

SmartCow: a project aimed at improving phenotyping capacity across cattle research infrastructures in Europe

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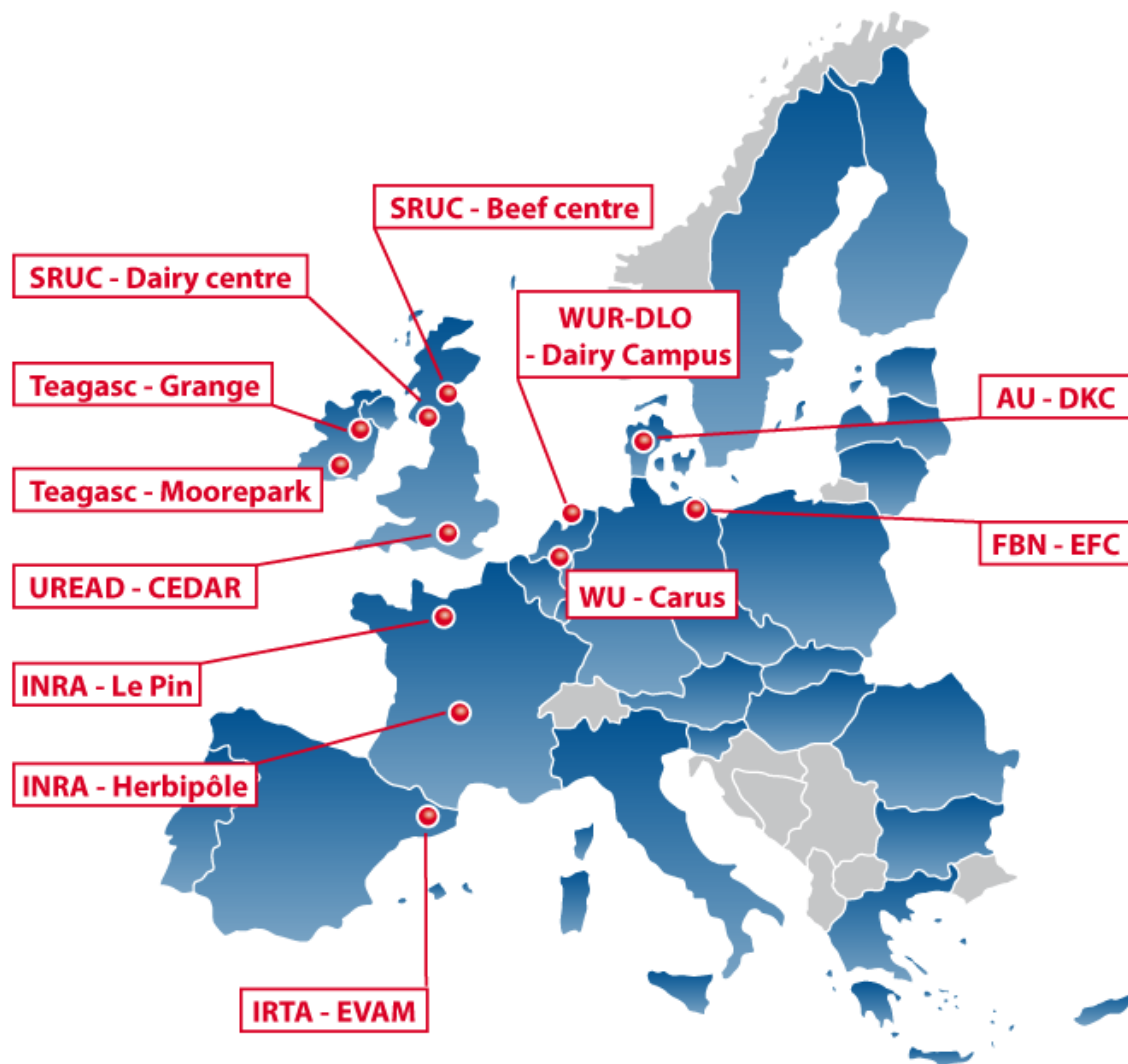
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Concept of SmartCow

