UMR Agronomie

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INRA SCIENCE & IMPACT

université PARIS-SACLAY

AgroParisTech
INSTITUT DES SCIENCES ET INDUSTRIES DU VIVANT ET DE L'ENVIRONNEMENT
PARIS INSTITUTE OF TECHNOLOGY FOR LIFE, FOOD AND ENVIRONMENTAL SCIENCES

Who we are

- ✓Three monitoring boards: AgroParisTech, INRA, Université Paris-Saclay
- ✓29 employees including 20 scientists (half of them: research engineers)
- ✓Over the past 5 years: 13 PhD students, 10 post doc
  - ✓2019: 5 PhD students
- ✓Over the past 5 years
  - ✓191 articles: 4.2 per researcher
  - ✓27% with external collaborators, 65% with other units from INRA and within EA department
- ✓Teaching: MSc Degrees, engineering courses in AgroParisTech
- ✓Various expertises: Ministry of Agriculture/Ecology, ADEME, ANSES

https://www6.versailles-grignon.inra.fr/agronomie/

Our shared ambition

The objective of the unit is to produce and promote scientific and expert methods and knowledge, from local to global scale, in order to:

- Assess the environmental impacts and ecosystem services of current and alternative cropping systems
- Produce resources (i.e methods, knowledge, tools) to support the stakeholders involved in the development of new agricultural practices

Design and assessment of cropping systems from local to global scale, within the framework of sustainable food systems

Our contribution

- **Biodiversity and pesticides:** increase biodiversity to ensure ecosystem services

Mixed species

Mixed varieties

LabEx BASC
Biodiversité, Agroécosystèmes, Société, Climat

- **Food transition:** reconnecting cropping systems with food systems

Grain legumes

ideas
INITIATIVE FOR DESIGN

- **Climate change (CC):** propose scenarios for adaptation and to limit the impact of CC

Cland

Our skills and expertise

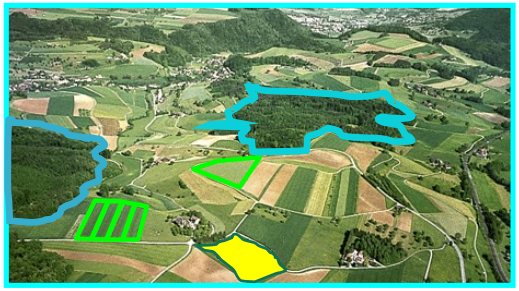
✓**Methodological innovations:** design workshops, expert modelling, etc.

✓**Work on frontier analyses:** meta-analyses, elicitation, etc.

✓ **Produce knowledge on biotic and abiotic interactions between:**

- cover crops, pests & diseases and natural enemies

- agricultural and non agricultural habitats

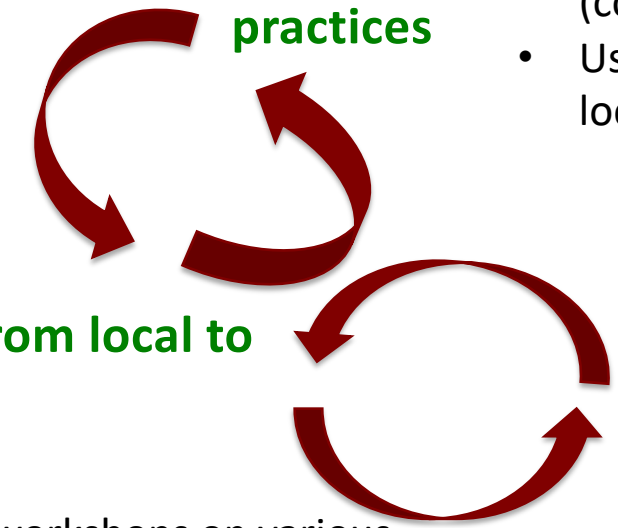


…at several scales: field – landscape – global (country, continent)

Methods for designing and supporting stakeholders in agronomy

Characterize agricultural practices

- Contribution to collaborative expertise & actions (corn, GMOs, glyphosate, neonicotinoids)
- Use of various types of cropping systems from local to national scale



Design cropping systems from local to landscape scale

- Participation on many design workshops on various topics
- Implementation of territorial measures on 32 catchment areas
- Step-by-step design of cropping systems

Test inovative cropping systems

- Evaluation of long-term results (SIC trial)
- Test different varieties and ecotypes (i.e. mixtures of various wheat varieties)

Comprehensive knowledge of the interactions within agroecosystems

- What kind of interactions are emerging between cultivated and their associated biodiversity in agroecosystems?
- Which ecosystem services can restore biodiversity within cultivated fields and their surroundings?

