

# Labeling and tracing of NGT organisms and their derived food products

**Marc De Loose** and Isabel Taverniers

**Sixth International Workshop on Regulatory Approaches  
for Agricultural Applications of Animal Biotechnologies**

06/11/2025, Gent



ILVO



# Flanders Research Institute for Agriculture, Fisheries and Food



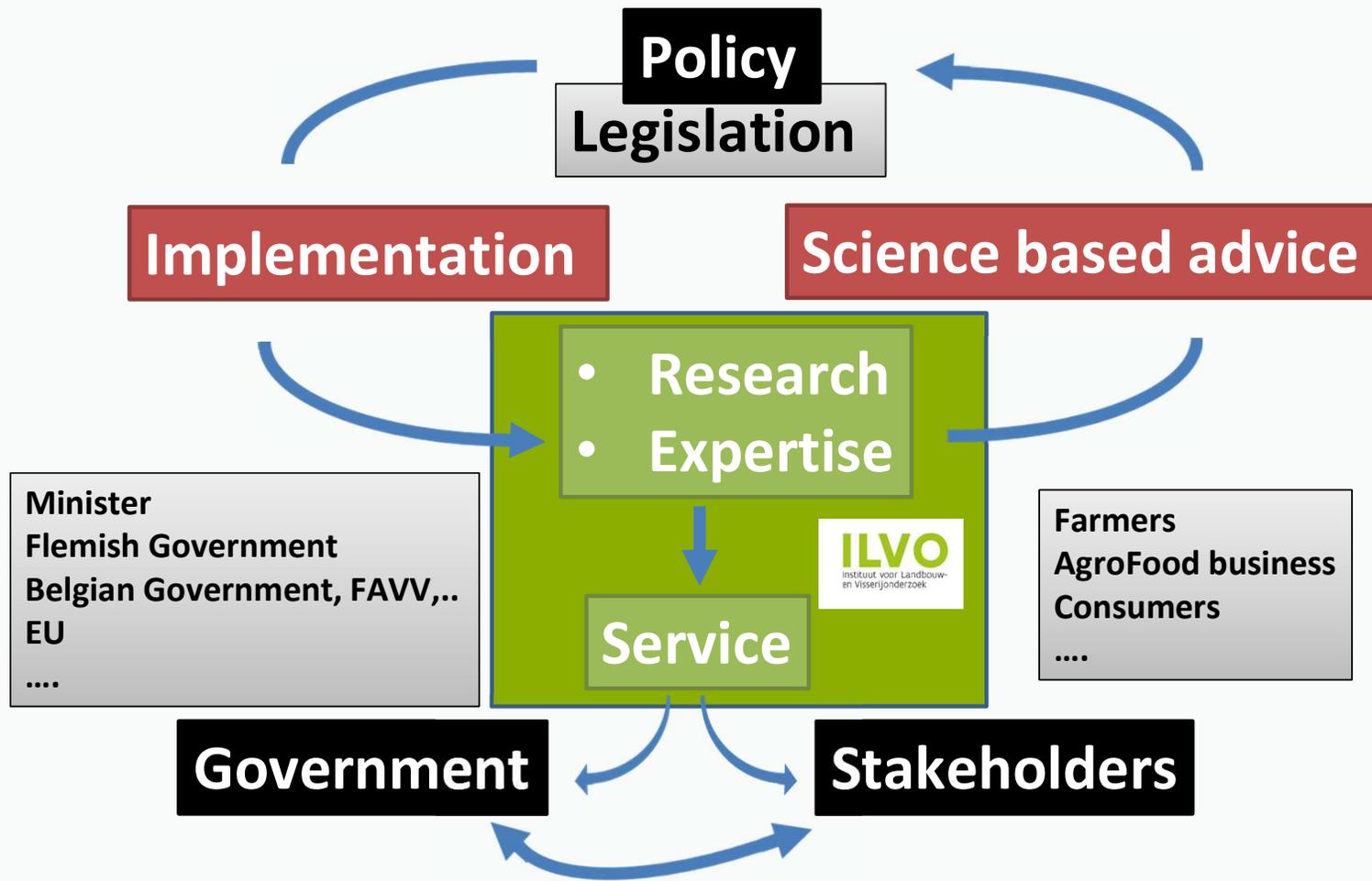
Flanders Research Institute for  
Agriculture, Fisheries and Food

## OUR INFRASTRUCTURE



- **10** sites in Merelbeke, Melle, and Ostend
- **220** ha trial fields
- **50** ha organic in agro-ecologisch platform
- Experimental greenhouses
- Experimental- and educational animal housing (dairy, pigs, poultry)
- **40** specialized labs
- Pilot plants for food and feed
- Specialized research facilities







# Lab analyses



**Belac accreditation**



Shelf life



Taste and odor  
research



GMO & Allergens  
detection



Cleaning and  
disinfection



Nutritional  
analysis



Microbiological  
physical, chemical  
safety & quality



Ring trials and  
reference series

# Labeling and tracing of GMO/NGT

Detection/identification

- Why?
- What?
- How?



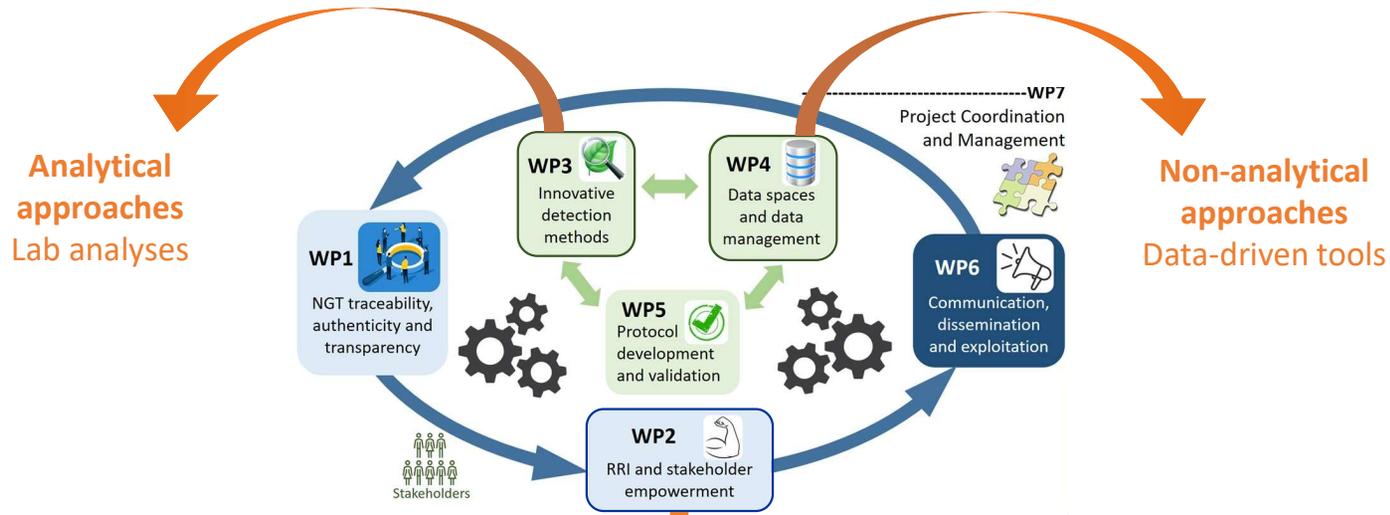
# DETECTIVE

Detection of NGT products to promote innovation in Europe

Topic: HORIZON-CL6-2023-FARM2FORK-01-11  
HORIZON-RIA; 4 years (2024-2027)  
20 partners from 12 countries  
Budget: 6 MIO Euro  
ILVO tasks



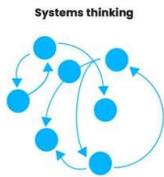
Develop and validate approaches to detect, identify and quantify plant and animal products resulting from NGTs (new genomic techniques)



Enable an improved understanding and awareness of the challenges related to traceability, authenticity and transparency of NGT derived products

## SMA

Systems map analysis



## Responsible Research and Innovation approach

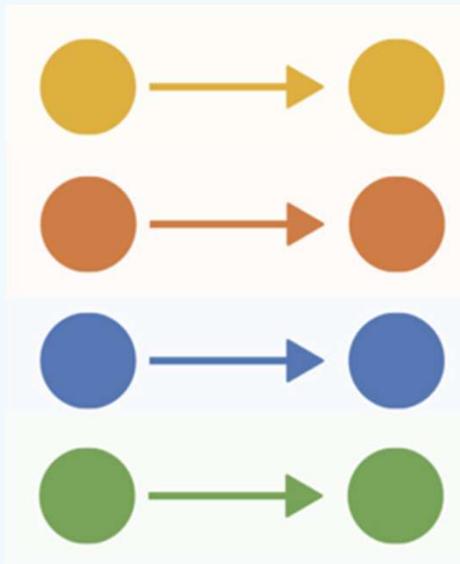




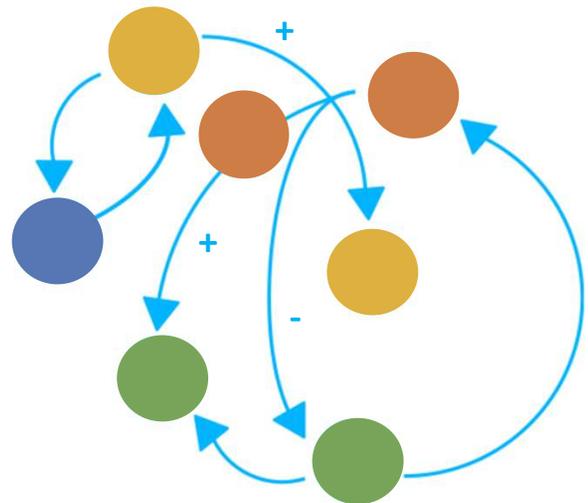
# Systems mapping analysis (SMA)



## Traditional thinking



## Systems thinking



Interconnected

Parts and relations

The whole behaves dynamically

Link with experiment & importance of learning

“None of us sees the system” (P. Senge)

