

NEWSLETTER

JUNE 2019 –ISSUE 5



editorial

By Michèle Tixier-Boichard

The 3rd Annual meeting of IMAGE took place on March 13-15, 2019, in the nice city of Brescia, Italy, thanks to the help of Università Cattolica del Sacro Cuore. It gathered 65 participants from 12 European countries and 3 non-European countries (Argentina, Colombia and Morocco). An invited talk featured the H2020 ReDiverse project (Biodiversity within and between European Red dairy breeds – conservation through utilization) given by Prof. Bernt Guldbrandtsen, Aarhus University. Both ReDiverse and IMAGE aim at increasing the services that gene banks can provide in complementarity to in situ conservation, particularly for breeds which are not undergoing intense selection with a fast genetic trend. The other invited talk, on Reproductive biotechnologies, was given by Prof. Pasqualino Loi from the University of Teramo. This talk underlined the interest of cloning to

save a rare wild species, whereas the ethical survey conducted by IMAGE revealed that a majority of opinions were against the use of cloning to increase the number of animals of a rare breed. Perception of cloning is obviously an issue! Our survey also revealed that only a minority of stakeholders considered that cryoconservation programmes may have a negative impact on subsidies for on-farm conservation programme. Thus the majority of stakeholders are supporting one objective of IMAGE which is to promote a more dynamic use of gene bank collections as a complement to on-farm conservation.

The Annual meeting underlined some major achievements that have been reached during the last 6 months, which are presented in this newsletter.





As a follow-up of the Dialogue Forum request regarding sanitary regulations for animal gene banks, a successful action has been undertaken by some partners of IMAGE to introduce elements specific to gene banks in the delegated act for germinal products establishments, traceability and animal health requirements for exchanges of gene bank material.

A new software developed by University of Göttingen is now available for researchers and breeders, either breeding companies or rare breeds associations, to test different breeding strategies, possibly incorporating the use of gene bank material. The Modular Breeding Program Simulator ([MoBPS](#)) is publicly available and was presented at the meeting of the European Forum of Farm Animal Breeders who had the opportunity to practice.

A major innovation for gene bank managers would be the possibility to assess the diversity present in their gene bank as compared to other gene banks as well as to on-farm populations. IMAGE will give them this possibility by developing a multi-species SNP chip at a low cost. A quick FAO survey had shown that 38 countries worldwide were interested by this tool provided it remained

affordable. The more numerous the users are, the cheapest the array can be. So, identifying a significant number of interested users was a prerequisite to proceed. The strategy to develop this new molecular tool has now been defined and 3 IMAGE arrays will be prepared for 6 species each. The first one will include the 6 species most represented in European gene banks: cattle, sheep, goat, horse, pig and chicken. The aims of this molecular tool was presented at a FAO side-event in February 2019 to national coordinators of genetic resources who had the opportunity to express their expectations. One strong message was to leave the possibility for non-European countries to suggest additional markers, or additional species, and this will be done.

Finally, the possibility to develop synergies between IMAGE and other EU-funded projects was explored within the Common Dissemination Booster (CDB) 'GenTORE' devoted to 'Fitter Livestock'. A special session entitled 'Burning issues in biodiversity 2: fitter livestock farms from better gene banks' will be held together with 4 other EU-funded projects at the next EAAP conference in Ghent, August 25-28, 2019.

We are looking forward to meeting you in Ghent!



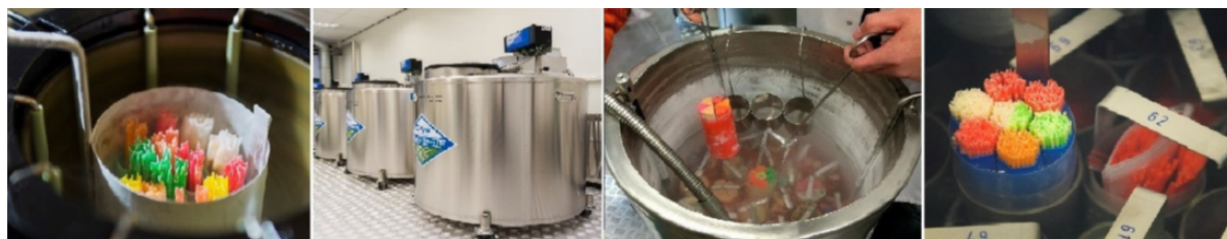
Annual meeting of IMAGE in Brescia in March 2019



Burning issues in biodiversity 1: What are the benefits from animal gene banks?