- Better coordination of research infrastructures (RIs) in the cattle sector is necessary to develop more efficient approaches to address the various challenges in cattle breeding and research
- SmartCow is a first step towards the integration of RIs for the European cattle sector, developing:
 - A common language, the best standardized techniques and data sharing
 - Improved and new methods to enhance phenotyping of new and more complex animal traits
 - With the full range of genetic (breeds) and environmental diversity across Europe

14 partners across Europe



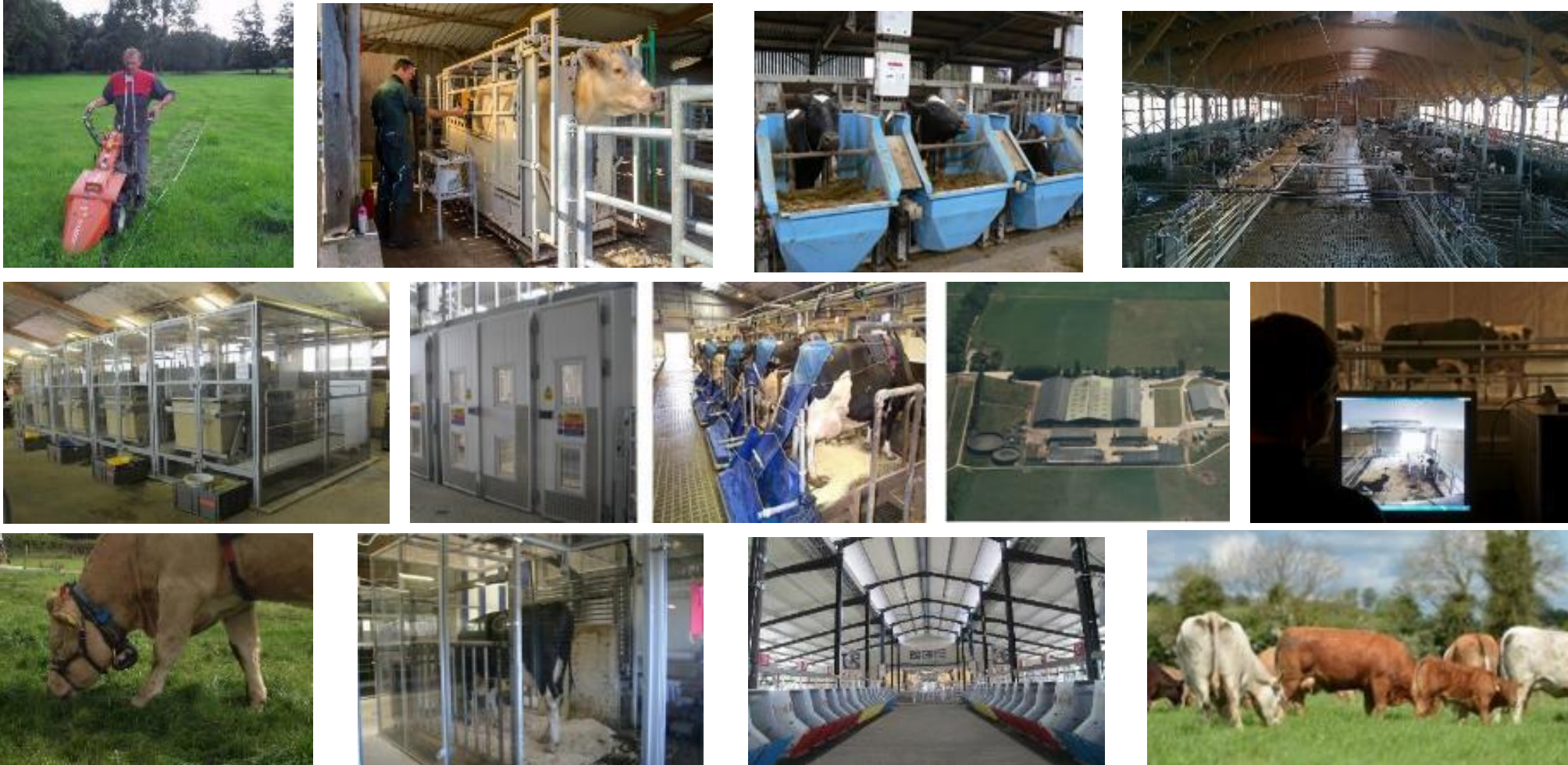
9 partners that bring Ris

- 11 major RIs distributed in 7 EU countries
- 12 locations, which include 18 installations
- 2500 dairy and 1000 beef cows

