Animal genetic resources provide the basis for selection and improvement of livestock, as well as for research projects aimed at characterizing the genome diversity and the relationships between genotype and phenotype. A large diversity of traditional and commercial breeds as well as experimental lines has been obtained as a result of domestication and selection of the main domestic animal species: cattle, sheep, goats, horses, donkeys, pigs, rabbits, poultry (chickens, turkeys, ducks, quails, guinea-fowls) and fishes. This variety ensures the capability and adaptability of livestock to fulfil its role in food production under different circumstances, now and in the future.

"One third of domestic breeds are considered to be at risk of extinction."

Farm animal gene banks are important sources of genetic variation to ensure breeds’ long term survival and for research purposes. However, most cryobanks are currently more active in storage than in distribution of genetic resources. Genetic diversity of livestock species has been shaped by breeders as well as by environmental variation. Thus, cryobanks are both a heritage and a resource for the future, which needs to be better evaluated and exploited in breeding plans to face adaptation to climate change, to respond to unanticipated market changes and to improve resilience of farming systems by increasing the range of diversity available to farmers.

"A renewed strategy is necessary for animal gene banks, taking advantage of genomics and biotechnologies."
“Innovative Management of Animal Genetic Resources” (acronym IMAGE) is a project funded by the Horizon 2020 Research and Innovation Programme of the European Union.

It started on March 1st, 2016 and unites 28 partners, including three SMEs, three NGOs, the Food and Agriculture Organization of the United Nations (FAO), nine research institutions, 11 higher education and research institutions, and INRA Transfert, a subsidiary of INRA, the co-ordinating partner. 13 EU countries are involved, together with Switzerland and four non-European countries: Argentina, Colombia, Egypt and Morocco.

"IMAGE aims at enhancing the use of genetic collections and upgrading animal gene bank management.

IMAGE will further develop genomic methodologies, biotechnologies and bioinformatics for a better knowledge and exploitation of animal genetic resources."

The ultimate goal of the project is to demonstrate the benefits brought by gene banks to the development of more sustainable livestock farming systems.

The project is organised in six research work packages (WP), one dissemination WP and the management WP.

"Raising awareness about the value of animal gene banks will contribute to popularising them in the society as a whole, since they represent both a heritage and a resource for the future."

First priorities are to launch surveys for 1) gene bank managers and 2) stakeholders, and to map available molecular data on gene bank collections in order to identify gaps and to define priorities for further characterisation through whole genome sequencing. At the same time, studies aimed at improving reproductive biotechnologies will be starting.

For more information on IMAGE please visit our website

**IMAGE at a glance**

www.imageh2020.eu

28 partners: 13 EU countries and 5 non-EU including Switzerland, Argentina, Colombia, Egypt and Morocco

Project duration: 1 March 2016 - 29 February 2020

Project Coordinator: Dr. Michèle Tixier-Boichard, INRA

Project Manager: Dr. Irina Carpusca, INRA Transfert
**news**

**IMAGE Kick-Off Meeting**

The kick-off meeting of the H2020 IMAGE project took place in Paris, 19-20 May 2016. It gathered 50 participants from 11 European countries and one non-EU country, Colombia.

The kick-off included a half-day devoted to WP meetings and exchanges between WPs in order to facilitate collaborations between them.

The main approaches of IMAGE were presented:

- Engaging the different types of stakeholders which are relevant for IMAGE, from the beginning of the project, and targeted meetings are both needed on a case by case basis;

- Improving the reproductive quality of the gene bank samples and their ‘usability’ in the field, with the development of new protocols and the perspective to assess the potential of new technologies to improve the cost-efficiency of using gene bank samples;

- Improving the connection between gene bank managers and supporting the set-up of the European Gene Bank Network for Animal Genetic Resources (EUGENA) in connection with the European Regional Focal Point;

- Assessing the potential of genetic diversity present in genetic collections by genomics and data integration;

- Facilitating access to information and resources by developing a new model for data integration in a web portal, and registering collections into the BioSamples database of EMBL-EBI;

- Developing, testing and demonstrating strategies and scenarios to facilitate the use of this diversity and to enhance synergy between gene banks and on-farm management of genetic resources; and

- Increasing awareness about the value of gene banks by a multi-faceted dissemination programme, including decision support tools for breeds and North-South workshops for capacity building.

**IMAGE 1st Dialogue Forum Meeting**

The first IMAGE Dialogue forum was held on August 28th, 2016 at Riddel Hall, Queen’s University, Belfast, Northern Ireland, in association with the ERFP general assembly and the EAAP conference.

"The IMAGE Dialogue Forum is a platform designed to involve all stakeholders in the discussion about the future of genetic management of farm animals."

Stakeholders with wide-ranging experience joined the IMAGE partners to discuss their views on the management of gene bank resources. Amongst the 51 participants were ERFP National Coordinators, scientists, government officials, as well as representatives from industry and NGOs. The event was hosted and moderated by Waltraud Kugler, SAVE Foundation, Switzerland.

The event started with a presentation by Michèle Tixier-Boichard, IMAGE Coordinator on the objectives and approaches of IMAGE. Sipke-Joost Hiemstra, ERFP chair and national coordinator gave his presentation on the European gene bank network EUGENA. The event continued with Beate Berger, the Austrian ERFP national coordinator and gene bank manager, on practical examples of gene bank management in Europe.

