

Status quo of the development of the European gene bank network



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IMAGE - Stakeholder Dialogue
Belfast – 28 August 2016



- **Gene bank = *Ex situ* conservation**
- "Ex-situ conservation" means the conservation of components of biological diversity **outside their natural habitats.**
- "In-situ conservation" means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, **in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.**

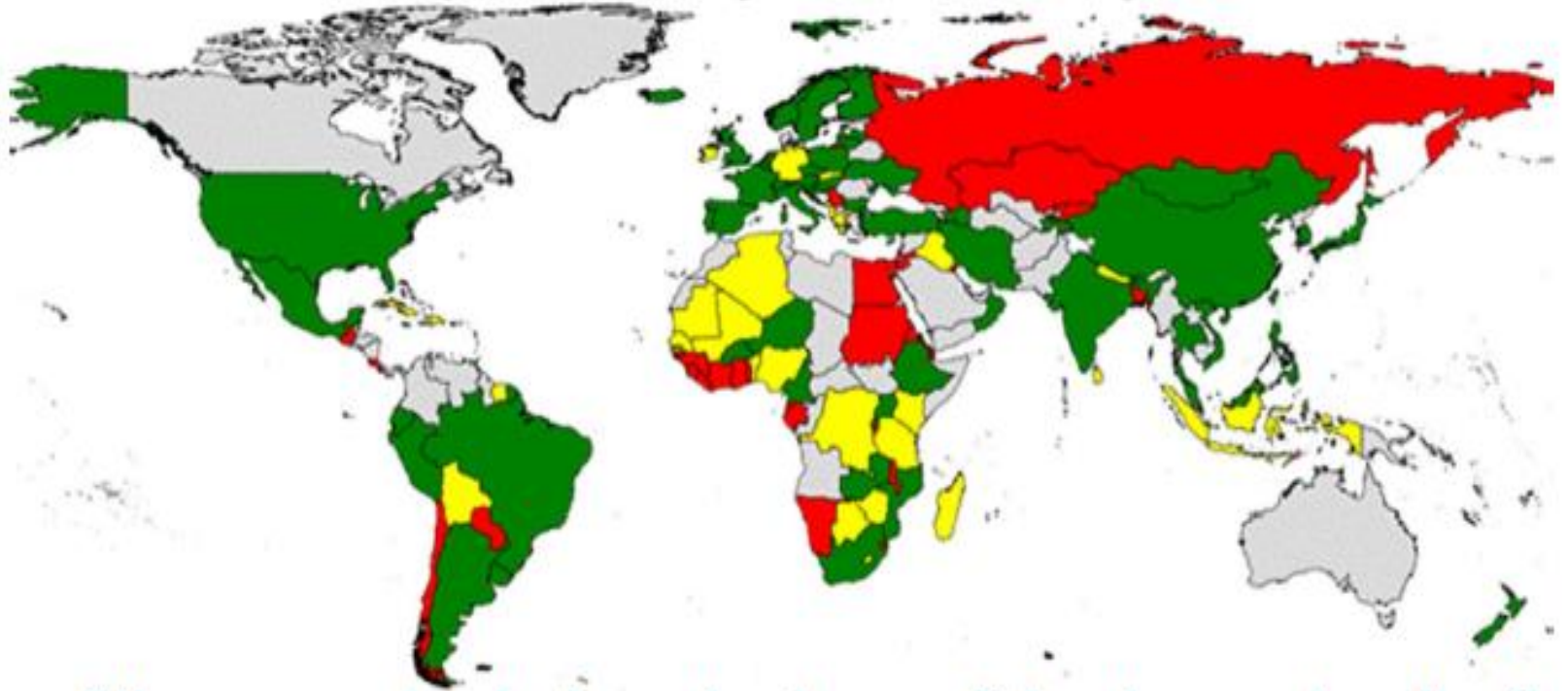
Role of gene banks



- Complementary to *in situ* conservation
 - Supports *in situ in vivo* conservation and breeding programmes
 - Enhances genetic diversity in existing populations
 - Source of genetic material for breed reconstitution or (new) breed development
 - For scientific research and characterization purposes
- Insurance for unknown future needs of animal breeding: long term storage
- Repository of genetic resources in 'public domain' for long term conservation

In vitro gene banks have been established by 64 countries and a further 41 countries are planning to do so.

