Horizon 2020 Programme

INFRAIA-02-2017
Integrating Activities for Starting Communities

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

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

Project ID: 730924

Deliverable number: D4.3

Deliverable title : Catalogue and planning of training courses and study tours

EC version : V1

Due date of milestone	**31/05/2018 (M4)**
Actual submission date	**19/06/2018 (M5)**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement n°730924

DOCUMENT INFO

1. Author(s)

Organisation name lead contractor	IDELE

Author	Organisation	e-mail
Philippe Dumonthier	IDELE	Philippe.Dumonthier@idele.fr

2. Revision history

Version	Date	Modified by	Comments
1			-

3. Dissemination level

PU	Public	X
CO	Confidential , only for members of the consortium (including the Commission Services)	☐

SmartCow
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EXECUTIVE SUMMARY

Background	No background
Objectives	This catalogue consists of the 10 training courses and the 4 study tours that will be provided as part of the SmartCow project. These activities are part of the WP4 and will contribute to the dissemination of the project results. The catalogue will be circulated as widely as possible among potential targets of these activities to encourage them to participate in the courses and tours.
Methods	The partners of the project involved in the 4.4 Task have been asked to provide: - a description of the training courses they wish to provide as part of the project - a provisional program of the study tour that they will be welcoming on their premises All the offers have been collated and harmonized in this catalogue.
Results & implications	Targets of the training courses and study tours can express their interest to participate and register. The training courses, which will take place either face-to-face or remotely, will be programmed according to requests received. The study tours will be programmed and organized jointly to the Annual Meetings of SmartCow.

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Introduction

This catalogue presents the training courses and study tours that will be organized within the framework of the SmartCow project. As the courses and tours will take place from 2019 through to 2021, their programs are subject to change. New training courses may also be added to this catalogue.
SmartCow offers:

- Face-to-face courses, taking place in various European countries
- Web conference courses, accessible from your office, via a PC + Internet connection and a phone
- One-day study tours

What is SmartCow?

SmartCow aims to promote coordinated use and development of key European cattle research infrastructure. It combines strong scientific and technical skills in animal nutrition (in vivo methods for nutrient utilization and emissions measurements), genetics (genotyped animals, phenotyping capabilities), health and welfare (sensors and automatic recordings of physiological and behavioral traits) and ethics in animal experimentation.
SmartCow receives funding from the European Union Horizon 2020 Research and Innovation Programme.

Partners

INRA (Institut National de la Recherche Agronomique), France
SRUC (Scotland's Rural College), UK
Aarhus University, Denmark
FBN Leibniz (Leibniz Institute for Farm Animal Biology), Germany
Teagasc (Agriculture and Food Development Authority), Ireland
CRA-W (Centre Wallon de Recherche Agronomique), Belgium
IRTA (Institut de Recerca i Tecnologia Agroalimentàries), Spain

How can I participate in a course or study tour?
The training courses and study tours target scientists, technicians, stakeholders, students, etc.
Tuition fees are covered by the SmartCow project. Participants will have to organize and fund their own travel and accommodation expenses.
Please note that all these activities will take place in English.

Contact

If you are interested in participating in a training course or a study tour, or if you need any further information about this training program, please contact:
Philippe Dumonthier
philippe.dumonthier@idele.fr
Phone : 33 (0) 1 40 04 49 43
Idele – Institut de l'Elevage
149, rue de Bercy
75595 Paris cedex 12 – France

www.smartcow.eu

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Table of contents

Training courses

Study tours

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Training course

Gold standard methods to assess key phenotypes in ruminant nutrition

Intake, whole tract digestibility, N balance, CH4 emission and feed efficiency

Organizing center: INRA (France)

Type of training: face-to face

Target participants:

Scientists, RI technicians, stakeholders
Master or PhD students

Training objectives

After the training session, the trainee will be able to:

- Understand the importance of targeted phenotype and its biological significance for both purposes : feed evaluation, and individual phenotyping
- Understand the technical, biological and ethical limits of gold standard methods for both purposes

Pre requisite skills

Knowledge on ruminant digestion and nutrition

Program

Assessing feed intake, whole tract digestibility, N balance, CH_4 emissions (considering open chambers as gold standard method but also other methods such as the SF6 tracer technique and GreenFeed) and feed efficiency in cattle
Biological significance of these phenotypes, and the advantages and limits (technical, biological and ethical) of each gold standard measurement method

Pedagogical approach: Lectures, study case and practical sessions in INRA facilities and laboratories

Duration: 3 days

Location: Theix (France), INRA Center

Trainers

Cécile Martin, Gonzalo Cantalapiedra-Hijar, Pierre Nozière and René Baumont (Inra)

