European Animal Breeders perspective on Gene Editing tools

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European Forum of Farm Animal Breeders (EFFAB)
Farm Animal Breeding and Reproduction Technology Platform (FABRE TP)

5th International Workshop on Regulatory Approaches for Agricultural Applications of Animal Biotechnologies, 19 August 2024

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CODE • EFABAR
The commitment to responsible breeding

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1. EFFAB and FABRE TP
2. The policy context in Europe
3. EFFAB – FABRE TP perspective
4. Current and future developments

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- Ensuring the representation of members' interests at the EU level (mainly)
- European policy and legislation
- Supporting and promoting responsible and balanced breeding - **Code EFABAR**
- Engaging and promoting dialogue around sustainable animal breeding and farming
- **Knowledge provider in EU projects**

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- Develop research and innovation agendas and set priorities
- Further **connect research ; knowledge institutes and the private sector**
- Promotes and supports **research and innovation** in animal breeding

EuroFAANG Research Infrastructure
GERONIMO Genome and epigenome enabled breeding in monogastrics
PIGWEB
HoloRuminant Understanding microbiomes of the ruminant holobiont
STEP UP
DETECTIVE
Digi4Live
Rumigen Towards improvement of ruminant breeding through genomic and epigenomic approaches
Interreg North-West Europe Co-funded by the European Union
HoliCow

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Transversal & science-based approach

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2. The European context (EU and UK)

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EU FARM to FORK and BIODIVERSITY STRATEGIES

Launch of the STRATEGIC DIALOGUE on the FUTURE of the EU AGRICULTURE + **Farmers protests**

NEW EUROPEAN COMMISSION

September 2023

June 2024

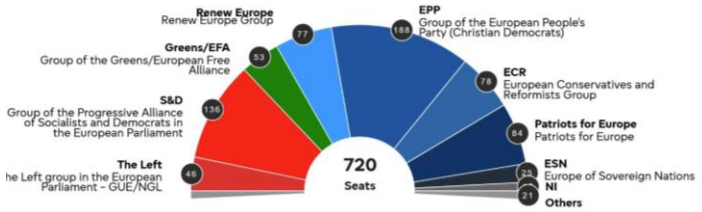
May 2020

February 2024

October-November 2024

STATE of the EUROPEAN UNION DEBATE at the EP

NEW EU PARLIAMENT



A competitive and sustainable agriculture for Europe

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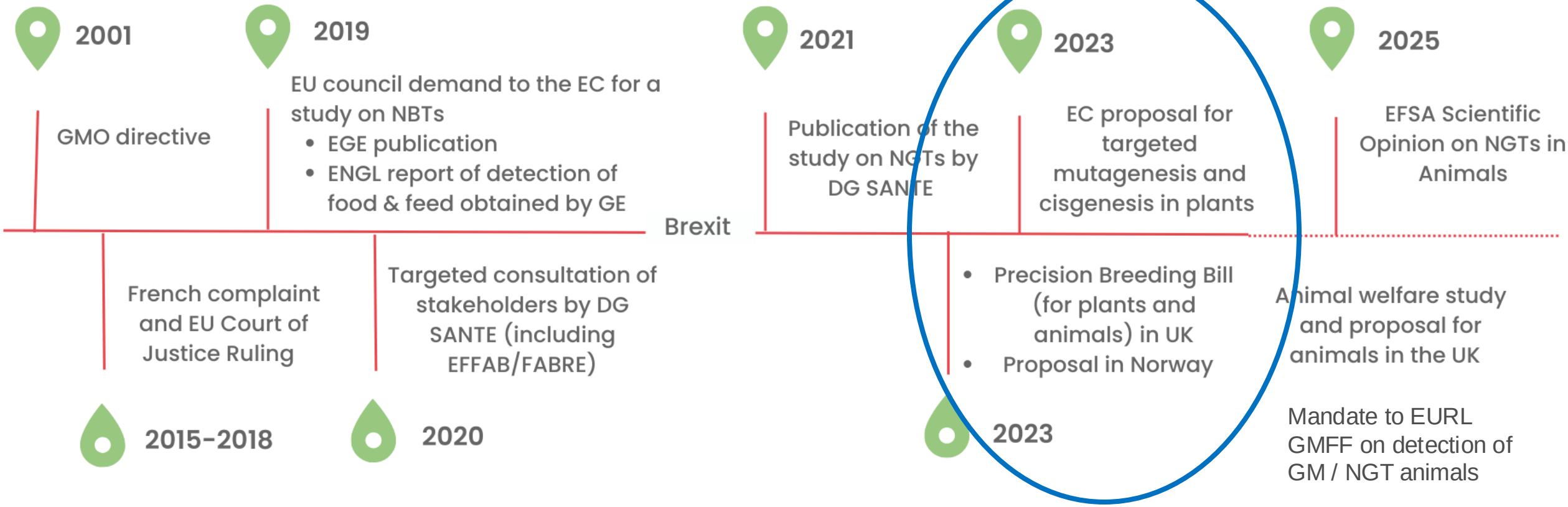
EU legislative framework for NGTs in Europe



