National and European Genetic Resources Strategy

CGN-model & EURC-EAB

S.J. Hiemstra – Centre for Genetic Resources, the Netherlands

Madrid - 28 November 2023

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EUROPEAN
REFERENCE CENTRE FOR
ENDANGERED
ANIMAL BREEDS

Introduce myself

- Head of the Centre for Genetic Resources, the Netherlands (CGN) of Wageningen University and Research
- National Coordinator for Animal Genetic Resources (FAO Global Strategy and Global Plan of Action)
- Director of European Reference Centre for Endangered Animal Breeds (EURC-EAB)

Centre for Genetic Resources, the Netherlands (CGN)

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www.wur.nl/cgn

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Centre for Genetic Resources, the Netherlands (CGN)

- Statutory Research Tasks (Ministry of Agriculture)
- Internationally recognised
  - Gene bank
  - Centre of expertise
- Conservation and sustainable use of genetic diversity
  - Crops
  - Livestock
  - Trees and shrubs
  - Species in aquaculture

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Food and Agriculture Organization of the United Nations | COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Commission on Genetic Resources for Food and Agriculture

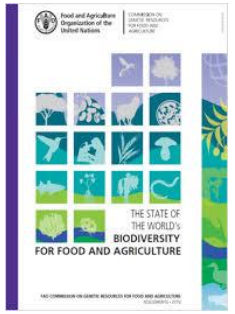
FAO Commission on Genetic Resources

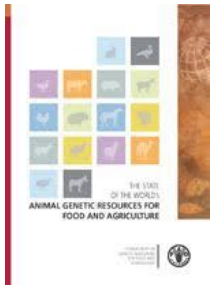
GLOBAL PLANS OF ACTION

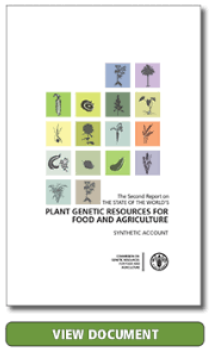
- **Plant**
- **Animal**
- **Forest**
- **Aquatic**
- Microbes and invertebrates
- Biodiversity for Food and Agriculture

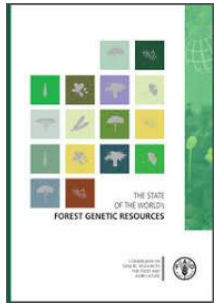
COMPLEMENTARY STRATEGIES

- Ex situ conservation
- In situ conservation
- Monitoring and characterization
- Capacity building and awareness raising









Campus of Wageningen University & Research

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CGN

Programme within WUR (Wageningen Research)

DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of
Wageningen Research, WOT-unit CGN
Droevendaalsesteeg 1, 6708 PB Wageningen, Netherlands

has been found to conform to the Quality Management System standard:

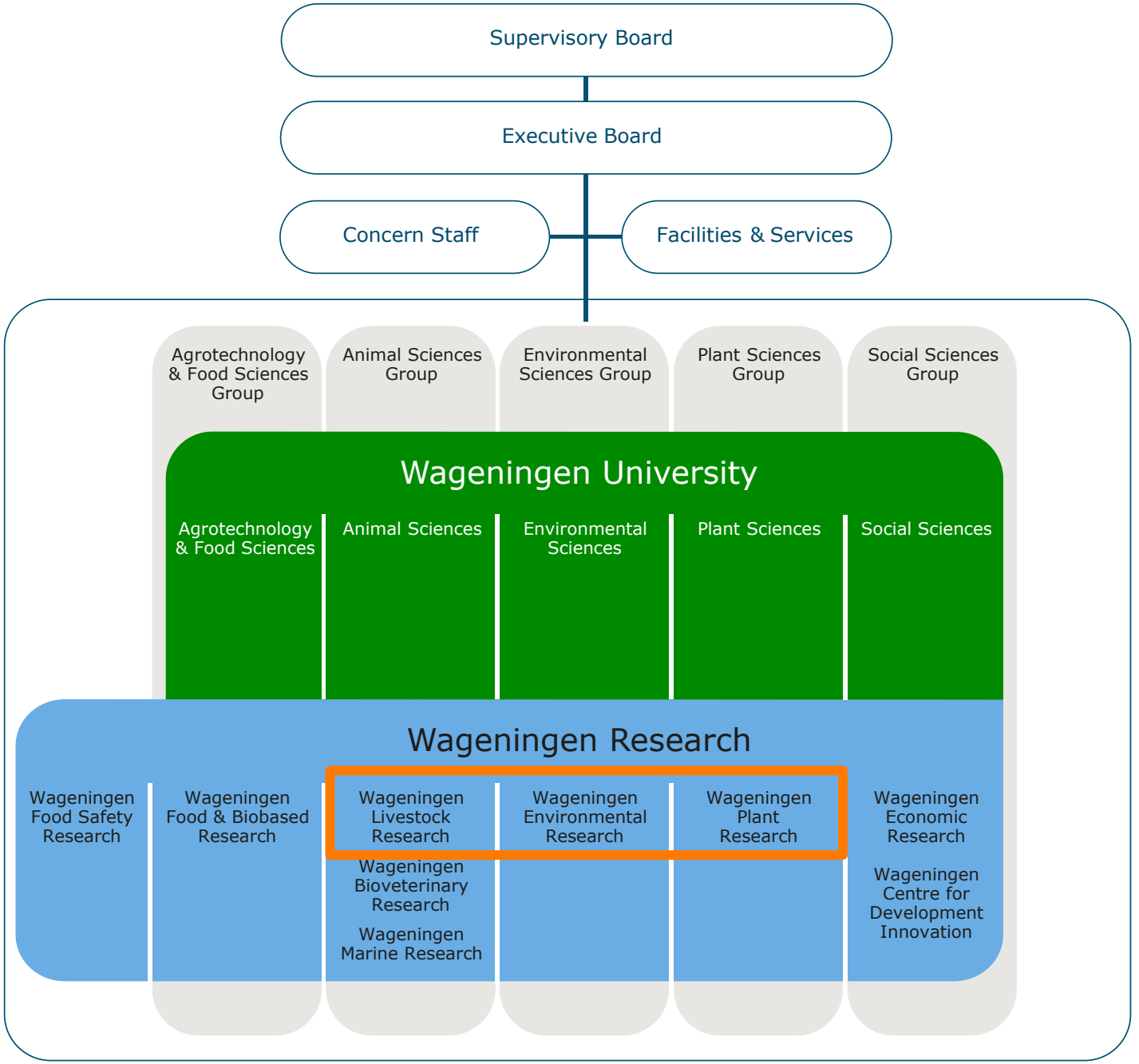
ISO 9001:2015

This certificate is valid for the following scope:
Conservation of genetic material of plants and animals, documentation of associated data, promotion of use of genetic resources and supportive research.

IAF

Centre for Genetic Resources, the Netherlands (CGN)

www.wur.nl/cgn



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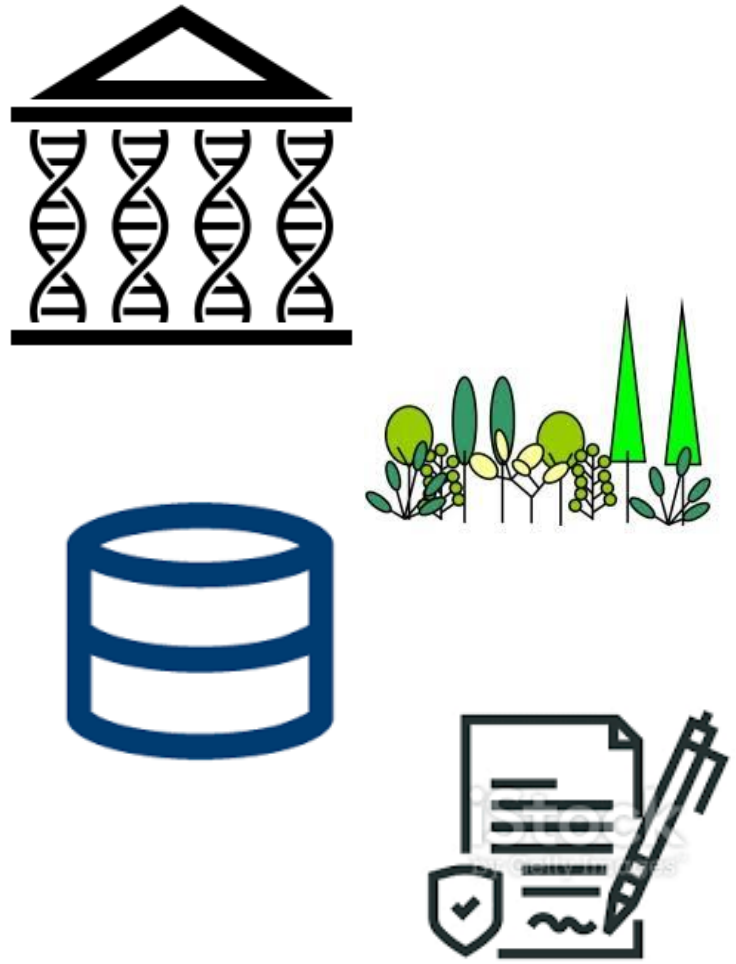
CGN – 4 main activities – across domains and species

- Develop and maintain **genebanks** for crops, livestock, trees and aquatic species (ex-situ)
- Advise - maintaining live **populations** (in-situ) and sustainable **breeding programs**
- **Digital** genebank development
- Coordination, communication and **policy advice**



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CGN – Animal Genetic Resources

- Compose and manage gene bank collections
- Advise rare breed societies: genetic management and sustainable breeding programs
- Policy advice (national and international level)
- Scientific research: population genetics, genomics, breeding, cryobiology, reproduction

