The JRC’s role in agricultural and environmental research

Andrea Hagyo

Joint Research Centre, DG JRC

D.5 Food security Unit

Agriculture & Environment & Climate Team

European Commission

Science for policy

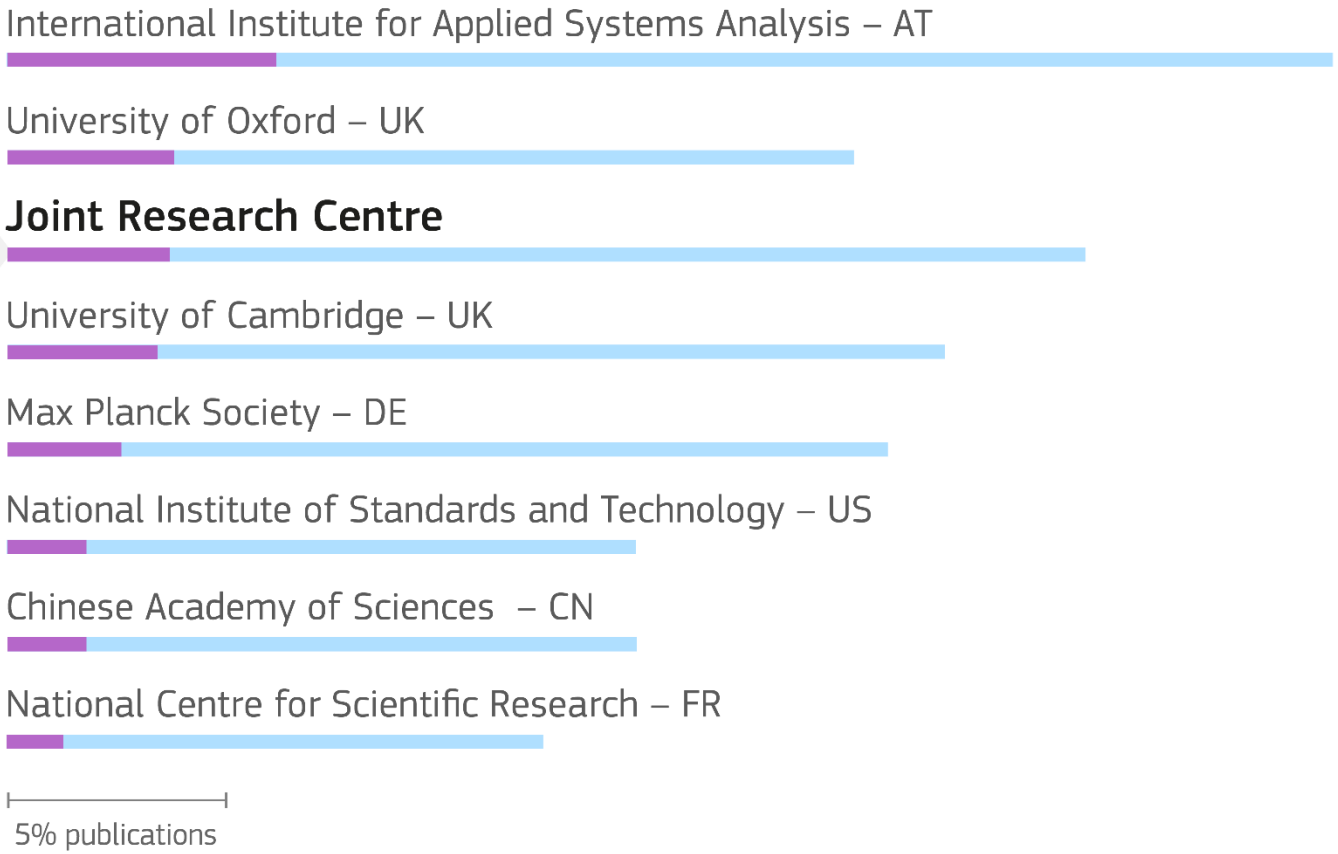
Our purpose

The Joint Research Centre provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society.

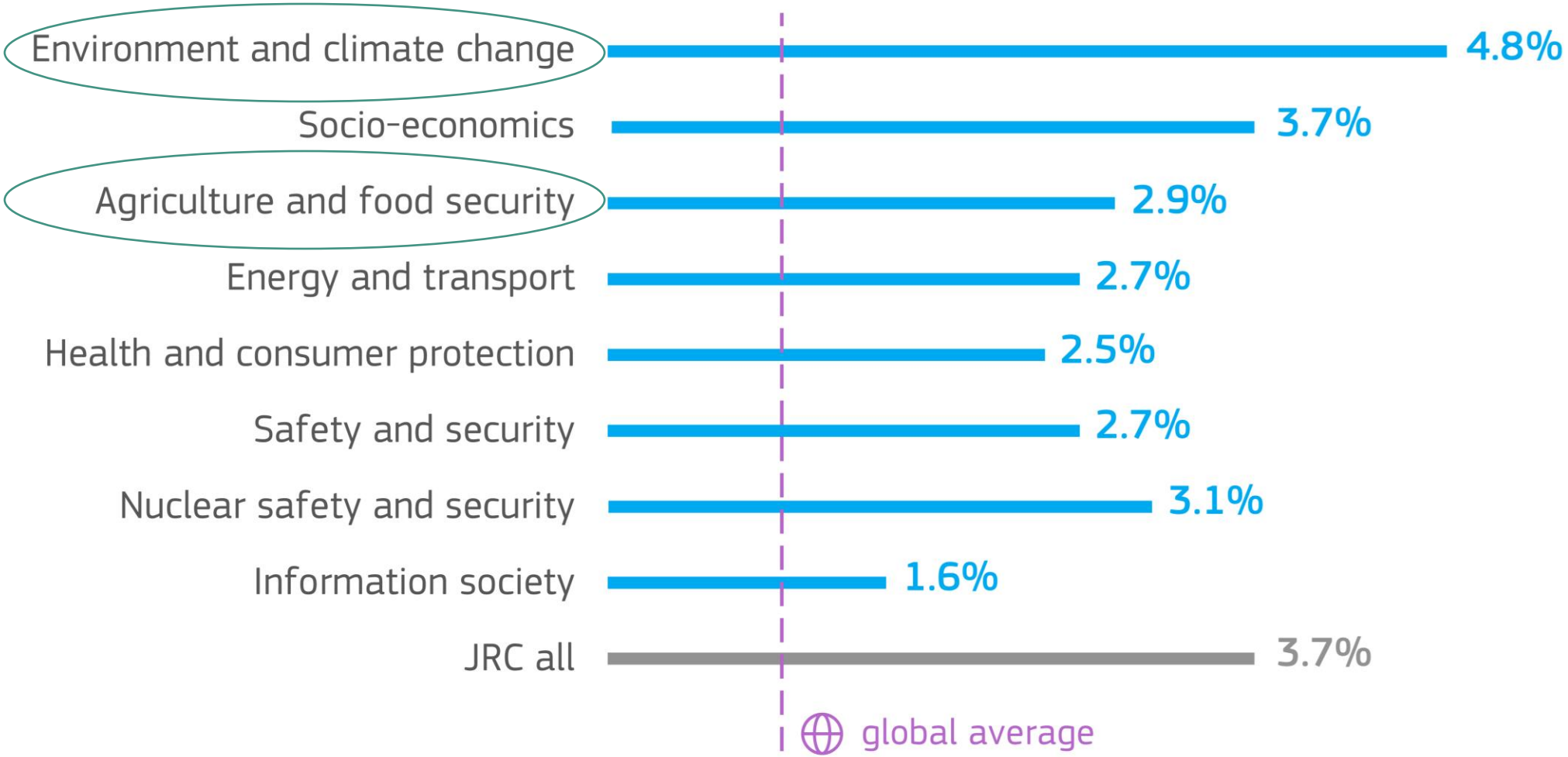
JRC scientific publications

3.7% publications
in the top 1% most
cited worldwide

24.5% publications
in the top 10%



Percentage of JRC publications among the globally most cited 1% (2018-2022)

