



# Combining the impact on biodiversity of agricultural management practices at local scale with land use at global scale

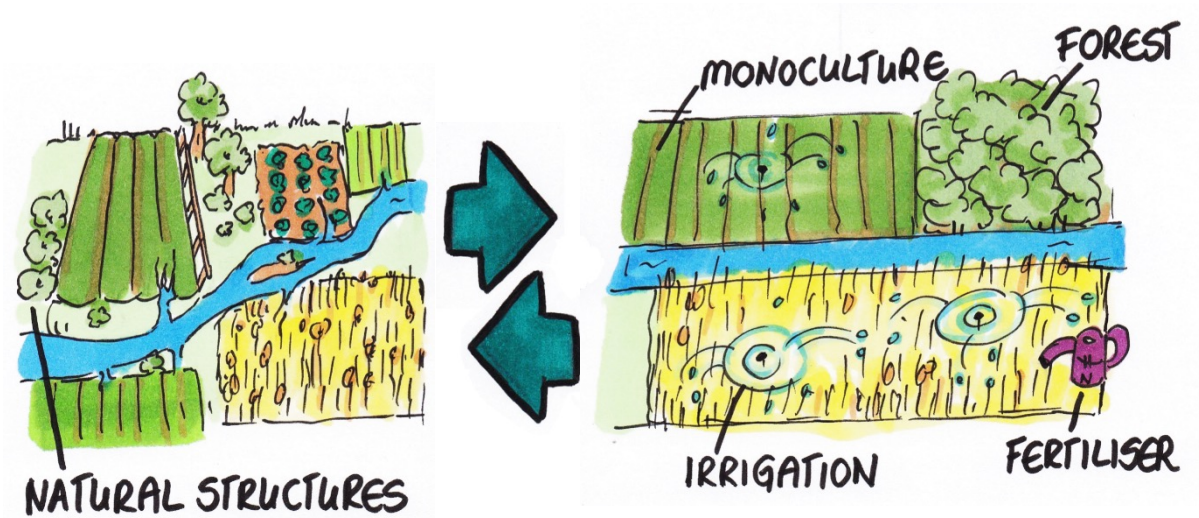
Maria Bystricky, Philippe Jeanneret

87<sup>th</sup> LCA Discussion Forum, September 3, 2024

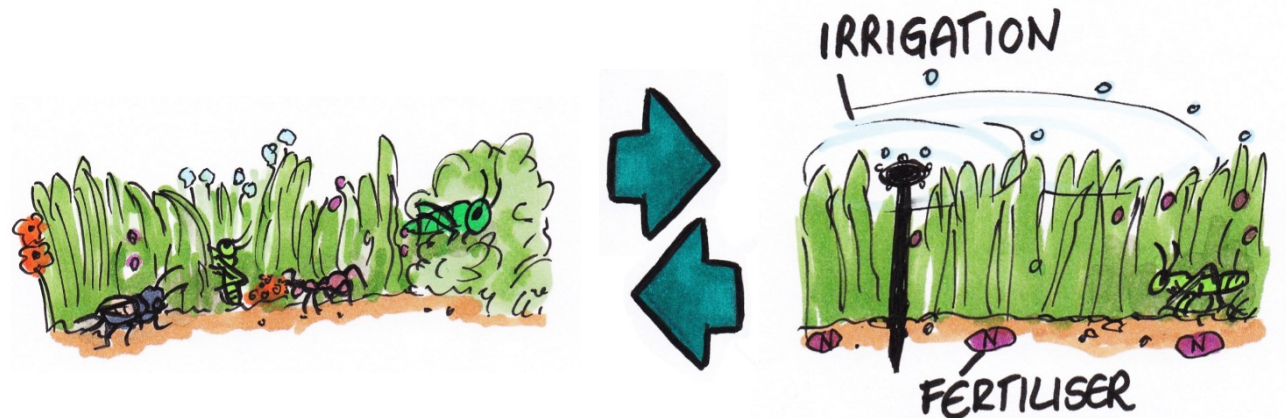


# Background

- Biodiversity impact of agriculture is influenced by land use (habitat) and management intensity

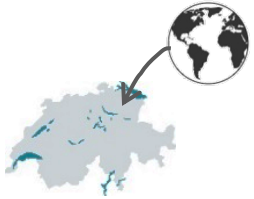


- Global land use biodiversity method recommended by GLAM does not sufficiently go into detail





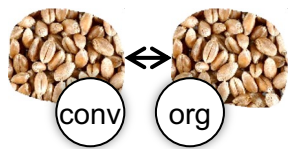
# Research questions that need to be addressed



- What is the Swiss agricultural sector's impact on biodiversity when policy measures are changed?
  - Example: promoting pesticide-free agriculture



- What is a farm's impact on biodiversity when management decisions are changed?
  - Example: fewer pesticides, other crops, other feedstuff



