

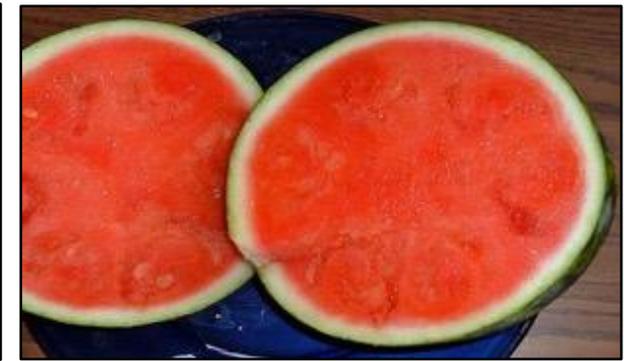
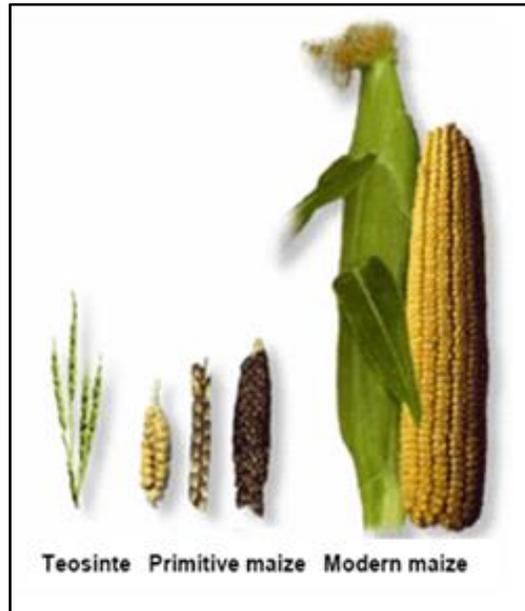
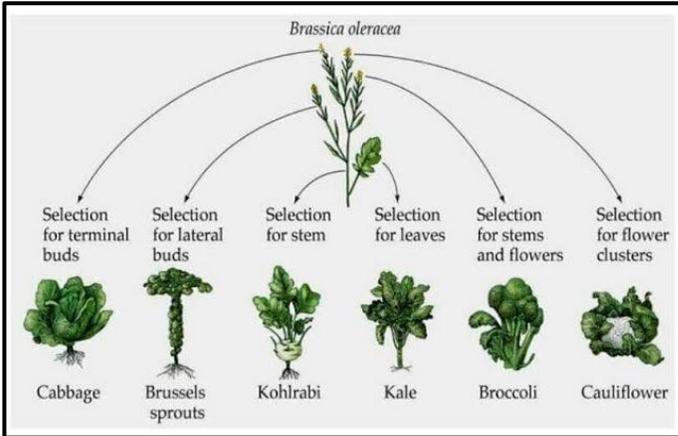
The potential of gene editing for sustainable agriculture

Dirk Inze

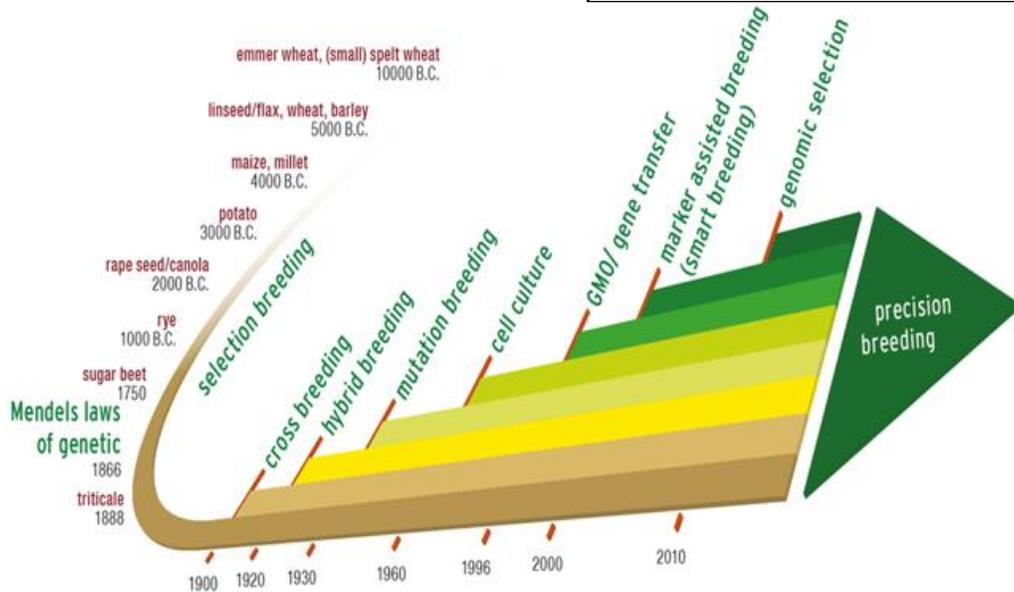
VIB-UGent Center for Plant Systems Biology