Earthworms / diseases

Associations among crop/grassland/legumes

Associated service plants

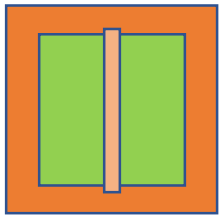
Flower strips/ beneficial organisms

Crop rotation, diversification of farming practices at landscape and regional level

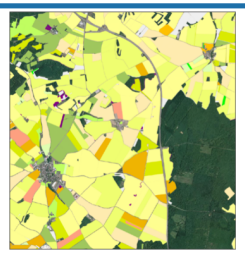
functional role of different forms of biodiversity at different scales

Sub-plots

Plots



Plots + boarders



Landscape

Regional & country level

Skills on meta-analysis

22 articles
6 expertise reports
1 educational book

Cropping systems comparisons
- Low-input
- Diversified
- Organic

Environmental impacts
- GHG
- Pesticides
- Effect of climate change

Collaborations
- **INRA**
- **CIRAD**
- **Technical Institutes**
- **USA**
- **The Netherlands**
- **Italy**

Offer of courses
on meta-analysis
in France and abroad

A strong contribution to expertise

EFESE
L'évaluation française des écosystèmes et des services écosystémiques

anses
agence nationale de sécurité sanitaire alimentation, environnement, travail
Connaître, évaluer, protéger

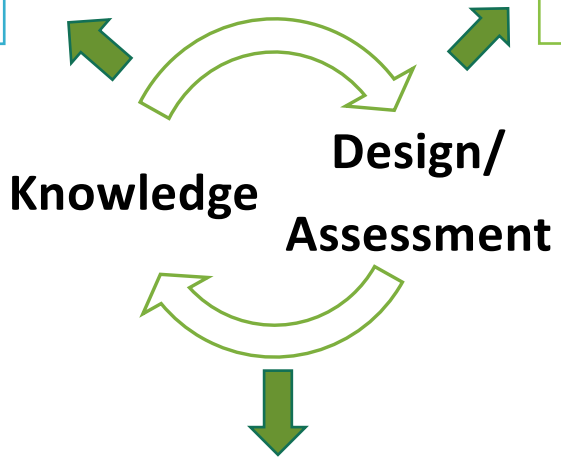
efsa
European Food Safety Authority

Agrimonde-Terra, a foresight exercise on land use and food security in 2050: scenario-building method and conceptual framework

Three areas of research but one team

Produce resources* to support the design and evaluation of agronomic innovations for sustainable food systems

Assess and manage the role of several forms of biodiversity** for the establishment of ecosystem services



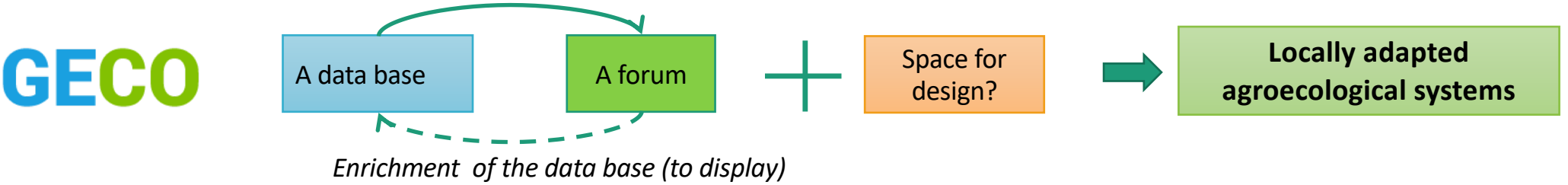
Develop and access different scenarios regarding cropping systems performances (i.e. yield) within the context of climate change (CC)

**methods, tools, knowledge*

*** Cultivated, managed and associated biodiversity*

Collaborative design of agro-ecological cropping systems: validation and use of a data management for design

➔ **How to validate and organize scientific and expert knowledge for Agro-peps/GECO to become a tool to help in the re-design of agroecological systems?**

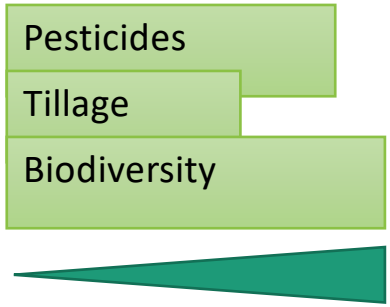


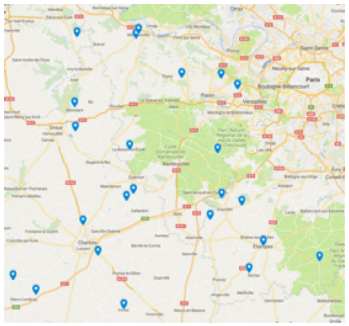
Unifying tool several actions of reduction of pesticides

- ✓ Multidisciplinary PhD thesis ***Maude Quinio*** *(Marie-Hélène Jeuffroy, Françoise Détienne et Laurence Guichard)*
- ✓ Host of "knowledge on the functioning of agroecosystems" (*A.Gardarin, C. Barbu, S. Médiène, M Valantin Morison*)

Analysis on the combination of flower strips and cropping systems for the enchantment of ecosystem services

How do cropping systems in line with ecological habitat manipulation change multi-trophic interactions and their associated ecosystem services?





Network of farmers (25 to 30)

Combining several research activities in and around our lab

- Quantify changes in biological components and multi-trophic interactions
- Measure several ecosystem services: regulation, biodiversity maintenance, production, carbon storage

A. Gardarin M. Valantin Morison, S. Médiène, M. Bertrand
Two upcoming PhD students

Climate change and crop distribution

➔ **How is climate change affecting the geographical areas suitable for field crops?**

Databases of yields measured at different scales

- ✓ Globally: FAO, gridded global data, published experiments
- ✓ Locally: agronomic trials in cultivated plots

- ✓ Databases of past climate data and future tested scenarios
- ✓ Machine learning

Aim to change maps of areas suitable for crop

→ “hotspots” of potential diversification in Europe in the future, which can be used to contribute to develop scenarios

Nicolas Guilpart, David Makowski, Marie Hélène Jeuffroy

Cland project & H2020 LegValue ; Coll. Nebraska University and UNIPI