

# **SCAOPEST**

## **Pesticide-free agroforestry cropping system: ex-ante performances evaluation**

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## SCAOPEST: from where does-it come from?

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The European questioning and debates about whose of the **next European farm models** to be enhanced and deployed

### Multifunctional

- secured
- safe
- environmentally friendly
- autonomous
- socially responsible
- resilient
- local
- .... and so on !

## SCAOPEST: from the French context to the idea

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In France, from 2007, controversial but helpful  
initiative:

the “*Grenelle de l’Environnement*”

### ***Agricultural sectors towards sustainable development***

by

- modifying the agricultural practices
- limiting the use of pesticides
- developing the organic farming
- restoring water quality
- developing sustainable forestry, bee-keeping...
- limiting soils artificialization

## SCAOPEST: Main objectives

Considering local markets (cereals, pulse and oilseed + next green chemistry's crops) and the global farm system (dairy cows)

### The design, set up, follow up and evaluation of innovative cropping system

- secured → as productive as possible
- safe → (to be verified)
- environmentally friendly → no pesticides  
→ biodiversity as ecological connectivity
- autonomous → limited exogenous N
- socially responsible → very low C footprint
- resilient → regarding water availability
- local → local food/feedstuff/biomass

# SCAOPEST: specifications and experimental details

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## PECS = PRODUCTIVE AND EFFICIENT CROPPING SYSTEM

### A fodder-oilseed agroforestry system with no pesticides

- agricultural practices → IPM and IWM, long rotation ...
- use of pesticides → No pesticides (NO<sub>3</sub><sup>-</sup>, yes)
- ~~developing the organic farming~~
- water quality → lines of trees, intra-parcel AF
- sustainable forestry, bee-keeping → diversity of crops, trees and catch crops
- ~~limiting soils artificialization~~

