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ON AGRICULTURAL GREENHOUSE GASES

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## Country report : FRANCE

Presentation to IRG Annual Meeting  
Cali, 5 February 2019

# GRA contributions

- IRG co-chair
- Field scale network co-chair (and past C&N modeling cross-cutting group)
- Contributions to CRG and LRG

# Other initiatives

- CIRCASA (coordination, Jean-François Soussana)
- EJP Soil (coordination, Claire Chenu, co-coord. WUR)
- 4 per 1000
  - INRA hosts research program,
  - Member of STC (Scientific and Technical cooperation Committee)
  - National study on potential and implications of the 4 per 1000 target (INRA and ADEME)
- Soil carbon monitoring methodologies
  - NIVA H2020 project
  - How to monitor soil C stocks in the next CAP? (Test area 100x1000 kms)
  - Methodological study funded by ADEME
- FACCE JPI and GRA
  - Several Eranets (e.g. on long-term soil C monitoring with NZ, Uruguay...)
  - Thematic Annual Program on soils with participation of INRA
- Carbon offset projects in agriculture (with Climate KIC)

# Implementing the Paris Agreement in the EU

## 2030 Climate and Energy Framework

$\leq -40\%$  Greenhouse Gas Emissions (domestic)

**Emission Trading System (ETS)**

**-43 %**

*Including: Power/Energy Sector and Industry, Aviation*

*Max 100 MTC O<sub>2</sub>eq*

**Effort Sharing Regulation**

**-30 %**

**Non-ETS  $\leq -30\%$**

*Including: road transport, buildings, waste, agriculture, Land Use, Land Use Change and Forestry*

