SmartCow: an integrated infrastructure for increased research capability and innovation in the European cattle sector

Topic INFRAIA-02-2017
(Starting Communities)

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Three types of activity in INFRAIA projects

Networking activities

- *harmonizing measurement methods, coordinated data management, joint training activities*

Joint Research Activities

- *improving measurement methods and ethics, developing new methods*

Transnational Access

- *Supporting access to key research infrastructures; developing a more efficient and attractive European Research Area*

Concept of SmartCow

Strategic aim: Efficiency and innovation by integrating key research infrastructures

Challenges and cross-cutting issues

- Efficient use of biomass – Food security
- Sustainable competitiveness of livestock systems
- Healthy livestock for healthy diets and people

Improving infrastructure for research and innovation

Solutions

- Networking Research Infrastructures to improve research practices
- Improving quality and ethics through new research methods
- Offering wider access to the most advanced research tools

Specific challenges for an infrastructure in agricultural science

- **In comparison with many fields, challenges due to:**
- Scale and cost of the work – but this is also a driver to use facilities more effectively (improve methods and share resources)
- Regional variation across Europe (agro-climatic zones, feeds, animal breeds, speciality products)
- Lack of common terminology

Networking activities

- An **interactive map** of national and regional facilities
- **Inventory** of cattle databases and samples banks
- A **cloud-based data platform** to gather and share data
- Publication of **protocols** for research and routine data recording
- An improved **trait ontology** (animal and environment)
- Effective ongoing **dissemination and knowledge transfer**
- Developing **co-ordinated training** across the sector

Joint research activities

- **Refining methods** in the field of nutrient efficiency and emissions
- Development of proxies (biomarkers) and **non-invasive methods**
- Development of a multivariate approach to phenotype behavioural, health and feed efficiency traits based on **sensor data**

→ ***Implementation of 3R principles (Replace, Reduce, Refine)***

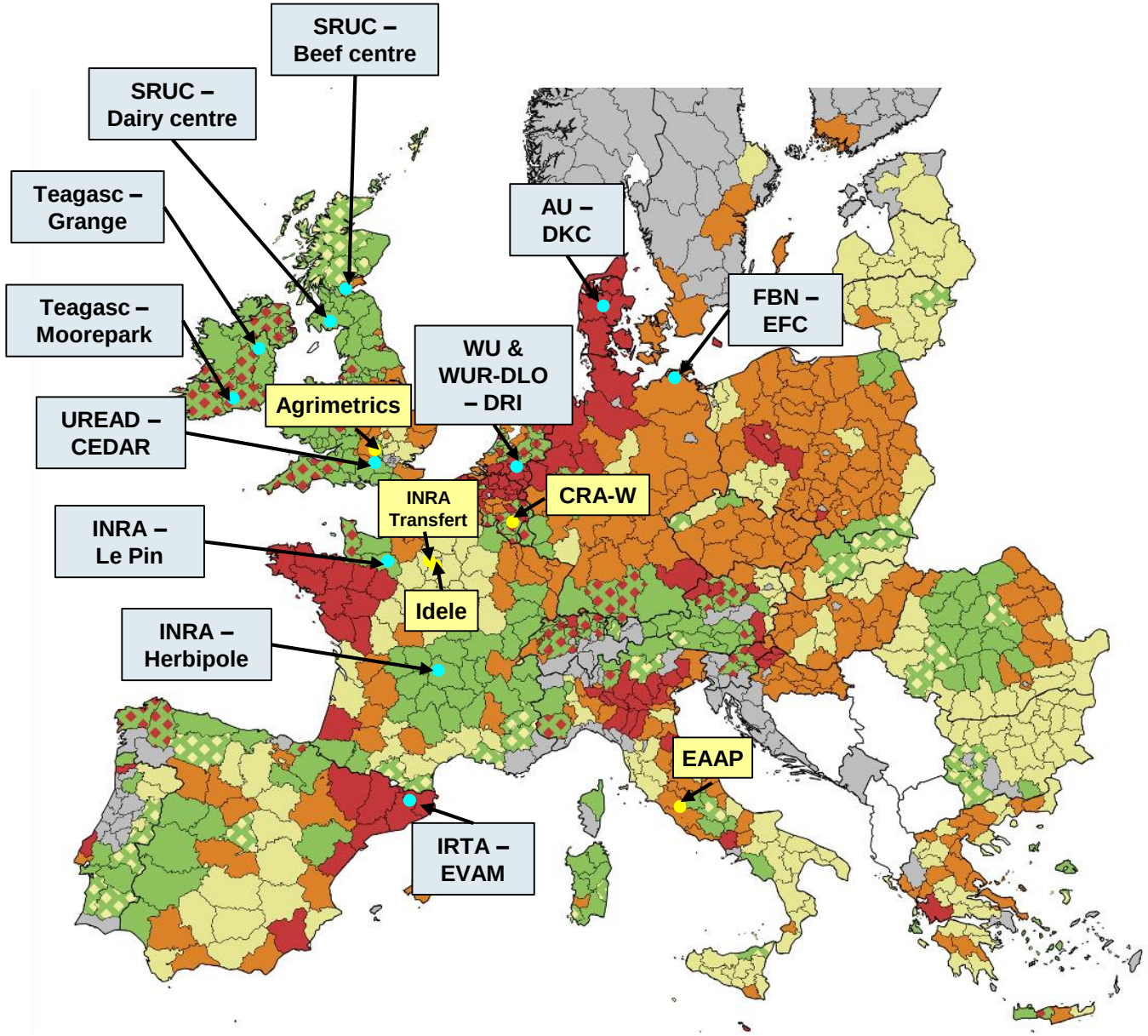
Transnational Access

- **Access to 20 European research installations**
  - Around 2,500 dairy and 1,000 beef cattle
  - Diversity of breeds and environmental conditions
  - High quality measurements (feed efficiency, emissions, digestion, metabolism…)

- **Budget ≈ 1.5 M€ : supporting around 30 experiments**
  - Call for access and project selection run within the project
  - Two types of experiment:
    - Focusing on animal performance and trade-offs between functions
    - Investigating underlying digestive and metabolic processes

Conclusions

- High-throughput phenotyping of farm animals is still in its infancy
- SmartCow is a first step towards the integration of Research Infrastructures for the European cattle sector
- Integration is necessary to develop more efficient approaches to address climate change, environmental issues and societal concerns, using:
  - A common language, the best standardized techniques and data sharing
  - With the full range of genetic (breeds) and environmental diversity across Europe



Thank you for your attention

- **High livestock density areas**
- **Mixed crop and livestock areas**
- **Grass-based livestock areas**
  - *Grass-based with high livestock density*
  - *Grass-based with medium livestock density*
  - *Grass-based with low livestock density*
- Low livestock density
- Not considered

Classification of livestock farming systems areas in EU after Dumont, Dupraz et al (2016) in "Roles, impacts and services provided by livestock in Europe (INRA collective expertise)"