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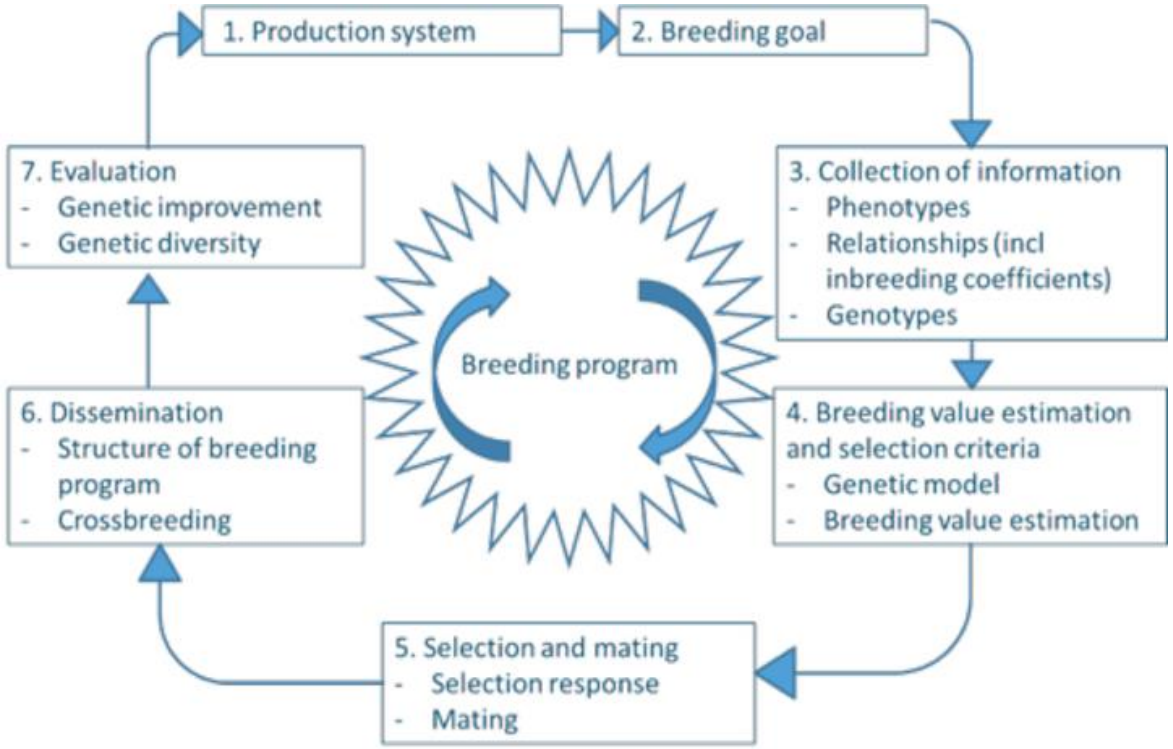
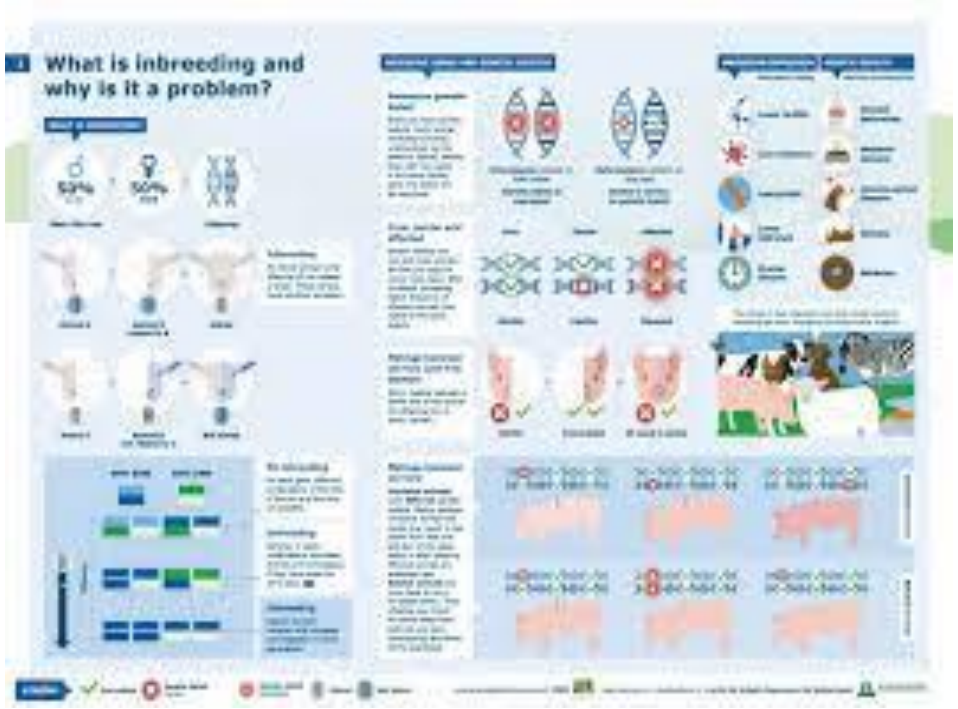
Food and Agriculture Organization of the United Nations

COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

AnGR - Sustainable breeding program is key!





CGN - Current livestock genebank collection – mainly semen

Species	Breeds	Donors	Doses	Birth years donors
	26	6,682	269,811	
	12	364	34,672	
	36	802	22,614	
	31	270	18,652	
	6	100	7,037	
	15	148	5,449	
	8	62	1,889	
	4	67	1,569	
	7	20	257	
	1	11	102	
	146	8,526	362,052	1959 ---------- 2022

Status July 2022

Annual targeted growth:

- 2% targeted growth in number of donor animals per year

Approaches to expand collection:

- Regular back up
- Offers from individual breeders and breeding organisations
- Targeted collection of genetic material

CGN – Aquatic Genetic Resources
- Genetic monitoring and Ex situ conservation

Relevante soorten

- Schelpdier
  - *Crassostrea gigas* (Japanse oester)
  - *Ostrea edulis* (platte oester)
  - *Mytilus edulis* (mossel)
- Vis
  - *Anguilla anguilla* (Europese aal)
  - *Scopthalmus maximus* (*Psetta maxima*) (tarbot)
  - *Sander lucioperca* (snoekbaars)
- Zeewier
  - *Saccharina latissima* (suikerwier)
  - *Ulva spp.* (zeesla)
  - *Laminaria digitata* (vingerwier)
  - *Undaria pinnatifida* (wakame)

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CGN - Forest genetic resources

Ex situ field collections (Roggebotzand)

- In Netherlands approximately 100 indigenous woody species
  - 50% rare to very rare
- Development of back-up seed collection

CGN - Plant genetic resources

- >23000 genebank accessions of 30+ crops from >100 countries
- Focus on vegetables
- Phenotypic and genomic information

CGN collections (March 24th, 2022)

lettuce	2552	wheat	4912
potato	1475	barley	2665
tomato	1337	flax	951
onion	432	pea	1015
spinach	539		
pepper	1177	*other crops*	3486
cucumber	924		
cabbage etc.	1796	*TOTAL*	23261

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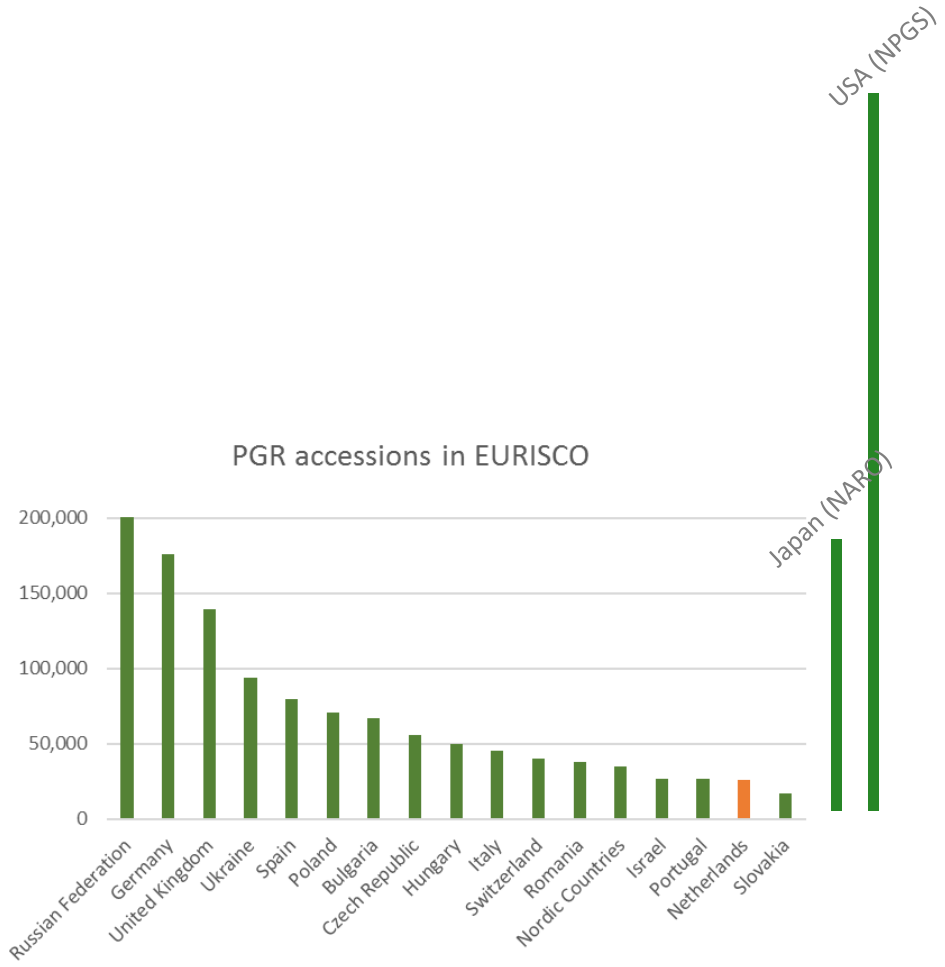
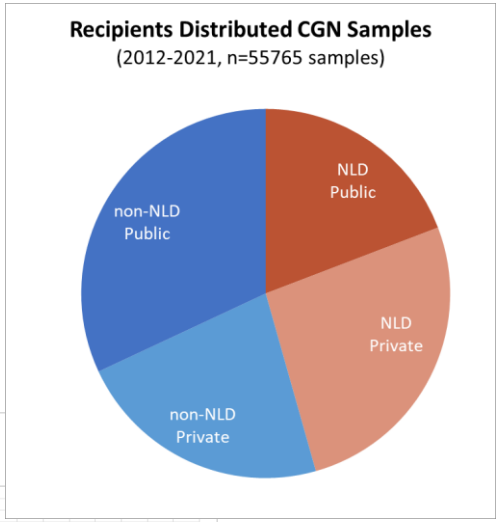
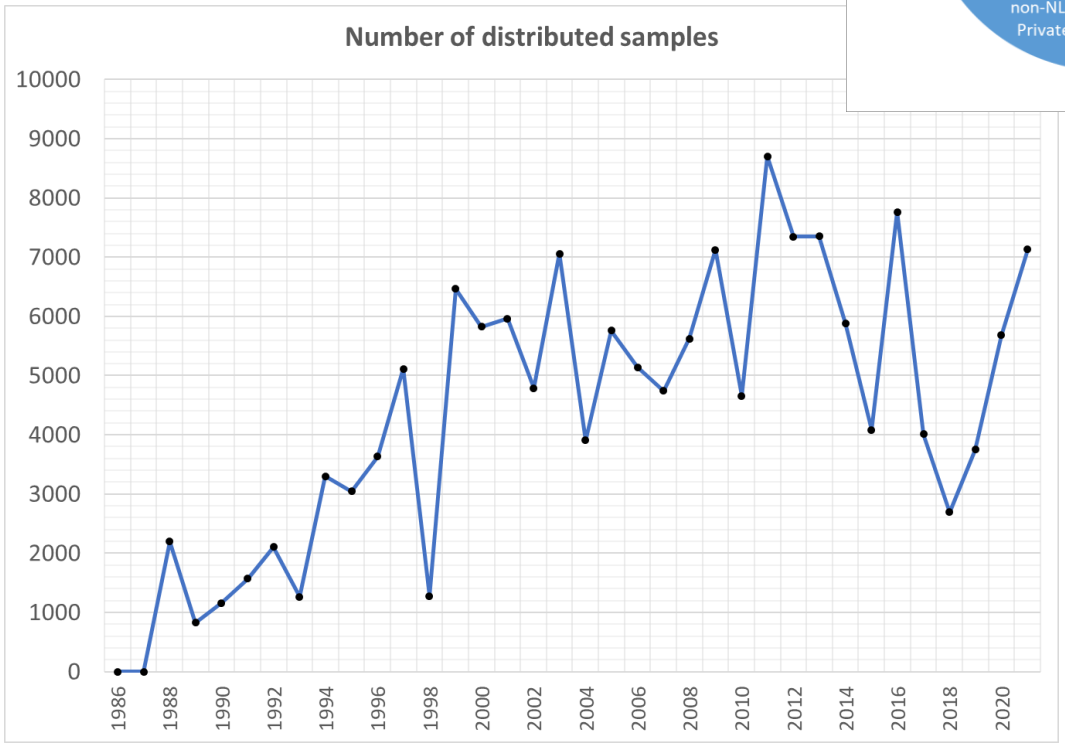
CGN – Plant genetic resources
High quality genebank – limited size – accessible







