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Validation of a method for biodiversity assessment in LCA (SALCA-Biodiversity) using indicator species groups

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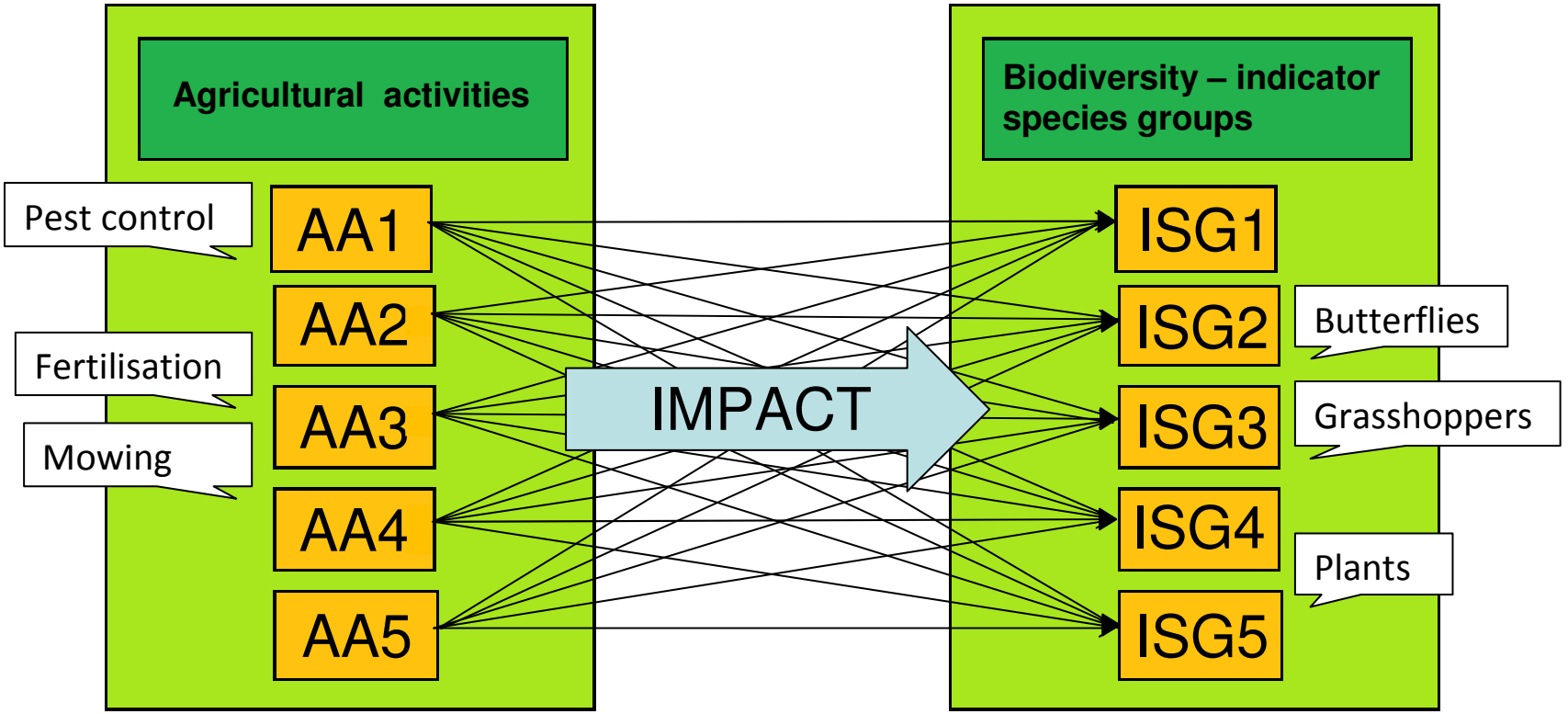
SALCA-BD (Biodiversity) Method

SALCA = Swiss Agricultural Life Cycle Assessment



11 indicator species groups: crop and grassland flora, birds, small mammals, amphibians, snails, spiders, carabid beetles, butterflies, wild bees and grasshoppers.