**GLOBAL AIM** Map and monitor the **As-Is situation** of the **NGTs detection methods** and **regulatory scenarios**

**SOCIAL**

FOOD SAFETY

ACCESS TO SUFFICIENT, SAFE  
AND AFFORDABLE FOOD

FREEDOM OF CHOICE

**TRANSPARANCY**

**INNOVATION**

ENVIRONMENT

# SOCIAL

FOOD SAFETY

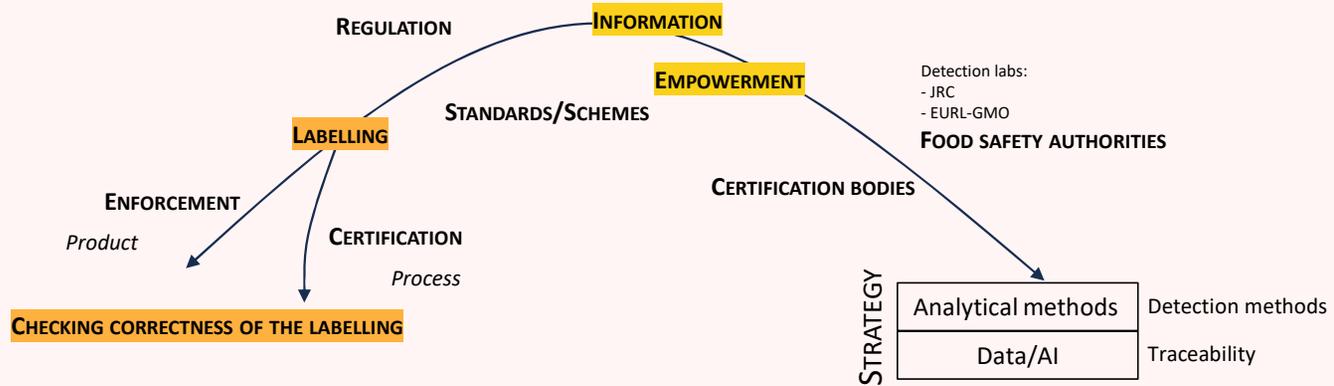
ACCESS TO SUFFICIENT, SAFE AND AFFORDABLE FOOD

