Objectives

- Strengthening the scientific nature of system experiments through a solid methological corpus
- Learning how to build an experimental design taking into account the objectives, hypotheses and how data will be analysed
- Sharing solutions to overcome problems usually encountered in system experiments (e.g. lack of replicates, changes in decision rules over time, analysis of experimental networks…)
- Building an international culture on system experiments

Originalities

The originalities of this summer school are fourfold.

- First, it is the first international summer school that addresses methodological questions raised by system experiments.
- Second, the summer school addresses both vegetal and animal productions, which are usually dealt with in different training courses.
- Third, participants will benefit from an active pedagogy and will gain hands-on experience through different teamworks conducted in small groups.
- At last, the teaching team is interdisciplinary and gathers agronomists, ecologists, statisticians and data scientists.

Corresponding organizers

- **INRA:** Françoise LESCOURRET
  Jean-Noël AUBERTOT
- **Scuola Superiore Sant'Anna:**
  Camilla MOONEN

Public

- **French and international researchers, engineers, PhD students involved in the design, monitoring and exploitation of system experiments**

Registration process and fees

- A maximum of 30 participants can be accommodated.
- **To apply, please complete the online Pre-registration form.** *Applications will be selected by the scientific committee of the summer school. You will be notified of your acceptance by e-mail, with instructions for online payment.*
- **Early birds (pre-registration before 15 April, 2019): 1100 €**
  Late pre-registration (between 15 April and 20 May): 1 300 €
  This amount covers all expenses for the week: registration, teaching material, food (breakfasts, lunches, social dinner and regular diners, coffee breaks), accommodation (single rooms), field trip & sightseeing tour in Volterra, and round trip to SIAF from Pisa or Florence airport.
- **Two full scholarships will be provided** to participants from developping countries. To apply, please send a resume and a motivation letter to SS-Syst-Exp@inra.fr **before 15 April**. *Applications will be selected on the basis of living costs in the country of the concerned organization, and relevance of the pedagogical objectives of the summer school to professional objectives of applicants.*

Lecturers

- Jean-Noël AUBERTOT, Inra, Toulouse, France
- Graham BEGG, James Hutton Institute, Dundee, Scotland
- Caroline COLNENNE-DAVID, Inra, Versailles, France
- Violaine DEYTIEUX, Inra, Dijon, France
- Vincent FAYOLA, Inra, Le Rheu, France
- Françoise LESCOURRET, Inra, Avignon, France
- Sandrine LONGIS, ACTA, Toulouse, France
- Camilla MOONEN, Scuola Superiore Sant'Anna, Pisa, Italy
- Magali SAN CRISTOBAL, Inra, Toulouse, France
- Jean VILLERD, Inra, Nancy, France

https://workshop.inra.fr/system-experiments/

Methodological Approaches to System Experiments

International Summer School

June 23-28, 2019 - Volterra, Italy

Context

Agriculture has to evolve to contribute to sustainable development worldwide. In order to do so, new cropping systems and livestock farming systems must be designed to produce agricultural goods that are satisfactory in quantity and quality, while ensuring a good income to farmers and preserving the environment, notably natural resources. There is growing evidence that the implementation of agroecology concepts is a major springboard to attain satisfactory compromises between these different objectives.

The agroecological transition is knowledge intensive. Experimental approaches are a cornerstone to produce knowledge and technical references. The progresses made in agriculture during the last century strongly relied on experimental approaches. However, these experiments were mainly factorial: the effects of one factor, or of a few factors, on a limited range of agricultural performances were analysed using standardised experimental designs. The consideration of the complexity of management and of a larger range of performances requires a systemic approach, where entire cropping or livestock systems, defined as combinations (over defined periods of time and space) of technical operations are tested. For more than two decades, in several European countries, researchers and advisers have been facing methodological problems related to so-called "system experiments". It was time to formalise and share methodological guidance to system experiments.

Methodological Approaches to System Experiments

Programme

Day 1 - Introduction to system experiments

- **Introduction**
  - Presentation of the programme and its pedagogical objectives
  - Brief presentation of lecturers and participants.
- **Lectures**
  - What are system experiments?
  - Typology of system experiments
  - Decision rules
  - Non statistical outputs of system experiments
  - What is a scheme of hypotheses?
- **Teamwork 1**
  - Building a scheme of hypotheses/conceptual scheme
  - *Short projects conducted in small groups*
- **Presentation of Teamwork 1 results**
  - *Plenary session*

Day 2 - Experimental designs

- **Lectures**
  - Differences between experiments and observations
  - General principles of experimental designs
  - Domain of validity of experimental designs
  - Optimisation of sampling strategies for data collection
  - True or false replicates, that is the question!
  - Landscape as an object or a context in experimental designs
- **Teamwork 2**
  - Experimental design (based on the results of Teamwork 1)





Day 3 - Inferential statistics/Field Trip/ Visit of Volterra

- **Lectures**
  - Overview of inferential statistics
  - Application to system experiments
- **Presentation of Teamwork 2 results**
  - *Plenary session*
- **Visit of Tuscan field experiments**
- **Free time + social dinner in Volterra**

Day 4 - Data mining

- **Lectures**
  - Graphical analyses
  - Overview of data mining approaches
  - Examples of data mining methods based on case studies
- **Teamwork 3**
  - Data analyses

Day 5 - Conclusion

- **Presentation of Teamwork 3 results**
  - *Plenary session*
- **Feedbacks on the training course from participants**
- **Take home messages and perspectives**

Practical information

- **Timing**
  - **Shuttle service:**
    - Departure to SIAF from Florence and Pisa international airports on Sunday 23 June, around 6 PM
    - Departures from SIAF on Friday 28 June at 2 PM, estimated arrival time at the airports at 3 PM
  - **Opening lecture** on Monday 24 June at 8:30 AM
  - **Checkout** on Friday 28 June at 1:30 PM
- **Venue**
  - The event is held at **SIAF, Volterra**
  - **Directions**
- **Visit our website** for updated information

Optional touristic day in Florence on Sunday 23 June!

Visit our website for more information.

Extra cost: 120€