Tuesday 27 August, 2019 08:30-12:30

International Convention Centre (ICC), Ghent, Belgium
Room Baeckeland 1



08:30	Short introduction about IMAGE - <i>Asko Mäki-Tanila</i>
08:35	Stakeholder involvement and ethics in conservation of animal genetic resources in gene banks - <i>W. Kugler</i>
09:00	Rationalization and further development of European livestock gene bank collections - <i>S. Hiemstra</i>
09:15	Rationalization and characterization of gene bank collections: a case study - <i>C. Danchin</i>
09:30	Optimising ex situ genetic resources collections for Spanish livestock conservation - <i>De Oliveira Silva</i>
09:45	Breakthrough to improve the reproductive capacity of gene bank material - <i>E. Blesbois</i>
10:15	<i>Coffee break</i>
10:45	Freezing poultry semen; effects of cpa concentration x cooling rate, and other factors - <i>H. Woelders</i>
11:00	The use of genomic variation in European livestock gene bank collections - <i>R. Crooijmans</i>
11:30	Genetic diversity and inbreeding in Dutch cattle breeds based on gene bank collection - <i>A.E. Van Breukelen</i>
11:45	Optimization of introgression breeding programs with MoBPS - <i>T. Pook</i>
12:00	Introgression of Blue Eggshell Color from a Gene Bank Collection into a White Leghorn Breeding Line - <i>C. Dierks</i>
12:15	Annotation of selection signatures in the bovine breed Asturiana de Valles - <i>C. Paris</i>

[Click here to register for EAAP 2019](#)



This project has received funding from the European Union's [Horizon 2020](#) research and innovation program under grant agreement No 677353. This publication reflects the views only of the author, and not the European Commission (EC). The EC is not liable for any use that may be made of the information contained herein.



Burning issues in biodiversity 2: *“Fitter livestock farms from better gene banks”*



IMAGE SESSION

Wednesday 28 August, 2019 14:00-17:00

International Convention Centre (ICC), Ghent, Belgium

Session 43, Room Baeckeland 1

TIME	SPEAKER	TALK TITLE
14:00-14:05	Michele Tixier-Boichard	Introduction
14:05-14:30	P. Cozzi	The IMAGE unified data portal to integrate and represent European gene bank
14:30-14:45	R. Baumont	SmartCow: integrating European cattle research infrastructures to improve
14:45-15:00	N. Gengler	GplusE: Mid-infrared milk analysis based technologies adding value to gene
15:00-15:15	H. Gilbert	Responses of pigs divergently selected for cortisol level or feed efficiency (Feed-A-Gene)
15:15-15:45	L. Colli	H2020 IMAGE project strategy to investigate local adaptation in European sheep
15:45-16:15	Coffee break	
16:15-16:30	C. Grovermann	Economic resilience and efficiency indicators of conventional and organic dairy farms across Europe (GenTORE)
16:30-16:45	L. Telo de Gama	Capacity building to enhance the use of Animal Genetic Resources in a multinational context
16:45-17:00	M. Tixier-Boichard	Final discussion and introduction to posters

[Click here to register for EAAP 2019](#)