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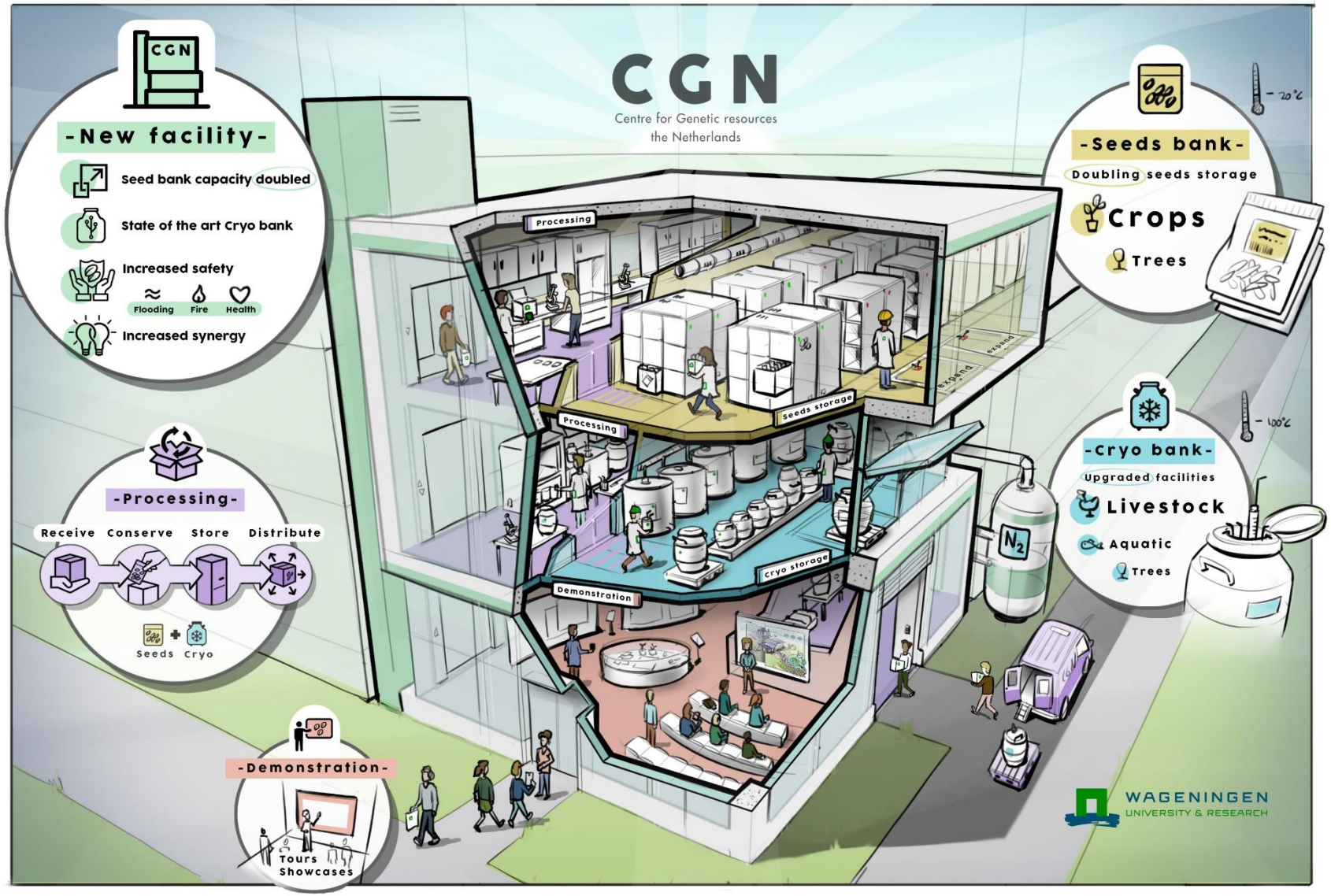
Towards new, larger, state of the art genebank and lab facilities



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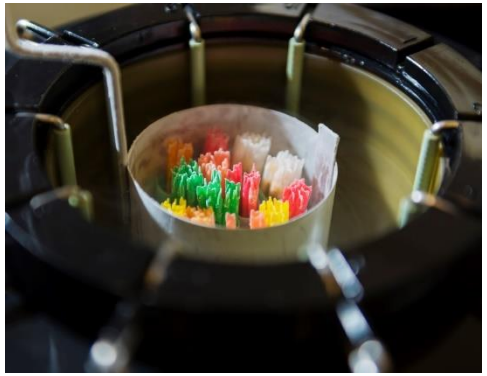
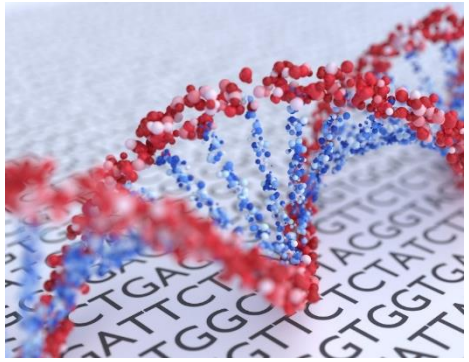
Synergies and opportunities – collaboration across domains

- Facility sharing
  - Cryostorage, seed storage, biobank
- Emerging technologies
  - Omics, bio-informatics
- Sometimes same stakeholders/actors
  - Eg seed collection in nature areas
- Policy support and coordination
  - FAO CGRFA & ABS Focal Point
- Communication and raising awareness





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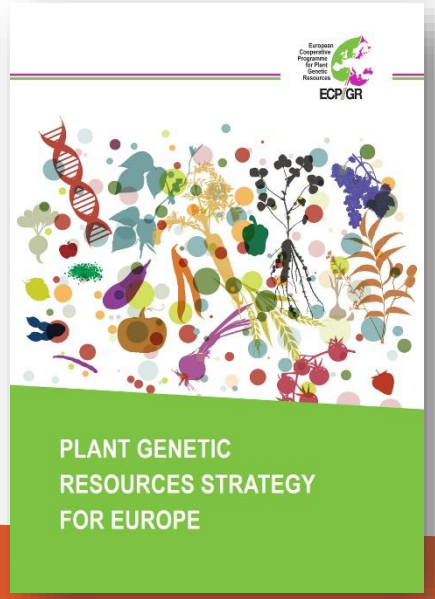
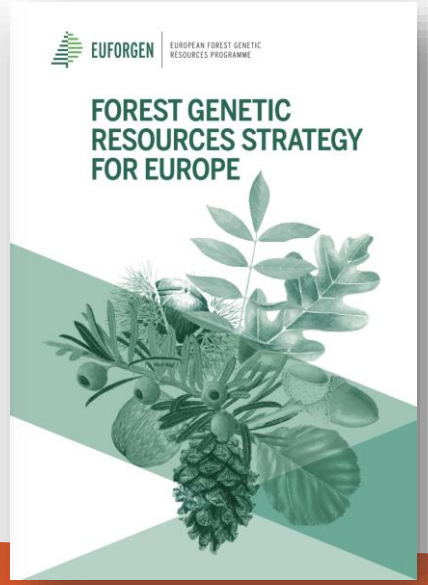
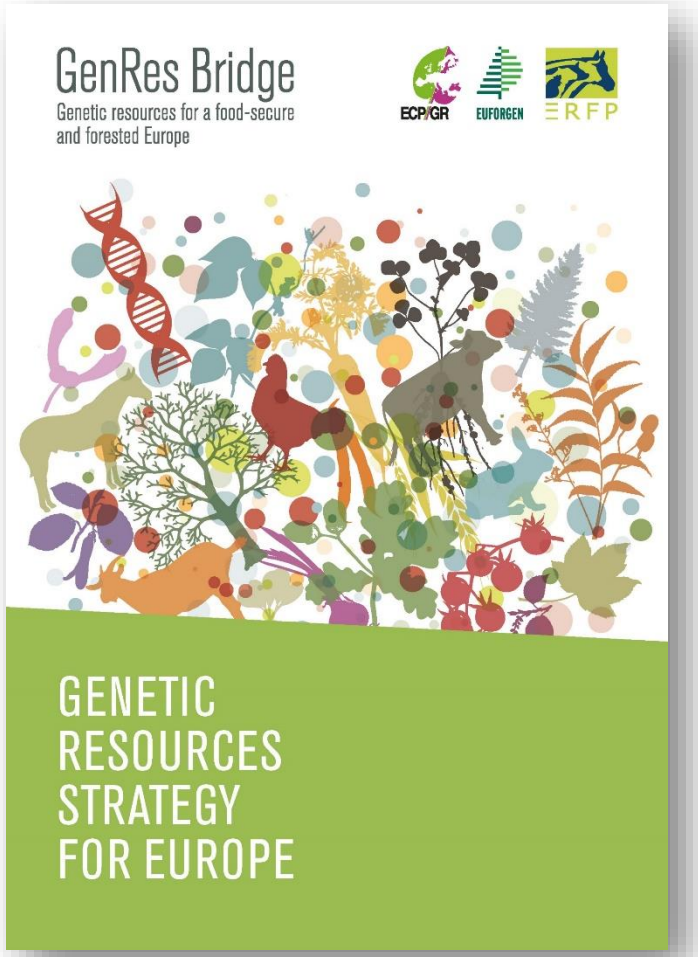
Genetic Resources Strategy for Europe

