European Plant Science Organisation
https://epsoweb.org

Report

Genome editing
Improving legislation and starting flagships to better address climate, environmental, food and health challenges

2nd Informal meeting in Brussels 24.1.2020

Brussels, 24.4.2020

The European Plant Science Organisation (EPSO) invited policy makers to join EPSO members in a 2nd informal meeting exchanging views on the current situation of genome editing in Europe and possible next steps to enable Europe to better address climate change, achieve food and nutritional security, and establish a sustainable agriculture in Europe and world-wide.

The major change compared to last the meeting is the European Commission study. The Council of the EU requested the EC to submit a study regarding the status of new genomic techniques under Union law. The EC will perform this study until April 2021, covering all new genomic techniques developed after 2001. In a first step EU-level Stakeholders, including EPSO, and the Member States were invited to provide their experiences through a questionnaire. EPSO will provide input.

The meeting focused on exchanging insights between scientists (1 / country) and policy makers (1-2 / country) from governmental bodies, again no industries involved. We discussed legislation, which steps could we take to bring the discussion forward (parallel with the study of the EU). Secondly, we discussed potential flagships. The meeting was held under Chatham House Rules.

In the first part of the meeting, participants discussed the **current legislation - if and how it could be improved** in the short and in the longer term. First, several participants gave detailed introductions of already available substantial suggestions to update or replace current EU-legislation.

The citizens' initiative started in July 2019, will end in July 2020 and they hope to collect 1 million signatures to "stimulate" the EC to take actions. Next to this they came up with a new legal proposal: 1) Introduce additional definition of long safety record and a new definition of mutagenesis; 2) Add an annex 1C, specifically for NBTs; 3) Organisms made using new mutagenesis techniques would only be exempted if the modification could also have been achieved by traditional breeding methods.
Comments:
This is not a small alteration. It is not very realistic to set up an all-encompassing crop trait database, it remains discriminatory.
Ii is important to underline that the number of signatures relates to this specific proposal, many more would sign up to a general improvement of the legislation as asked by many scientists.
Another Northern country proposal focusing on product-based legislation instead of process based, was mentioned as a long-term approach.
Policy makers explained the need for an improved legislation to be clear and simple.

The VIB proposal: there is a difference in the GMO definition between Europe and the Cartagena Protocol on Biosafety (no exemptions for classical mutagenesis). The EU is focused,

on the other hand, on "conventional organisms." Originally, the differences in focus were not seen to create "operational differences", so the EU did not change its legislation. However, after the ECJ case it creates a difficult situation (slide 18).
It would be very good to 1) harmonize between Cartagena and other GMO legislation, 2) avoid discrimination between products with the same genetic properties, 3) achieve enforceable legislation, 4) enable genome editing for sustainable agriculture and food production. VIB envisages four options: 1) Change the definition of a GMO (align with Cartagena LMO); 2) Expand annex 1A part 2 (techniques that do not lead to GMO; favored by VIB); 3) Introduce a definition of mutagenesis (including modern techniques); 4) Expand annex 1B (add additional techniques that are exempted), or create an annex 1C with these new techniques.
The VIB position is focusing on short term options, in order to harmonise with the rest of the world. The long-term approach might only work on a global scale and this makes it difficult to achieve at the moment.
Comments:
This proposal should be discussed with colleagues from regulatory bodies. Changing the GMO definition will be very difficult, so in the opinion of certain people we should take out mutagenesis techniques from the GMO definition. Mind you: nature offers the best and powerful mutagenetic techniques…
In summary: VIB favours option 2, expand annex 1A. However, we have to be careful how we rewrite recitals, so as to overcome Recital 17.

The Leopoldina statement: Recommended measures: 1) Change GMO definition (revise article 2) or the area of exemption (either amend annex IA part 2 or amend annex IB), 2) Additionally an introduction of a preliminary examination procedure in individual cases.
Comments:
There are some similarities with the VIB proposals. It underlines again the need to change the GMO definition.
It is doubtful if the proposed preliminary examination will work from a legal perspective. Probably therefore this proposal will only work within Europe.
Always remind people that regulations exist (Annex II) that apply to any new plant variety and are successfully used for conventional breeding. Therefore, varieties exempt from GM legislation are still subject to these other regulatory requirements by default, ensuring safety.

