



Agroforestry the European way. State of the art and challenges

1st EURAF Conference,
10 October 2012

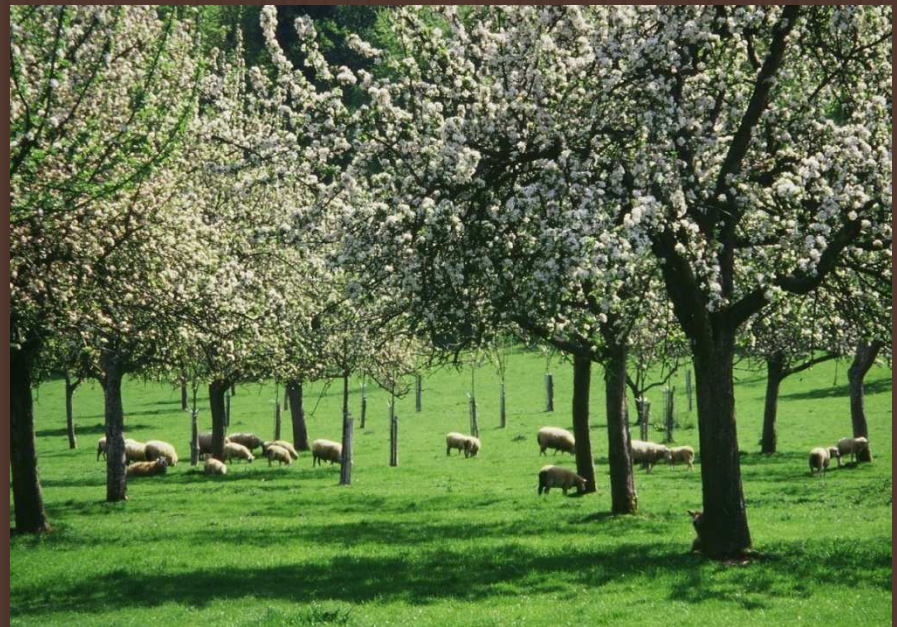
Session 4 at the European Parliament, Brussels

Christian Dupraz

INRA, Montpellier, France



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



Trees and Agriculture : a change of paradigm

Trees inside parcels
Trees around parcels





Around parcels





Inside parcels



7



Innovative Agroforestry

On-farm research

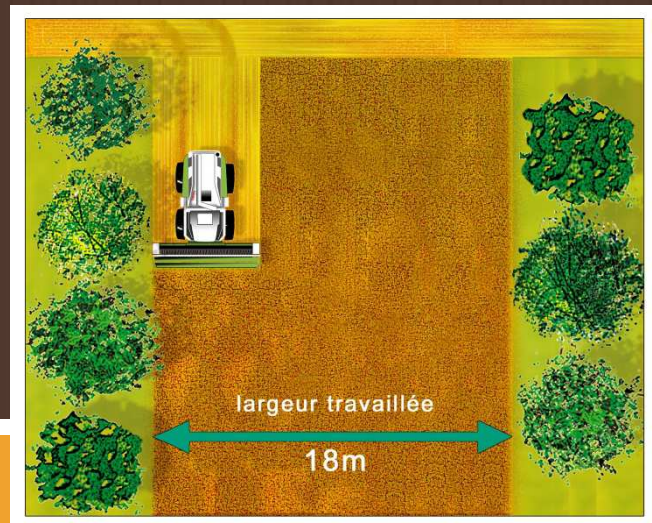






1990-2010
What did we learn?

Agroforestry is not a mixture of agriculture and forestry : it's a new farming system



Traditional agroforestry practices are valuable

But modern schemes better adapted to
present-day agriculture are feasible

**Agroforestry is deep-rooted in European
agriculture**

Agroforestry offers innovative solutions to modern challenges of rural development

Farm income, Rural employment,
Biodiversity, Soil protection, Water
protection, C sequestration

But the key finding is :

Agroforestry makes money

Compatible with modern machinery

Requires time and capability to invest for the next generation :
help needed!

Proven



To mix or not to mix : trees and crops/animals...

Mixture

Separation



1 ha

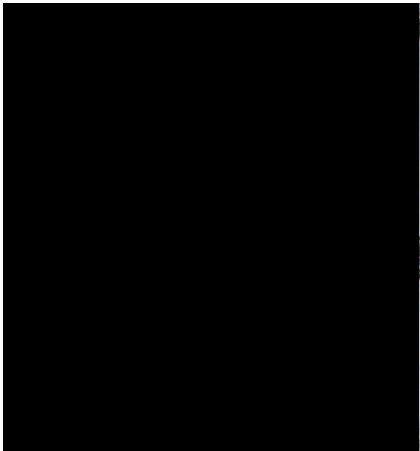


0.8 ha

0.6 ha

LER = 1.4 ha

Land Equivalent Ratio (LER) (Mead and Willey, 1980)