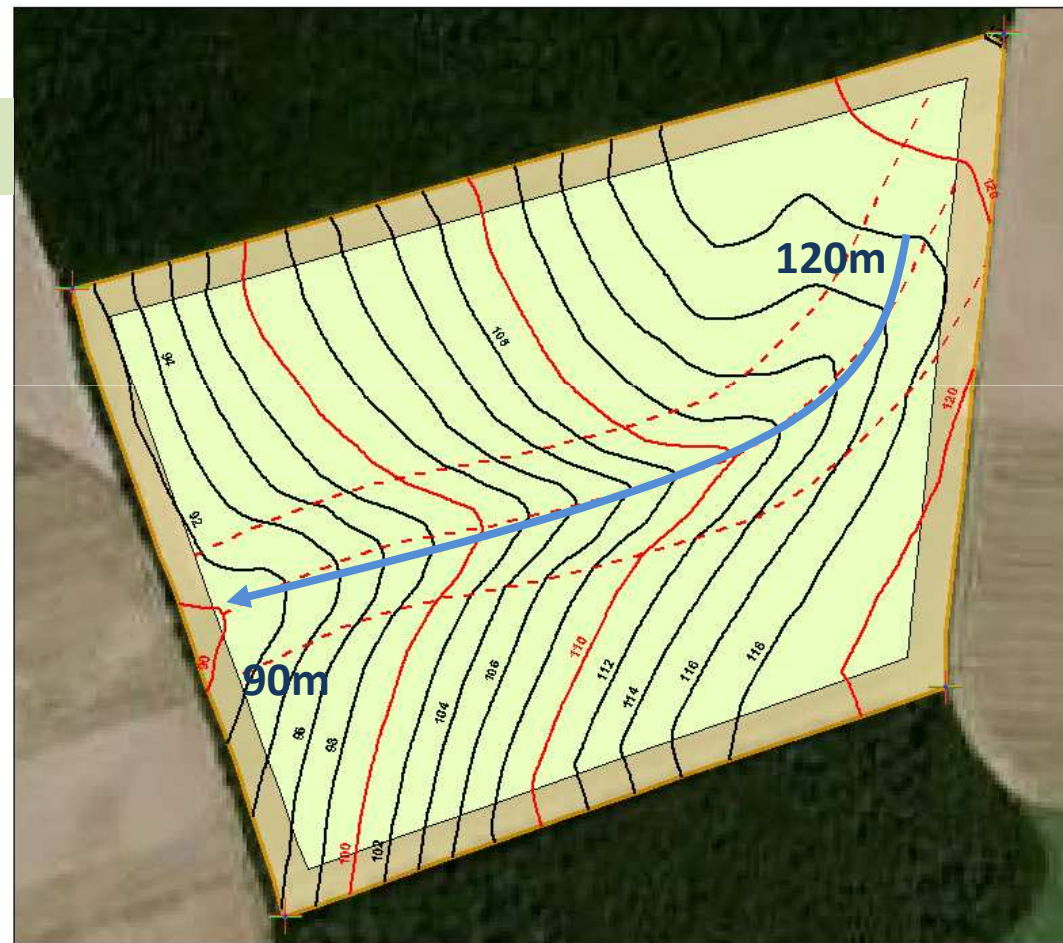


# SCA0PEST: specifications and experimental details

## *Limit soil erosion and water run-off*

Land form

**Slope**  
**7%**  
**(3-14%)**



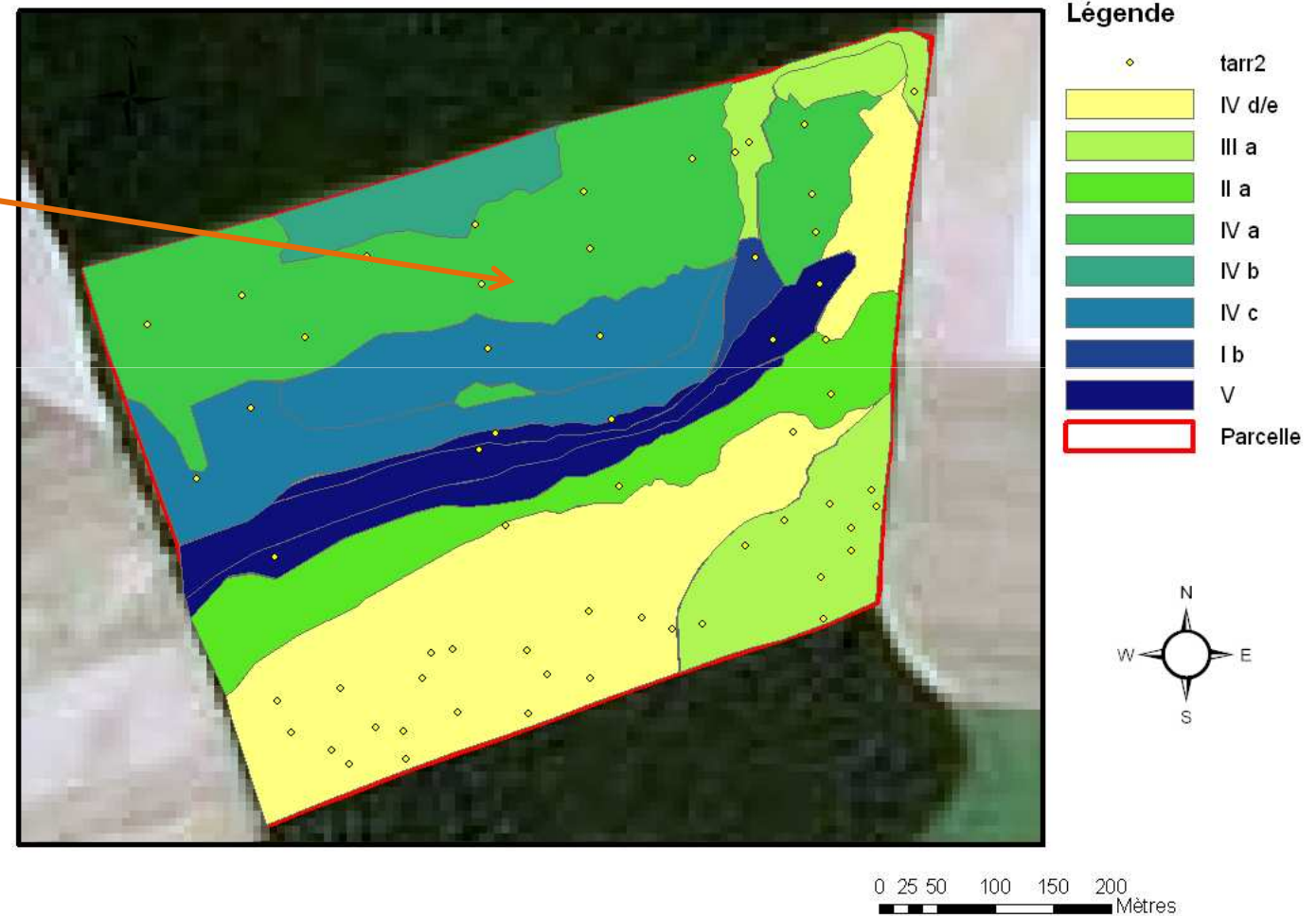
(Image: Google Earth, Nov. 2009)



