

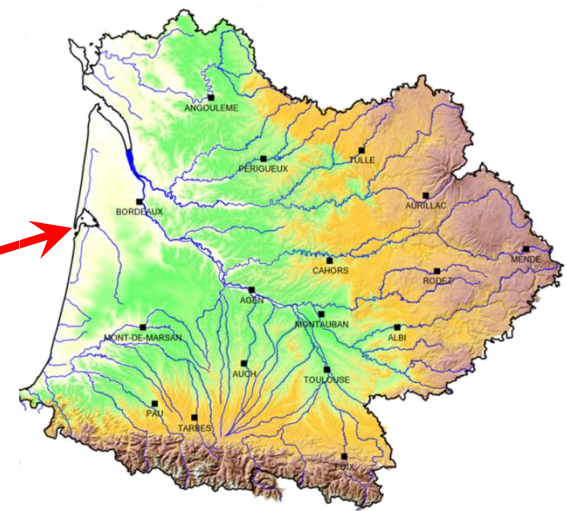


Towards integrated agroforestry systems in the Adour-Garonne watershed (SW France)

Fabien Balaguer, French Agroforestry Association (AFAF)
6th July 2016, CDG Arable Crops, Brussels

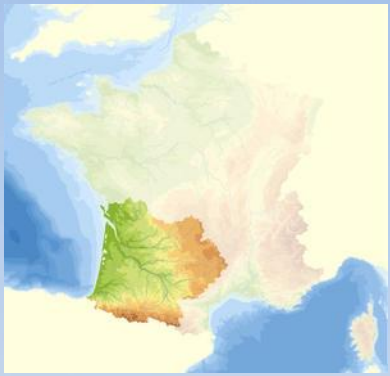


The Adour-Garonne watershed – **Where?**



Adour-Garonne watershed

What context brings about the need for change?



**Not enough water?
Too much water?**





**Water degrading
the soils...**

**... And soils
degrading the
water...**





The new assessment of soil loss by water erosion in Europe



Panos Panagos^{a,*}, Pasquale Borrelli^a, Jean Poesen^c, Cristiano Ballabio^d, Emanuele Lugato^a,

- Mean soil loss in EU: **2.46 t/ha annually**
- **12.7%** of European arable lands have soil loss **>5 t/ha annually**
- Among all land uses, **arable and sparse vegetation** have the highest soil loss rates

What are the solutions?



Agr'eau – a farmer-centered initiative

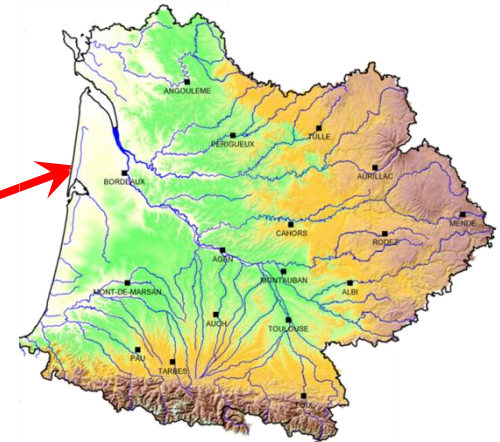
Aim: collaborative development of farming practices that allow for...

- **Sustainable soil & water management** (landscape approach)
- **Intensification & optimization** of farming systems

→ **Producing more, with less... while protecting the environment**



A long-term development programme started in 2013



Adour-Garonne watershed

Agr'eau – A multi-partner, local initiative

The institutions

Program manager:

French Agroforestry Association



Founding partners:

IAD : Sustainable agriculture Institute

A.O.C Sols: local soil conservation association

Arbre et Paysage 32: local farmer association



Sponsors:



Water Agency: 50% of programme budget

Associated partners:



Agr'eau – A multi-partner, local initiative

The people

Ag. extension
officers

River
conservationists

Farmers*

Researchers

Foresters

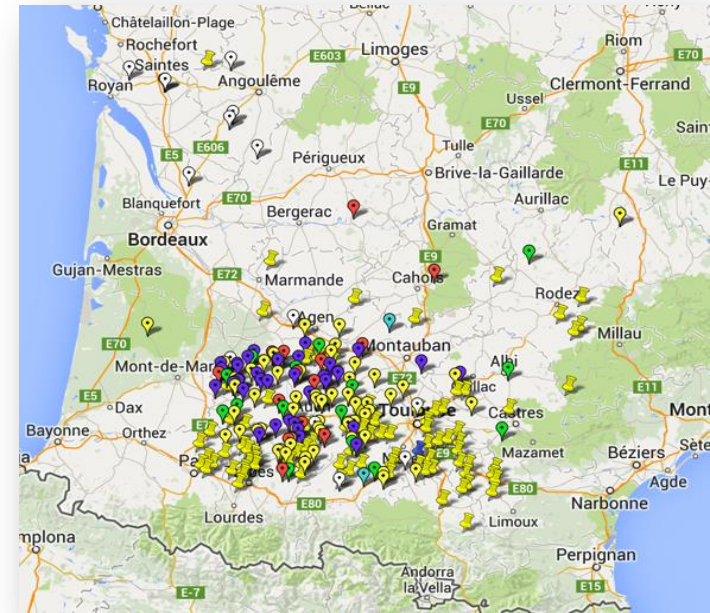
Road
maintenance
officers

Bee-keepers

*nearly 300 farms (still increasing)

A program for **all farmers**, regardless of:

- **Certification** scheme (conventional, organic...
... **everyone welcome!**)
- Type of **farming system**: arable, vegetable, mixed crop-livestock systems, viticulture...
- **Pedoclimatic** context
- **Size** of farm
- Level of **experience**...



Conversation agriculture...