State of development of *in vitro* gene banks for animal genetic resources



Many of these gene banks in early stages of development; collections often with gaps;

Gene banks in Europe?

The screenshot shows a web browser window displaying the RFP Europe website. The address bar shows the URL: <http://www.rfp-europe.org/conservation-infrastructure/ex-situ-conservation/>. The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The website header features the RFP Europe logo and a banner image of various animals. Below the header, there is a navigation menu on the left with links such as About ERFP, Programme (MYPOW), ERFP Secretariat, Assembly, Steering Committee, Working Groups, Task Forces, Ad hoc Actions, Publications, European Database EFABIS, Conservation infrastructure, In situ conservation, Ex situ conservation, Intranet, and Imprint. The main content area is titled 'Ex situ conservation' and contains the following text:

Ex situ conservation

In addition to the long-term storage of semen, which is a relatively simple and cheap operation for preserving genetic variation, embryos and tissue are also valuable for the *ex situ* conservation of entire genotypes, including for local breeds at a critical stage of endangerment. There are differences between countries on how *ex situ* conservation schemes are organised, especially on how breeding associations and AI centres are involved. Furthermore, there is European and national (sanitary) legislation governing the collection and cryo-conservation of genetic material. In some species, major technological limitations exist, while in others, major advances have been made. The review of available technology and urgent needs of legislation could be done in collaboration across countries.

Currently, the ERPF Working Group "Ex situ conservation" and Task Force "Access and Benefit Sharing" are developing an overview of the existing genebanks in Europe and the material held by them as well as the conditions under which the material is available. This overview should serve further deliberations on the establishment of a European network for animal genetic resources (ERPF-ANR).

[List of existing genebanks in Europe \(draft version 24th June 2014\)](#)

The sidebar on the right contains a 'Contact' section with links to Daniela Bojkovski and Moica Simcic, and a 'Links' section with links to DAD-IS, FAO State of the World's Animal Genetic Resources, FAO Global Plan of Action, EU Genetic Resources in Agriculture, EAAP, and Convention on Biological Diversity. The bottom of the page shows a Windows taskbar with various application icons and a system tray with the date and time (18:06, 27-8-2015).

Survey Results – 25 national Gene Banks in Europe



Species represented in national gene bank collections	Percentage of countries
Cattle	92%
Sheep	64%
Goat	52%
Horse	60%
Pig	56%
Chicken	20%
Rabbit	8%
Duck	8%
Bee	8%
Dog	4%
Goose	4%

Type of genetic material in European gene banks	Percentage of countries
Semen	84%
Embryos	44%
Embryonic cells	4%
DNA/blood	44%
Ovarian cells/oocytes	20%
Gonadal tissue	4%
Somatic cells/tissue	20%

Host institution for gene bank collections	Percentage of countries
- Public or semi-public institution	72%
- Breeding association or AI centre	8%
- Network of organizations	20%
Legal basis for national gene bank	
- National/regional law or regulation	38%
- Agreement on (research) program	31%
- Not mentioned	31%
Ownership of genetic material	
- Public or semi-public ownership	56%
- Breeding association or AI centre	8%
- Provider or depositor	4%
- Mixed public-private	32%

Conclusions and future perspectives

- Diversity of national Gene Banks in European countries
- Different national strategies and institutional/legal frameworks
- Need for better characterization and documentation of gene bank collections
- Opportunities for harmonization and exchange of knowledge and experiences

References

- ERFP 2014. <http://www.rfp-europe.org>
- Ducheve, Z., Cong, T.V.C. and Groeneveld, E. (2010). Bioinformation, 5, 219-220.
- FAO, 2007. Global Plan of Action for Animal Genetic Resources (GPA)



■ European Genebank Network for AnGR

■ A Genebank for AnGR is defined as:

- a repository for *ex situ* conservation and sustainable use of AnGR
- held by a host institution
- authorized and/or recognized by a national authority
- a genebank may be constituted by one or more repositories (*in vitro* or *in vivo*) collaborating as a network.

