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Evaluating economic and technical performances of sunflower-soybean intercrop in French farming systems

Hélène Tribouillois, Philippe Cristante, André Estragnat, David Champclou, Grégory Vericel, Nathalie Landé, Laurent Bedoussac, Eric E. Justes

► To cite this version:

Hélène Tribouillois, Philippe Cristante, André Estragnat, David Champclou, Grégory Vericel, et al.. Evaluating economic and technical performances of sunflower-soybean intercrop in French farming systems. 18. International Sunflower Conference, Feb 2012, Mar del Plate, Argentina. 1 p., 2012. hal-02803630

HAL Id: hal-02803630

<https://hal.inrae.fr/hal-02803630v1>

Submitted on 5 Jun 2020

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Sunflower-soybean intercropping

An efficient solution for increasing natural resources use efficiency and yield production?

Nathalie LANDE
CETIOM
lande@cetiom.fr

Laurent BEDOUSSAC
ENFA, UMR AGIR
laurent.bedoussac@toulouse.inra.fr



H. TRIBOUILLOIS¹, P. CRISTANTE², A. ESTRAGNAT², D. CHAMPCLOU¹,
G. VERICEL¹, N. LANDE², L. BEDOUSSAC³ and E. JUSTES¹

¹INRA, UMR AGIR, 31326 CASTANET TOLOSAN, France
²CETIOM, Avenue Lucien Bretignières, 78850 THIVERVAL GRIGNON, France
³ENFA, UMR AGIR, 31326 CASTANET TOLOSAN, France