Complementary domain-specific strategies for plant, animal and forest genetic resources address more concrete aspects that are particular to each domain

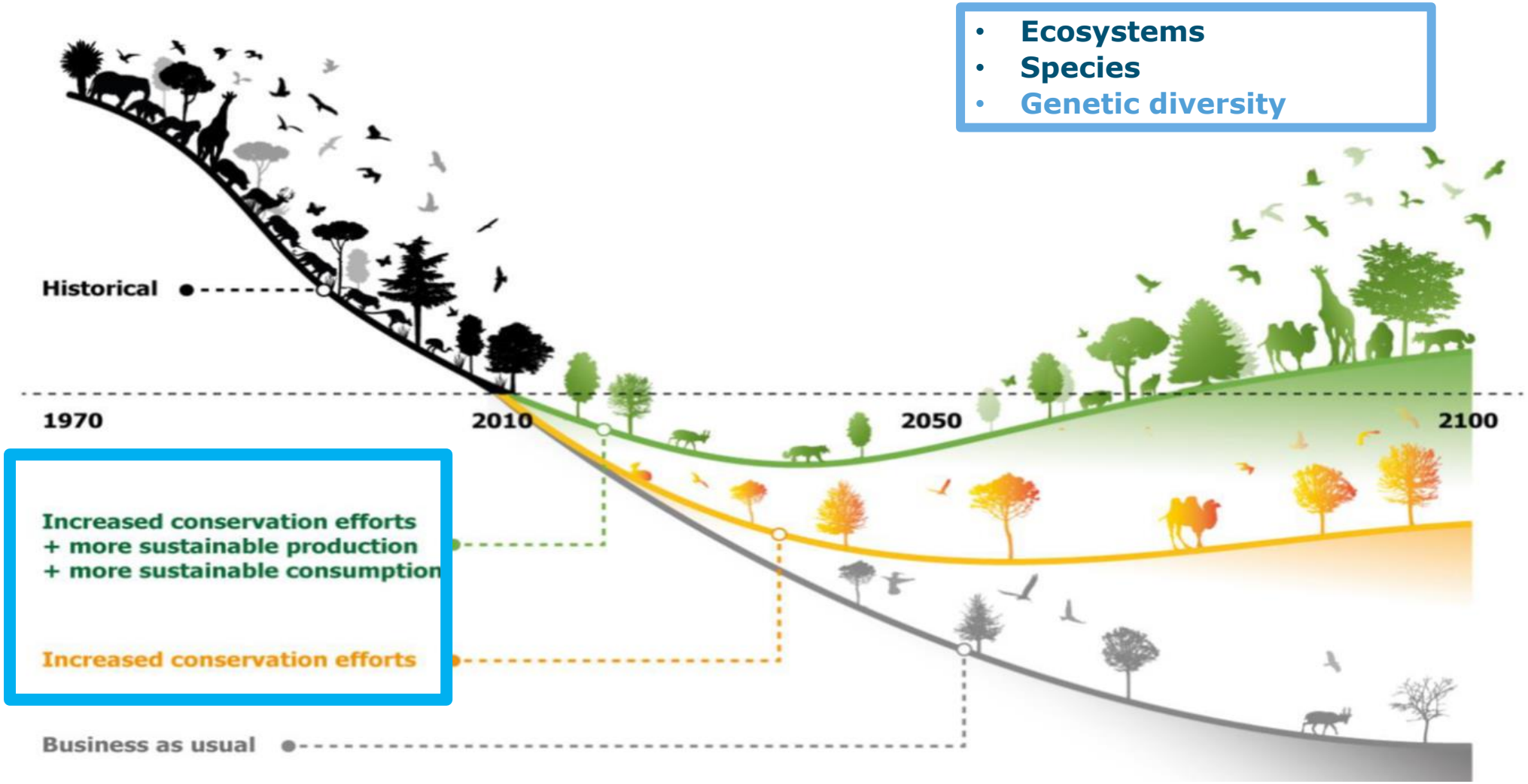






This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817580

Bending the curve for Biodiversity



Leclère et al. 2020. Bending the Curve for biodiversity. *Nature*

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Adapted from Luigi Guarino

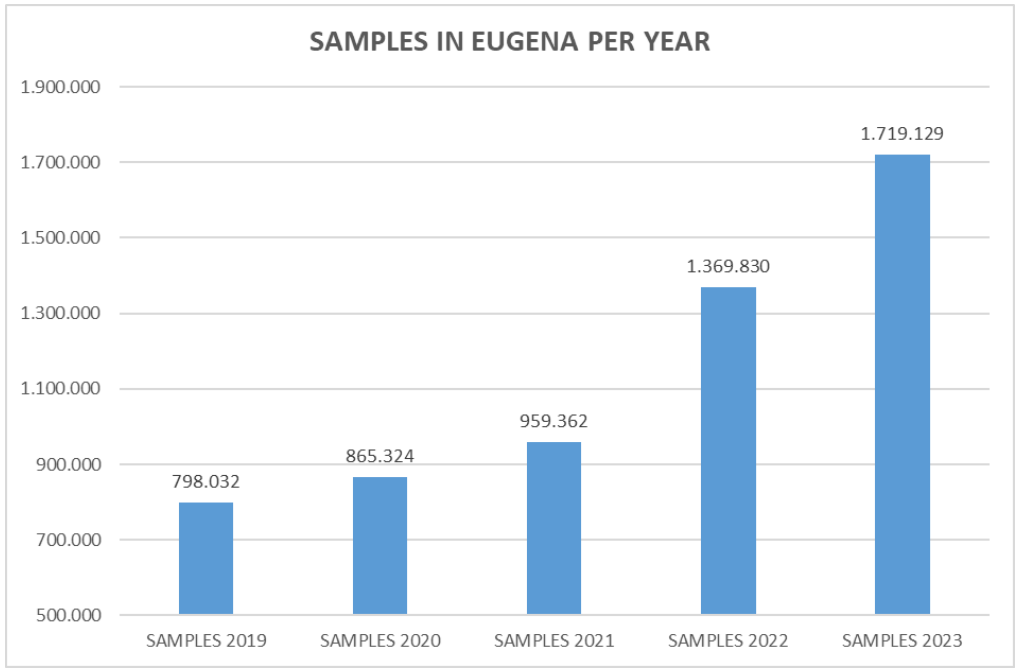
GR strategy → action and implementation

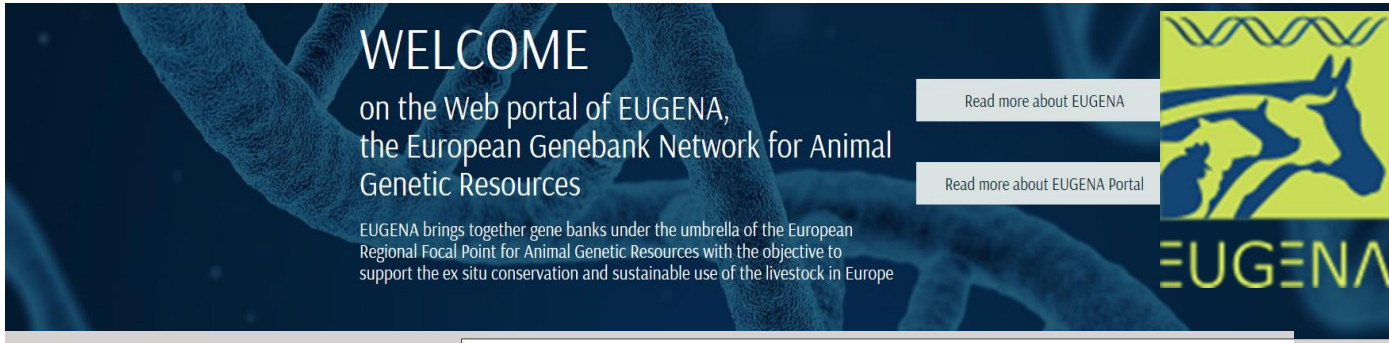
- Need for **complementary** *in situ* and *ex situ* strategies
  - In situ
  - Live (breeding) populations
  - On farm
  - Gene banks
  - In vivo
  - In vitro
- Different **stakeholder** roles/perspectives

Opportunities to improve GR management at **European level**?

