Assessing the technical, economic and environmental performances of low-input and legume-based cropping systems

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Context

- Impact of pesticides on human health and the environment
- Development of pesticide resistance
- Withdrawal of active substances

➔ **Need to reduce pesticide use**

- Legumes are rarely present in cropping systems and have a minor place in protein-rich raw material production
- France has a very negative balance in plant proteins

➔ **Need to produce more legumes to improve protein self-sufficiency in France**

Legumes:
- A diversified plant family
- With agronomic and environmental advantages
- Highly nutritious source of plant proteins

Legumes are key to design more diversified, sustainable and less pesticide-reliant cropping systems

A paradox ?

Legumes:
- Sensitive to abiotic stresses
- Susceptible to several difficult to manage diseases and pests
- Weak competitors against weeds

Legumes considered as difficult to grow without pesticides, risky and unprofitable

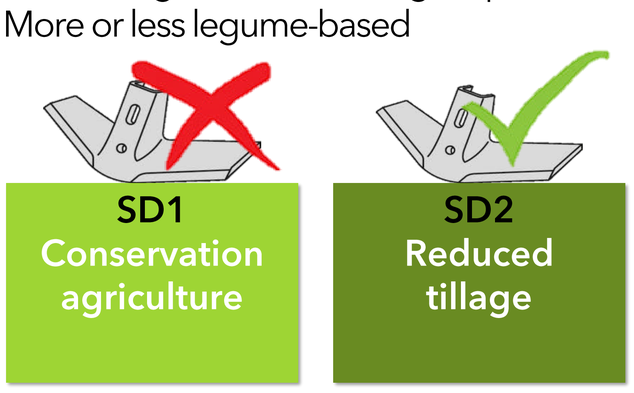
Research question

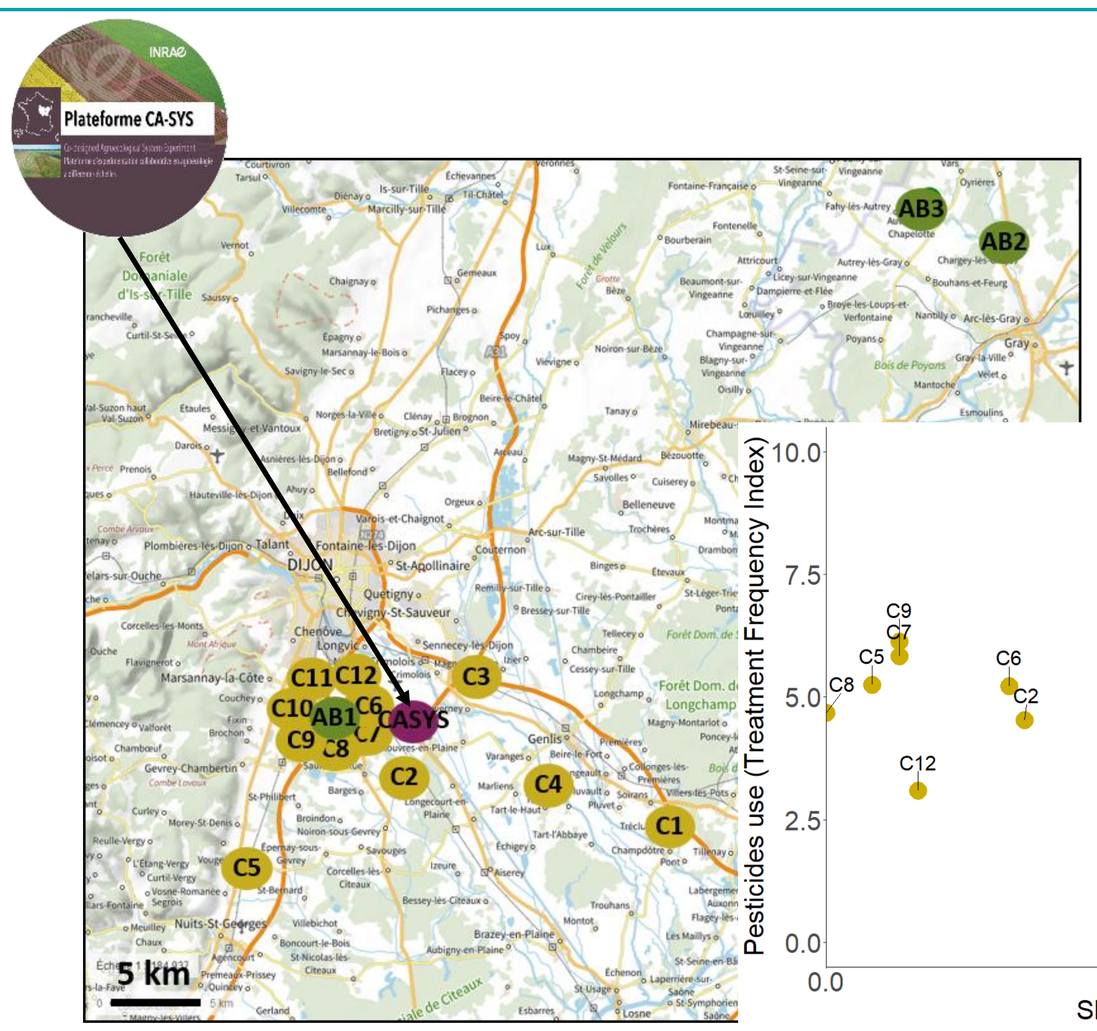
How do low-input and legume-based cropping systems perform compared with reference cropping systems in the same production situation?

