



Cryobanks as BRCs: the French CRB-Anim infrastructure project, and prospects for setting up a european network for such BRCs

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Some history

about BRCs

- 2001 : **OECD** initiative: BRC concept (not connected with CBD)
- 2001-2003 : 2 calls for BRC projects in France
- 2006 : OECD guidelines for human and microbial BRCs
- 2008 : BRCs on the French roadmap for research infrastructures, 1 call
- 2010 : a French standard for certification of human and microbial BRCs
- 2010 : French **government launches** a **new programme** 'Investing for the future', 1.5 billions euros for health and biotechnologies, including research infrastructures from the roadmap (BRCs are in) ; 2 INBS calls (2010, 2011)
- 2011: a French standard for certification of plant and animal BRCs
- 2012: the **CRB-Anim project for animal BRCs** **!!!! 11 M€**
is selected by INBS call

Scientific background of an infrastructure project for animal BRCs

Animal Genetic Resources

Genomic revolution

Reproductive biotechnologies

→ need for an **extensive coverage of domestic species**, within and between breeds variability
→ **Reference panels** for population genetics studies,
→ **connect collections of reproductive material with collections of genomic samples**
→ **better document** populations in cryobanks
→ offer the possibility to **produce animals of a defined genotype**



Objectives of CRB-Anim

- improve practices, standards, and develop synergy between BRC members of the network → improved visibility
- enrich collections for domestic animal species having a collective management programme or a national organisation :
→ collect samples and develop new methods for genebanking
- secure collections, provide traceability
- facilitate distribution and establish common rules
- strengthen the scientific use (research projects) and the economic exploitation of collections
- prepare a European extension : ESFRI roadmap ?
 - topic for an infrastructure call in EU programme '2020 Horizon'

CRB-Anim 'nodes' and supporting institutions

PUBLIC BRCs

- GIS 'Cryobanque nationale' (livestock) : recognized BRC; [INRA, Institut de l'Elevage](#); since 1999, [MAISONS-ALFORT](#), 11 sites ([TOURS](#), [RENNES](#), [LYON](#))
- Reproductive BRC for pets (dogs) : [CERREC](#) / [VetAgroSup](#), [LYON](#)
- Genomic BRC GADIE for livestock : [ISO 9002 - 2008](#) / [INRA JOUY](#)
- Genomic BRC for dogs CaniDNA : [RENNES](#), [CNRS](#) with 4 Vet Schools

[Foundation for Research on Biodiversity](#) : connection with the national research strategy for biodiversity

PRIVATE BRCs

- [GIE Labogena](#), genetic analysis and storage, [ISO 17025-2005](#), [JOUY](#)
- [Antagene](#), genetic analysis and storage, [LYON](#)

Partners and Users

Technical Institutes, Breeds Associations or professional unions: [IE](#), [UNCEIA](#), [IFIP](#), [IFCE](#), [SYSAAF](#), [SCC](#), [LOOF](#)

Ministry of Agriculture: support the national Cryobank

Diversity of stored materials

	Serum/ plasma	DNA	Somatic tissues and fluids	RNA	Gonadic Tissues	Cell cultures	Embryos	Gametes
GADIE BRC	-	-80°	-80°	-80°	-	-	-	-
Labogena	-	-20°	-20°	-	-	-	-	-20°
CERREC	-20°	-	-80° / -180°	-	-180°	-80° / -180°	planned	-20°/-180°
CanidNA	prévu	-20°	+4°/-20°/-80°	-80°	-	-	-	-
Antagene		-20°	+4° / -20°					
Cryobank	-	-	-180°	-	planned	-180°	-180°	-180°

Current state: 280 000 doses/12 species N.Cryob + CERREC
60 000 samples GADIE+ CanidNA ; ~50 000 Labogena + Antagene

Project organisation

- WP1 : governance, coordination, rules for distribution and cost calculation
- WP2 : technological developments
- WP3 : collection enrichment
- WP4 : Web portal, information system, traceability, certification
- WP5 : characterization
- WP6 : training
- WP7 : socio-economic exploitation

Phase 1
Construction
4 y **7 M€**

Phase 2
Operation
6 y **4 M€**

**WP3/WP7: 450 – 500 k€ for each major species
250 k€ for aquaculture**

Technological Developments (WP2)

Genomics

INRA, CNRS, Labogena, Antagene

Objectives:

_quality, quantity, safety

•Tissus

- Sampling procedure
- Biological fluids
- Proteins
- integrity

• Nucleic Acids

Quality : fast and accurate methods

Quantity: WGA, is it reliable ?