Source: *Jeanneret et al., 2006; Jeanneret et al., 2008*

SALCA-BD output

OSD	Overall species diversity	⟺	All indicator species groups
EDS	Diversity of ecologically demanding species and species of great value	⟺	Only for spiders, carabid beetles, butterflies and grasshoppers

→ For the habitat types grassland, arable crops and semi-natural habitat

→ Estimation for the crop, rotation, parcel and farm levels

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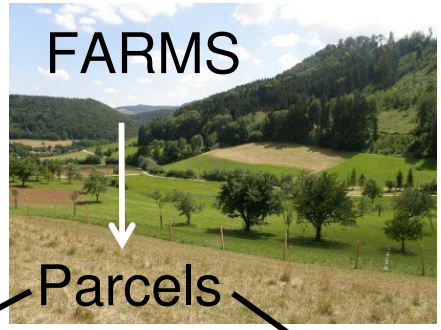
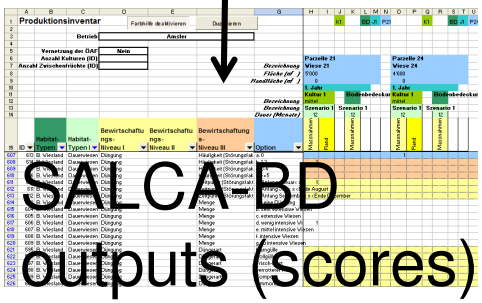
Aim

10 grassland dominated



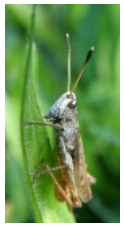
Agricultural activities

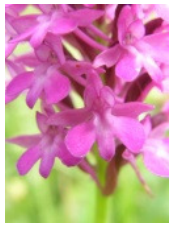


SALCA BD outputs (scores)

Comparison

Diversity of grassland flora and grasshoppers in the field





→ Only grassland parcels

→ Comparison at the parcel and farm levels

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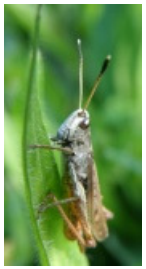
Methods: Grassland flora and grasshoppers collection in the field

Grassland flora

→ 198 parcels (10 farms)

→ randomly chosen 28 sqm plot



Grasshoppers

→ 77 parcels (6 farms)

→ Visual and acoustic determination during one hour walking through the parcel

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Statistical analysis: correlations

Correlation tests between:

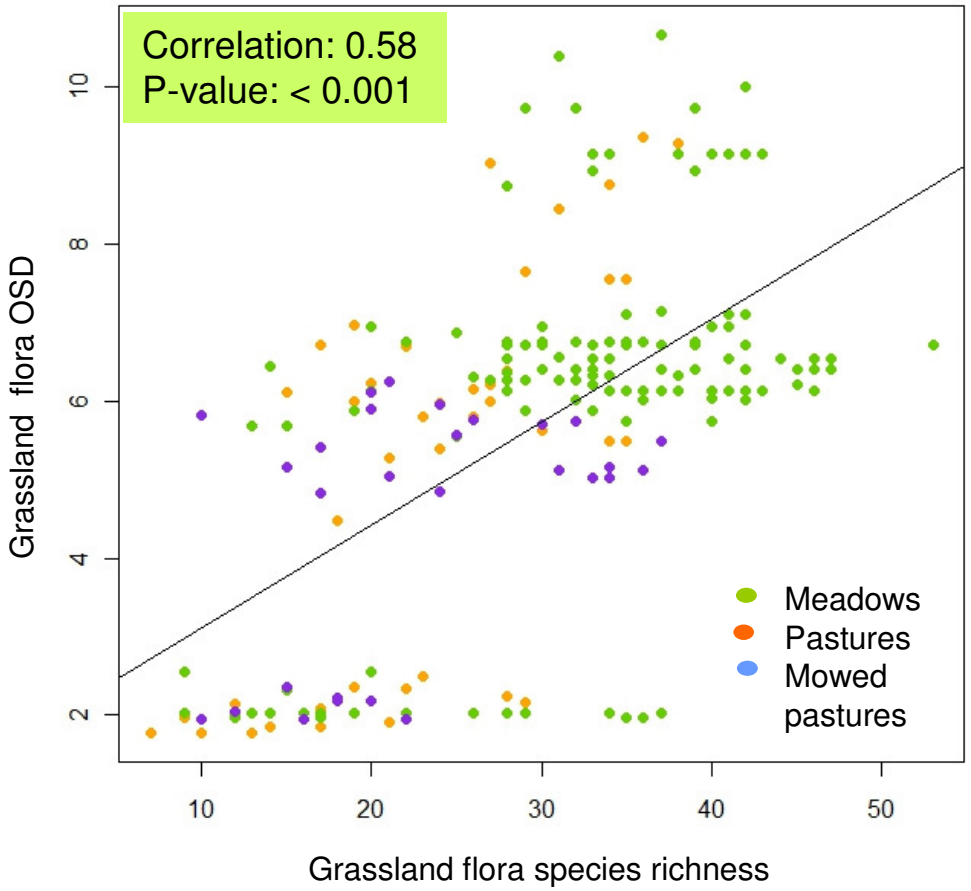
SALCA-BD scores		Field data
Grassland flora OSD	↔	Species richness
Grasshopper OSD	↔	Species richness
Grasshopper EDS	↔	Species richness