The Norwegian Biotechnology Advisory Council proposal is a short term solution suggesting a three - tiers approach, assessing not only risks but as well benefits (see www.bioteknologiradet.no/a-forward-looking-regulatory-framework-for-gmo/). Tier 1 is equal to VIB option 2 and would trigger a notification (similar to the Leopoldina proposal), but no need for final approval. It includes assessments of societal benefits, sustainability and ethics. For GMO medicinal products separate regulations should be considered.
Comments:
Working with the differences between tiers would also offer solutions for the problem around detection – e.g. tier 1 only document based.
More countries in Europe, Asia and America are working on similar approaches.
The proposal could benefit from definitions from others like VIB.
Tier 1 definition, difficult part is "what can arise in nature".
This could be included in the 2001/18 regulation similar to adding Annex 1A part 2 (Option 2).

Spanish Inter-ministerial Council of GMO preliminary report on GMO legislation and NBT: On the ministry website: www.mapa.gob.es/es/agricultura/temas/biotecnologia/mejora-genetica/. As a result, Competent Authorities call on the European Commission to carry out a broader-ranging revision and modernization of the EU biotechnology policy. Policy and regulation must continue to ensure a maximum level of safety and environmental protection, but they also have to be aligned with the advances in science and technology and flexible to cope with future challenges. The approach of this review should be based on giving priority to the safety of the final products, over techniques. We acknowledge that factors other than scientific evidence are inherent to policy-making procedures. These must be also considered, identified and communicated in a transparent way.
Comments:

An English translation would be most appreciated.

Other Nordic ministries ask for a strong focus on plants and small changes in the legislation. They choose a science-based approach and fully agree that we need new tools to achieve sustainability and want to concentrate on plants and possibly exclude animals.

During the discussion the following **general issues** were highlighted for further consideration to improve the legislation: 1) better address global challenges such as climate change, environmental impact, food and nutritional security, 2) arrive at a legislation adhering to international law (Cartagena protocol), 3) enable implementation of the ECJ ruling (for example a simple notification for the class of genome editing products that could be achieved by classical mutagenesis, breeding or evolution, but not additionally regulating these), 4) strengthen European competitiveness, and 5) offer a free choice to developing countries to use the technology without restrictions when exporting their products to Europe. In addition, in a future meeting concerns raised by parts of society should be addressed as well.

We need to start a short term AND a longer-term improvement of the legislation almost in parallel: There is an urgency to come up with short term solutions to better address societal challenges and to be competitive globally - gene edited products will enter the European market from outside countries in increasing quantity over time. Even short-term solutions might take up to five years.
In addition, we need a long-term paradigm shift from mainly process- to mainly product-based legislation in Europe.

Policy makers need to know which problems we can help to solve with these new technologies, e.g. reducing pesticide use as stated in the European Green Deal, contribute to Food and Nutritional Security in Europe and globally in future. A coordinated effort by scientists and policy makers across Europe would be appreciated – one of the ideas of the informal science and policy meetings.

Regarding the EU study, there was agreement of its high importance and that we need to take action to coordinate our inputs.

In the second part of the meeting, the concept of **flagship projects towards genome edited products with consumer benefits for the European market** and initial ideas for such flagships from the 1st informal meeting were followed up.

First outcome from a study by the Norwegian Biotechnology Advisory Board on the **Norwegian consumers' attitudes towards gene editing in Norwegian agriculture and aquaculture** was presented, which has been published in the meantime at www.bioteknologiradet.no/filarkiv/2020/04/Report-consumer-attitudes-to-gene-editing-agri-and-aqua-FINAL.pdf. The study is based on more than 2000 representative responses. Two main conclusions were: 1) Use of the technology matters! It would be unethical not to use genome editing for addressing the Sustainable Development Goals (SDGs). The use connected with organic food would be appreciated. Labelling different to GM would be appreciated indicating which trait(s) were improved. 2) Who developed it matters! National / small breeding companies are appreciated, whereas multinationals are seen more negatively. Similar for cultivation by farmers. Many consumers trust national companies and safety authorities.
Comments:
It would be useful to carry out similar studies in other countries across Europe.