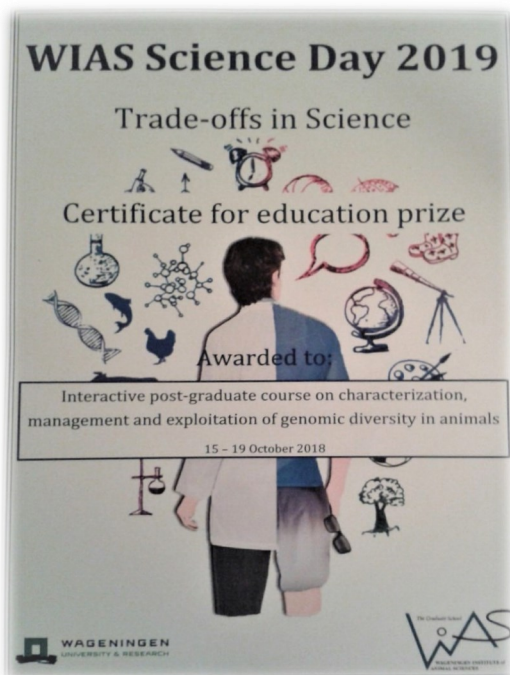


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news

IMAGE Course wins Education Prize

By Sipke Joost Hiemstra



We are very happy to announce that interactive PhD course on 'Characterization, management and exploitation of genomic diversity of animals' that took place between 15-18 October 2018, received the **2018 Education Prize** of the Wageningen Graduate School of Animal Sciences. We would like to thank all our enthusiastic lecturers and to the lead organizer Aniek Bouwman for their contribution.



4th IMAGE Dialogue Forum

Access and Benefit Sharing (ABS) Rules

What does ABS mean for conversation, research and use of Animal Genetic Resources (AnGR)?

The 4th IMAGE Dialogue Forum will occur at "Levend Erfgoed Expo" in Wachtebeke, Belgium on **Sunday, 25 August 2019 between 15:00 – 18:00**. The Dialogue Forum will take place right after the European Regional Focal Point (ERFP) Annual Meeting and at the beginning of the SAVE network meeting.

The 4th IMAGE Dialogue Forum will focus on access and benefit sharing requirements which result out of international agreements (Nagoya Protocol), EU ABS Regulation (511/2014) and national legislation. ABS may affect all sectors of

animal breeding: conservation breeders as well as breeding companies, the research sector and governments.

The invitation for the 4th IMAGE Dialogue Forum is [available](#). In order to register please fill in the [form](#).



news

IMAGE at EFFAB-FABRE TP AGM 2019

At the EFFAB and FABRE TP Annual General Meeting (AGM) in Dublin on May 15-16, 2019, Torsten Pook from University of Goettingen demonstrated MoBPS (Modular Breeding Program Simulator) to the members of the breeding sector. In addition, a demo-version of the interface was also available for the participants of the meeting. Pook underlined that MoBPS has the flexibility to design according to different needs. MoBPS is accessible [here](#).

Additionally, in the meeting, IMAGE results were presented by Luis Telo de Gama from University of Lisbon. In his presentation, EFFAB and FABRE TP members of the breeding sector were informed about some of the methods developed and key results obtained by IMAGE partners.



Common Dissemination Booster (CDB) logo is finalized!



Sustainable LiveStock Farming

with similar objectives. The aim is to better disseminate the scientific outcomes of the 6 projects (GenTORE, SAPHIR, FeedaGene, SmartCow, IMAGE, GPlusE) to end-users. This unique cluster of projects will deliver innovative results to help farmers in Europe and internationally improve their businesses.

The Common Dissemination Booster (CDB) 'GenTORE' devoted to 'Fitter Livestock designed a new logo and a new banner is on the way!

This useful tool was created to improve the dissemination activities of the scientific projects



A questionnaire-based survey of the impact and use of cryobanks in the context of the IMAGE project

By Denis Laloe and Eleonore Charvolin-Lemaire, INRA, France

During 2018, we conducted a questionnaire-based survey about the impact and use of cryobanks. This survey, produced by WP1 of IMAGE project, was distributed to the participants at various meetings and events concerning cryobanks and breed conservation. A French version of this questionnaire was also edited online. The aim of this survey was to improve our understanding of the concerns and motivations of the professionals and experts regarding the different aspects of cryobanking.

Two main types of questions were investigated:

- the motivations for breed conservation (main objectives for cryobanking a breed, the main criteria to choose between breeds, type of management and financial system that should be developed)
- the innovations in biobanking and trades offs (research on semen properties, using cloning methods for rare breeds, collecting embryos through sacrifices, collecting tissue samples).