Objectives of EUGENA (1)



- To support development of national genebanks
- To share information and knowledge between countries
 - Quality standards and protocols
 - Strengthen national strategies
- To facilitate access to, and assessment of AnGR kept in genebank collections
 - European portal/register for gene bank collections
 - Rationalization of collections

Objectives of EUGENA (2)



- To increase the efficiency of *ex situ* conservation of the genetic diversity of (subregional) transboundary breeds
- To promote harmonization of acquisition+access terms
- To create an element of the European research infrastructure
- To facilitate international exchange of AnGR - implementing the Nagoya Protocol on ABS

Current/Next steps for EUGENA



- Countries and ERFP are in process of signing Memorandum of Understanding
 - Participating Gene Banks at national level
- EUGENA Logo
- Development of Portal
 - Access to Register of Gene Banks and Data

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Current access to gene bank info




EFABIS

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Single Breed Reports

- [Breed Data Sheets](#)
- [Empty Breed Data Sheets](#)

Breeds Population Reports

- [Early Warning Tool](#)
- [Single breed population structure & Inbreeding](#)
- [Comparing breeds on population structure](#)
- [Population structure charts](#)

Other Information

- [Breeds by species and country](#)
- [Status of reporting by country](#)
- [Image browser](#)
- [Transboundary breed](#)
- [Cross-table generator](#)
- [Conservation programmes](#)

Annual regional statistics

- [Degree of completeness of EFABIS and number of breeds per country](#)
- [Number of breeds with population data compared to total number of breeds recorded in EFABIS](#)
- [Frequency of updating the population size in EFABIS](#)
- [Degree of completeness of EFABIS based on Population Data Index](#)
- [Trends of population size by species](#)
- [Population trends over the years](#)

Transboundary genebank data

- [Transboundary breed overview](#)
- [Cryodata charts per transboundary breed](#)
- [Cryodata charts per country](#)
- [Search material](#)