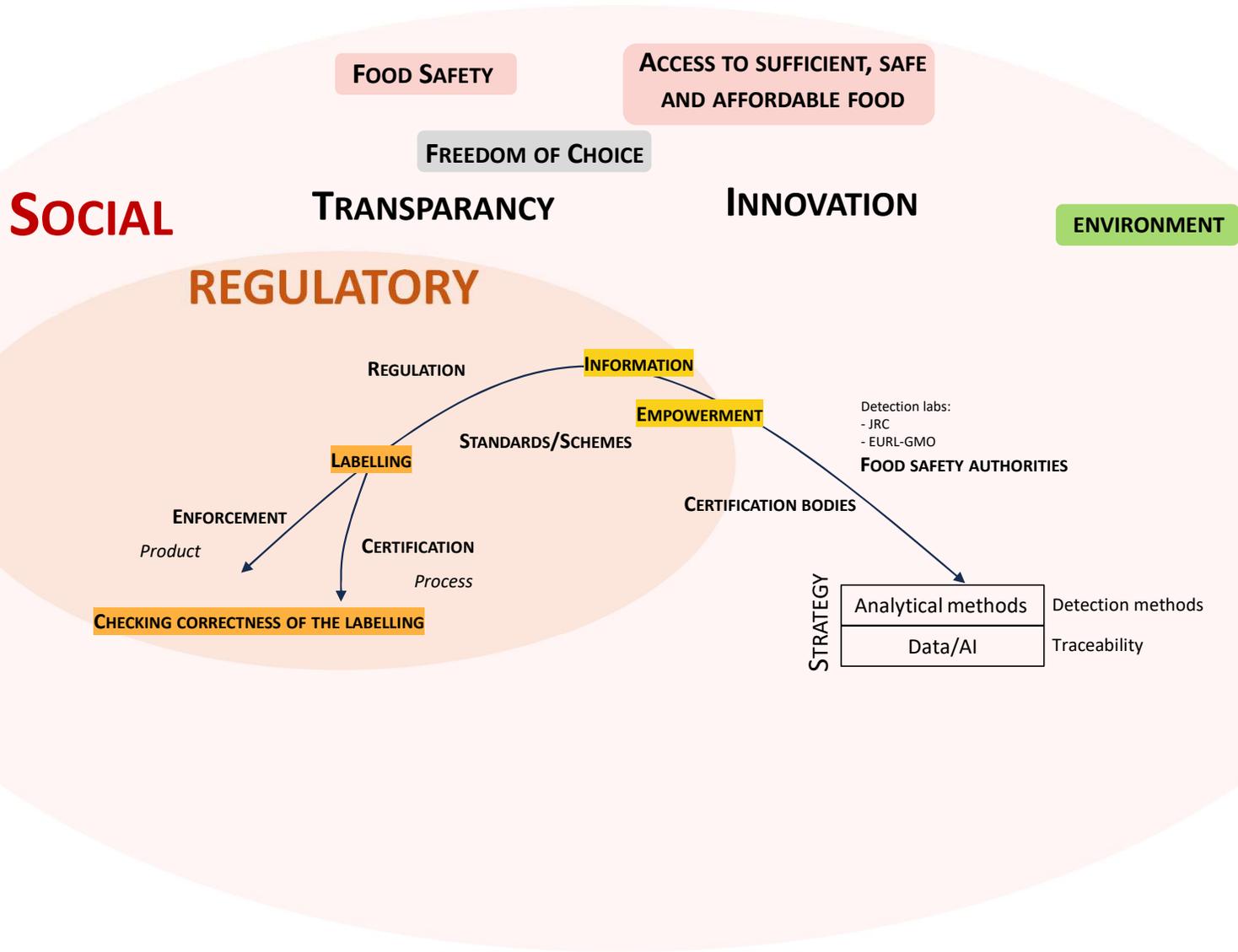
FREEDOM OF CHOICE

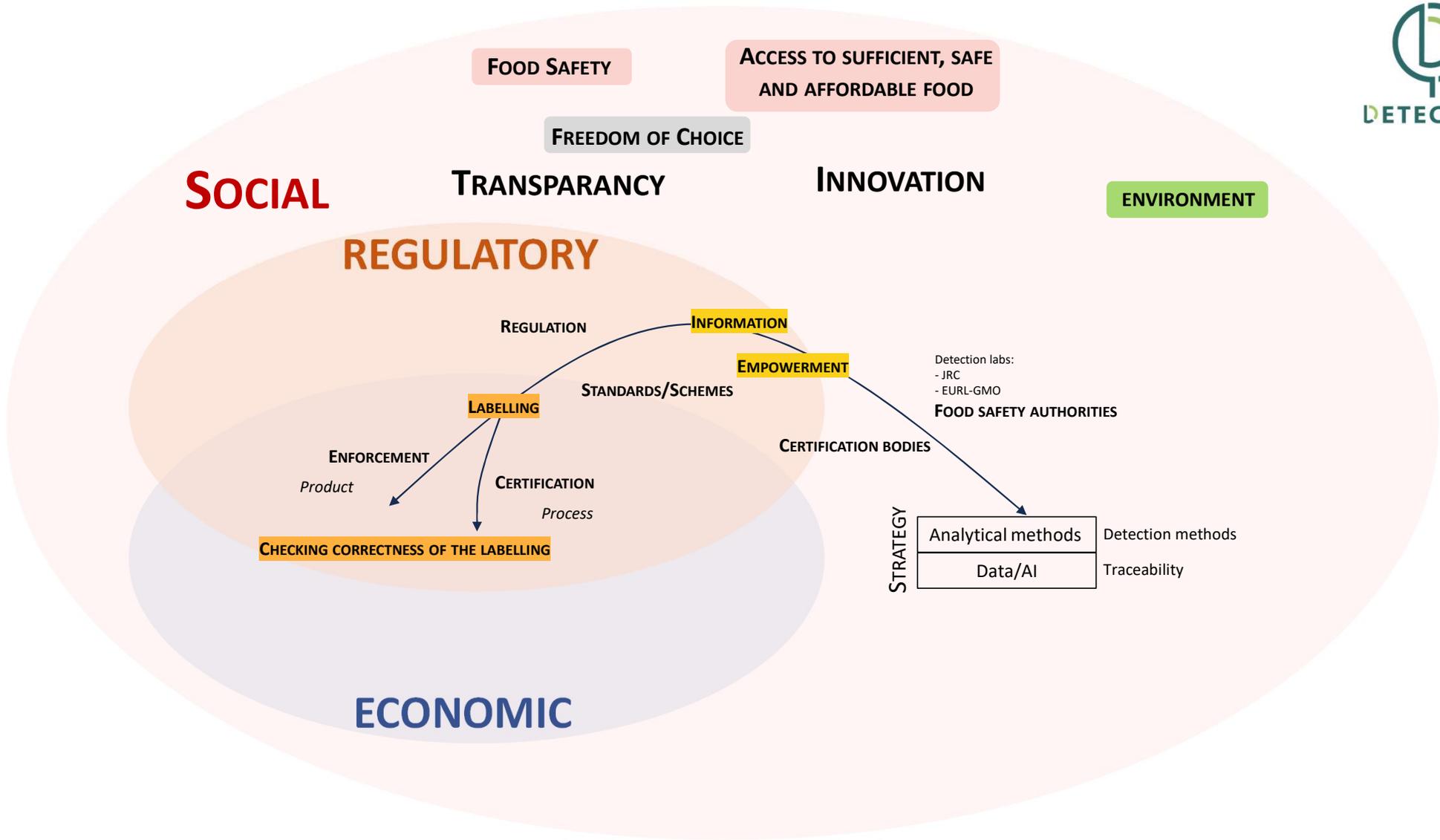
## TRANSPARENCY

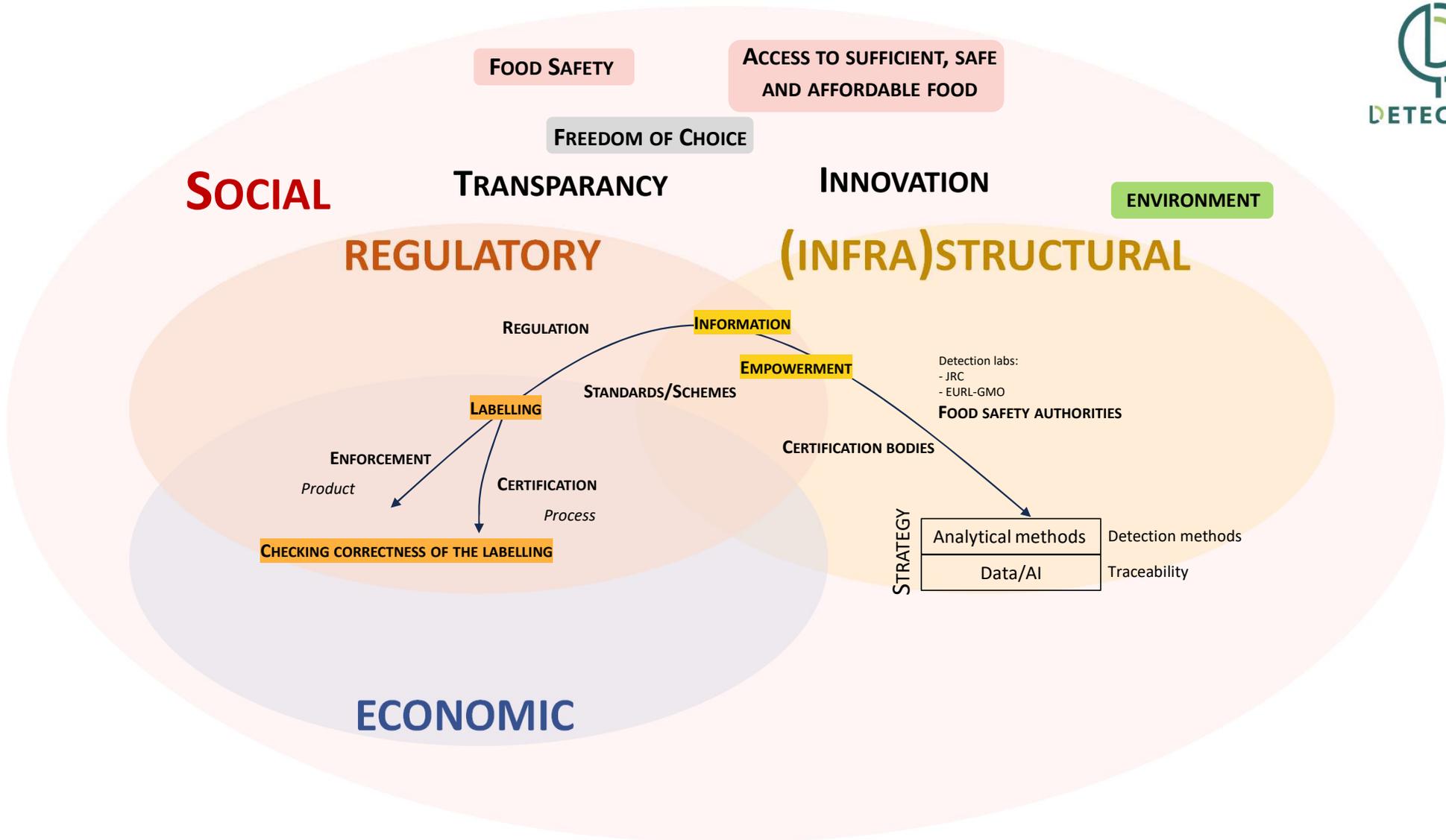
## INNOVATION

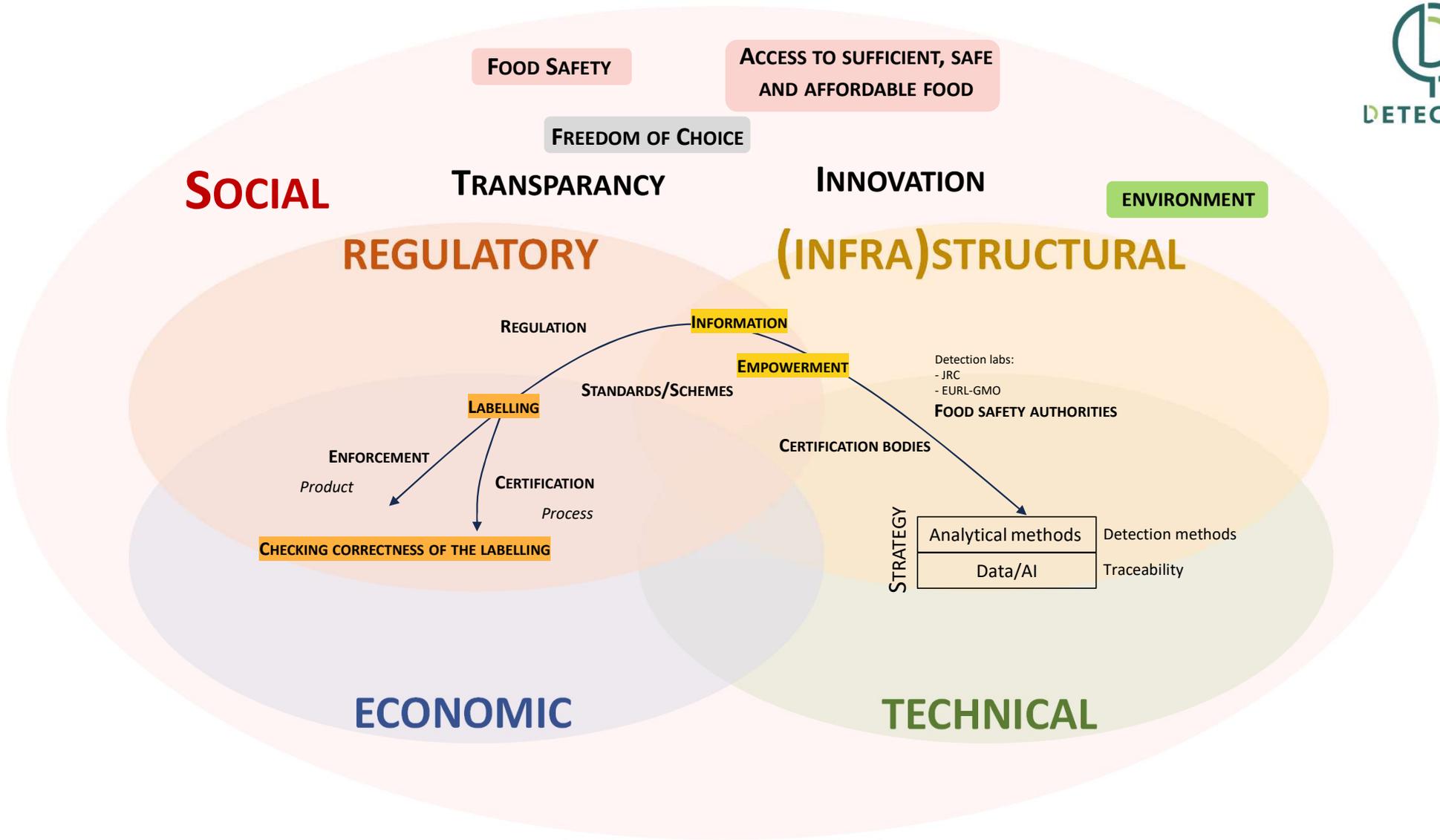
ENVIRONMENT





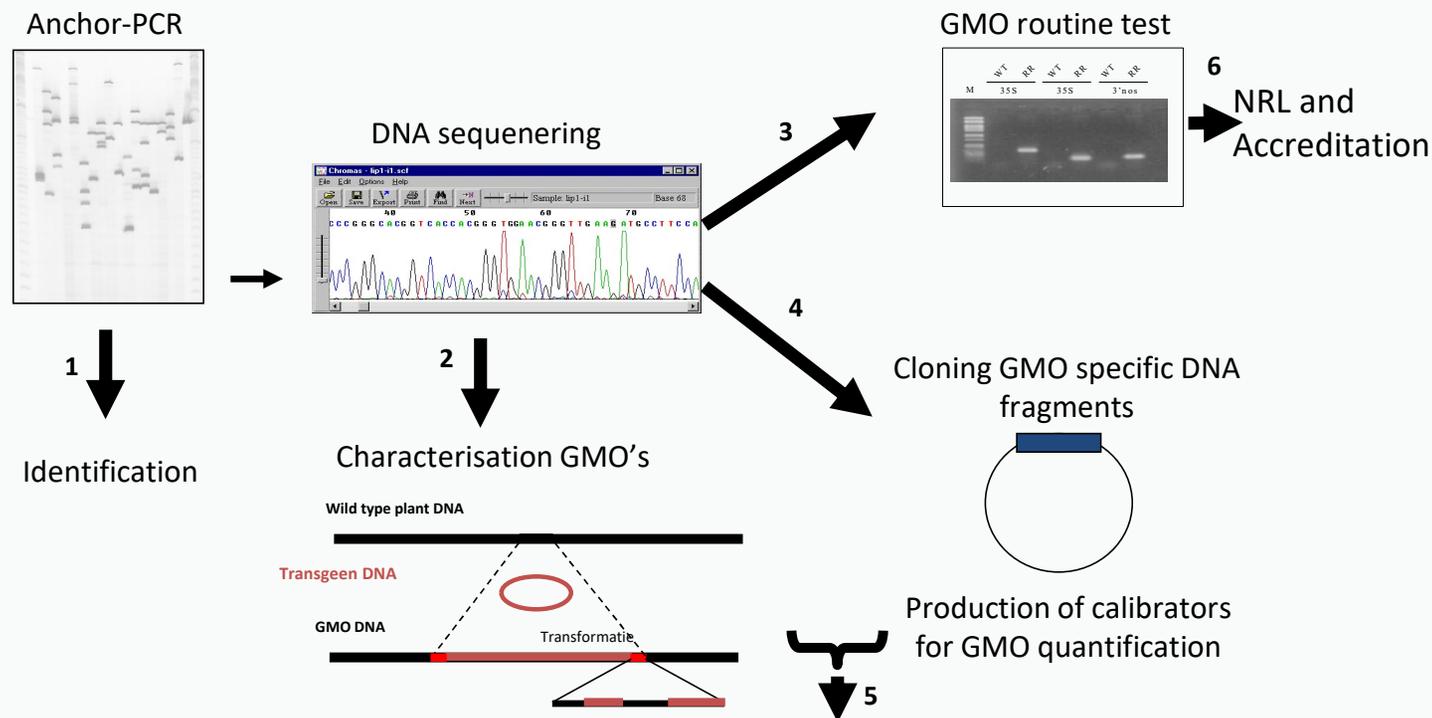






# Event specific detection of GMOs

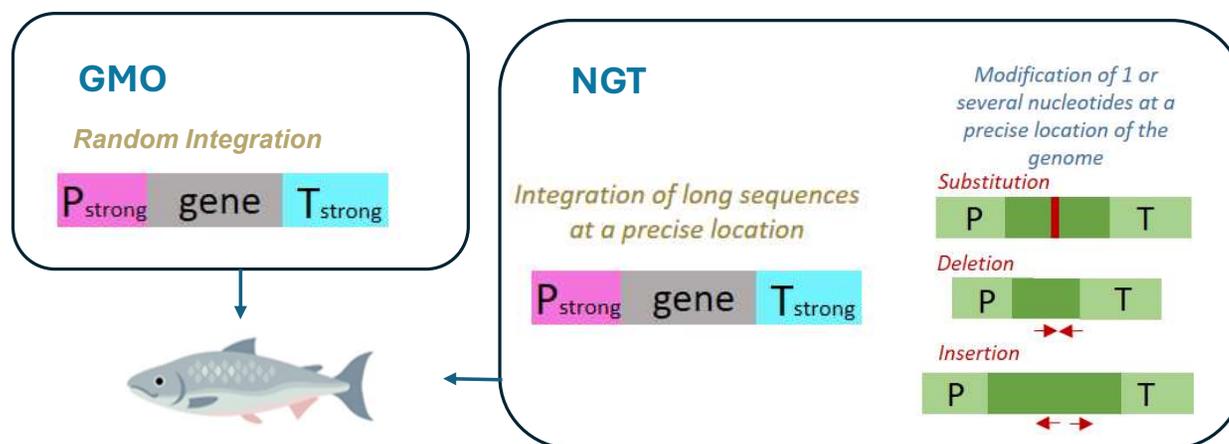
## link between autorisation dossier and enforcement