At this moment, 159 persons responded. Profiles of

the respondents were balanced between researchers and stakeholders. The most important affiliations concerned research institutes or universities (51% of the respondents), breed associations (22%), government representatives (14%) and non-governmental organizations (8%).

The role of respondents was diverse, including scientists, students, breed managers and cryobank managers. Note that some respondents played different roles or had more than one affiliation. Various species were concerned: ruminants, poultry, pig, horses and fish. A majority of respondents has a multi-species purpose (58%). However, a great number of respondents worked with ruminants, especially cattle. Interestingly, about 10% of respondents worked with fish species, thanks to the specific spreading of the survey to the scientific participants of the Horizon 2020 research infrastructure project Aquaexcel 2020. Among all the respondents, 36% worked with rare breeds and 12% with commercial breeds. A large part of respondents (45%) worked with both kind of breeds.

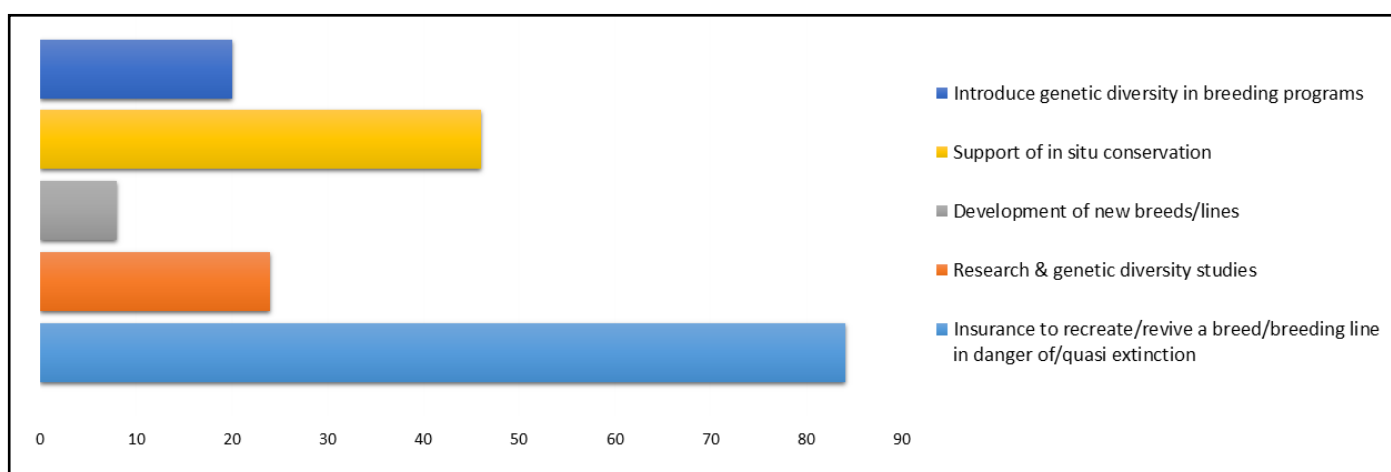


Figure 1. Number of times the criterion is considered the most important





The main topics of the questionnaire are reviewed below:

1- Objectives of cryoconservation of breeds

It was asked to rank different objectives by order of importance. *Figure 1 gives the number of times the objectives was considered most important.* Among the various proposals, the item “Insurance to recreate/revive a breed/breed line in danger of extinction” came up most frequently, followed by the items “support of in situ conservation”, and “research and genetic diversity studies”. Conversely, introducing genetic diversity in breeding programs or develop new breeds or lines are given a lower priority.

2- Main criteria to choose a breed for cryoconservation

Among several criteria, the three most often mentioned criteria are the high degree of endangerment, the special traits and characteristics of value and the genetic distinctiveness, while the economic or environmental value appear to be less important.

3- Impact of cryoconservation on the in situ conservation

Several answers were possible for this item. The cryoconservation impact on the in situ conservation was considered as positive by 89% of the respondents. Among the positive impacts, the conservation of within-breed genetic diversity (62 %), the revitalization of blood lines (53 %) and

the collaboration between breeders and research (52 %) are the most frequently mentioned.

