CA-SYS: CO-DESIGNED AGROECOLOGICAL SYSTEM EXPERIMENT

Long term experimental platform
on agroecology at various scales

INRA
SCIENCE & IMPACT

Project leaders

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Objectives of the CA-SYS Plateform

- Design and evaluate different agroecological systems
- Study the transition towards these agroecological systems
  (Agronomical performance, evolution of farming practices, multi-performance during the shift towards new ecological equilibria...)
- Breed new varieties adapted to agroecological conditions
  (Tolerant to multiple stressors, enhancing beneficial plant-microbe interactions...)
- Understand the biological processes underlying the functioning of agroecological systems
- Develop / update current experimental methods to create knowledge about agroecological systems

Different agroecological systems

An **agroecological system** comprises adjacent fields farmed with one (or a few) cropping systems. These fields interact with semi-natural habitats located in the surrounding landscape (woods, hedges, grass margin strips, flower strips). The spatio-temporal arrangment as well as the management of fields and the semi-natural habitats are considered as a complete strategy implemented to meet specific goals (e.g. multi-performance, biodiversity, etc...)

The agroecological systems tested in the CA-SYS platerform consist of:

- A substantial amount of semi-natural habitats to enhance the natural enemies of pests
- Four cropping systems combining a large diversity of farming practices

Some ambitious objectives

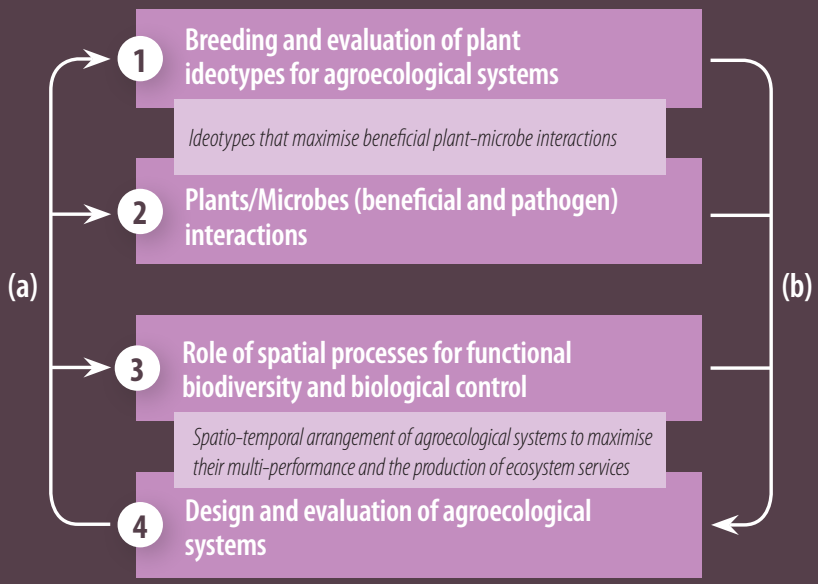
Targetted increases in the multi-performance of systems

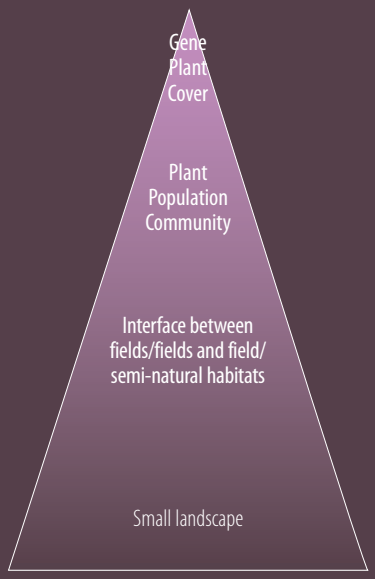
- Profitability and productivity identical to neighouring farmers over a 10 year-horizon
- Low environmental impact

By maximising the use of biological processes
(biological control of pests, improving nitrogen cycling...)

By drastically reducing the use of pesticides

General framework: four themes





(a) The establishment of contrasted cropping systems (Theme 4) will offer contrasted agroecological conditions to conduct specific studies in Theme 1, 2 and 3 (*assessment of biological processes, evaluation of varieties...*).