EU legislation: 1829/2003/EC en 2001/18/EC

# The challenge for detection of NGTs

## Small modifications



## Proposal of legislation for NGT plants: classification in 2 categories

### NGT1

- Limited number of modifications (< than 20 nucleotides).
- Assimilated to conventional organisms
- Deletion OK

### NGT2

- All other cases
- Same rules than for GMOs
- Modifications of the NTG1 type that result in a herbicide resistance gene are classified as NGT2



## JRC TECHNICAL REPORT

Detection of food and feed plant products obtained by targeted mutagenesis and cisgenesis



European Network of GMO Laboratories (ENGL)

- The identification of DNA alterations resulting from targeted mutagenesis and cisgenesis that are not unique remains, therefore, extremely difficult, as the altered sequences may mimic naturally occurring sequence variants, or they may not be distinguishable from those alterations obtained through conventional breeding. ....
- An alternative approach for the detection of unauthorised GMOs has been proposed in 2010, using documentation-based screening .....
- ....., analytical confirmation for enforcement of the regulations would still be required and may remain challenging.



European  
Commission

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### New detection methods on products derived from new genomic techniques for traceability, transparency and innovation in the food system

HORIZON-CL6-2023-FARM2FORK-01-11



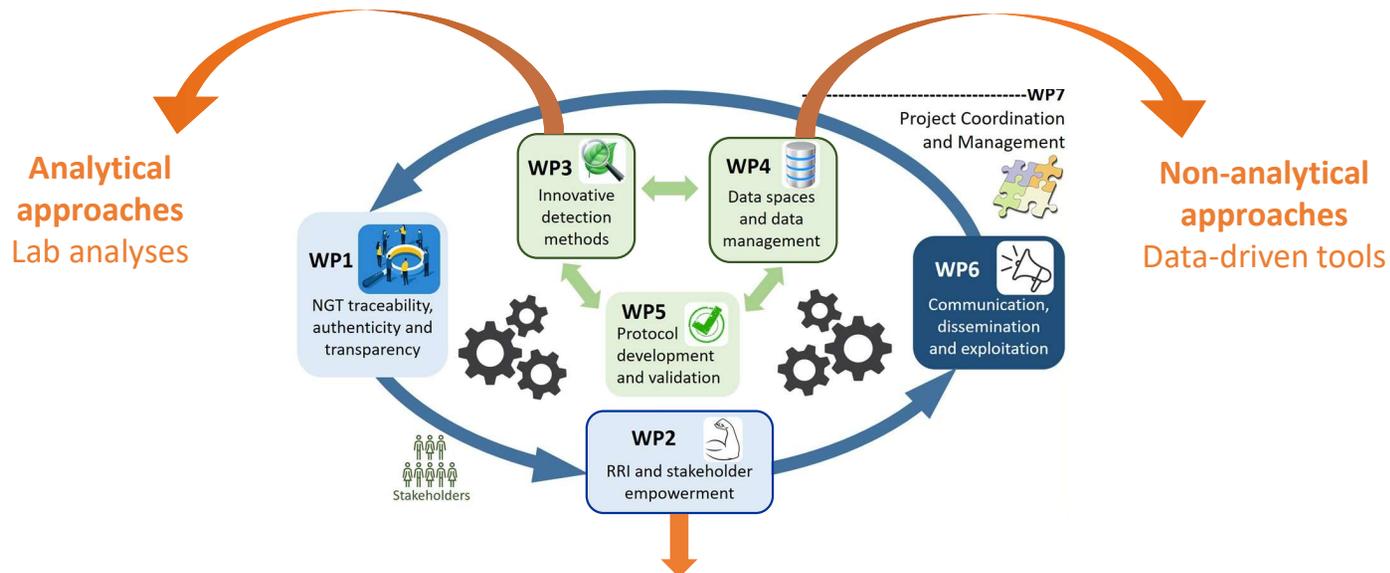
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**Develop** and **validate** approaches to **detect, identify** and **quantify** plant and animal products resulting from **NGTs** (new genomic techniques)



Enable an **improved understanding** and **awareness** of the **challenges** related to **traceability, authenticity and transparency** of NGT derived products



# New detection methods for NGT products

*Frédéric Debode, CRA-W  
WP3 leader*



Funded by  
the European Union

**Webinar #1 | NGTs in Livestock**  
Detection, Traceability and Policy Perspectives



# Material : Collection of samples representative of the market



Commercially relevant species – Diversity of species - Commercial status – Origin – Frequently modified genes – Types of modifications

**Soybean**  
Starch content

**Canola**  
**Sugarbeet**  
Herbicide tolerance



**Rice**  
Fatty acid profile

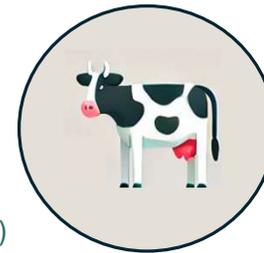
**Chicory**  
Reduced bitterness

**Maize**

**Potato**  
Cisgenic  
Better tolerance  
to *Phytophthora*

**Pig**  
Tolerance to Virus  
(PRRSV)

**Cow**  
Milk allergen  
Colour (climate change)



**Cow** (non NGT)  
Myostatin  
Milk allergen (beta-lactoglobuline)  
Transcription factors

**Goat**  
Tolerance to prion

**Fish**

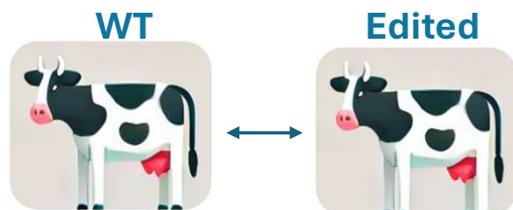
**Sheep**

# The challenge for detection



Developers are also working on detection methods to test the offspring

## Methods proposed by developers



Test of one animal



Non-degraded DNA

## Methods for the DETECTIVE project



Mix of several animals



Degraded DNA

Evaluation of multiple performance criteria (guidelines)

# Labeling and tracing of GMO/NGT

- Why?
- What?
- How?

# Labeling and tracing of NGT organisms and their derived food products – the European perspective

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# Food Labeling

Food labeling refers to the mandatory and voluntary information displayed on food packaging, enabling consumers to make informed choices. In the EU, this is strictly regulated, primarily through **Regulation (EU) No. 1169/2011**.

The main goals are:

- **Consumer protection:** Prevent misleading information.
- **Health protection:** Avoid risks such as allergies.
- **Transparency:** Provide clear details about composition, origin, and shelf life.

# What is Traceability in context of Food Regulation?

**Traceability** refers to the ability to track a food product through all stages of production, processing, and distribution. It is a key component of food safety and risk **management** in the **European Union**.

## Three Levels of Traceability

1. **Inbound traceability:** Tracking raw materials or products received by a company.
2. **Internal traceability:** Monitoring how incoming products are processed or transformed within the company.
3. **Outbound traceability:** Tracking products as they leave the company and move to the next stage in the supply chain.

## Legal Framework

- **EU Regulation 178/2002:** Establishes general principles of food law, including traceability.
- **Belgian Royal Decree of 14 November 2003:** Covers self-checking systems, notification obligations, and traceability requirements.

## Why Is Traceability Important?

- **Food safety:** Enables rapid identification of contamination sources (e.g. salmonella).
- **Product recalls:** Allows targeted and efficient withdrawal of affected products.
- **Transparency:** Provides clear information to consumers and authorities.
- **Quality control:** Helps producers verify which raw materials were used in specific batches.

**Who Oversees Traceability?** In Belgium, the **FASFC (Federal Agency for the Safety of the Food Chain)** monitors:

- Documentation of product flows, .....

# Traceability in context of above-legal (voluntary) standards

refers to going **beyond the minimum legal requirements** for tracking food products through the supply chain.

## What Does It Mean in Practice?

- **Extended Scope:** may require **full chain traceability**, including farm-level data, processing details, and transportation conditions.
- **Additional Attributes:** Recording not just origin and lot numbers, but also:
  - Environmental impact (carbon footprint)
  - Animal welfare compliance
  - Fair trade or social responsibility indicators
- **Digital Integration:** Use of blockchain or ERP for real-time data sharing across all stakeholders.

## Examples of Above-Legal Standards

- **GlobalG.A.P.** (Good Agricultural Practices), **Fair Trade** or **Sustainability Labels**

These standards often require **traceability as a tool for certification**, ensuring that claims (e.g., “organic” or “fair trade”)

## Why Is It Important?

- Builds **consumer trust** through transparency, supports **brand reputation** and market access.

# Detection refers to the process of identifying and determining the presence of unwanted or hazardous elements in food products.

## What Does Detection Involve?

- **Identifying contaminants**, such as:
  - **Microbiological hazards** (bacteria, viruses, fungi)
  - **Chemical substances** (pesticides, heavy metals, residues)
  - **Physical contaminants** (glass, metal fragments)
- **Detecting unauthorized additives** or excessive levels of permitted substances.

