Wheat-clover intercropping can induce positive Plant-Soil Feedback with minimal impact on soil physical properties.

Picone R.*, *Sharaf A., Arfaioli P., Pietramellara G., Pathan S.I.*

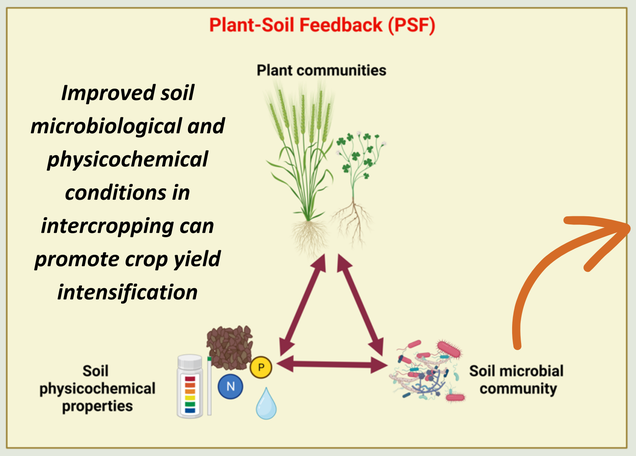
Department of Agriculture, Food, Environment and Forestry, University of Florence, P.le Delle Cascine 28, Firenze, 50144, Italy

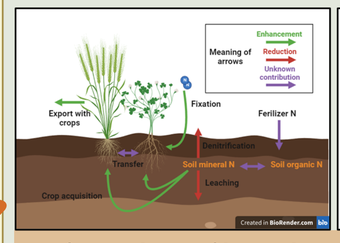
****riccardo.picone@unifi.it***

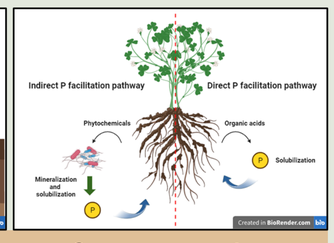
Background

- The utilization of **legume-cereal intercropping**, which is guided by principles of **complementarity** and **facilitation**, can lead to increased **resource use efficiency** and higher **crop yields**
- It is essential to evaluate the **modifications** in **soil multifunctionality** that occur within this system to ensure its **widespread application**

Knowledge gaps and hypothesis

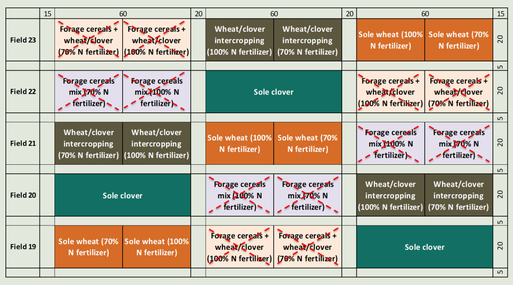


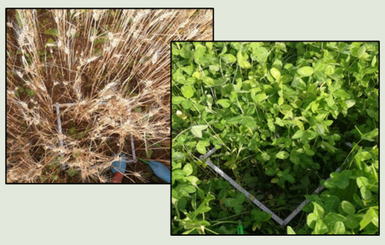


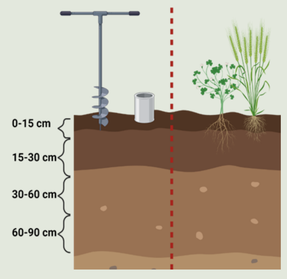


The implications for **nutrient biogeochemical cycles** in soil are not yet fully understood

Experimental design and sampling







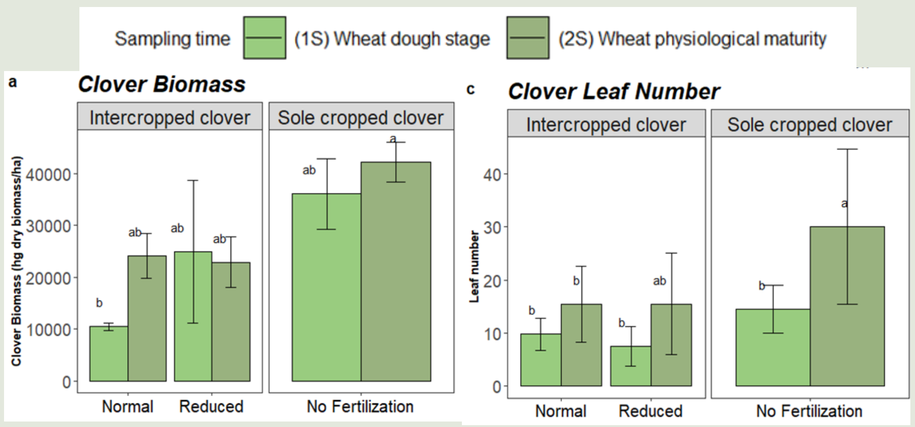
- **Plant** aboveground **biomass** sampled at two phenological stages
- **Chemical** and biological properties in two **niches** (**bulk** and **rhizosphere**)
- **Physical properties** in the **profile** (0-90 cm)