*Full flexibility*

*Max 280 MtCO<sub>2</sub>eq*

**New!!**

**Land Use, Land Use Change and Forestry**

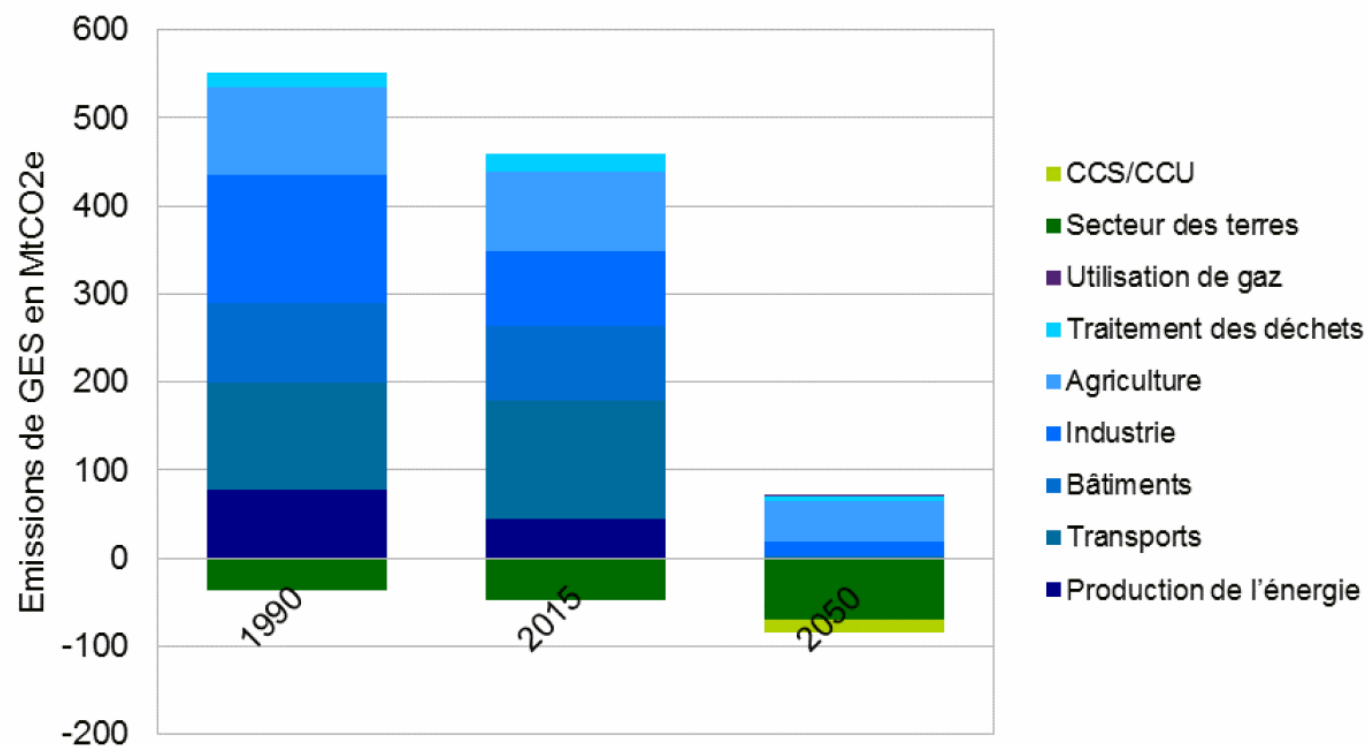
**$\leq 0\%$**

**"No-Debit"**

# Projects, initiatives and contributions to IRG's topics

National strategy for France planning carbon neutrality in 2050: increased forest and soil C sink, reduced ag. emissions (mostly after 2030)

Evolution des émissions nettes de GES dans le scénario AMS



# Opportunities, future actions and funding

*Here, list the opportunities and future actions already identified for your country (soil carbon sequestration, GHG inventories, ...) at different scale (field, farm, region, national, international ...)*

**Assess 4 per 1000 potential and implications**

**Improve national inventories**

**Support voluntary carbon offset projects**

*Here, list the possible funding from your country for projects or initiatives in this field*

**International calls (CIRCASA, EJP soil) with support of ANR (French agency for research)**

**International cooperation (Joint international labs, e.g. with China, research network)**

# National assessment of the 4 per 1000 aspirational target for soil C sequestration (agriculture and forestry)

- ✓ identify agricultural management practices which are likely to increase soil C stocks
- ✓ assess and map the C storage potential at the national level; compare to the 4 per mille aspirational target
- ✓ assess side effects on other GHG, N and water cycle, yields
- ✓ Two climatic scenarios
- ✓ Comparison of predicted C stocks in 2040
  - under current management practices (baseline)
  - under new management
- ✓ Economic assessment