1996



1997



2002



2005



2003



2009



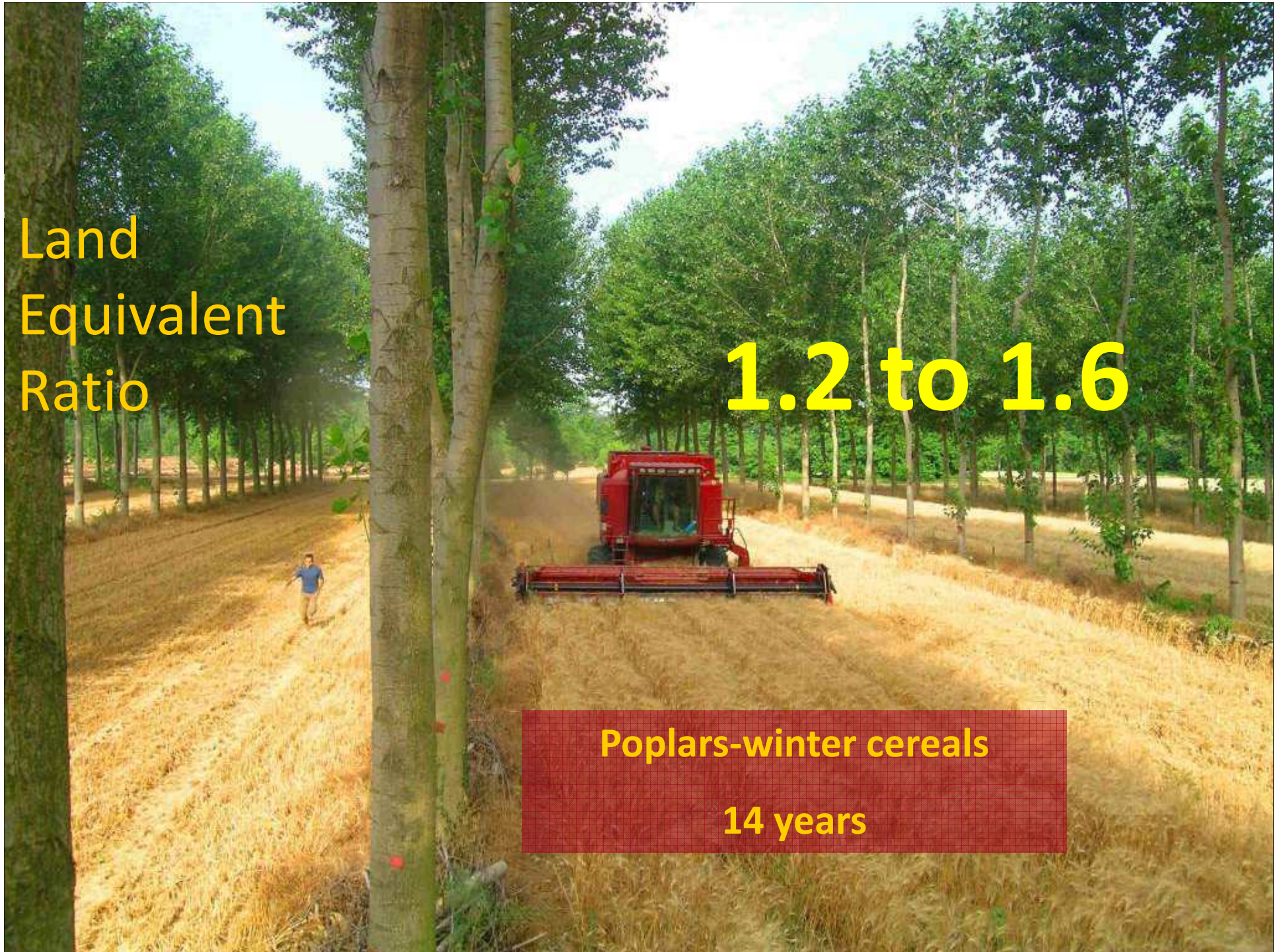
2010

Land
Equivalent
Ratio

1.2 to 1.6

Poplars-winter cereals

14 years



A 1.4 LER means

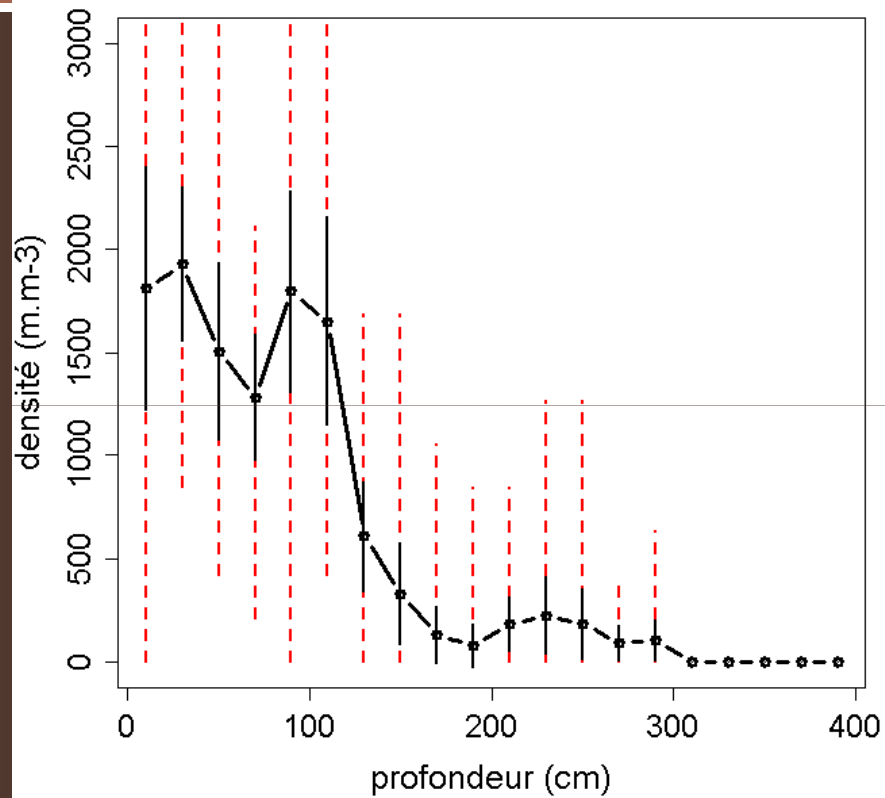
that a 100 ha agroforestry farms produces as much crop and tree products as a conventional 140 ha farm where trees and crops are separated



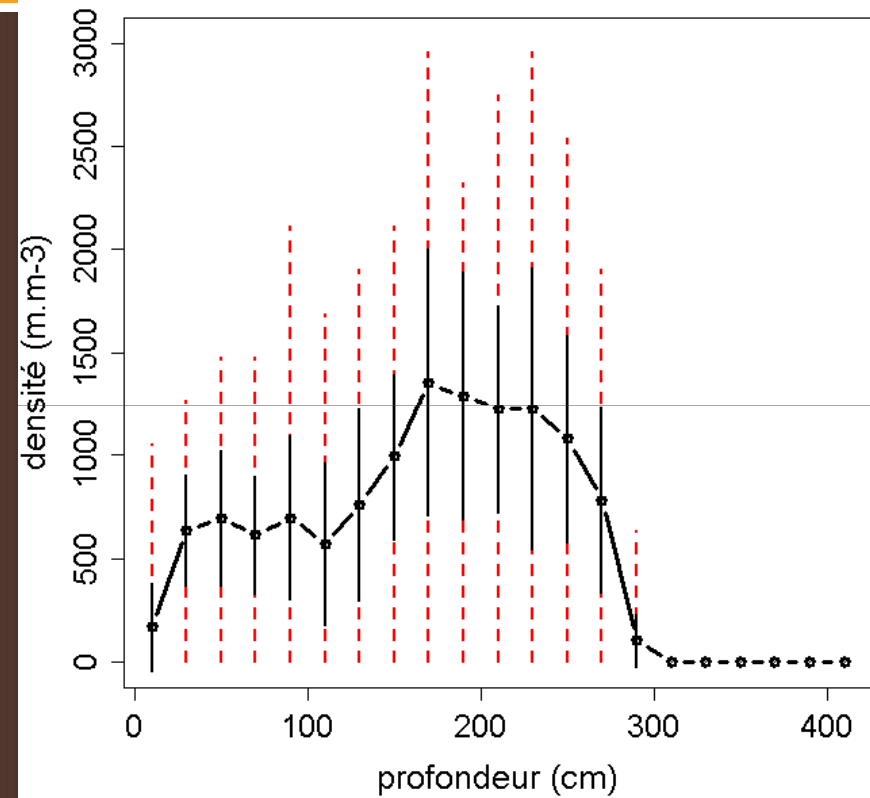
Part of a new green revolution

Increased efficiency of natural production factors (light, water, natural nitrogen)

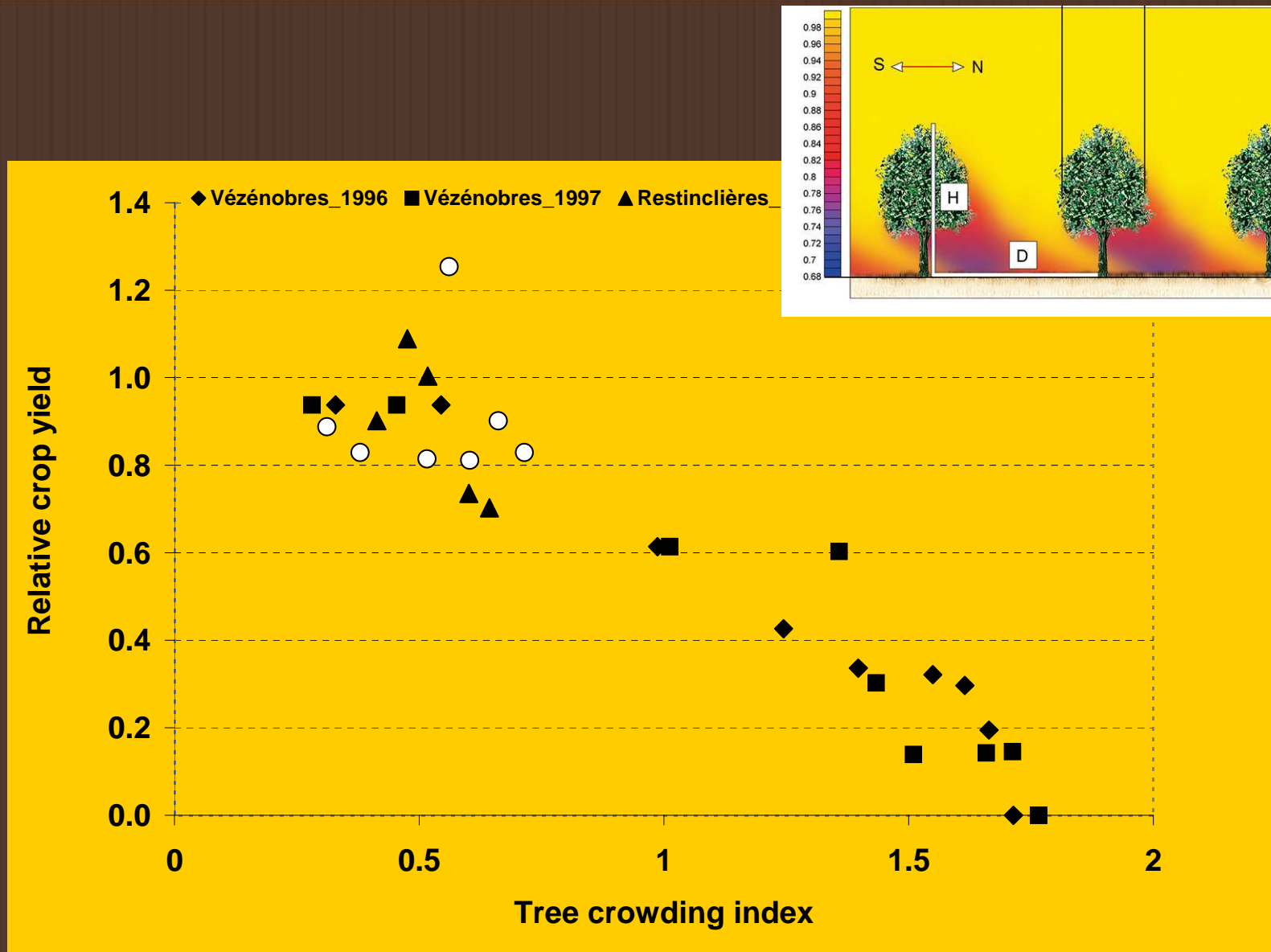
Root profiles of 14 year old walnut trees (Novembre 2009)