Long term Storage

Reproduction and Cryobiology

INRA + IFREMER, INSERM

SYSAAF, IFCE

Objectives:

Reproductive potential, biosafety

Epigenome characterization

Different types of material:

Semen

Germ Cells & gonads

Embryos & larvae

Somatic Cells

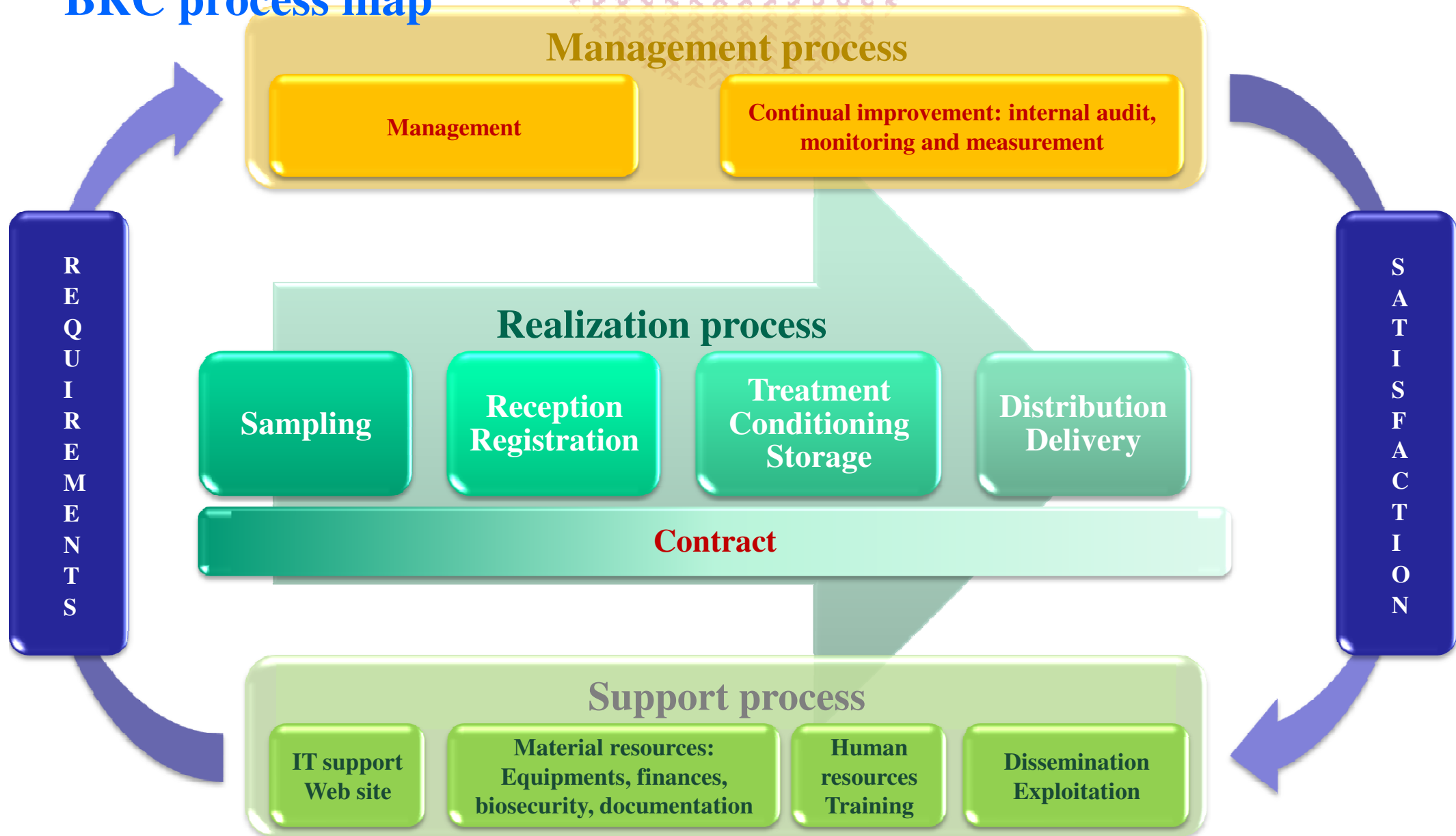
Collection enrichment and characterization