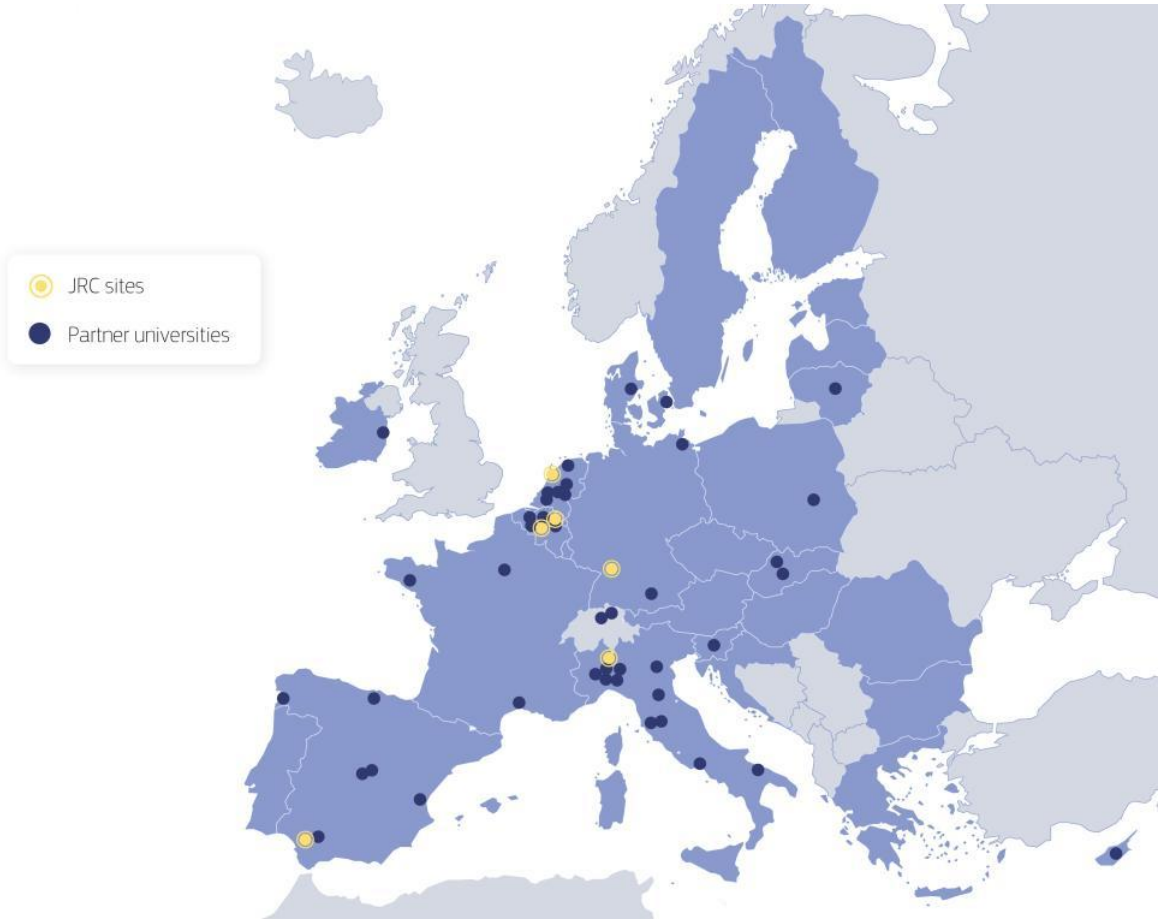


JRC in the Horizon Europe programme

- Non-nuclear **direct actions of the JRC**
  under Pillar II 'Global Challenges and European Industrial Competitiveness'
- **Horizon Europe Work Programme Group**
- Where indicated in the work programme, **JRC may participate as** member of the selected consortium
  Beneficiary with zero funding or associated partner.

- Can contribute with specific **platforms, EU-wide data, models and/or through knowledge centres** e.g.
  KC for Global Food and Nutrition Security
  KC on Earth Observation
  KC for Biodiversity
- Applicants are encouraged to consider possible contribution to JRC platforms.

Collaborative Doctoral Partnership (CDP) programme



Joint doctoral research between Higher Education Institutions (HEI), such as universities, and the JRC

Build and strengthen long-term relationships

[Collaborative Doctoral Partnership (CDP) programme - The Joint Research Centre: EU Science Hub]

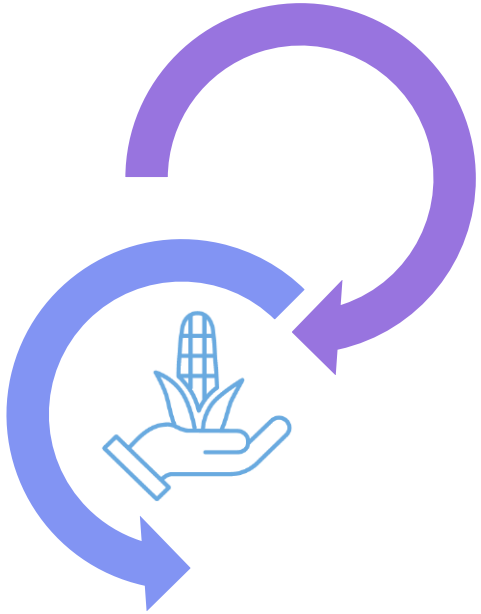
JRC Directorate D - Sustainable Resources

Our mission

to provide independent scientific evidence to support the development, implementation, evaluation and coherence of EU policies in the areas of

- agriculture and rural development,
- international development cooperation,
- environment and climate change,
- blue growth and fisheries,
- the bioeconomy,
- industry and trade.

JRC's agri-environmental research



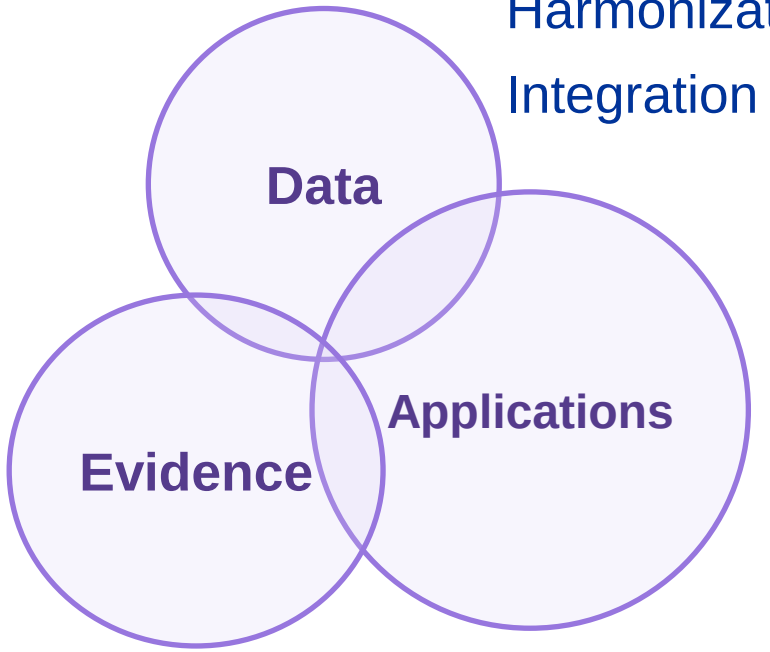
Evaluating the current and future environmental and climatic performance of agriculture

Assessing agricultural production, food security, nutrition and food system sustainability in a European and global context

