

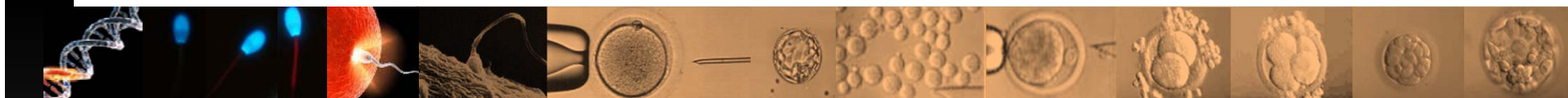


European Project n° 677353 H2020 programme

Innovative Management of Animal Genetic rEsources (IMAGE) : an EU project aimed at enhancing the value of gene banks

Michèle TIXIER-BOICHARD & the IMAGE Consortium

GABI, INRA, AgroParisTech, University Paris-Saclay
Jouy-en-Josas France

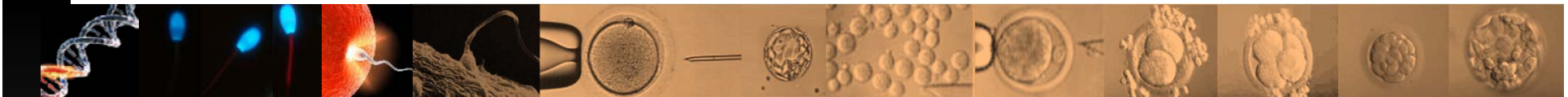


Animal gene banks in Europe : an asset

Questions which led to IMAGE proposal :


- ✓ Do we know enough about the genetic resources they store?
- ✓ Do we get the maximum from our gene banks ?
- ✓ DNA banks in research institutions : not connected with states' gene banks

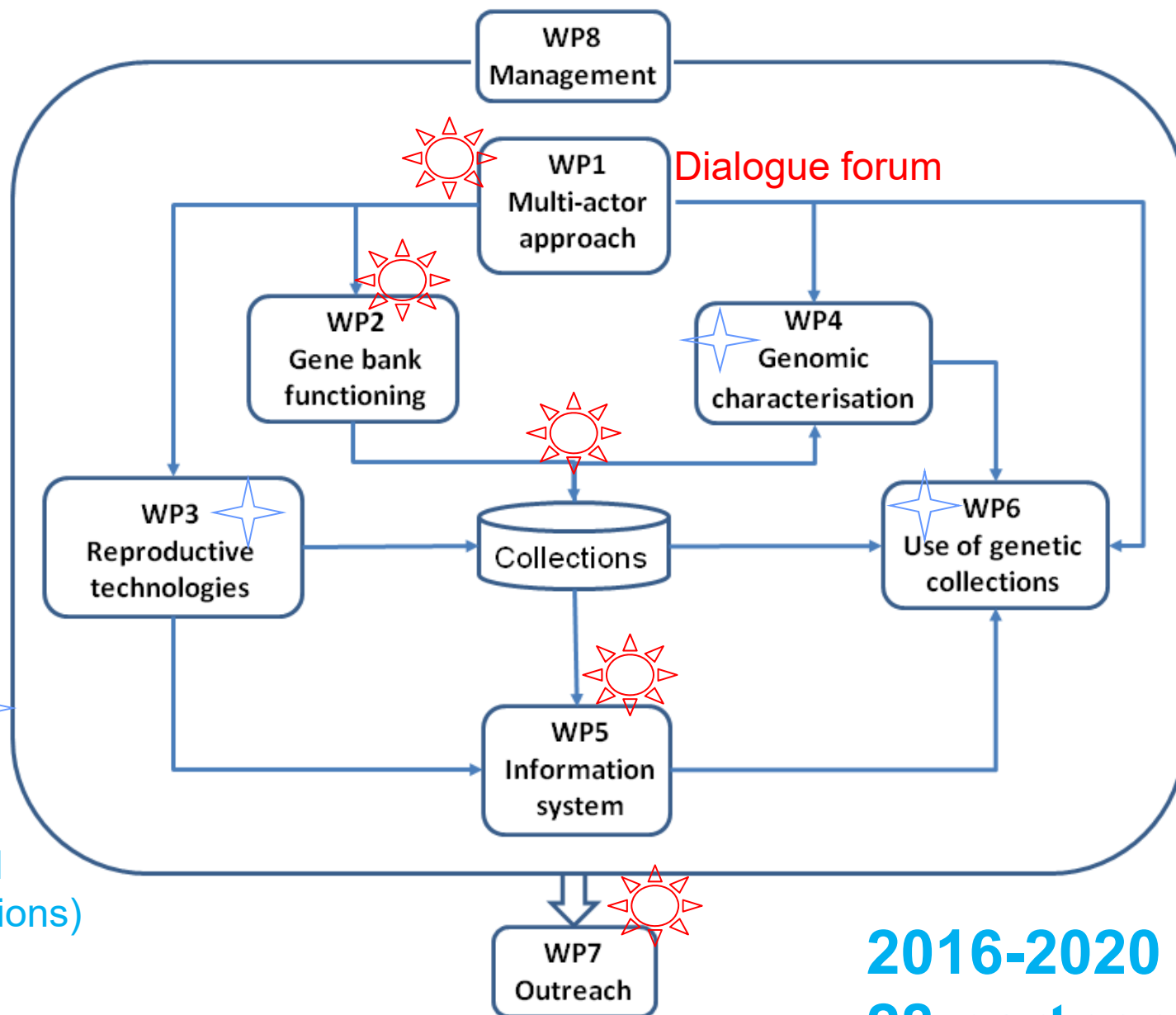
→ **Knowledge needed to better integrate gene banks within animal breeding**