- What is a product's impact on biodiversity compared to another product?
  - Examples:  
animal-based foods compared with plant-based foods,  
conventional compared with organic products

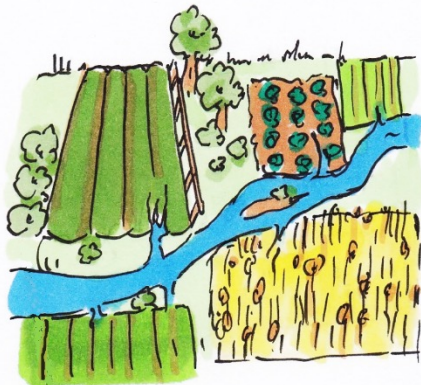


# Method biodiversity score (SALCA-biodiversity)

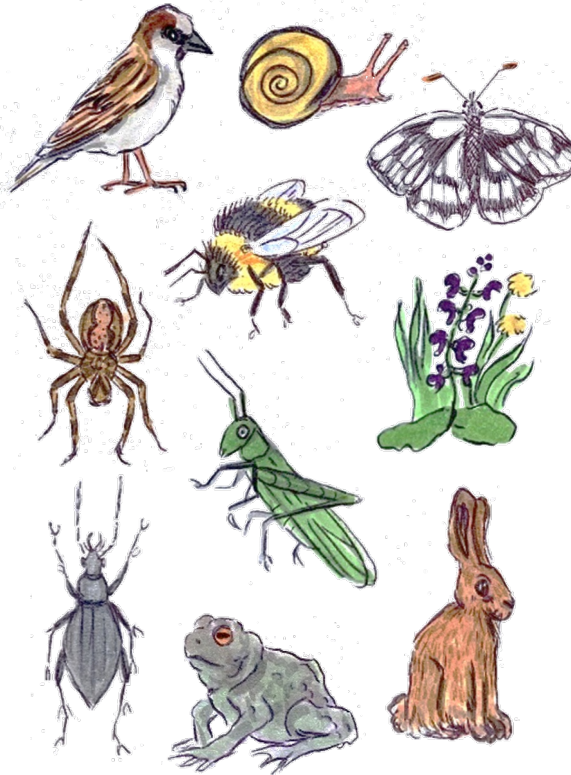
Management options



Habitat



Effect on 11 indicator species groups



Score per indicator species group

3.8

9.1

15.2

7.0

6.4

6.8

7.3

6.9

2.1

7.4

5.4

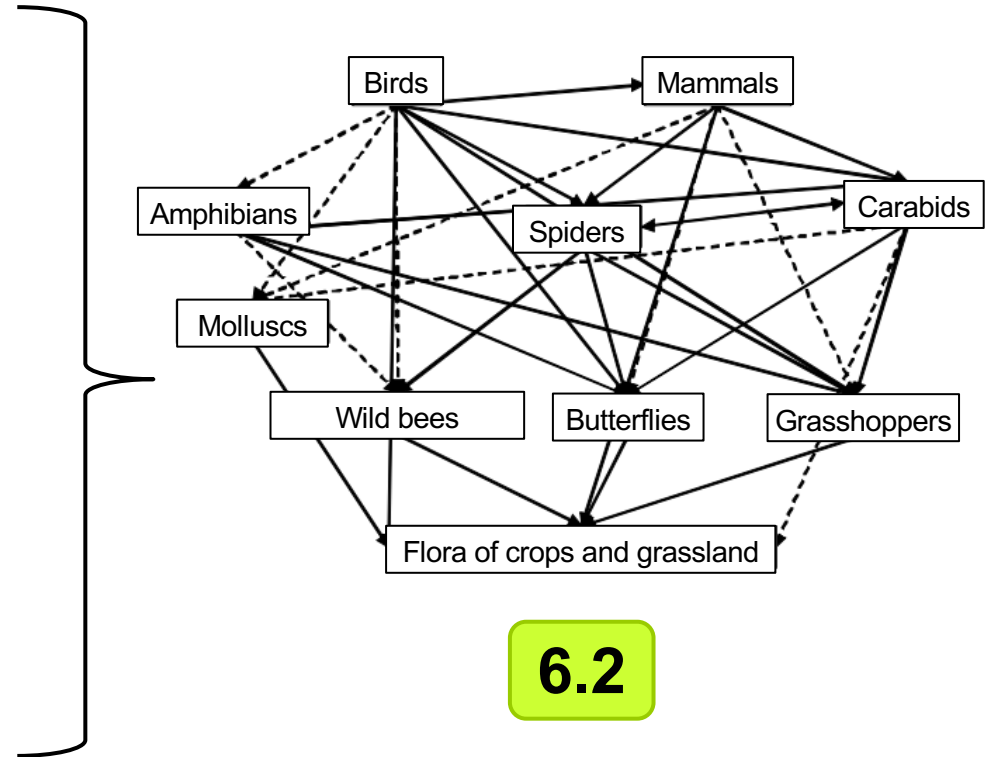


# Method biodiversity score (SALCA-biodiversity)

Score per indicator species group

Aggregation: overall score per crop

- 3.8
- 15.2
- 6.4
- 7.3
- 2.1
- 5.4
- 9.1
- 7.0
- 6.8
- 6.9
- 7.4



Species group	Weighting factor
Flora of crops	10.0
Flora of grasslands	8.5
Spiders	6.8
Carabids	6.8
Wild bees	6.4
Butterflies	6.0
Molluscs	5.3
Birds	5.1
Grasshoppers	5.0
Small mammals	4.1
Amphibia	3.1



