



## How plant breeding innovation can help sustainable food security

Dr. Petra Jorasch, Manager Plant Breeding Innovation Advocacy  
 Nowe Techniki Genomowe - Nowoczesna biotechnologia dla sektora rolno-spożywczego  
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 Instytut Hodowli i Aklimatyzacji Roślin



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## Who we are?

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**National member associations** from EU Members States and beyond, which in turn represent many thousand seed businesses across Europe.

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**Direct company members** from family businesses to multi-nationals, including seed related industries.

Euroseeds has members also in other parts of the world: e.g. in the USA, Canada etc.



### Mission:

**Maintaining the EU's global leadership in seed exports** by keeping clear and workable rules and market access conditions;

**Providing a broad range of high-quality seed products for all types of agriculture, including organic**, as a result of innovative and diverse breeding and seed production programmes;

**Fostering future plant breeding innovation in the EU** by assuring investment in plant breeding and protecting inventions and plant breeders' rights.

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# The EU Seed Sector – Facts & Figures

**EMPLOYMENT:**  
approx.

**52.000**

**ANNUAL R&D SPENDING:**

up to: **20%**

(of the companies' turnover)

**R&D STATIONS:**

**750**

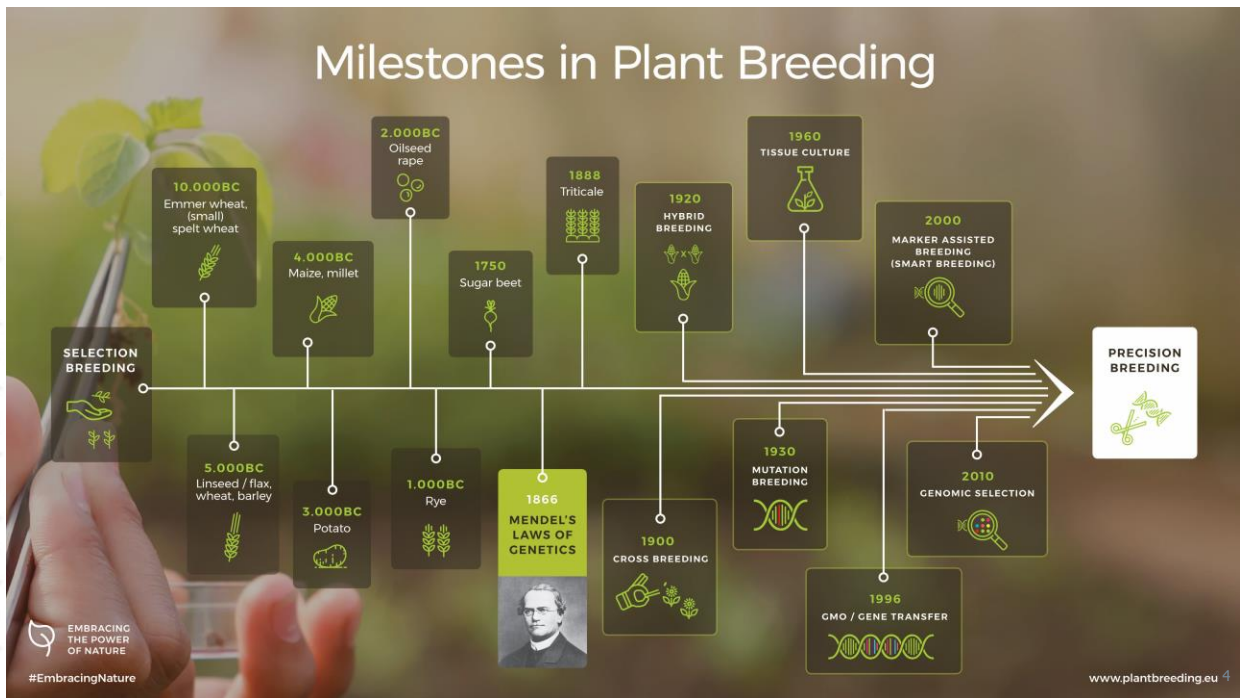
**3.500** NEW VARIETIES

of agricultural and vegetable species come to the EU market **EVERY YEAR\***.

**42.000** DIFFERENT VARIETIES

of agricultural and vegetable species are available to EU farmers **TODAY\***.