Date of course or estimated period of course

2019

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Training course

Measurement techniques and proxies for ruminant methane emissions

Organizing center: SRUC (UK)

Type of training: Web conference

Target participants

Early career researchers and research technicians
Master or PhD students

Training objectives (capacity to be transferred)

After the training session, the trainee will be able to:

- Describe the principles of operation of respiration chambers for measuring methane emissions
- Outline the available proxy or short-term measurement techniques for estimating methane emissions from ruminants.
- Understand the strengths and weaknesses of these techniques and proxies

Pre requisite skills

Graduate-level understanding of ruminant production systems and ruminant nutrition/rumen function

Program

- Theory and practice of operation of respiration chambers
- Short-term methane measurements (GreenFeed, 'sniffers' and laser methane detector) – theory, strengths and weaknesses
- Proxies based on rumen sampling (rumen microbiome; rumen genes) – theory, strengths and weaknesses
- Modelling rumen methane emissions

Pedagogical approach: Lectures – incorporating video clips of the equipment under discussion.

Duration: 2 x 1 hour sessions

Trainers

Pr Richard Dewhurst, Dr Gemma Miller and Laura Nicoll (SRUC)

Date of course or estimated period of course

2019

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement N°730924

Training course

Measurement techniques and proxies for feed efficiency of beef cattle

Type of training: Web conference

Organizing center: SRUC (UK)

Target participants

Early career researchers and research technicians
Master or PhD students

Training objectives

After the training session, the trainee will be able to:

- Understand the reasons for measuring feed conversion efficiency of beef cattle – particularly in the context of breeding programs
- Describe and justify appropriate protocols for measuring feed conversion efficiency in beef cattle
- Understand the basis of proxy measurements for feed conversion efficiency in beef cattle (rumen microbial genes; Nitrogen isotopic fractionation).
- Understand the strengths and weaknesses of these techniques

Pre requisite skills

Graduate-level understanding of ruminant production systems and ruminant nutrition

Program

- Background to the economic significance of feed efficiency in beef production.
- Theory and practice of feed efficiency protocols for beef cattle – equipment and techniques for recording feed intake, growth rates and the composition of weight gain. International examples of incorporation of feed efficiency into breeding programs.
- Theoretical basis of proxies for feed efficiency in beef cattle (1) rumen microbial genes and (2) Nitrogen isotopic fractionation

Pedagogical approach : Lectures – incorporating video clips of the equipment under discussion

Duration: 2 x 1 hour sessions

(1) measuring feed conversion efficiency and residual feed intake in beef cattle

(2) markers or proxies for feed conversion efficiency in beef cattle.

Trainers

Professor Richard Dewhurst, Dr Carol-Anne Duthie and Laura Nicoll (SRUC)

Date of course or estimated period of course

2019

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Training course

Feed efficiency in dairy cattle

Type of training: Web conference

Organizing center: IRTA (Spain)

Target participants

Scientist, RI technicians, stakeholders
Master or PhD students

Training objectives
After the training session, the trainee will be able to:

- evaluate feed efficiency in dairy cattle using several methodologies

Pre requisite skills: Dairy nutrition knowledge

Program

Comparison of direct measurements of feed efficiency (RFI vs milk/DM intake)
Feed efficiency under negative energy balance
Alternatives methods to assess feed efficiency

Pedagogical approach

Lectures and practical sessions

Duration: 2 x 1 h session

Trainers

Àlex Bach and Marta Terré (IRTA)

Date of course or estimated period of course

2019

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Training course

Ethics and welfare in animal experimentation

Organizing center: INRA (France)

Type of training: Face to face training

Target participants

Scientists, RI technicians, stakeholders, etc. All people dealing with experimental projects
Master or PhD students

Training objectives

After the training session, the trainee will be able to:

- Manage his/her own attitude towards the concepts of animal welfare, emotions in animals, ethics, and individual and collective responsibilities in the process of animal experimentation
- Raise his/her own awareness about evaluation and management of pain in herbivore experimentation

Pre requisite skills: experience in animal experimentation

Program

Concepts of animal welfare and emotions in animals
Animal-centered or human-centered ethics, human-animal relationship, individual and collective responsibilities in animal experimentation
Concepts of pain and suffering, evaluation and management tools of pain in the process of animal experimentation

Pedagogical approach

Lectures and discussions

Duration: 1 or 2 days

Location: France (probably at INRA Center in Theix or VetAgro Sup in Lyon)

Trainers

Scientists from INRA

Date of course or estimated period of course

Spring or autumn 2019

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Training course

Respiration chamber and methane emission

Type of training: Face-to-face course

Organizing center: FBN Leibniz (Germany)

Target participants

Early career researchers, Research Technicians
Master or PhD students

Training objectives

After the training session, the trainee will be able to:

- Understand the principles of respiration chamber and GreenFeed
- Understand the relationships between methane production, intake and composition of feed
- Sample rumen fluid and analyze selected methane proxies

Pre requisite skills

Advanced PhD students and PostDocs with a Master in Animal Sciences or related fields

Program

Visit and introduction to Respiration Chamber and GreenFeed
Dietary factors influencing methane production
Host Physiology effects on methane production
Hands on training of oral rumen fluid sampling
Methane proxies
Lab analysis of methane proxies from ruminal fluid: Short-chain fatty acids and mcrA abundance using GC-FID and real-time PCR
Lab analysis: Fecal archaeol extraction and subsequent GC-MS analysis

Pedagogical approach: Lectures, case study, practical sessions

Duration: 2 days face-to-face course

Location (for face-to-face courses only): Leibniz Institute for Farm Animal Biology (FBN), Germany

Trainers

Cornelia Metges, Björn Kuhla, Michael Derno (FBN Leibniz)

Date of course or estimated period of course

Late 2019, early 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement N°730924

Training course

Ontologies in SmartCow

Organizing center: INRA (France)

Type of training: Face-to-face

Target participants

Scientists, RI technicians
Master or PhD students

Training objectives

After the training session, the trainee will be able to:

- Understand the usefulness of the ontologies to name experimental measures
- Use these ontologies
- Use the ontologies adapted to SmartCow

Pre requisite skills

Basic knowledge in biology

Program

What is an ontology?

- Definition
- History
- Examples of use of ontologies (application of ontologies)
- Exercise: building a small ontology

French ontologies from INRA-PHASE:

- Animal Ontology for Livestock (ATOL)
- Environment Ontology for Livestock (EOL)
- Animal Health Ontology for Livestock (AHOL)

Ontology in SmartCow:

- Description
- Use of this ontology in infrastructures of SmartCow

Pedagogical approach: Lectures, practical sessions

Duration: 2 days

Location: France, to be defined

Trainers

Catherine Hurtaud, Olivier Dameron, Marie-Christine Meunier-Salaün, Jérôme Bugeon, Alice Fatet, and Claire Nédellec (INRA)
Monika Solanki (Agrimetrics, UK)

Date of course or estimated period of course: Early 2020

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Training course

Validation and use of sensor outputs for recording animal behavior

Organizing center: Aarhus University (Denmark)

Type of training: Face-to face

Target participants

Scientists
Master or PhD students

Training objectives

After the training course the participants will be able to

- Understand the protocol for validation of sensor output delivered in Task 7.1 of the SmartCow project
- Develop a protocol for validation of a specific sensor for automatic recording of behaviour
- Describe the pitfall in using sensor outputs

Pre requisite skills

Basic knowledge on cow behaviour and statistical methods for validation

Program

Different type of sensors, different types of behaviour. What do the sensors measure. Lectures on how to validate the out from sensors that record behavior. Barn visits and data flow from cow (sensor) to database including pitfalls for data transfer sensor- computer- database – computer for analysis.
How to develop a protocol for validation of output from a specific sensor. Lectures and training sessions in pitfalls in use of different types of sensors.

Pedagogical approach

Lectures and sessions including training on real dataset obtained from the research farm

Duration: Two days with arrival the day before and short welcome in the evening

Location: Denmark, Aarhus University and Foulum with access to the research farm and programs needed for access to data

Trainers

Pr Lene Munksgaard, Emma Ternman and technician from our data group (Aarhus University)

Date of course or estimated period of course: Early 2020

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Training course

Introduction to Infrared spectroscopy tools developed in SmartCow

Organizing center: CRA-W, Centre wallon de Recherches agronomiques, (Belgium)

Type of training: Web conference

Target participants

Scientists, R&D stakeholders
PhD students

Training objectives

After the training session, the trainee will be able to:

- understand the principle of Infrared spectroscopy
- use the proxies to investigate rumen fermentation parameters

Program

General introduction to Infrared spectroscopy
Presentation of example of the proxies developed

Pedagogical approach

Lecture, question and answer section

Duration: 2 hours

Trainers

Vincent Baeten, Frédéric Dehareng, Clément Grelet and Amélie Vanlierde (CRA-W)

Date of course or estimated period of course

In the second half of 2021

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Training course

Biomarkers assisted-predictions of feed efficiency and their main determinants in cattle

Type of training: Web conference

Organizing center: INRA (France)

Target participants

Scientists, Students, RI technicians, stakeholders
Master or PhD students

Training objectives

After the training session, the trainee will be able to:

- Understand the principle by which some biomarkers could be related to feed efficiency and their determinants (digestibility, N balance and rumen fermentation parameters including CH4 emissions)
- Overview of the main laboratory steps enabling to analyze the proposed biomarkers
- Understand the advantages, limits and the conditions of use of biomarkers to predict feed efficiency and their determinants at the herd and individual level.