4- Acceptance of technology and ethical issues

These questions firstly concerned the research on semen conservation technology and the use of cloning or transgenesis methods for conservation purposes. The majority of the respondents supports the use of these techniques, except for cloning. The level of support varies according to the respondents profile. Particularly, it is higher for students and scientists, and for people involved in the aquaculture industry. The same scheme is observed for ethical issues, namely the use of slaughter of animals (rabbits or chicks) for sample cryobanking.

5- Decision and funding

For questions relative to decision and funding, a great majority of respondents consider that the decision-making process should be handed over to a multi-actor board, while national governments should be the main funder for maintaining cryobanks.

This survey has been disseminated mainly to our usual community of stakeholders, researchers, NGO and professionals. They were already educated about the main concern of the survey. It could be interesting to extend this questionnaire to the civil society. Another question could be addressed: how to measure the environmental value of breeds. It has been a surprise to see that these parameters do not seem to be already included in the main criteria for choosing breeds to conserve in cryobanks. However it is one of the arguments to justify why animal genetic resources are a part of agroecology.



MoBPS – Modular Breeding Program Simulator

By Torsten Pook, Thuy Ha, Henner Simianer, University of Goettingen, Germany

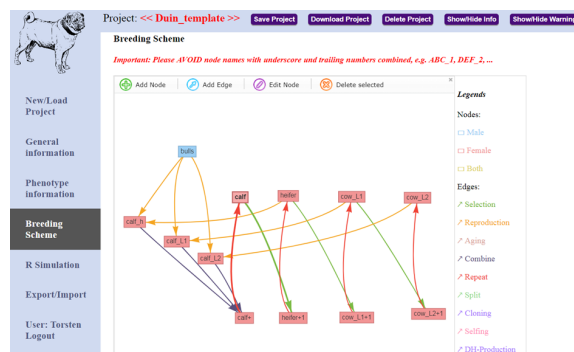
Breeding programs are needed to improve the genetic ability of livestock populations with regard to productivity, fitness and adaptation while maintaining genetic diversity. Progress towards the target is limited by the available economic resources and the used selection and mating design. Hence, the identification of an optimal breeding program is an optimization problem of almost unlimited complexity. To assist both breeders and scientists in simulating and comparing complex breeding programs we developed the R-package MoBPS (Modular Breeding Program Simulator) in the context of IMAGE Task 6.

MoBPS provides the computational efficiency to simulate thousands of generations of individuals with millions of individuals by deriving individual haplotypes on-the-fly and performing all computation and data storage bit-wise. Nevertheless, we still allow for the necessary flexibility to design whatever breeding program one can think of. In the context of IMAGE this can for example mean to test different scenarios to introduce germplasm from gene banks into selected populations. Flexibility means that we allow for using all available biotechnologies like genome editing or reproduction technologies and commonly applied selection techniques like single-step genomic breeding value estimation. In addition to that, we developed a most general approach to describe a breeding scheme by a set of nodes and edges. In this modular representation, each node represents a cohort of individuals and each edge represents a breeding activity. In addition to the R-package itself we also developed a web-based graphical user interface to provide a more intuitive way of using MoBPS

without required programming knowledge or reading of the lengthy user manual.

At this year's EFFAB and FABRE TP meeting in Dublin we presented MoBPS within the context of the IMAGE workshop. In addition, a demo-version of the web-based interface was available for testing during the breaks of the meeting. During and after the meeting MoBPS received high interest and lead to lively discussion about potential applications and limits of the tool. At this year's EAAP in Ghent, the IMAGE session on Biodiversity will include both a talk on the software itself as well as an application example for the introgression of the blue eggshell QTL from a gene bank collection into an elite line.