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## Plant breeding is responsible for approximately 66 percent of annual productivity growth

**DID YOU KNOW?** **THE VALUE OF PLANT BREEDING IN THE EU IN THE LAST 20 YEARS**

EMBRACING THE POWER OF NATURE

Since 2000, plant breeding has had a **significant impact on EU's crop yield growth**. In fact, it accounts for an **ANNUAL YIELD GROWTH OF 1.16%**

#EmbracingNature

STUDY: <https://hffa-research.com/wp-content/uploads/2021/05/HFFA-Research-The-socio-economic-and-environmental-values-of-plant-breeding-in-the-EU.pdf>

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## Without 20 years of plant breeding in the EU 22 million hectares of additional land would be needed



= territory of Romania

Source: <https://hffa-research.com/wp-content/uploads/2021/05/HFFA-Research-The-socio-economic-and-environmental-values-of-plant-breeding-in-the-EU.pdf>

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## Without 20 years of plant breeding the EU would become a major net importer



The EU would have been a **net importer of all arable crops**

- Without 20 years of plant breeding, the EU would become a net importer in all arable crops:
  - **including wheat and other cereals**
- International competitors would gain in competitiveness and increase their market shares.

Source: <https://hffa-research.com/wp-content/uploads/2021/05/HFFA-Research-The-socio-economic-and-environmental-values-of-plant-breeding-in-the-EU.pdf>

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## The EU Policy Framework: Plant Breeding Innovation & The EU Farm to Fork & Biodiversity Strategy

- - **50%** Pesticide use
- - **20%** Fertilizer use
- - **10%** productive farmland
- > **25%** under organic production



[https://ec.europa.eu/food/farm2fork\\_en](https://ec.europa.eu/food/farm2fork_en)

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## Production losses of more than 23 percent can be expected if the EU strategies are implemented by 2030

### Production losses until 2030 (in percent)

Crop/Region	EU	DE	FR	IT	ES	UK
Wheat	26	32	29	23	22	31
Corn	22	30	22	19	19	23
Other cereals	23	31	22	22	21	23
OSR	24	28	25	19	19	26
Sunflower seeds	22	28	22	19	19	23
Other oilseeds	22	28	22	19	19	23
Raw sugar	21	19	25	27	27	26
Potatoes	23	29	24	22	22	26
Pulses	20	30	18	24	24	19
Green maize	23	30	24	22	22	26

On average, hectare-weighted, production losses of more than **23 percent** might be the outcome for the EU in total if the strategies are fully implemented by 2030:

- **10 percent** from non-productive land
- **13 percent** from lower yields due to input change.

Source: <https://hffa-research.com/wp-content/uploads/2021/05/HFFA-Research-The-socio-economic-and-environmental-values-of-plant-breeding-in-the-EU.pdf>

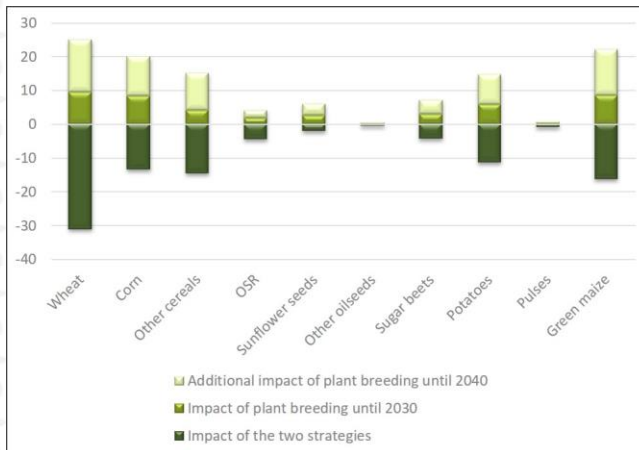
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## Plant breeding until 2040 at current pace will only be able to partially compensate for market losses