- **Addition of 350,000 samples**, 8,900 individuals, 22 species mammals, birds, fishes, shellfish, insect: **reproductive + genomic** endangered breeds; extreme genotypes , genetic models experimental farms, QTL projects, diversity projets (EU, international) collections to prepare migration of parentage testing to SNPs
- **Genotyping** new collections : **BRC nodes are also 'platforms'**
 - will involve fishes, horses, birds (markers or DNA sequencing)
- **Gather all available data**
- **Call for research projects**

At year 4: for characterization (~ 10 projets 50 k€ each)

Quality management and certification

BRC process map



Information System

- **WEB Portal** : dedicated server, hosted by CTIG - Jouy
 - Disseminate and share information about collections
 - Define common descriptors (passport data) and file formats
 - Communication tool for members of the CRB-Anim network
 - Common entry point for samples request (standard form)
- Registration on the **French diary for BRCs**, i3CRB.fr, and the 3CR group of all French BRCs (sharing expertise) what about a **EU diary** ?
- A node of the **national data repository on genetic resources**, RGScope, part of the national network for biodiversity monitoring managed by FRB

Training

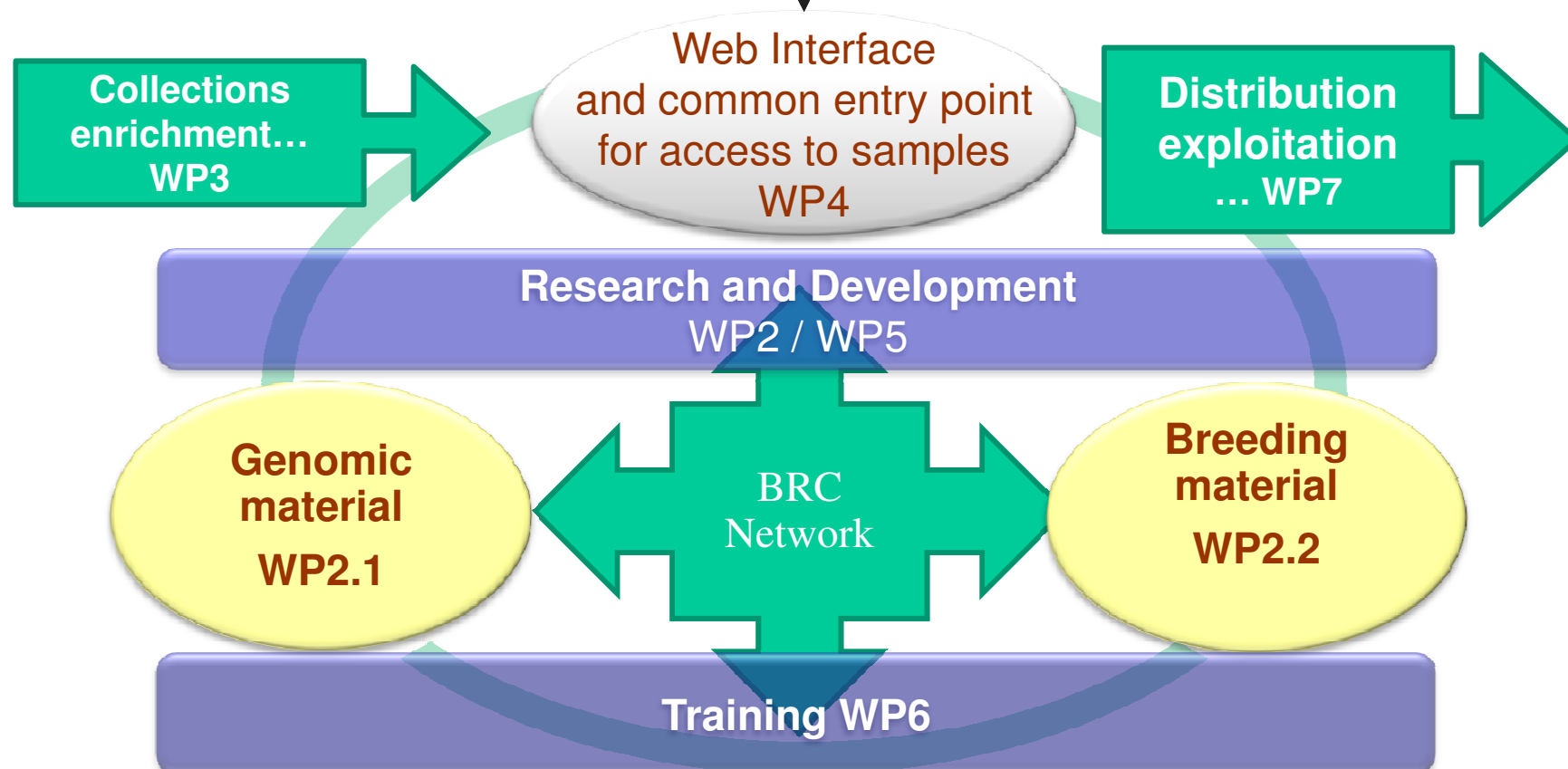
- A strategy to include BRCs (what are they, what do they offer..) at **all levels of training** : L, M, D, continuous education
- Targeted fields: animal genetics, reproductive physiology and reproductive biotechnologies, animal production, management of collections
- Univ. Tours, AgroParisTech, VetAgroSup, Univ Rennes
- Promote doctoral seminars, congress sessions
- Register to the ***European Farm Animal Genomic Resources project*** of ESF (exchange of scientists, summer schools, 3 years to go)

