

## *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**



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## EXECUTIVE SUMMARY

<b>Background</b>	<p>Each project partner was invited to send a description of the training course or study-tour on offer and these descriptions were collated into a catalogue.</p> <p>For study tours, the program is designed to visit the best-equipped facilities in the consortium and to discuss with scientists on recent measurement techniques and scientific results.</p> <p>For training courses, a diversified program ranging from teaching scientific basics, recent research results, state-of-the-art analytical techniques and for face-to-face trainings, hands-on-training in the lab was tailored to attract specifically young scientists.</p>
<b>Objectives</b>	<p>The study tour and training program aim at transferring and ensuring sustainability of the knowledge generated by the project and fostering innovation by the means of e-learning, face-to-face courses and study tours targeting very specific and specialised actors, in particular the next generation of scientists in cattle breeding.</p>
<b>Methods</b>	<p>We used the following method :</p> <ul style="list-style-type: none"> <li>• Designing a study tour and training program,</li> <li>• Disseminating this program among the scientists and stakeholders, using the networks of the Smartcow partners and existing media</li> <li>• Managing the enrolment of the candidates</li> <li>• Organising the study tours and courses</li> </ul>
<b>Results &amp; implications</b>	<p>Apart from one study-tour that had to be postponed due to a lack of participants, all the other events organised within the framework of the programme were highly successful in terms of participation: 30 participants for the study tour to SRUC, around 30 people at the two face-to-face training courses, and over 150 participants at the 5 webinars.</p>

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## 1 Elaboration and dissemination of the program

Philippe Dumonthier, Idele, coordinated the elaboration of the study tours and training courses program in June 2018.

Each project partner was invited to send a description of the training course or study-tour on offer and these descriptions were collated into a catalogue.

The program offers 4 study tours (in UK, France, Germany and Denmark) and 12 training courses (face-to-face or web conferences). The partners disseminated this catalogue among their contacts (scientists, stakeholders...) by emails, Internet, and social networks.

Philippe Dumonthier also presented the program at the first meeting of the Stakeholder Platform on June 5<sup>th</sup>, 2018 in Brussels and at the EAAP Annual Meeting on Aug. 28<sup>th</sup>, 2018 in Dubrovnik (Croatia).

## 2 The 2018-2019 study-tour program

### 2.1 The study tour at SRUC, UK – 5<sup>th</sup> and 6<sup>th</sup> March 2019

#### 2.1.1 Program

This study tour was organised with the help of the SRUC. Over a period of two days, it consisted of:

- A general presentation of the SmartCow programme and its potential benefits for stakeholders
- Visits to SRUC research installations at Easter Howgate Farm and Dumfries, Scotland
- Indoor presentations by SRUC researchers, with discussion sessions

The following themes were covered:

- Feed efficiency and proxies
- Precision livestock farming technologies
- Nutrition trials with dairy cows
- Animal handling and welfare
- Methane emissions (respiration chambers and proxies)

#### 2.1.2 Participation

Around thirty people participated in the study tour.

They came from various countries: UK, France, Belgium, Ireland, Spain, Netherlands...

Among them were researchers from research centres, and representatives of various companies, such as animal feed and seed companies, and livestock equipment manufacturers.

### 2.1.3 The study-tour

The group came to see the beef research facilities of SRUC at Easter Howgate farm, near Edinburgh. Head of the SRUC Beef & Sheep Research Centre Dr Carol-Anne Duthie and her team showed visitors the respiration chambers (the 'GreenCow' facility for work on ruminant methane emissions), individual feeding and precision livestock farming research. In addition to a focus on feed efficiency and greenhouse gas research, the visitors also heard about SRUC expertise in animal behaviour and welfare monitoring, as well as rumen microbiome research. Key areas of research for the SRUC beef team are: animal imaging and sensing systems; biomarkers for animal performance, efficiency and health; measurement systems and proxies for greenhouse gas emissions; role of the rumen microbiome (microbial species and genes) in animal performance; as well as carcass and meat quality evaluations.