### Comparing and balancing partial market supply effects

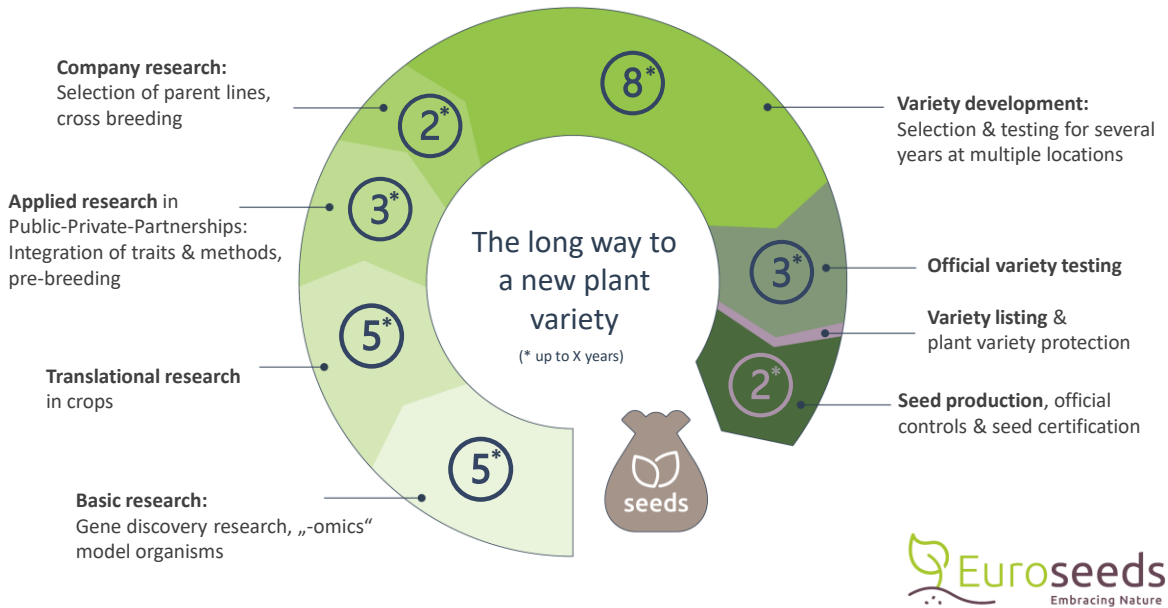


- Extra market supply in 2030 with plant breeding between 2020 and 2029 won't be enough to compensate for losses of the strategies.
- Two decades of plant breeding progress at current pace will potentially compensate for market losses with respect to six crops.
- In the cases of **wheat, OSR, other oilseeds and pulses**, however, this might be not adequate.
- **Plant breeding should speed up !**

Source: <https://hffa-research.com/wp-content/uploads/2021/05/HFFA-Research-The-socio-economic-and-environmental-values-of-plant-breeding-in-the-EU.pdf>

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## 'New Breeding Methods can speed up breeding and help achieving goals of the "Farm to Fork" and Biodiversity strategies

### Scenario:

- Conservative calculation: Saving **two years** of variety development
- Speed up plant breeding progress per time unit by **18 percent**
- Not only **1.16 but 1.34 percent plant breeding-induced yield progress** per annum in few years from now
- Until 2040: an extra yield increase of **2.6 percent**

### Positive effects:

- Provide **extra** food for almost **20 million** more humans
- Avoid global GHG emissions of roundabout **350 million tons**
- Preserve biodiversity living in about **2.0 million hectares** (global average)



- Various contributions towards meeting the objectives of the EU "Farm to Fork" and Biodiversity strategies

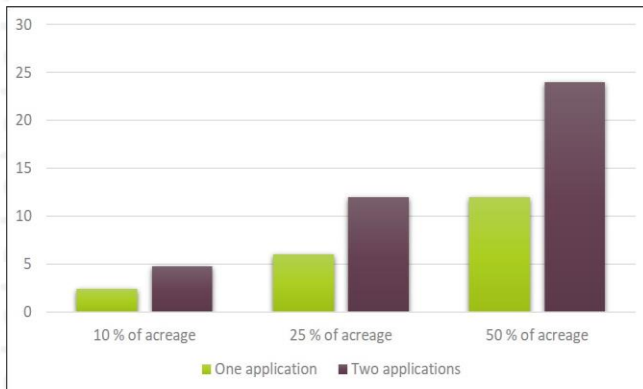
Source: <https://hffa-research.com/wp-content/uploads/2021/05/HFFA-Research-The-socio-economic-and-environmental-values-of-plant-breeding-in-the-EU.pdf>

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## New Breeding Methods can help reducing the number of fungicide applications in wheat by fungi-resistant varieties