Pure walnut grove



Walnut wheat Agroforestry



Research for action : guidelines for improved AF systems

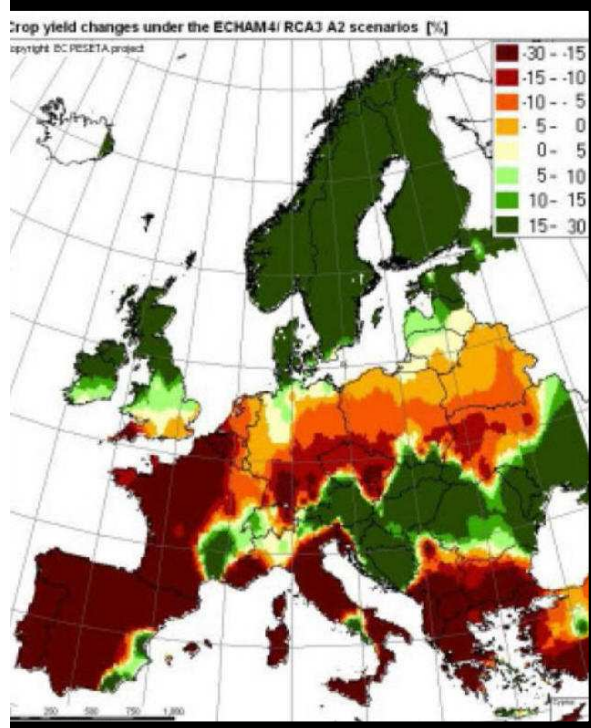
Environmental services of agroforestry

Landscaping, positive image of farming with nature



Adaptation to Climate Change

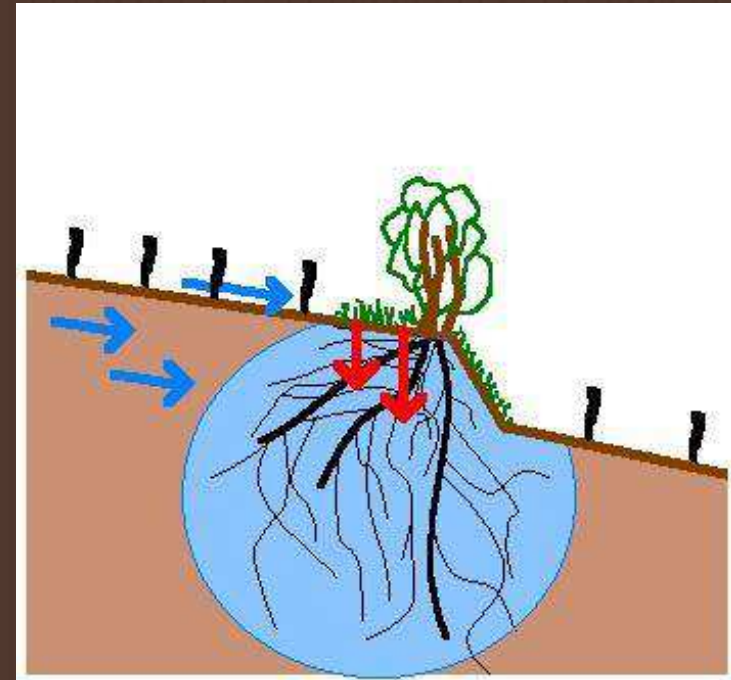




CROPS IN AGROFORESTRY SYSTEMS ARE PROTECTED AGAINST CLIMATE CHANGE HAZARDS

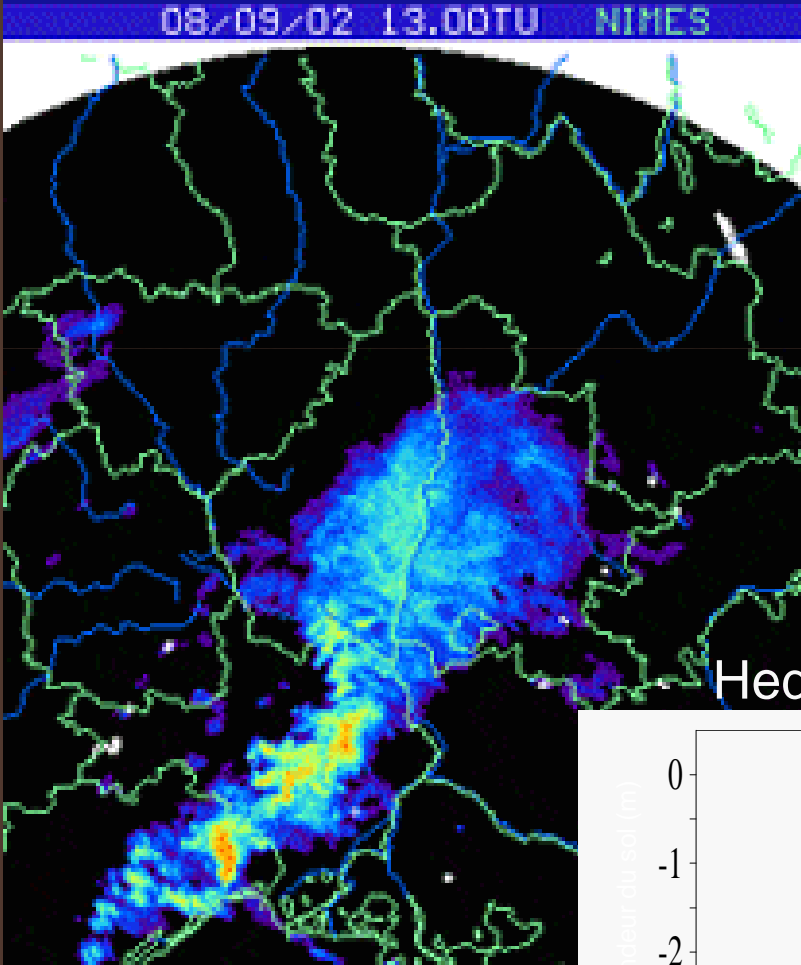
Improving water infiltration

Increase of soil porosity, terracing, increase in soil organic matter pools...