In the context of the revision of the Animal Welfare legislation

EC mandate delivered to EFSA

Dec 2022 — 2023-2024 — Jun 2025

Part 1. Mapping of known cases of *"NGTs"* applied to animals for agri, food & feed uses

External Procurement awarded to Alison Van Eenennaam

[Review of applications of NGTs applied to animals involved in the production of agri/food/feed products (2023).]

Part 2. EFSA Scientific opinion on *"NGTs"* applied to animals for agri, food and feed purposes, covering aspects of MC, FF, AHAW and ERA risk assessment

GMO Panel adoption of the scientific opinion

efsa JOURNAL

External Scientific Report

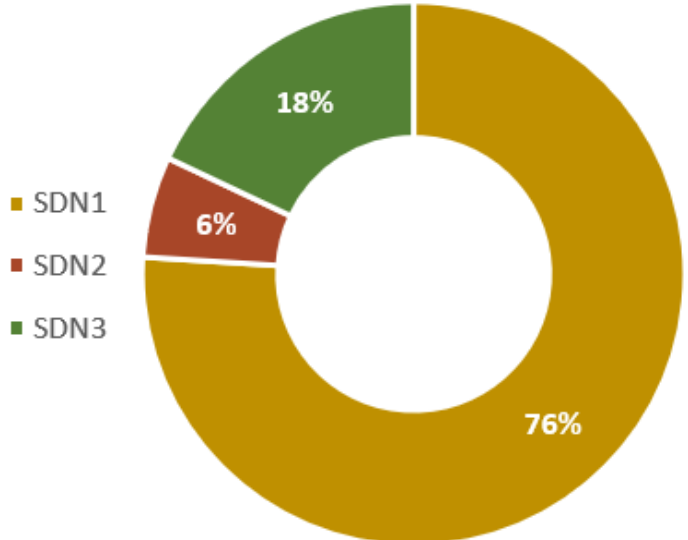
APPROVED: 31 July 2023
doi: 10.2903/sp.efsa.2023.EN-8311