Everything we eat is the result of plant breeding



Milestones in Plant Breeding



Gene editing is applied on large scale



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TRAITS CATEGORIES

- Traits related to biotic stress tolerance (149)
- Traits related to abiotic stress tolerance (66)
- Traits related to improved food/feed quality (174)
- Traits related to increased plant yield and growth (179)
- Traits related to industrial utilization (105)
- Traits related to herbicide tolerance (57)
- Traits related to product color/flavour (46)
- Traits related to storage performance (18)

GENOME EDITING TECHNIQUE

- CRISPR/Cas (720)
- TALENs (30)
- BE (26)
- ZFN (7)
- ODM (6)
- PE (4)

COUNTRIES

- China (444)
- USA (165)
- Japan (41)
- South Korea (34)
- France (31)

Displaying 794 results

Traits related to biotic stress tolerance

Highly significant reduction in susceptibility to fire blight, caused by the bacterium *Erwinia amylovora*. Apple is one of the most cultivated fruit crops throughout the temperate regions of the world. (Pompili et al., 2020)

SDNI
CRISPR/Cas
Università degli Studi di Udine
Fondazione Edmund Mach, Italy

READ MORE

Viral resistance: Enhanced resistance to sweet potato virus disease (SPVD). SPVD is caused by the co-infection of sweet potato chlorotic stunt virus (SPCSV) and sweet potato feathery mottle virus. (Yu et al., 2021)

SDNI
CRISPR/Cas
Jiangsu Normal University
Jiangsu Academy of Agricultural Sciences
Xuzhou Institute of Agricultural Sciences in Jiangsu Xuhuai District, China

READ MORE

Fungal resistance: enhanced resistance to *Phytophthora infestans*. *Phytophthora infestans* causes late blight disease, which is severely

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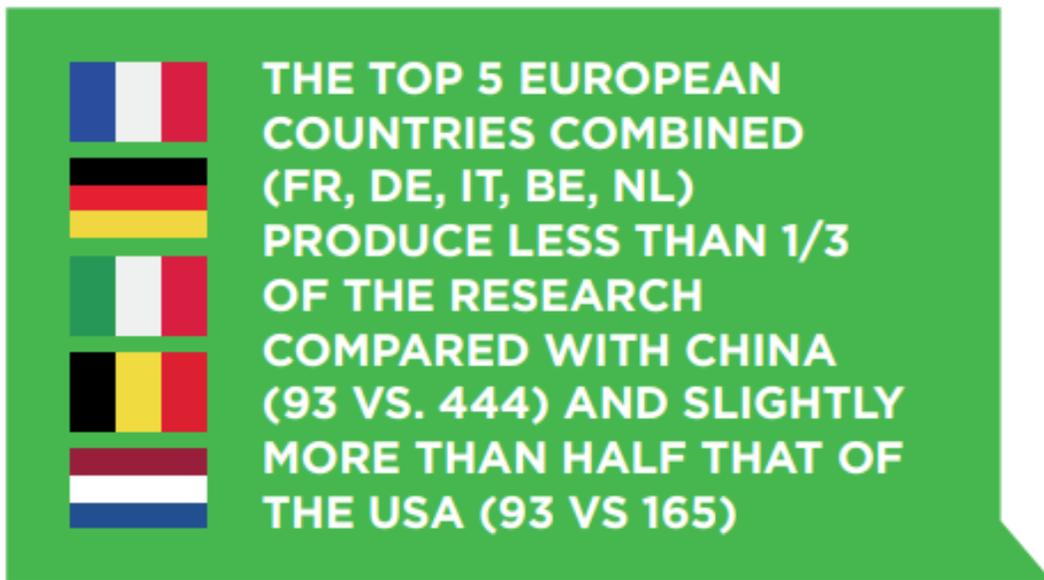
www.eu-sage.eu/genome-search

