

# HUDSON RIVER



B i o

t e c h n o l o g y

Creating Tomorrow's Crops

# Genome editing: the game-changer technology

**THE NOBEL PRIZE**  
**The Nobel Prize** @NobelPrize · 21h  
2020 Chemistry Laureates Emmanuelle Charpentier and Jennifer Doudna discovered one of gene technology's sharpest tools: the CRISPR/Cas9 genetic scissors. Using these, researchers can change the DNA of animals, plants and microorganisms with extremely high precision.



THE NOBEL PRIZE IN CHEMISTRY 2020

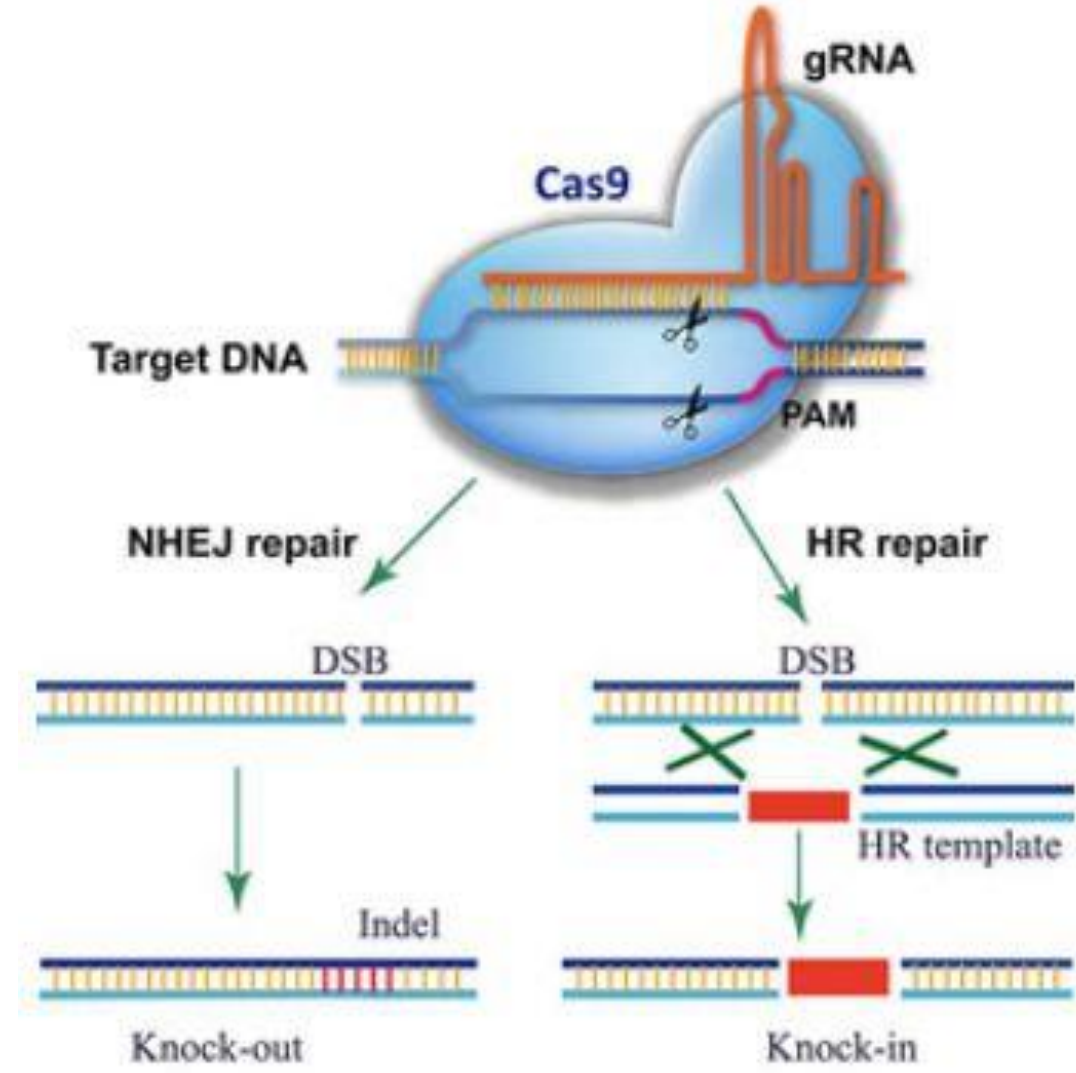
Emmanuelle Charpentier Jennifer A. Doudna