Some examples

Development and professionalization of the European Gene Bank Network for **Animal Genetic Resources** (**EUGENA**)

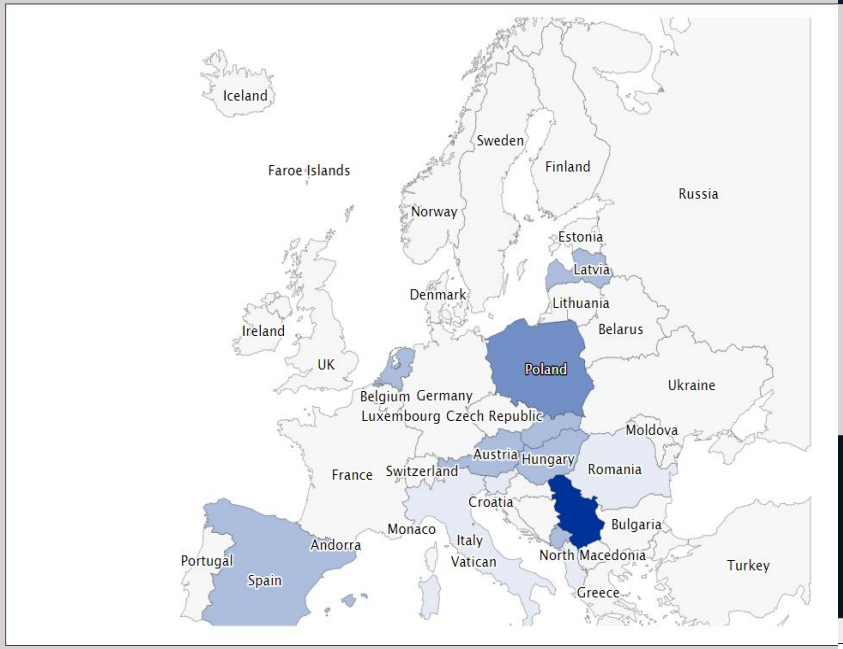




13 Countries

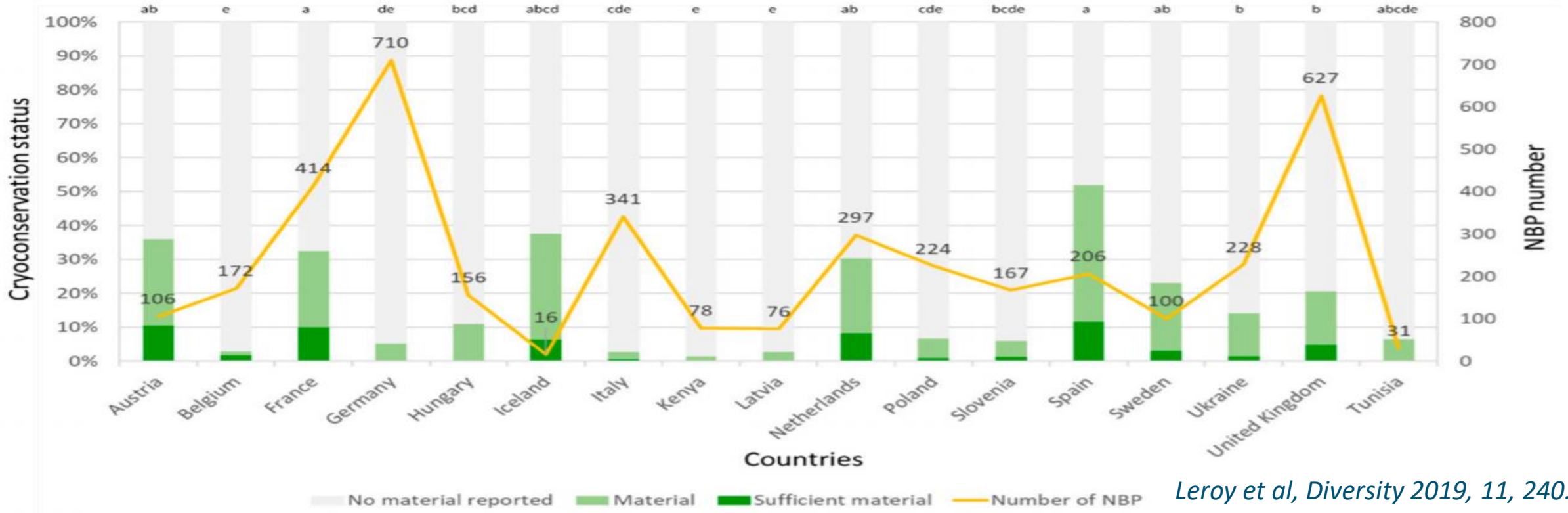
13 Gene Banks

1869169 Samples



Identify collection gaps (**AnGR**) – within/between countries

- Many breeds "at risk" have very limited samples stored in gene bank
- All breeds need regular back up storage in gene banks (before becoming at risk)



Leroy et al, Diversity 2019, 11, 240. Cryoconservation of Animal Genetic Resources in Europe and Two African Countries: A Gap Analysis.

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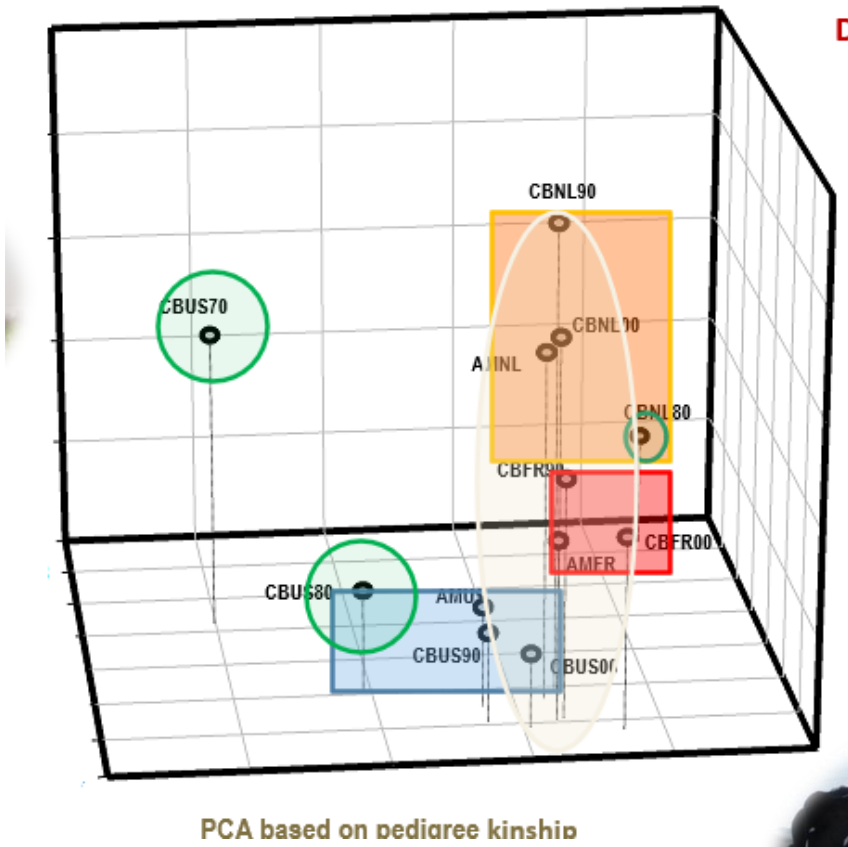
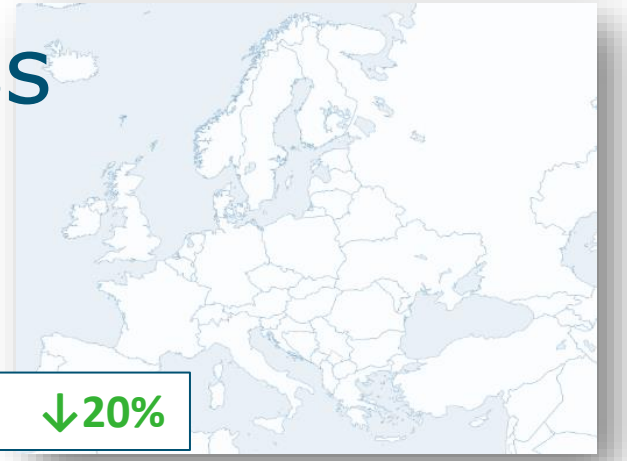
Opportunities: Reduce redundancy and promote collaboration between countries (**AnGR**)

Comparing the Dutch, French, and US Holstein Friesian genebank collections



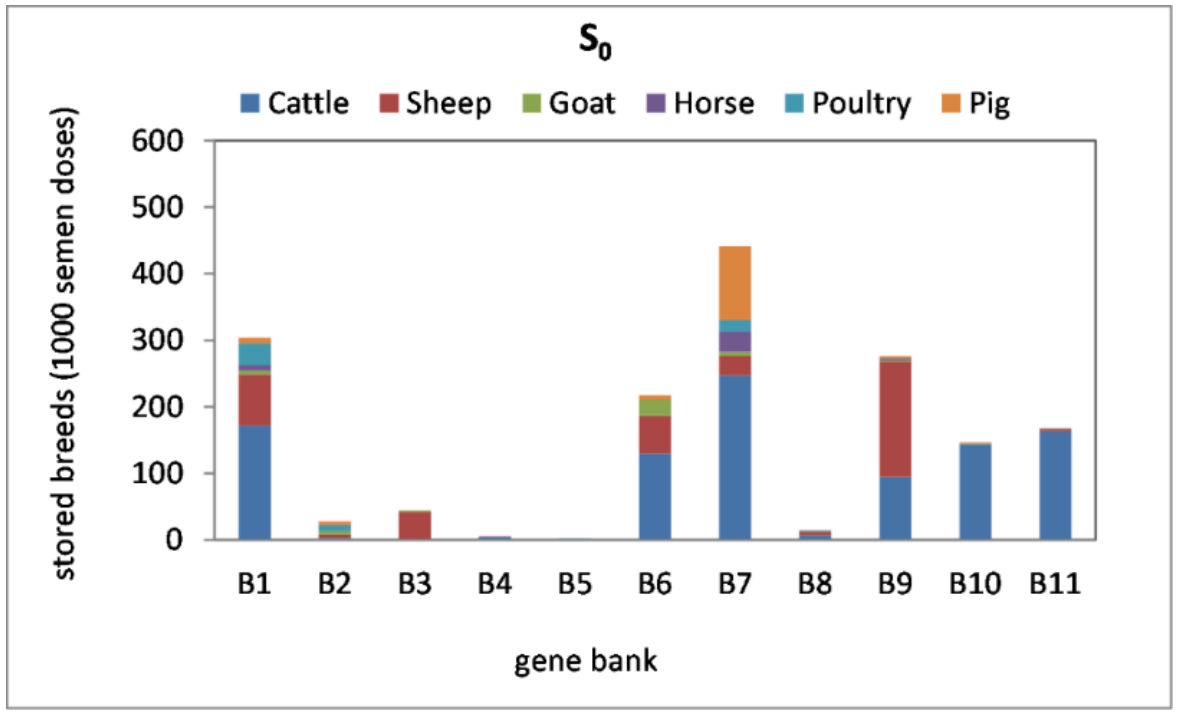
Coralie Danchin et al.