*OSD = overall species diversity
EDS = diversity of the ecologically demanding species or/and great value species

Results: Grassland flora
Parcel level

→ Positive and highly significant correlation

→ High spreading of the points



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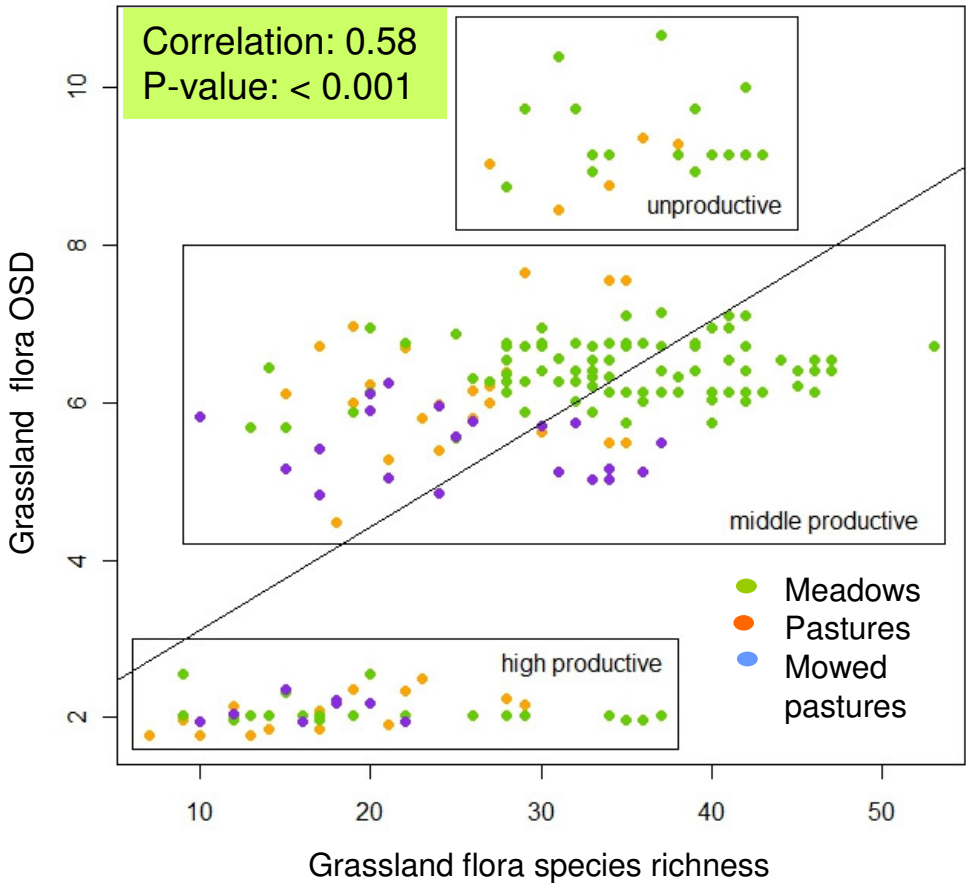
Results: Grassland flora
Parcel level