## Legal Framework

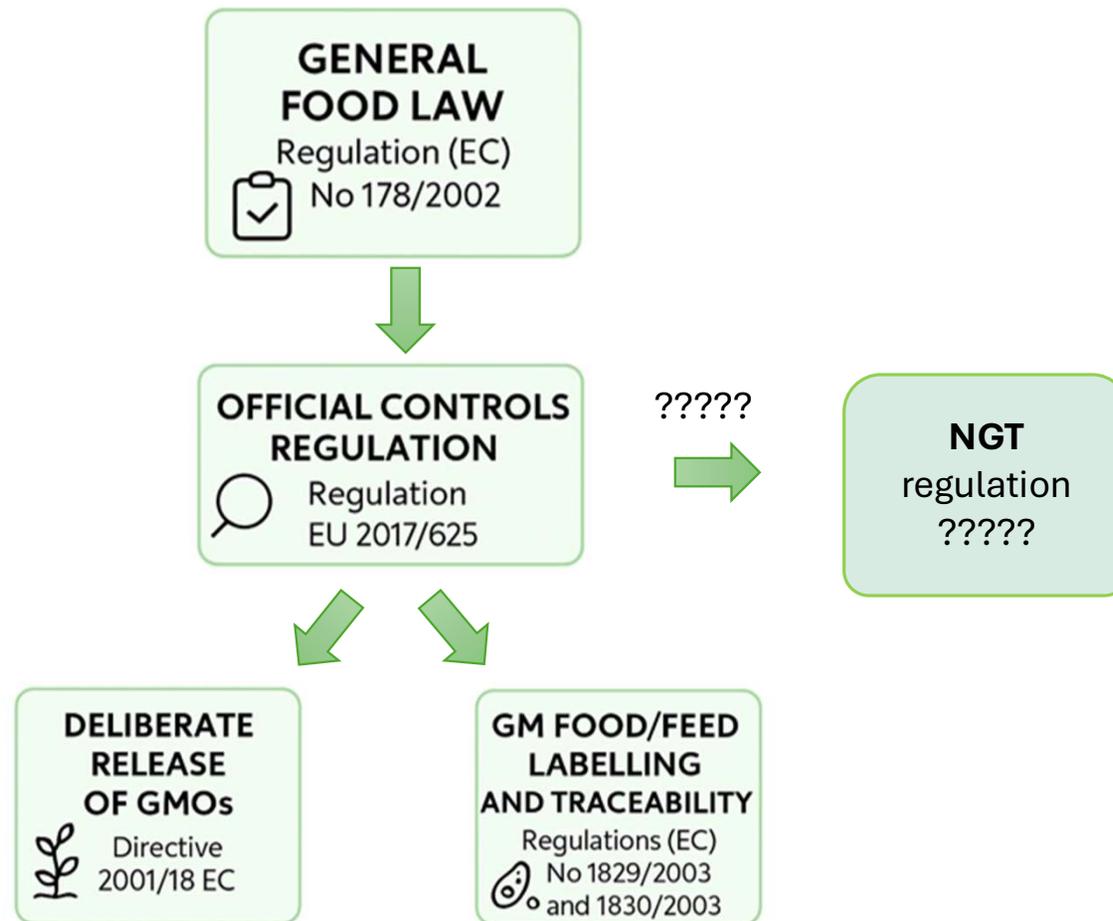
- **EU Regulation (EC) No. 178/2002**: Establishes general principles of food safety, including risk management and monitoring.
- .....

## How Is Detection Performed?

- **Laboratory analyses**: Microbiological tests, chemical analyses.
- **Sensors and technology**: Real-time detection of contamination.

## Why Is Detection Important?

- Prevents **foodborne infections and intoxications**, Protects **public health**.
- Supports **traceability and product recalls**.



# Do we need enforcement of a legislation?



# Compliance enforcement – GMOs/NGTs

For enforcement, **Competent Authorities** in Member States must:

- Ensure compliance with authorisation conditions and labeling requirements
- Implement **risk-based sampling and analysis** to detect unauthorised GM events



## GENERAL FOOD LAW

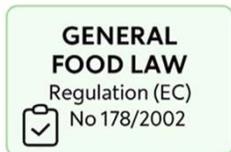
Regulation (EC)

No 178/2002



### General Food Law

- **Article 17:**
  1. Food and feed business **operators** are primarily responsible for ensuring compliance with food law – autocontrol system (ACS)
  2. **Member States** must **enforce** these rules through **official controls**
- **Article 65:**
  - Adequate **resources** must be available for **competent authorities** to perform controls
  - Highlights the **complementary role** of official controls to operators' own systems (ACS)
- **Article 88:**
  - Requires competent authorities to **investigate suspicions of non-compliance**, determine origin and extent, and ensure corrective actions are taken by operators.



## Official Controls Regulation (OCR)

- **Article 1 & 2:** Defines the scope and the term “**competent authority**” as the central bodies responsible for organizing official controls
- **Article 9:** Mandates **risk-based official controls** with appropriate frequency across all operators in the agri-food chain
- **Article 11:** Requires authorities to **communicate** about controls and their outcomes
- **Article 23:** Specifically addresses **controls related to GMOs** in food and feed. It outlines actions when **unauthorized GMOs** are detected, referencing Directive 2001/18/EC and Regulation (EC) 1829/2003
- **Article 138:** Details enforcement actions when non-compliance is found, including tracing the origin and ensuring operators remedy the issue and prevent recurrence
- **Article 139:** Covers **sanctions** applicable to violations.

**GENERAL  
FOOD LAW**  
Regulation (EC)  
No 178/2002



**OFFICIAL CONTROLS  
REGULATION**  
Regulation  
EU 2017/625



**DELIBERATE  
RELEASE  
OF GMOs**  
Directive  
2001/18 EC

### **Directive 2001/18/EC – Deliberate Release into the Environment**

- **Scope:** deliberate release of GMOs into the environment, including field trials and commercial cultivation
  - **Part B:** Authorisation for experimental releases at national level
  - **Part C:** Authorisation for placing GMOs on the market across the EU.
- **Environmental Risk Assessment (ERA):** Mandatory prior to any release, assessing potential effects on human health and the environment
- **Traceability:** Requires traceability of GMOs at all stages of their release and use.
- **Zero Tolerance:** GMOs not authorised under Part C are prohibited from being placed on the market.
- **Notification System:** Member States must notify the Commission and other states of any detected unauthorised GMO presence via the Rapid Alert System for Food and Feed (RASFF)

**GENERAL  
FOOD LAW**  
Regulation (EC)  
No 178/2002



**OFFICIAL CONTROLS  
REGULATION**  
Regulation  
EU 2017/625

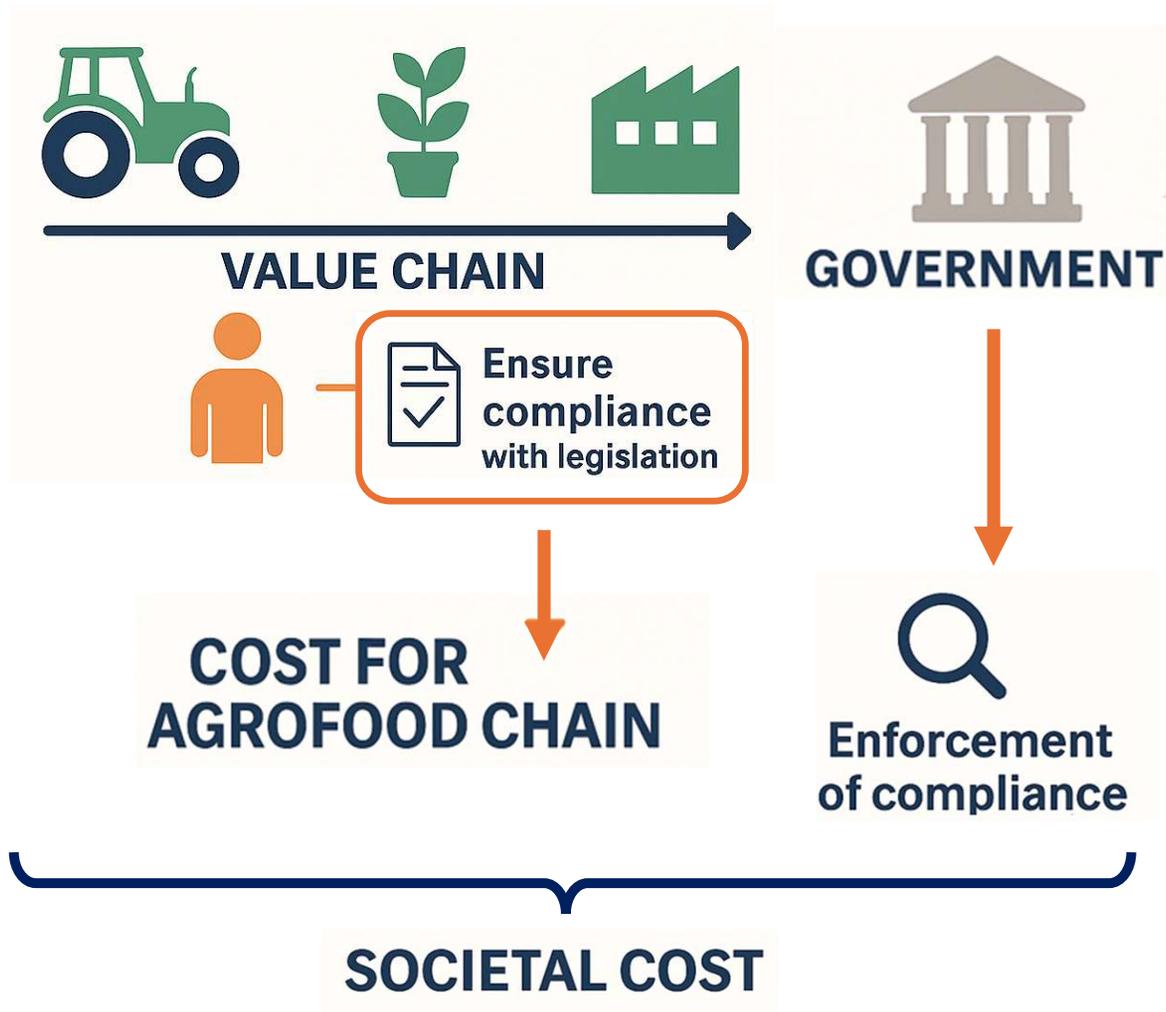


**DELIBERATE  
RELEASE  
OF GMOs**  
Directive  
2001/18 EC

**GM FOOD/FEED  
LABELLING  
AND TRACEABILITY**  
Regulations (EC)  
No 1829/2003  
and 1830/2003

### **Regulation (EC) No 1829/2003 – GM Food and Feed**

- **Scope:** Food and feed containing, consisting of, or produced from GMOs
- **Authorisation Requirement:** All GM food/feed must be authorised before being placed on the market.
- **Safety Assessment (RA):** Conducted by EFSA, includes molecular characterisation, toxicology, allergenicity, nutritional impact, and environmental effects
- **Labelling Threshold:** Mandatory GMO labelling if GMO content exceeds 0.9% per ingredient, unless presence is adventitious or technically unavoidable
- **Low-Level Presence (LLP):** For feed only, GMOs pending authorisation may be tolerated up to 0.1% under Regulation (EU) No 619/2011
- **Monitoring and Enforcement:** MS official controls; detection methods (event-specific)



# Labeling and tracing of GMO/NGT

## Enforcement of compliance

- Why?
- What?
- How?