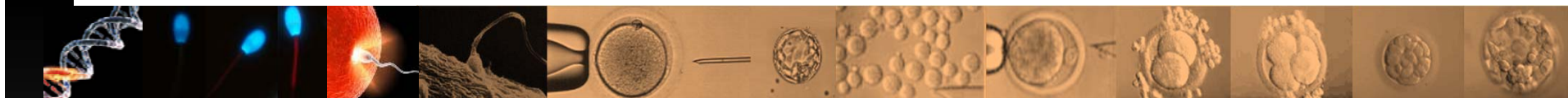
Project Set-up

 All species

Chosen Species 
(-specific needs
-biological considerations)

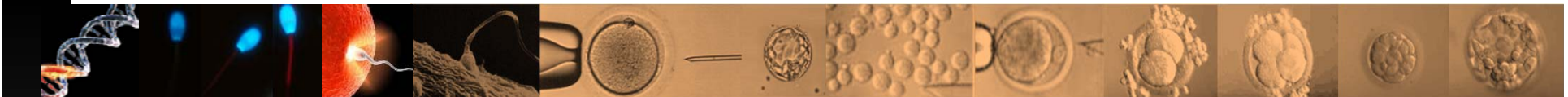


2016-2020
28 partners



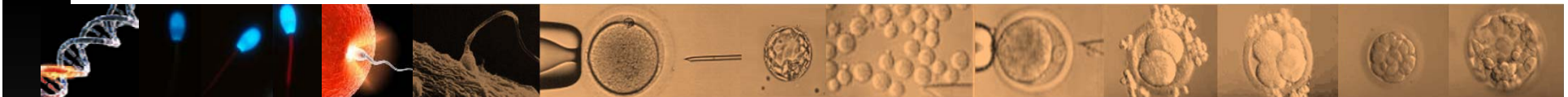
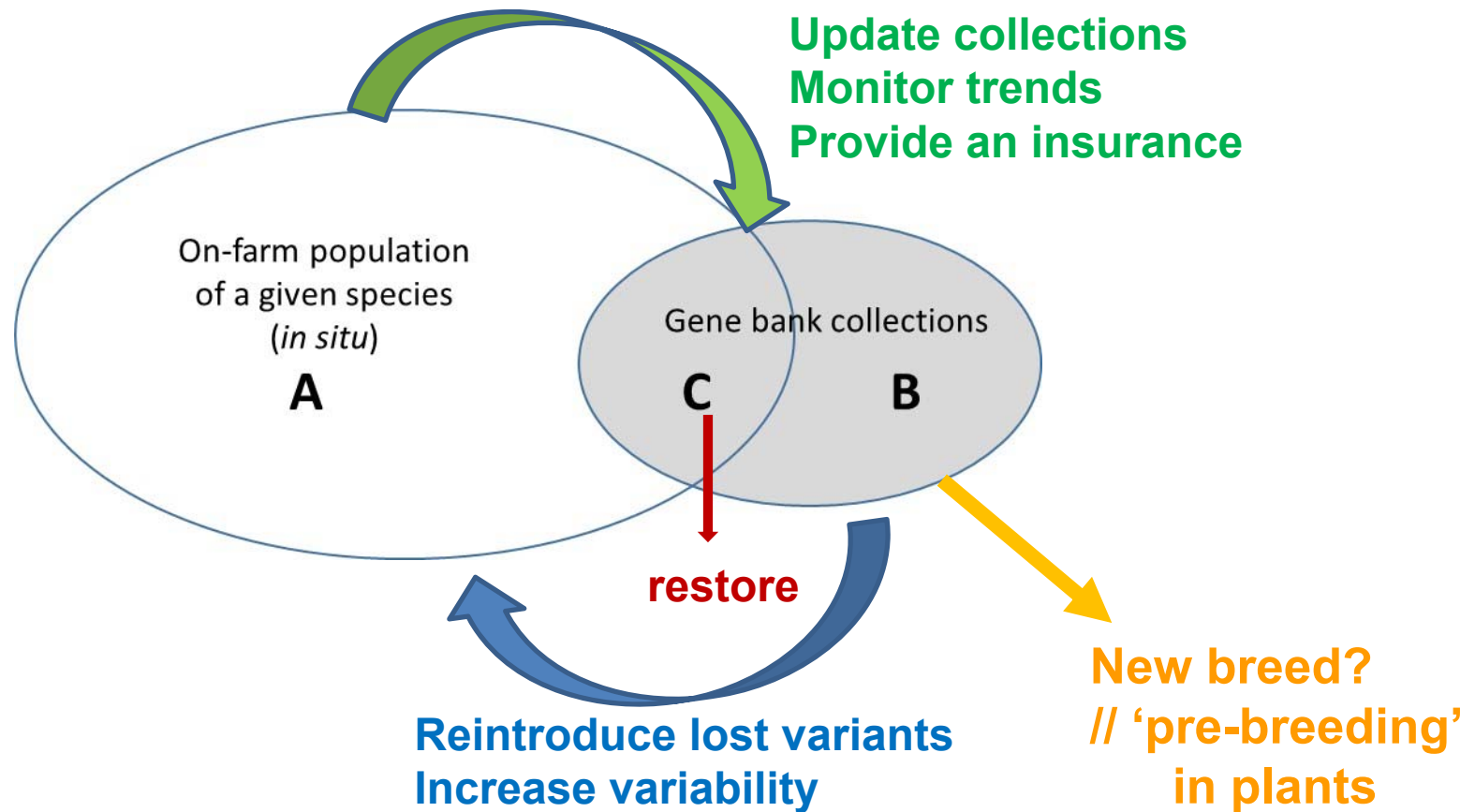
A range of scientific disciplines

- Social sciences, interface with legal bodies (WP1)
- Management sciences, economics (WP2)
- Biology of reproduction, cryobiology, cell biology (WP3)
- Genomics, population genetics, biogeography (WP4)
- Informatics, bio-informatics (WP5)
- Mathematical modeling, quantitative & population genetics (WP6)
- Communication, education (WP7)



Knowledge gaps (1)

- Representativeness of gene banks



Filling this gap

IMAGE survey (Passemard et al., 2018)

Germplasm **AND** DNA banks, **not enough connected**

‘Big 5’ : cattle, sheep, goat, horse, pig; **546 breeds**