"for the development of a method for genome editing"



©Johan Järnstad/The Royal Swedish Academy of Sciences

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# Gene editing to meet market demands

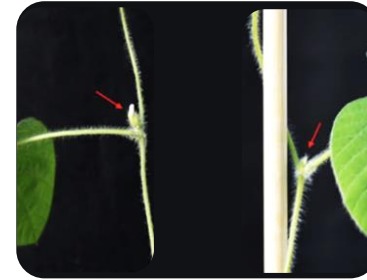
“In the next 50 years, we will need to produce as much food as has been consumed over our entire human history”

*Megan Clark, CSIRO*



**Early yield, architecture**

*Soyk, Nat. Genetics*



**Flowering time**

*Han, Front. Plant Sci.*



**Disease resistance**

*Peng, Plant Biotech. J.*



**Drought tolerance**

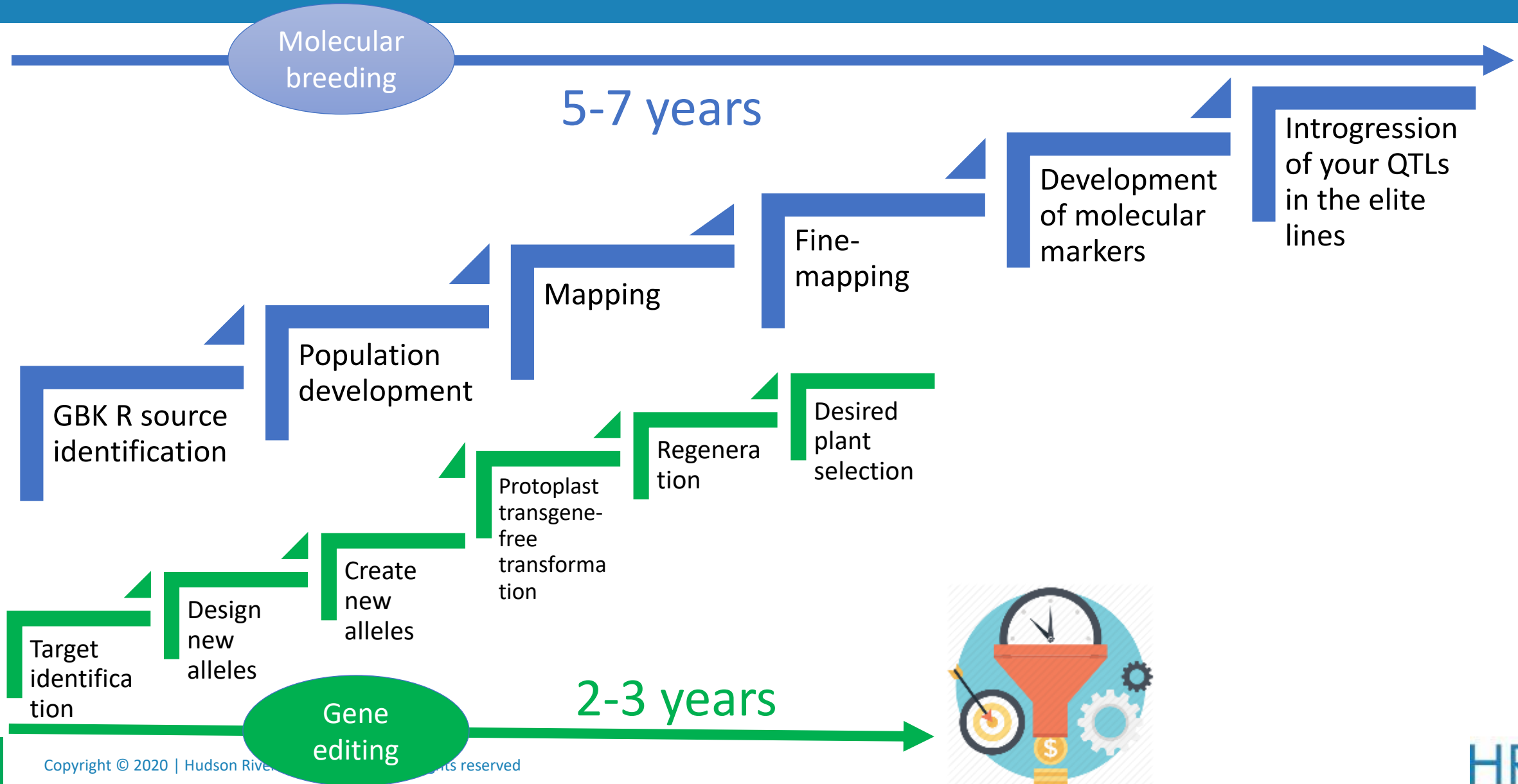
*Shi, Plant Biotech. J.*



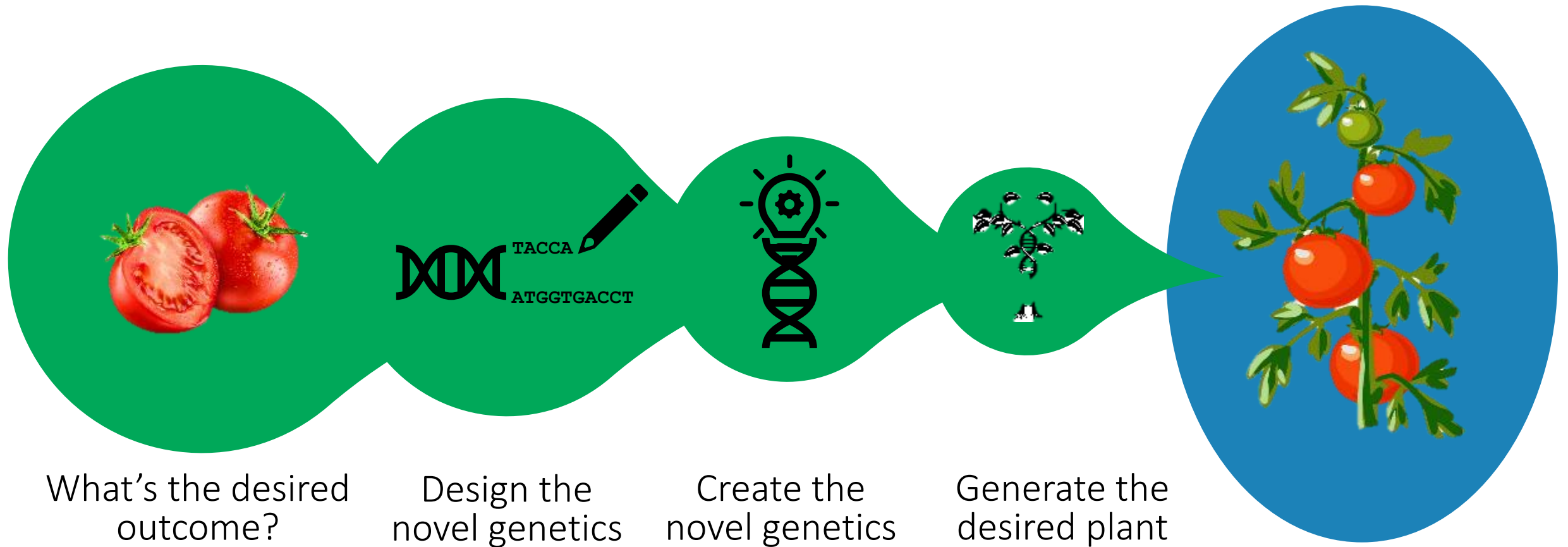
**Yield increase**

*Li, Front. Plant Sci.*

# Breeding rule: the quicker, the better



# Genome editing: Tomorrow's crops



# Hudson River Biotechnology

## HRB quick facts

- Agricultural biotech company
- Founded early 2015, the Netherlands
- Private & public funding
- ~200m<sup>2</sup> R&D facility in Wageningen
- Team of 13 FTE, rapidly growing



Ranked among StartupCity Magazine's top 15 Biotech start-ups in Europe (2019)