# DETECTIVE

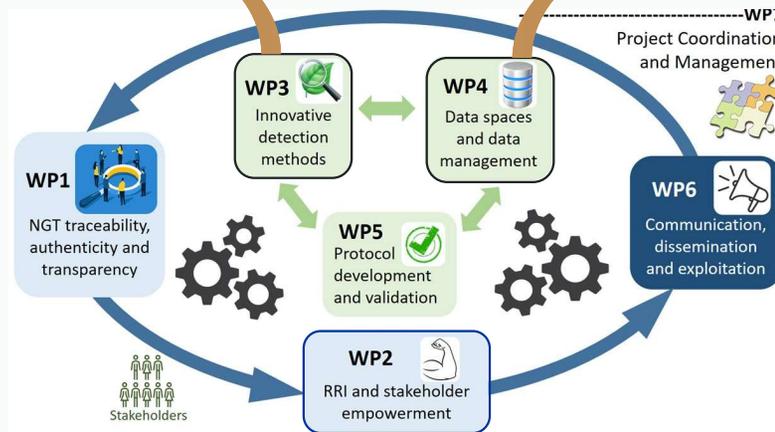
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Partner: from 12 countries  
Budget: 14.00 Euro

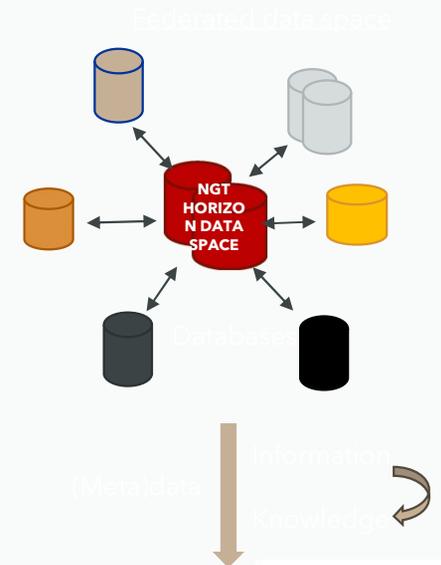


**Develop** and **validate** approaches to **detect, identify** and **quantify** plant and animal products resulting from **NGTs** (new genomic techniques)

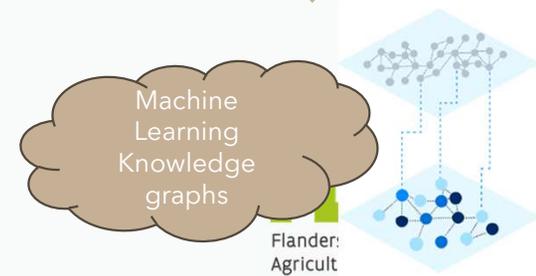
**Analytical approaches**  
Lab analyses



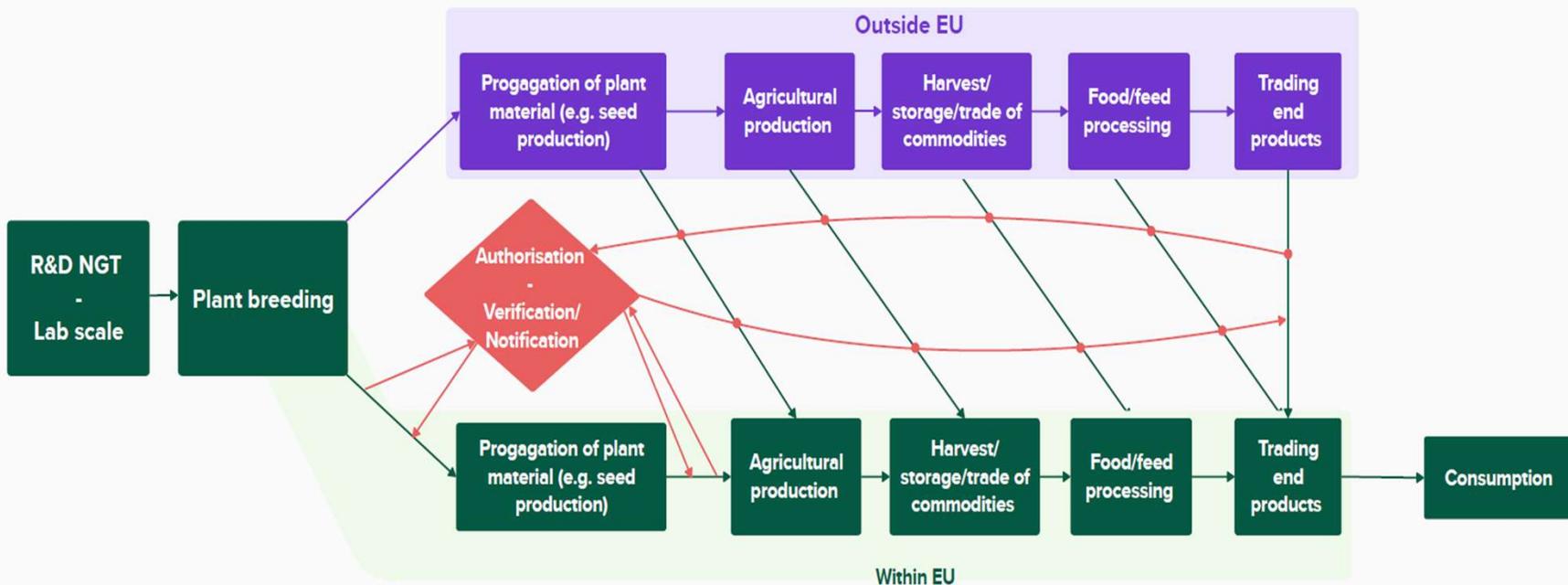
**Non-analytical approaches**  
Data-driven tools



Enable an **improved understanding** and **awareness** of the **challenges** related to **traceability, authenticity and transparency** of NGT derived products



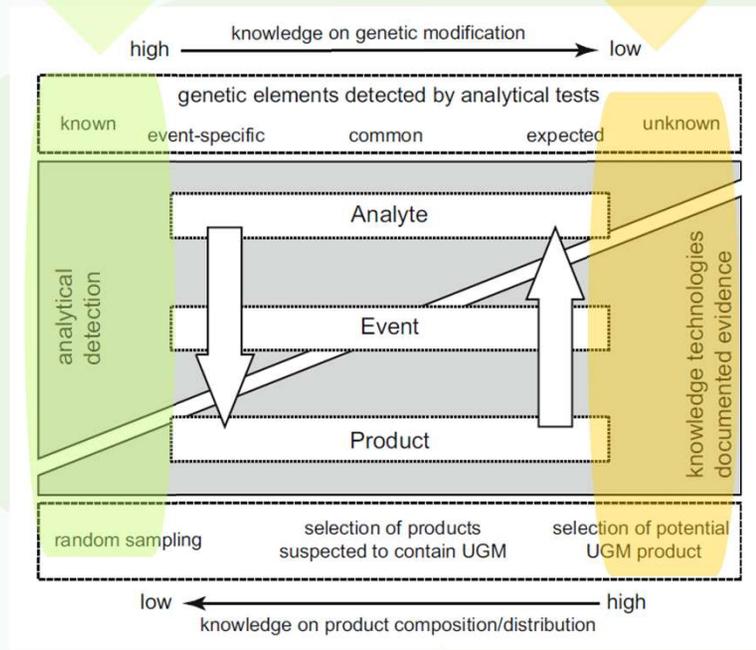
Where can we find relevant data?  
They are present all over the value chain!!!!  
How to connect them?



### 3. Ideas raised in the past: Data mining as a first idea?

**More knowledge on modification**  
Analytical detection  
Random sampling

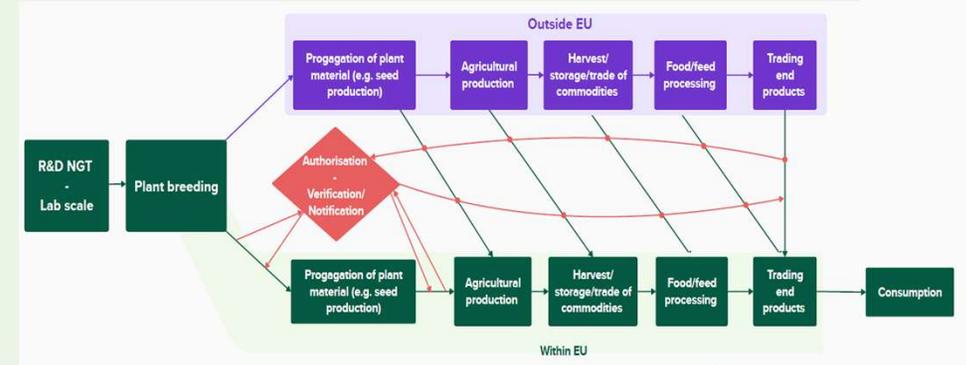
**Less knowledge on modification**  
Product-based analysis  
Selective, documentation-based sampling



Ruttink et al. 2010

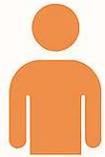
### Building a federated data space

#### TECHNICAL SUBSYSTEM





**VALUE CHAIN**



Ensure compliance with legislation



**GOVERNMENT**



Enforcement of compliance

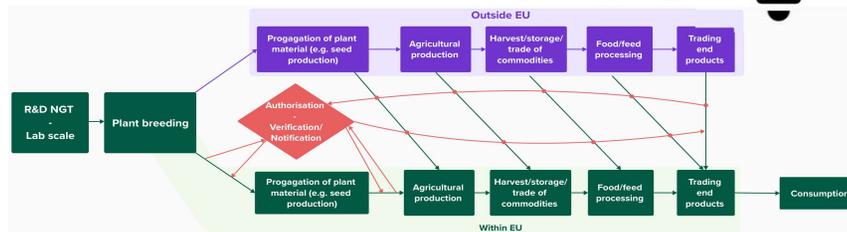
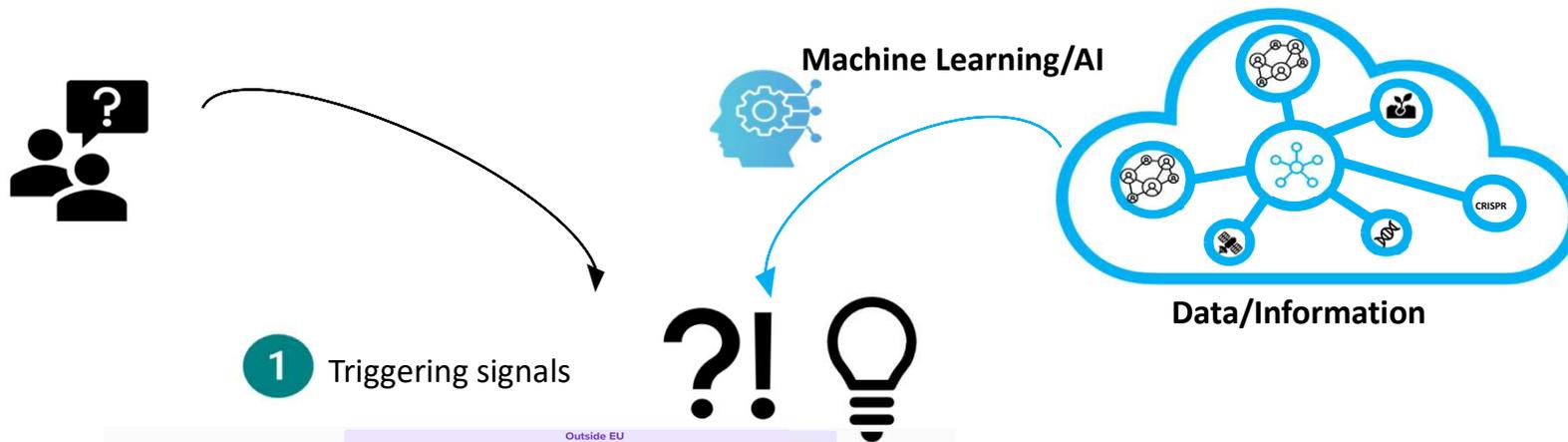