### Avoidable fungicide applications in wheat (in million)



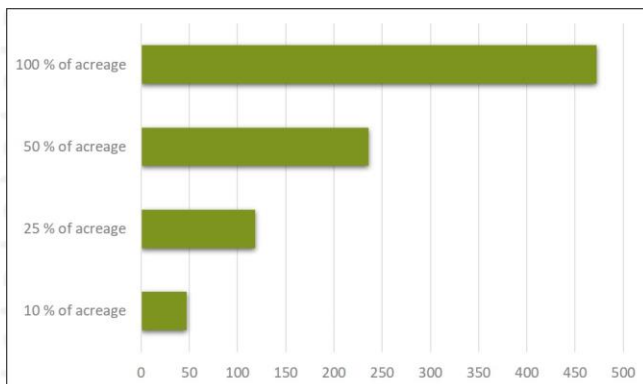
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## New Breeding Methods can help avoiding of pre-harvest losses in oilseed rape by increasing pod shatter resistance in new varieties

### Avoidable land use for oilseed rape (in 1,000 hectares)



Source: <https://hffa-research.com/wp-content/uploads/2021/05/HFFA-Research-The-socio-economic-and-environmental-values-of-plant-breeding-in-the-EU.pdf>

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- Example - PILTON:
  - Breeding for multiple fungi resistance,
  - May avoid fungicide application
- Assumptions:
  - One (two) application less per season at current acreage
- Potential effects:
  - Up to **25 million applications** less alone in EU wheat
  - Thousands of tons of fungicides can be substituted

- Example - Project John Innes Centre:
  - Breeding for reduced susceptibility to pod shattering
  - May avoid seed losses and subsequent voluntary seeds
- Assumptions:
  - Avoid yield losses of **9.0 percent**
- Potential effects at EU-level:
  - **500,000 hectares** are almost one tenth of the currently used area
  - Lower pressure on land supports, e.g., mitigation of GHG emissions

## Recommendations from the HFFA Study

- **For private decision-making:**

- Plant breeding is an extremely important area of R&D, and plant breeders must take responsibility by investing even more into innovation
- Targets: higher yields but also, e.g., resistances, agronomic traits, orphan crops etc.

- **For public decision-making:**

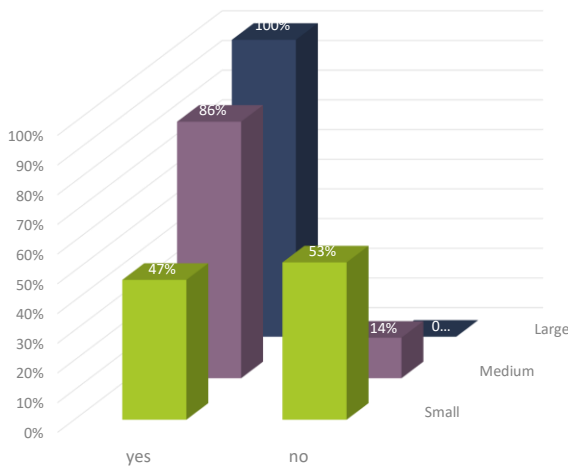
- Must encourage and not hinder plant breeders to further invest
- Strengthen R&D as well as fundamental research
- Support public awareness raising through interdisciplinary research and evidence-based information campaigns
- Establish a differentiated regulatory framework based on proportionate and non-discriminatory safety considerations for individual techniques and characteristics of resulting products

Source: <https://hffa-research.com/wp-content/uploads/2021/05/HFFA-Research-The-socio-economic-and-environmental-values-of-plant-breeding-in-the-EU.pdf>

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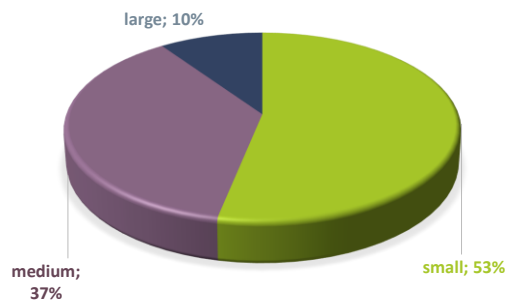
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## Euroseeds Members: Current research and development (R&D) activities for NBTs



Percentage of companies according to company size currently active in NBT-related R&D.