Production

Harmonization

Integration



Map

Analyse

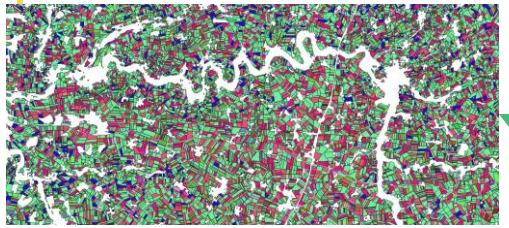
Synthesise

Models

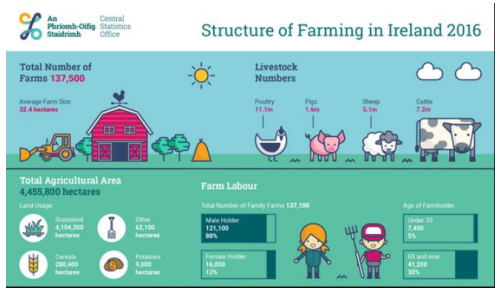
Indicators

Dashboards

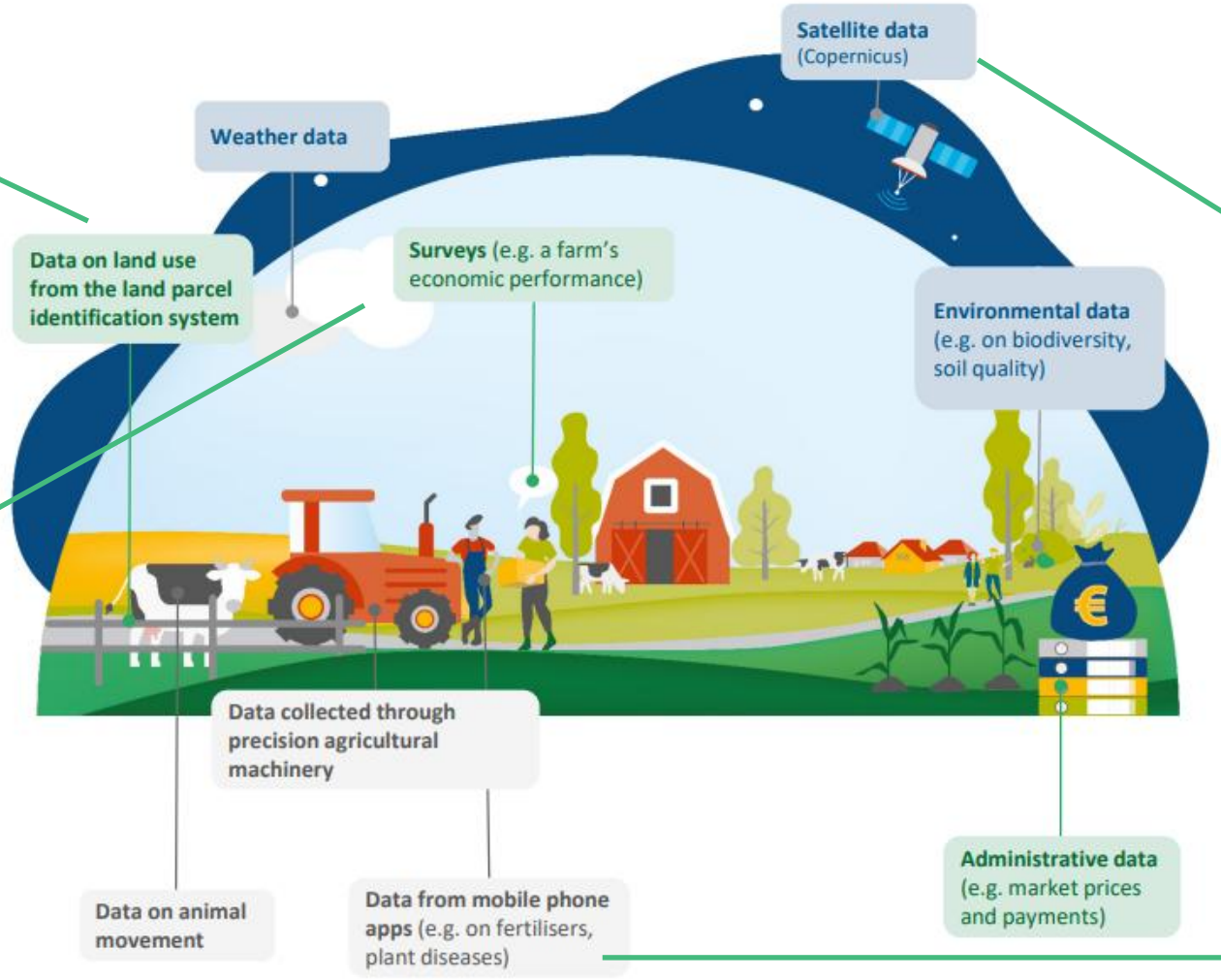
Stats & data collected & created around the farm



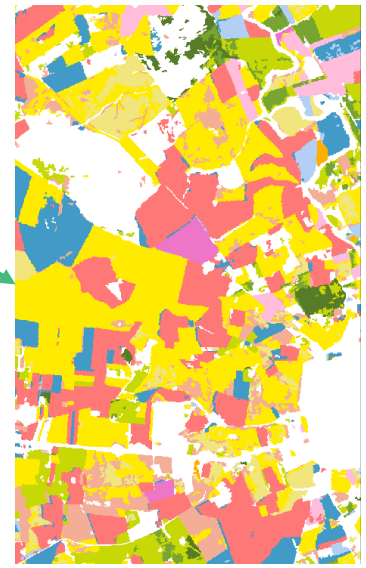
Parcel and holding data - IACS



Farm holding data



Source: ECA.

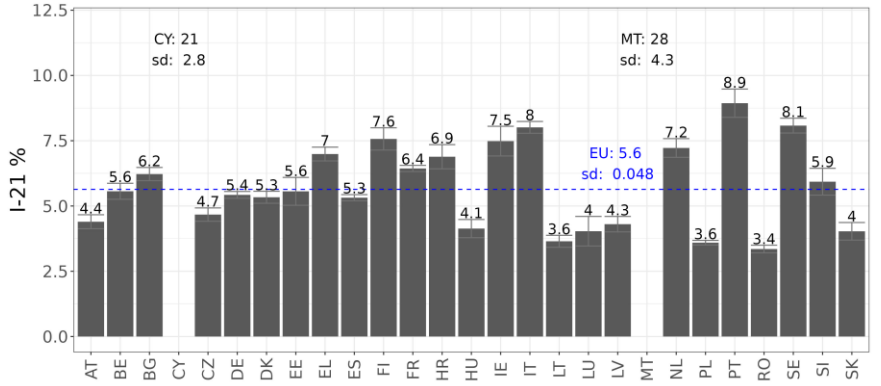


Pixel data

Available, comparable, interoperable, used, fit?

Strengthening EU monitoring schemes

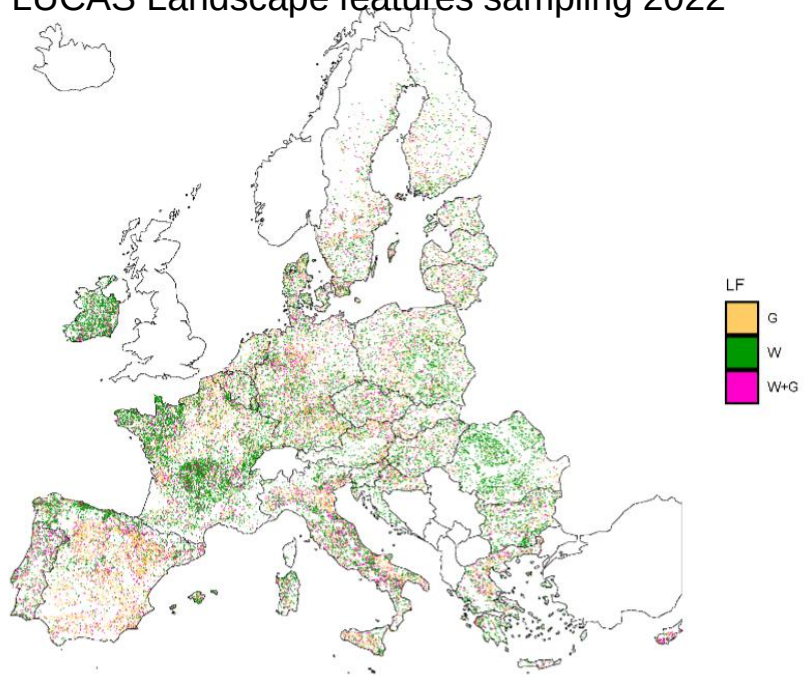
LUCAS: EU's Land Use/ Land Cover Survey



LUCAS Landscape Features

- LF in 93,000 LUCAS quadrats of 100x100m
- Spatial representativeness at MS level (possibly NUTS2)
- Consistent quantification of LFs for the EU and MS level
- Information on different types of landscape features