**BLOCKCHAIN TRACEABILITY**



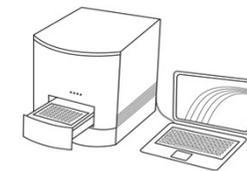
Analytical detection at locus level

# From knowledge-based discovery to data-driven approaches



2 Identify the problem

3 Confirm hypothesis



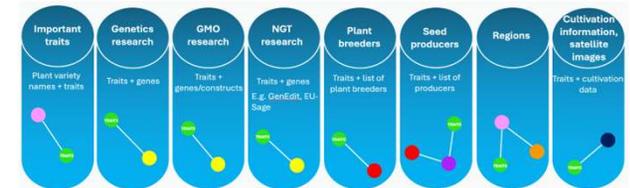
PCR based analysis

# Status task 4.1 (Building a federated data space structure), task 4.3 (Building additional databases) and task 4.4 (ML-driven enforcement)

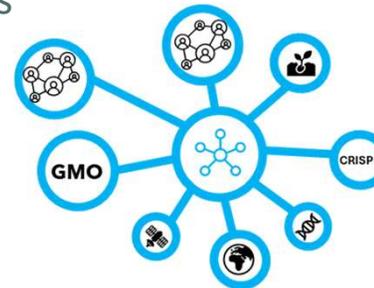


The development process can be divided into different stages:

1. Data selection: identify / collect the data silos



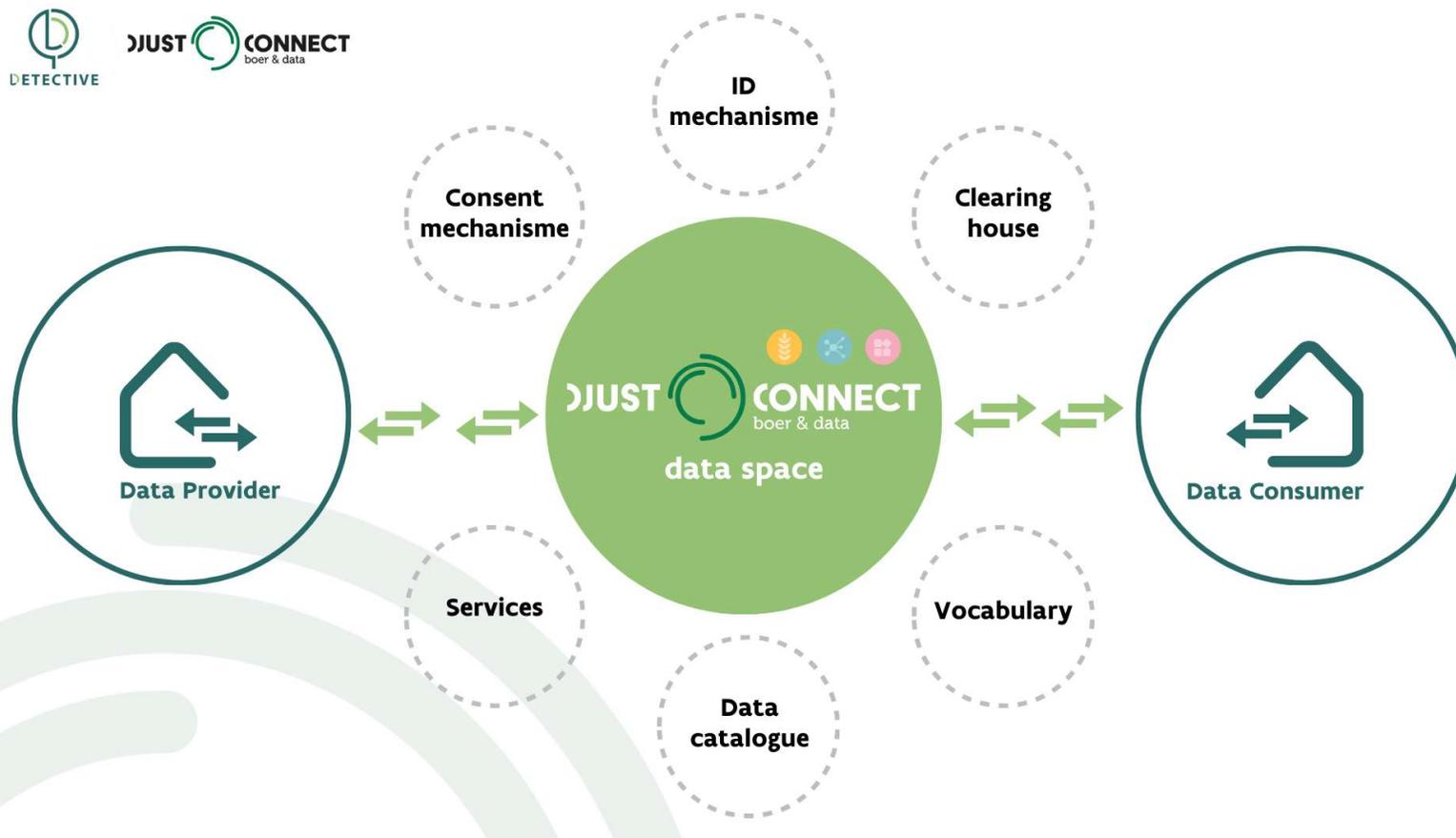
2. Data sharing platform and data space



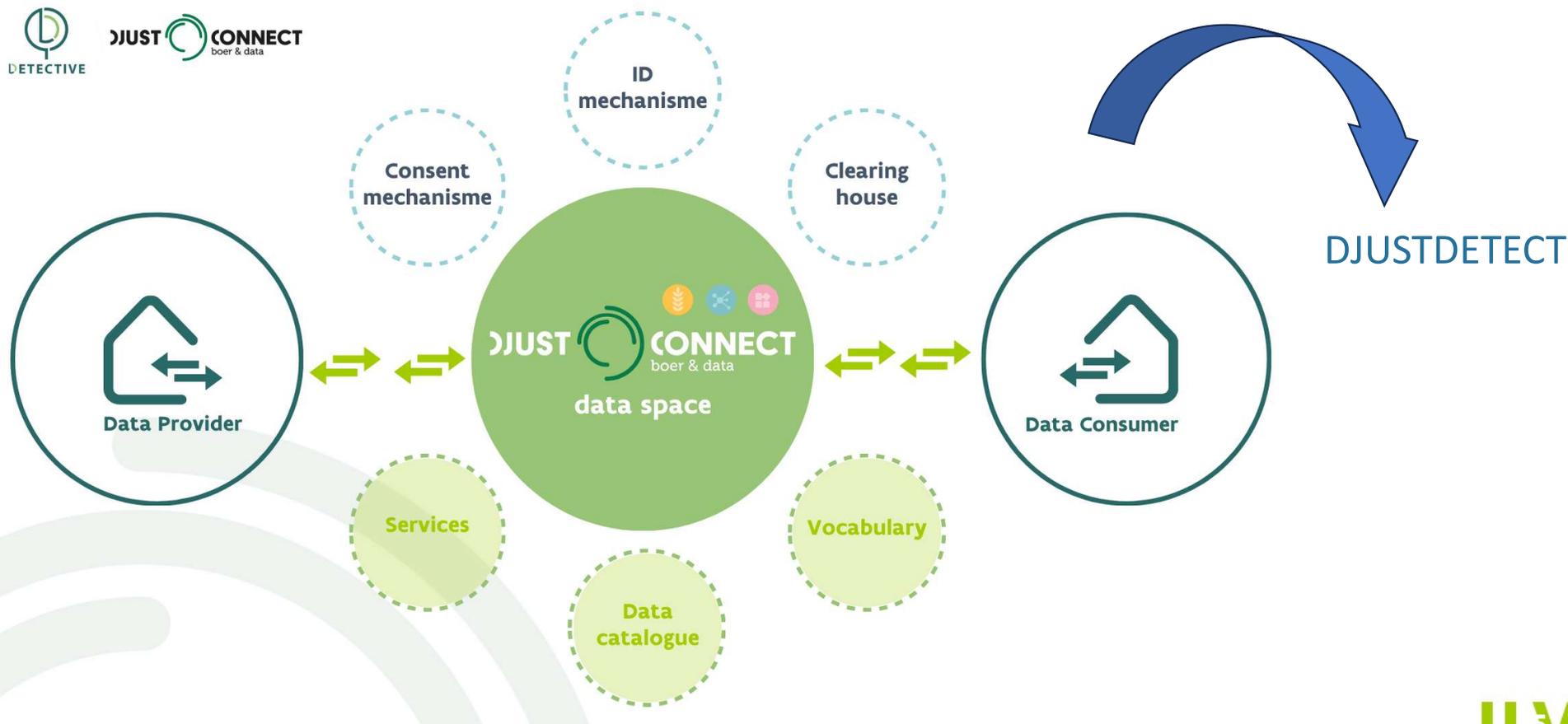
3. Proactive exploration of hypothetical end user scenarios