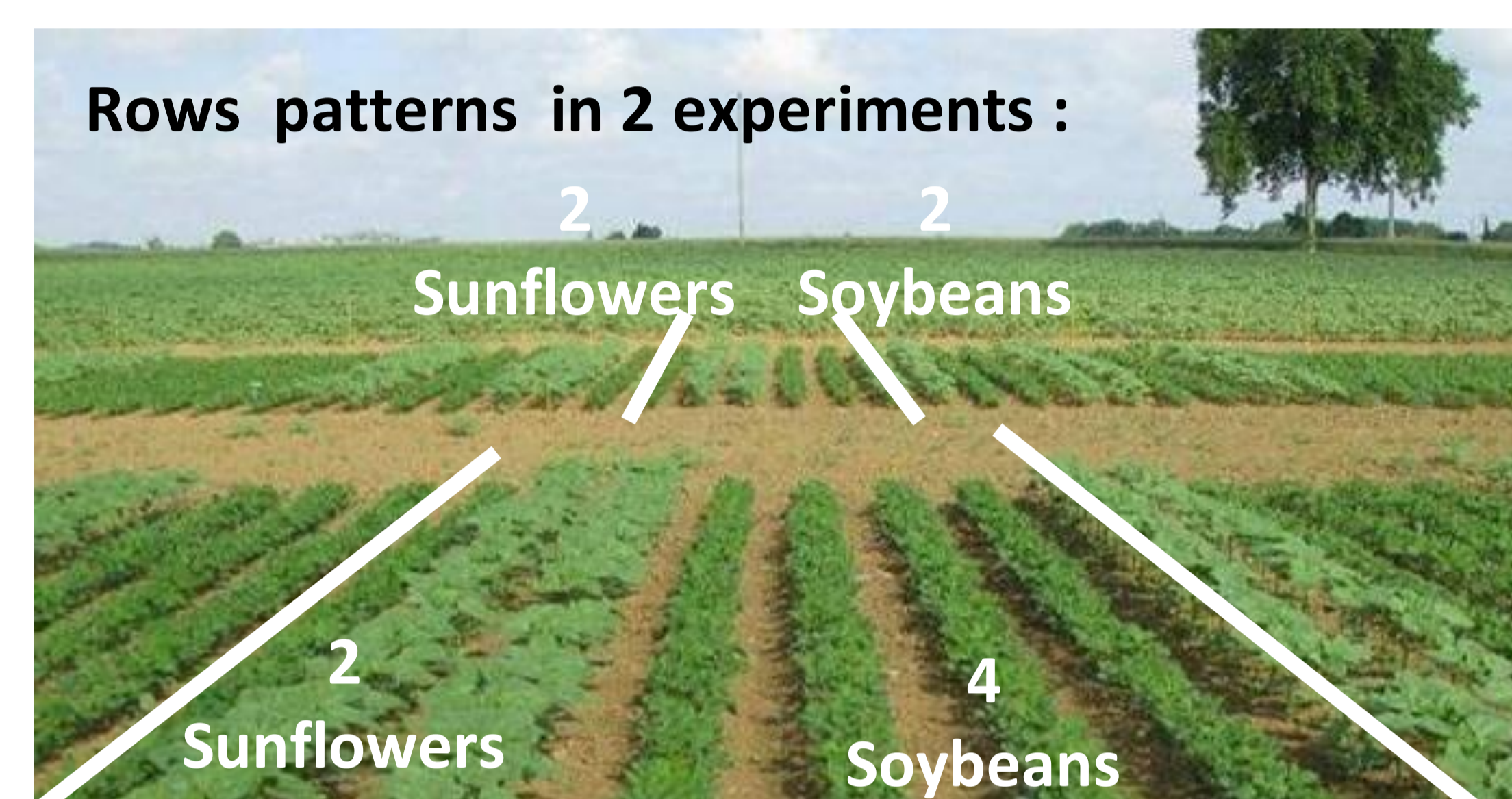


OBJECTIVES

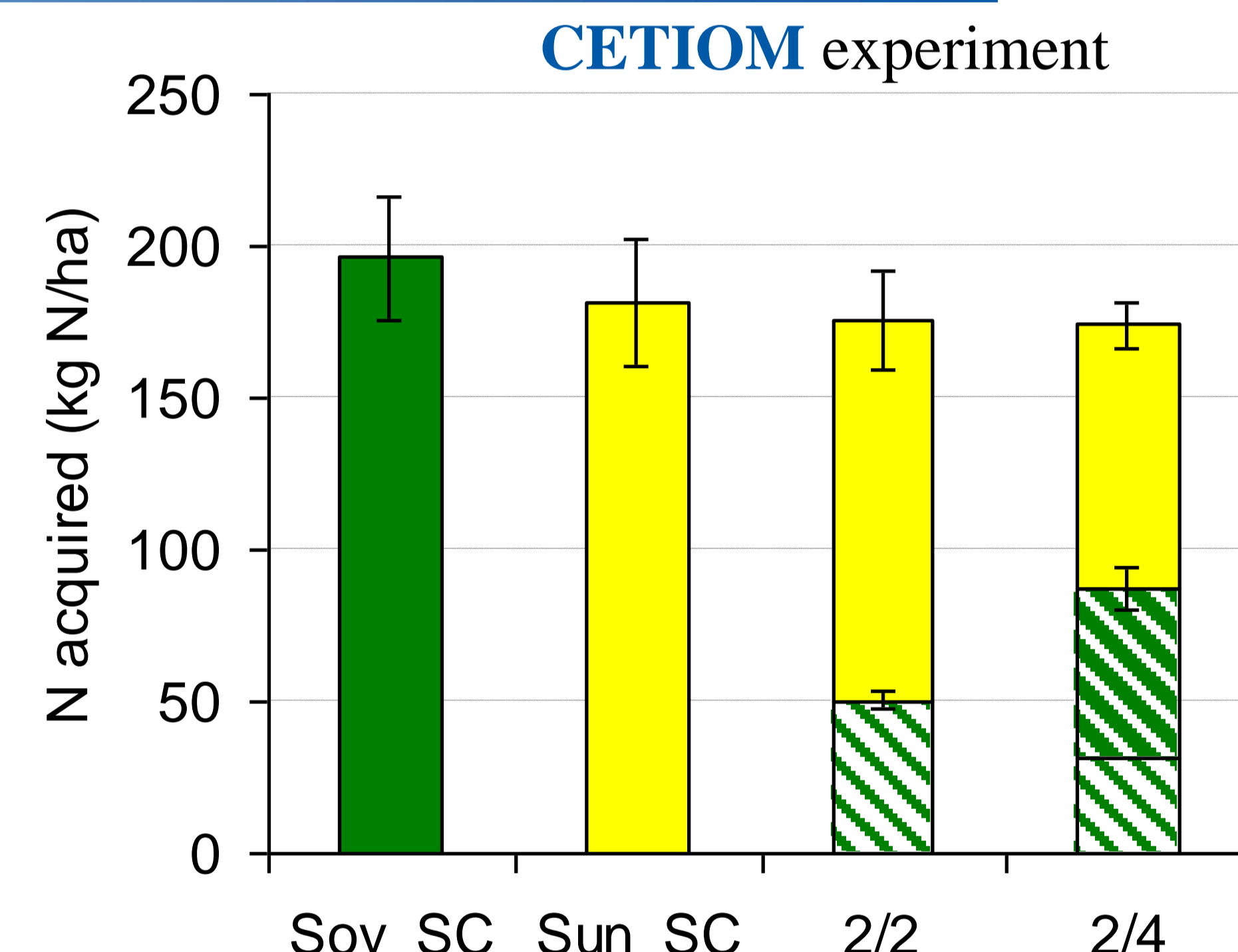
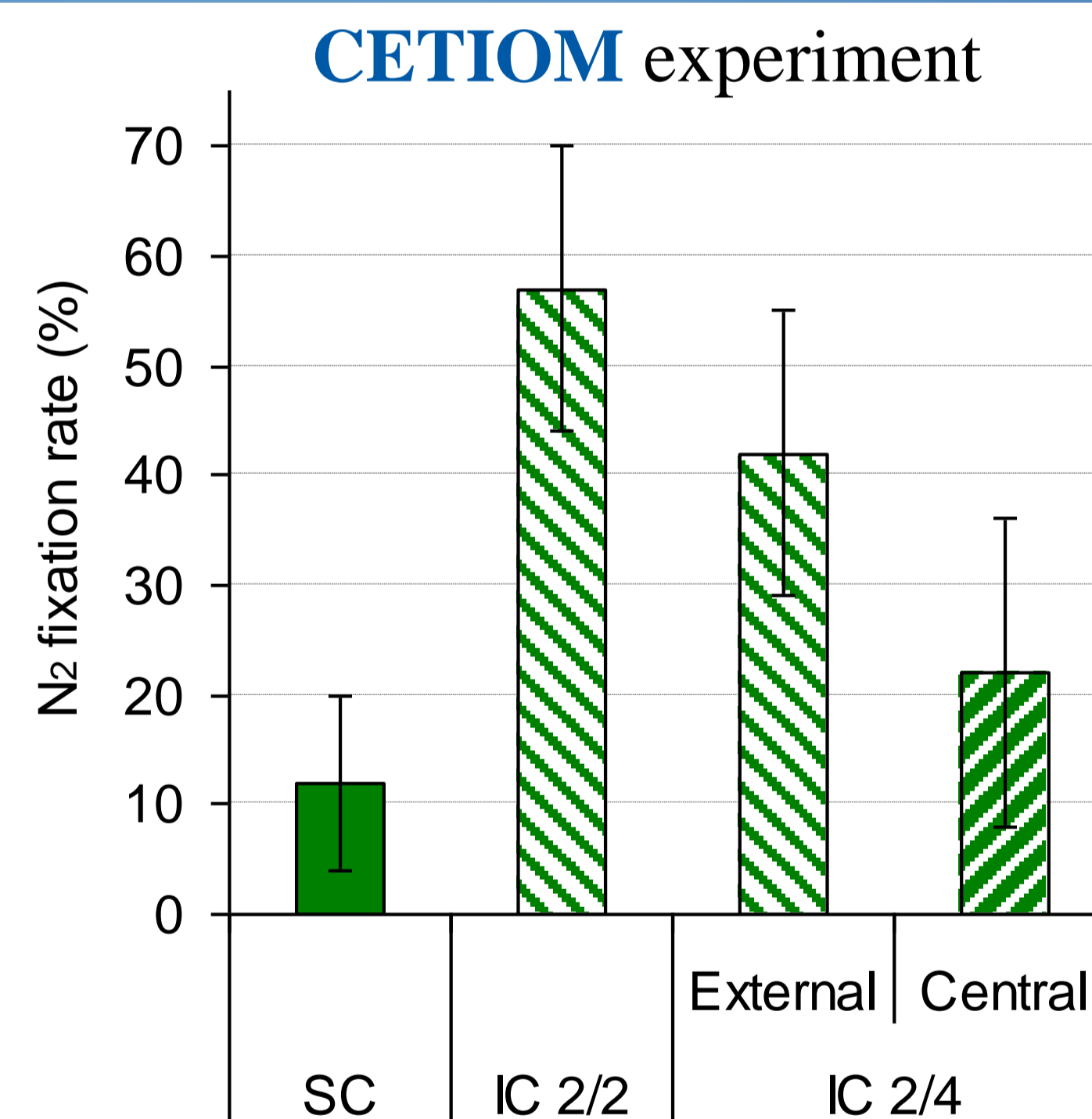
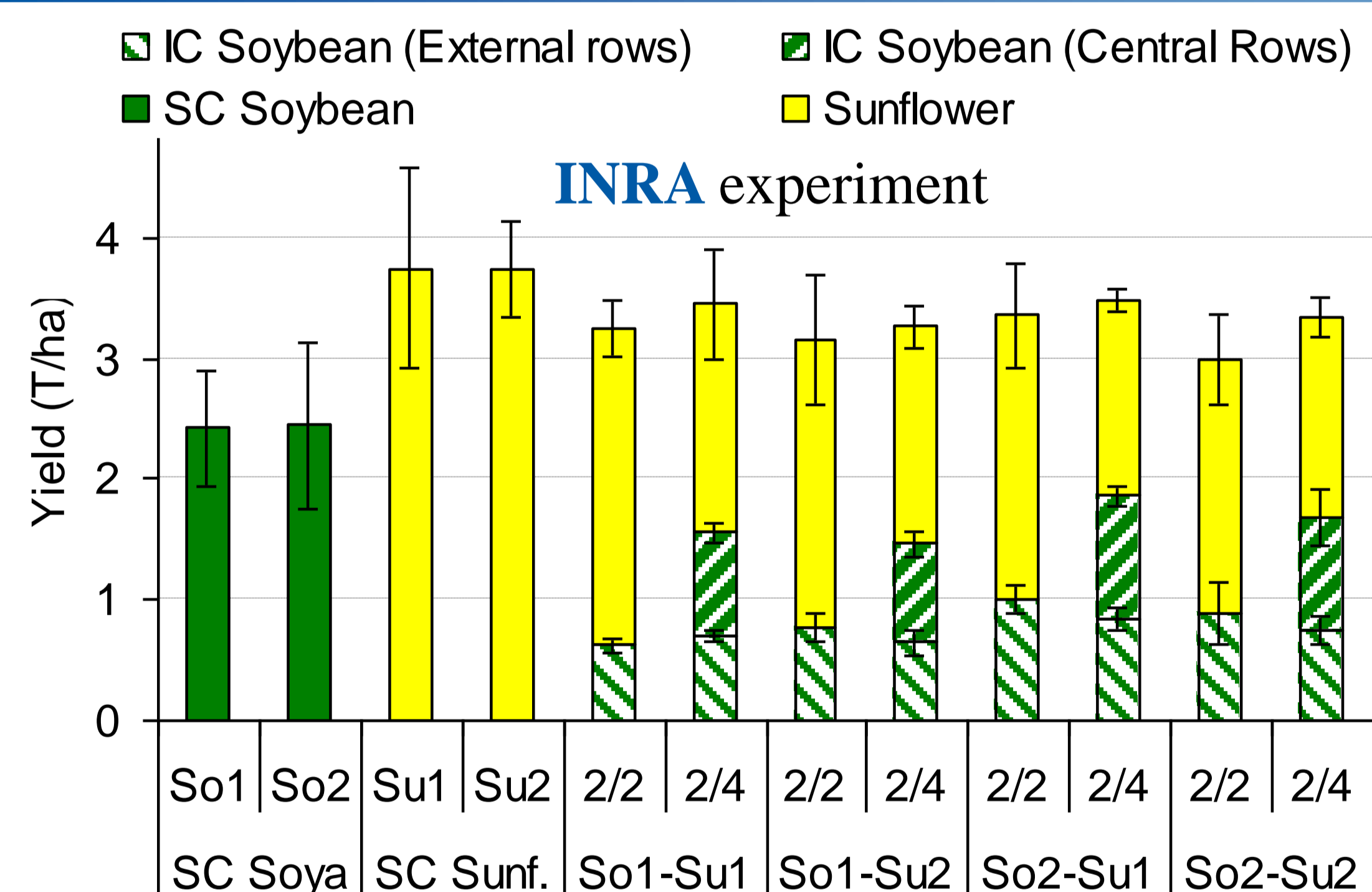
- **Intercropping (IC)** - the simultaneous growing of two or more species in the same field for a significant period - **can improve the use of environmental resources** (light, nutrients and water) resulting in yield and quality advantages compared to sole cropping (SC).
- Few papers - mainly coming from Africa and Asia – deals with **sunflower-soybean intercropping**.
- No reference in temperate climates despite these crops are **adapted to Southern Europe conditions**.
- **Aim of our study: analyze the dynamical functioning of sunflower-soybean intercrops and their performances in order to determine their efficiency and the conditions to maximize resources use.**

