

## Diversity-functioning relationships in agroecosystems: from crops over weeds to soil microbes

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### 1 Introduction

- Intensive agricultural methods have shown their limits, and we greatly need to find more **sustainable ways of producing food**.
- Increasing species diversity in cropping systems, such as **intercropping**, could be one possible solution, since **biodiversity** is known to **increase productivity** and **ecosystem services** in natural systems.
- Here we investigate how an increase in diversity at the crop level scales up to diversity and functioning at the level of **weeds** and **soil microbes**.

### 2 Hypotheses

#### Crop productivity



#### Weed communities

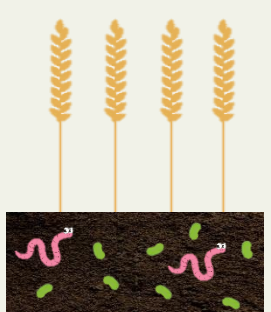


Weed species richness ++  
Weed biomass +++



Weed species richness -  
Weed biomass --

#### Soil microbial communities

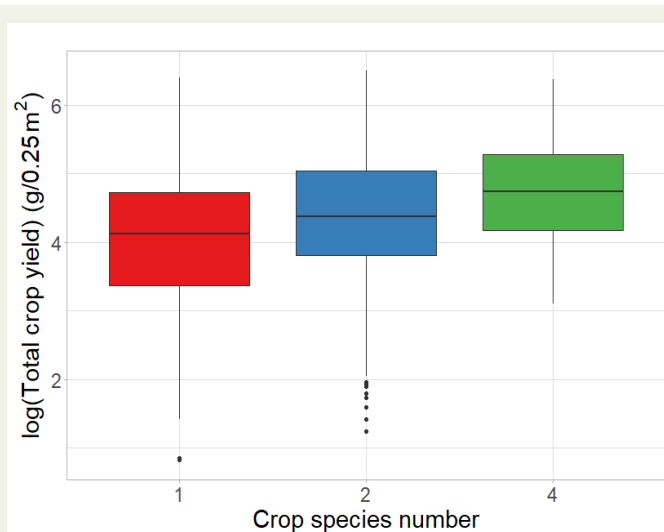


Soil microbial diversity --  
Soil microbial activity (basal respiration measured as CO2 flux) -



Soil microbial diversity +++  
Soil microbial activity (basal respiration measured as CO2 flux) +

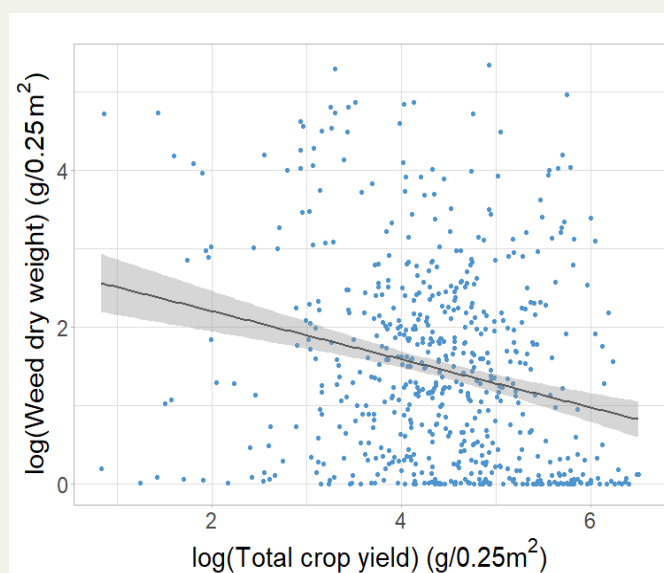
### 3 Results



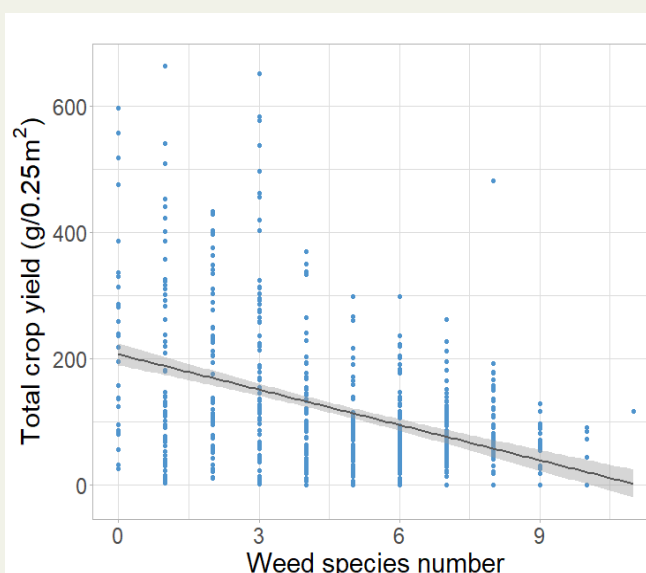
• **Total crop grain yield increases with crop species number**

(4-1:  $p = 0.047$  ;  
4-2:  $p < 0.001$ )

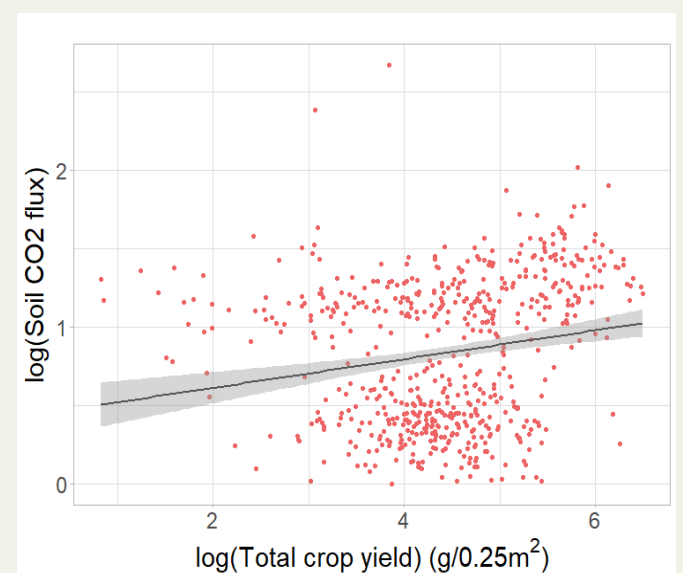
• **Weed biomass decreases with total crop yield** ( $p < 0.001$ )



• **Weed species richness decreases with total crop yield** ( $p < 0.001$ )



• **Soil activity increases with total crop yield** ( $p = 0.0016$ )



### 4 Conclusion

- **Increasing crop diversity** leads to an **increase in crop grain yield**  
→ positive diversity-productivity relationship
- **Weed suppression** and **soil activity positively** correlates with **crop productivity** and species composition, but not with crop diversity
- Increasing diversity in agricultural systems therefore has the potential to lead to several beneficial effects on various levels.