Pre requisite skills: Knowledge on ruminant digestion and metabolism

Program

The main drawbacks associated to the gold standard methods for measuring the whole tract digestibility, N balance, CH4 emissions and feed efficiency in cattle.
The historically proposed as well as recently discovered biomarkers to predict feed efficiency and their determinants and the methods and equipment enabling their laboratory analyses
The limits and potential of some biomarkers to predict feed efficiency and their determinants in cattle at the herd and individual level
Presentation of a guideline for an optimal biomarkers-assisted prediction

Pedagogical approach

Lectures and study case

Duration: 2 x 1.5 hours session

Trainers

Cécile Martin, Gonzalo Cantalapiedra-Hijar, Donato Andueza, Pierre Nozière and M. Nasrollahi (INRA UMR Herbivores)

Date of course or estimated period of course: Late 2021

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One-day study tour

Innovations to improve feed efficiency, reduce GHG emissions and improve the welfare of beef cattle

Organizing center: SRUC (UK)

Program

Visit SRUC research facilities with presentation from researchers on:

- Feed efficiency and proxies
- Precision livestock farming technologies
- Animal handling and welfare
- Methane emissions (respiration chambers and proxies)

Visit to a commercial farm demonstrating precision livestock farming technology, with presentations from the farmer and technical staff of Agri-EPI Centre Ltd.

Location

UK, Scotland, in SRUC Beef Research Centre, Easter Howgate Farm (close to Edinburgh) and a commercial beef farm in the Scottish Borders (<1 hour coach journey from Edinburgh).

Period

February or March 2019

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One-day study tour

INRA Herbipôle: A European Research Infrastructure on cattle in mountain grassland area

Organizing center: INRA (France)

Program

The Herbipôle is a multidisciplinary experimental research platform on ruminants and grasslands, with a regional, national and European vocation, largely opened to scientific and professional partners, federating on a single facility complementary scientific approaches and disciplines. The aims of the research projects conducted at the Herbipôle deal with ruminant farming systems in grassland mountain areas, preserving their welfare and in connection with product qualities (milk, meat, cheeses and meat) and environmental impacts.

The Herbipôle gathers all the INRA experimental installations of ruminants in Auvergne-Rhône-Alpes region (Massif Central, in the center of France) that are distributed over 3 locations: Laqueuille, Theix and Marcenat. The unit consists of 90 permanent staff. The experimental herds are of 900 bovines and 800 sheep distributed on more than 1100 ha of grassland, located at an altitude between 850 and 1500 m a.s.l.

The visit will be focused on experimental tools for phenotyping animals:

- Feed intake and eating behaviour
- Activities of dairy and beef cows
- Beef cow milk production
- Greenhouse gas emissions by ruminants

For further details: https://www6.ara.inra.fr/herbipole_eng/

Location

France, INRA experimental farm of Laqueuille and Marcenat

Period

The study tour will take place early October 2019, around the *Sommet de l'élevage*, which is the Europe n°1 livestock show (https://www.sommet-elevage.fr/en/home-en/) held every year near Clermont-Ferrand.

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One-day study tour

Danish Cattle Research Centre

Organizing center: Aarhus University (Denmark)

Program

Introduction to Research farm at AU by The head of the Danish Cattle Research Centre (Merete Jensen) including the management of the Centre.

Tour to the facilities where researcher using the different parts of the facilities will introduce and explain about the options in the specific parts of the barn. This will include facilities for behavioural studies, facilities for studies of nutrient digestion and metabolism using fistulated and multi-catheterized cows, and facilities for measuring enteric methane. The collection of data and handling of data both automatically recorded data and manually recorded data will be demonstrated as well as the options researchers have for access to the data by a person from the data group as well as a researcher.

Location

Denmark, Aarhus University, Foulum

Period

Early 2021

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One-day study tour

Intensive grazing systems in temperate climates

Organizing center: Teagasc (Ireland)

Program

The role of the Dairy Research Programme in Moorepark is to increase the competitiveness of the dairy industry through scientific research and to do so in a manner compatible with food quality and safety, the environment and animal welfare requirements. The Centre is engaged in a number of areas of research. Staff work collaboratively on specific research issues.

Attendees will see firsthand grazing management research in intensive grass based systems with a range of topics including – selecting the right cow for the system, choosing the right grassland cultivar/mixture for our systems and many other topics to be confirmed closer to the visit.

Location

Ireland, Teagasc Moorepark, AGRIC, Fermoy, Co. Cork

Period

Early 2022

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