New Genomic Techniques (NGT) in animals and their agri/food/feed products

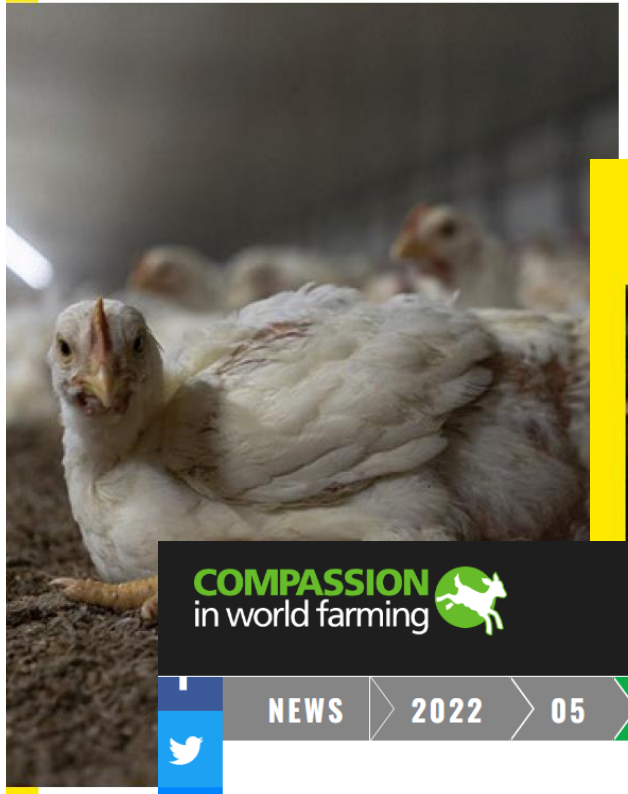
Alison L. Van Eenennaam

Abstract

This report presents a review of the commercial and pre-commercial stage applications of new genomic technologies (NGT) applied to farm animals and their agri/food/feed products. Additionally, a literature review was performed to compile a comprehensive listing of peer-reviewed research and development stage gene edited animals for food and agricultural applications. A total of 195 publications resulting in live animals were compiled. To date, several developed or ongoing research applications have been authorized for commerce, or judged to be "non-GMO" hence conventional, in at least one country including knockout tiger pufferfish and red sea bream in Japan; tilapia, cattle, pigs and horses in Argentina; cattle and tilapia in Brazil; and two gene-edited cattle were granted enforcement discretion in the United States meaning their products can enter the food supply. One application, the targeted *exon* deletion of a gene resulting in porcine respiratory and reproductive syndrome virus resistance in pigs is formally in the precommercial stage. There are proof-of-concept applications in multiple food species testing gene targets for traits of commercial interest. The most common trait category targeted was meat and fibre yield (31%), followed by reproduction (24%), biotic stress (18%), multiple traits (7%), colour (6%), production of hypoallergenic products (5%), product quality (4%), abiotic stress (1%), and other (4%). The majority of these were SDN-1 applications using Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)/Cas9 to introduce small insertions and deletions to inactivate a gene. The large number of applications focused on reproduction is due in part to interest in both single-sex



EU Platform on Animal Welfare 10.11.2021



Bred to suffer:
[Broiler chickens]

EU Platform on Animal Welfare 10.11.2021

EUROGROUP FOR ANIMALS

Bred to suffer:
[Dairy cows]

- Unregulated genetic selection
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egislation.

COMPASSION in world farming

DONATE NOW | ACT NOW | SIGN UP

NEWS > 2022 > 05 > GENE EDITING BILL: SIGNIFICANT THREAT FOR FARMED ANIMALS

GENE EDITING BILL: SIGNIFICANT THREAT FOR FARMED ANIMALS

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3. EFFAB and FABRE TP perspective

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Challenges and opportunities for animal breeders

- **New proposal for plants** ➔ still under discussion between Member States

- **Developments for GE in animals in the EU and UK**
  - Precision Breeding Bill ➔ AW assessment
  - EFSA Scientific Opinion to be published in 2025
  - Detection methods (JRC WG)

- Revision of animal welfare legislation ➔ limitations for breeding operations?