**Forthcoming (June 2019)**

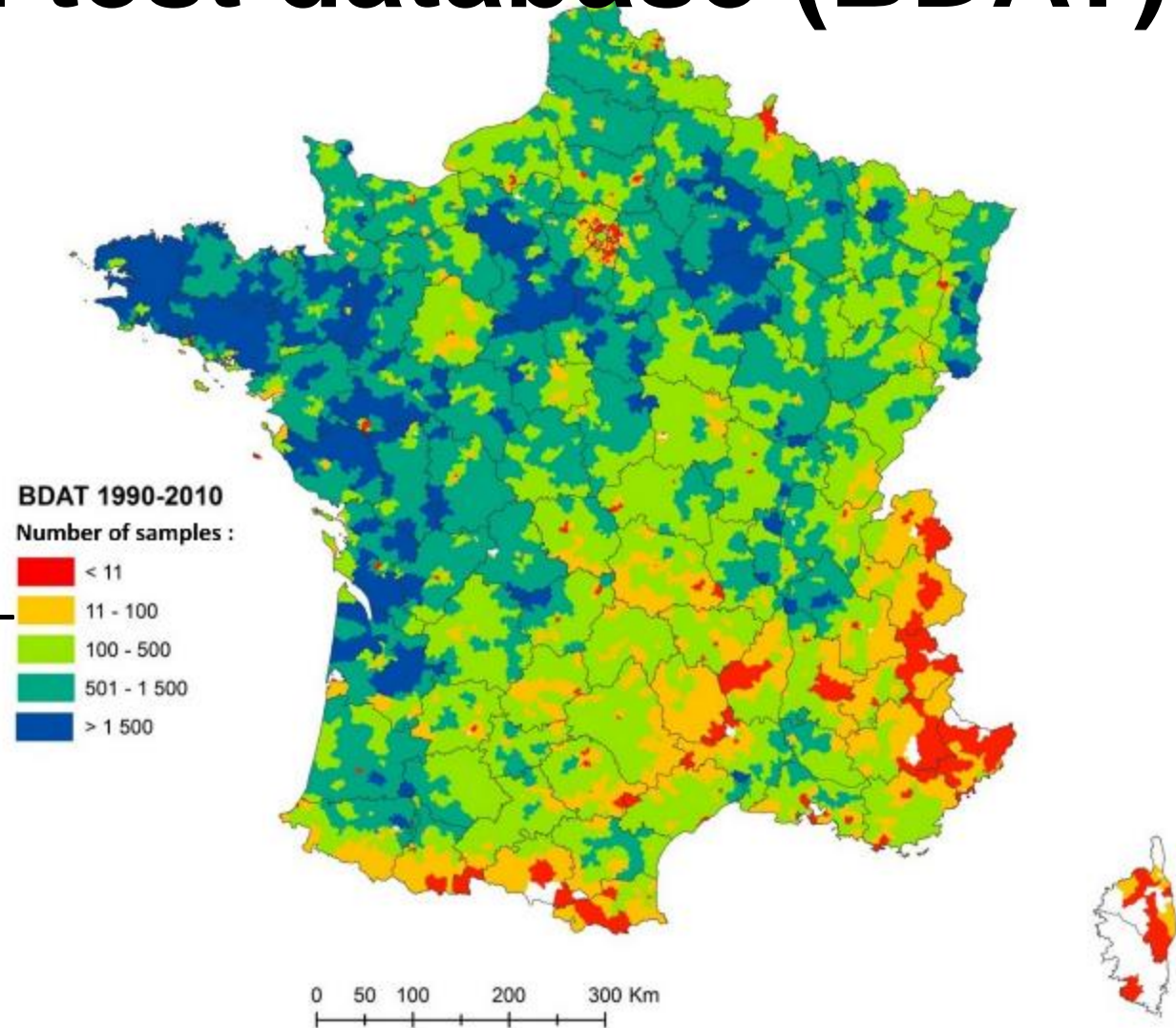
# Research and infrastructures Outline

1. Existing soil monitoring networks in France: BDAT, RMQS, SOERE, ICOS
2. Soil organic carbon (SOC) mapping and trend detection
3. Overview of soil-climate related research in INRA laboratories from the *Environment and Agriculture* department