MATERIAL AND METHODS

- Experiments were carried out in 2010 on **CETIOM** and **INRA** stations (SW France)
- The two species were **sown at the same time** (avril or may) but **harvested separately**
- **Three main treatments were compared:**
 - SC Soya:** cv. Isidor (So1) earlier than cv. Ecuror (So2) ;
 - SC Sunflower:** cv. Fabiola (Su1) earlier than cv. Melody (Su2) ;
 - Soya-Sunflower IC:** Each specie sown at the SC row density
- **Two spatial row structures:**
 - 2/2** (2 sunflower rows alternated with 2 soya rows)
 - 2/4** (2 sunflower rows alternated with 4 soya rows)
- **CETIOM** experiment was irrigated (50 mm) with no fertilizer (initial soil N content of 361 kg N/ha)
- **INRA** experiment was not irrigated and soybean rows were fertilized in order to compensate the inoculation inefficiency



RESULTS



- Total IC yield > SC Soya but < than SC Sunflower
- Soya yield higher in 2/4 IC than in 2/2 IC
- **Sunflower more productive than Soya in IC**
- IC Soya N₂ fixation rate > SC Soya which was very low due to high initial soil N
- Sunflower competition for soil N increase N₂ fixation rate of neighboring soya rows
- N acquired in IC lower than sole crops and IC Soya N acquired highest in 2/4 IC

CONCLUSIONS

- **Sunflower-soybean best performances** were obtained with : **i) low inputs conditions ; ii) 4 soybean – 2 sunflower rows structure and iii) the latest soybean cultivar intercropped with the earliest sunflower.**
- Intercropped **sunflower always presented a competitive advantage on the soybean** leading to low legume yields.
- **Further genotype-environment interactions researches are needed** for optimizing resources use such as exploring precocity, aerial architecture of genotypes and adapting row structure and management, by favoring complementarities.



INSTITUTIONS



FUNDINGS



18th International Sunflower Conference

Mar del plata - Argentina

27/02/2012 – 01/03/2012

ALIMENTATION
AGRICULTURE
ENVIRONNEMENT