Exploitation

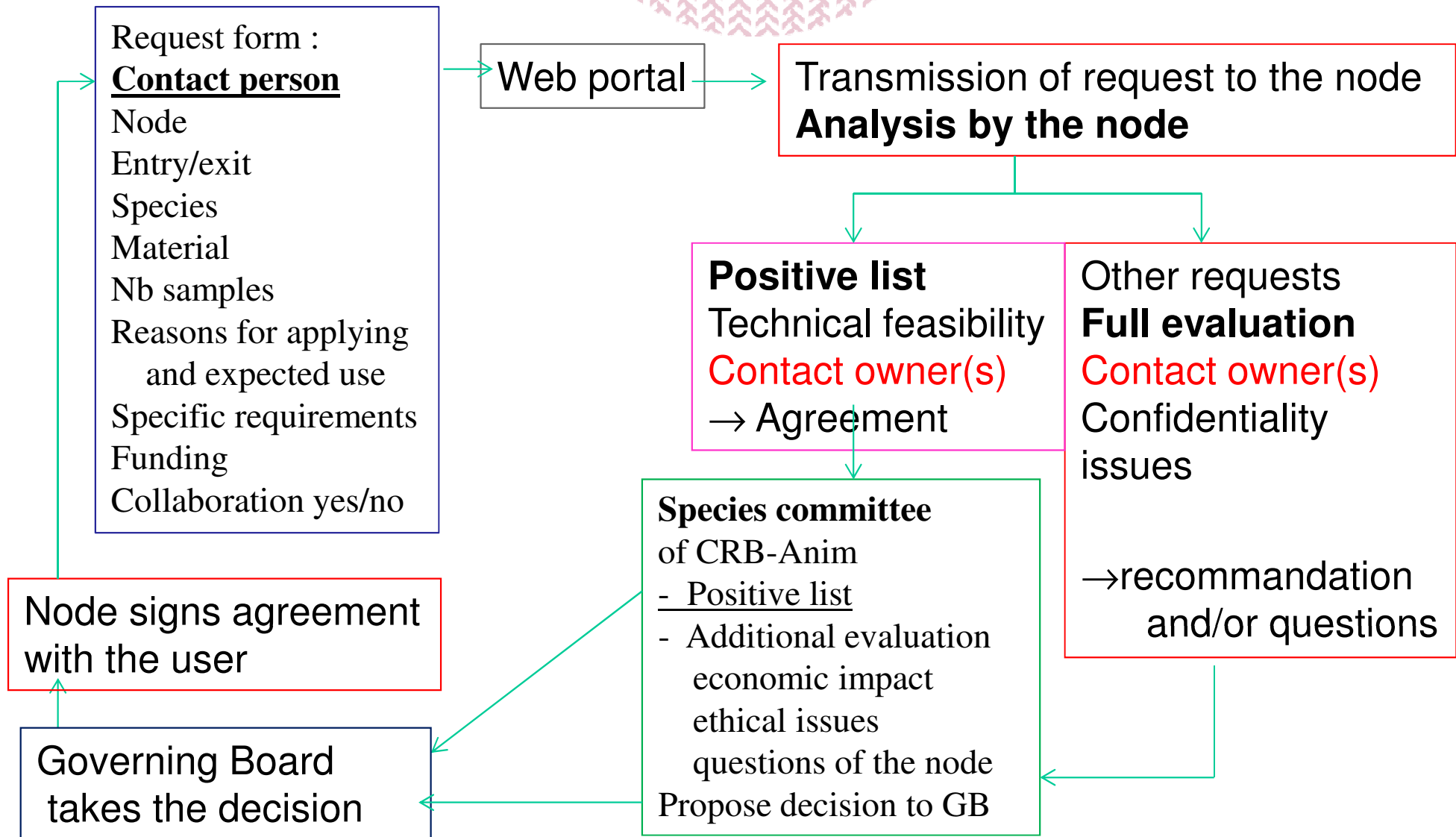
- **Scientific :**
 - Genetics (selection signatures, causal mutations, genetic trends)
 - Reproductive biology , Comparative biology, Physiology of Exercise
 - Increase scientific awareness on the scientific value of these collections
- **Socio-economic (consortium agreement between partners)**
 - Support the **livestock sector** (on a contract basis): **strong economic weight in France, in Europe**
 - Insurance/sanitary crisis ; diversification ;
 - Population management (inbreeding)
 - **Genetic Models** (patents)
 - Anomalies, biomedical models, diagnostic test
 - Transgenic animals for biomedical research
 - **Biobanking Technologies** (patents)
 - Diluants, freezing procedures (donkey ?) (IMV company)