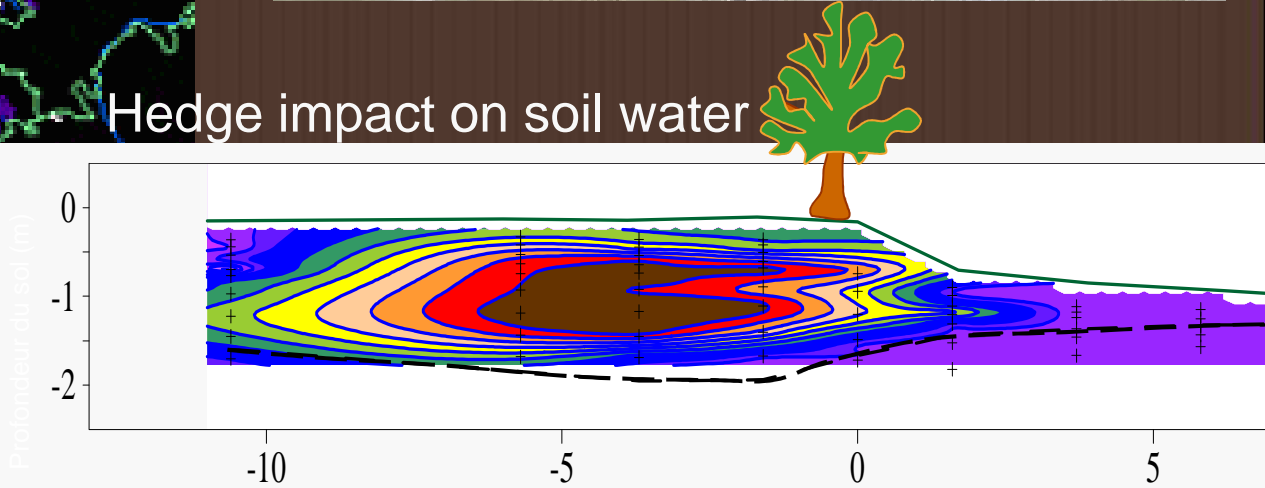


Floods mitigation

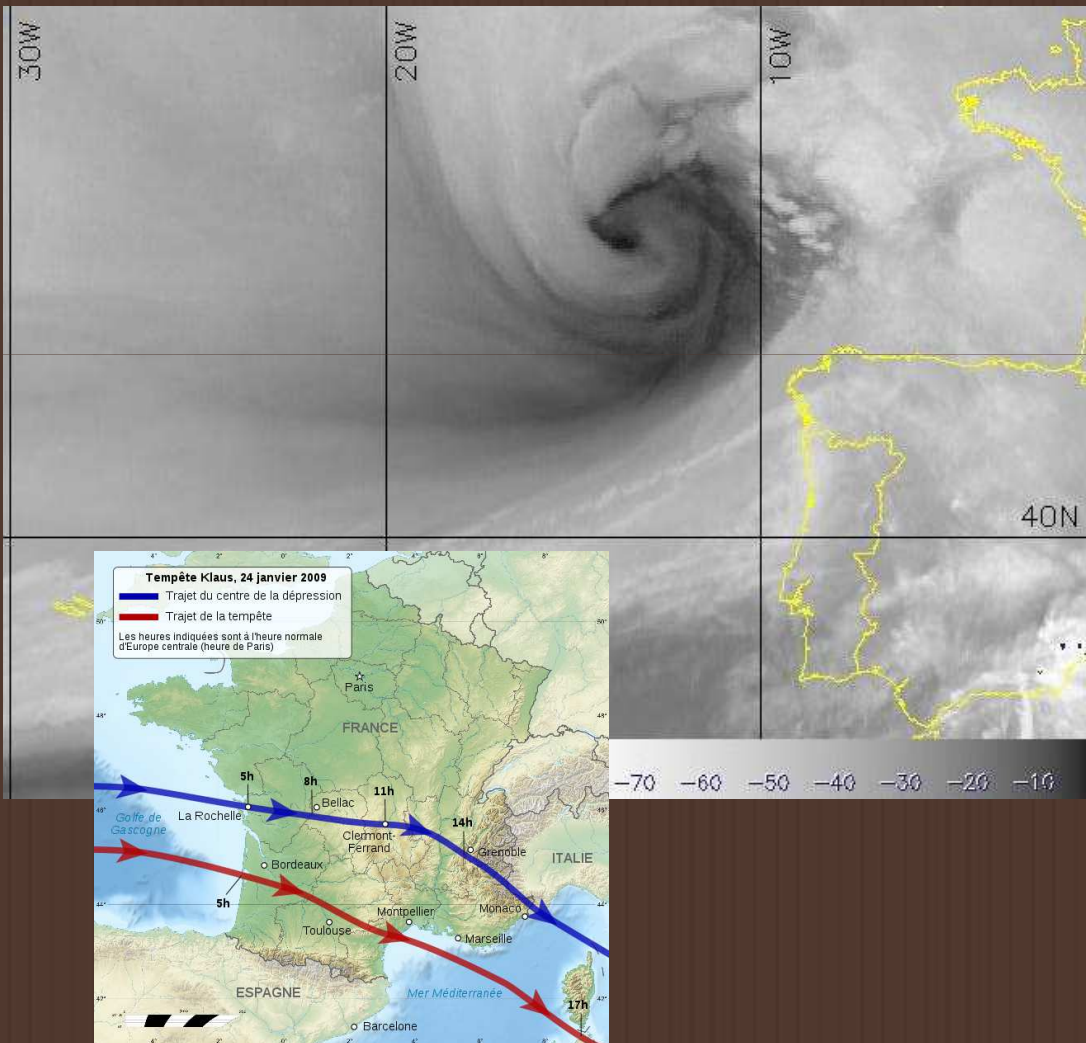
Under study



Hedge impact on soil water



Resilience to stormy events



About 300 million trees were felled in France, approximately 3% of the national total (photo courtesy AFP)





Mitigation of Climate Change : Carbon storage



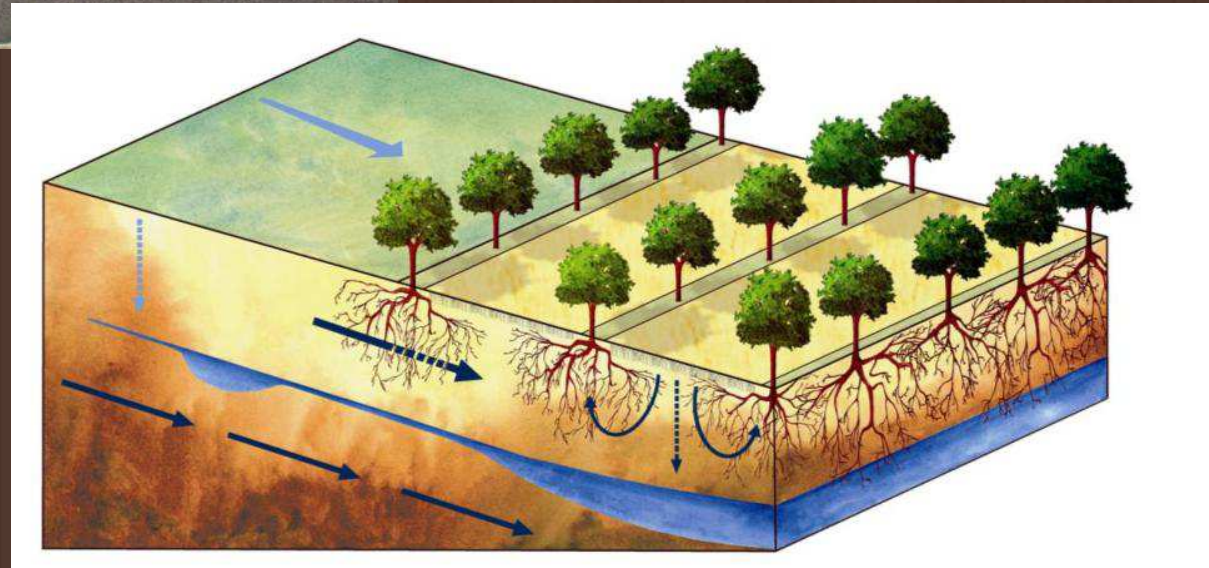
- 1 to 2 T C/ha/year with 50-100 trees/ha
- More than most other options for C sequestration in European agriculture
- Sequestration in the soil : under study