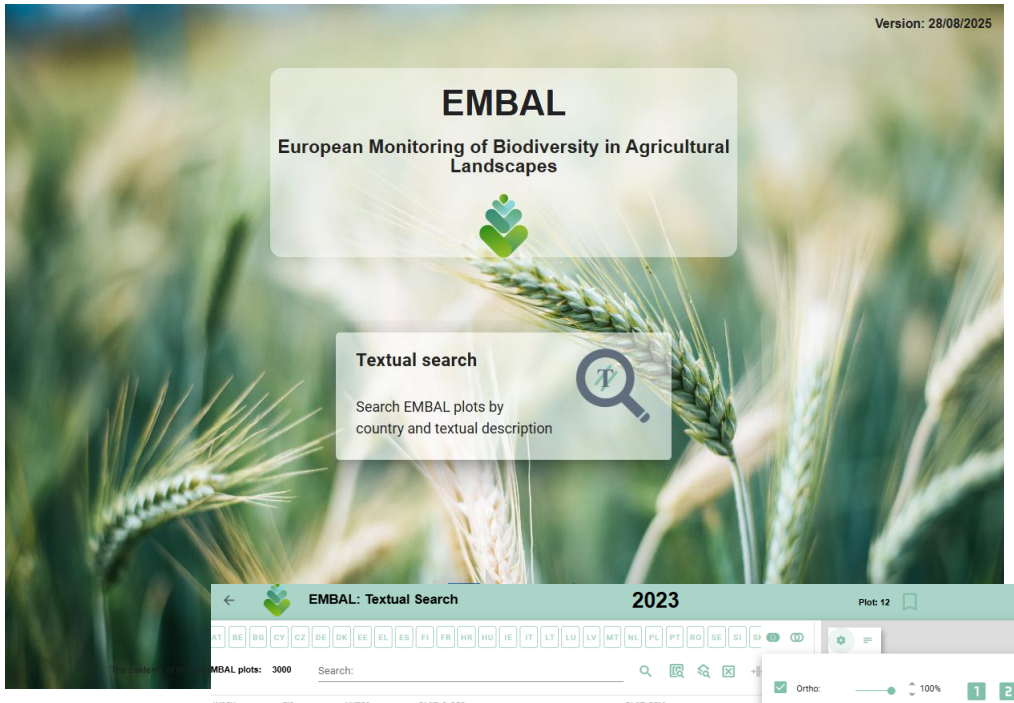
LUCAS Landscape features sampling 2022

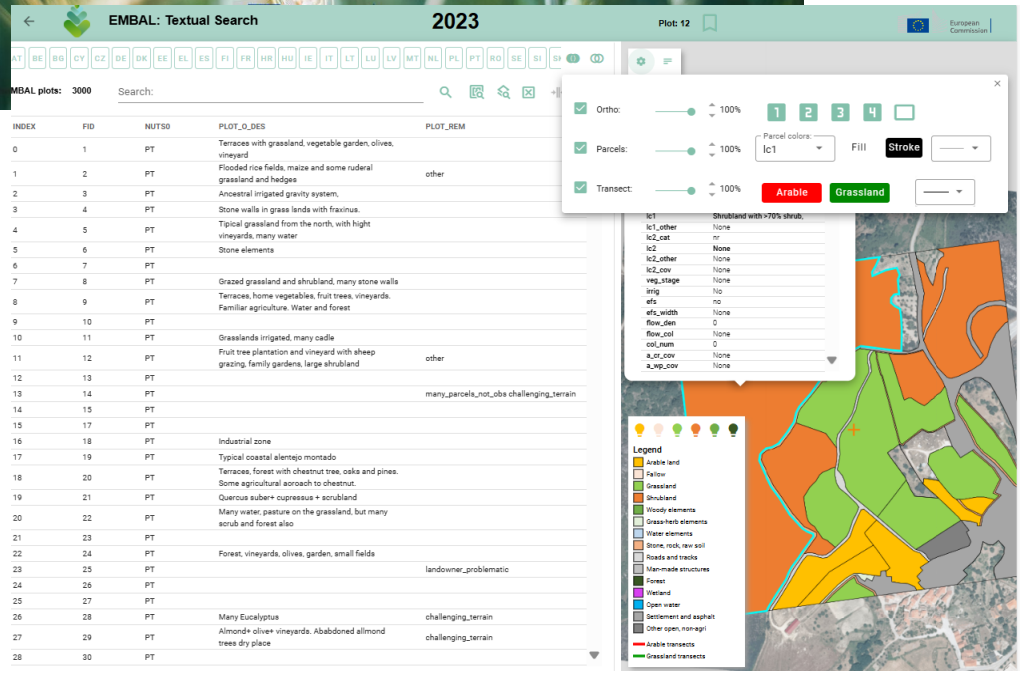


Musavi et al., *in preparation*

Monitoring of biodiversity in Agricultural Landscapes (EMBAL)

- In all 27 EU MSs
- 3000 plots
- 500 x 500 m
- Plot, parcels, transects
- Land cover, landscape elements, habitat types, biodiversity and pollination resources





EMBAL dataset in JRC Data Catalogue

1. Geo-anonymized viewer
   - Access with ECAS account

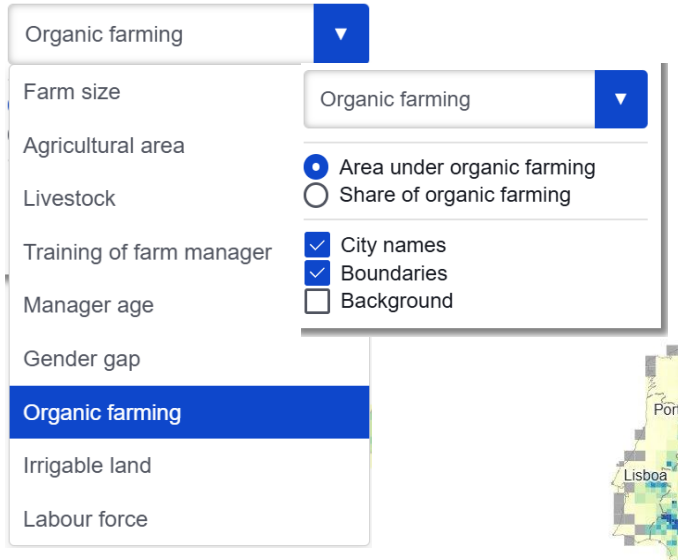
2. Full version with plots, transects, photos accessible after
   - approved research proposal and
   - signature of Confidentiality Agreement

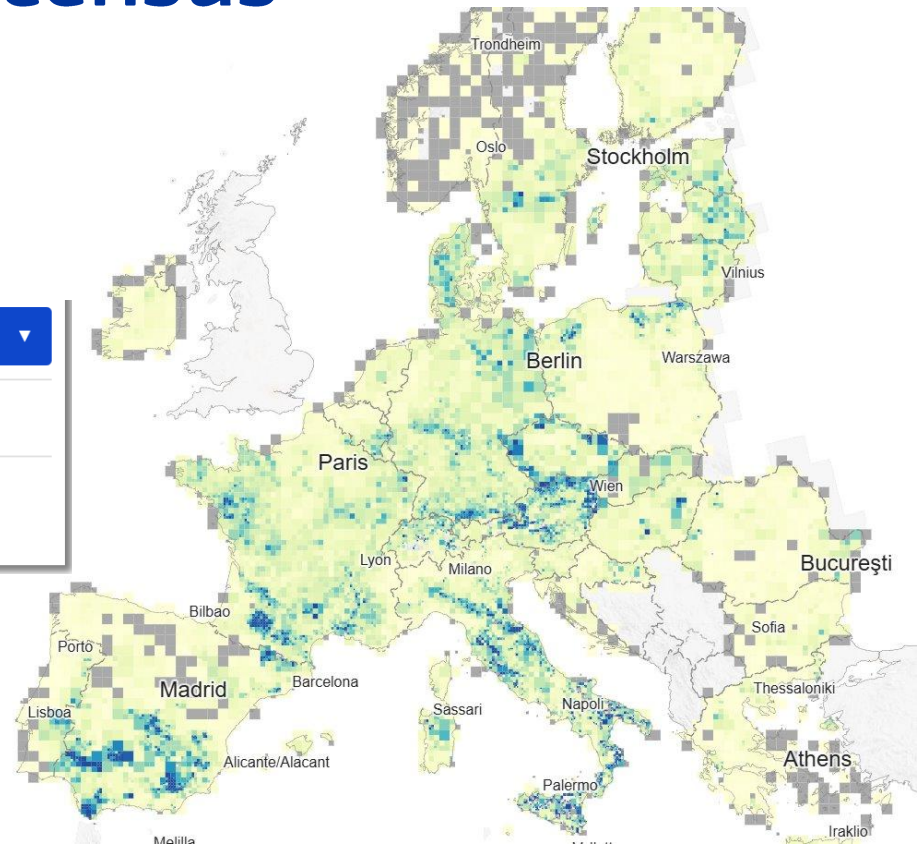
Geospatial data from agricultural census

Spatially gridding the Integrated Farm Statistics

EUROSTAT and JRC

- New method for disclosure control guaranteeing privacy of data
- Multi-resolution grids
  - 1-5-10-20-40-80 km





Skoien et al., *2025* A flexible approach for statistical disclosure control in geospatial data | Journal of Geographical Systems

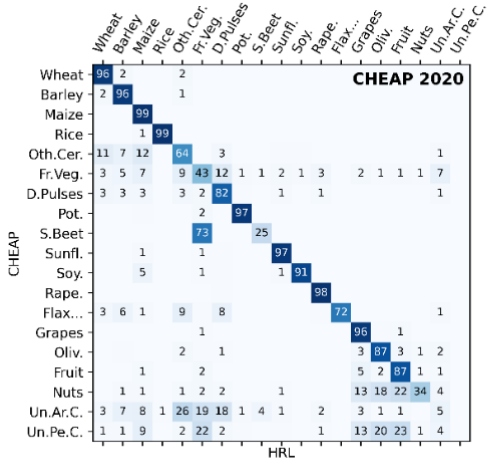
Lampach et al., *2025* ESSDD - Statistical Atlas of European Agriculture: Gridded Data from the Agricultural Census 2020 and the Spatial Distribution of CAP Contextual Indicators