Share of small, medium and large companies participating in the Euroseeds Survey



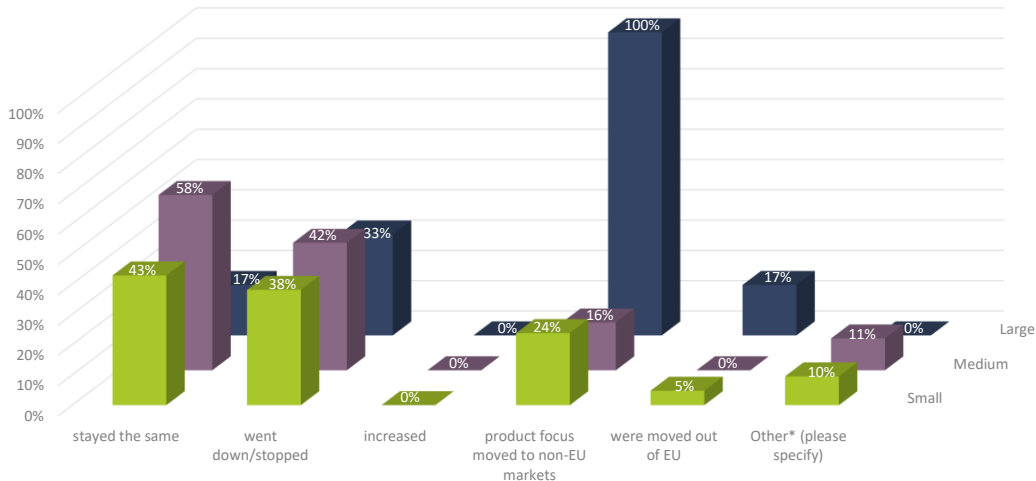
The Euroseeds Survey covers 62 plant breeding companies of all sizes. Company sizes were defined as follows: Small Companies: < 50 Mio € annual turnover; Medium-sized companies > 50 Mio € < 450 Mio € annual turnover; Large companies > 450 Mio € annual turnover.

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## Euroseeds Members: Change of R&D activities with NBTs after the 25 July 2018 ECJ ruling on mutagenesis breeding



Effect of the ECJ ruling on NBT-related R&D activities of companies. Percentages as to the total number of companies per company size group. Multiple answers were possible, because the situation within companies might differ depending on the crop species and the projects. In addition, and under "other\*" companies commented: all projects were re-evaluated, some projects were put on hold and activities were modified in specific cases. These include discontinuation, reduction of scope, change in market focus and re-evaluation of timelines; We will keep watching the future transition in the EU; some programs did not start as a consequence of the ECJ decision; After the decision of the ECJ, we decided to use the technology only for gene discovery and validation and not for product development with partners anymore.

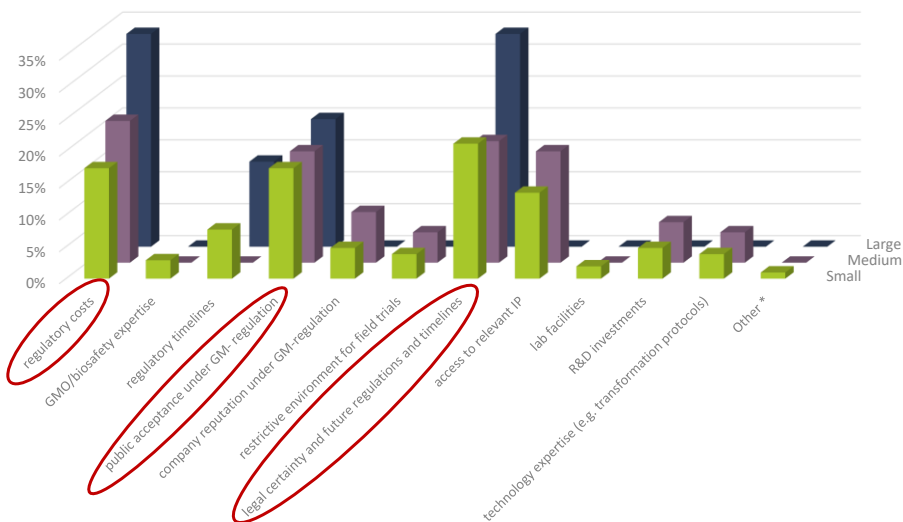
euroseeds.eu

Source: <https://www.frontiersin.org/articles/10.3389/fpls.2020.582011/full>

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## Factors Euroseeds member companies see as most significant in limiting the potential of the use of new breeding methods