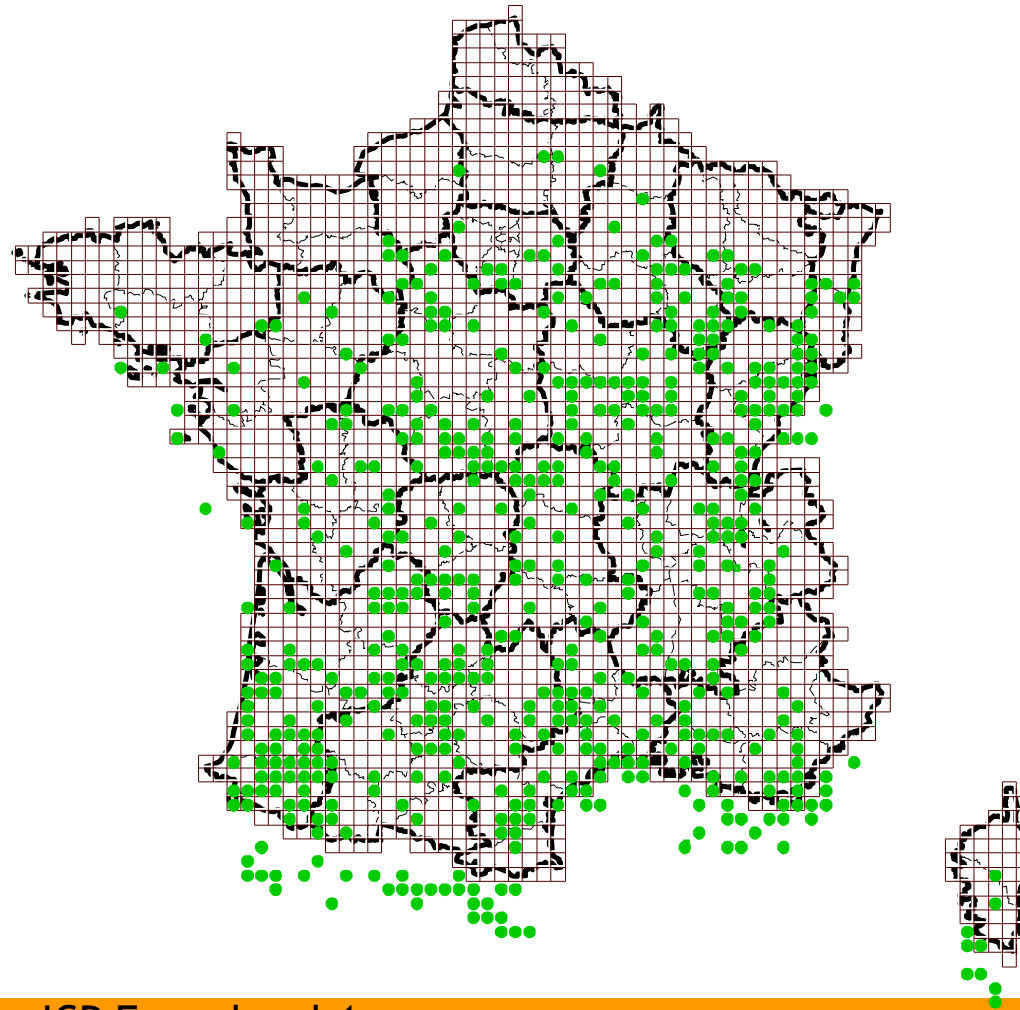


# The French soil test database (BDAT)

- Since 1990, collection of fertility soil tests based on normalized methods
- More than **24 million** analytical results from **2,4 million** cultivated topsoil samples (1990-2016)



## 2. RMQS: the Soil Quality monitoring network



2200 sites sampled  
every 10 years

900 agricultural sites  
600 forest sites  
(ICP Forest level  
1)  
550 grassland  
sites

+

2 campaigns 2000-  
2009 and 2015-2025

● ICP Fores level 1

# RMQS: the national soil samples archive



### 3. Long term soil and agrosystems observatories

- Impact of **land use history**: permanent pastures, rotations crops/pastures (ORE ACCB: 3 sites)
- Impact of **organic waste recycling** on agricultural soils (SOERE Pro : 3 sites)





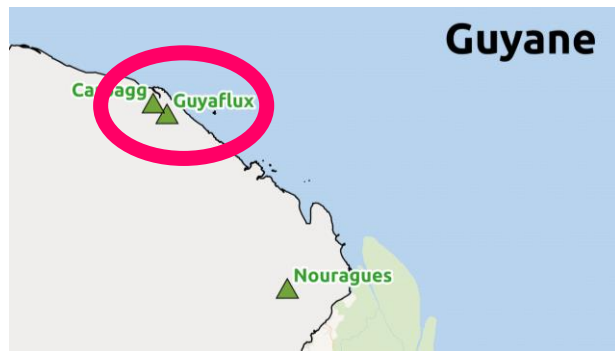
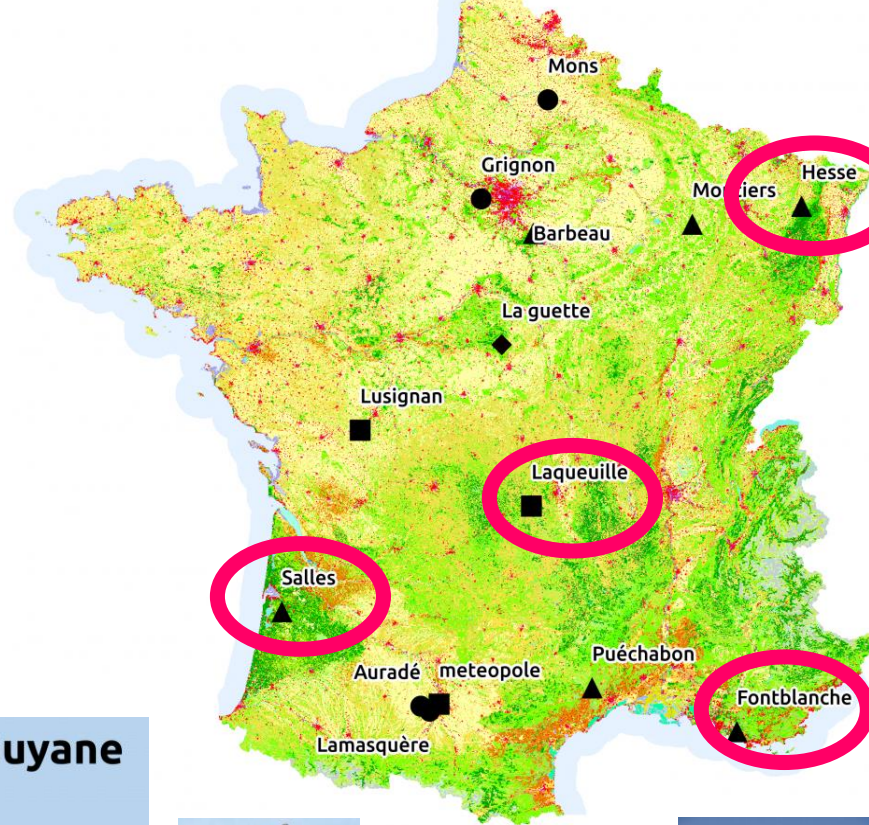
# 4. ICOS: the Integrated Carbon Observation System