Search tool



Search cryo material from transboundary breeds

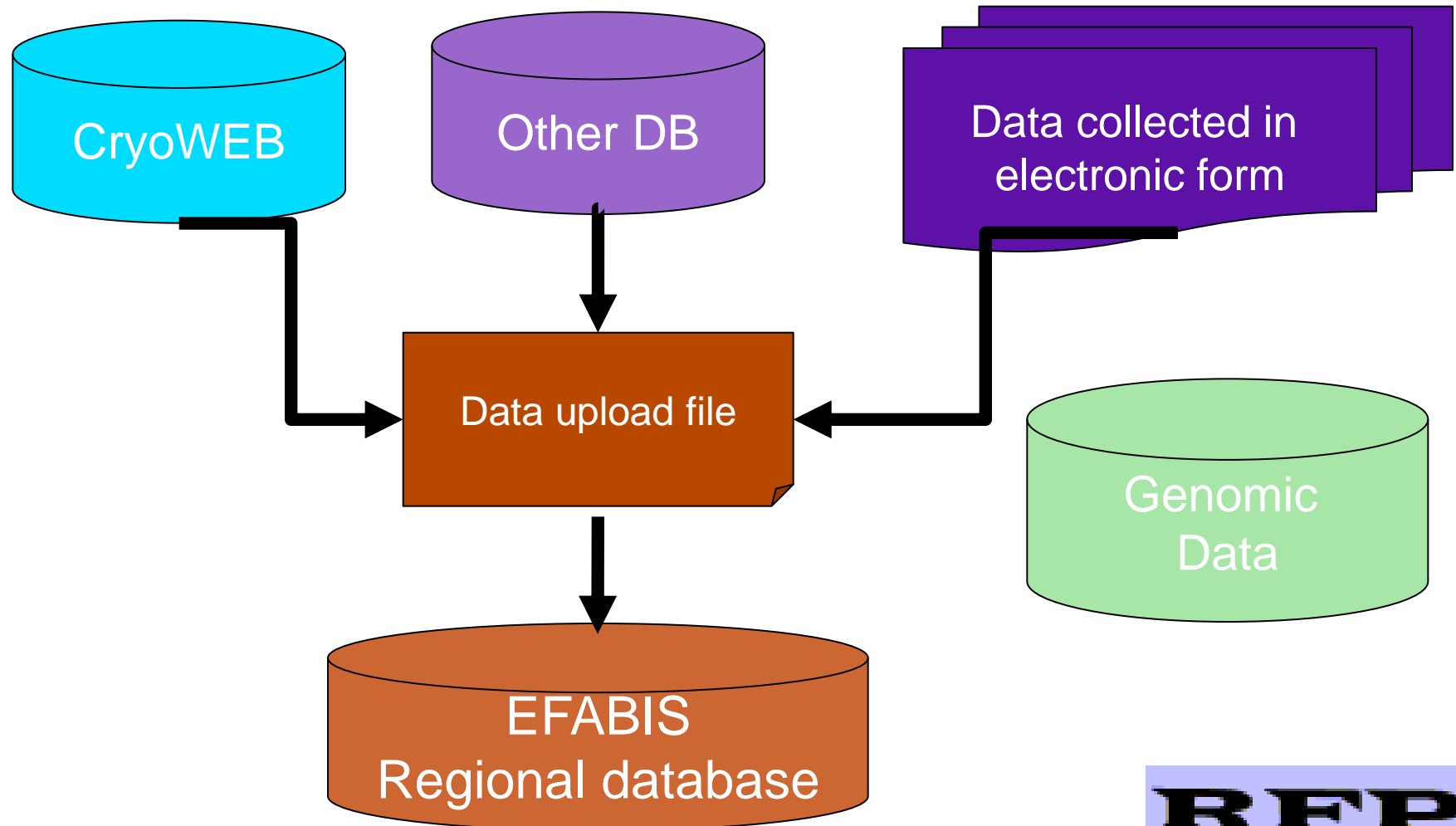
Species

Transboundary name

Cryobank data: ALL (ALL)

Year	Breed na	Country	Total(m)	Total(f)	Semen	Donors(r)	Embryos	Donors(f)	Oocytes	Donors(f)	Somatic c	Donors(r)	Somatic c	Donors(f)	DNA	Donor
2011	Aberdeen	Austria	4	0	200	4		0		0		0		0		
2004	Aberdeen	Ukraine			1554200											
2008	Aberdeen	Austria	3	0	150	3		0		0		0		0		
2005	Aberdeen	Austria	2	0	100	2		0		0		0		0		
2002	Aberdeen	Austria	1	0	50	1		0		0		0		0		
2006	Aberdeen	Austria	2	0	100	2		0		0		0		0		
2005	Aberdeen	Ukraine			1359100											
2003	Aberdeen	Ukraine			1591800											
2003	Aberdeen	Austria	1	0	50	1		0		0		0		0		
2001	Aberdeen	Austria	1	0	50	1		0		0		0		0		

Cryobank data at European level (EFABIS)



What do we know about gene banks and collections?



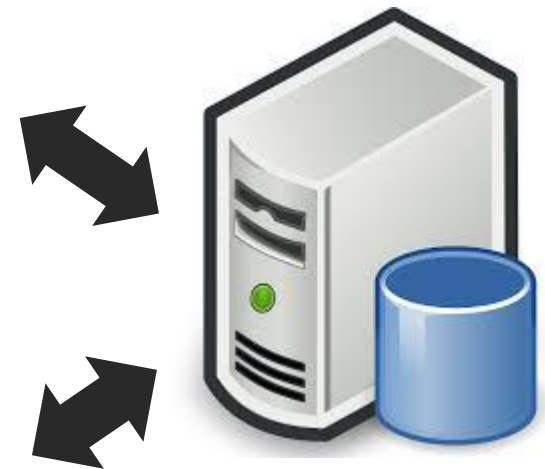
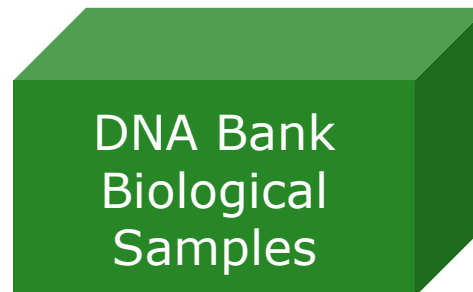
- Little information of national gene bank collections in EFABIS
- No single/easy entry point to get access to (meta) information about gene banks/collections
- Hard to get an overview of gene bank in Europe and their characteristics and specific collections