In the **discussion on possible flagship projects** it was suggested to start some which can lead to products on the European market in some years. A second waive could develop products for the longer-term. Challenges to address could include e.g. reducing pesticide use, improving drought tolerance, stop and revert insect decline.

Several policy makers suggest using existing multinational collaborations of funders, such as Nordic countries combined with some central European countries. This could be a focus of a **third informal science and policy meeting later in 2020**.

Conclusions and actions

Participants agreed to continue the open dialogue between the science and policy participants from this meeting and invite representatives from other countries interested in the issue and a member of the European Parliament.
The 3rd meeting will shortly look into updates regarding improving the legislation and mainly focus on flagship projects towards genome edited products with consumer benefits for the European market by 1) Discussing if more countries want to follow the Norwegian consumer survey, 2) present ongoing / approved calls, projects, and 3) discuss opportunities for future calls / programmes / projects at national and multinational levels.

Actions:

- All participants (this always includes those that apologised to due to overlapping activities) kindly provide to us their availability to meet in Brussels in the European quarter (if possible at KoWi) between 19.10. and 6.11.2020 (see email text) and Ministry participants kindly indicate if they wish to present ongoing, approved or possible future opportunities regarding flagship projects.
- All participants are welcome to send us news items for a quarterly update regarding genome editing legislation and efforts to improve the legislation from among the participants.
- Ministry participants kindly suggest to EPSO which additional ministry colleagues to invite (providing name, ministry, email). Should this not be possible under GDPR, please recommend such colleagues to contact EPSO expressing their interest to join the next such informal meeting.
- All participants are welcome to brainstorm with their colleagues on further ideas for flagship projects or already started initiatives that could become a flagship and send to us by August to include in the preparatory material for the next meeting.

EPSO 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. Notwithstanding the technical option retained, EPSO supports a science-based revision of the present European legislation establishing a more proportionate product-based risk assessment. EPSO is also willing to contribute to the societal debate on genome editing and to communicate in a fact-based and yet accessible manner about innovative plant science and its societal role.

Ralf Wilhelm, Ernst van den Ende, Alan Schulman and Karin Metzlaff

Ralf Wilhelm, EPSO Chair WG Agricultural Technologies; Ernst van den Ende, EPSO Board; Alan Schulman, EPSO President; Karin Metzlaff, EPSO Executive Director.

Contacts:

Ralf Wilhelm	Ernst van den Ende	Alan Schulman	Karin Metzlaff
+49-3946-47570	+31-317-482146	+358-295-326521	+32-2213-6260
ralf.wilhelm@julius-kuehn.de	ernst.vandenende@wur.nl	Alan.Schulman@helsinki.fi	Karin.Metzlaff@epsomail.org

Annex I Supporting literature - links

- The Norwegian Biotechnology Advisory Board (2020). Norwegian consumers' attitudes toward gene editing in Norwegian agriculture and aquaculture. www.bioteknologiradet.no/filarkiv/2020/04/Report-consumer-attitudes-to-gene-editing-agri-and-aqua-FINAL.pdf

- EPSO Statement on the Horizon Europe Strategic Plan, 18.2.2020. https://epsoweb.org/epso/epso-statement-on-the-horizon-europe-strategic-plan/2020/02/18/

- Nordic Public Private Partnership for Pre-breeding (PPP) - Workshop 5-6.2.2020 for future call https://www.plant-phenotyping.org/index.php?index=580&event=Workshop_Nordic_Plant_Genetic_Resources_Enhancement_in_a_changing_climate_Public_Private_Partnerships_in_Pre_Breeding

- "Towards a scientifically justified, differentiated regulation of genome edited plants in the EU", joint statement from the German National Academy of Sciences Leopoldina, the Union of the German Academies of Sciences and Humanities, and the German Research Foundation, December 2019, 84 P., ISBN: 978-3-8047-4064-8. www.leopoldina.org/en/plant-breeding

- The Council of the EU requested on 8.11.2019 the Commission to submit, by 30.4.2021, a study in light of the Court of Justice's judgment in Case C-528/16 regarding the status of novel genomic techniques under Union law https://eur-lex.europa.eu/eli/dec/2019/1904/oj.