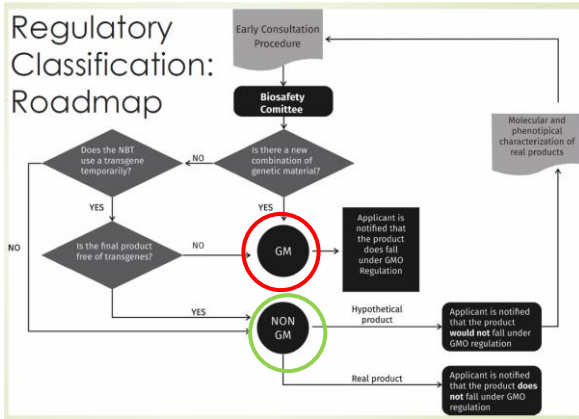
Priority factors that companies regard as most significant as to negatively influence the potential use of NBTs in their breeding programs (3 answers possible). Percentages as to the total number of replies of companies grouped according to company size (multiple answers possible). Total number of replies: small companies, 104; medium-sized companies, 63; large companies, 15. The number of replies for small companies exceeds the number of possible answers (number of small companies multiplied by three) by 2 replies, because 2 companies provided 4 replies without indicating the top three factors. The number of replies for medium and large companies is smaller than the expected. Three medium sized and one large company indicated less than three priority factors. Under "other\*" one organic seed company mentioned restrictions due to private organic standards that exclude using NBTs.

Source: <https://www.frontiersin.org/articles/10.3389/fpls.2020.582011/full>

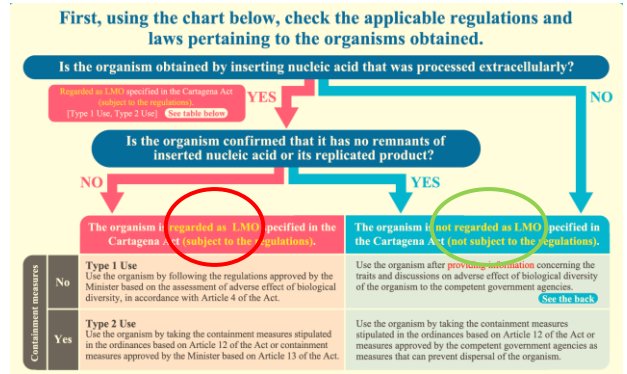
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# How do other countries make NGTs work?



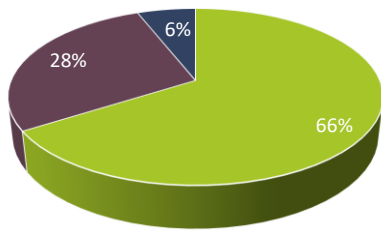
Lema, M. OECD workshop, 2018



[https://www.env.go.jp/press/2\\_2\\_%20genome%20editing\\_En.pdf](https://www.env.go.jp/press/2_2_%20genome%20editing_En.pdf)

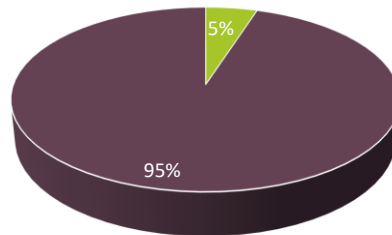
## Argentina: Enabling regulations for NGTs support local developments & increased diversity of developers