# HRB solves bottlenecks in gene editing

## The need:

- CRISPR gene editing has started transforming plant breeding, however, CRISPR breeding is held back by substantial bottlenecks:
  - Technical (editing efficiency, delivery in plants, plant regeneration from *in vitro* cultures)
  - Complicated and expensive CRISPR licensing
  - Need for substantial in-house capabilities

## Our solution:

- HRB solves these bottlenecks:
  - Our TiGER workflow provides solutions to technical CRISPR bottlenecks
  - We use MAD7 as a highly cost-effective CRISPR solution
  - We offer tailored end-to-end CRISPR breeding solutions, as well as technologies to address specific gaps in in-house workflows

# CRISPR plant breeding with TiGER



## 1. Target identification

- Genes
- Gene regulatory elements

## 2. Guide design

- MAD7 CRISPR
- Non-transgenic (RNPs)
- Proprietary guide design software
- In vitro and in vivo guide validation



## 3. Enter into cell

- PEG, biolistics
- Under development: Nanoparticle-based delivery through plant cell wall (patent pending)

## 4. Regeneration

- From protoplasts, callus cell cultures
- Under development: single cell regeneration, advanced materials

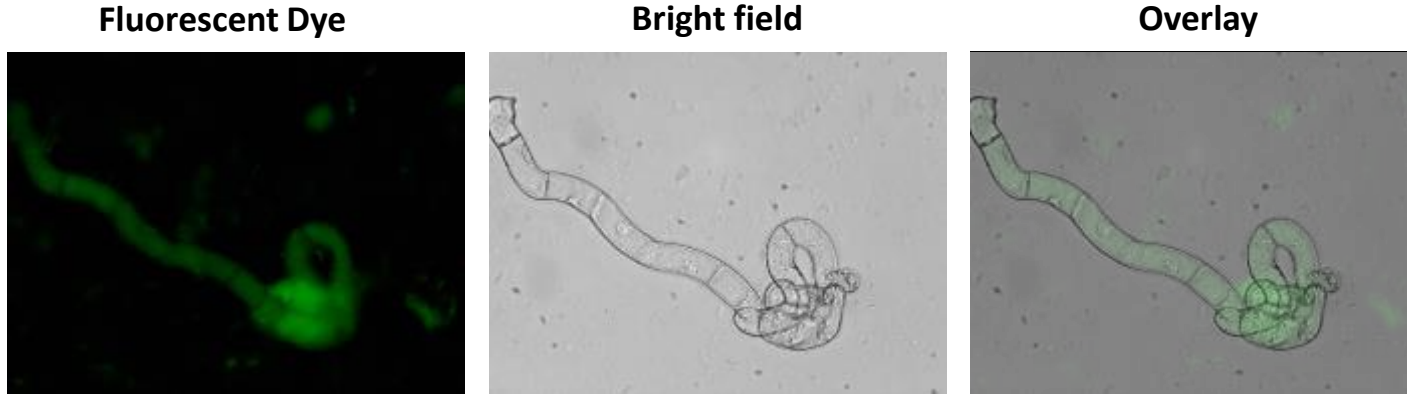




# Delivery to intact cells via nanoparticles

## Cultured callus cells

Fluorescently labeled BSA, encapsulated



Fluorescently labeled BSA, encapsulated

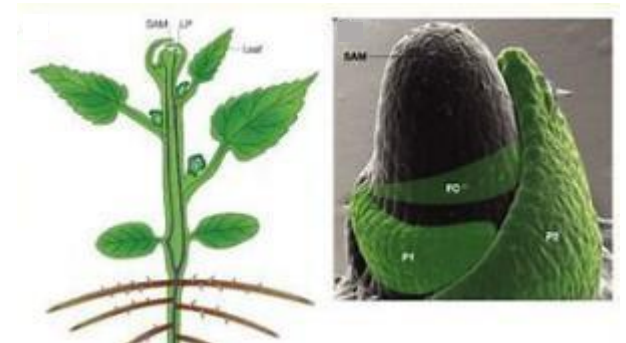


Untreated

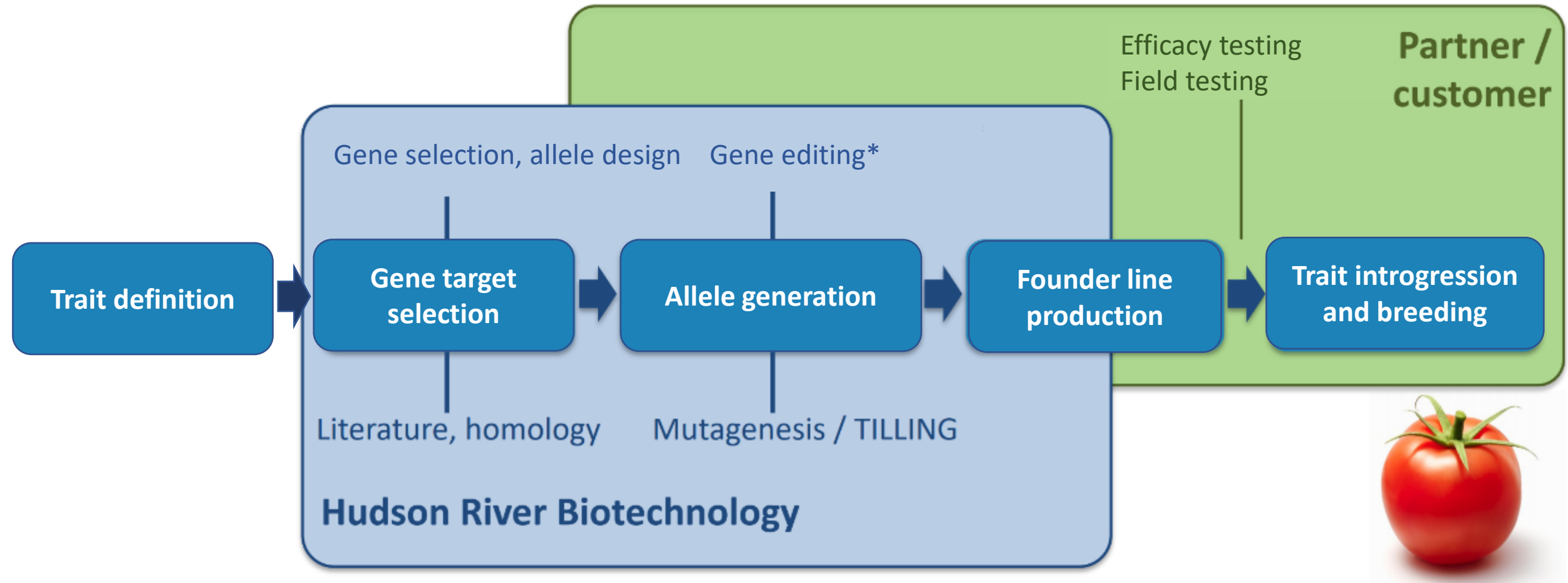


Shorter timelines compared with conventional tissue culture

Allows for direct delivery to plant tissues



# HRB as your partner in product development



\*HRB is fully licensed (R&D and commercial) to use MAD7 and Cas9 CRISPR proteins.