poultry and fish are increasing, little redundancy across gene banks

Major weakness : <20% of collections with molecular data (except for cattle), different genotyping tools (chicken) limit integration



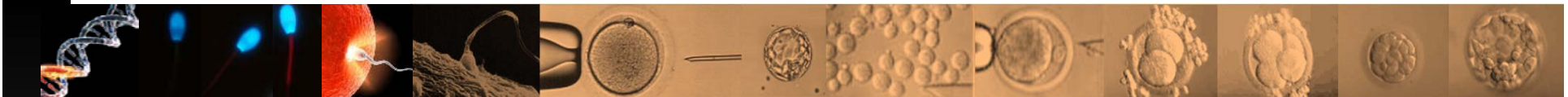
- * additional sequencing and genotyping

300 chickens, 110 pigs, 10 cattle, 450 sheep (100 seq)

landscape genetics, detection of deleterious variants

- * define a model for data integration \Rightarrow web portal

- * plan to develop a multi-species genotyping tool



Knowledge gaps (2)

- Limitations in reproductive biotechnologies according to species

- **Variable reproductive efficiency of germplasm material,**

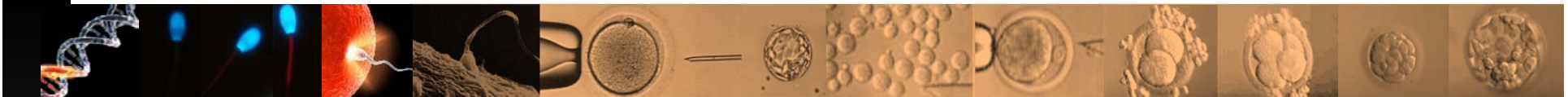


**improve sperm cryopreservation methods in poultry
better characterize individual variation to predict fertility
by proteomics (poultry) or miRNA study (cattle)**