Building local innovation networks

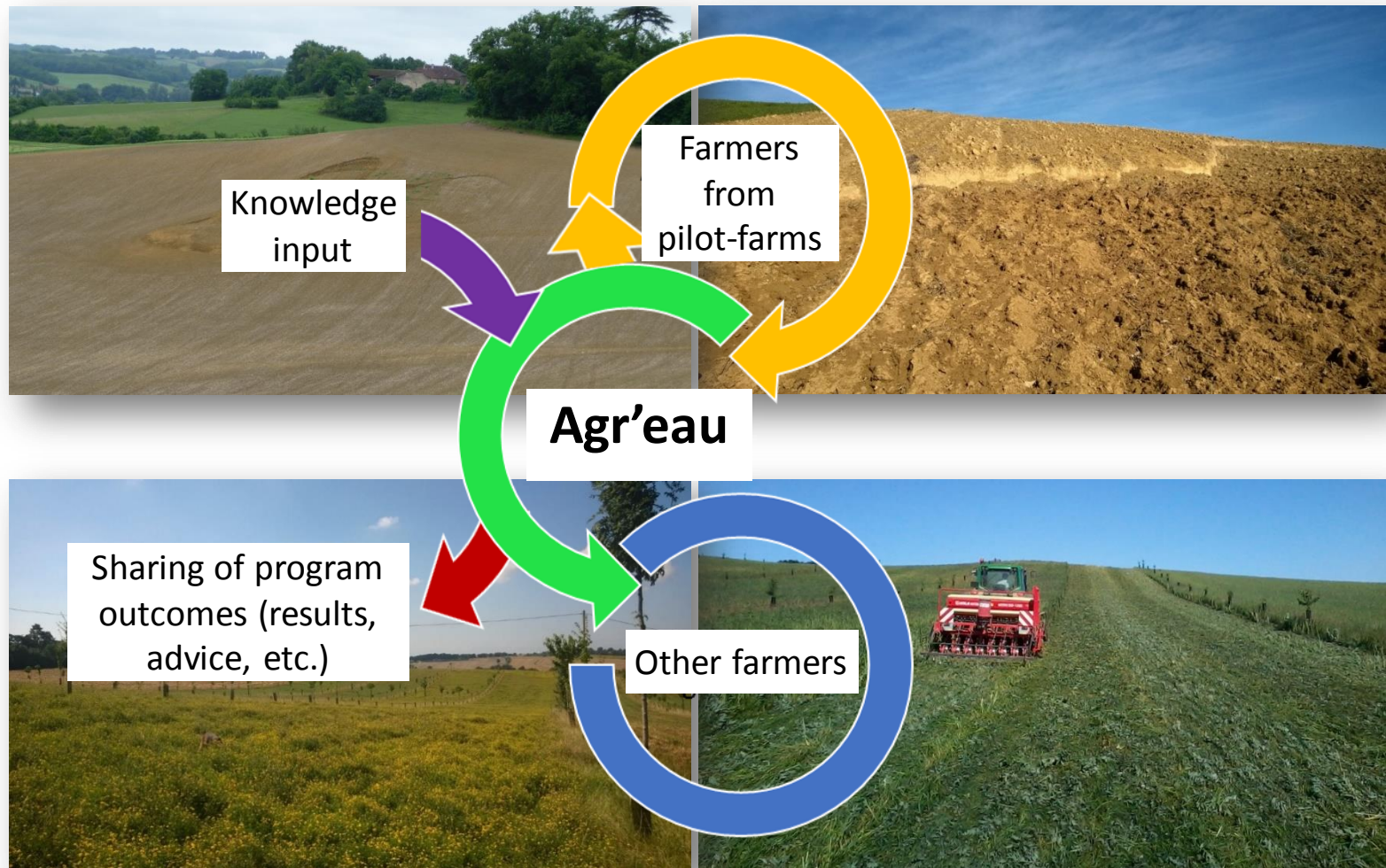


The keystone of the Agr'eau initiative:

The pilot-farms

- A 2-scale follow-up and evaluation:
farm & field-level
- A constant interaction with research
- Expected: 125 pilot-farms by 2017

Farmers, the motor of innovation!



What approach to use?

Plant and tree cover... a survival blanket?



Note: Forests seldom die from water shortage...

What is a farmer's job?