Opportunities: Costs optimization across genebanks/countries (**AnGR**)

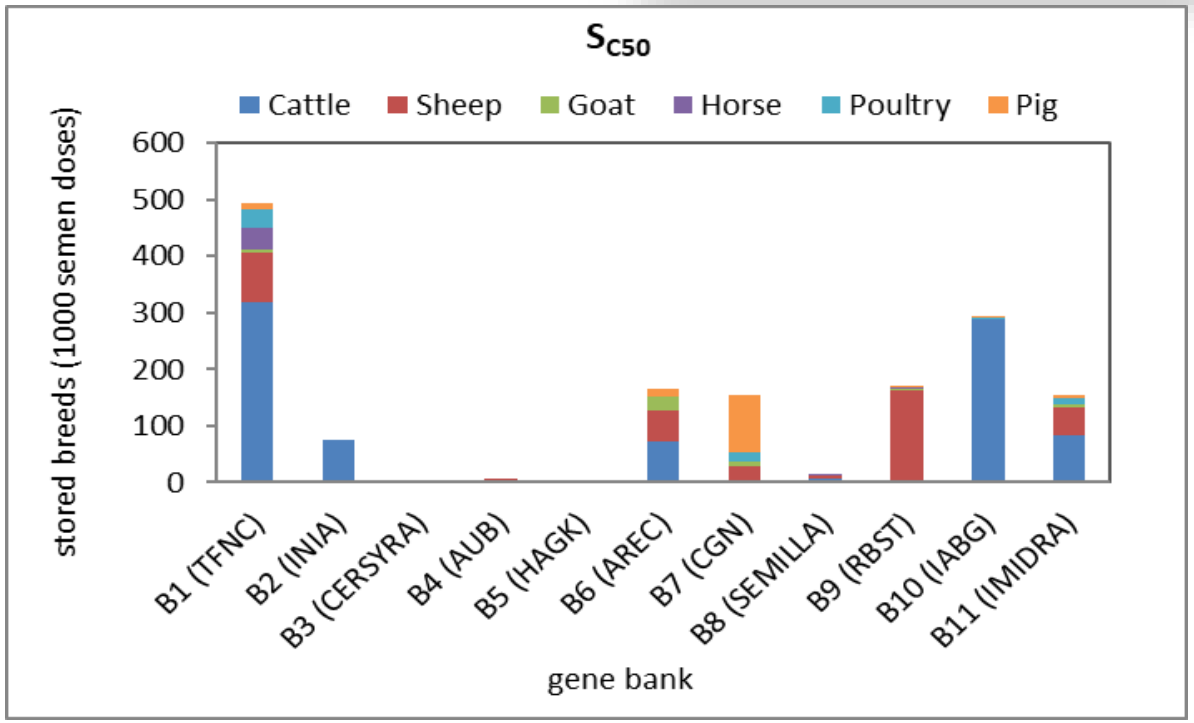


Current breed conservation *Vs* **Optimal**

Cost: 22.3 M EUR



Cost: 18 M EUR ↓20%



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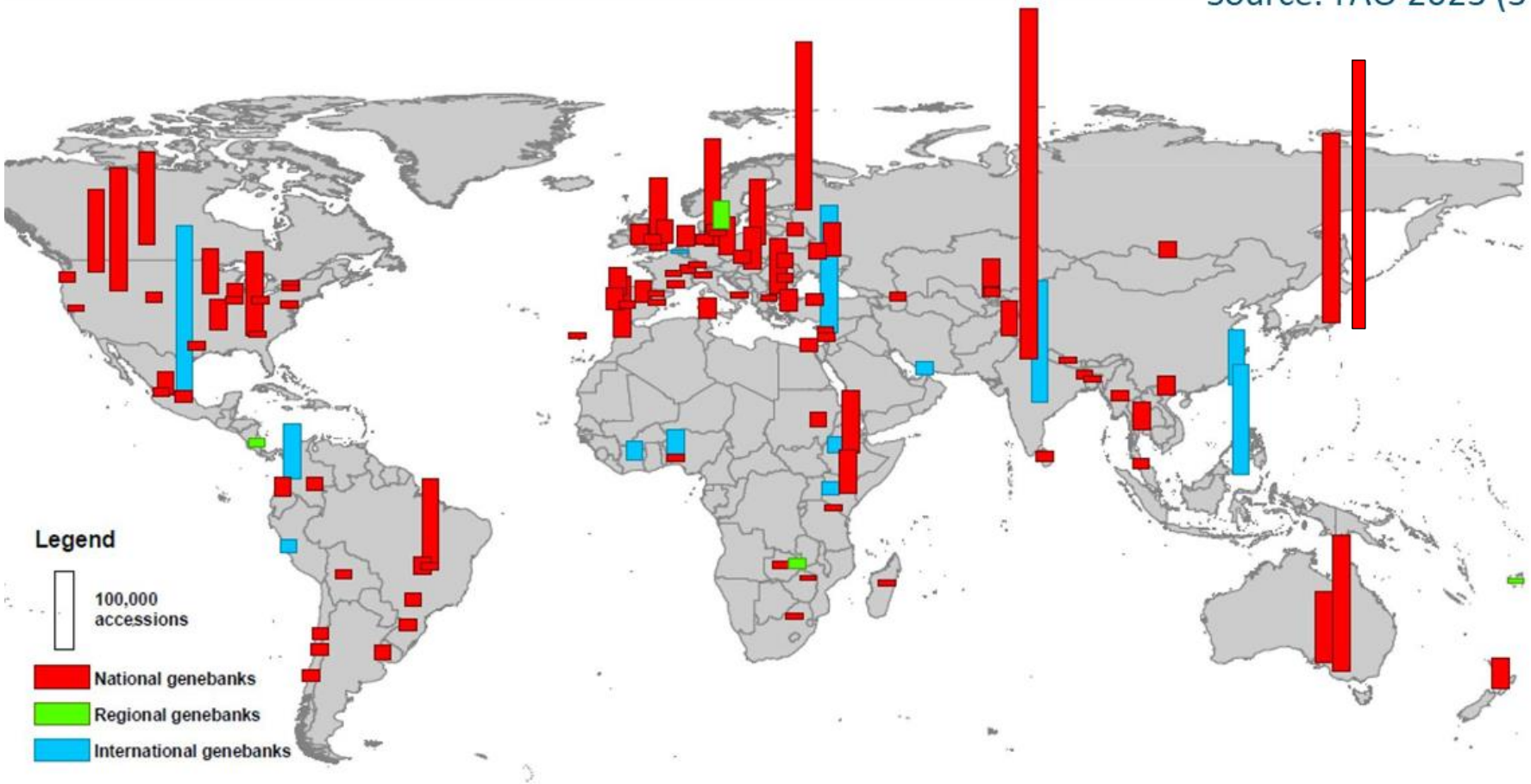
Rafael De Oliveira Silva, Bouda Vosough Ahmadi, Sipke Joost Hiemstra, Dominic Moran, 2018)

IMAGE Innovative Management of Animal Genetic Resources

Need to improve quality and efficiency of **PGR** genebank network

Source: FAO 2023 (3rd SoW PGR)



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Make European/global **PGR** conservation system more effective → Quality Management

- Reliability genebanks is unclear (often low)
  - Procedural weaknesses
    - material gets lost in the genebank
    - material is not accessible
  - Lack of risk-management
    - no (or only local) safety back-up
- No international coordination / weak collaboration
  - Countries can not rely on each other
  - Redundancy

Theo van Hintum, CGN

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EU Research Infrastructur

PRO-GRACE
PROMOTING A PLANT GENETIC RESOURCE COMMUNITY FOR EUROPE

main objective

A concept of a novel

Catalogue, describe, preserve and enhance

RARe Ressources agronomiques

INRAE

cirad

IRD Institut de Recherche pour le Développement FRANCE

EuroFAANG

Home | About | Projects

EuroFAANG

Accelerating genome to phenome research for farmed animals in Europe

By establishing EuroFAANG, **the H2020 projects GEroNIMO**, **AQUA-FAANG**, **BovReg**, **GENE-SWitCH**, **Rumigen** and **HoloRuminant** have formed a closer relationship to coordinate their objectives within Europe in association with the international FAANG initiative. EuroFAANG brings together a wide range of expertise in farmed animal biology and breeding, genomics, bioinformatics, modelling and open data, as well as multiple platforms for dissemination and outreach, with a common goal to discover links between genome and phenome (i.e. G2P) in the frame of the FAANG to Fork strategy.

In **EuroFAANG**, the six projects have identified joint strategies to empower research, as well as for communication, dissemination and training activities. Examples are the common planning and development of collaborative analyses and the coordinated organisation of training courses. EuroFAANG further aims to maximise user engagement and uptake of the results by targeting a wide range of stakeholder groups.

EuroFAANG

Accelerating genome to phenome research for farmed animals in Europe

Disease resistance | Biological efficiency | Precision breeding

Reduced environmental impact | Feeding a growing population

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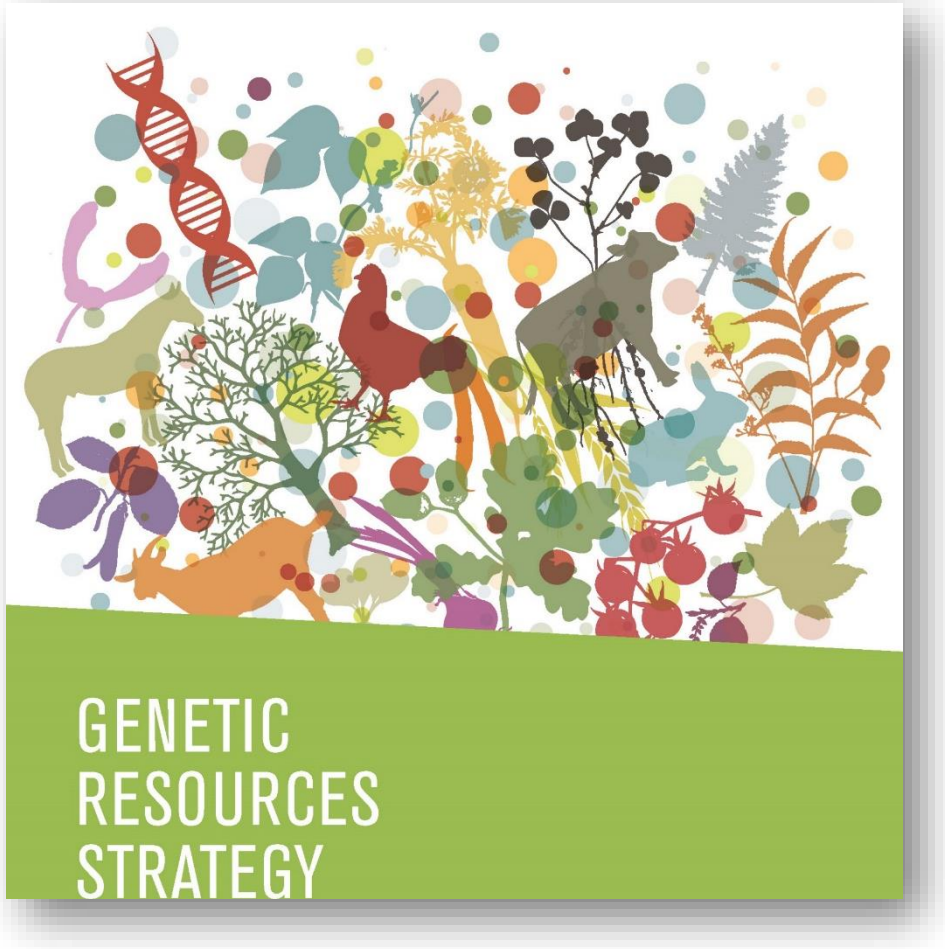
GR Strategy - Better coordination at EU level!