Analyses

- **Quantification** of **phylogenetic** and **functional** markers of **soil microbial community**
- **Plant performance**
- **Soil physicochemical properties**
- **Soil physical properties**

Findings

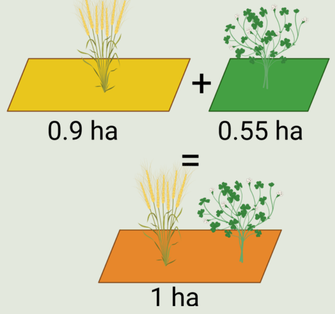
Plant performance



Cropping system(*)

- No significant changes in **wheat performance** (higher plasticity)

LER	100% N fertilization	70% N fertilization
Totale	1.44	1.47
Clover	0.57	0.54
Wheat	0.87	0.93

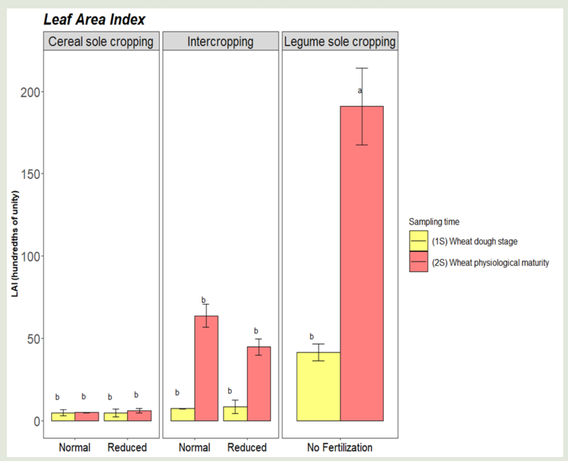


Land Equivalent Ratio

- Hypothesized **wheat-mediated** *Cuscuta sp.* suppression

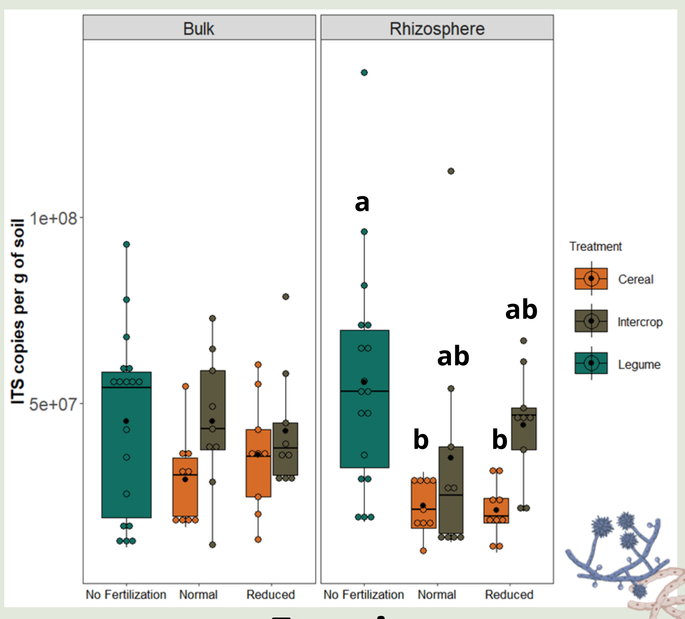
	100% N fertilization	70% N fertilization
Aggressivity	2,78	2,99

Leaf Area Index



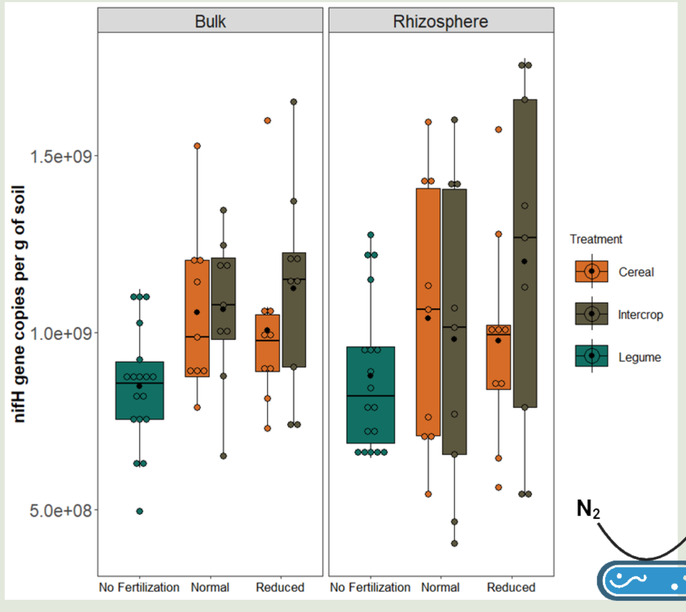
Cropping system; Time; Cropping system X Time(***)