NGT Product Notifications 2015-2021



- Local developer
- Foreign developer
- Foreign but submitted by local company

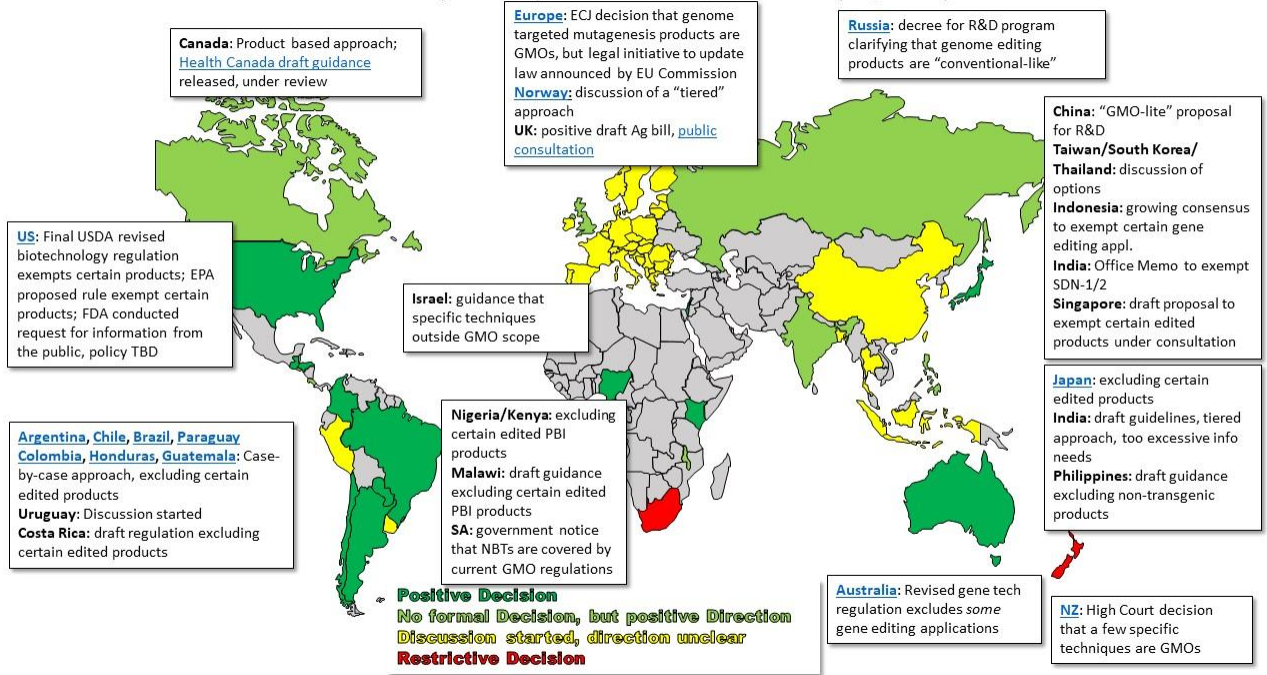
GMO Approvals



- Local developer
- Foreign developer

Reference: Goberna et al., 2022; doi: 10.3389/fbioe.2022.835378

## Policy developments around the world (03/2022)



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## Basic Considerations

- New Genomic Techniques (NGTs) applications are versatile and can be used in the development of a wide range of different plant products:
  - GMO – like products
  - Conventional - like products
- More and more countries follow the principle that plant varieties developed through the latest breeding methods should not be subject to biotech regulations if they could also be
  - Obtained through earlier breeding methods or
  - Result from spontaneous processes in nature.

## CRITERIA that could help establish proportionate regulatory oversight

The genetic variation in the final plant product should **NOT be covered by the scope of the existing EU legislation for GMOs** if

- 1) there is **no novel combination of genetic material** (i.e. there is no stable insertion in the plant genome of one or more genes that are part of a designed genetic construct\*), or
- 2) the final plant product solely contains the stable insertion of inherited **genetic material from sexually compatible plant species**, or
- 3) the genetic variation is the **result of spontaneous or induced mutagenesis**.

absence of  
foreign DNA  
✓

Cisgenesis ✓

targeted  
mutagenesis  
✓

\*According to the definition of a living modified organism in Art 3 of the Cartagena Protocol to which the EU and its Member States are a party

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## Conclusions

- Plant varieties, regardless of a certain breeding method, provide the genetic potential for sustainability
  - Environmental: e.g. reduction of inputs by disease resistance, drought resistance
  - Societal: e.g. improved quality, health and
  - Economic: e.g. improved income by improved yields and quality
- NGTs provide additional opportunities to support sustainability:
  - Breeding time
  - More targeted breeding approaches reducing complexity in breeding
- Enabling regulations for NGTs support local developments & increased diversity of developers
- NGTs applications are versatile and can be used in the development of a wide range of different plant products:
  - GMO – like products
  - Conventional - like products
- Europe should join the increasing number of countries that follow the principle that plant varieties developed through the latest breeding methods should not be subject to biotech regulations if they could also be
  - obtained through earlier breeding methods or
  - result from spontaneous processes in nature.