The ensuing discussion covered topics such as sanitary regulations, data/material sharing, ethics in biotech and standardization of gene bank management.
Up to now there are 25 gene banks for animal genetic resources identified within Europe. Some are governmental with the main purpose of conservation, while others are research gene banks that are not fully connected. Knowledge is needed to better involve gene banks in animal breeding programmes. IMAGE aims to improve the connections between gene bank managers and users.

A demonstration program for genetic introgression in chicken will show possible ways of using gene bank material. Priorities for cattle genotyping will be identified. Populations which are represented in gene banks with time series (i.e. samples from different stages of the breeding programme) will be inventoried in order to identify possible case studies for monitoring trends in genetic diversity.

"The Dialogue Forum consists of annual meetings, smaller topical meetings and any further measures to identify ideas, needs and attitudes of stakeholders."

Besides the expected achievements, Michèle Tixier-Boichard pointed out the importance of the involvement of stakeholders from the very beginning to be able to shape the whole process of the project, instead of simply presenting them with completed results at the end of the project.

In addition, FAO organized a special meeting of participants on quality management systems for gene banks. Ms. D’Arbaumont (INRA, France), Sipke J. Hiemstra (Centre for Genetic Resources, the Netherlands (CGN) of Wageningen University & Research) and Paul Boettcher (FAO) gave presentations at the meeting, which also included general discussion on gene bank management. The meeting was attended by more than 20 persons.

Commission’s Session report is available here.

IMAGE Dialogue Forum

The next annual IMAGE Dialogue Forum will be held around the EAAP conference in Talinn, Estonia (28 August - 1 September 2017, https://eaap2017.org/) and will include presentations, a discussion session and wine & snacks. Visit our website for details on the Dialogue Forum Meetings and Sessions www.imageh2020.eu

If you would like to participate or suggest topics to be discussed at the event, contact:
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WP2 "The European Genetic Collection Survey" Preliminary Results

The European genetic collection survey for animal genetic resources draws to a close. The goal of this survey was to characterize and map genetic collections all around Europe. Two types of collections can be distinguished:

i) **germplasm collections covering biological samples of reproductive material**, and

ii) **genomic collections covering other biological samples (DNA, tissue)**.

After the initial distribution of the questionnaire, 54 gene banks from 19 European countries have replied to the survey in the first 3 months.

According to the preliminary results 28 institutions are holding a germplasm collection, whereas 8 institutions are holding a genomic collection and 18 institutions are holding both collections.

In more than 80% of cases, the institution managing the collection is public. In most of the cases 5 species are dominant in germplasm collections: cattle, sheep, goat, horse and pig. For genomic collections, chicken can be added.

A detailed report of the results of the survey is under development, and will become available soon at the IMAGE website.

**WP6 Case study "from gene banks to breeding lines"**

The first steps towards demonstrating an efficient introgression of a rare characteristic from a chicken gene bank into a contemporary laying line have been carried out.

Araucana goldhalsig

White Leghorn

Photo by S. Henne
F1 crosses have been set up based on a cross of Araucana males, which carry the blue egg shell color as single monogenic dominant trait, and White Leghorn females of a high performing layer line. F1 males have been genotyped and selected for further breeding.

The selection is based on a "gene-dropping" simulation approach incorporating molecular information. This simulation approach was implemented in a flexible way enabling the simultaneous consideration of multiple factors, which may influence the selection progress.

Using this approach, several selection strategies were compared and the best F1 males, which will ensure the highest genetic diversity and the preservation of the genetic make-up of the recipient line while at the same time transferring the gene of interest, were identified.

Laboratory assays as well as statistical procedures have been established and optimized to identify potential breeders at an early age.

**profiles**

**Dr. Michèle Tixier-Boichard, INRA**

**Project Coordinator**

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Dr. Tixier-Boichard is a senior scientist at GABI, working on chicken genetics since 1985.

She participated in the European projects, ChickMap (1995-1998) and AvianDiv (1998-2000), and was an invited expert in SEFABAR (sustainable breeding) and GLOBALDIV (characterisation and management of animal genetic resources).

She has more than 100 papers published in peer-reviewed journals, and she has been the supervisor of 10 theses (two at present) and 15 master students.

She chairs the board of the French National Cryobank and coordinates the national infrastructure project for biological resource centres of domestic animals, CRB-Anim.

She has been elected as vice-president of the World Poultry Science Association’s board from 2004 to 2016.

**Prof. Dr. Johann Sölkner, BOKU**

**WP1 Leader—Multi actor participation and knowledge exchange**

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Prof. Dr. Johann Sölkner is a full professor at the University of Natural Resources and Life Sciences, Vienna and leader of the animal breeding and genetics working group.

He has been involved in the design of breeding programs for different species in Austria, but also in various developing countries.

He is the National Coordinator of the Genetics Commission of the European Association for Animal Production (EAAP), and President of the Austrian Association for Rare Endangered Breeds (ÖNGENE).

ÖNGENE has developed rules and procedures for support of keepers of currently more than 30 local endangered livestock breeds implemented by the European Regional Development Fund.
publications

Pan European Networks: Science & Technology
A review of IMAGE by Michèle Tixier-Boichard, Project Coordinator

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 677353.

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