# SCA0PEST: specifications and experimental details

*and soils with limited water availability*

chalky  
boulder  
clay

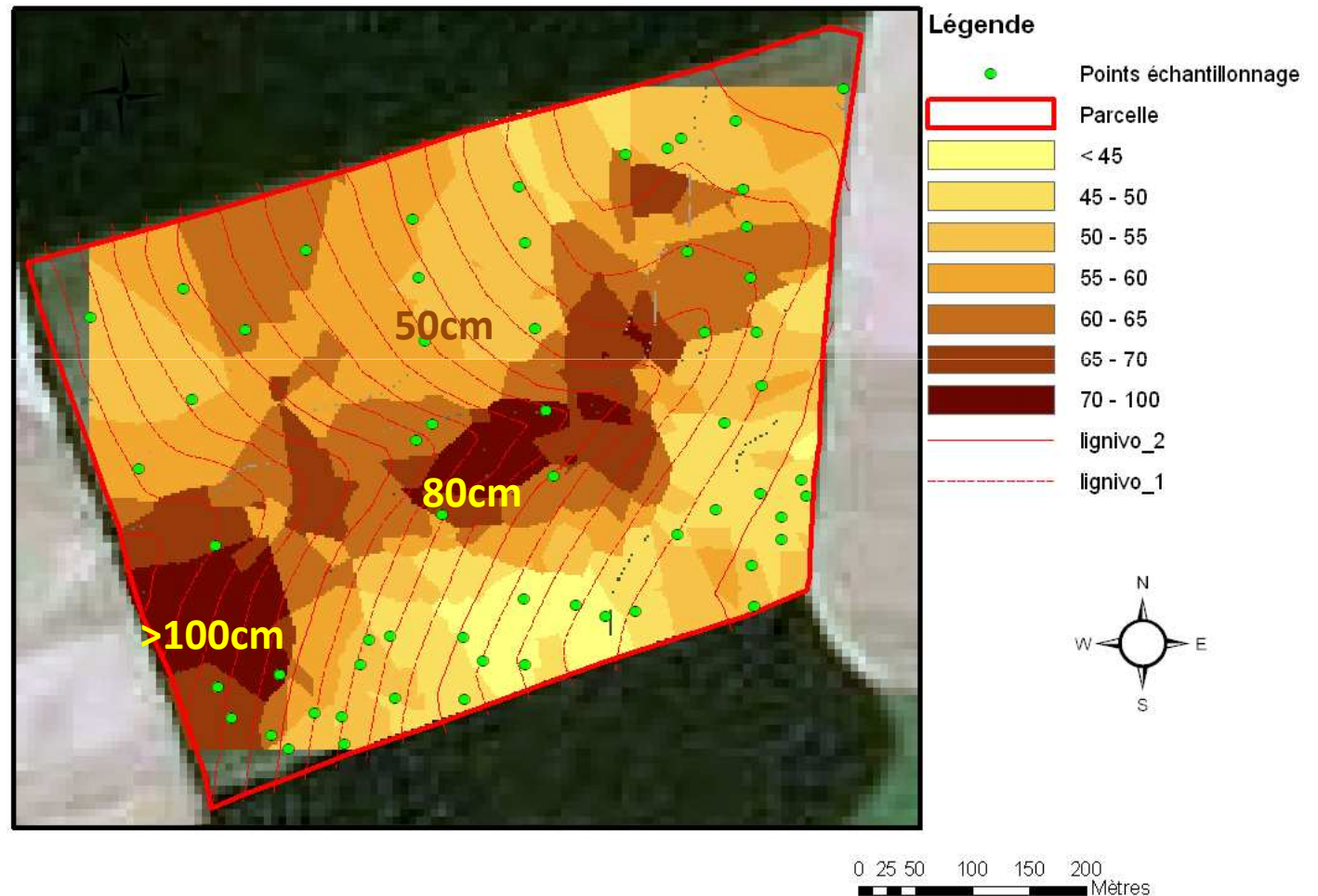


# SCA0PEST: specifications and experimental details

*Make the most from thin soils*

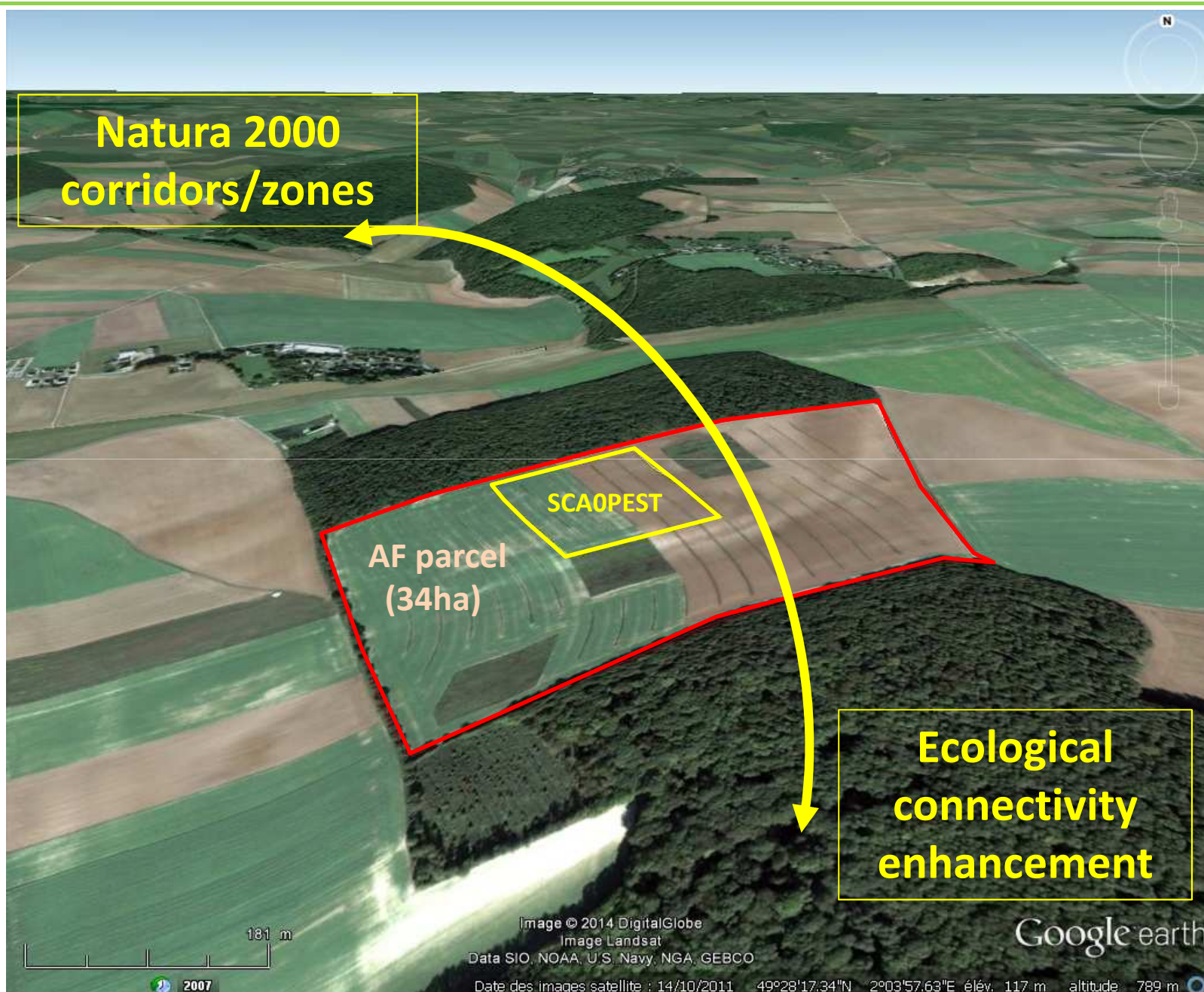