Geospatial data from agricultural census - Experimental statistics - Eurostat

Innovative geospatial agri-environmental monitoring

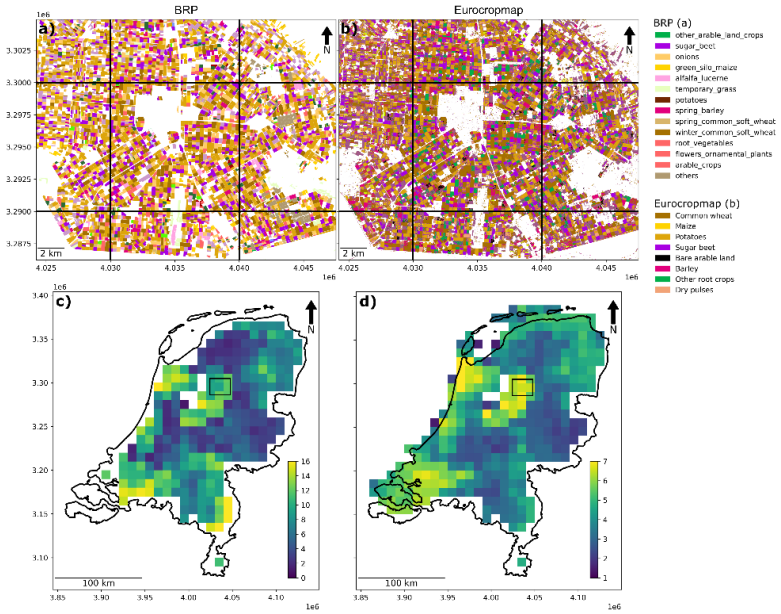
Integrating in-situ observations, statistics, and Earth Observation with advanced analytics

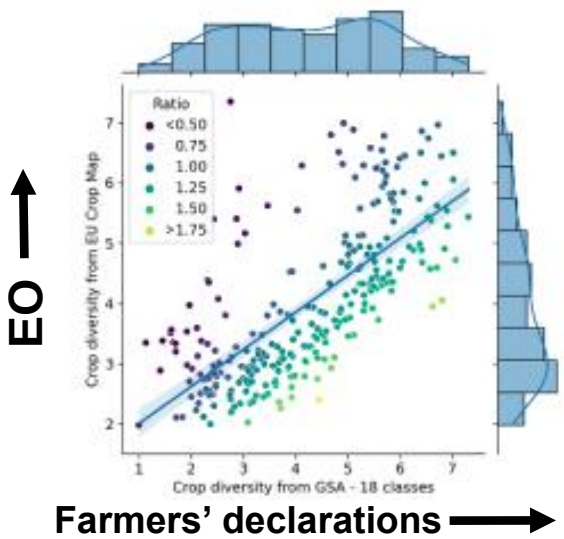
Release, apply, and collaborate to generate EU wide data, analyses and indicators



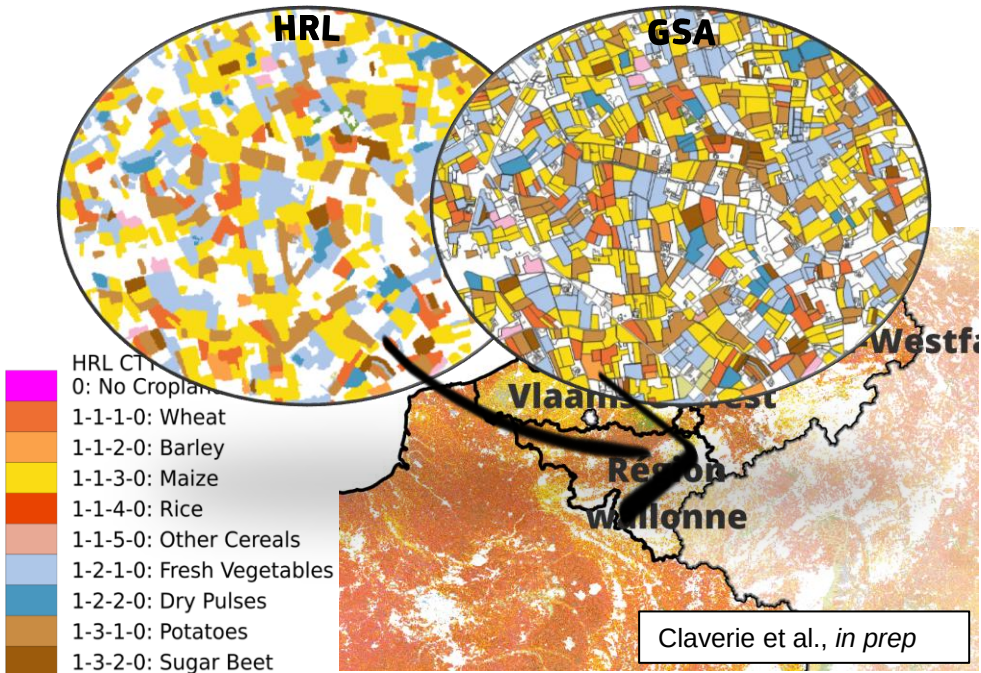
	Over. Acc.	90%
	Area (kha)	F1-score
Wheat	5,000	96%
Barley	3,000	94%
Maize	4,000	96%
Rice	50	-
Oth.Cer.	1000	69%
Fr.Veg.	700	41%
D.Pulses	600	76%
Pot.	500	97%
S.Beet	100	40%
Sunfl.	700	96%
Soy.	200	92%
Rape.	1,000	97%
Flax...	100	83%
Grapes	500	94%
Oliv.	100	85%
Fruit	100	77%
Nuts	20	-
Un.Ar.C.	90	-
Un.Pe.C.	0	-
	macro-F1	86%

