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 genebank 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

Institut National de la Recherche Agronomique France

Animal Production Research Institute Egypt

Agronoria (Corporacion Colombiano de Investigacion Agropecuaria) Colombia

Ecole Polytechnique Federale de Lausanne Switzerland

European Molecular Biology Laboratory Germany

Friedrich Loeffler Institut Germany

Georg-August-Universitaet Germany

Hasznallat-gennegyarsazi Kozpont Hungary

Institut National de la Recherche Agronomique Morocco

Instituto Nacional de Investigacion y Tecnologia Agraria y Alimentaria Spain

Instituto Nacional de Tecnologia Agropecuaria Argentina

Stichting Wageningen Research Netherlands

Szkola Glowna Gospodarstwa Wiejskiego Poland

Partners

Research Institutes/Universities:

- Institut National de la Recherche Agronomique France
- Animal Production Research Institute Egypt
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- Instituto Nacional de Tecnologia Agropecuaria Argentina
- Stichting Wageningen Research Netherlands
- Szkola Glowna Gospodarstwa Wiejskiego Poland

- Universidad Complutense de Madrid Spain
- Universidade de Lisboa Portugal
- Universita Cattolica del Sacro Cuore Italy
- Universitats Fuer Bodenkultur Wien Austria
- The University of Edinburgh United Kingdom
- Wageningen University Netherlands
- SRUC United Kingdom

SME’s and International organisations:

- Institut de l’Evivage 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 FAO Italy
- Nordiskt Genresurscenter Sweden
- SAVE Foundation Switzerland

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. Michele Tixier-Boichard, INRA IMAGE project: www.imagh2020.eu @imageh2020

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.

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"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 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 challenge of biobanks. Developing a portal for data access and sharing tools is an answer to the challenge of biobanks.

**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.

**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.

**Enhanced methodologies for preservation and characterization of gene bank collections**

IMAGE research showed the value of Dutch gene bank collections of the cattle breeds HF and MRY, not only for conservation of genetic diversity, but also for genetic improvement in current breeding programs when loss of genetic diversity is to be prevented or changes in breeding goals 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 (PGC) in chickens.

**‘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 embryos) 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.**

![Number of genetic collections per species in gene banks surveyed in Europe.](image)

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**

- Continuous improvement
- Customer-oriented
- Risk analysis
- Process approach
- Staff involvement
- Decision-making on facts
- Satisfactory of interested parties
- Continuous improvement
- Staff involvement

**Number of genetic collections per species in gene banks surveyed in Europe.**