Materials and methods

INRAE experimental platfom CA-SYS (Dijon)

4 agroecological cropping systems
- Tested over the 2019-2023 period
- With zero-pesticide
- Maximizing the use of biological processes
- More or less legume-based

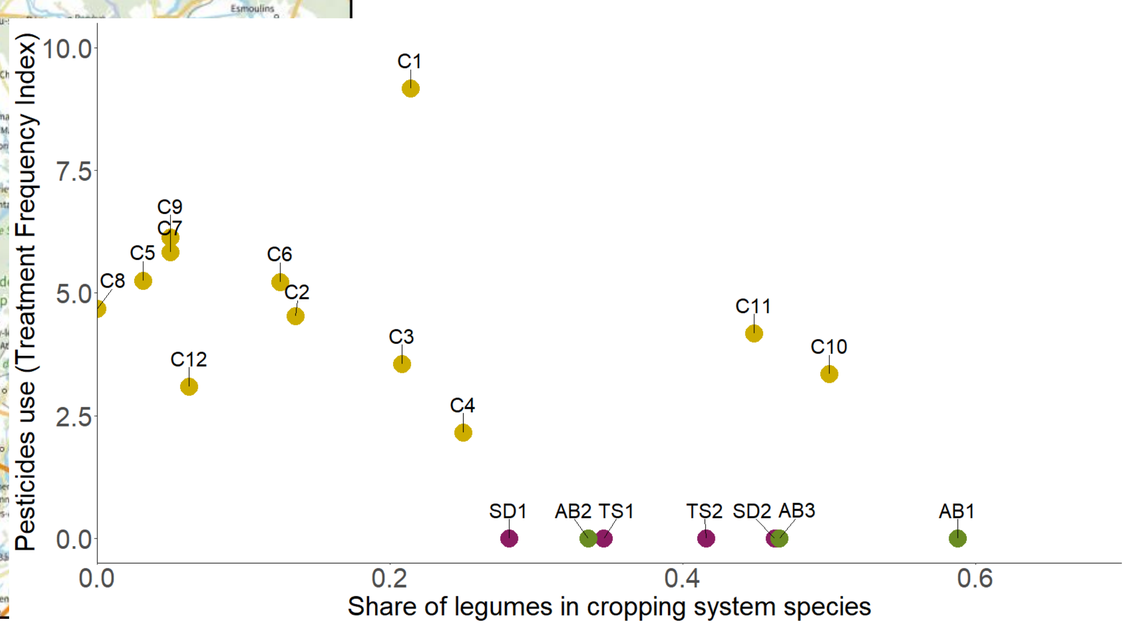