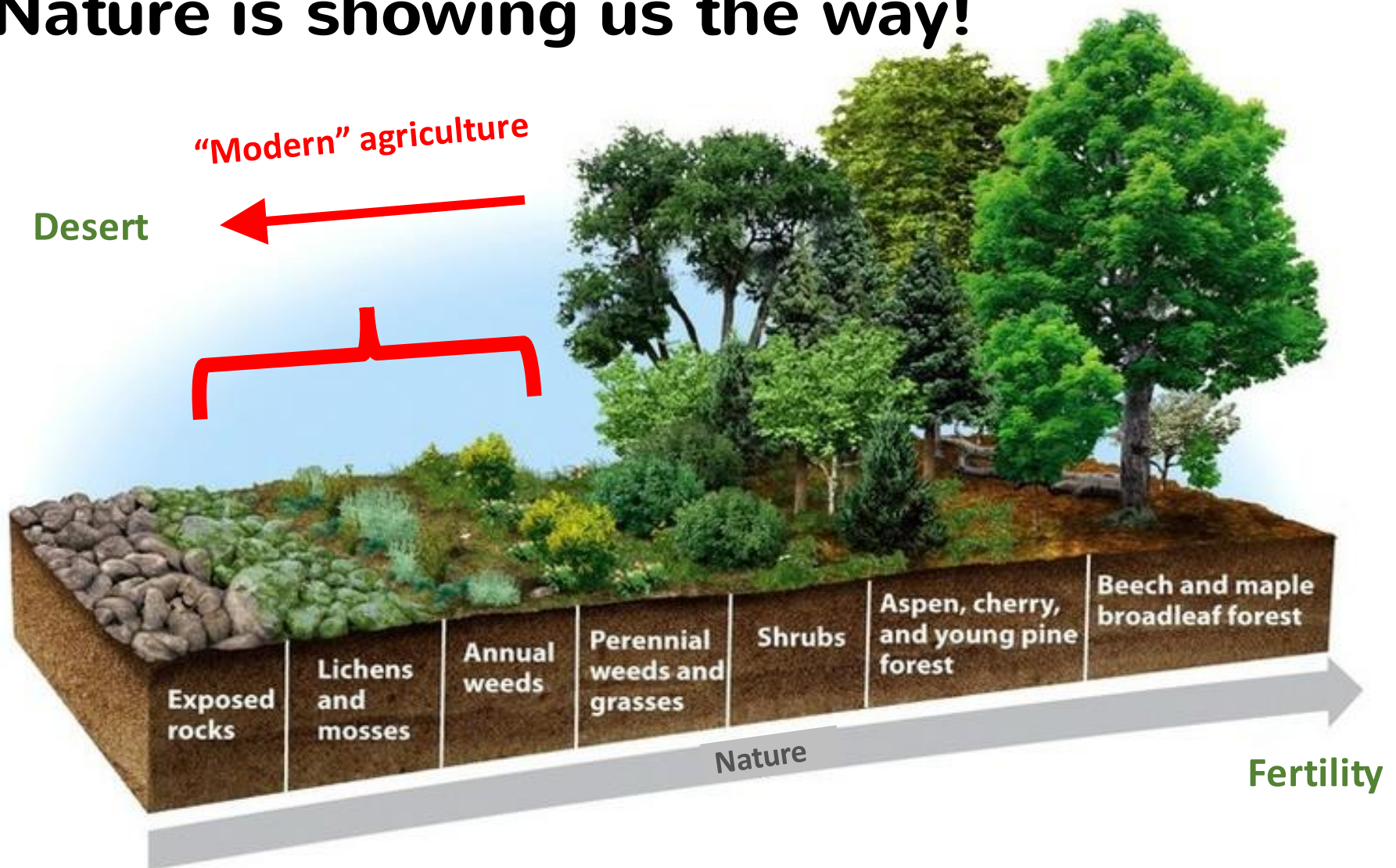
Capturing the **sun**...



... and turning it into **biomass**
(= carbon)

Everything starts from here!

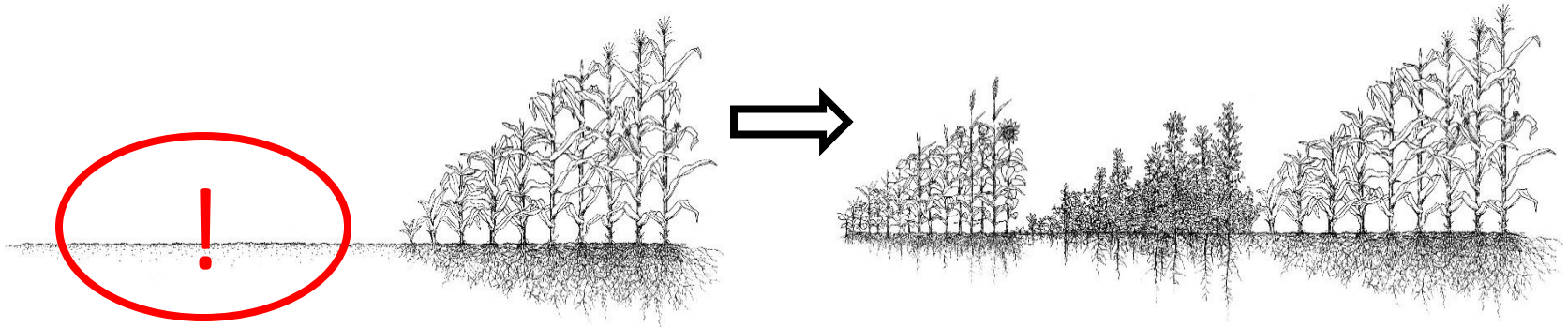
Nature is showing us the way!



Principle 1 : retain plant cover **all year long**, **no soil disturbance**

Principle 2 : plants as **big** as possible... and **on top of each other**

Crop succession (1 year)



BEFORE:

- 1 crop a year
- Soil left bare part of the year
- Low biomass production

Vicious circle

AFTER:

- Up to 3 crops a year
- Soil permanently covered with plants
- High biomass production