The group then transferred by coach from Edinburgh to Dumfries – calling in to see SRUC's teaching campus at Barony (just north of Dumfries). At Barony, the visitors were introduced to SRUC's wide range of teaching programmes and shown the teaching dairy facilities. This campus will shortly start a major period of expansion to become the focus for teaching, research and consultancy in the South and West of Scotland.

The group expanded with more local stakeholders on the following day and was shown around SRUC's Dairy Research facilities at Crichton Royal Farm, near Dumfries. Long-serving research farm manager Hugh McClymont gave an overview of the farm, its enterprises and production levels. Researchers then spoke about work on dairy cattle breeding, dairy systems analysis, feeding trials and precision dairying. The visitors then toured the dairy facilities – seeing the long-established Langhill breeding study, as well as facilities for research on feeding, growth and health of adult cows and calves. The Langhill Herd was central to SRUC being awarded The Queen's anniversary Prize for Higher and Further Education in 2017. There was particular interest in new calf research facilities that are being established in conjunction with Agri-EPI Centre Limited, which provide for detailed recording of intakes of water, milk, concentrates and forages, as well as individual weights.

The main benefits for stakeholders were: to see some of the facilities available in the SmartCow TNA programme, to stimulate thinking about opportunities through the TNA programme, to see in operation a wide range of research relevant to SmartCow objectives and to compare and contrast production issues and opportunities for cattle production in their region with Scotland. As always with international visitors, there were insights that stakeholders provided to researchers about other production systems and opportunities, as well as their priorities for future research facilities and projects.

## 2.2 The study tour at INRA, France, 3<sup>rd</sup> October 2019

A study-tour was scheduled for 3 October 2019. It was due to take place in France, on the site of INRA Auvergne (Theix and Laqueuille centers), but it was cancelled on account of the low number of participants enrolled.

The programme involved a visit to Herbipôle, a research site wholly-dedicated to the rearing of herbivorous farm animals in mountain areas, with an ensemble of infrastructures adapted to new research questions, notably the sustainability of livestock-rearing systems. The presentations were to cover the following areas: improving feed efficiency, reducing GHG emissions and improving the welfare of beef cattle...



The date was chosen so that visitors to the Sommet de l'Elevage, Europe's n°1 livestock show, which took place from 2nd to 4th October, could take the opportunity to visit the INRA center.

Unfortunately, this study tour had to be cancelled. Several reasons have been put forward for the low number of enrolments:

- communication around the event came too late, and the content was not presented attractively enough
- a stakeholder meeting had already been organised on the same site in early 2018 during the SmartCow project kick-off meeting, and this adversely impacted a share of potential participants

We are currently reflecting on the best solution: either re-program the same study-tour in October 2020 but with more timely and efficient communication, or replace it with a different event.

### 3 The 2019 face-to-face training courses program

#### 3.1 Respiration chamber and methane emission, at FBN Dummerstorf (Germany), 7th to 8th October 2019

This 1.5 day training course was organised and taught by Björn Kuhla and Cornelia Metges (FBN Leibniz).

It was aimed at explaining the principles of the respiration chamber and GreenFeed, the relationships between methane production, intake and composition of feed, and learning how to sample rumen fluid and analyze selected methane proxies.

The program was as follows:

- 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
- Lab analysis: Fecal archaeol extraction and subsequent GC-MS analysis

The maximum number of participants was set to 8, given the capacity around the respiration chamber installations and in wet labs. In the end, 6 candidates were selected to take part: a researcher from a private UK company and 5 PhD students from Universities in Denmark (Aarhus University), Ireland (University College Dublin) and Norway (NMBU). Their feedback on the training course and the skills they picked up were very positive. After their return, all attendees thanked the organisers for holding the training course via email. Therein they confirmed the high quality of the course and asked for sending teaching documents and the group picture that was taken during the

course. One of the attending PhD students (from NMBU) even applied afterwards for a TNA at FBN in which he - together with his supervisor – was successful.