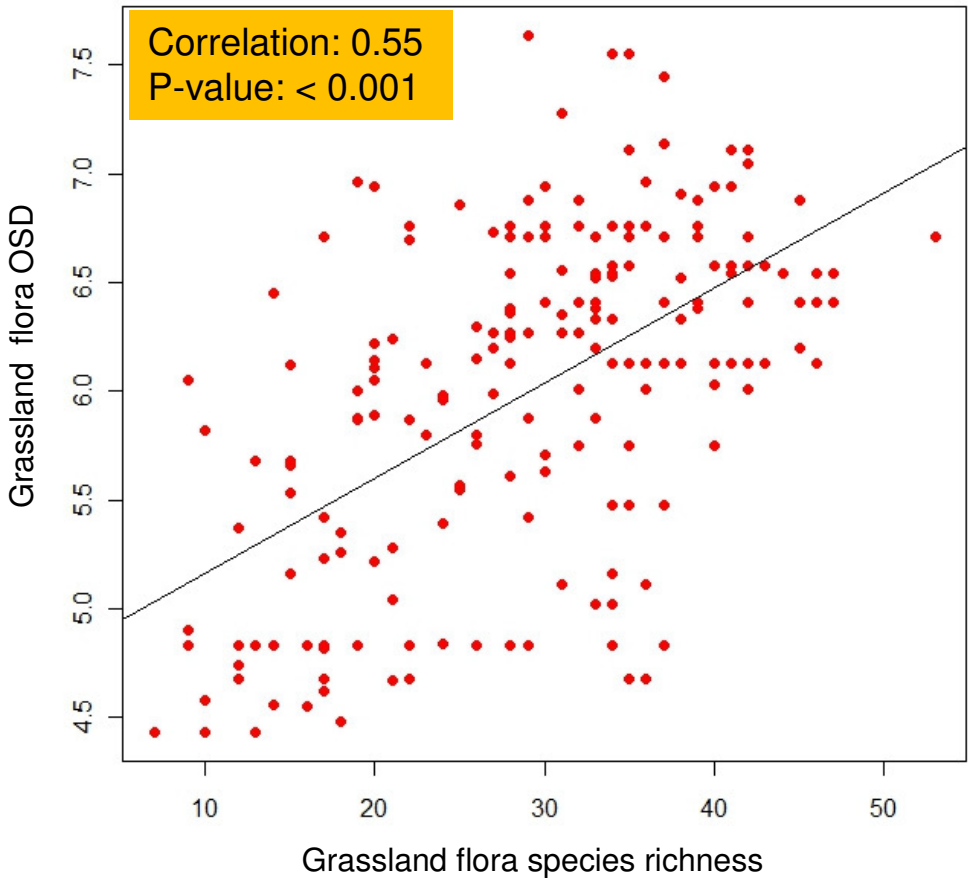
→ Positive and highly significant correlation

→ High spreading of the points

→ Subdivision into grassland intensity classes (Salca-BD)