EU-SAGE: > 150 Plant Research Centers across Europe

- > 850 peer reviewed publications on gene editing in crops
- > 70 different crop species
- High diversity of applications with benefits for the producer and the consumer

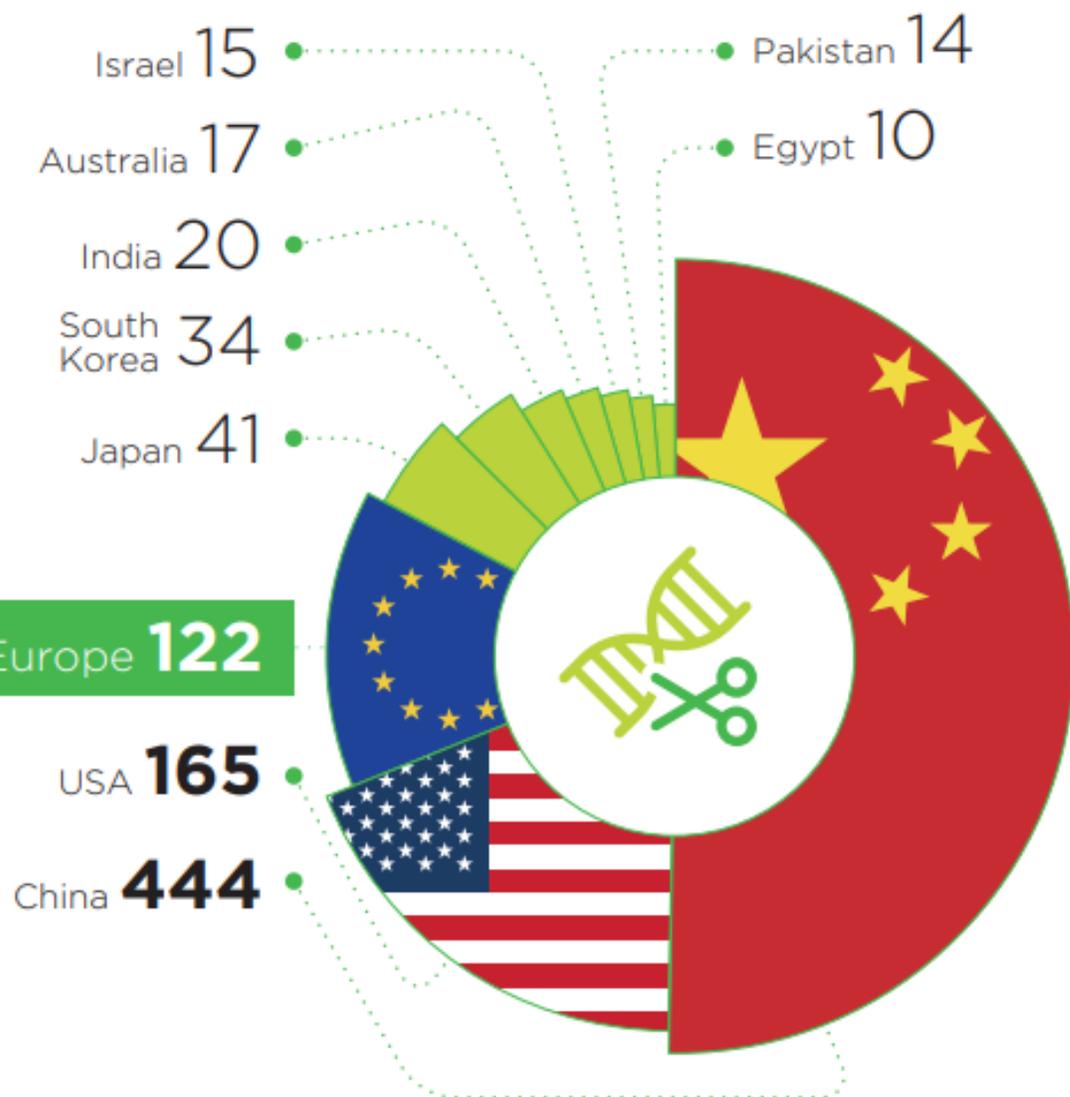
Where does gene editing take place?