Soils depth

**H<sub>2</sub>O**  
availability  
**75mm**  
(50-130)





# SCA0PEST: specifications and experimental details



# SCAOPEST: the design

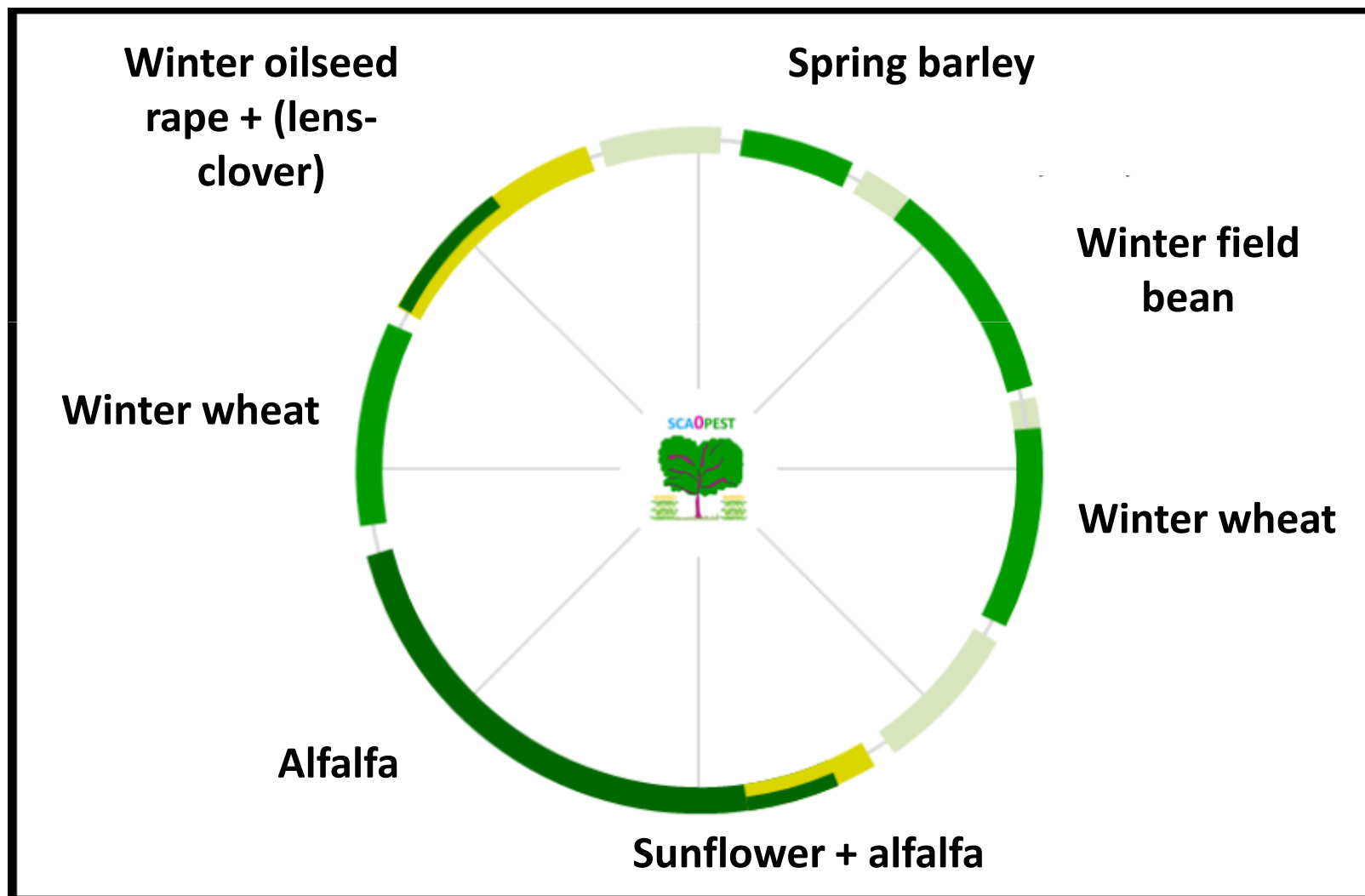
**Co-design** undertook through a 6 months iterative process



