above-mentioned reasons, any explanation of the sent.iment data need to be handled with caution.

TMACC is working on the implementation of better performing Deep Learning (DL) models and on targeted sentiment and emotion analysis that allows to search in shorter pieces of text, e.g. paragraphs or sentences.

Keyword-based data selection

Articles relevant to the topic are selected by searching for a pre-established set of relevant combined keywords that appear in the title or text of the article. To obtain the selected keywords in all official EU languages for this report, we translated the keywords automatically from English to all other EU23 languages by using the European Commission's E-Translation services.

In addition, automated methods can be applied to extract more specific information, or to generate further metadata. It is possible to search for specific countries or dates. Other functions include the retrieval of the list of the most frequently occurring keywords, expressions, entities (institutions or persons) or quotes for the subset of articles representing negative, positive or neutral articles or a specific emotion. A comparison of this kind of information can help the analysts to identify the context in which the research topic appears.

Appendix

Main queries

1) GMO OR NGT in title:
2) GMO OR NGT AND European Commission in title OR description:
3) GMO OR NGT AND European Commission in title OR text:

Keywords for GMO and NGT:

("genetically modified" OR "генетично модифицирани" OR "geneticky modifikované" OR "genetisk modificeret" OR "genetisch veränderte" OR "γενετικώς τροποποιημένα" OR "modificado genéticamente" OR "geneetiliselt muundatud" OR "muuntogeeninen" OR "génétiquement modifié" OR "géinmhodhnaithe" OR "genetski modificirani" OR "géntechnológiával módosított" OR "geneticamente modificati" OR "genetiškai modifikuotas" OR "ģenētiski modificēts" OR "modifikat ġenetikament" OR "genetisch gemodificeerd" OR "zmodyfikowane genetycznie" OR "geneticamente modificada" OR "modificat genetic" OR "gensko spremenjene" OR "genetiskt modifierade" OR "genetic modification" OR "генетична модификация" OR "genetická modifikace" OR "genetisk modifikation" OR "genetische Modifikation" OR "γενετική τροποποίηση" OR "modificación genética" OR "geneetiline muundamine" OR "geneettinen muuntaminen" OR "modification génétique" OR "modhnú géiniteach" OR "genetska modifikacija" OR "genetikai módosítás" OR "modificazione genetica" OR "genetinė modifikacija" OR "ģenētiskā modifikācija" OR "modifika ġenetika" OR "genetische modificatie" OR "modyfikacja genetyczna" OR "modificação genética" OR "modificare genetică" OR "genetická modifikácia" OR "genetska sprememba" OR "genetisk modifiering" OR "genome editing" OR "редактиране на генома" OR "editace genomu" OR "genomredigering" OR "Genombearbeitung" OR "επεξεργασία γονιδιώματος" OR "edición del genoma" OR "genoomi redigeerimine" OR "genomin muokkaus" OR "édition du génome" OR "eagarthóireacht ghéanóim" OR "uređivanje genoma" OR "genomszerkesztés" OR "modifica del genoma" OR "genomo redagavimas" OR "genoma rediġēšana" OR "editjar tal-ġenoma" OR "genoombewerking" OR "edycja genomu" OR "edição do genoma" OR "editarea genomului" OR "úprava genómu" OR "urejanje genoma" OR "new genomic" OR "нов геном" OR "nový genom" OR "nyt genom" OR "neue genomische" OR "νέα γονιδιωματική" OR "nuevo genómico" OR "uus genoomika" OR "uusi genomi" OR "nouvelle génomique" OR "nua géanómaíoch" OR "novi genomski" OR "új genomikai" OR "nuovo genomico" OR "nauja genominė" OR "jauns genomisks" OR "ġenomika ġdida" OR "nieuwe genomic" OR "nowy genomiczny" OR "nova genómica" OR "noua genomică" OR "nový genóm" OR "nova genomska" OR "det nya genomet" OR "new genomic technique" OR "нова геномна техника" OR "nová genomická technika" OR "ny genomisk teknik" OR "neue genomische Technik" OR "νέα γονιδιωματική τεχνική" OR "nueva técnica genómica" OR "uus genoomitehnika" OR "uusi genomitekniikka" OR "nouvelle technique génomique" OR "teicníc ghéanómaíoch nua" OR "nova genomska tehnika" OR "új genomikai technika" OR "nuova tecnica genomica" OR "nauja genominė technika" OR "jauna genomikas tehnika" OR "teknika ġenomika ġdida" OR "nieuwe genomische techniek" OR "nowa technika genomowa" OR "nova técnica genómica" OR "noua tehnică genomică" OR "nová genómová technika" OR "CRISPR" OR "CRISPR-cas9" OR "CRISPR/Cas9" OR "GMO" OR "OGM" OR "anti-OGM" OR "anti-GMO" OR "NGT" OR "NGTs" OR "NGT-related" OR "non-NGT" OR "NGT-free" OR "GMO" OR "GMOs" OR "non-GMO" OR "non-GM" OR "GMO-free")

Keywords for European Commission:

("coimisiún eorpach" OR "comisia europeană" OR "comisión europea" OR "comissão europeia" OR "commission européenne" OR "commissione europea" OR "eiropas komisija" OR "euroopa komisjoniga" OR "euroopan komissio" OR "european commission" OR "europeiska kommissionen" OR "europese commissie" OR "europos komisija" OR "europska komisija" OR "európai bizottság" OR "európska komisia" OR "evropska komisija" OR "evropská komise" OR "komisja europejska" OR "kummissjoni tal-unjoni ewropea" OR "ευρωπαϊκή επιτροπή" OR "европейска комисия")

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