Virtuous circle

**No-till + direct seeding into living mulch =
Healthy, fertile, filtering soils**



**12 t of
biomass/ha**



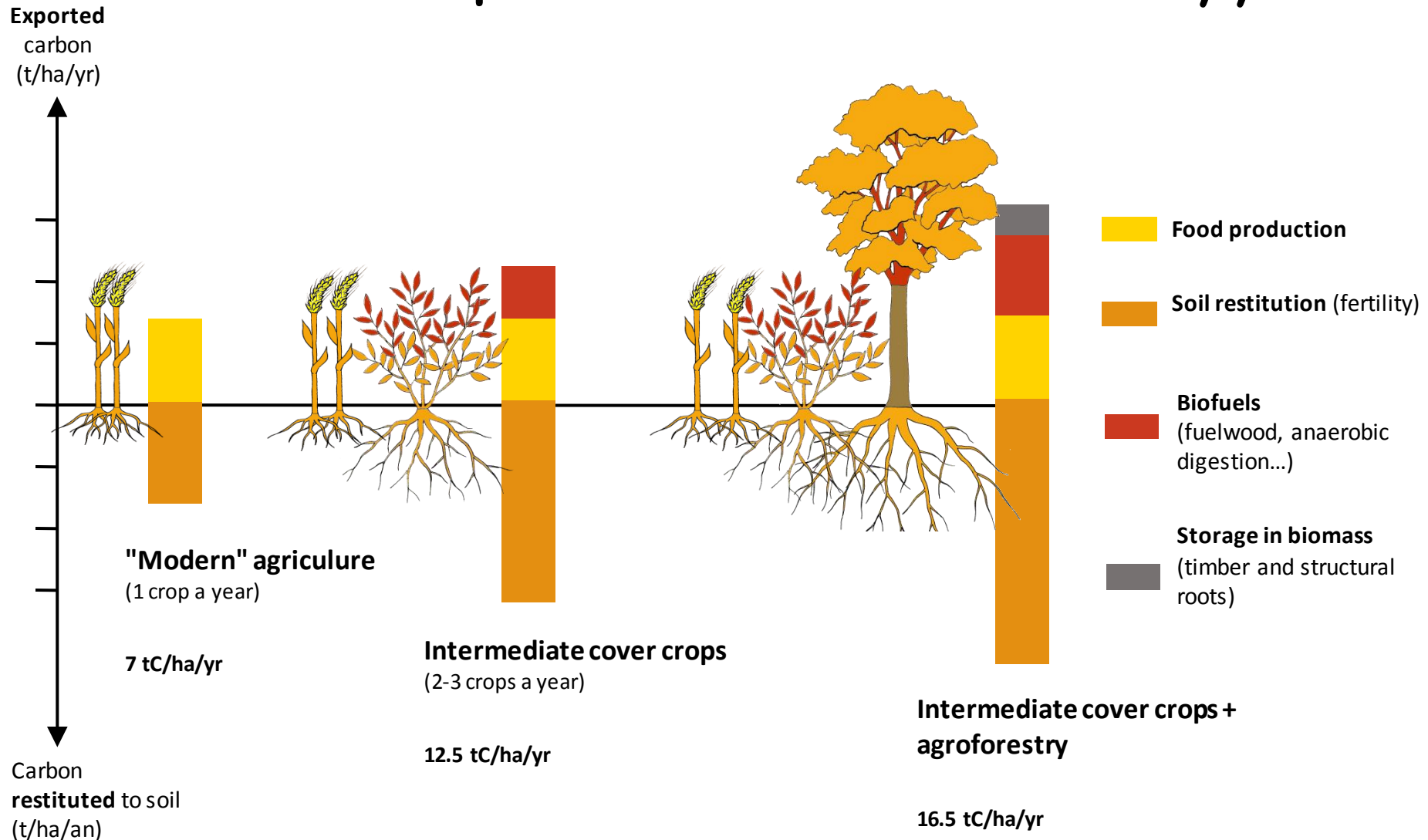
Mimicking forest dynamics in agriculture...





Carbon, fertility... and climate

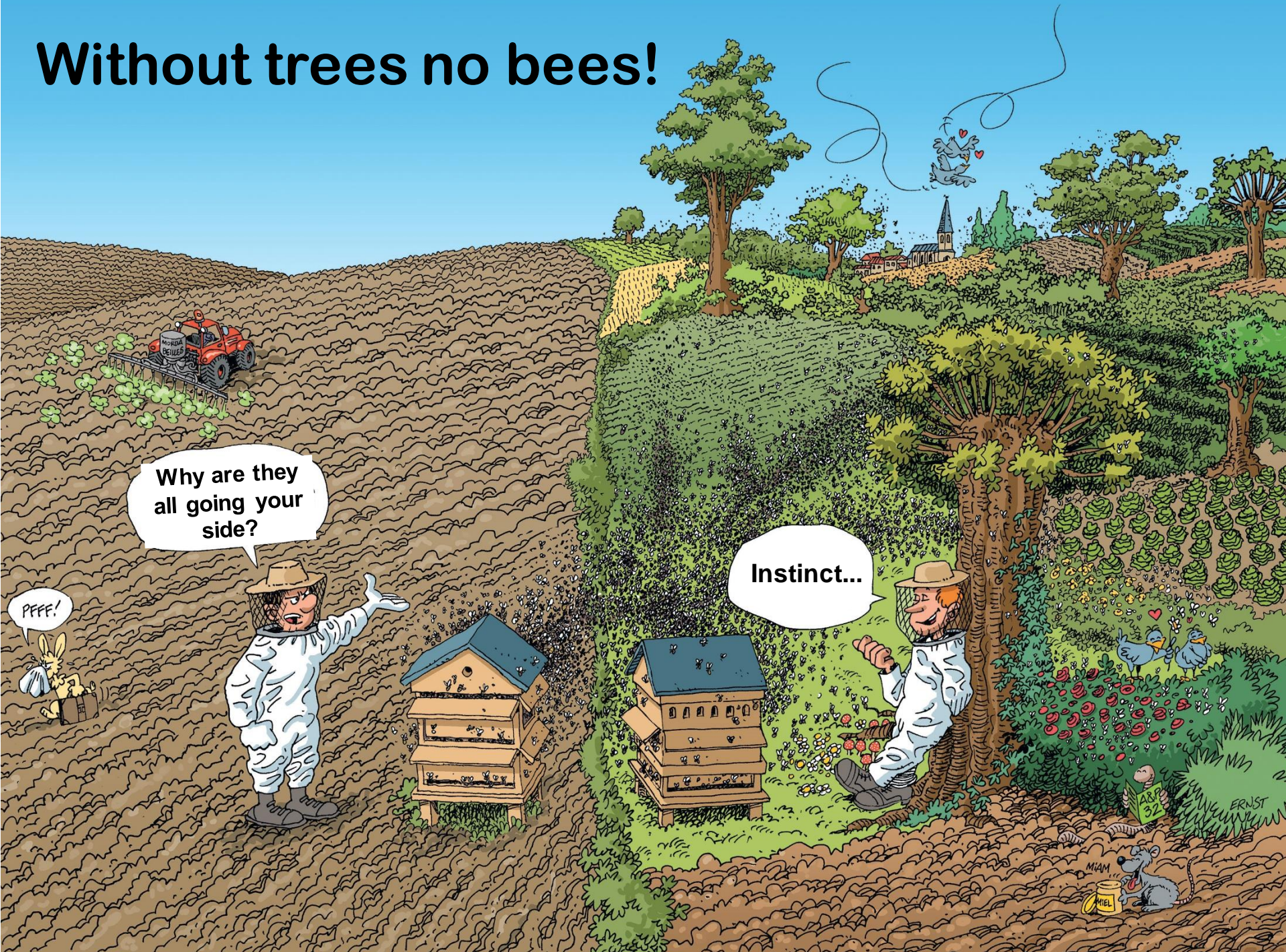
France could capture **twice as much** carbon every year!



