

















# IN-SYLVA-France, the national RI for forest adaptation and forestry innovations

IUFRO 2019, Curitiba Brazil, 29 Sept – 5 Oct



C Pichot, L Saint-André, A Bouvet, C Deleuze, F Ehrenmann, C Ginisty, C Meredieu, E Paillassa, C Plomion, S Said, L Savagner, P Sist





# **CONTEXT and CHALLENGES**

- French Forest (16.3Mha, heterogeneous, 2/3 of broadleaved)
- Currently in a unique and unprecedented situation (global change)
- Has to deal with three interconnected transitions (climate, energetic, industrial)

- Sustainability of the production function of forest ecosystems (increasing demand - fuel wood, bio products)
- Carbone sequestration (4P1000, 3S dilemmaStocks, Sequestration, Substitution)
- Adaptation and silvicultural innovation (levers: genetic resource, biogeochemical cycles et silviculture)















# A multi-organisms and distributed

**National Research Infrastructure** 

for adaptive forest management
that promotes *in-situ* forest experimentations
with *in lab* and *in silico* technologies
to help setting up innovative projects
for sustainable forest management
of temperate and tropical forests
and being a driving force the European scale.





# A National Research Infrastructure

# that will address the challenges of Global Changes \*

(sustainability of wood production, C sequestration, CC mitigation),

to answer the questions of ecological and energetic

transitions (increased demand of fuel wood – energy, bio products),

taking into account the diversity of forest systems

\*climate, biological invasions, atmospheric deposition, land use change





More than 4 000 ha and 5 000 sites in forest

1 site includes several treatments (experimentation)

A network includes several sites on French territory

IN-SYLVA-France Main experiments – high geographic coverage



High throughput screening



Distributed Information Systems and Modeling Tools



In-situ, in-lab et in-silico long-term facilities, recognized and supported by national partners







## An infrastructure to address research and forest management issues thanks to technological innovations

	Silviculture	Genetic	Biogeochemistry
Silviculture	Forest management practices		
	forest regeneration  physiological indicators of stress  Decision rules to adapt management	Genotype x silviculture => forest services (wood, C)? Ungulates => functional traits ?	Factors of soil sustainability  Biogeochemical leverages for better forest resilience to global changes
	practices to biotic and abiotic risks		
Genetic	Choice of material for planting, Conservation of FGR  Varietal innovation  Assisted Migration model	<ul><li>- G x E determinism of traits?</li><li>- Genetic architecture?</li><li>- Phenotype prediction?</li><li>- High-throughput phenotyping</li></ul>	Biogeochemical factors of species distribution  => assisted migration, matching between plantations and soil/climatic conditions.
Biogeo- chemistry	Wood harvesting and soil compaction => soil fertility?	Phenotype x Genotype x Env. interaction?  spatial scale of local adaptation?  Adaptive capacities of the FRMs = f(soil)?	Soil fertility remediation High throughput measurement of soil fertility  Physico-chemico-biological indicators of impacts
	Research Question	Management Question	Technological innovation .06/14
			02/10/2019





## An infrastructure to address research and forest management issues thanks to technological innovations

	Silviculture	Genetic	Biogeochemistry
Silviculture	Forest management practices		
	forest regeneration	Genotype x silviculture	Factors of soil sustainability
	physiological indicators o	b b +es => functional traits?	Biogeochemical leverages for better forest resilience to global changes
	Decision rules to adapt practices to biotic and Silvicus,	environmental (sensus with	
Genetic	-uitur	al ex ment simulat	
	Choice of material for planting, Conservation of FGR	The services (wood, C)?  The services (wood, C)?	Biogeochemical factors of species "ctribution"
	Varietal innovation	- Phenotype prediction - High-throughput phenotype.	sted migration, matching en plantations and soil/climatic
	Assisted Migration model		itions.
Biogeo- chemistry	Wood harvesting and soil compaction => soil fertility?	Phenotype x Genotype x Env. interaction? spatial scale of local adaptation?	I fertility remediation High throughput measurement of soil fertility
	- John Tertifity .	Adaptive capacities of the FRMs = f(soil)?	Physico-chemico-biological indicators of impacts
	Research Question	Management Question	Technological innovation .07/14
			02/10/2019





A Research Infrastructure listed on the National road map (May 2018)

Observation and naturalist networks (eg. RENECOFOR)

Monitoring (for example phenology, air pollution, soil monitoring..)

Reference





**National Forest Inventories** 

Environmental monitoring, Resource-level patrons

IN-SYLVA Experimental networks

Genotype x Environment x Silviculture Interactions Adaptation of forests to global changes Workshops ICOS / OZCAR / ANAEE

Generic processes, GHGs, Biotic / abiotic interactions

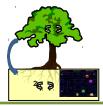




Generalize







Assets

Experimentation

Instrumentation

**Impacts** 

Forest policy

**Ecological diversity** 

Innovation

Ecosystem functioning

Models

Resource

Empirical

Process-based



A research infrastructure that brings together all the French R & D actors involved in forest management







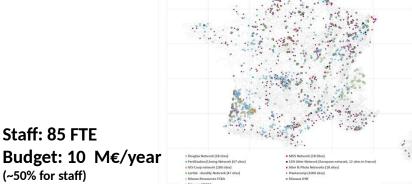








28 experimental networks about silviculture, genetics or biogeochemistry most of them are multi-organisms



Publications IN-SYLVA ■ Revue Avec Facteur Impact Revues de Transfert

62 publications /year (of which 22% in transfer journals, Guides and reports)