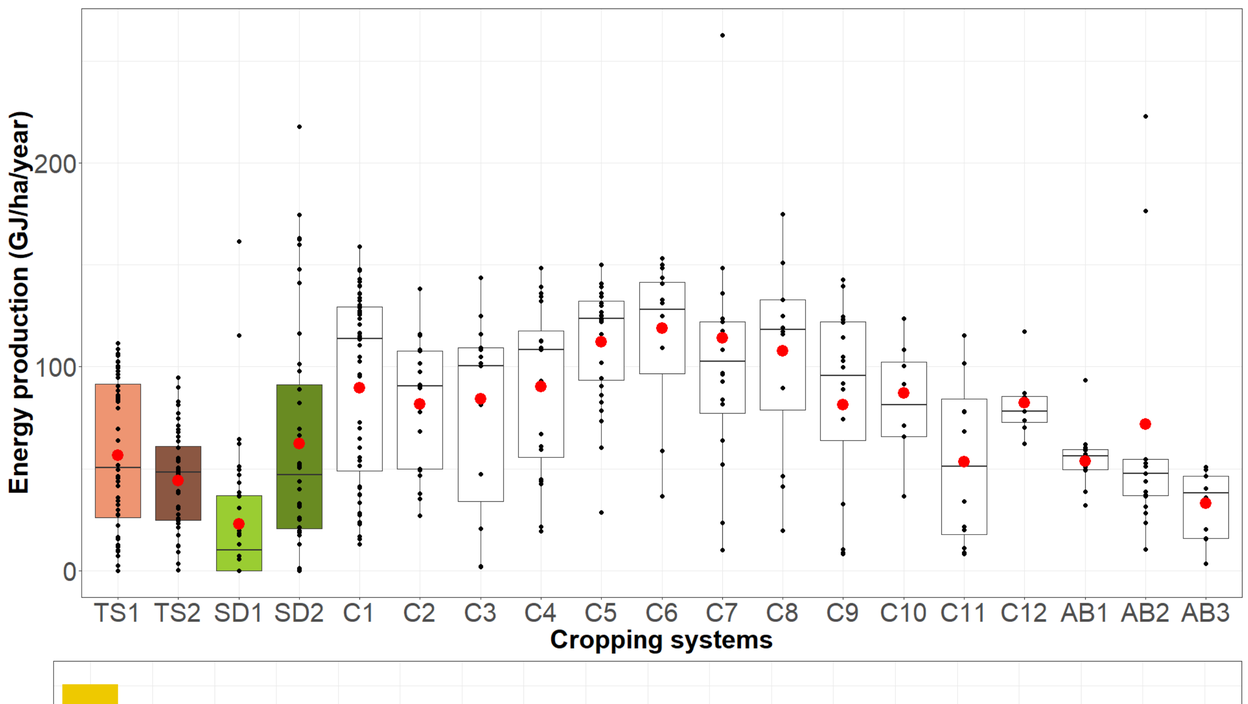
Perform a **multicriteria assessment** of these agroecolgical systems and compare them to **15 reference cropping systems**

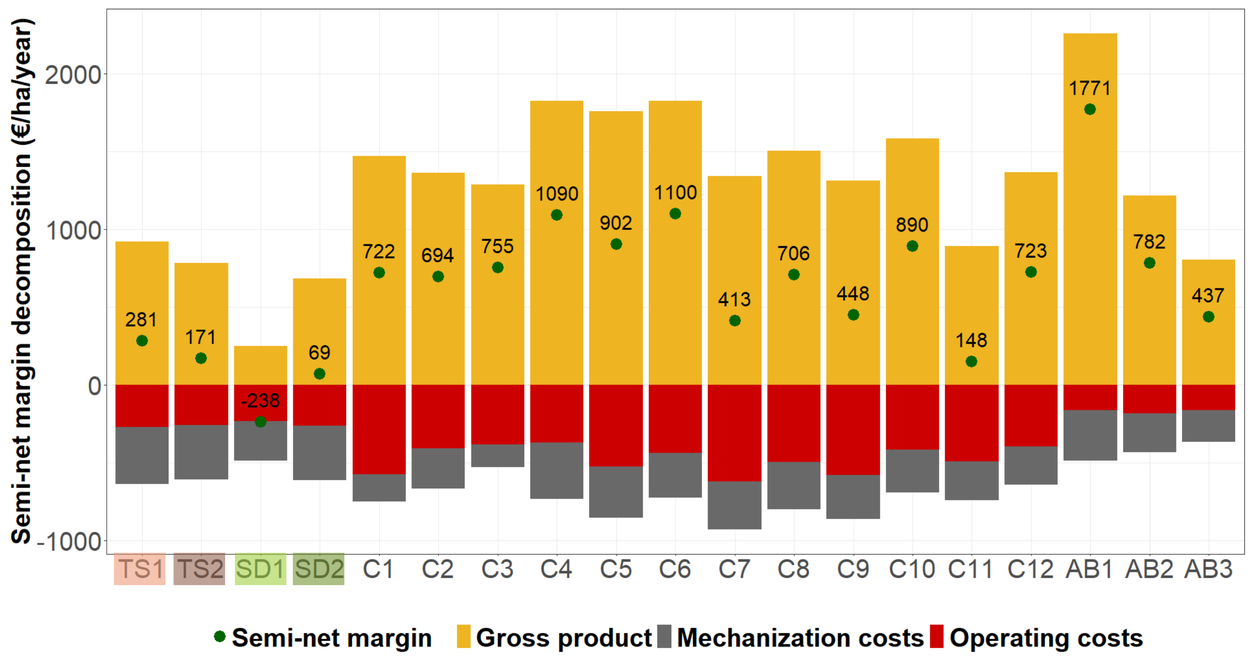
- 12 conventional cropping systems
- 3 organic cropping systems