**More biomass means more life...
... sustainably**



Without trees no bees!



Trees all year round

- Some key woody species:
 - End of winter: willow, hazel
 - June: resource gap → hornbeam
 - Fall: English ivy
 - Diversity, continuity = balanced diet



Honeydew & propolis (bee glue)

An exclusiveness of trees!



Miellat

Oak



Larch



Fir



Spruce

Propolis



Beech



Horse chestnut



Elm



Poplar

Intermediate cover crops: producing, protecting, feeding

Phacelia



Buckwheat



Sainfoin



Clover



Alfalfa



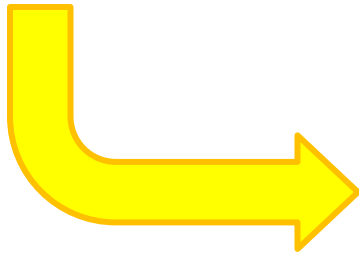
Viper's
bugloss



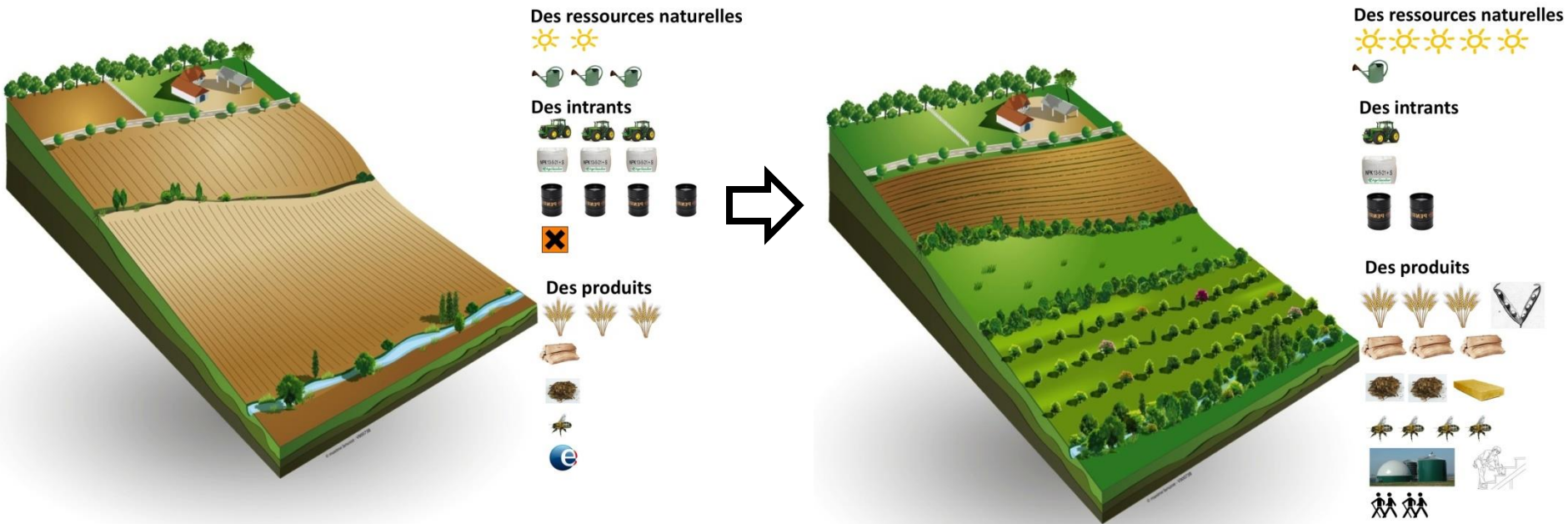
Bridging the gaps...



Producing more, with less!