Farmers' declarations compared to Earth Observation



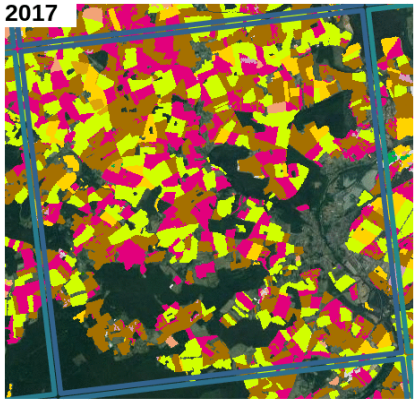


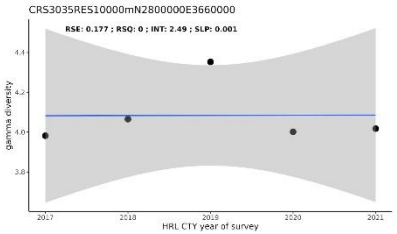
Van der Velde et al., *2025*

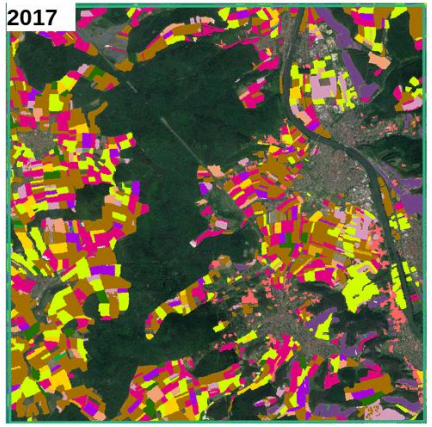


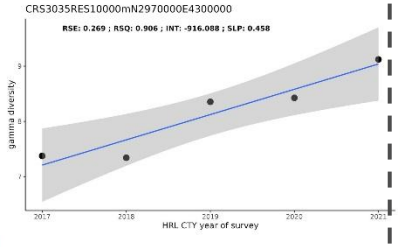
Claverie et al., *in prep*

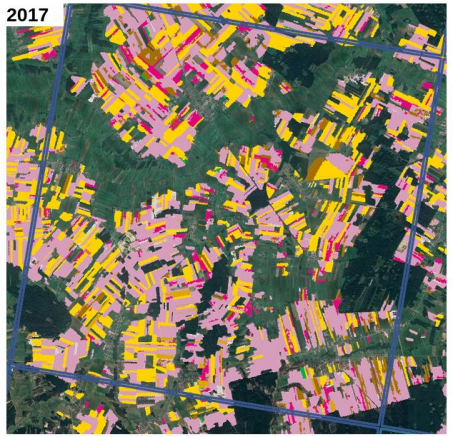
Crop diversity as a time-series

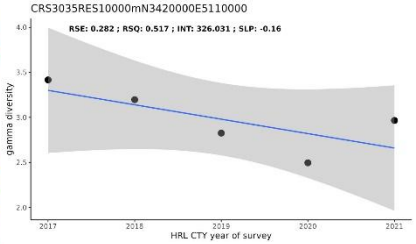


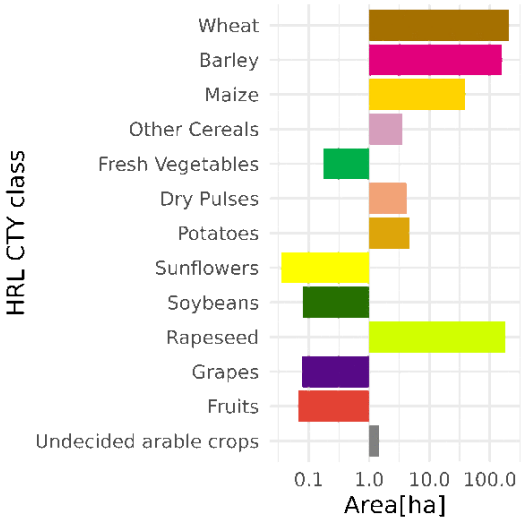




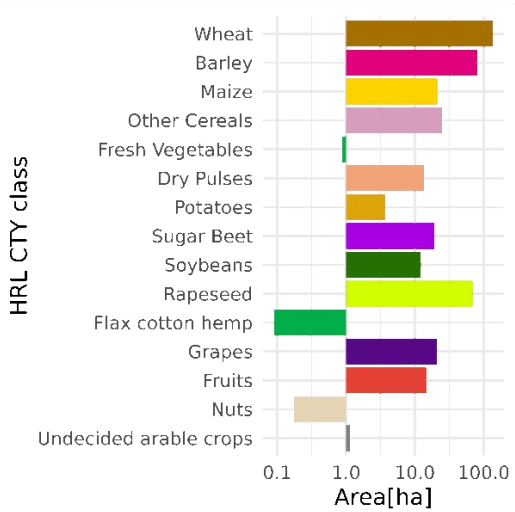




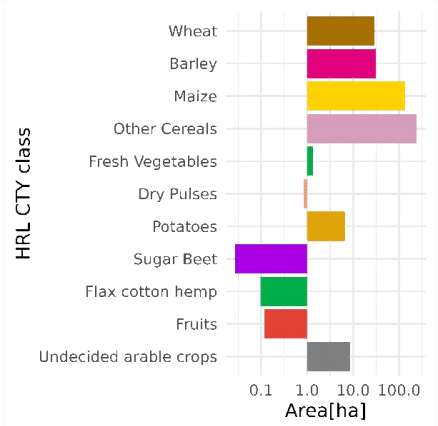




Centre-Val de Loire (FRB0), France



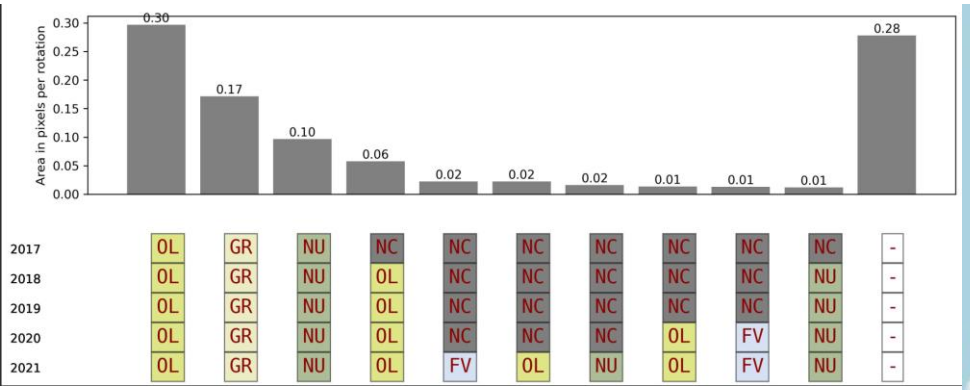
Unterfranken (DE26), Germany



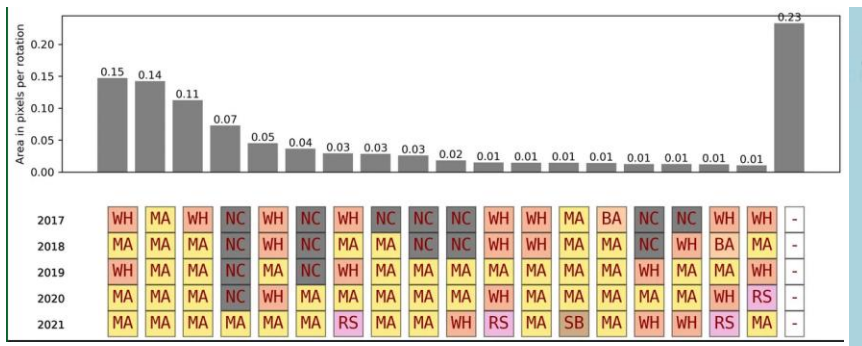
Podlaskie (PL84), Poland

Iordanov et al., *in prep*.

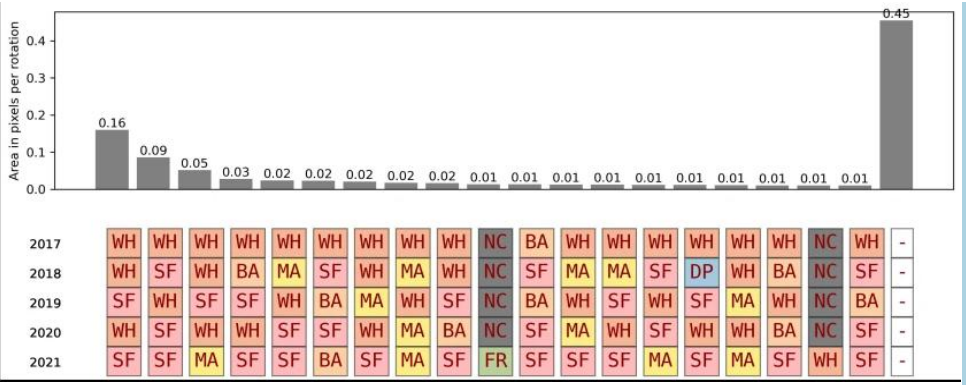
Examples of most common rotations at LAU4

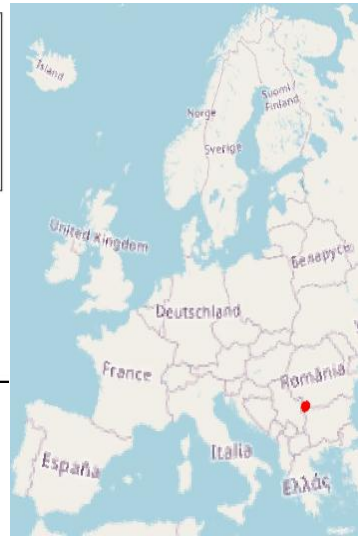


Mainly permanent crops: Olive trees, Grapes and nuts (south of Spain)

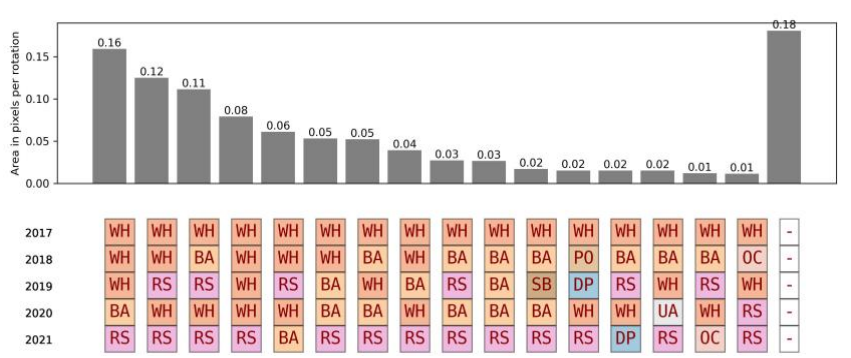


Cereals : Wheat- Maize – Rapeseed (West of France)





Wheat – sunflower –barley (South of Romania)



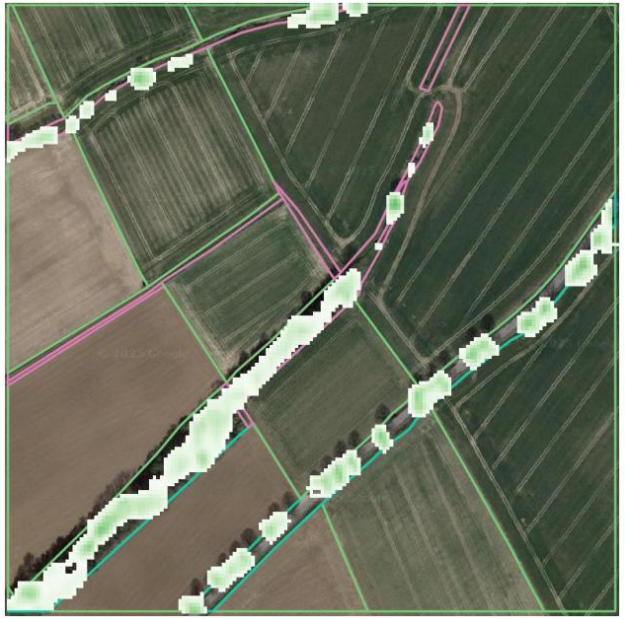
Wheat – barley -rapeseed (North of Germany)