<sup>(1)</sup> <http://agropeps.clermont.cemagref.fr/mw/index.php/Accueil>

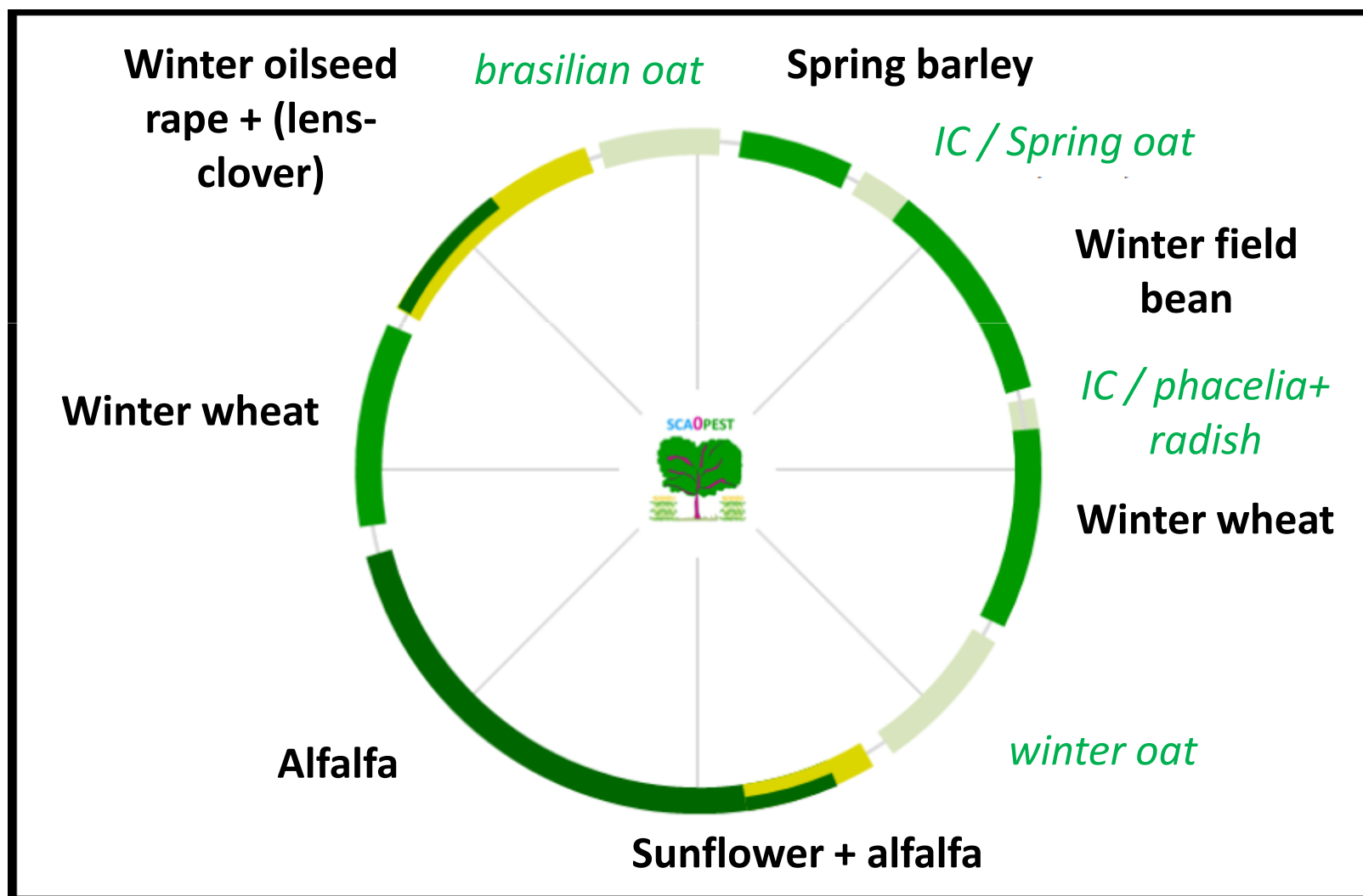
## SCAOPEST: the design

### *A 8 years long cropping system*



## SCAOPEST: the design

### *12 successive biomass/food/feedstuff crops*





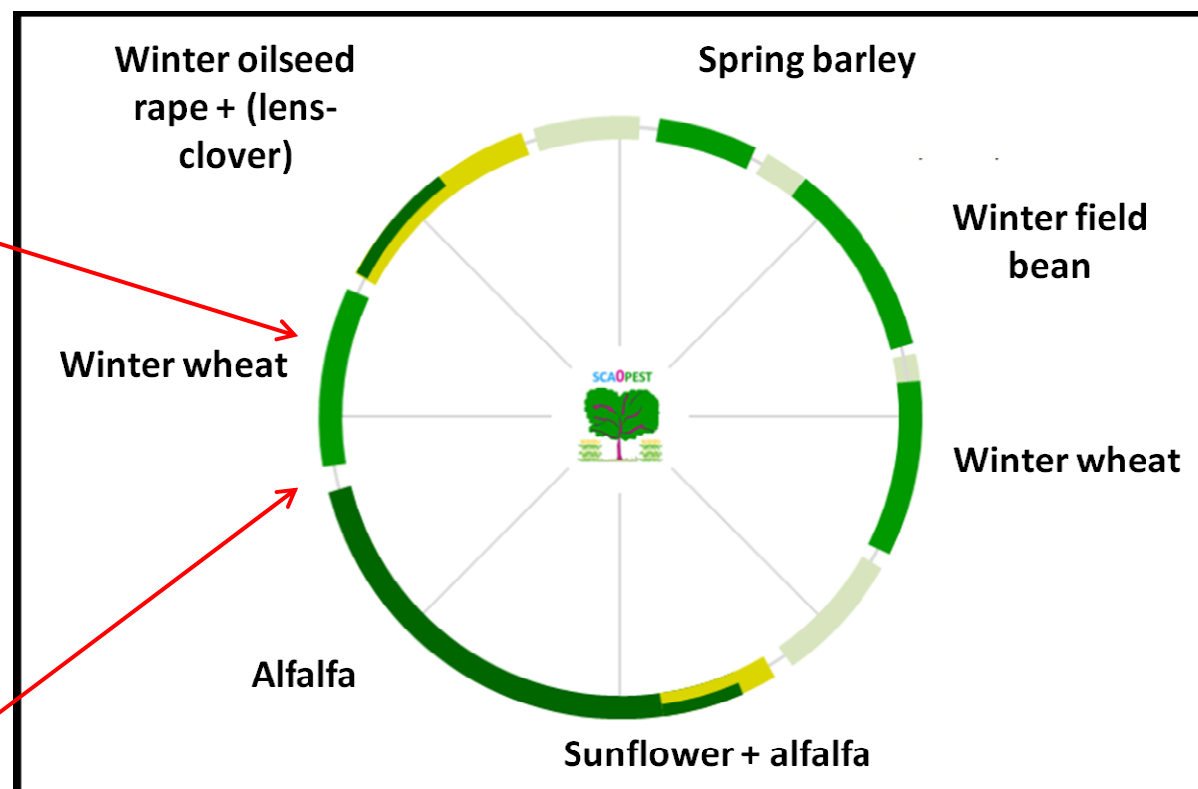