# Data Space: organisational form



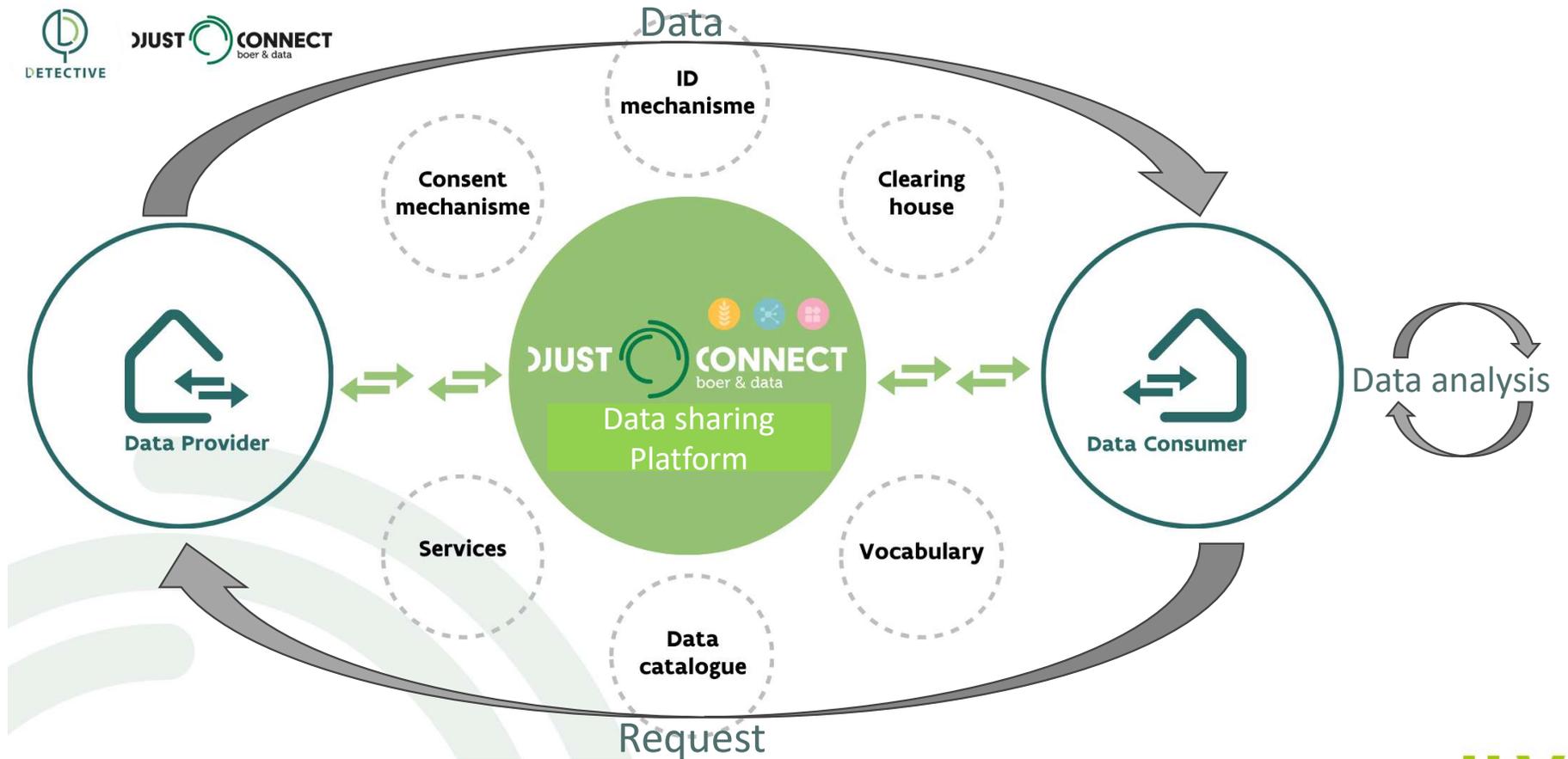
# Data Space: organisational form



DJUSTDETECT

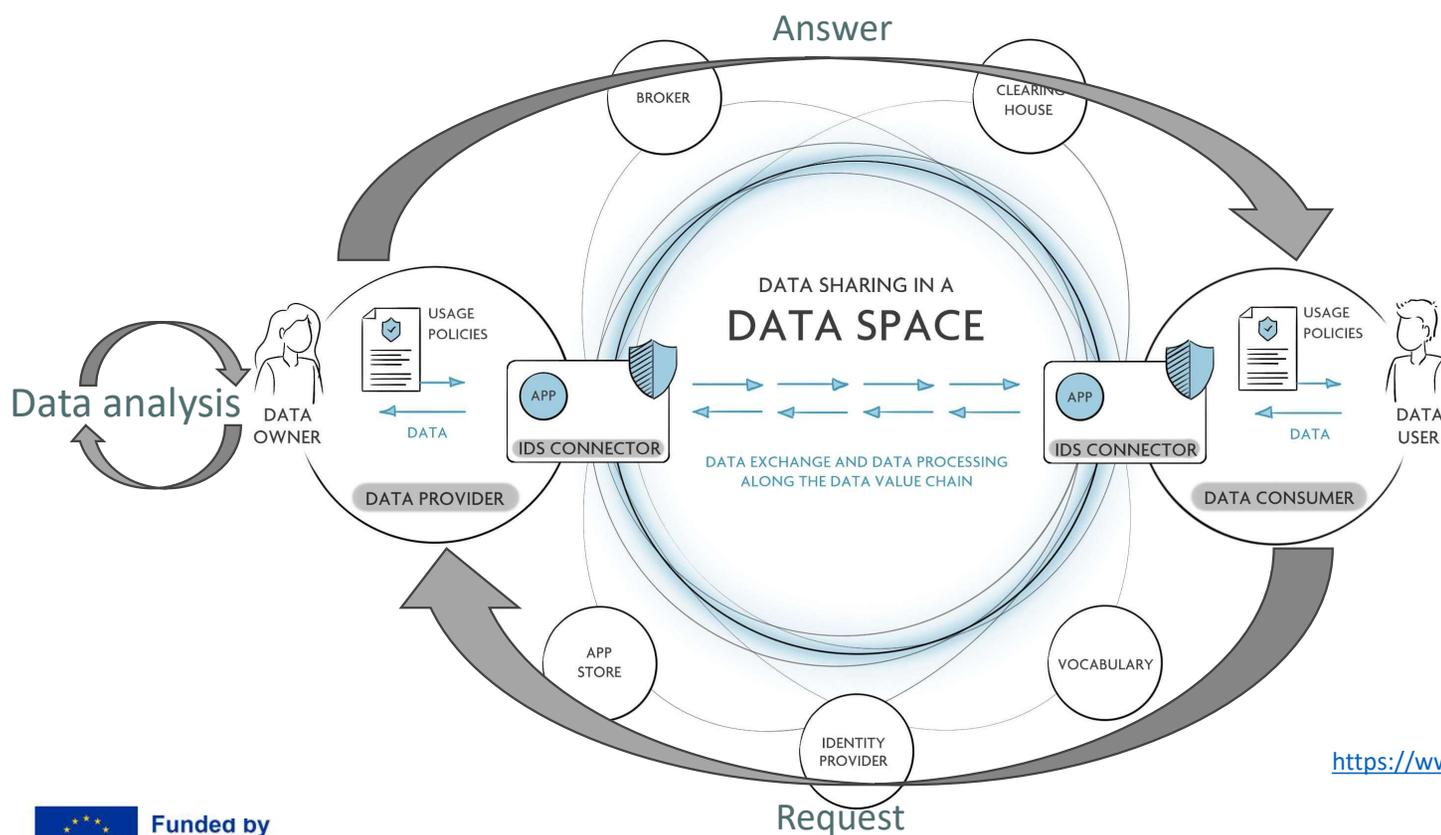
# Status task 4.1 (Building a federated data space structure)

## Data sharing platform (Shareable data)



# Status task 4.1 (Building a federated data space structure)

Data space (Shareable data + controlled use of data without sharing)



<https://www.imec.be/nl/articles/wat-zijn-data-spaces>

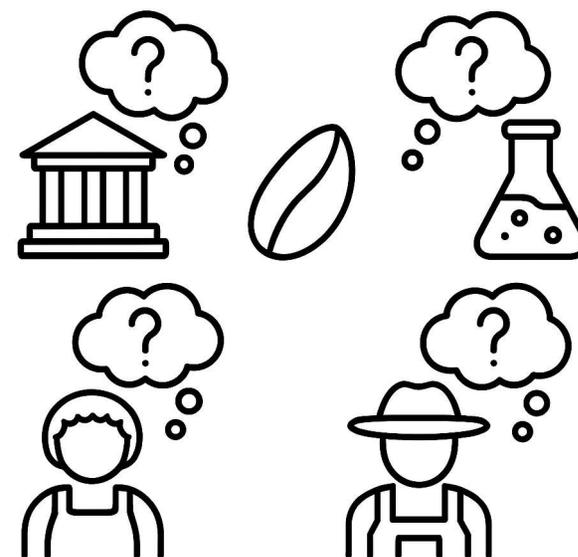
# Hypothetical End-User Scenarios

## Examples of type users (non exhaustive list):

- Governmental Control Agency (FSA)
- Control of seed
- Enforcement Lab
- Food producer
- Farmers

Each having their specific questions and required answers

And may require **Building additional databases (T4.3)**



# Enforcement GMO legislation: sampling +analysis

- **Today:**

- Control plan (yearly)
- Random sampling (inspector)
- Analytical checking of GMO presence
  - Screening
  - Identification
  - Quantification
  - Report
- Interpretation
- Compliance with legislation?
- Action if not (RASFF)

- **Future?**

- Control plan
- Data collecting and sharing, data analysis
- Data driven sampling
- Analytical checking of hypothesis of potential non-conformity
- Yes/No
- Action if not compliant (RASFF)



**SOCIAL**

FOOD SAFETY

ACCESS TO SUFFICIENT, SAFE  
AND AFFORDABLE FOOD

FREEDOM OF CHOICE

**TRANSPARANCY**

**INNOVATION**

ENVIRONMENT



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New detection methods on products derived from new genomic techniques for traceability, transparency and innovation in the food system

HORIZON-CL6-2023-FARM2FORK-01-11





## EUROPE'S CHOICE

POLITICAL GUIDELINES  
FOR THE NEXT EUROPEAN COMMISSION  
2024–2029

**Ursula von der Leyen**

*Candidate for the European Commission President*



## EUROPE'S CHOICE

Campaigning across Europe ahead of this year's European elections was a reminder of what makes our Union what it is. Almost 500 million people with such disparate cultures, complex histories and differing perspectives all coming together at the same time to articulate their wish for an entire Union of 27 countries. In casting their vote they also help to build a shared European identity – all of this bound together by our

[https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648\\_en?filename=Political%20Guidelines%202024-2029\\_EN.pdf](https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648_en?filename=Political%20Guidelines%202024-2029_EN.pdf)

Each Commissioner will be tasked with focusing on reducing administrative burdens and simplifying implementation: less red tape and reporting, more trust, better enforcement, faster permitting.

**Thank you for your attention !**

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