- Scattered and dispersed landscape of high number of actors and activities for conservation and use of GR in Europe with responsibilities at national or EC levels
- Opportunities - Efficient use of resources, synergies, burden sharing, knowledge exchange, harmonization
- Need to establish EU Reference Center / EU Coordination and Information Centre



European Regional Focal Point (**AnGR**)

- Three European Genetic Resources Networks
- Networks of National Coordinators
- NC = Government representative
- Implementing the FAO Global Plan of Action
- Objectives
    - More rational system of conservation
    - Information and knowledge exchange
    - Technical collaboration
    - Sharing responsibilities and tasks

ERFP

EUFORGEN

European Cooperative Programme for Plant Genetic Resources

ECP//GR

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100years 1918 — 2018

EUROPEAN REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Designation of EURC-EAB

COMMISSION IMPLEMENTING REGULATION (EU) 2022/2077

of 27 October 2022

designating the European Union reference centre responsible for the scientific and technical contribution to the establishment and harmonisation of the methods for the preservation of endangered breeds, and the preservation of the genetic diversity existing within those breeds

(Text with EEA relevance)

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100years 1918 — 2018

EUROPEAN REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS





Scope: EU Animal Breeding legislation (2016/1012)

- Bovine, Porcine, Ovine, Caprine, Equine species
- EURC-EAB works on endangered breeds of those animal species only
- **Responsible for the scientific and technical contribution to the establishment and harmonisation of methods for the preservation of endangered breeds, and the preservation of the genetic diversity existing within those breeds**

Funding EC DG SANTE and national co-funding

- Initial activities planned 2023-2024 – long term commitment

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100years 1918 — 2018

INSTITUT DE L'ELEVAGE idele

Federal Office for Agriculture and Food

EUROPEAN REFERENCE CENTRE FOR ENDANGERED ANIMAL BREEDS

Core group

Coralie Danchin (IDELE)

Sipke Joost Hiemstra (WLR)

Holger Göderz (BLE)

Mirjam Spoelstra (WLR)

Lisa Balzar (BLE)

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EURC-EAB - Activities – According to Article 29 (4)(b)(ii) of Regulation (EU) 2016/1012

1. **Cooperation** with breed societies, third parties designated by breed societies and competent authorities

2. **Methods** for the preservation of endangered breeds, and the preservation of the genetic diversity existing within those breeds

3. **Emerging problems**, international cooperation and technical expertise

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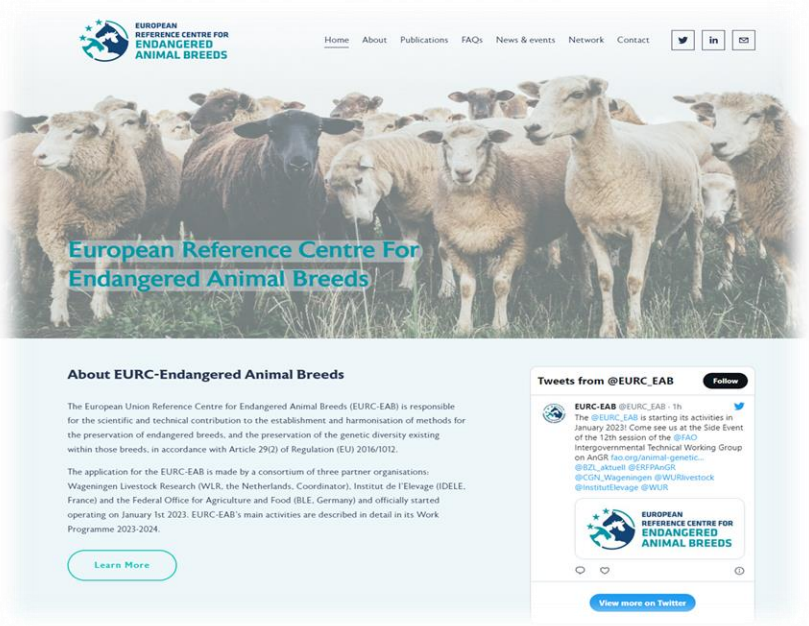
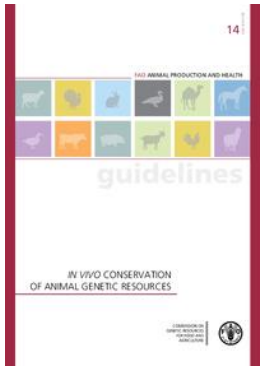
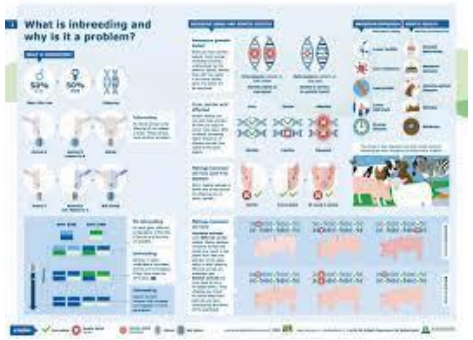
Development and maintenance of EURC website and EURC contact point



- www.eurc-eab.eu - info@eurc-eab.eu
- Frequently asked questions (FAQ)
- Guidelines
- Communication with network
  - NCA
  - breed societies
  - third parties
- Collecting (emerging) questions/problems





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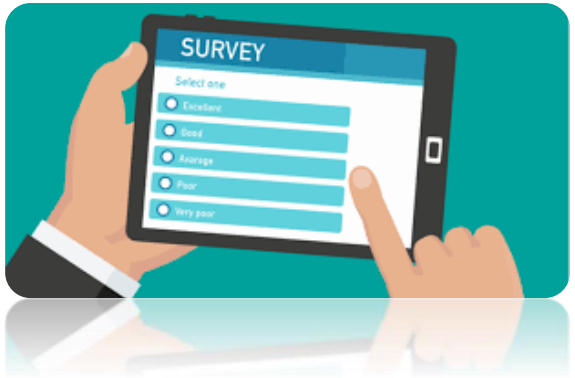
Survey on status of implementation of (EU) 2016/1012 for endangered breeds

- Status of implementation of (EU) 2016/1012 among breed societies of endangered breeds
- Status of implementation of possible derogations, according to (EU) 2016/1012 for endangered breeds in breeding programmes
- Collecting national definitions and mechanisms
- Collecting questions, challenges, obstacles and other issues
- Also Non-EU countries to see the situation in whole Europe



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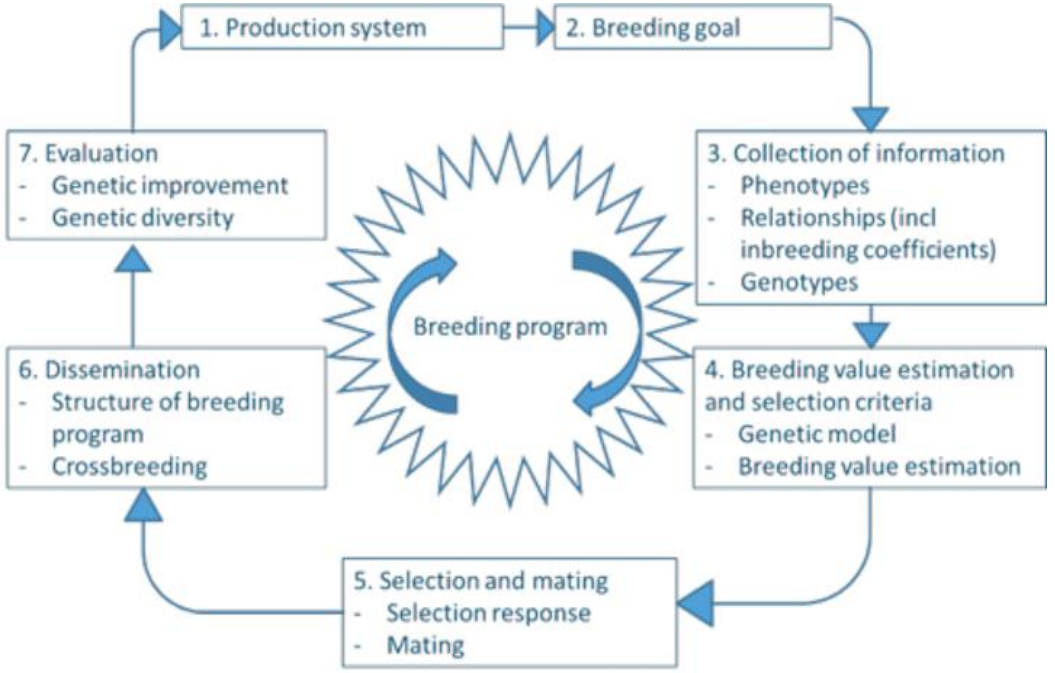
Guidelines for evaluating breeding programmes for endangered breeds

- (Self)Assessment tool to evaluate breeding programs
- Support the preservation of endangered breeds and genetic diversity within those breeds
- For breed societies, third parties and competent authorities



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Harmonisation of breed risk status indicators

- Suggestions and advise towards harmonisation of:
  - Minimum criteria for classification of a breed as “endangered breed”
  - Parameters/indicators for assessing breed risk status and genetic health (demographic, genetic, socio-economic, etc)
- Relevant for various EU legislation
- FAO and ERFP link

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Ex situ conservation of endangered breeds as a complementary tool for in situ conservation

- Complementary ex situ conservation strategies for breeding program support and long term conservation of endangered breeds
- Provide best practices and guidelines
- Emerging issues on EU Animal Breeding and EU Animal Health legislation
- ERFP and EUGENA network link

EUGENA

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Training and dissemination through webinars and conferences

- Webinars for different target groups
- Presentations at conferences, workshops and other meetings at European and national level
- Meetings and workshops organized in collaboration with other relevant organisations

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Cooperation with European and internationally recognised organisations