A weaker position for (animal) breeders and Research & Innovation

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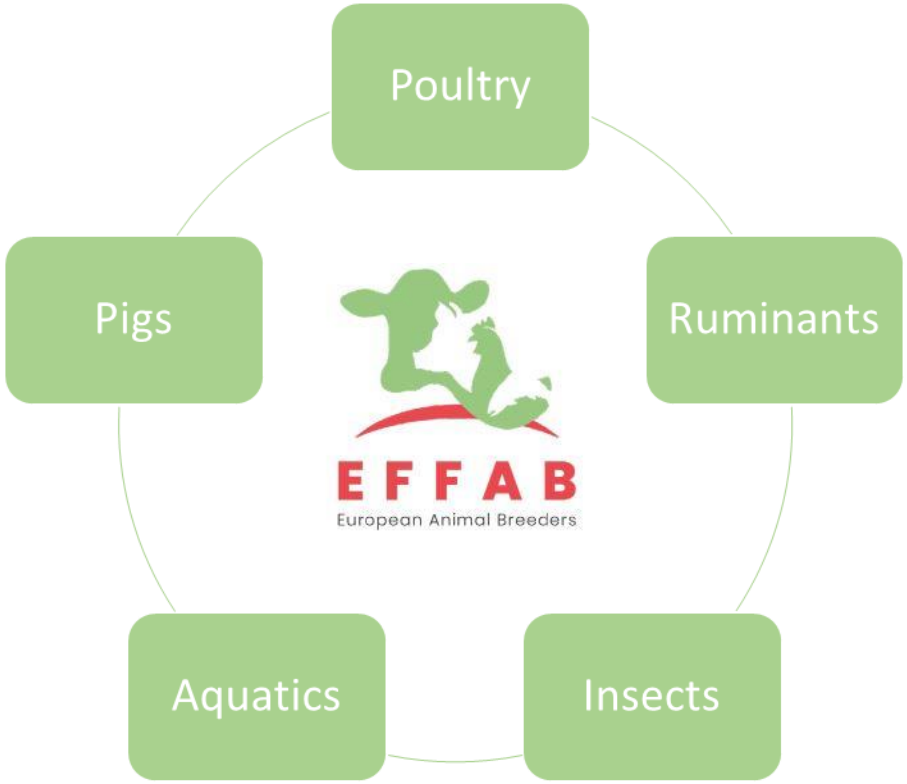
What is Animal Breeding?

A breeding program
=
a balanced and responsible combination of many different traits



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Responsible and Balanced breeding

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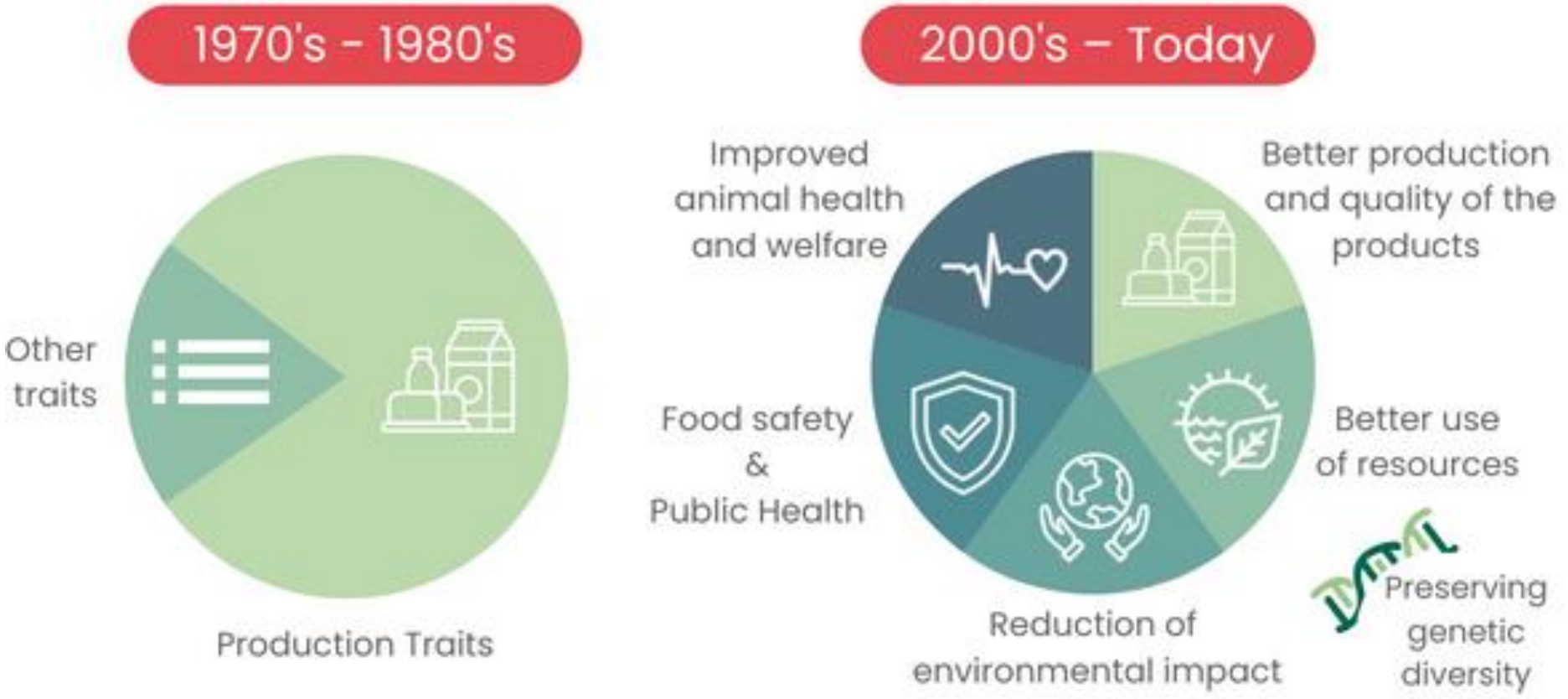