Under study

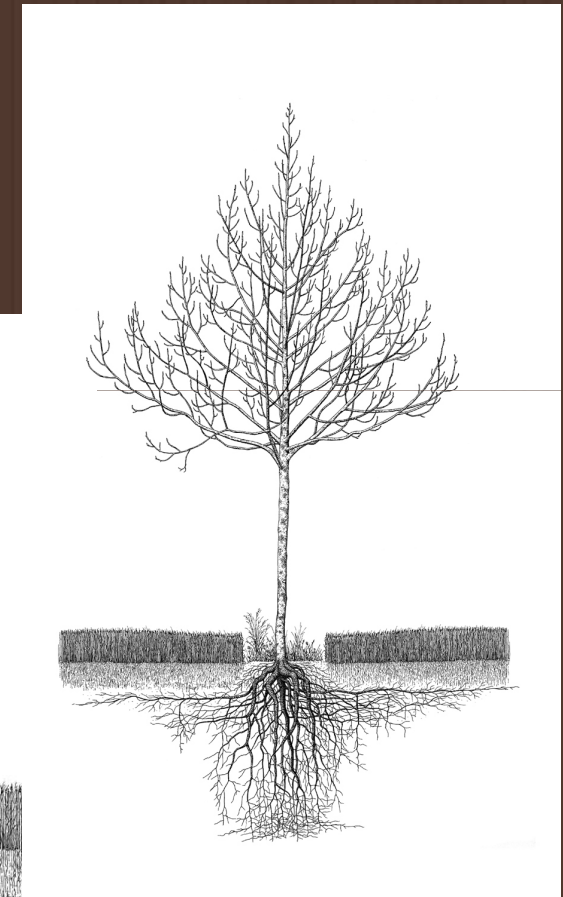
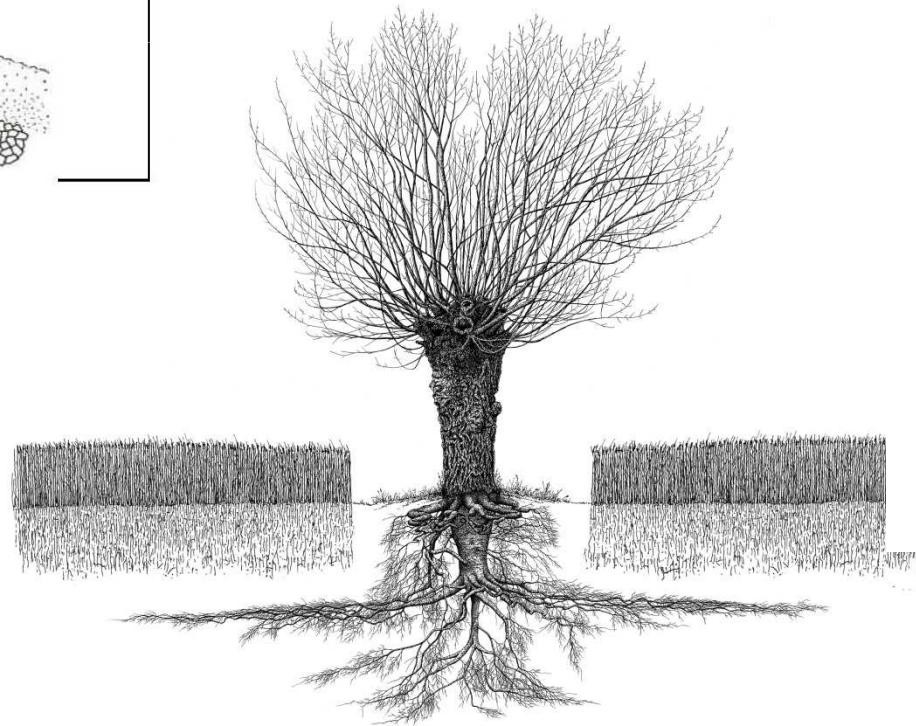
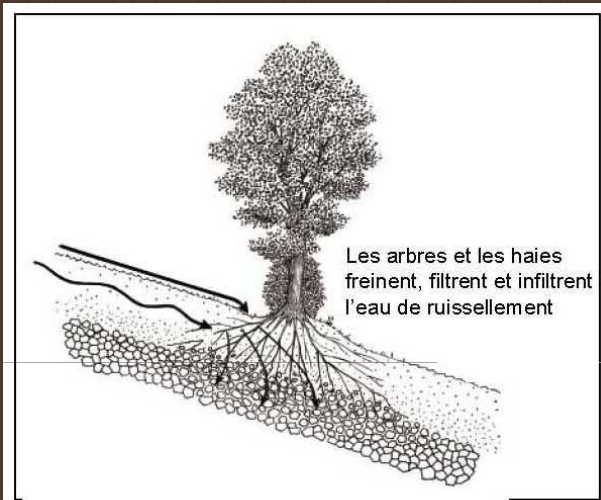
Protection against fire hazards



Soil protection

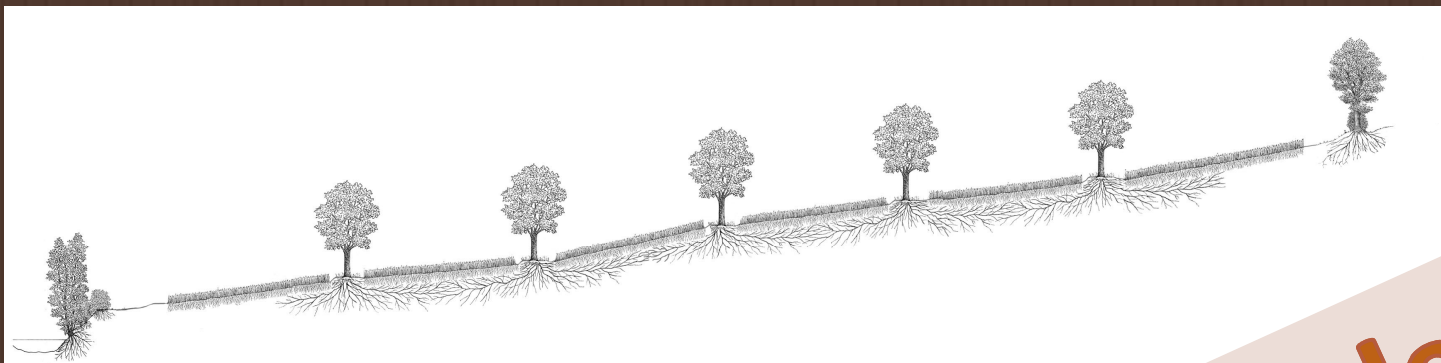
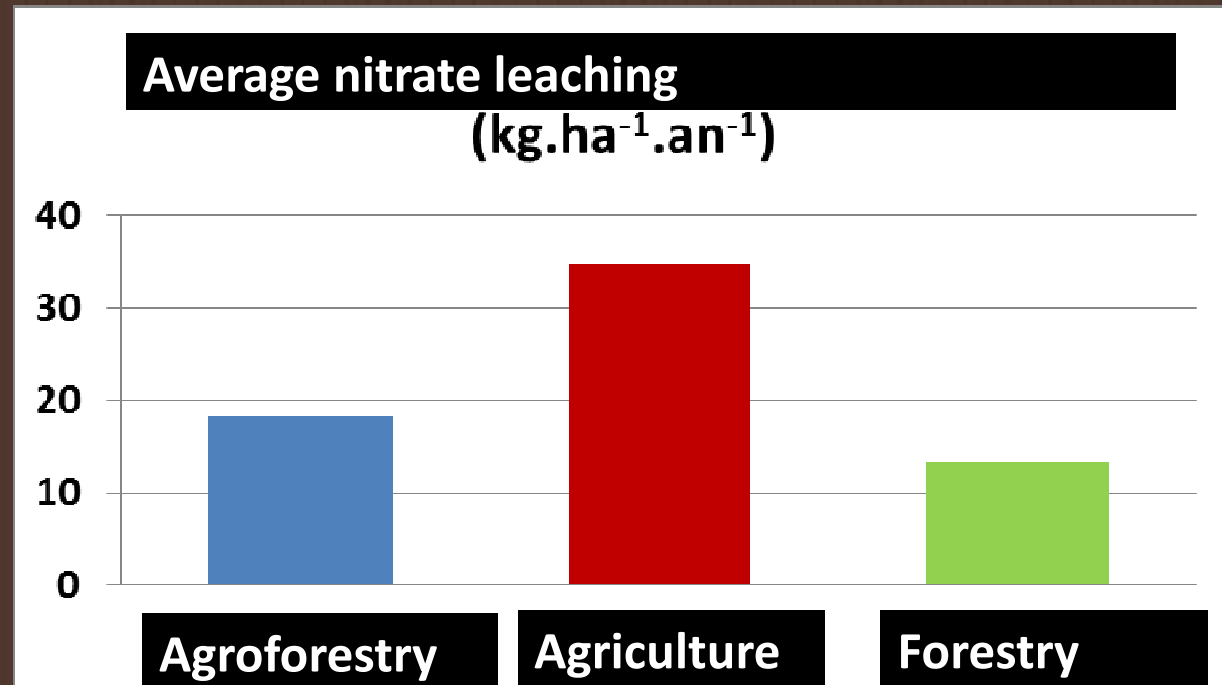