Network management

- **Governing board (14p)** : 8 partners + Cryobank secretary, Univ.Tours, Vet schools(1), Chairs SC et SF, Min Agriculture
- **Stakeholders forum (SF)**: livestock organisations, companies.. IE, IFiP, SYSAAF, IFCE, RacesFrance, UNCEIA, SCC, SYNALAF, LOOF, ACSEDIATE, FFV, ANERCEA, IMV
- **Scientific committee (SC 20 p)**
INRA (6), CNRS (3), IFREMER (3), INSERM (1), AgroParisTech (2), National Veterinary Schools (2) ISARA Lyon (1) FRB (1), **autres infras IA**, → groupes de travail par espèces “sci+stakeholders”
- **International advisory board**, 5 permanent members (FAO, european BRCs, ESFRI BMS group) + 5 members to be chosen according to current priorities, call for projects ...
- **Possible extension to additional animal BRCs** during the project



Distribution of samples



Conclusions

- **In order to extend the vision of a cryobank towards a research infrastructure, are the following principles applicable across Europe ?**
- Connect existing BRCs and harmonize their operations (certification)
- Commitment to disseminate information & facilitate access to biological materials for the scientific community
- Support the livestock sector, have a stakeholders forum
- Maintain strategic collections for biodiversity
- Agree on rules for distribution
 - Rights of the provider, ABS regulations
- Define an economic model: contribution of users to operational costs must be realistic but not dissuasive

Yes ? : propose it to ESFRI, to EU commission



Thank you

Thanks to all members of CRB-Anim

ALIMENTATION
AGRICULTURE
ENVIRONNEMENT





Main activities of a BRC

- Collect and receive biological samples
- Samples handling and treatment : quality control, extraction of DNA/RNA, production of derivatives
- Conserve: safety, long term
- Characterize and document, database, Web portal
- Distribute samples according to well established rules
- Training of the staff
- Quality management

Cost calculation :

a common reference

Type of cost	Nature of costs	details
Fixed	Operating costs	building (rent value)
		Building maintenance
		Fluids (electricity, gaz, heat/cold, water)
		Repair
	Depreciation	Equipment, robots ...
	Human resources	Technicians, Engineers
	General costs	Computing - Database
		Office consumables
		Secretary, management,
		R&D
		Logistics
		Lookout system and alarms
Variable	Consumables	Collection and shipment of samples
		Storage plastics
		Chemicals