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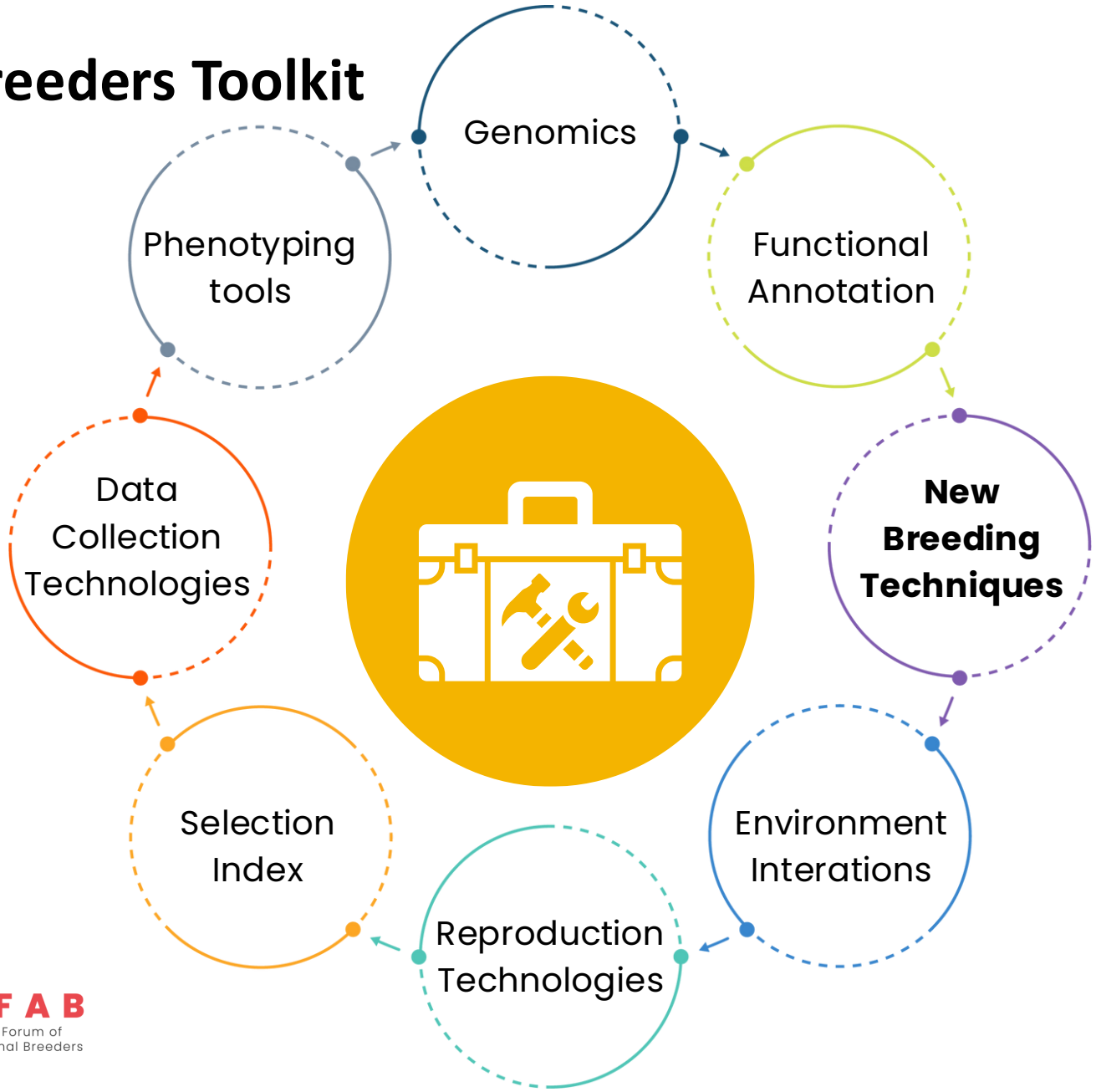
CODE EFABAR Messages