ERFP

ICAR

COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

FAO FIAT PANIS

EAK · EVT · FEZ · EAAP · EUROPA

EAAP European Federation of Animal Science

EFFAB European Animal Breeders

SAVE foundation

INTERBULL

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Close link with European Regional Focal Point for AnGR

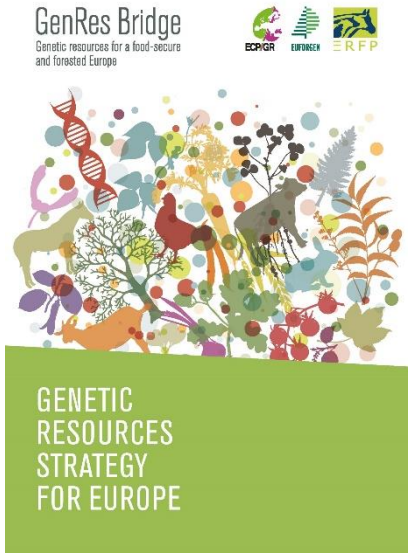
Network of European National Coordinators (NC) = European Regional Focal Point for AnGR
Implementation of **FAO Global Plan of Action** – European Coordination

Working Groups

- In situ conservation
- Ex situ conservation
- Information and Documentation

Task Forces and Ad Hoc Actions

ERFP



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Provide input and technical expertise for the Standing Committee on Zootechnics and for exchange between Member States

- Provide technical expertise to the Standing Committee on Zootechnics
- Upon request of SCZ, discuss technical issues, provide recommendations
- Signalling, identifying and collecting (emerging) issues and challenges

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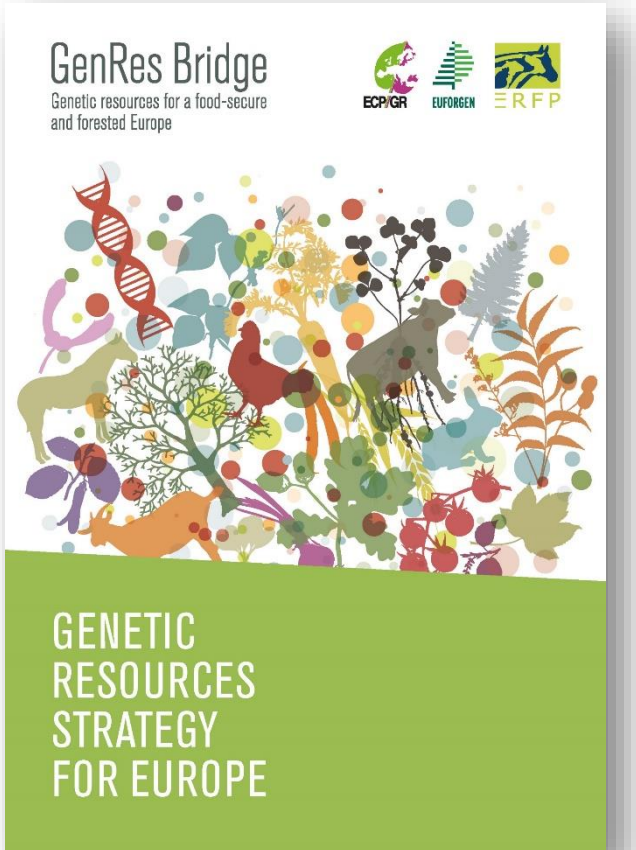
Beyond EURC-EAB → Need for EU Coordination and Information Centre (ECIC) for *agricultural genetic resources*

- Global policy frameworks and legislative instruments call for genetic resources conservation and sustainable use (CBD and SDGs, FAO GPAs; ITPGRFA)
- Scattered and dispersed landscape of high number of actors and activities for conservation and use of GR in Europe with responsibilities at national or EC levels
    - Plant and animal genebanks
    - Nature protection areas
    - Breed societies and private plant/animal breeding industry
    - Research centres and universities
    - Many other actors involved in conservation and promoting the sustainable use of genetic resources



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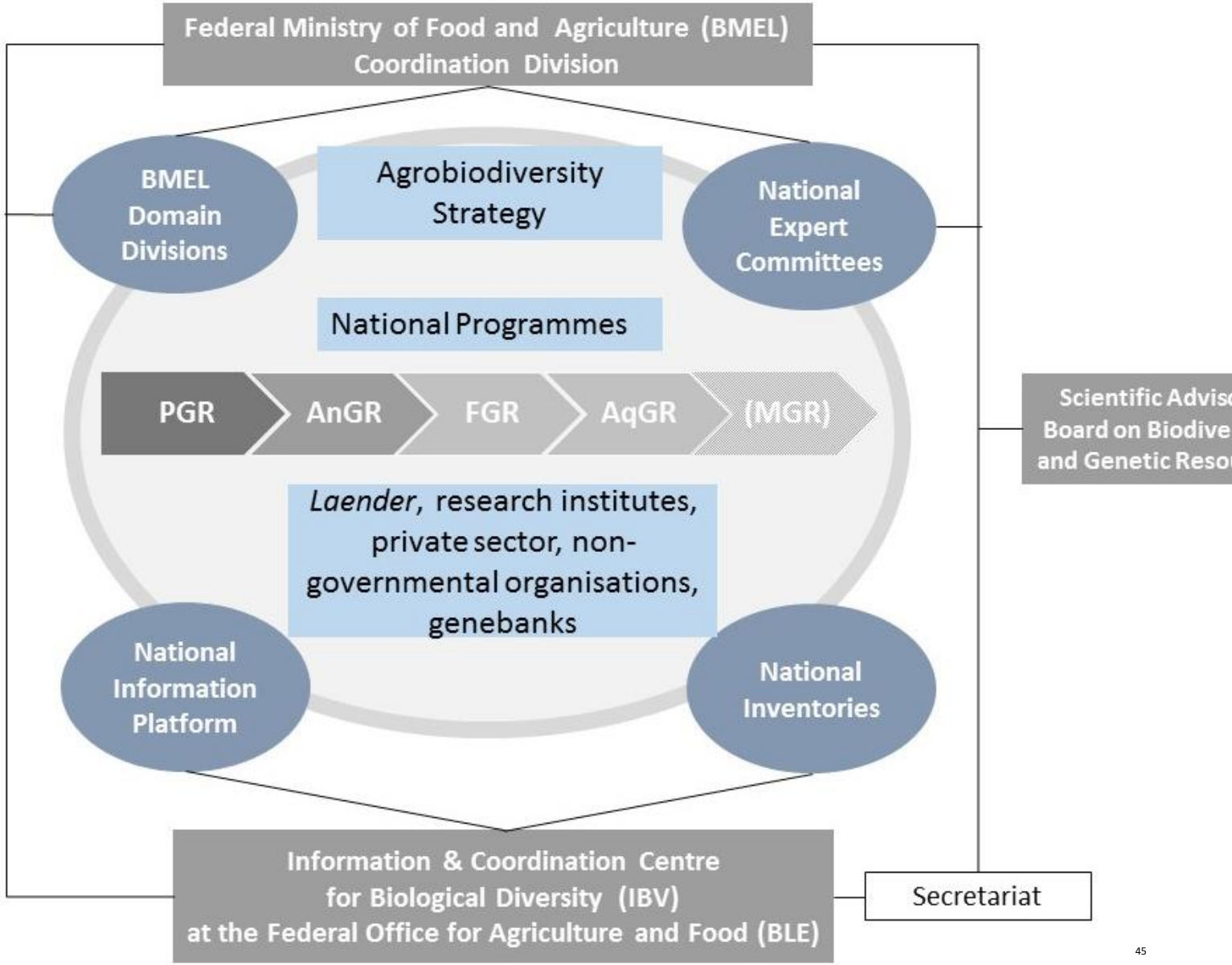
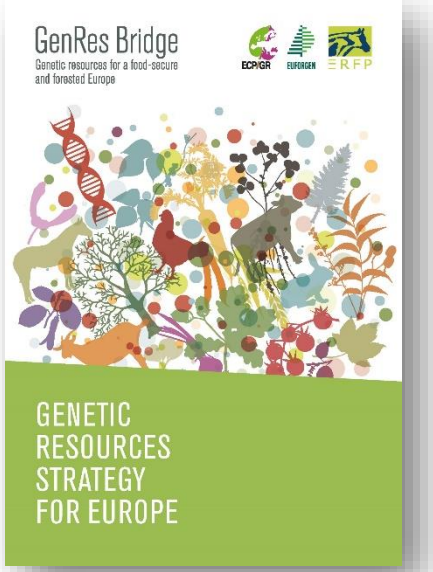
Reference to German organisation structure



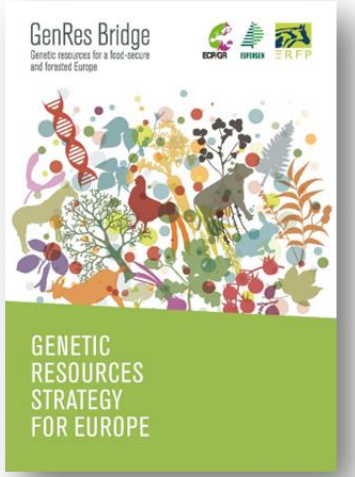
Bundesanstalt für Landwirtschaft und Ernährung

What possible tasks and functions for ECIC (1)



- Further developing the policy and regulatory framework for genetic resources in Europe (incl. Green Deal, CAP, R&I)
- Act as a European project implementation, reporting and payment agency for the conservation and sustainable use of agricultural genetic resources
- Coordinate Europe's contributions to international cooperation (incl. FAO CGRFA, ITPGRFA and Crop Trust, CBD/NP, SDG context) - promote and coordinate effective implementation, documentation and reporting on agricultural genetic resources conservation and sustainable use in Europe
- Create awareness among all relevant European stakeholders of the roles, values and status of agricultural genetic diversity
- Support the European cooperative programmes, and the national programmes, in implementing the European and domain-specific genetic resources strategies

What possible tasks and functions of an ECIC (2)



- Provide technical advice to the European Commission and national governments as a centre of expertise on genetic resources conservation and use
- Promote and advise on long-term funding and commitment for (complementary) conservation strategies, characterization, management, documentation and use of GR
- Advice to the development, selection and definition of agreed international indicators to monitor genetic diversity and to agreed standards for assessing threats;
- Coordinate European ABS issues on applicability of the EU ABS Regulation related to GRFA.
- Host the secretariats of ECPGR and ERFP (reference to EURC-EAB, as defined in the EU Animal Breeding Regulation)

Thank you for your attention

Centrum voor Genetische bronnen, Nederland (CGN)

www.wur.nl/cgn

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