

Training

Three postgraduate training courses were organized in 2018, involving lecturers from various IMAGE partners, aiming to build capacity in conservation of genetic resources as well as in genbank management using novel technologies. The one-week course programs were designed to provide training with high quality standards, engaging international lecturers and post-graduate students and professionals. Enthusiastic young researchers coming from 17 different nationalities (from Europe, Africa and

South and North America) attended these courses. All course programs were designed to develop the required skills of researchers engaged in conservation genetics and population management, which included one section devoted to "on-the-job-training", providing the environment and framework for participants to apply the acquired new knowledge in their projects and discussing them with lecturers.

By Luis Gama



Towards the future

The challenge for animal gene banks towards the future will be to raise global awareness of the value of their collections for research and breeding and to further strengthen, implement and optimize the *ex situ* conservation strategies. The establishment of the EUGENA network of gene banks in Europe (governed by the European Regional Focal Point of FAO), together with the information and tools delivered by the IMAGE project, should help to achieve this goal.

Partners

Research Institutes/Universities:

-  Institut National de la Recherche Agronomique **France**
-  Animal Production Research Institute **Egypt**
-  Agrosavia (Corporación Colombiana de Investigación Agropecuaria) **Colombia**
-  Ecole Polytechnique Federale de Lausanne **Switzerland**
-  European Molecular Biology Laboratory **Germany**
-  Friedrich Loeffler Institut, **Germany**
-  Georg-August-Universität **Germany**
-  Haszonallat-gemegorzesi Központ **Hungary**
-  Institut National de la Recherche Agronomique **Morocco**
-  Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria **Spain**
-  Instituto Nacional de Tecnología Agropecuaria **Argentina**
-  Stichting Wageningen Research **Netherlands**
-  Szkoła Główna Gospodarstwa Wiejskiego **Poland**

28 European and non-European partners: 20 Research institutes/Universities, 8 SMEs/International organisations
Project duration: 01/03/2016 – 29/02/2020

Funding: €7 million
Project coordinator: dr. Michèle Tixier-Boichard, INRA
IMAGE project
www.imageh2020.eu
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Wageningen University **Netherlands**



SRUC **United Kingdom**

SME's and International organisations:



Institut de L'élevage **France**



Lohmann Tierzucht GmbH **Germany**



Parco Tecnologico Padano S.R.L. **Italy**



European Forum of Farm Animal Breeders **Netherlands**



Food and Agriculture Organization of The United Nations **Italy**



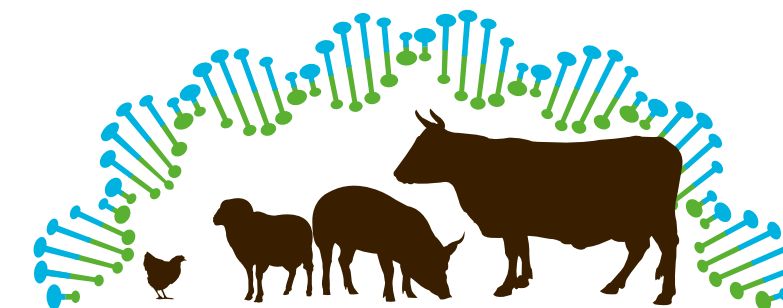
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IMAGE

Innovative Management of Animal Genetic Resources



"IMAGE aims to enhance the use of genetic collections and to upgrade animal gene bank management by further developing genomic methodologies, biotechnologies, and bioinformatics for a better knowledge and exploitation of animal genetic resources."

Background

The Global Plan of Action for Animal Genetic Resources identified **conservation of animal genetic resources** as a "Strategic Priority Area". Farm animal **gene banks** are important sources of genetic variation to ensure breeds' long term survival and preservation of rare genotypes. Yet, their collections need to be better documented and progress in **reproductive biotechnologies is needed to improve feasibility of gene banking**.

About IMAGE

IMAGE partners are developing a **renewed strategy** for animal gene banks, taking advantage of genomics and biotechnologies. For instance, coupling the preservation of reproductive material in cryobanks with the storage of DNA and tissue samples is recommended to increase the usefulness of biobanks. Developing a portal for data access and sharing tools is an answer to the main challenges:

- Variation in sizes of actors in European breeding industry requires gene banks to deliver services tailored to different actors and farming systems
- New sequencing and genomic data ensure an equal status per species at gene bank collections.
- New biomarkers of sperm quality and new methods of conservation of germplasm could improve fertility of gene bank material.
- Optimization of decision-making steps to illustrate synergies between ex-situ and in-situ for variation in future populations