- EPSO statement (endorsed by all EPSO Representatives for 197 institutes / universities), 19.2.2019: https://epsoweb.org/download/epso-statement-on-ecj-ruling-regarding-mutagenesis-and-gmo/

- EPSO welcomes Commissioner Andriukaitis statement and call for action 'New plant breeding techniques need new regulatory framework', 29.3.2019: https://epsoweb.org/epso/epso-welcomes-commissioner-andriukaitis-statement-and-call-for-action-new-plant-breeding-techniques-need-new-regulatory-framework/2019/03/29/

- VIB statement (including signatories for 109 institutes / universities and 18 associations), 25.7.2019: http://www.vib.be/en/news/Pages/Open%20Statement%20for%20the%20use%20of%20genome%20editing%20for%20sustainable%20agriculture%20and%20food%20production%20in%20the%20EU.aspx

- Open letter from Swedish Vice chancellors of Umea University and representatives from funding agencies, 25.7.2019: https://www.upsc.se/documents/News/News_2019/2019-07-25_Open-letter-concerning-GMO-regulations.pdf

- ESA Open Letter to Member States on the EU Court Ruling on Mutagenesis, 9.5.2019: https://www.euroseeds.eu/app/uploads/2019/07/Letter-to-Member-States-at-Scopaffs-July-2019.pdf

- Grow scientific progress: crops matter! – European citizen initiative, 25.7.2019: https://ec.europa.eu/citizens-initiative/public/initiatives/open/details/2019/000012/en

- Statement from the Ethical Council in DK (in Danish): GMO and ethics in a new time: http://www.etiskraad.dk/~/media/Etisk-Raad/Etiske-Temaer/Natur-klima-og-foedevarer/GMO-2019/DER_Udtalelse_GMO_og_etik_i_en_ny_tid_m_baggrundsnotater.pdf#page=27 (© Det Etiske Råd 2019 ISBN: 978-87-92915-15-3)

- Statement by the Group of Chief Scientific Advisors, 13.11.2018: https://ec.europa.eu/info/sites/info/files/2018_11_gcsa_statement_gene_editing_2.pdf

- Bratlie et al. 2019: A novel governance framework for GMO. EMBO Reports (2019) 20: e47812; DOI 10.15252/embr.20194781 [Suggestion from Norway to modify legislation on genetic engineering] http://www.bioteknologiradet.no/filarkiv/2019/03/2019-04-16-Genteknologiloven-komplett-ENGELSK-siste.pdf

- Paper from the NL suggesting the modifications in the Annexes of 2001/18/EC prior to the ruling, 21.3.2019: https://www.cogem.net/index.cfm/nl/publicaties/publicatie/voorstel-voor-aanpassing-van-de-vrijstelling-in-de-ggo-regelgeving-aanvullende-criteria-voor-het-vrijstellen-van-gg-planten?order=relevance&q=&category=&from=30-09-1998&to=21-03-2019&sc=fullcontent

- Curia - Judgement of the court in case C-528/16, 25.7.2018: http://curia.europa.eu/juris/document/document.jsf?docid=204387&doclang=EN

- Wasmer 2019: Roads Forward for European GMO Policy—Uncertainties in Wake of ECJ Judgment Have to be Mitigated by Regulatory Reform. Front. Bioeng. Biotechnol. 7:132. doi: 10.3389/fbioe.2019.00132. https://www.frontiersin.org/articles/10.3389/fbioe.2019.00132/full

- Joint Statement of AFBV and WGG, 13.9.2019: https://cdn.website-editor.net/ed25e686182040aeb41d3b3d05cc2cd2/files/uploaded/AFBV-WGG-Statement.pdf

Annex II: Regulations and obligations for conventional breeding and variety testing

EU database of registered plant varieties

The common catalogues of varieties of agricultural plant and vegetable species list the varieties which can be marketed in the EU.
Catalogues are based on the registration of plant varieties in EU countries after they have been technically examined there and notified to the Commission.
Variety registration is a precondition for the certification of seed.
To be listed, varieties must meet standards on:

- Distinctness
- Uniformity
- Stability
- Value for cultivation and use - for agricultural crops.
  This value is based on:
  - Yield
  - Resistance to harmful organisms
  - Response to the environment
  - Quality characteristics

Legislation

- Council Directive 2002/53/EC on the common catalogue of varieties of agricultural plant species.
- Council Directive 2002/55/EC on the marketing of vegetable seed.
- Council Directive 2008/72/EC on the marketing of vegetable propagating and planting material other than seed.
- Commission Directive 2003/90/EC: Rules on minimum characteristics and minimum conditions for examining certain varieties of agricultural plant species.
- Commission Directive 2003/91/EC: Rules on minimum characteristics and minim conditions for examining certain vegetable species.
- Commission Regulation 637/2009/EC of 22 July 2009 establishing implementing rules as to the suitability of the denominations of varieties of agricultural plant species and vegetable species.

Forest tree species

Legislation

- Council Directive 1999/105/EC of 22 December 1999 on the marketing of forest reproductive material
- Commission Regulation EC 1597/2002 of 6 September 2002 laying down detailed rules for the application of Council Directive 1999/105/EC as regards the format of national lists of the basic material of forest reproductive material

Fruit genera and species

FRUMATIS (Fruit Reproductive Material Information System) 7 EU variety register (updated 2-Sep-2019) to improve the traceability and promote the dissemination of information on the varieties that can be marketed in the EU. The EU variety register contains the varieties with an official description - which need to be officially registered - as well as varieties with an officially recognised description. Before official registration the variety's identity is tested for:

- Distinctness;
- Uniformity;
- Stability

Legislation

- Council Directive 2008/90/EC on the marketing of fruit plant propagating material and fruit plants intended for fruit production
- Commission Implementing Directive 2014/97/EU implementing Council Directive 2008/90/EC as regards the registration of suppliers and of varieties and the common list of varieties

Vine propagating material of the genus *Vitis*

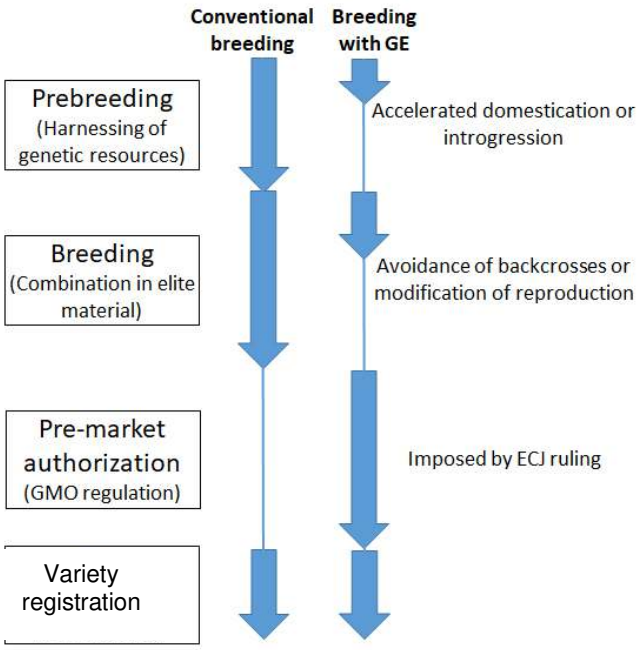
Common catalogue of varieties of vine propagating material: Before a variety is listed in a national catalogue of vine varieties the variety's identity is tested for:

- distinctness;
- uniformity;
- stability.

Legislation

- Council Directive 68/193/EEC of 9 April 1968 on the marketing of material for the vegetative propagation of vines
- Commission Implementing Decision (EU) 2017/478 of 16 March 2017 releasing certain Member States from the obligation to apply to certain species Council Directives 66/401/EEC, 66/402/EEC, 68/193/EEC, 1999/105/EC, 2002/54/EC, 2002/55/EC and 2002/57/EC on the marketing of fodder plant seed, cereal seed, material for the vegetative propagation of the vine, forest reproductive material, beet seed, vegetable seed and seed of oil and fibre plants respectively, and repealing Commission Decision 2010/680/EU