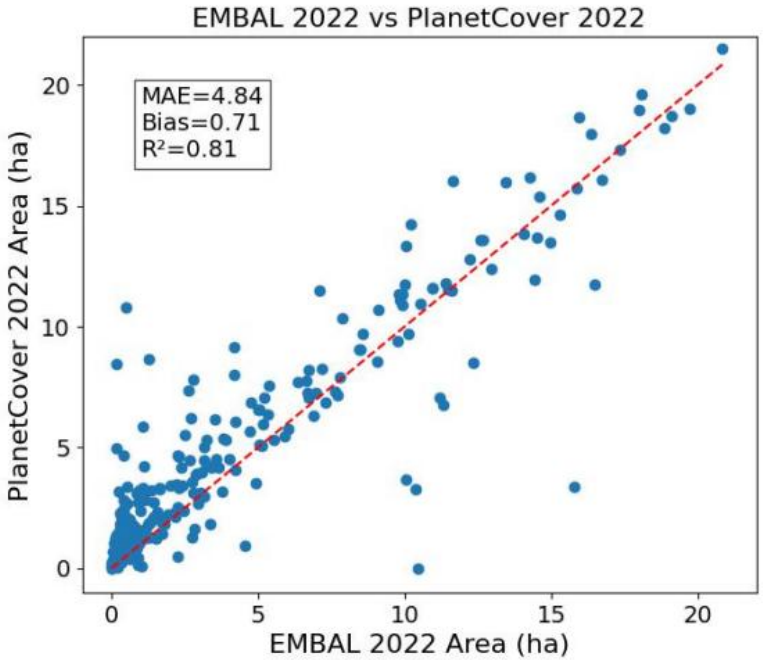
Martinez-Sanchez et al., *in prep*.

Earth observation for improved monitoring of woody features?

- Compare EMBAL data against new EU-wide 3m EO Trees Outside of Forest product (*collaboration with University of Copenhagen*)

- Highly detailed simulations of woody features restoration based on parcel boundaries and Copernicus Small Woody Features (Marcantonio et al., 2025)





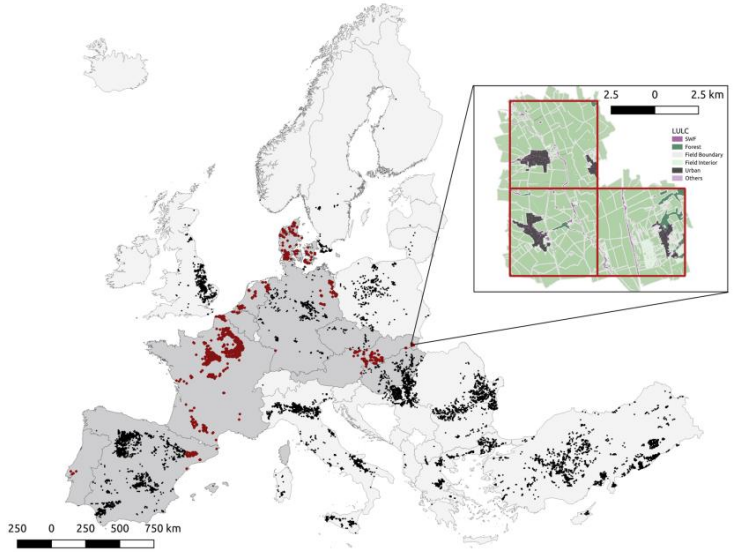


Fig. 1 Overview of the subset of 5 × 5 km grid cells for the 27 EU Member States selected for the simulations. Black cells represent cells with crop surface > 90%, red cells the subset of these cells with GSA parcel boundaries, which are shown (in grey) in the example inset together with the other land use/cover categories. The countries coloured in darker grey are those represented in the final set of cells

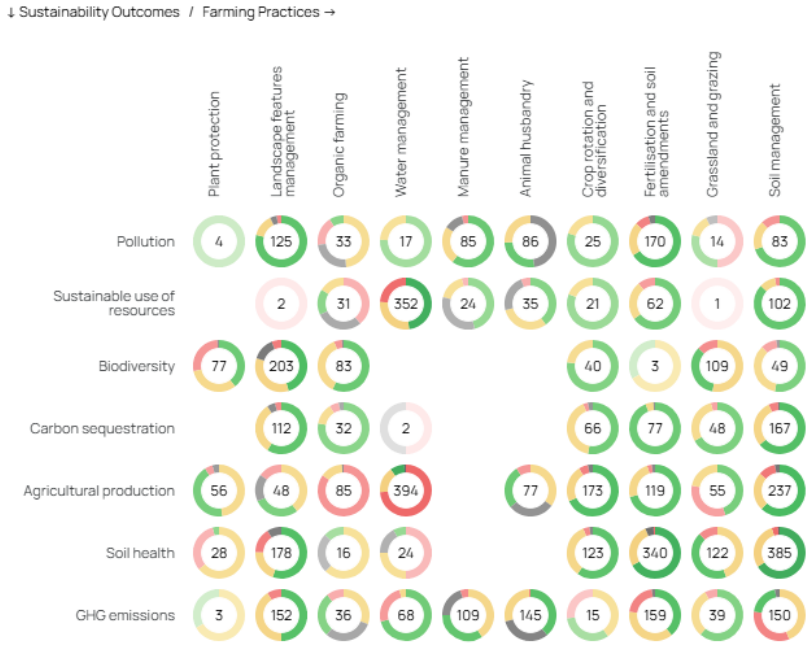
Schievano et al., *2025*

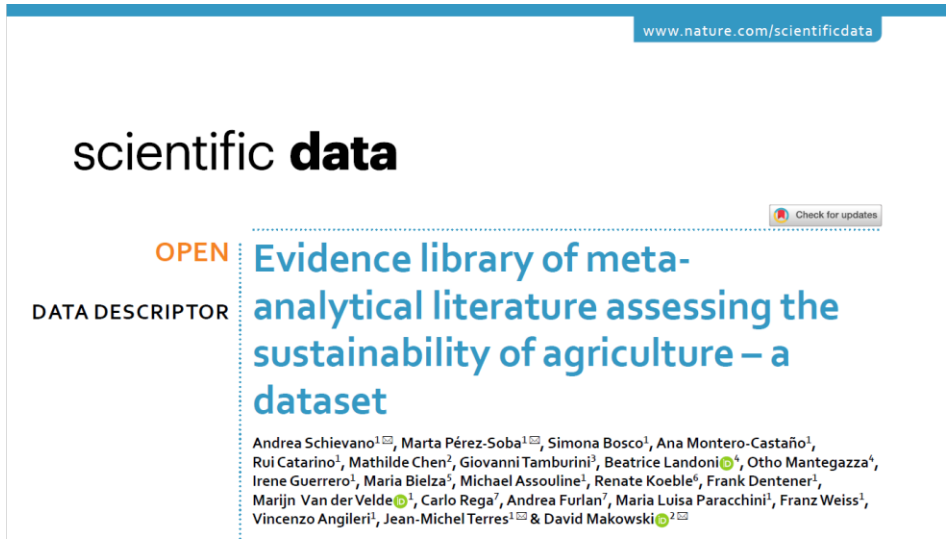
JRC Farming practices Evidence Library

JRC-Farming-Practices dataset (version 2023)

- systematic screening of peer-reviewed meta-analyses
- 34 categories of sustainable farming practices
- 3700 records

The chart illustrates, for the selected combination of classes of practices and sustainability outcomes, the distribution of results showing significant **positive** or **negative** effects, **non-significant** effect or **non-statistically-tested** results. Numbers represent the count of available results.