### 3.2 Gold standard methods to assess key phenotypes in ruminant nutrition, at Inra Theix (France) – 15th to 17th October 2019

This 2-day training course was coordinated by Cécile Martin (Inra Theix). About 10 staff members from Inra Theix were involved in presenting this training course, regarding both the lectures and running the workshop.

The aim was to understand the importance of targeted phenotype and its biological significance for both purposes (feed evaluation, and individual phenotyping) and understand the technical, biological and ethical limits of gold standard methods for both purposes.

The program was as follows:

- Animal experiments and ethics
- Intake and feeding behaviour
- Digestibility and N waste
- Enteric methanogenesis
- Feed efficiency
- Workshops :
  - Best practices to quantify CH<sub>4</sub> emissions with the SF<sub>6</sub> tracer technique, with open-respiration chamber, and with GreenFeed
  - Monitoring tools for feeding behavior studies (medria, biocontrol trough)
  - Tools for digestion studies

In total 23 people from Ireland, Denmark, France, Spain, Norway, Italy, Gabon enrolled the full 2-day training course: 14 people registered to the SmartCow website as PhD students, postdoc, technician or scientists, from university or research centers. In addition the course was opened to 8 students from a Master course on “Global quality in animal production” organised by VetAgro Sup and INRAE, and to 1 INRAE staff members. Others INRAE staff members partially participate in the training course.

The survey carried out among participants after the training course comprised very good participant feedback:

LESSONS in room	8.4 / 10
WORKSHOP CH <sub>4</sub>	9.2 / 10
WORKSHOP Feeding behaviour – digestion, N balance, pH	8.7 / 10
ORGANISATION	9.3 / 10

What was particularly appreciated:

- size of the small groups (n=12) when possible during the workshops for more interaction
- balance between lessons / workshops
- video and tutorials





What was missing:

- a global visit/overview of all the animal facilities of Herbipôle
- even more practical work close to the animals
- 1 evening meal for networking

Participants asked to have an electronic access to work documents (slides, video).

## 4 The 2019 webinar training program

A series of 5 complementary training sessions via webinar on the theme of feed efficiency were offered from September to October 2019. Each webinar was run by a researcher from either SRUC or IRTA. They lasted 1 hour and included presentations on the subject, as well as questions and exchanges by chat with the participants.

The schedule of the training courses is as follows:

- Feed efficiency in dairy cattle, 30<sup>th</sup> Sept, by Dr. A. Bach (IRTA)
- Ruminant methane emissions and measurement techniques, 2<sup>nd</sup> Oct, by Dr. G. Miller (SRUC)
- Feed efficiency of beef cattle and measurement techniques, 9<sup>th</sup> Oct, by Dr. C.A. Duthie (SRUC)
- Microbiome proxies for methane emissions and feed efficiency, 23<sup>rd</sup> Oct, by Pr. R. Roehe (SRUC)
- Proxies for methane emissions and feed efficiency, other than microbiome proxies, 30<sup>th</sup> Oct, by Pr. R. Dewhurst (SRUC)

This remote training mode was able to reach a very wide audience (20 to 40 people for each webinar), from many – mostly European – countries. In all, 150 people took part in a SmartCow webinar.

## 5 Preparation of the 2020 training programme

2019 was also spent preparing the 2020 training programme. Three new training courses were scheduled:

- Validation and use of sensor outputs for recording animal behaviour, 22-23 April 2020, by Lene Munksgaard from Aarhus University Aarhus (Denmark)
- Using ontologies to improve animal science research, 10-11 June 2020, by Catherine Hurtaud from INRA Rennes (France)
- Ethics and welfare in animal experimentation, 22-23 Sept 2020, by Isabelle Veissier from INRA Clermont-Ferrand (France)

Dissemination of this program and recruitment of participants will start in early 2020.



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