5 other partners for specific skills

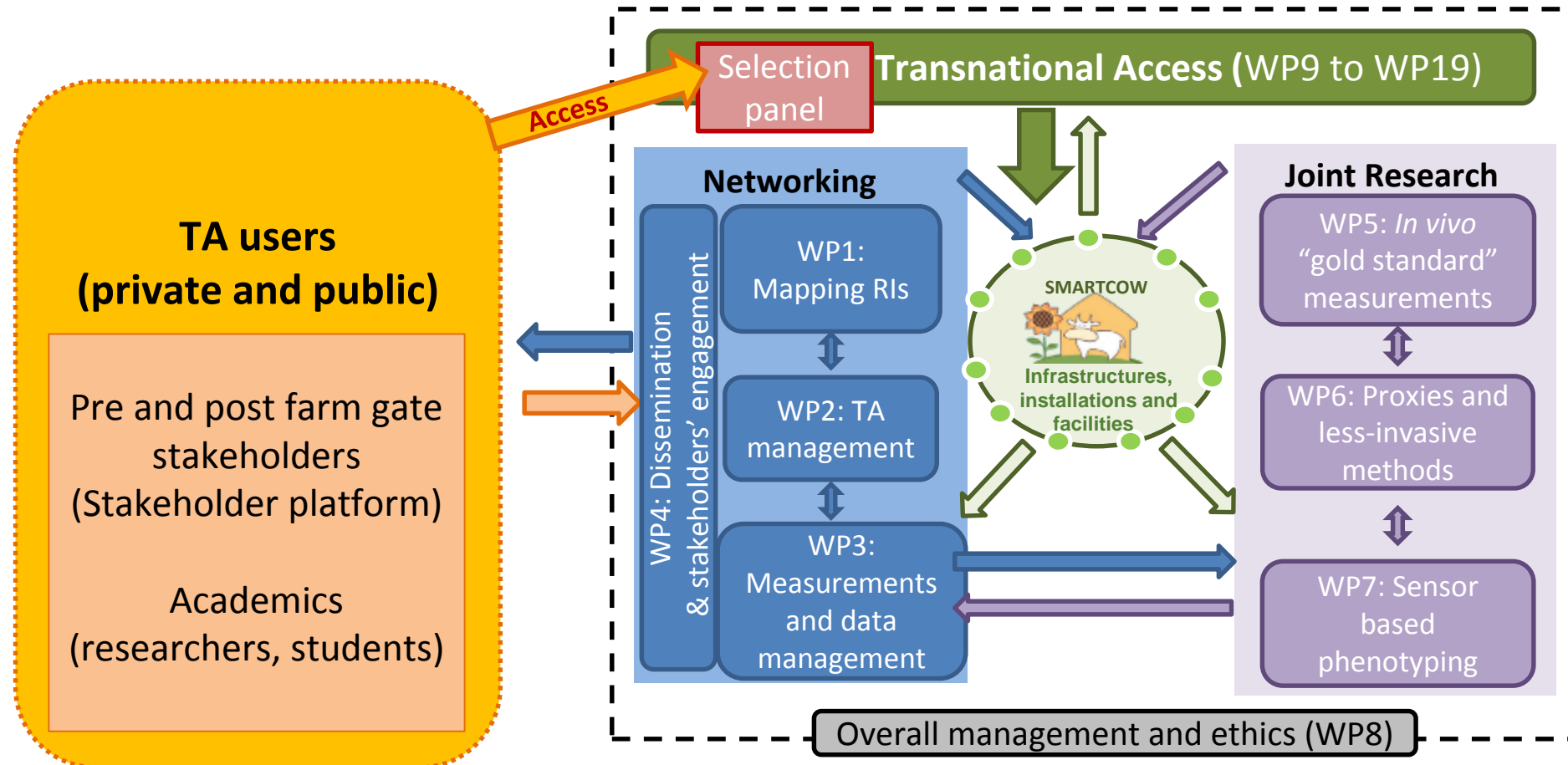
- Agrimetrics : Cloud based data-platform
- CRA-W : NIR and MIR techniques
- Idele and EAAP: Dissemination and stakeholders
- INRA Transfert: Project management

A large range of measurement capabilities in nutrition, physiology and behaviour



ICAR Conference, Interbeef Working Group, Prag, 17-21 June 2019

SmartCow WPs organisation



How will SmartCow improve phenotyping capabilities?