# SCAOPEST: the design

## *Agro-technical rules of decision known for each crop*

- 3 cultivars mix
- septoria/rusts tolerance cultivars
- awned ears
- 25cm inter-rows
- sowing : october 25<sup>th</sup>
- 1 spiked chain harrow
- 1 rotary hoe
- 1 row-crop cultivator
- expected density: 275
- expected yield: 6.5 t/ha
- 125 UN.ha<sup>-1</sup> in 2 times

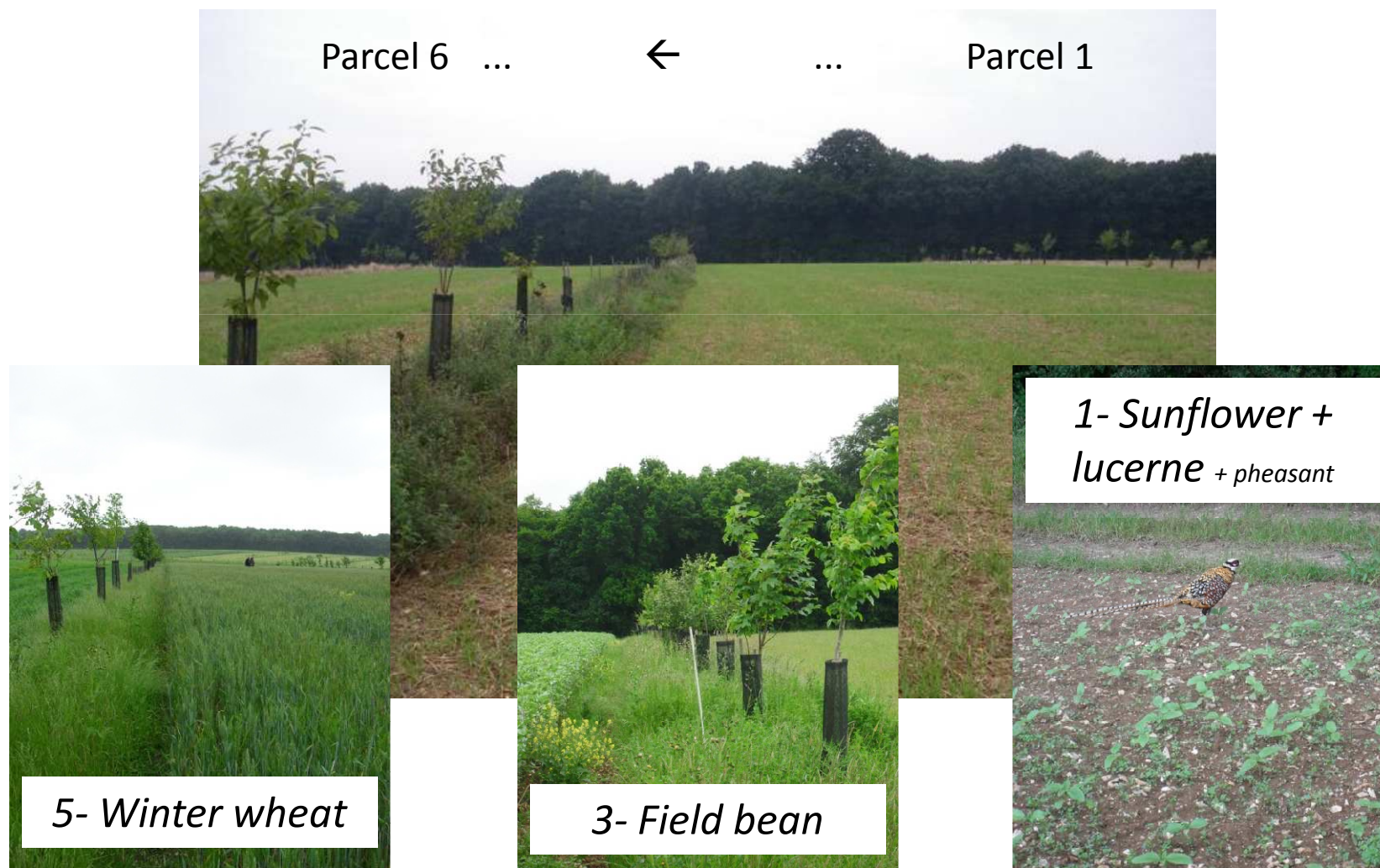
...