In the list of countries where most gene-editing research on plant varieties is conducted -

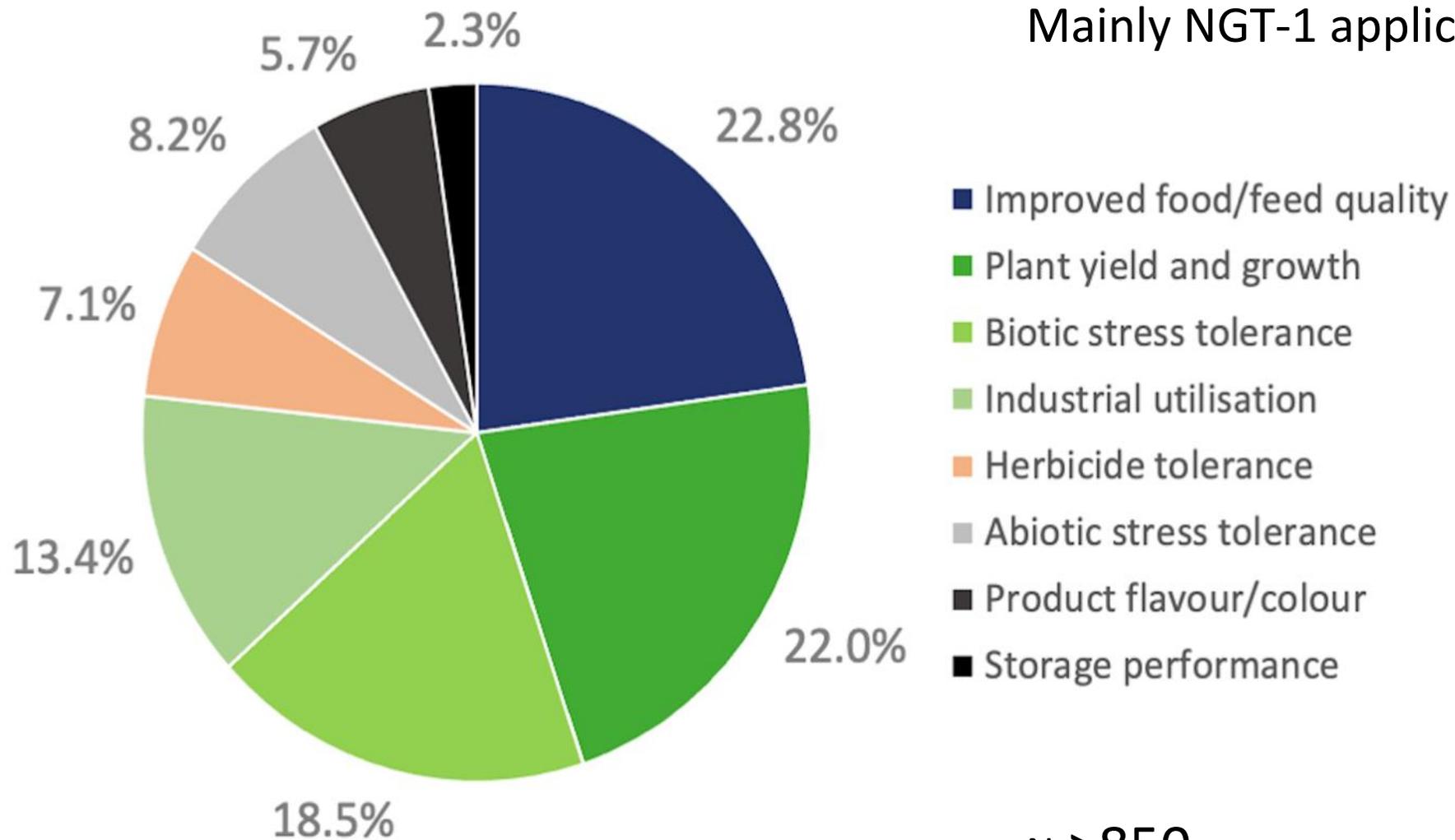


THE TOP 5 EUROPEAN COUNTRIES COMBINED (FR, DE, IT, BE, NL) PRODUCE LESS THAN 1/3 OF THE RESEARCH COMPARED WITH CHINA (93 VS. 444) AND SLIGHTLY MORE THAN HALF THAT OF THE USA (93 VS 165)

To ensure a resilient and competitive European agri-food sector, an enabling and science-based regulatory framework for NGTs is urgently needed to help translate innovative research into impactful commercial products.



High diversity of applications



N >850

70 different species

CRISPR based solutions!