- Animal Breeding programs improve at the same time a group of traits, not only production nor health, welfare
- Progress is measured and monitored
- Code EFABAR is kind of self-regulation in place, and it's regularly revisited with recent developments (every 3 years)
- Any legislative initiative or proposal need to consider Code EFABAR as a basis
- As long as balanced breeding is performed --> AW is ensured

Breeders Toolkit



Potential opportunities to improve some specific traits

- Disease resistance
- Animal Welfare
- Biodiversity

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EFFAB and FABRE TP perspective

➔ Interesting applications to improve Animal Health and Welfare and better contribute to more sustainable and competitive EU breeding sector

➔ defining what is ethically feasible and accepted by society

Regulatory and technical Challenges :

➔ EFSA and ENGL involvement ➔ definition of safety data (Guidelines for potential applications /Detection methods?)

➔ More research is needed in Animal Genetics & Reproduction

➔ If the EU is not taking action: a weaker position for (animal) breeders and research ➔ what about imports ?

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4. Current and future developments

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EuroFAANG
RESEARCH INFRASTRUCTURE

The EuroFAANG RI Project – A European infrastructure for farmed animal genotype to phenotype research

A European Think-Tank on Genome Editing

DETECTIVE

DETECTIVE: DETECTION OF NGT PRODUCTS TO PROMOTE INNOVATION IN THE EUROPEAN UNION

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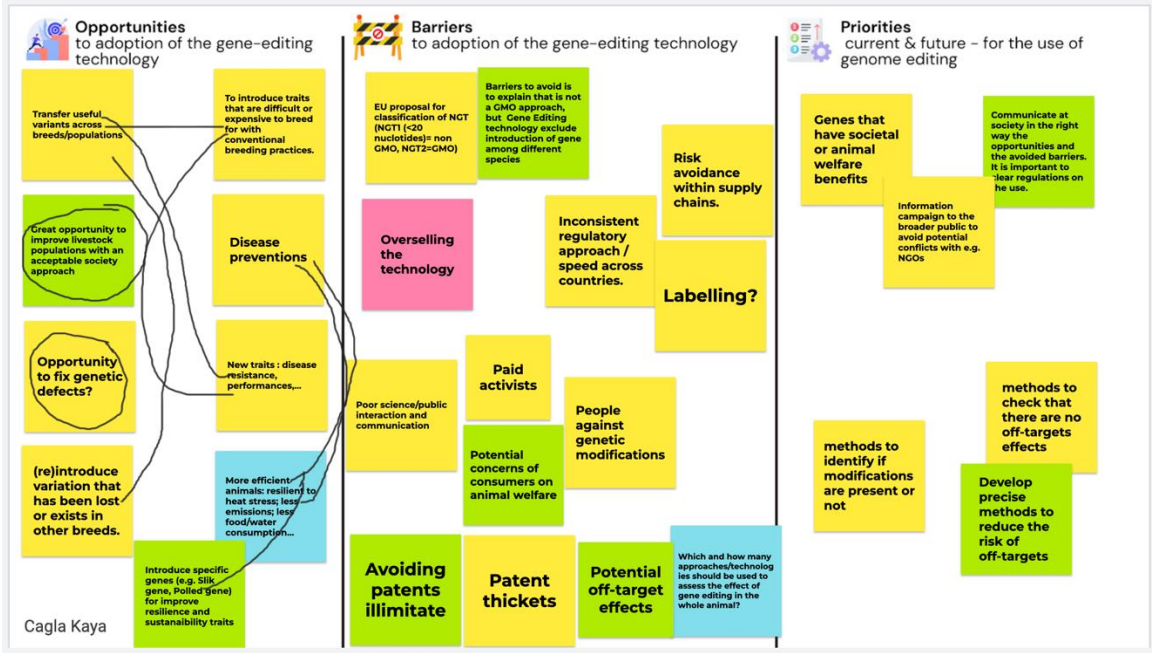
Think-tank on genome editing

2 Virtual Meetings in 2023 and 2024

- Barriers, opportunities and priorities
- Terms and Key Definitions and High-throughput phenotyping platforms and functional assays



Keywords	EU Legislation/ EC Definition	Most Common Scientific Definition
Gene Editing	Techniques that are capable of altering the genetic material of an organism.	A method that lets scientists change the DNA of many organisms, including plants, bacteria, and animals.
Genetically Modified Organisms	Organisms, (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.	Organisms whose genetic material has been altered using genetic engineering techniques
New Breeding Technologies	Techniques that are capable of altering the genetic material of an organism, developed after the publication of Directive 2001/18/EC.	Techniques developed during the twentieth century to develop more efficient tools for modifying the genome