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1000 Brussels

[www.euroseeds.eu](http://www.euroseeds.eu)

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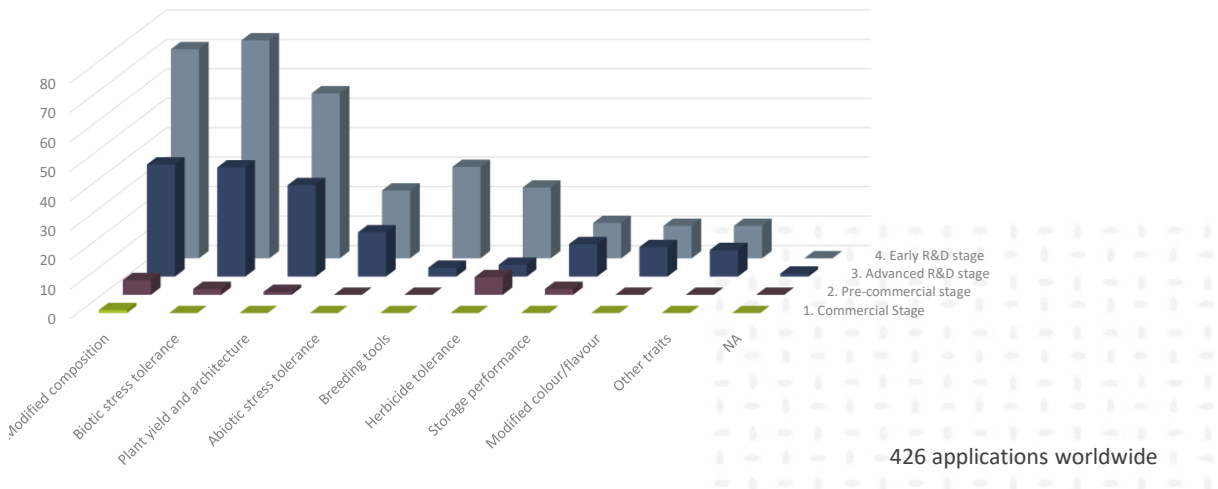


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## JRC Study on NGT Market Applications /Plants

Plant Characteristics and R&D Phase



426 applications worldwide

Euroseeds number

[euroseeds.eu](http://euroseeds.eu)

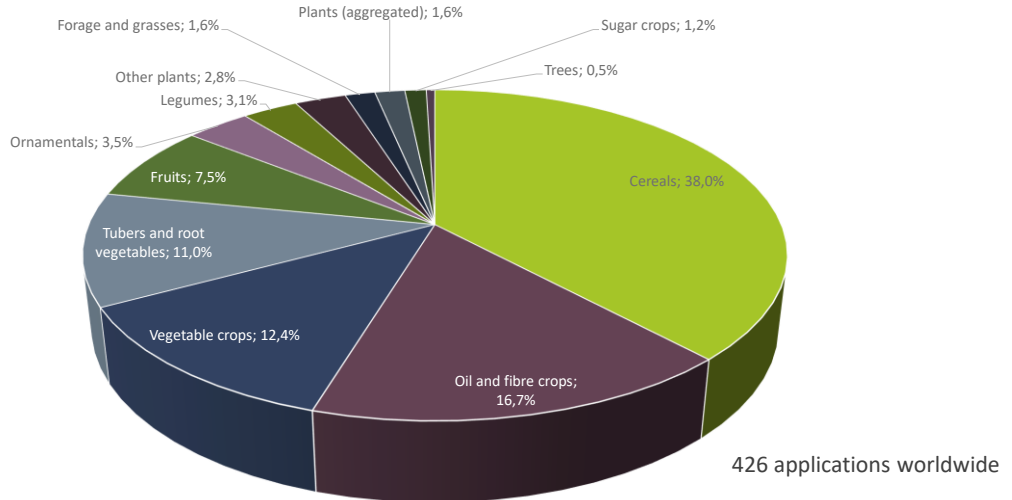
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## JRC Study: Plants developed with NGTs /worldwide



Euroseeds number

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