Results: Grassland flora
Parcel level

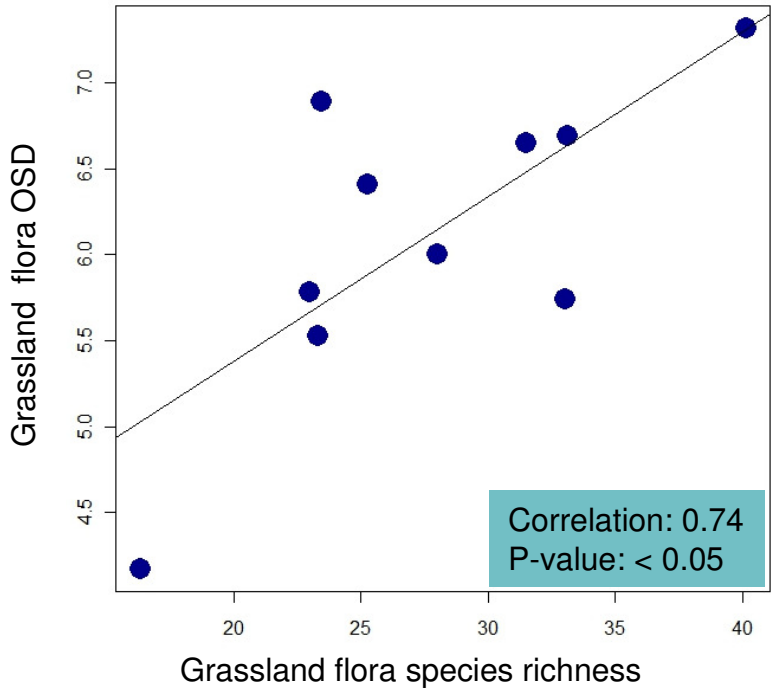


→ Slight decrease of the correlation value from

0.58 to 0.55

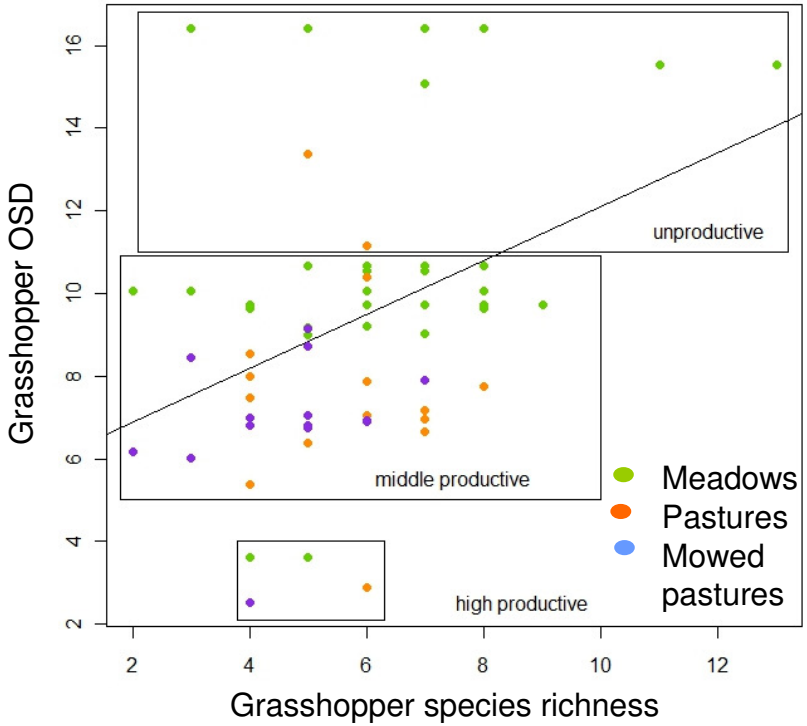
→ Correlation still highly significant

Results: Grassland flora
Farm level

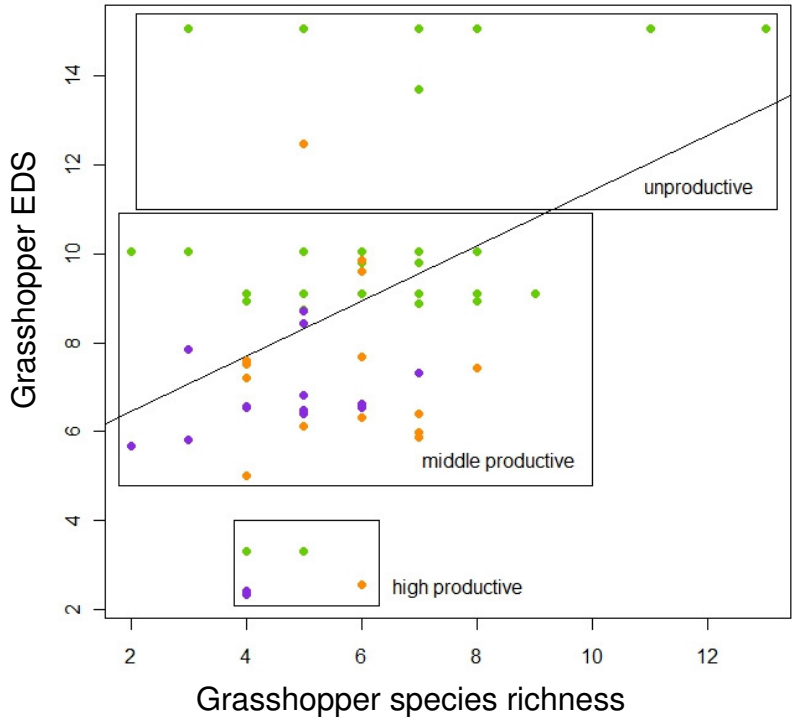


→ Positive significant correlation

Results: Grasshoppers
Parcel level

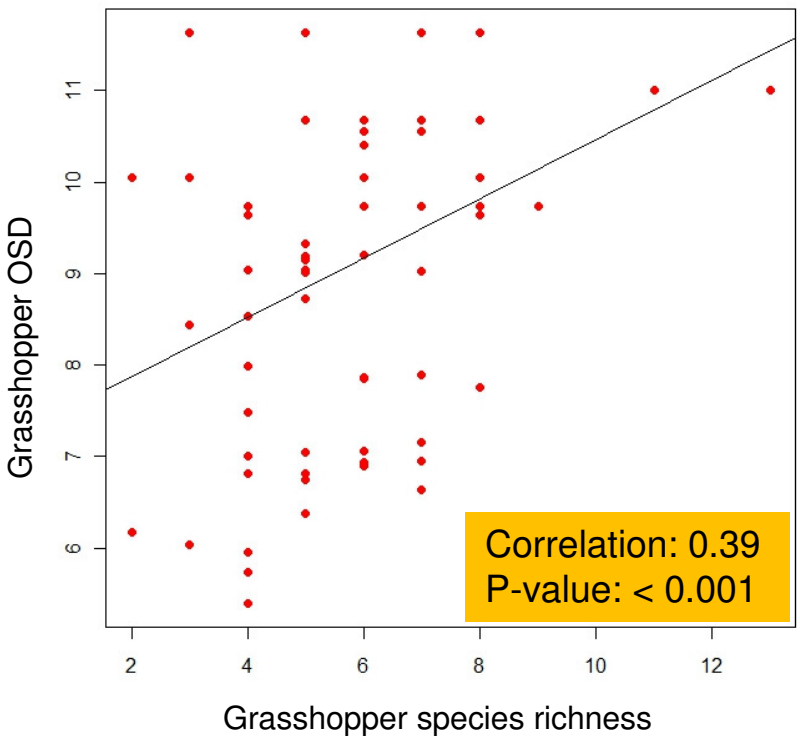


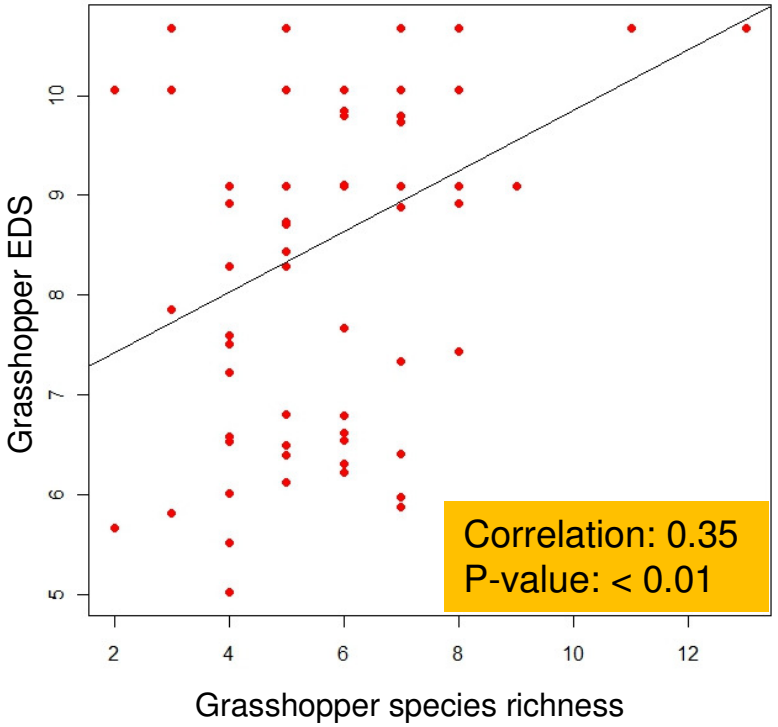
Correlation: 0.39
P-value: < 0.001



Correlation: 0.36
P-value: < 0.01

Results: Grasshoppers
Parcel level

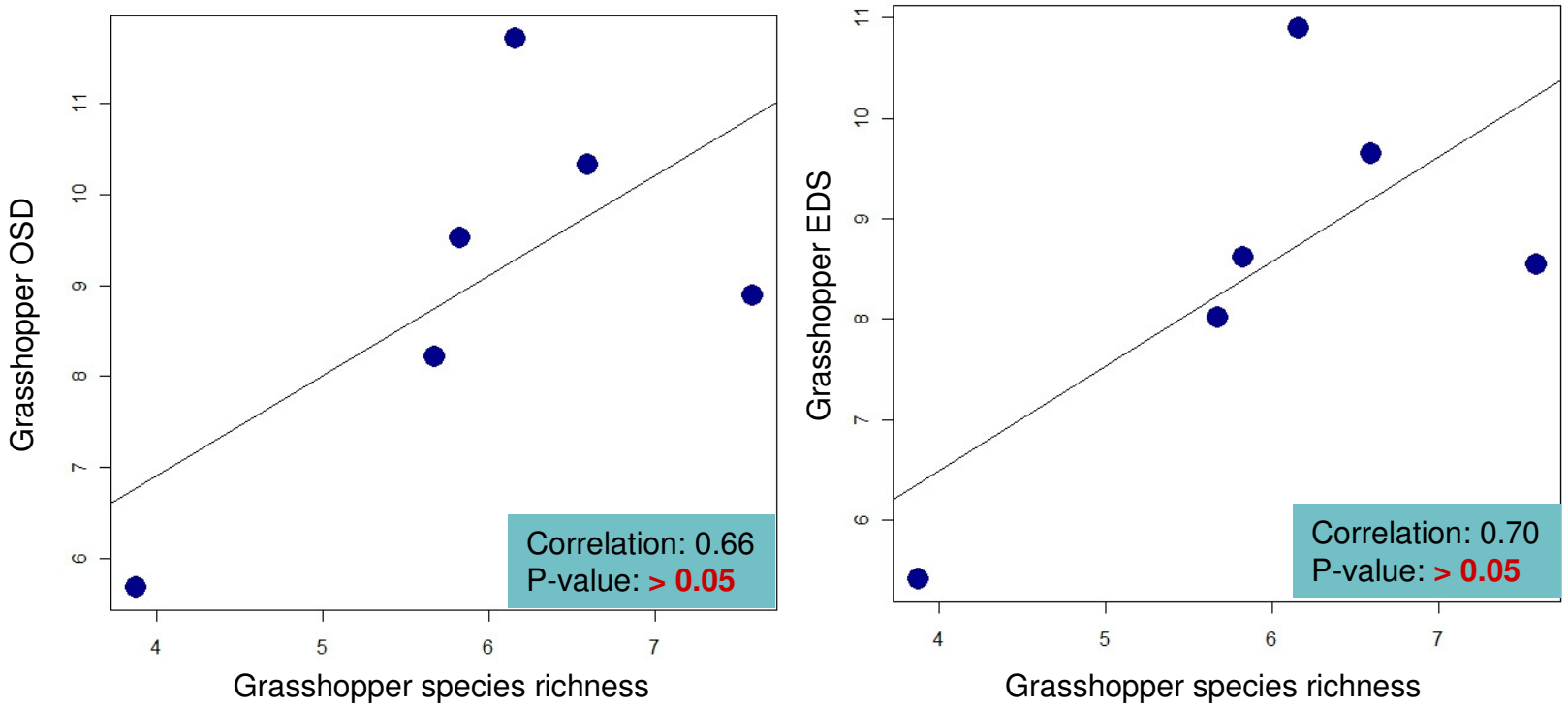




→ OSD: correlation value 0.39 > 0.39

→ EDS: correlation value 0.36 > 0.35

Results: Grasshoppers
Farm level



→ Only six farms

→ Despite high correlation values, non significant