(b) The knowledge derived from Theme 1, 2 and 3 will contribute to the design and evolution of the agroecological systems being tested.

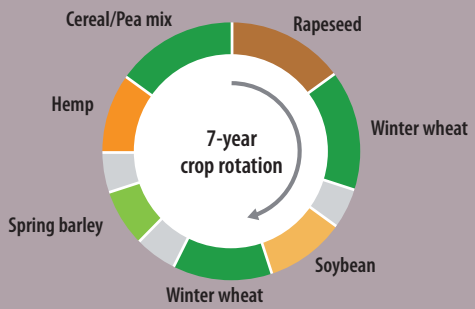
Explore two main agricultural practices

NO-TILL & COVER-CROP BASED SYSTEMS

TILLAGE-BASED SYSTEMS

Explore two levels of crop diversification

EXPLORE TWO LEVELS OF CROP DIVERSIFICATION



Example of crop rotation

TEMPORAL DIVERSIFICATION + SPATIAL DIVERSIFICATION

Mixture of crop/cover crop species and varieties

An innovative experimental framework

NESTING FACTORIAL EXPERIMENTS IN SYSTEMIC EXPERIMENTS

- **Systemic experiments** to design and assess agorecological systems
- **Factorial experiments** to test new varieties/mixture in agroecological conditions and to understand the effect of specific practices (e.g. cover crop termination tactics)

► In each field, a specific area is dedicated to factorial experiments

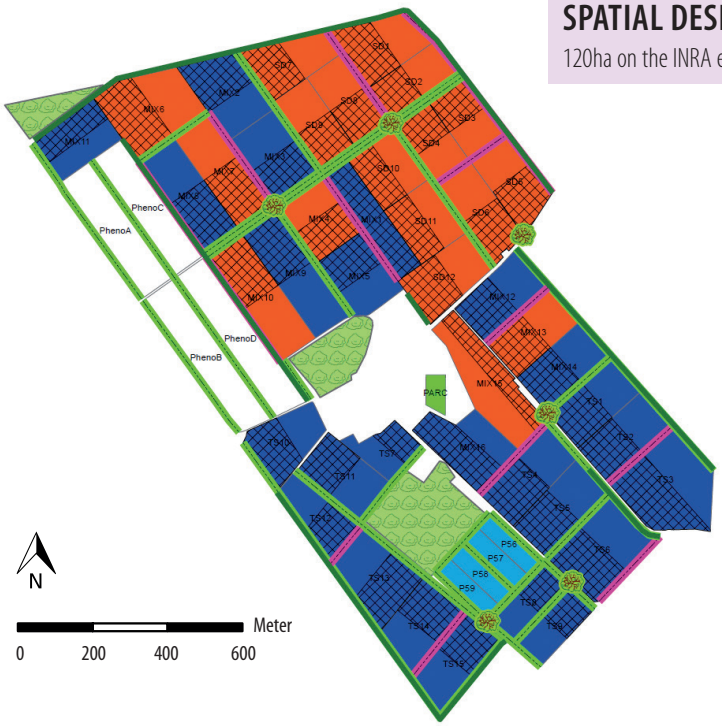
THREE ZONES OF CONTRASTED CROPPING SYSTEMS EMBEDDED WITHIN A LANDSCAPE OF SEMI-NATURAL HABITATS

- **Zone 1: No-till & cover crop based-systems only**
- **Zone 2: Tillage-based systems only**
- **Zone 3: Zone mixing fields of no-till and tillage-based systems**

► To test the effect of the spatial distribution of practices (homogeneous in Zone 1 and 2 vs. heterogeneous in Zone 3) on the spatial distribution of organisms and ecological processes

SPATIAL DESIGN OF THE CA-SYS PLATEFORM

120ha on the INRA experimental unit "Domaine d'Epoisses" located near Dijon (FR)



Semi-natural habitat

- Hedges
- Isolated trees
- Flower strips
- Grass strips

Cropping systems

- No-till systems
- Tilled systems
- Nested area dedicated to factorial experiment

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