Free carbon input, for rich and living landscapes



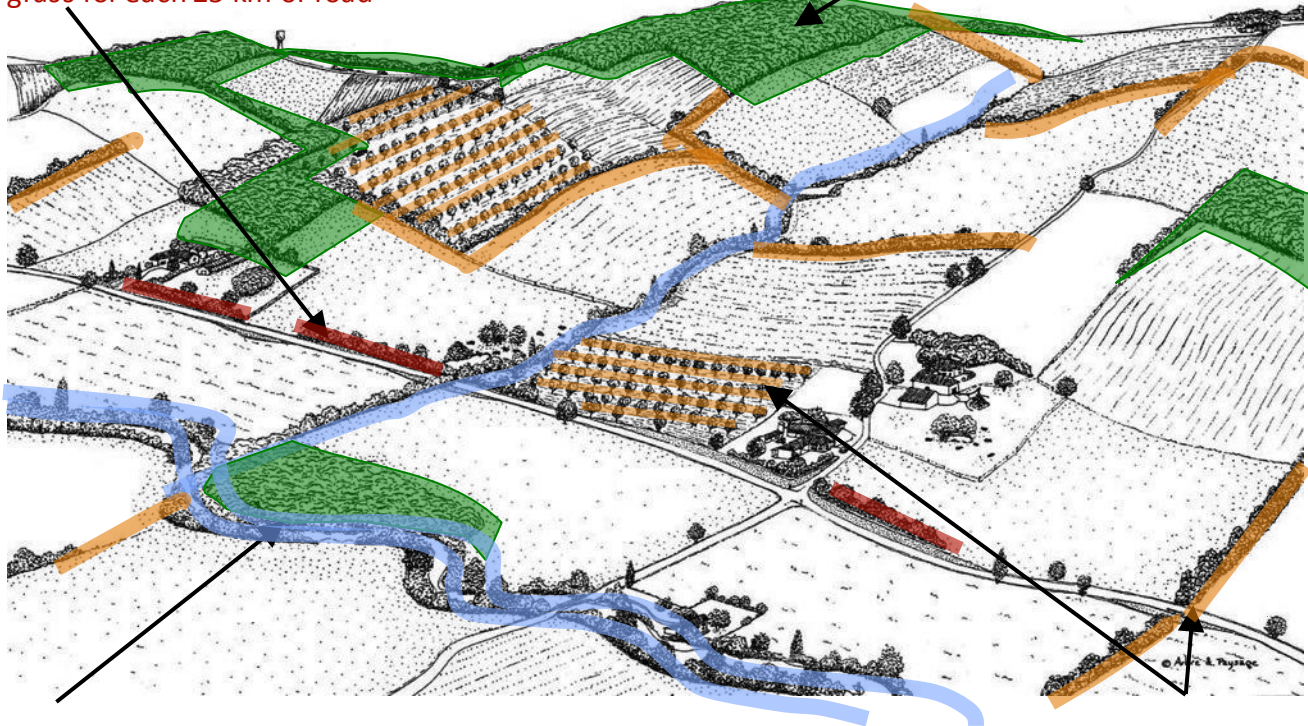
Diversifying and optimizing productions at a landscape level (food, timber, fuelwood...)

Road maintenance officers

125 m³/yr of fuelwood
75 t of grass for each 25 km of road

Foresters

880 m³ of fuelwood for an area of 800 ha



River conservationists

460 m³/yr of fuelwood for each 55 km of river

Farmers

30 m³ of fuelwood/yr/farm
(100 ha, of which 20ha are agroforestry
+ 5km of hedges)

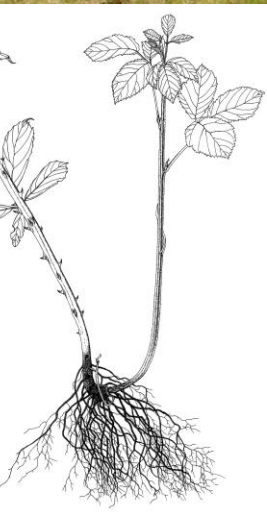


To plant...

... or not to plant!

(Assisted Natural Regeneration)





The thorn (*Rubus* spp.) is the mother of the oak!

The multi-purpose biomass as a socio-economic leverage:

Development of new **jobs** and **market channels**



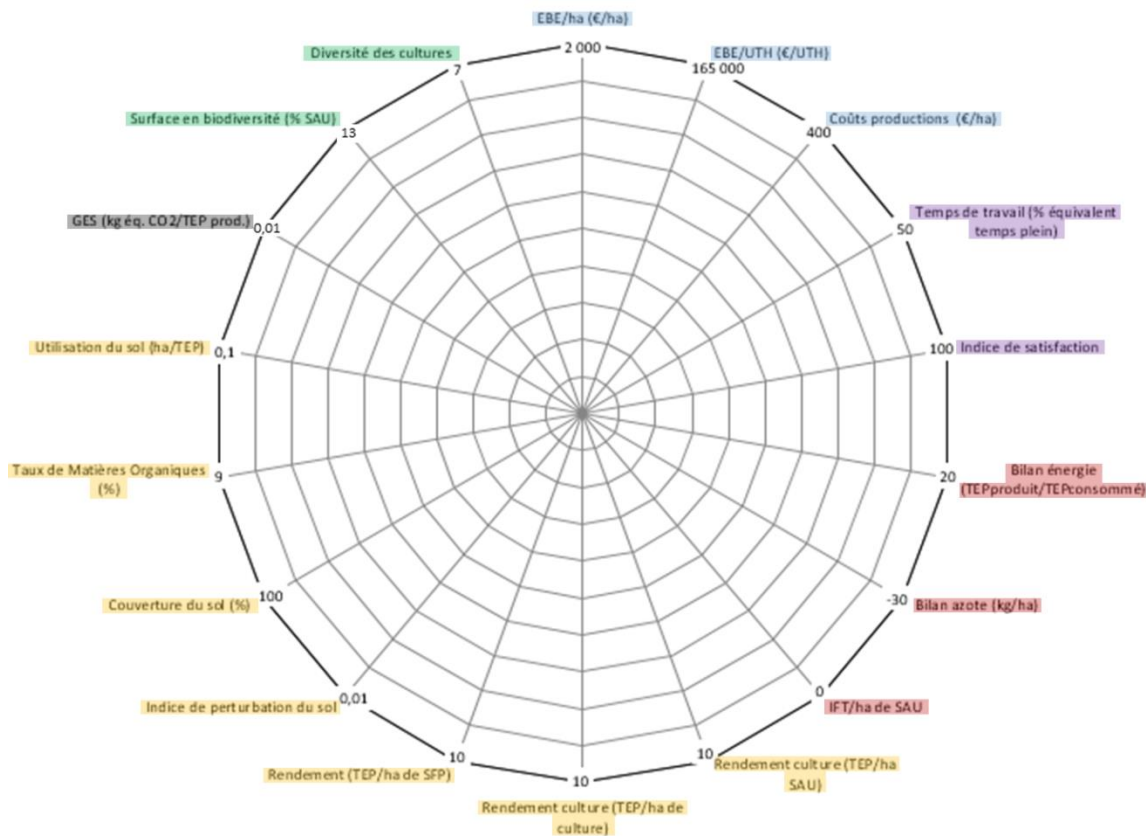


Assessing the performances

- Providing farmers with **user-friendly** evaluation **tools/indicators** to guide their **decision making**
- Gather and **analyze** the results (successes & failures)
- **Out-scaling & up-scaling**