- **need for complete recovery of germplasm**



**improve embryo freezing procedures in pigs
develop alternative methods in poultry :
primordial germ cells, gonad grafting**



Main constraints (1)

- Gene bank operations
- **Animal health regulations for exchange of germplasm**
local breeds cannot afford heavy monitoring programmes

! limits collection enrichment

old samples do not comply with current regulations

! limits use of collections

⇒ **issue for the dialogue forum of IMAGE**

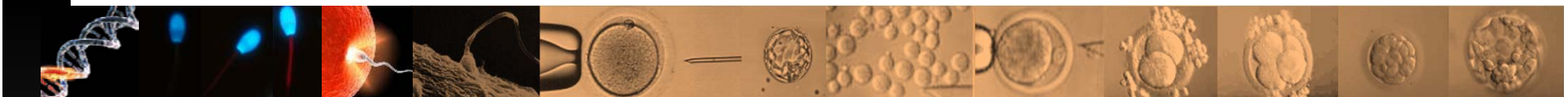


action to increase awareness of EU policy makers

no success in getting an appointment with EU officer

mobilisation of some national experts on the issue of germplasm

⇒ specific measures may be taken by countries for gene banks



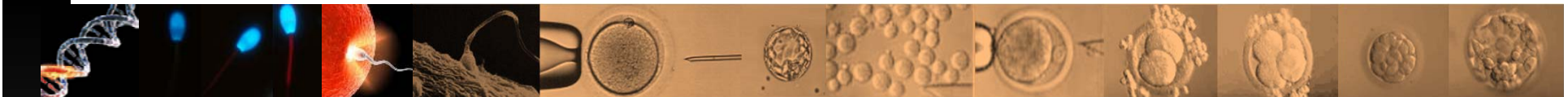
Enhancing the use of collections

– Stakeholders expectations :

positive & conservative attitude... not so innovative !

– Methodological developments

- to account for variable rates of inbreeding across the genome in the optimisation of procedures for the management of genetic diversity
- A new simulation software to model and optimize conservation schemes
- A method to plan an introgression experiment of a rare variant (blue egg) accelerated with in ovo genotyping



This year dialogue forum

Challenging views from an economic approach of gene banks:
maximise conservation of diversity (nb of breeds)
at minimum cost

Studies of 12 gene banks for 5 species (D. Moran & coll)

Analysis of collections: 517 breeds with some redundancies

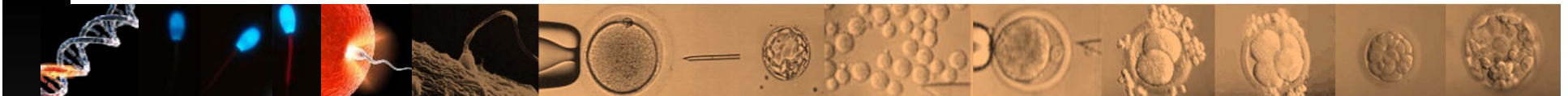
Analysis of costs: total costs for these 12: \approx 15 M€

economic optimisation: costs could decrease by 25%

If constraint on capacity (50% limit): decrease by 20%

Groups discussion on 4 questions about : public involvement,
benefits for whom, policy incentives, a single EU bank ?

.... Synthesis will be on imageh2020.eu



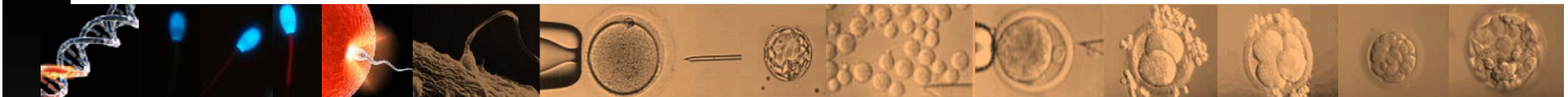
Conclusions

IMAGE is a multidisciplinary effort:

New data, new tools ...
new ideas to manage gene banks

Long-time effort :

EUGENA network of European animal gene banks
provides a framework to make use of IMAGE results



Thanks to the 28 partners

<http://imageh2020.eu/>