- Pathogen- and pest resistant varieties: less **pesticides**
- Improved nutritional quality (eg. more unsaturated fatty acids, reduced gluten levels,...):
healthier food
- Protein crops for Europe (Soya bean, Faba beans,...): **alternative protein source**
- Improved uptake of nutrients such as nitrogen: **biodiversity, less fertilizer**
- Resilience to drought and high temperatures: **food safety**
- High yields : **food security**
- Bio-energy crops (efficient CO2 capture and storage,...), **not in competition with food production**
-



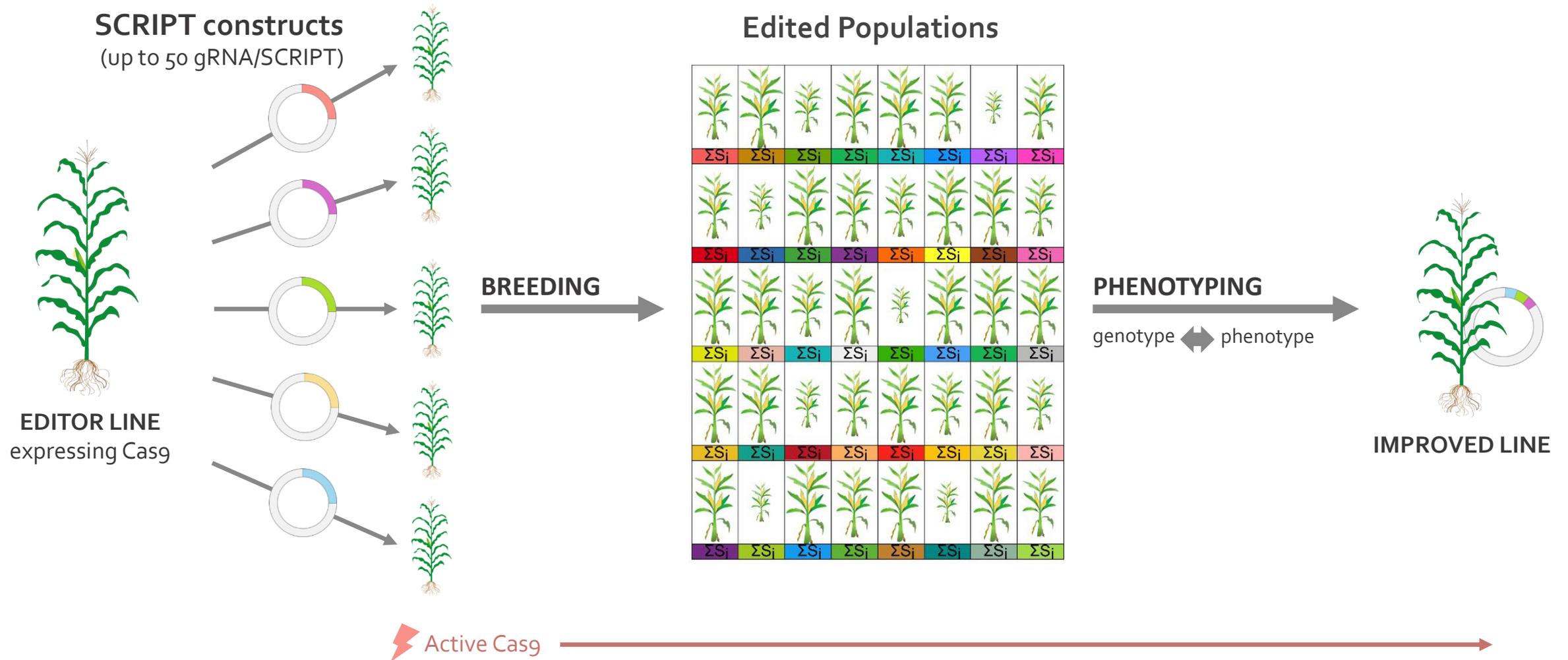
43 reported field trials using gene editing in the EU, UK and Switzerland

- Blight resistance in potato
- Early flowering wheat
- Improved digestibility in maize
- Enhanced yield in maize
- Increase drought tolerance in maize
- Barley with a lower requirement for nutrients
- Short stature maize
- Increased Vitamin D3 content
- Improved tomato storage time
- Eliminating tuber browning in potato
-



UK, Denmark,
Belgium, Sweden,
Italy, Switzerland,
Spain

BREEDIT: Multiplex gene editing and Breeding



Powerful approach to tackle complex, polygenic traits

Dirk Inze
VIB-UGent Center for
Plant Systems Biology



If the **future**
could whisper,
it would call out for

CRISPR.

eusage

European Sustainable Agriculture
Through Genome Editing