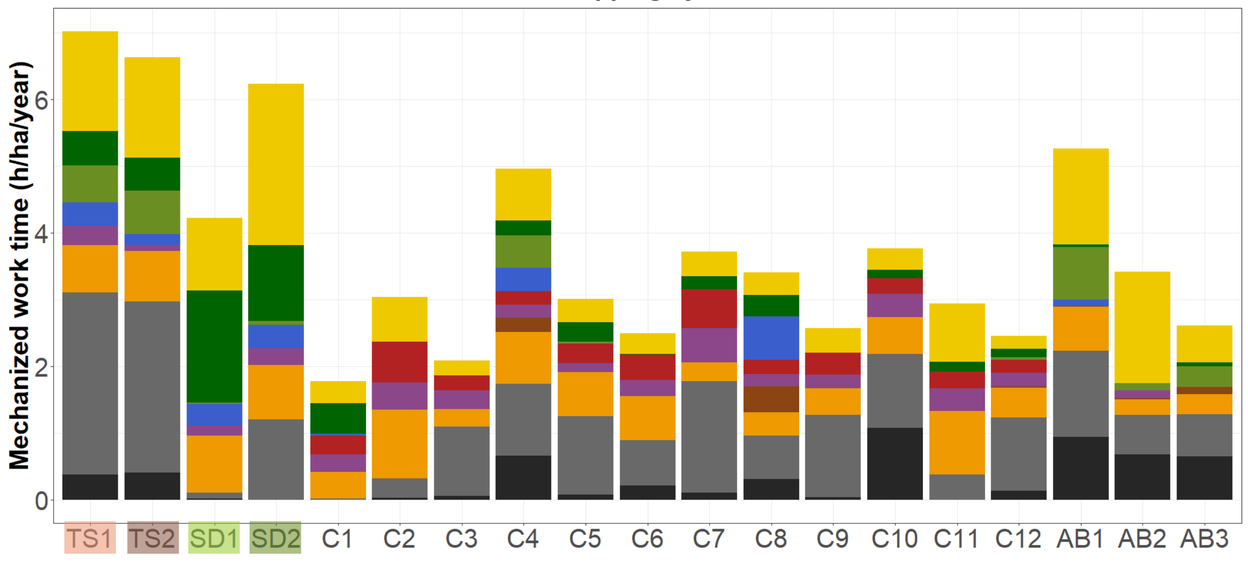
With contrasted pesticide use intensities, shares of legumes and soil tillage strategies

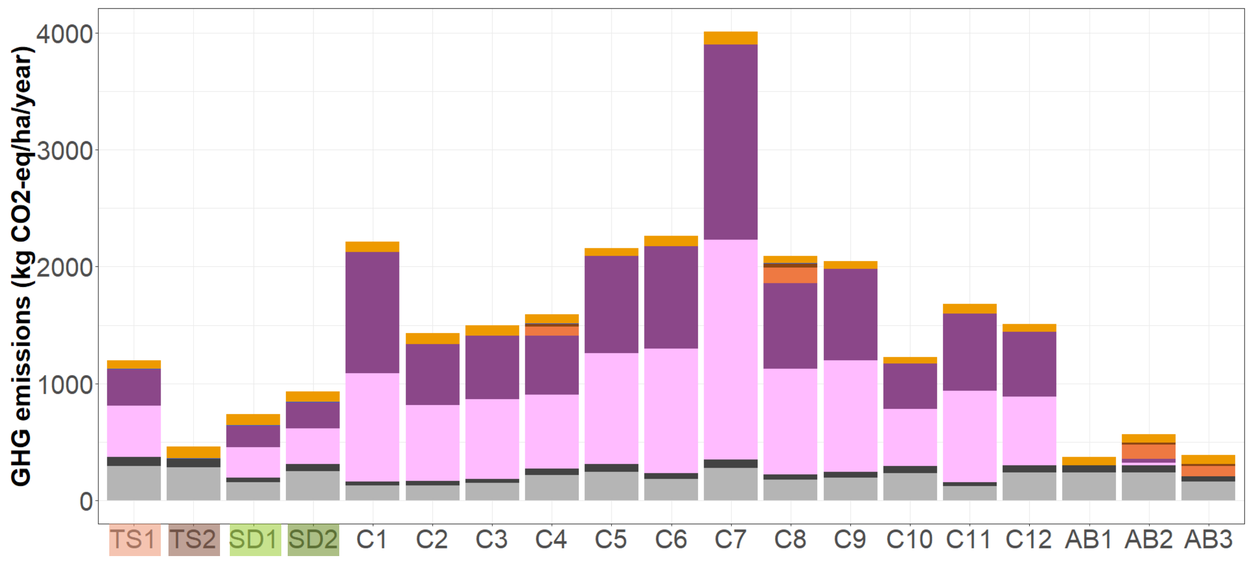


Preliminary results









Conclusion

- The agroecological cropping systems tested on the CA-SYS platform appear **less productive and profitable** than the reference cropping systems.
- They succeed in their environmental objectives with a **net decrease in energy consumption and greenhouse gas emissions**, but are **more labor-intensive.**

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