Abundance of microbial groups



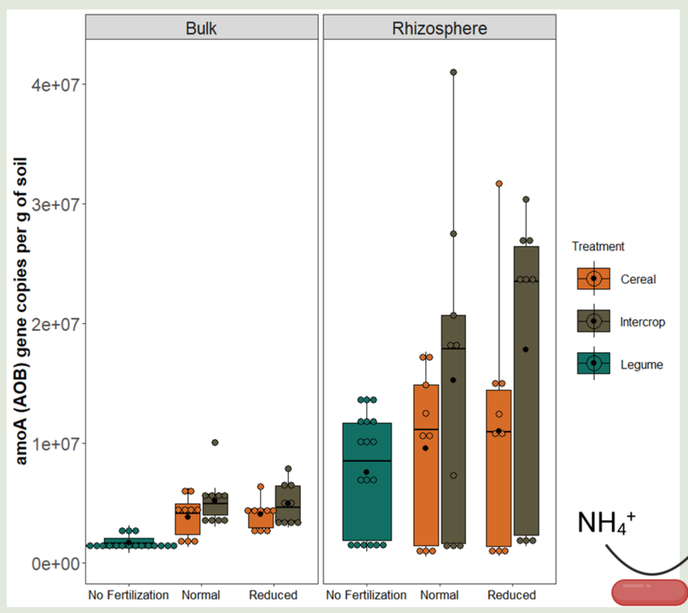
Fungi

Rhizo. ⇒ Fertilization (*); Cropping system (.)



N2-fixing Bacteria and Archaea

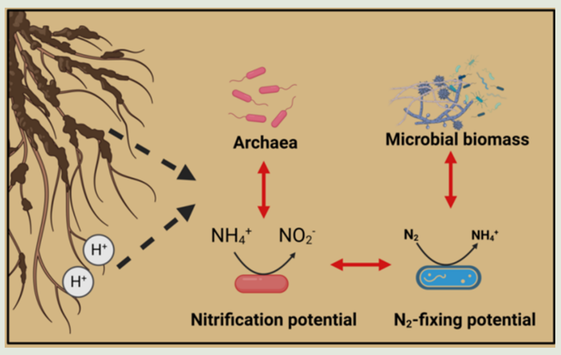
Rhizo. ⇒ Fertilization X Cropping system (*)



Ammonia oxidizing bacteria

Bulk ⇒ Fertilization(*)

Pearson's correlation

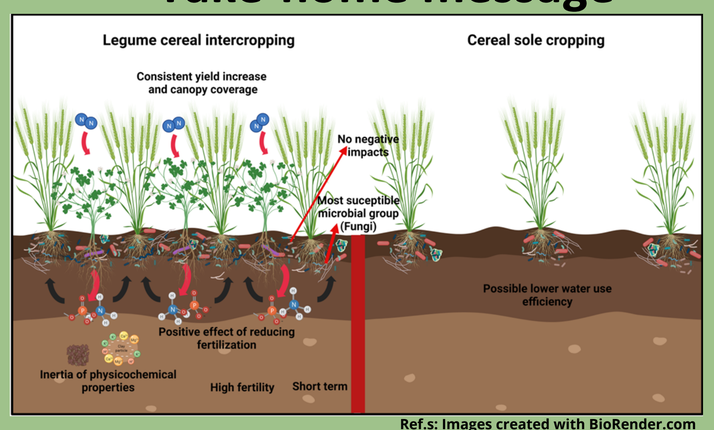


Red arrows indicate significant positive correlations

Soil physicochemical properties

- Unaffected **soil physical** properties in the profile
- Significant increase in **humidity** with **reduced N fertilizer input** in **sole wheat** in **both** soil **niches**
- No changes in **pH** and **Cation Exchange Capacity**

Take-home message



This work is supported in the frame of Horizon Europe Programme, agreement no. Project 101082289 — LEGUMINOSE (https://www.leguminose.eu/).

Ref.s: Images created with BioRender.com
Plots created with RStudio
Poster created in Canva.com