# Why work with HRB?

## We are a technology provider, not a seed company

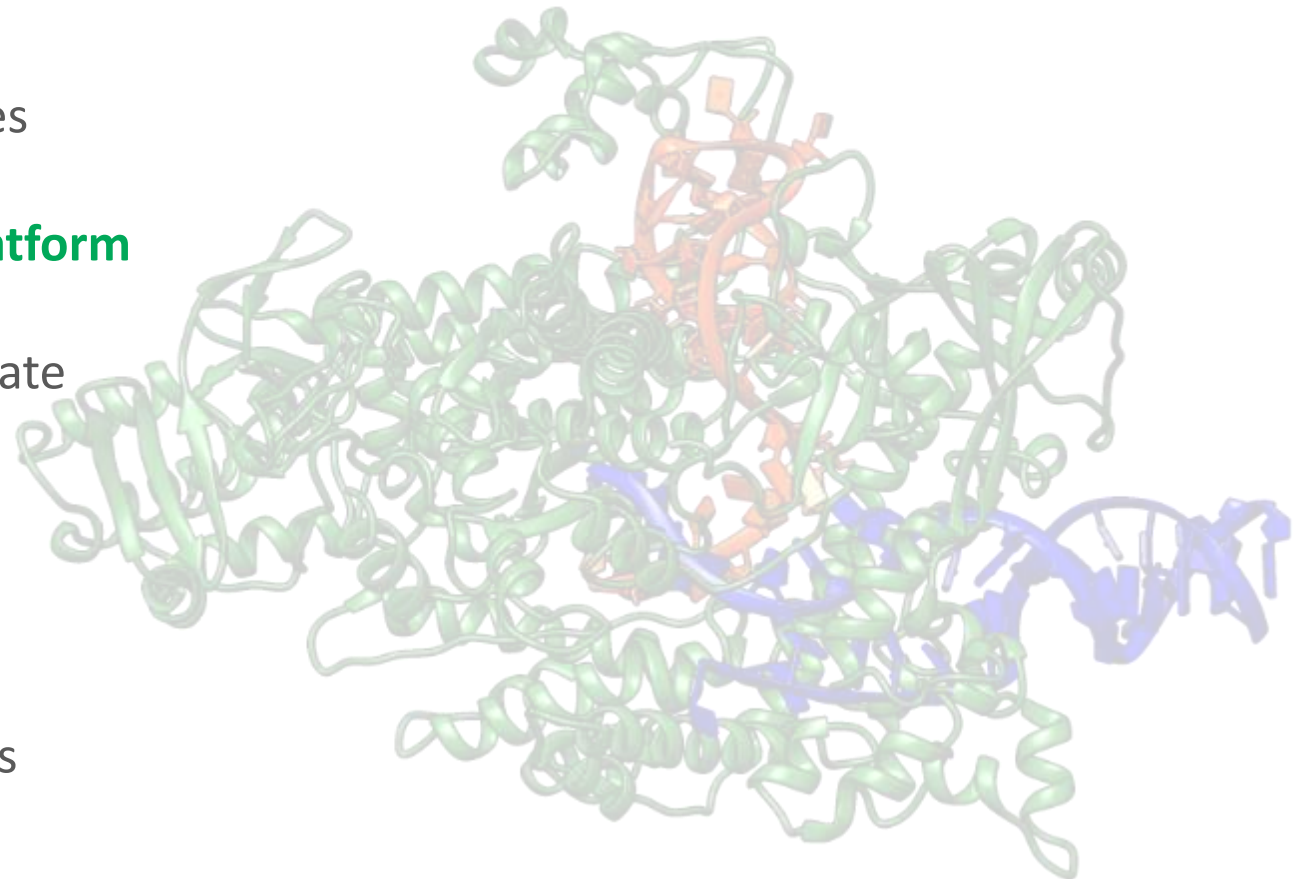
- Focus on latest technological developments
- Will not develop our own varieties
- TiGER workflow and IP on cornerstone technologies

## We are constantly improving our state-of-the-art platform

- Continuing to shorten timelines
- Expanding the range of genetic profiles we can create
- Robust expression of plant phenotypes

## We aim to be nimble, realistic and fair

- Sharp focus on molecular plant breeding solutions
- Simple organizational structure
- Avoid unrealistically high licensing/ milestone costs



# Our customers

## 1. Seed companies of any size

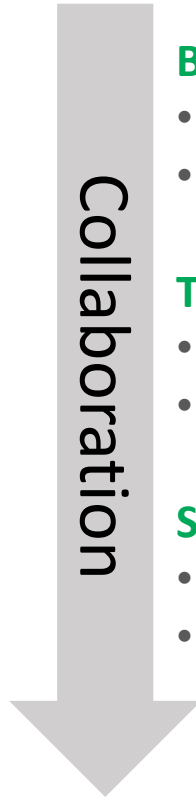
- Largest seed companies - specific technologies
- Smaller/ medium sized breeders – CRISPR end-to-end solutions (trait development)

## 2. Ingredient/ food companies

- Outsourcing gene-editing activities

## 3. Other biotech companies

- Pharmaceutical



### Breeding projects

- End-to-end breeding solutions, trait development
- Technology licensing

### Technological co-development

- Crop specific breeding projects
- Disease resistance etc.

### Strategic partnership

- Tailored outsourcing of gene-editing activities
- Long term breeding and/ or technological collaborations

# Contact info



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