Need for a Portal

- Enabling access to the (register of) Gene banks and information about gene bank collections in Europe

Genebanks:

- Germplasm/reproductive collections
- Genomic/DNA collections





IMAGE

will support

EUGENA

European Gene Bank Network for Animal
Genetic Resources

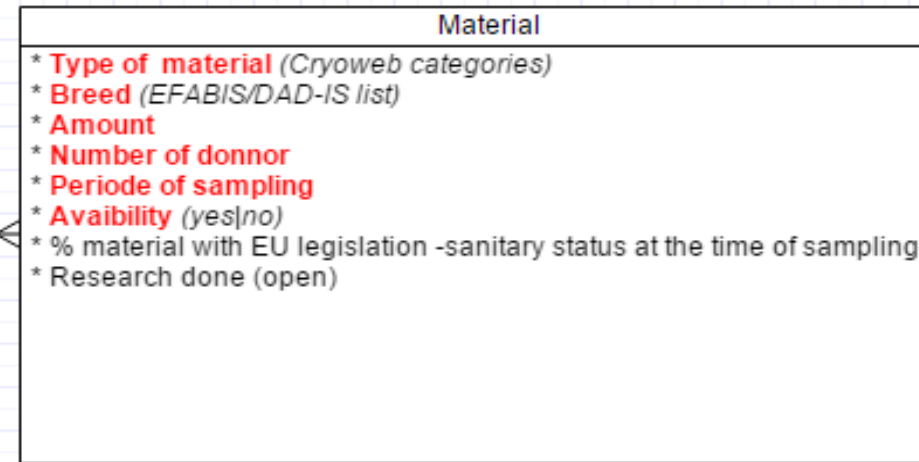
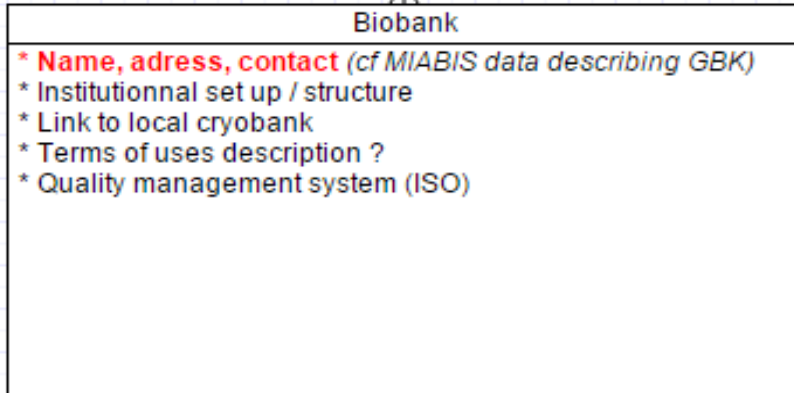
General objectives of IMAGE

- to enhance the use of genetic collections
- to upgrade animal gene bank management
- to demonstrate the benefits brought by gene banks

IMAGE – further Objectives

- Strategic analysis of current *ex situ* collections: diversity, utility, risks, redundancies, complementarities
 - Documented inventory of *ex situ* collections – virtual integration – central data portal
 - New characterization information and new tools to better evaluate the potential usefulness of collections
- To enhance utilization of genetic material of genebanks or biobanks in (future) breeding, conservation and research!

Portal development - Minimum data fields



The screenshot displays two web interfaces. The top interface is the 'SLU Biobank Sample collection database', which shows a table of sample collections with columns for English Name, Organization, Species Kingdom, and Species Binomial. The bottom interface is the EURISCO website, which provides information about the European network of ex situ National Inventories (NIs) and the EURISCO Catalogue.



Summary

- Most European countries have gene bank collections
- Large variability between gene banks
- Limited information available on gene banks and their collections
- IMAGE will help the EUGENA genebank network to further develop
- Joint EUGENA-IMAGE data portal development, also linked to EFABIS/DAD-IS

Thank you for your attention



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