Deep roots ecosystem services



Reduction of Nitrogen transfers to water bodies

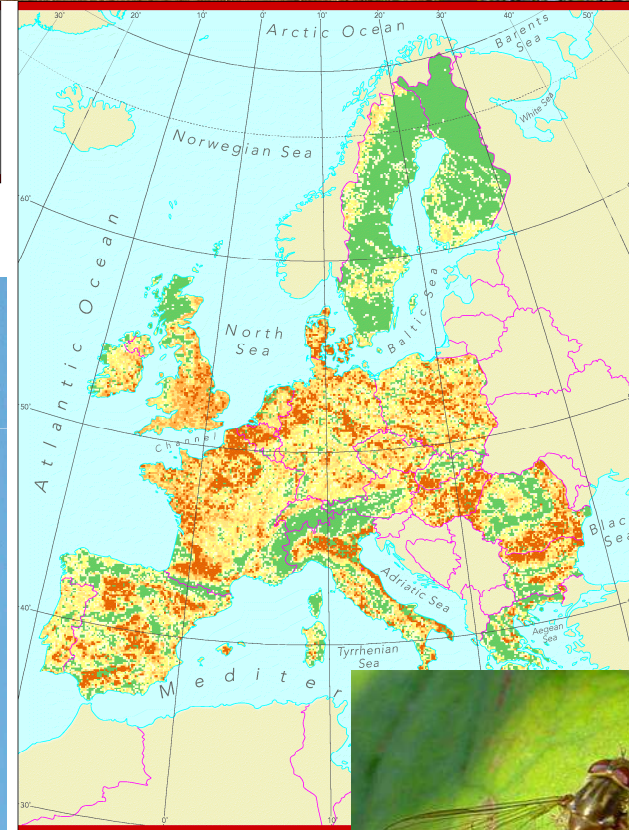
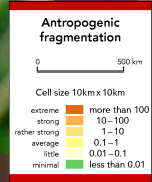
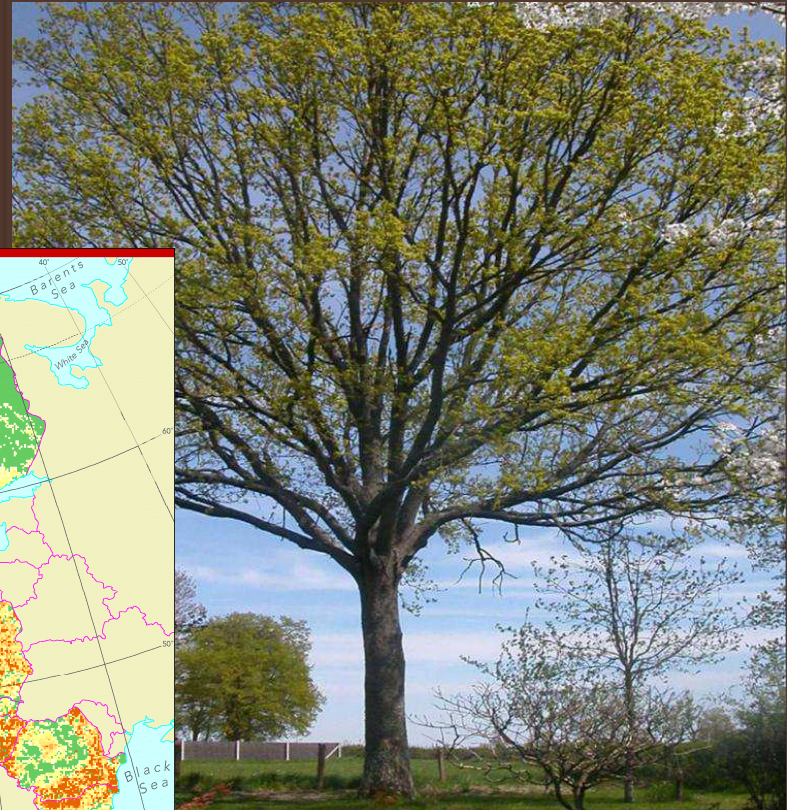
Site : Restinclières,
Prades Le Lez, France