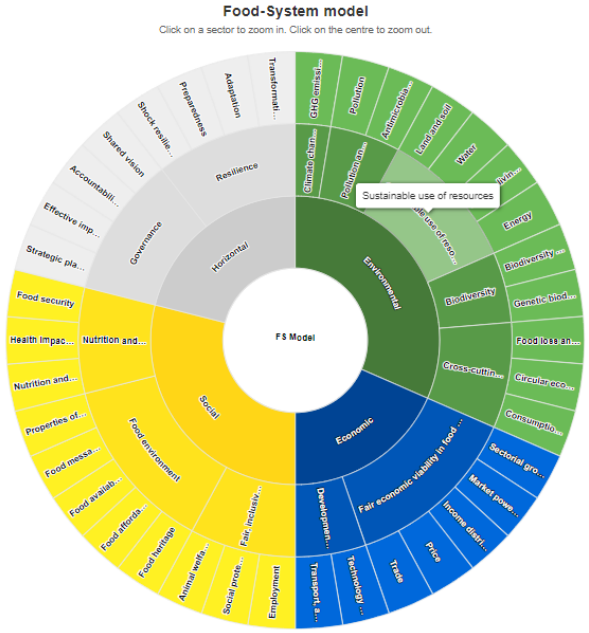


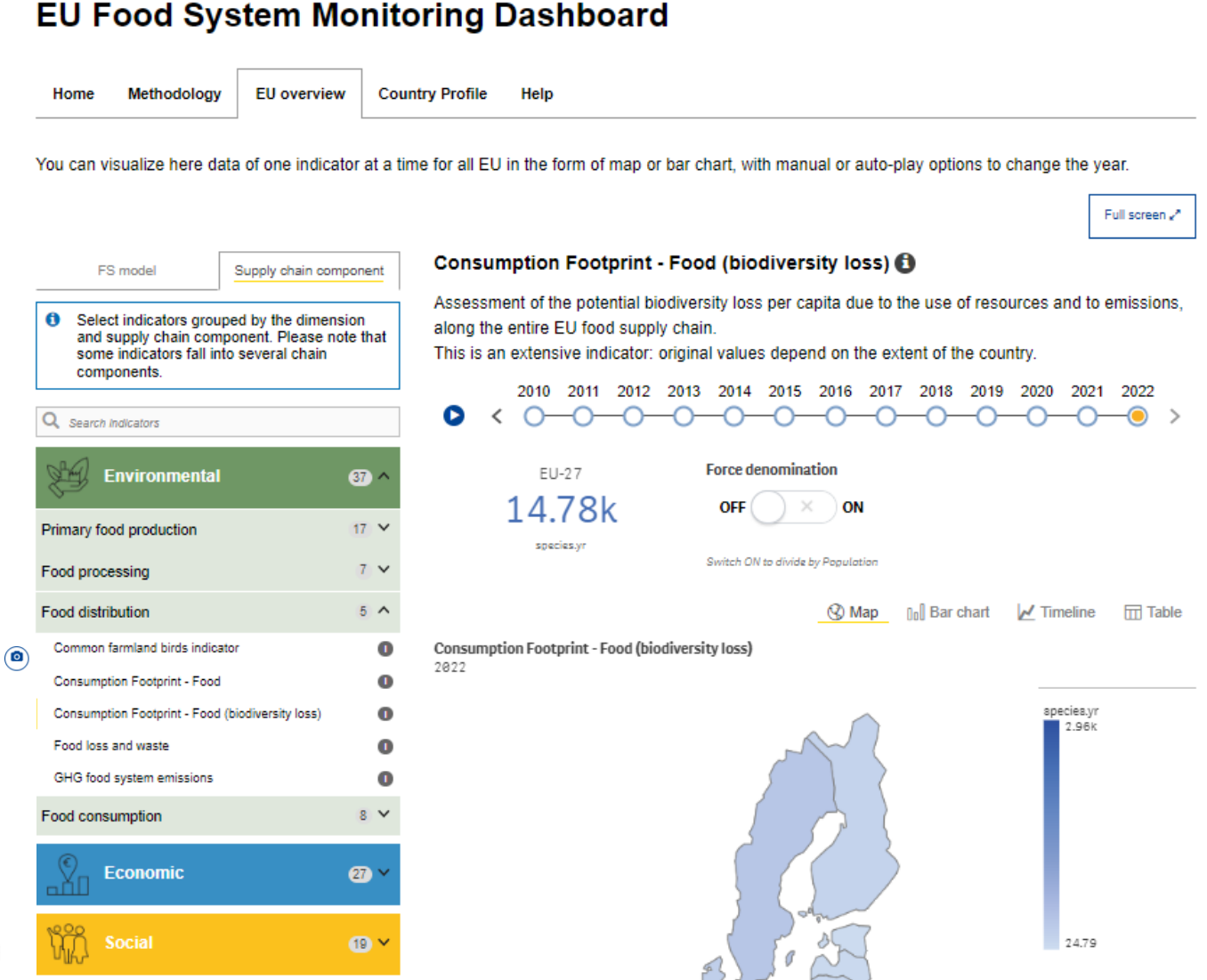


Classification scheme of farming practices

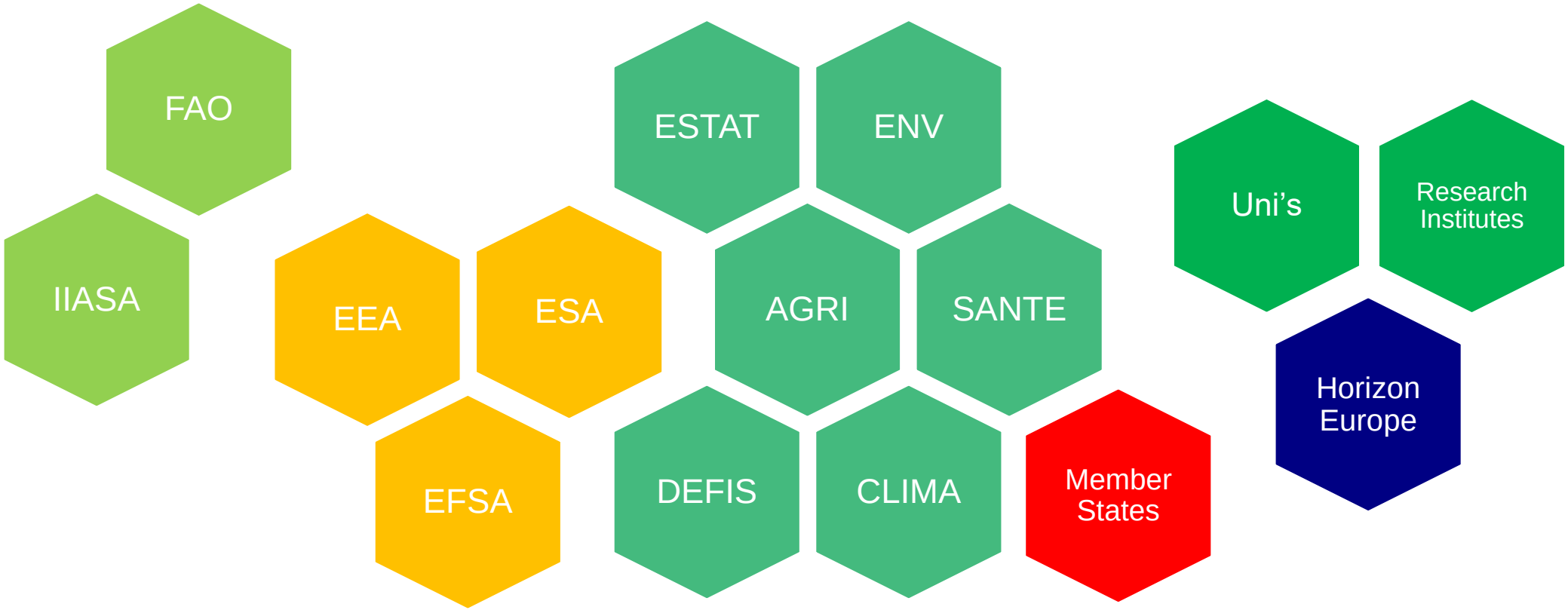
Comprehensive classification scheme to systematise interventions in CAP Strategic Plans

European Union Food System Monitoring





Network and collaboration essential for our work



Cooperation with Horizon Europe projects

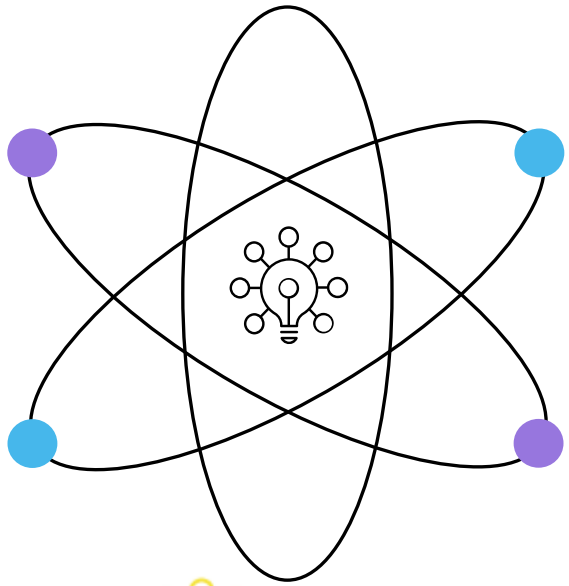
LAMASUS
Land Management for Sustainability

Eco Ready

Achieving Ecological Resilient Dynamism for the European food system through consumer-driven policies

MAMBO

Modern approaches to the monitoring of biodiversity



BIOCLIMA

Improving Monitoring for Better Integrated Climate and Biodiversity Approaches, Using Environmental and Earth Observations

europe LAND

Towards Sustainable Land-Use in Europe

TRANSFORM

Innovating crop rotations for climate-resilient agriculture

Thank you

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