New Genomic Techniques	Techniques capable of changing the genetic material of an organism and that have emerged or have been developed since 2001, when the existing GMO legislation was adopted.	Techniques that are capable of altering the genetic material of an organism, developed after 2001
New Reproductive Techniques	Currently, there is no specific EU Legislation Definition available for "New Reproductive Techniques" in the context of animal breeding and genetics.	Technologies aimed at facilitating reproduction in breeding programs, including artificial insemination and embryo transfer.
Established breeding and reproductive Techniques	-	Traditional and widely accepted methods used in the selective breeding of domestic animals to improve desirable and heritable qualities in the next generation

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EuroFAANG Research Infrastructure

Outcomes

- Linked to the EURO-FAANG RI concept and development project

- But also to be linked to Code-EFABAR, the commitment to responsible farmed animal breeding, and The Animal Task Force and FABRE TP priorities

We will report the outcomes of the think-tank via formal deliverables to the European Commission and disseminate the findings via EuroFAANG RI project networks and activities.

Deliverables are available on https://eurofaang.eu/deliverables/ we are working on an interactive portal

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atf animal task force
A European Public-Private Partnership

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Research Infrastructure

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Conclusions

- European (and UK) elections HAVE BEE AND ARE an extremely good momentum to continue to change the narrative around animal breeding

- Showcasing the Concept of Responsible and Balanced breeding and need to improve dialogue about
-
- The essential role of animal breeding (work with our Partners)

- The need to be part for the EU and UK to be part of the conversation about Animal Biotechnologies

Global legal framework for GE in farm animals ?

4th International Workshop on Regulatory Approaches for Agricultural Applications of Animal Biotechnologies September 2022, Brazil

5th International Workshop on Regulatory Approaches for Agricultural Applications of Animal Biotechnologies Online in 2024

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Thank you

Questions?

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