Under study

Biodiversity protection





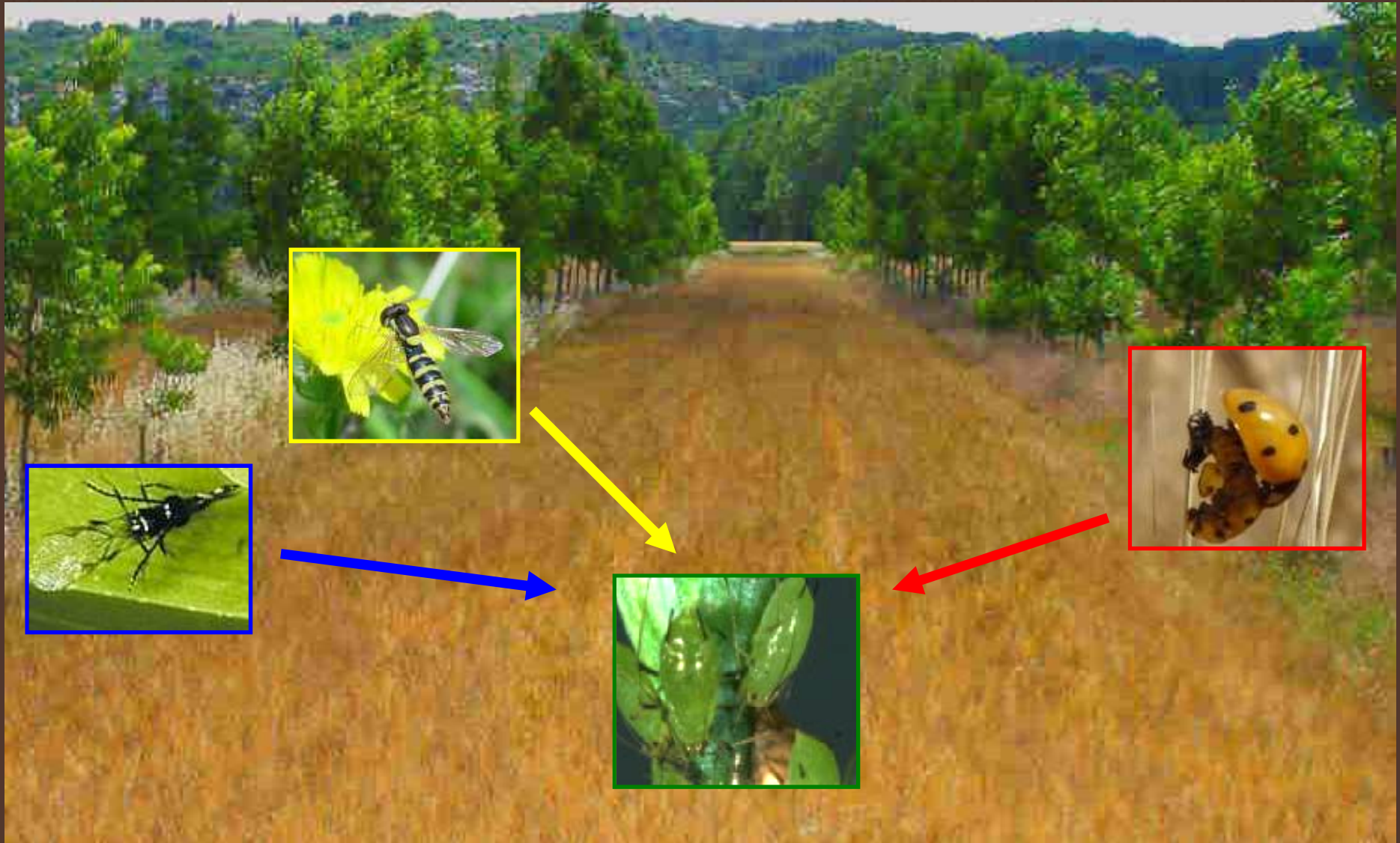
Habitat fragmentation reduction



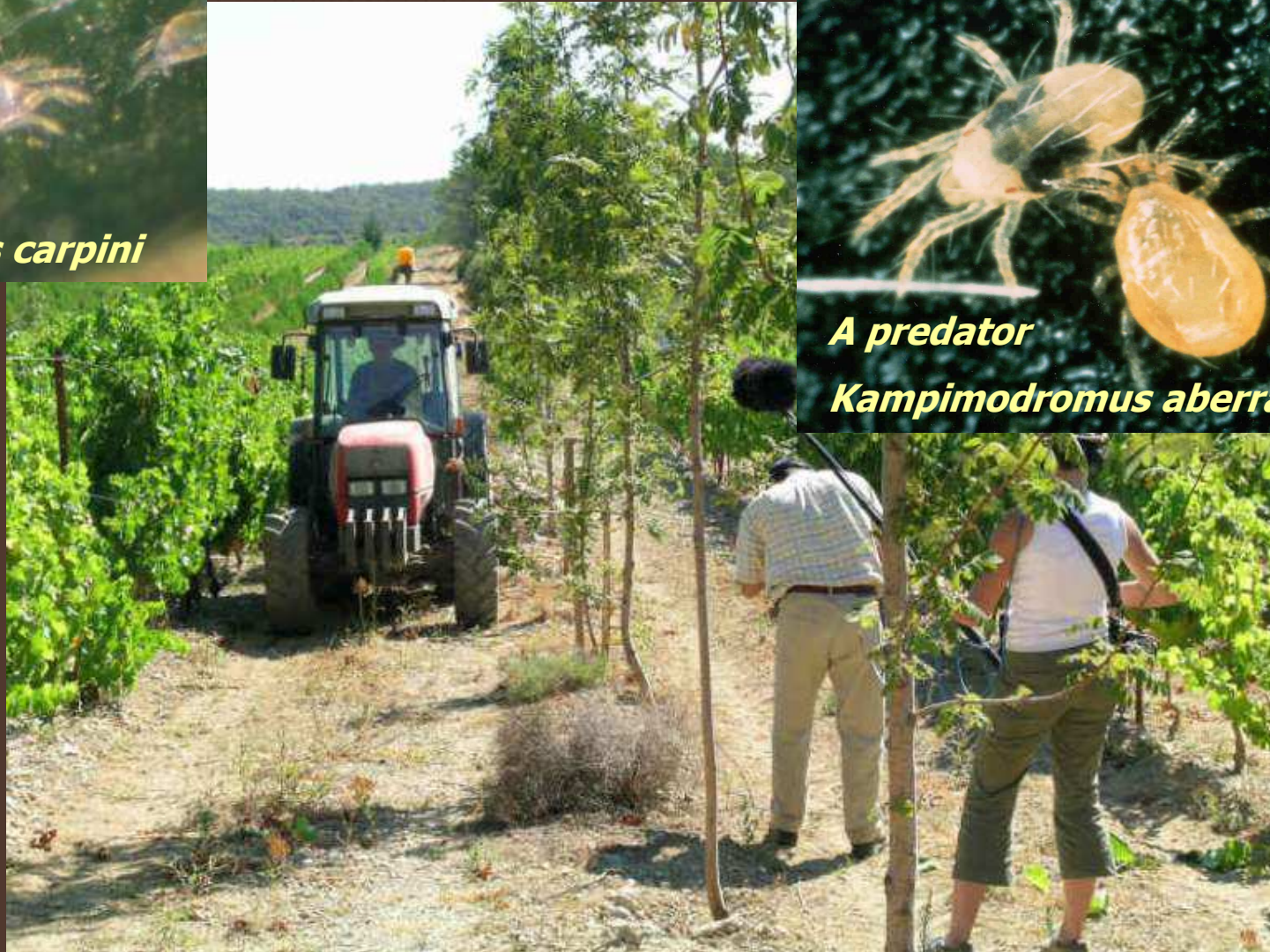
Towards reducing the use of pesticides
in agroforestry ?

Under study, hypothetical

Biological control of wheat aphids in agroforestry



Biological control of vineyards mites in agroforestry



Habitat ratio : a new tool for the conditionality of the future Common Agricultural Policy?

Field trees in the future CAP

Habitat ratio = proportion of the farm area under the beneficial influence of trees and natural habitats



Towards reducing the use of fertilizers in agroforestry ?

To be studied, hypothetical

Profitability



This 60 year old walnut grove (156 trees/ha)
is valued at 120 000 euros of timber per hectare

Proven

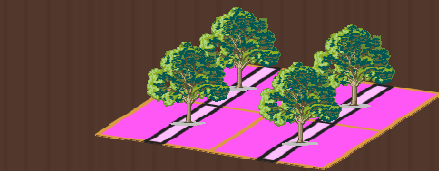
Research is still in the making....



To be explored...

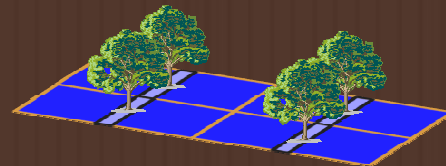
- Ecophysiology of shaded crops
- Microclimatology of heterogeneous stands
- Identification of tree and crop ideatypes adapted to agroforestry
- Sélection of shade varieties for all major crops
- Sélection of deep-rooted trees
- Modelling tree-crop interactions
- Biological control of pests in agroforestry plots
- Nutrients cycling in treed agrosystems

Pending : Virtual experiments

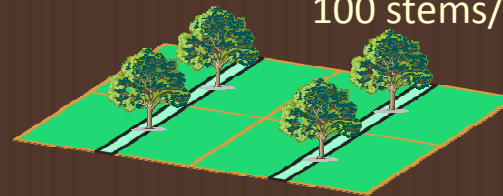


7 m x 7 m
200 tiges/ha
(forest control)