- Inventory equipment and related techniques
- Inventory of animal databases and sample banks
- Develop unified guidelines for specific measurements (book of methods)
- Improve the animal trait ontology for cattle (ATOL and EOL)
- Develop a cloud-based data platform to gather and share data
- Refine methods in the field of nutrient efficiency and emissions
- Develop proxies (biomarkers) and non-invasive methods
- Develop a multivariate approach to phenotype behavioural, health and feed efficiency traits based on sensor data

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

ICAR Conference, Interbeef Working Group, Prag, 17-21 June 2019



Book of methods in cattle physiology *(led by Björn Kuhla & Sadjad Danesh Mesragan)*



- Metabolic, digestive, anatomic, behavioural traits
- Mostly Innovative and/or minimal invasive tools/instruments
- Links with animal trait ontology (ATOL www.atol-ontology.com)
- Avoiding duplicates and taking ICAR guidelines in consideration



For each method:

- Pre-requisite
- Preparation
- Recording
- Validation (if necessary)

Publication of the book planned beginning 2021

Evaluation of proxies to predict feed efficiency and its determinants in cattle

(led by Cécile Martin, Gonzalo Cantalapiedra and Frédéric Dehareng)

To identify their **range of applicability** across **diets** and **individuals**

Parameter (GSM)	Proxies	Matrices	Status
<ul style="list-style-type: none">• Total tract digestibility• N partitioning• Animal feed efficiency	<ul style="list-style-type: none">• NIR• Urea-N; 15N natural abundance• Urea-N; 15N natural abundance• Metabolites	<ul style="list-style-type: none">• Faeces• Milk, blood, Urine, faeces• Blood	<ul style="list-style-type: none">• Solid• New
<ul style="list-style-type: none">• CH4 emission• VFA, ammonia, pH (rumen)	<ul style="list-style-type: none">• MIR• NIR• MIR• Volatile metabolome	<ul style="list-style-type: none">• Milk• Faeces• Milk• Breath gas	<ul style="list-style-type: none">• Solid• New

- **Creation of databases and sample banks**
- **Laboratory analyses**
- **Meta-analysis of the data**

You are invited to participate to SmartCow by the Transnational Access (TNA)

What is it?

- Funding for other industry/academics to run studies in facilities of SmartCow partners
- Transnational = in a different state from the one in which you work
- Access = Providing access to 18 leading cattle research facilities in Europe (12 available for the 2nd call)
- These facilities have:
 - Around 2,500 dairy and 1,000 beef cattle
 - Diversity of breeds and environmental conditions
 - High quality measurements (feed efficiency, emissions, digestion, metabolism...)