*Stale seedbed technique*



## SCAOPEST: the set-up

***6 contiguous parcels hosting each year, one of the rotation's crops, for at least 6 years***



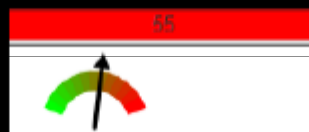
# SCAOPEST: the ex-ante assessment

*From co-designed PECS, multicriteria analysis is performed*

## ODERA System Assessment of the weeds' infestation risks

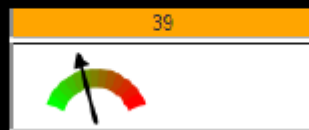


**Field Violet**



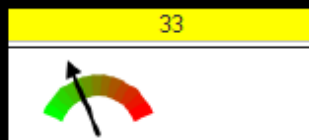
**Wheat, barley, field bean**

**Scarlet pimpernel**



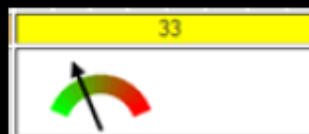
**Sunflower**

**Corn speedwell**



**Sunflower, oilseed rape**

**Common lambsquarters**



**Sunflower, oilseed rape, barley**

**Perennial sowthistle**

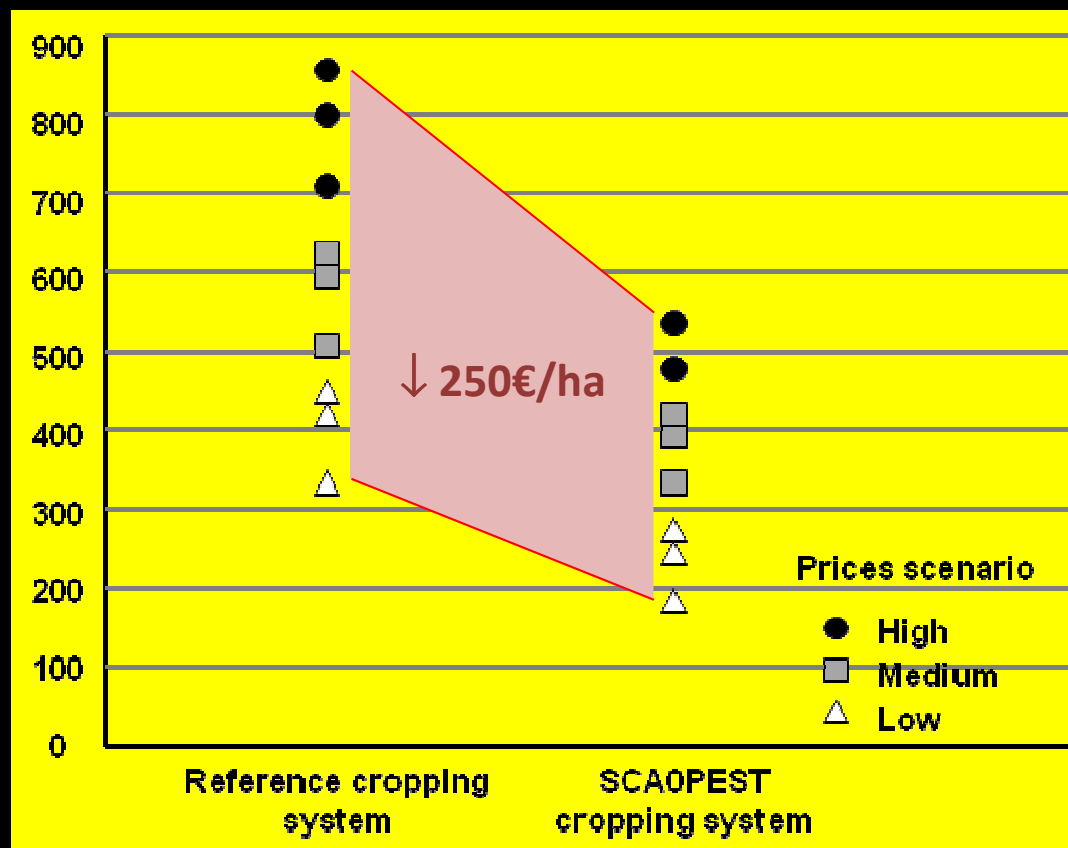


**Sunflower**

## SCAOPEST: the ex-ante assessment

*From co-designed PECS, multicriteria analysis is performed*

Endure project / STEPHY guide  
Assessment of the direct margin

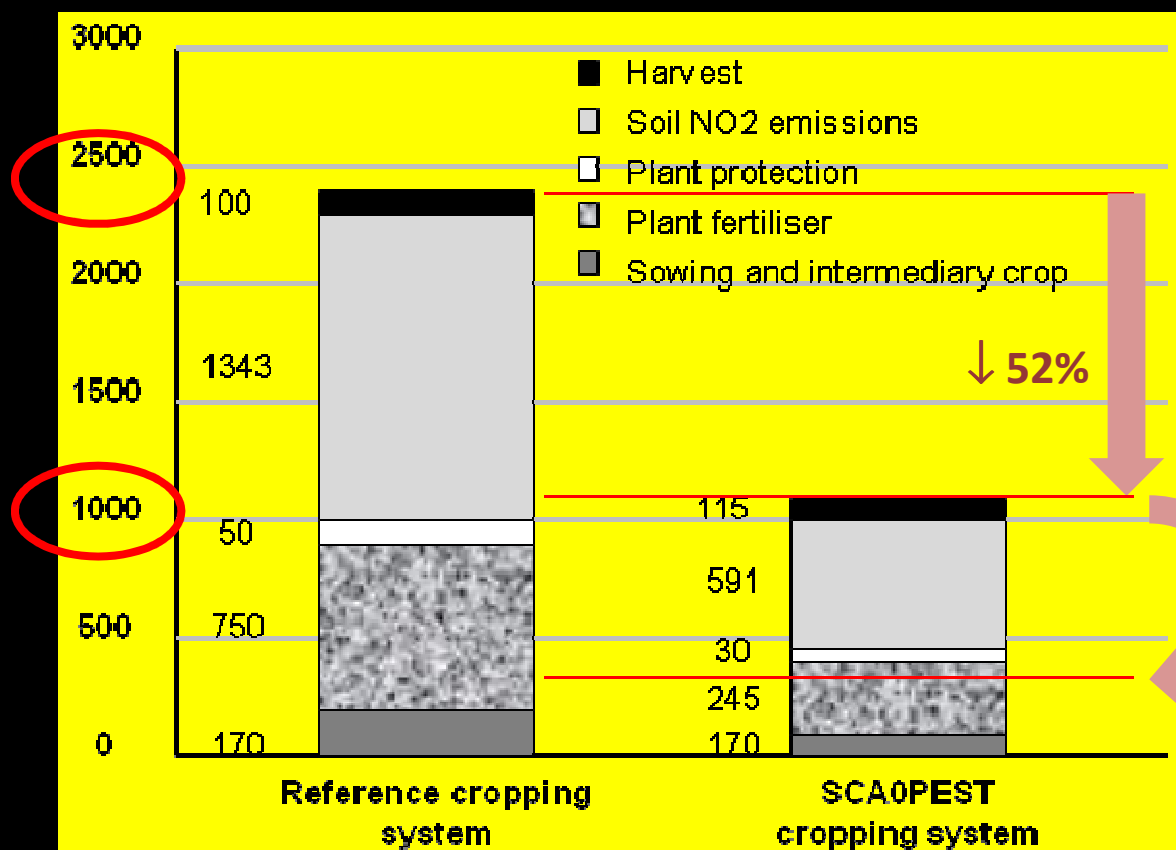




# SCA0PEST: the ex-ante assessment

*From co-designed PECS, multicriteria analysis is performed*

Endure project / STEPHY guide  
Assessment of the GHG emission



HisAFé  
simulations

- 600 eq.  
kCO<sub>2</sub>/year/ha

## SCAOPEST: the ex-ante assessment

*From co-designed PECS, multicriteria analysis is performed*

IDELE statistics: assessment of the potential gains from lucerne / dairy cows



		Wheat prices (€/t)		
		180	200	250
Protein supplements prices (€/t)	360	+2	+1	+0
	400	+3	+3	+1
	450	+5	+4	+2
	500	+6	+5	+4

With a 9t/ha/year lucerne, and a 25% incorporation in the dairy cows' ration → **2-5 €/1000 liters**

Meaning, for 350 000 liters/year and 4 ha of lucerne (≈25%):

$$[2-5 * 350] / 4 = 175-437 \text{ €/ha/year}$$