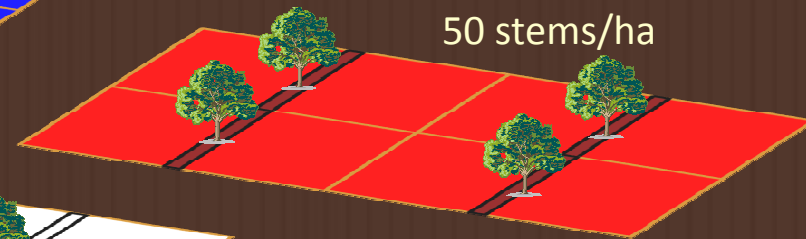
11 m x 5 m
180 stems/ha



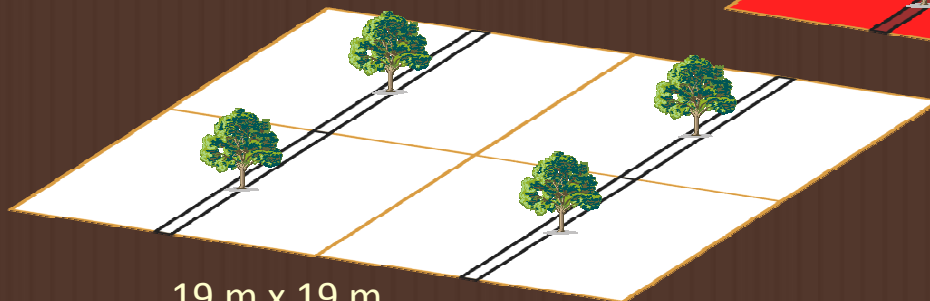
11 m x 9 m
100 stems/ha



19 m x 11 m
50 stems/ha

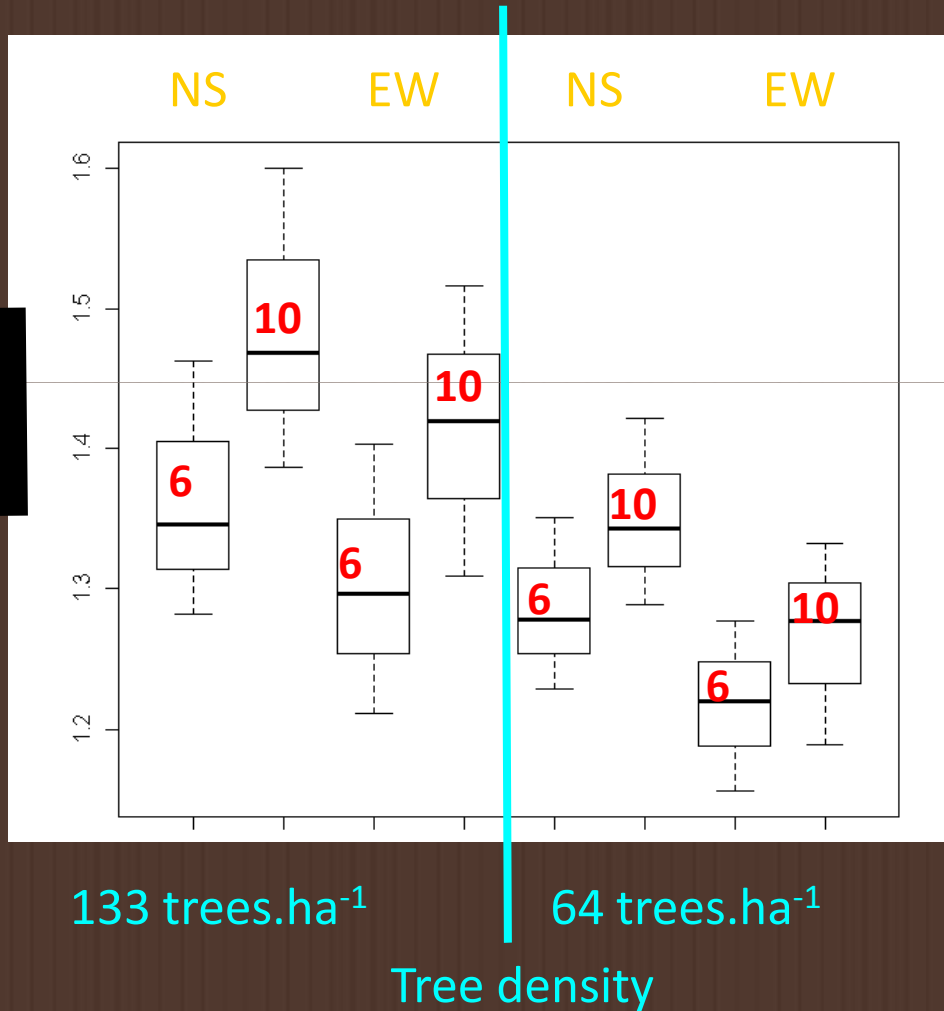


19 m x 19 m
30 stems/ha



Pending : System optimisation assisted by modelling

LER



Tree line orientation
North-South / East-West

Pruning height :
10 m versus 6 m



Pending : Designing enhanced and innovative agroforestry systems

Biomass production in agroforestry

Various tree managements



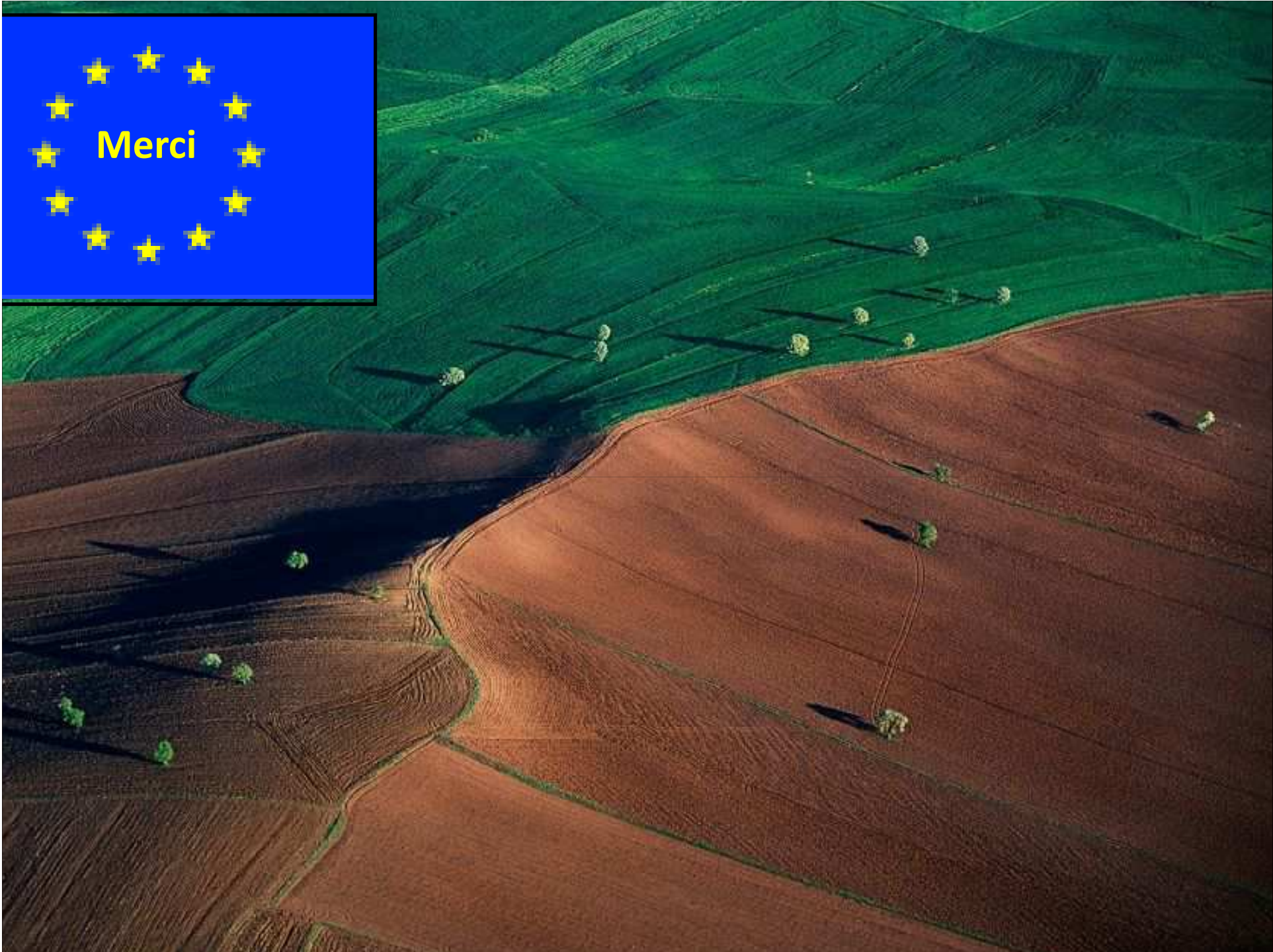
Expect progresses

Adopt to...

product AND protect



A tribute to European pioneer farmers...



Merci