Timeline for conventional breeding and optimal application of genome editing in the breeding process



Annex III: Regulations and obligations for GMO breeding and testing in the EU

	Convent. breeding	Convent. mutagenesis	Classic GMP/GMM	Genome edited P/MO
Dir. 2001/18/EC „Deliberate release“	Non GMO	GMO exempted from further obligations	GMO	GMO
Reg. (EG) 1829/2003 „GM Food / feed“	Non GVO	Non GMO	GMO	GMO
Reg. (EG) 1830/2003 „GMO Traceability“	Non GMO	Non GMO	GMO	GMO
Dir. 2009/41/EG „Contained use “; GMM	-	Non GMO	- /GMM	- / ?
Reg. (EU) 2018/848 Organic production and labelling	Non GMO	(Non GMO)	GMO	GMO
Cartagena-Protocol	Non GMO	Non GMO	GMO	Non GMO; *if transgenic*: GMO
Dir. 2002/53 Plant varieties Catalogue	Non GMO	Non GMO	GMO / -	GMO / -

GMP = genetically modified plant; GMM = genetically modified microorganisms

Definitions in Directive 2001/18/EC

Recitals

(17) This Directive should not apply to organisms obtained through certain techniques of genetic modification which have conventionally been used in a number of applications and have a long safety record.

Article 2 - Definitions

For the purposes of this Directive: […]

(2) "genetically modified organism (GMO)" means an organism, with the exception of human beings, in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination;

Within the terms of this definition:

(a) genetic modification occurs at least through the use of the techniques listed in Annex I A, part 1;

(b) the techniques listed in Annex I A, part 2, are not considered to result in genetic modification;

Article 3 - Exemptions

1. This Directive shall not apply to organisms obtained through the techniques of genetic modification listed in Annex I B.

2. This Directive shall not apply to the carriage of genetically modified organisms by rail, road, inland waterway, sea or air.

ANNEX I A - TECHNIQUES REFERRED TO IN ARTICLE 2(2)
PART 1
Techniques of genetic modification referred to in Article 2(2)(a) are inter alia:
(1) recombinant nucleic acid techniques involving the formation of new combinations of genetic material by the insertion of nucleic acid molecules produced by whatever means outside an organism, into any virus, bacterial plasmid or other vector system and their incorporation into a host organism in which they do not naturally occur but in which they are capable of continued propagation;
(2) techniques involving the direct introduction into an organism of heritable material prepared outside the organism including micro-injection, macro-injection and micro-encapsulation;
(3) cell fusion (including protoplast fusion) or hybridisation techniques where live cells with new combinations of heritable genetic material are formed through the fusion of two or more cells by means of methods that do not occur naturally.

PART 2
Techniques referred to in Article 2(2)(b) which are not considered to result in genetic modification, on condition that they do not involve the use of recombinant nucleic acid molecules or genetically modified organisms made by techniques/methods other than those excluded by Annex I B:
(1) in vitro fertilisation,
(2) natural processes such as: conjugation, transduction, transformation,
(3) polyploidy induction.

ANNEX I B - TECHNIQUES REFERRED TO IN ARTICLE 3
Techniques/methods of genetic modification yielding organisms to be excluded from the Directive, on the condition that they do not involve the use of recombinant nucleic acid molecules or genetically modified organisms other than those produced by one or more of the techniques/methods listed below are:
(1) mutagenesis,
(2) cell fusion (including protoplast fusion) of plant cells of organisms which can exchange genetic material through traditional breeding methods.

Obligations for GMO other than generated by classical mutagenesis

- Authorisation procedure (*step by step*: lab -> field trial -> market release; *case by case*: each event)
- Authorisation for field releases (at national level; limited risk assessment; essentially prevent spreading, protect environment)
- Authorisation of deliberate release to the market requires a detailed risk assessment comprising
    - Description of the organism(s) and modifications
    - Compositional analysis
    - Toxicological and allergological evaluation
      …
    - Environmental risk assessment
        - impact on non-target organisms
        - impact on bio-geochemical cycles
        - impact of crop management
        - …
    - Monitoring of the release

    - Labelling of products containing or made from GMO
    - Acknowledged detection methods (verified detection method)