Discussion

→ At the parcel level significant correlations between Salca-BD scores and field data for both groups, but lower correlation values for the grasshopper group

- Only 6 farms resp. 77 parcels;
- Fewer grasshopper species present on the parcels;
- Surrounding and history also play a major role.

→ At the parcel level both grasshopper OSD and EDS estimates showed significant correlations.

→ At the farm level positive significant correlation only for the grassland flora

- Farms recorded for the grasshopper group too few to detect statistical significance?

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Conclusions

→ Salca-BD limitations affect some organisms more than others

→ At the parcel level the results show that the method is appropriated to estimate the impact of agricultural activities for the groups grassland flora and grasshoppers.

- Suitable for investigation of the optimization of agricultural activities of a farm in regard to biodiversity and for comparison of farms with different production systems (Bio, IP,…) or different land uses
- Good prospects that the estimations are satisfying also for the other indicator species groups and the other habitat types (crops and semi-natural habitats)

→ At the farm level more research is needed to ascertain the results

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Thank you...

…to the ten landowners who permitted to carry out the study on their farms:

Mr. Amsler, Mr. Haltiner, Mr. Lenzin, Mr. Liechti, Mr. Marbot, Mr. Müller, Mr. Nussbaum, Mr. and Mrs. Rotschi, Mr. Schmid, and Mr. and Mrs. Studer.