# SCAOPEST: the longitudinal follow up

## *Diversity of the agrosystem's components followed*



**Annual allometric  
measures**



**Aphid /  
entomophagous  
insects**



**Weeds dispersal  
from alleys**

*And so many others components ...*

**Soils OM**

**Water av.**

**Yield components**

**Connectivity**

**Worms**

**Crops status**

**Foliar diseases**

**Bats, birds,  
carabidaea ...**

## SCA0PEST: final results and expectations

**From the design, set up, follow up and evaluation of innovative cropping system**

**Produce references for farmers whose having limited soils potential and who are afraid of “intra” agroforestry**

**Propose a particular agroforestry site designed and monitored to collaborative and demonstration projects**

**Host thematic and/or generic projects (Agripsol, SCA0PEST, Auxiprod ...) asking for forestry and agricultural controls**

**Participate to advisory and training process for farmers, agricultural sectors and students**

**→ Participatory research network of “0Pesticides” agroforestry systems ???**



# SCA0PEST

## Pesticide-free agroforestry cropping system: ex-ante performances evaluation

Many thanks for your attention

See you in 2 years for SCA0PEST operational results

*This action is driven by the French Ministry in charge of Agriculture, with the financial assistance of the National Water and Aquatic Environment Office who is funding the Ecophyto 2018 program from fees on diffuse pollutions*



écophyto2018

Réduire et améliorer l'utilisation des phytos :  
moins, c'est mieux

DEPHYécophyto

Réseau de Démonstration, Expérimentation et Production  
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