Dialogue Forum

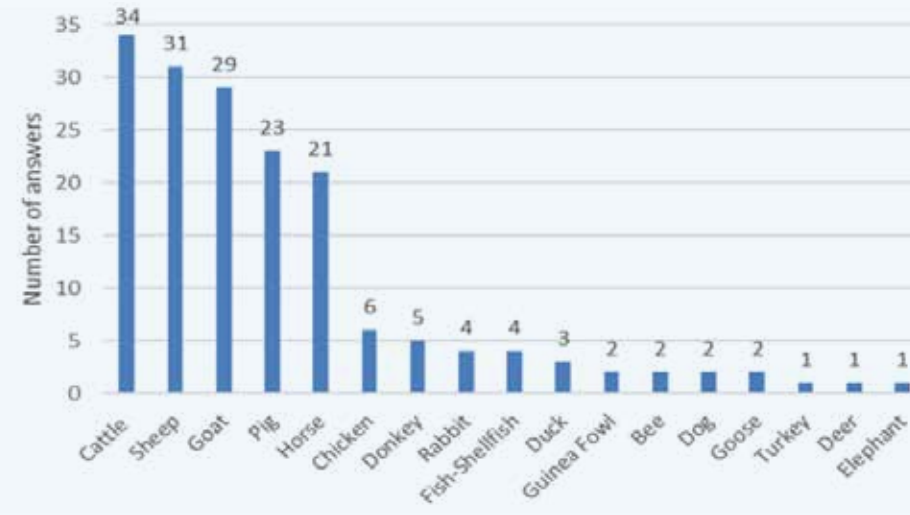
Organization of a yearly Discussion Forum brought together experts from different stakeholder groups, including policy makers, non-governmental organizations and academics.

In 2017, the forum focused on raising awareness about specificities of gene banks to be considered into the Delegated Acts to the Animal Health Law (2016/429), such as unknown health status of the donors, very old material, or certification of production sites. The dialogue forum identified possible solutions such as additional tests or national derogations.

In the case of locally transboundary breeds, bilateral agreements should allow more flexibility. In 2018, IMAGE organised a side-event to the 10th FAO ITWG session on Animal Genetic Resources to discuss ethical issues regarding cryopreservation of animal genetic resources with representatives from several EU and non-EU countries.

"Enhanced quality and scope of European gene bank collections"

IMAGE provided for the first time a strategic analysis of the current ex-situ collections for domestic animals in Europe. Most countries have developed germplasm collections (e.g. semen or embryo's) for long term conservation purposes but limited connections were found with the genomic collections often maintained by individual researchers (or groups) for their own projects.



Number of genetic collections per species in gene banks surveyed in Europe. (by Danchin and Hiemstra)

To enhance gene bank services, IMAGE has developed a diagnostic tool for individual gene banks to assess and review the state of implementation of a quality management system:

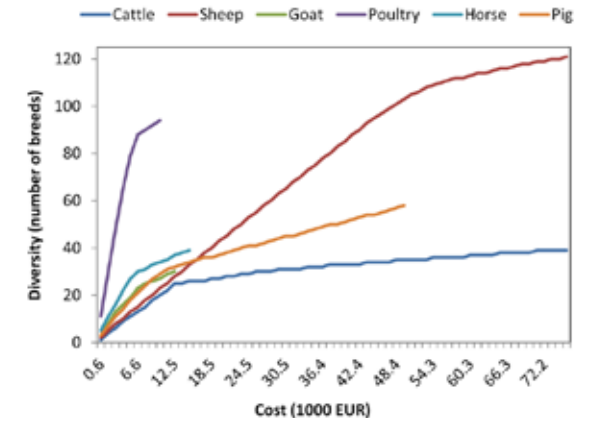
Principles of ISO 9001:2015



Economic model for cost-efficient gene banking

Optimization of gene banking was analysed from an economic point of view, with a mathematical model which helps to create several scenarios, allowing decision makers to (further) develop cost efficient gene bank strategies at national and European level.

Sensitivity analysis of diversity as a function of collective EU budget for livestock breeds (from Silva et al., 2018)



Enhanced methodologies for conservation and characterization of gene bank collections

IMAGE research showed the value of Dutch gene bank collections of the cattle breeds HF and MRV, not only for conservation of genetic diversity, but also for genetic improvement in current breeding programs when loss of genetic diversity is to be constrained or changes in breeding goal occur. Another case study was on pig breeding lines conserved in the Dutch gene bank. It showed that conservation of lines which have been merged in the past decades conserved diversity which is essential for breeding of the old Dutch Landrace currently undertaken, while this diversity is now lost in the live population.

Animal reproductive cells are highly specialized cells that suffer during the cryopreservation process and that need specific procedures in order to be able to produce progeny after cryopreservation. IMAGE obtained:

- 1) improvements in cryopreservation methods of semen and primordial germ cells (PGCs) in chickens,

- 2) the study of new actors involved in semen quality in cattle and chickens,
- 3) progress in the identification of efficient host animals for gene re-introduction in birds following the use of stored PGCs or gonadic grafting.

By Eszter Várkonyi Patakiné