Staff: 85 FTE

(~50% for staff)



A governance adapted to IR objectives

## **Orientation council**

\* Users and stakeholders demands

## Scientific Council

- Scientific evaluation
- Scientific questions

  New orientations

## **General Assembly**

- Exchanges
- Events
- Representation in orientation council

## **Trusteeship Council**

- Define the strategy
- Define the GTs permanent and temporary
- Check implementation

24 researchers (1 foreign, 1 French per discipline)

Oxford, Canadian Forest Service, INIA, Gent University, UCL, WSL, UQAR, FVA, Freiburg University

Université de Rouen, BSA, AgroParisTech, IGN, CNRS, CNES, INRA, IRSTEA

## **Executive council**

- Infrastructure monitoring
- Operational implementation

## Work group

Strengthen and adapt networks

## Work group

Light in-situ instrumentation

#### Work group

Develop high throughput measurement capabilities

#### Work group

Develop varieties and silvicultures

#### Work group

Federate information systems

#### Work group

Develop decision support tools

## Workshop

.....

Workshop

.....

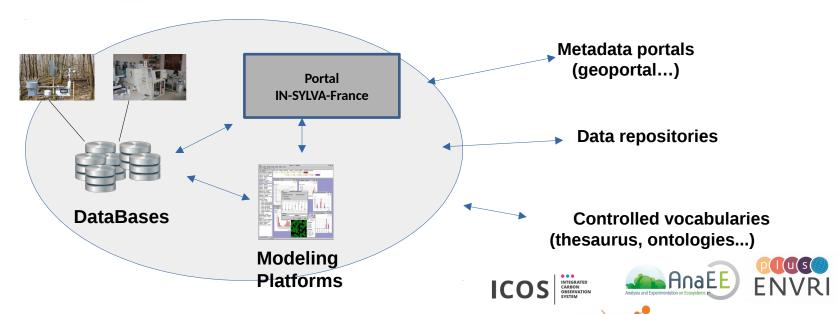


# **IN-SYLVA-France develops.....**



An information system adapted to the objectives of the RI, a Major Issue!

with a web portal for the discovery of resources

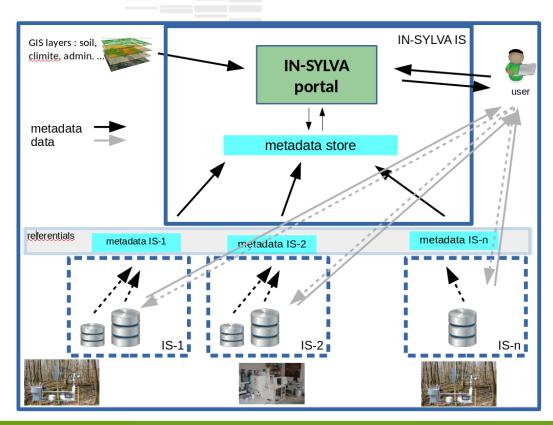






## A distributed information system for FAIR data management





- rich metadata interoperable with international standards (ISO, EML...)
- controlled vocabularies:
  - \* IN-SYLVA partners & networks
  - \* observed/measured variables
  - \* experimental treatments
  - \* taxon
  - \* units
- shared within IN-SYLVA community
- connected to IS of other env. RI
- open to the world for research and management



# **IN-SYLVA-France**



- brings together resources for silviculture, genetics and biogeochemistry experimentations
- develops innovative solutions
- brings to knowledge existing resources including data from experimentations
- develops data/metadata interoperability
- is for researchers, forest managers, policy makers, education... and citizens
- contributes to Open Science
- as the French national component to future EU and international RI



# The web site of IN-SYLVA-France





Accueil Actualités **IN-SYLVA France** 3 Juillet 2018 : Rencontre au MAA à Paris IN-SYLVA-France est une infrastructure nationale regroupant les dispositifs de recherche des Établissements > 13 Juin 2018 : Réunion des groupes de travaillant sur la gestion forestière. travail > 17 mai 2018 : Publication de la feuille Elle constitue une réponse aux enjeux socio-économiques et environnementaux rappelés dans le PNFB: de route nationale des infrastructures adaptation des forêts aux changements globaux, emplois via l'innovation sylvicole, adéquation amont-avail de recherche dans les filières. Son originalité est de coupler les leviers sylvicoles, biogéochimiques et génétiques pour > Avril et Mai 2018 : mise en place des favoriser une vision intégrée de la sylviculture et d'élaborer une gestion adaptative et durable des groupe de travail peuplements forestiers. Avril 2018 : Mise en ligne du site web IN-SYLVA fédère les réseaux d'expérimentation étudiant les interactions entre pratiques x ressources Mars 2018 : In-Sylva France sur la génétiques x environnement ainsi que des plateformes analytiques caractérisant le climat, les sols et le feuille de route des Infrastructures matériel végétal à haut-débit. Nationales > 5 Février 2018 : Lancement du projet IN-SYLVA-France structure ces réseaux, les renforce et fait évoluer les équipements et les systèmes In-Sylva France d'information associés. IN-SYLVA-France procure des services en matière de développement (ex : choix de provenances et d'espèces, itinéraires et trajectoire des systèmes sylvicoles), de formation académique et continue (démonstrateurs). IN-SYLVA-France ambitionne de placer la France comme leader européen de la gestion forestière, contribuant ainsi au rayonnement économique de la filière

Accès aux métadonnées & données