The primary design philosophy behind MoBPS is to provide the community with a tool that is able to simulate all breeding programs and we will continuously add new features if they are requested and we deem them to be of general usefulness. MoBPS itself is already openly available at <https://github.com/tpook92/MoBPS>, whereas the web-based application is still in closed-beta (for potential access contact torsten.pook@uni-goettingen.de as it is still rapidly growing to include all of the functionality the R-package itself is already providing).



profiles



Dr. Irina Carpusca, INRA Transfert

WP8 — Project management and consortium coordination

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Dr. Irina Carpusca is a consultant in European projects engineering, assisting researchers in setting up and managing European collaborative research projects. She works within INRA Transfert, INRA's subsidiary specialised in technology transfer and project engineering. She holds a European Ph.D. in Cell and Molecular Biology resulting from a cooperation between the University of Strasbourg (France) and the University of Freiburg (Germany), as well as a Master's degree in Business Administration from the Strasbourg Business School (France). Since 2007, she supports researchers in setting up their European and national projects and performs operational management and supervision of these projects. Her European project engineering experience spans the EU's 6th, 7th and Horizon 2020 Framework Programmes for Research of the European Commission, and resulted in the delivery of 10 proposals of which 7 have been selected for funding and the successful management of 7 projects (6 of which are now terminated). Within the IMAGE project Administrative Team, Irina supports the Coordinator, Michèle Tixier-Boichard (INRA), with the administrative and financial management, coordinating and monitoring the planning, execution and finalisation of contractual obligations, and acting as a pivotal liaison centre between consortium partners and the European Commission services.



Harmen Doekes, Wageningen University & Research

WP6 — T6.2 Developing optimized conservation and introgression strategies based on extended optimal contribution methods

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Harmen P. Doekes is a PhD-candidate at Wageningen University & Research Animal Breeding and Genomics, the Netherlands. During his MSc in Wageningen, Harmen performed research projects on genetic diversity in Dutch dogs (Wageningen) and on variance estimation in dairy cattle (at SRUC, Scotland). After finishing his MSc, he became one of the PhD-candidates funded by IMAGE. His PhD-project focusses on the use of genomic information in dairy cattle to 1) characterise inbreeding and its effects on performance, i.e. inbreeding depression, 2) demonstrate the value of gene bank samples for use in the current breeding program, and 3) maximise genetic gain within a breeding program while managing diversity, using (extended) optimal contribution selection. Harmen has so far published two peer reviewed papers and two co-authored papers.

publications

The effects of recent changes in breeding preferences on maintaining traditional Dutch chicken genomic diversity, 10.1038/s41437-018-0072-3 Chiara Bortoluzzi, Richard P. M. A. Crooijmans, Mirte Bosse, Sipke Joost Hiemstra, Martien A. M. Groenen, Hendrik-Jan Megens

Value of the Dutch Holstein Friesian germplasm collection to increase genetic variability and improve genetic merit, 10.3168/jds.2018-15217 H.P. Doekes, R.F. Veerkamp, P. Bijma, S.J. Hiemstra, J. Windig

The impact of using old germplasm on genetic merit and diversity-A cattle breed case study, 10.1111/jbg.12333 Sonia E. Eynard, Jack J. Windig, Ina Hulsege, Sipke-Joost Hiemstra, Mario P. L. Calus

Optimizing ex situ genetic resource collections for European livestock conservation, 10.1111/jbg.12368 Rafael De Oliveira Silva, Bouda Vosough Ahmadi, Sipke Joost Hiemstra, Dominic Moran

Introgression of Blue Eggshell Color from a Gene Bank Collection into a White Leghorn Breeding Line Dierks C., Ha N.T., Simianer H., Cavero D., Preisinger R., Weigend S.



videos

IMAGE has published new videos on its [YouTube channel](#). Every now and then we will publish a video from an IMAGE partner, explaining the impact of their contributions to the IMAGE project. You may reach the videos below.



Michèle Tixier-Boichard, INRA
IMAGE Coordinator



Sipke Joost Hiemstra, CGN/WUR
IMAGE WP2 leader



The IMAGE Project Coordinator **Michèle Tixier-Boichard** explained the aims and the current achievements of IMAGE at FAO. Click the picture above to see the video.

Sipke Joost Hiemstra gave a presentation about the ethical questions related to cryopreservation for animal genetic resources at FAO. Click the picture above to see the video.

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IMAGE Newsletter

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