Agr'eau follow-up procedure – Farm-level

- **Multi-criteria evaluation** of farm performances (radar charts)



Economic viability

Social viability

Input efficiency

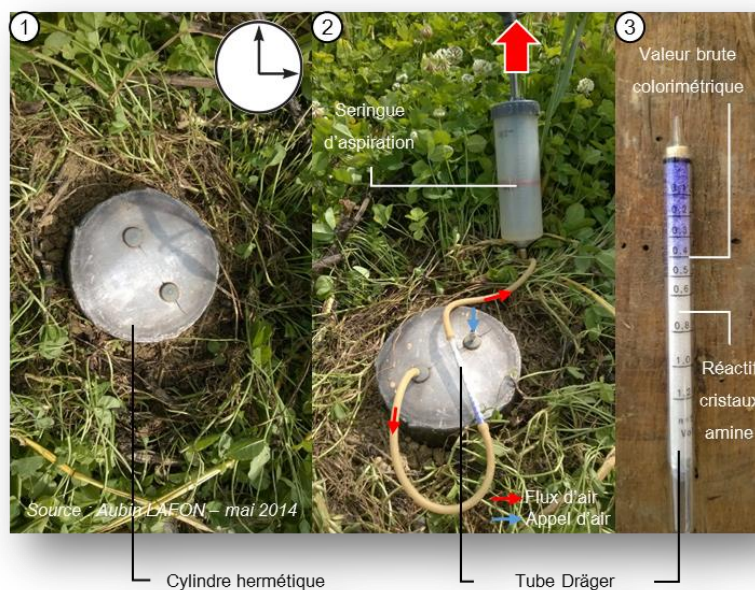
Soil quality

Green house gases

Biodiversity

Agr'eau follow-up procedure – Field-level

- **Humus & carbon balances**: impact of farming practices on soil organic matter
- **Soil quality** assesment: biological activity, water infiltration capacity, etc.



Carbon storage in agroforestry systems*

- "Basic" agroforestry** (AF)
→ Storage 1tC/ha/yr

- Improved soil management
= Direct Seeding in Living Mulch (DSLML)
→ Storage 1tC/ha/yr

* Soil only

** trees + conventional soil management

"Integrated" AF syst.
AF + DSLM
→ Storage 1tC/ha/yr

And at a national scale ?

Annual potential of storage:
165 Mt eq-CO₂

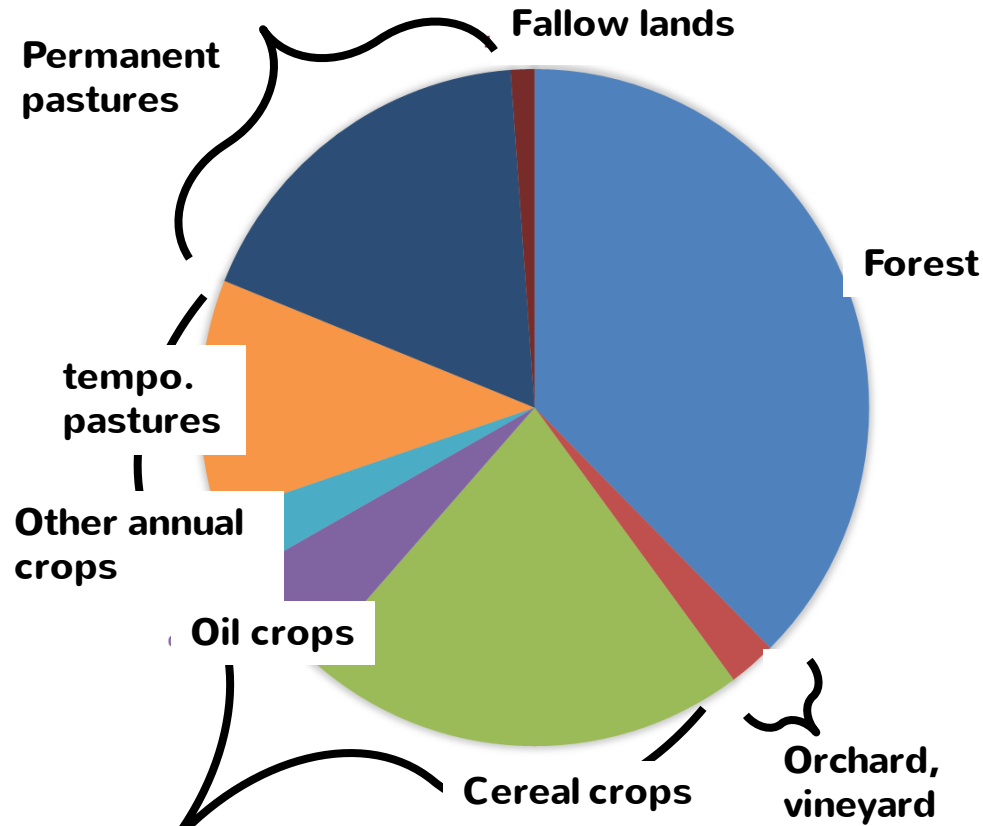
→ **33%** of all French GHG emissions (500 Mt eq-CO₂)

... Not to mention the contribution of this agriculture to the **reduction of emissions** through:

- Reduction of energy consumption (soil cultivation, industrial ferti&pest...)
- Reduction of N₂O & CH₄ emissions due to improved soil management
- Production of renewable energy (biomass) in substitution of fossil fuels

11 Mha in AF (including "bocage")

51 Mt eq-CO₂ stored/yr



15 Mha in DSLM + AF

111 Mt eq-CO₂ stored/yr

1 Mha with LM on soils

3.7 Mt eq-CO₂ stored/yr

French agricultural landscape: far from carbon saturation!