Quantifying and understanding of the greenhouse gas emissions and sinks

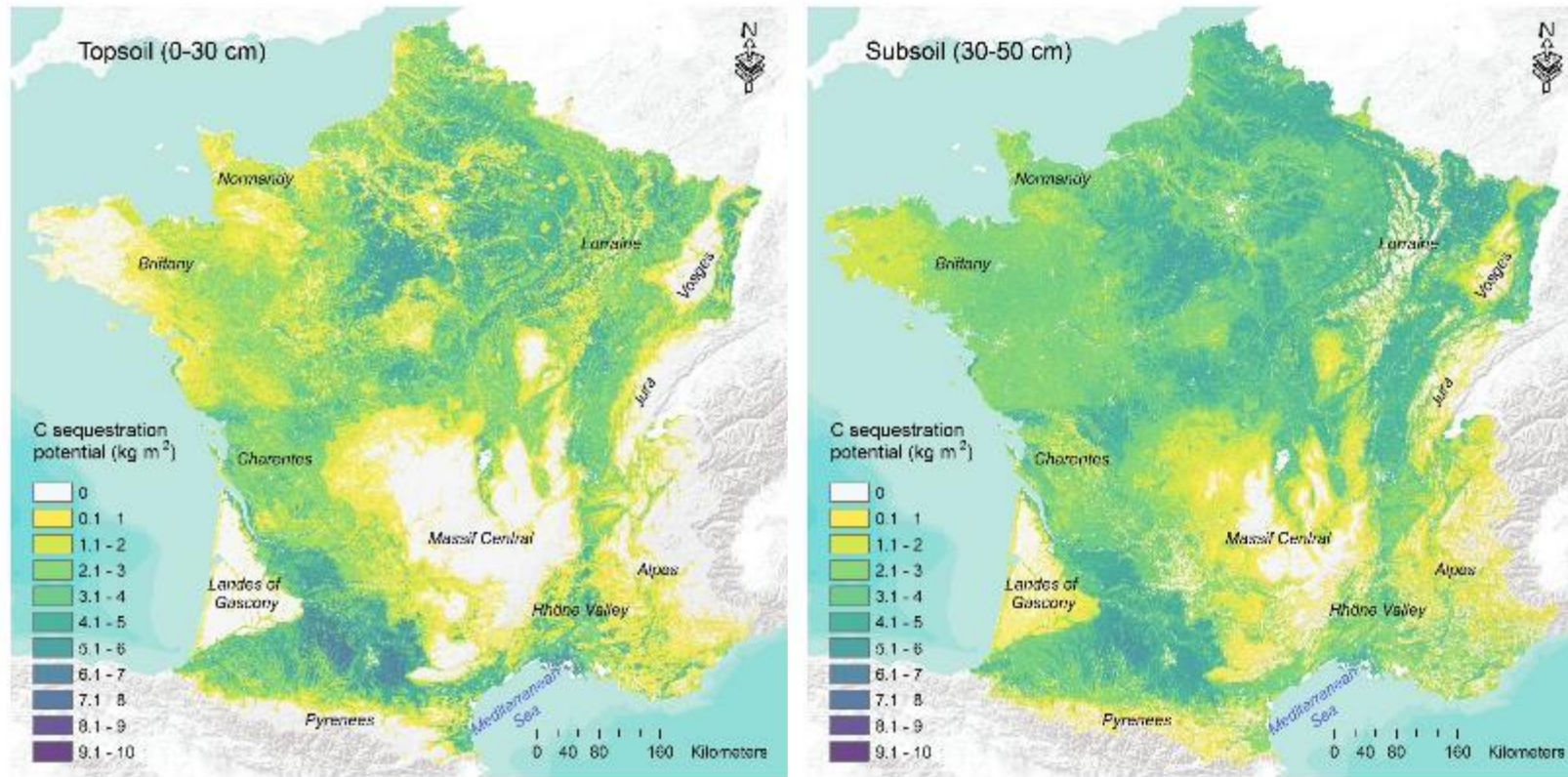


- 17 Stations:

- Forests (8)
- Pastures (4)
- Crops (4)
- Wetlands (1)



# Model based soil carbon sequestration potential in France

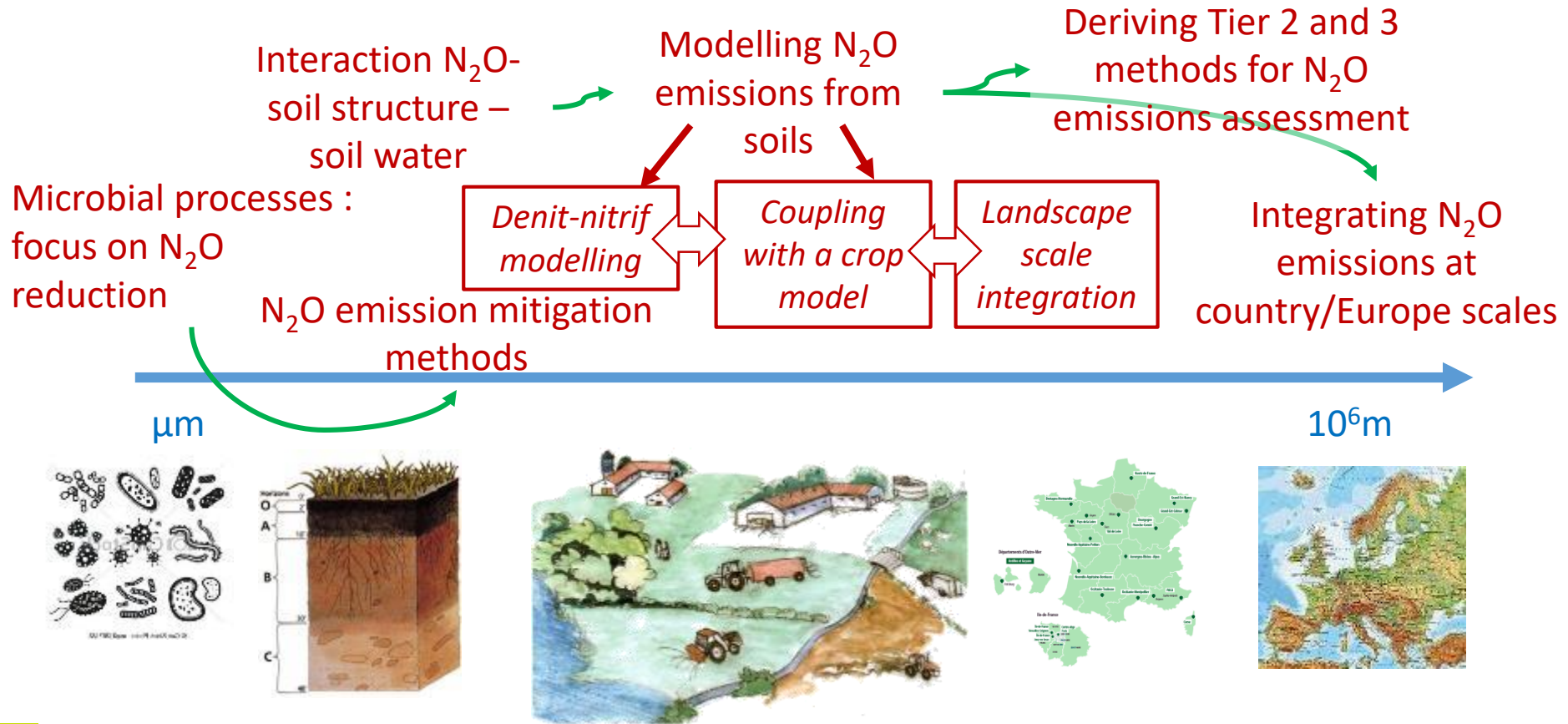


**High potential** → Intensively **cultivated plains**  
**Low potential** → **Mountainous areas and forest**

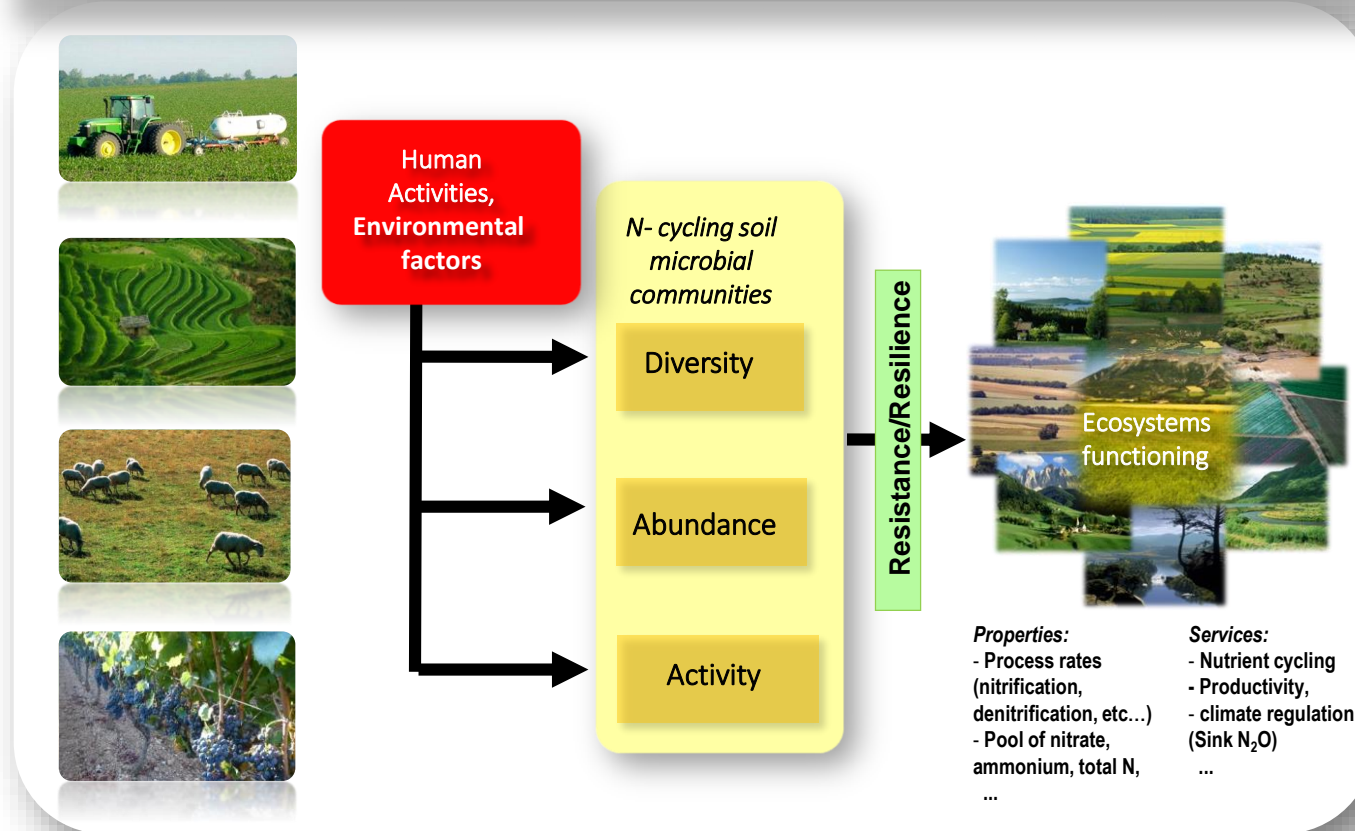
# N<sub>2</sub>O: a range of scales, from soil microbiology to country/Europe integration

N<sub>2</sub>O emission measurement, from small cylinder (lab) to **plot scale** and landscape integration

Database on N<sub>2</sub>O emissions from soils over France



# Drivers and ecology of N-cycling communities involved in the emissions of the greenhouse N<sub>2</sub>O for sustainable agroecosystems



- ◆ What are the relationships between the diversity, the abundance of ammonia – oxidizers as well as denitrifiers and N<sub>2</sub>O emissions?
- ◆ Can we foster in arable soils the microbial communities acting as a N<sub>2</sub>O sink?

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# Synthesis

1. Monitoring networks on Soil C and GHG emissions
2. Mapping of SOC stocks and C storage
3. Mechanisms of soil C sequestration (residence time, C input by roots) and improvement of SOC dynamics models
4. Drivers and mechanisms of GHG emissions (microbial ecology of denitrification in soil) and improvements of emission models
5. Coupling of C, N, P cycles in agrosystems
6. Expertise on C storage potential



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