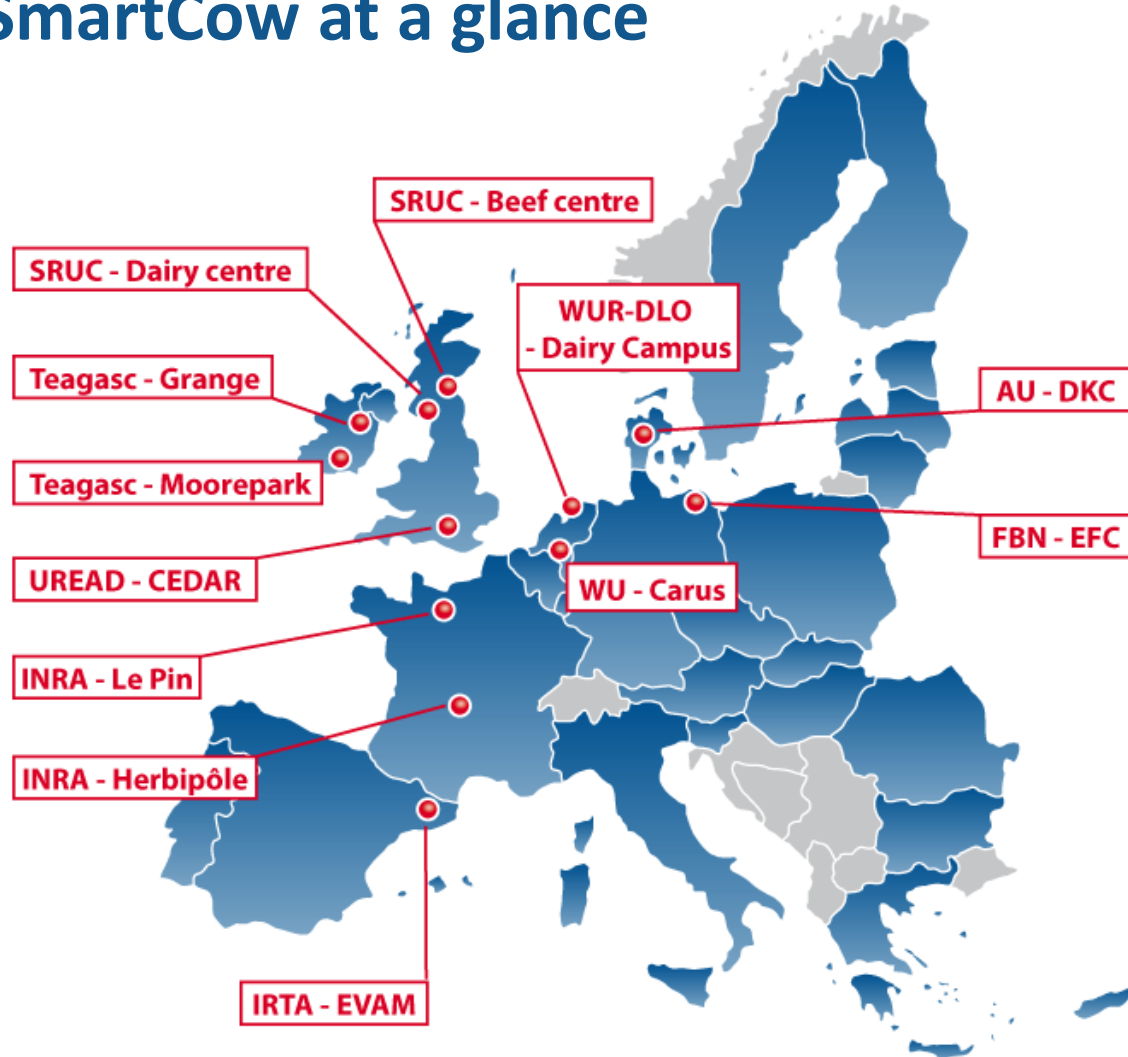
How and when to apply?

- Two-stage application process:
- Short pre-proposals: 30 June 2019
- Selected full proposals: 30 September 2019
- Forms at: <http://www.smartcow.eu/calls/second-call-open/>
- TNA management team: Richard Dewhurst, Lene Munksgaard, René Baumont (smartcow-tna@inra.fr)

Thank you for your attention



SmartCow at a glance



First-class Cattle Research Infrastructures (RIs) across Europe:

- 11 major RIs distributed in 7 EU countries
- 12 locations, which include 18 installations
- 2500 dairy and 1000 beef cows

- **Networking of RIs** to inventorize resources, harmonize procedures, and share data
- **Joint research activities** to improve experimental methods and phenotyping capability
- **Interaction with stakeholders** to stay in line with industry needs and improve dissemination

<http://www.smartcow.eu/stakeholders/>

TRAINING PROGRAM

For Scientists, Technicians, Stakeholders, PhD students

- Face-to-face training courses
- Free web-conferences
- One-day study tours in 4 different countries

<http://www.smartcow.eu/resources/training/>

TRANSNATIONAL ACCESS CALLS

Offers external users (academic and industry) free access to SmartCow RIs

- 30 projects during the 4 years of SmartCow
- Access to around 10,000 cow-weeks

<http://www.smartcow.eu/calls/>



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