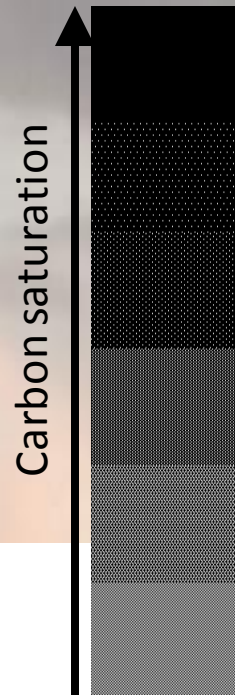
Mature forests:

ca. saturated in
carbon

Agriculture:

→ **Huge storage
potential**

= 7,2 Gt eq-CO₂!



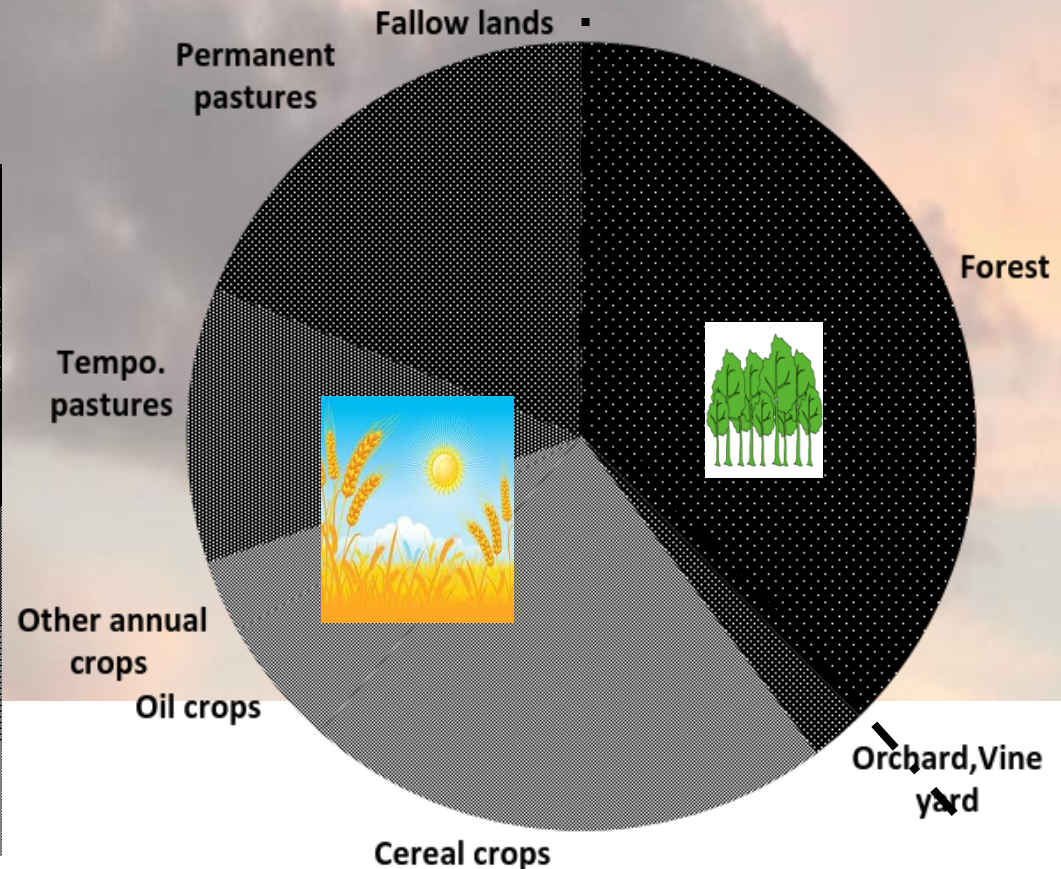
French rural landuse repartition

Agriculture (29 Mha):

Filling up C reservoir

Forest (16.5 Mha):

Managing C reservoir



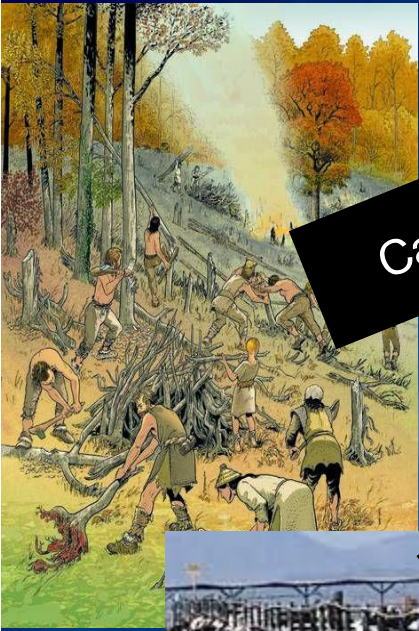
Source: Agreste, AFAF

Building a climate-smart landscape?



North France, early 20th century

Le bocage dans le Perche, près de Nogent-le-Rotrou (Eure-et-Loir). - Cl. L.P.V.A.



Carbon



Carbon



Carbon



Carbon

Carbon





Carbon

Carbon

Carbon

Carbon

Carbon

Starting: january 2016
Ending: december 2020

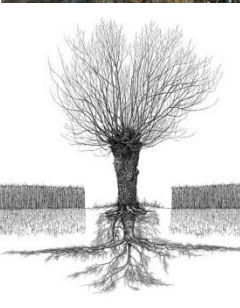


BAG'AGES Research Project



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