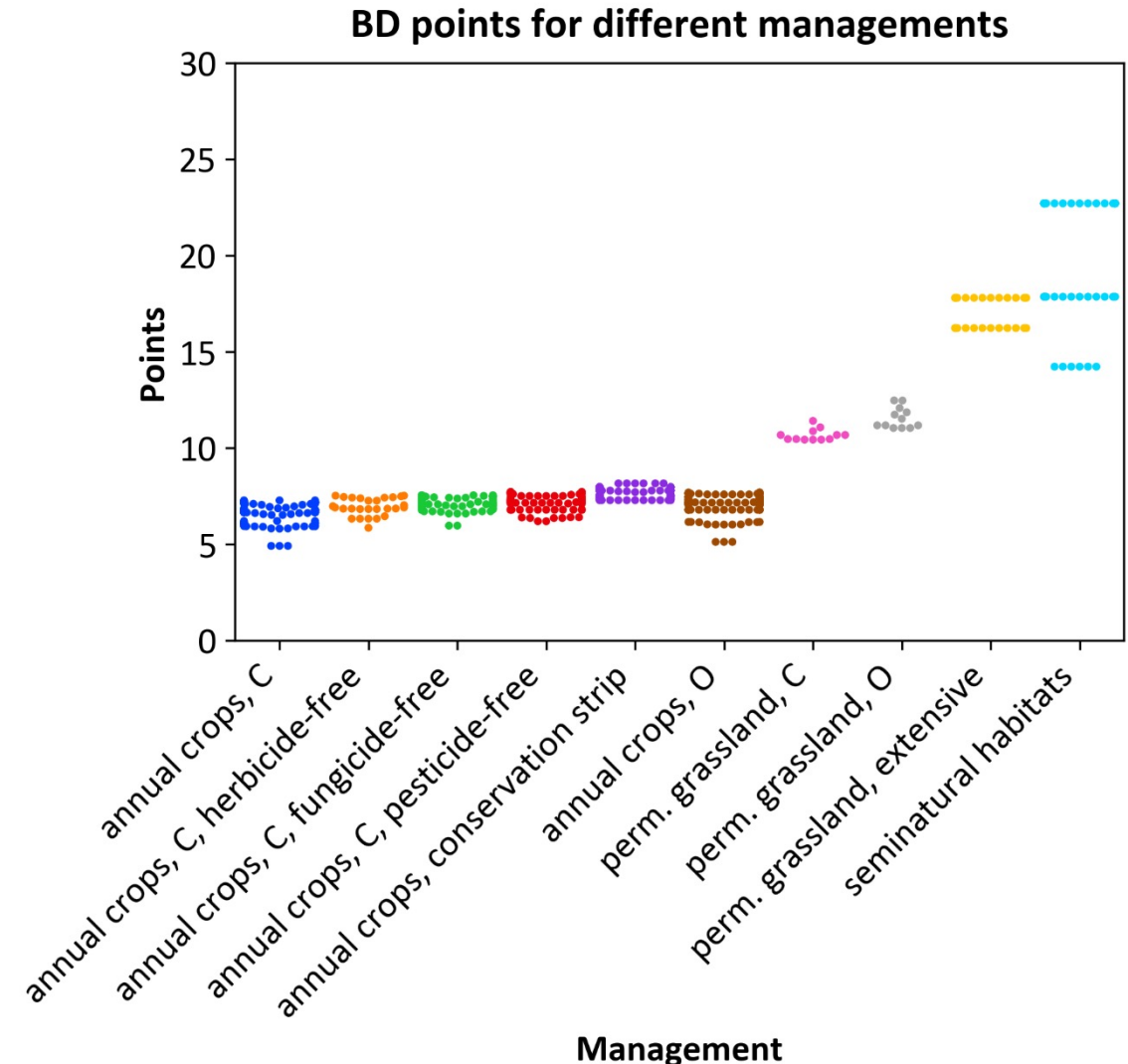
# BD points for crops and management intensities

Values taken from 601 LCI datasets that describe standard crop production in Switzerland.

BD points available for

- 41 annual crops, grassland types and seminatural habitats
- different management regimes and regions

Each dataset was allocated to one of the land use classes from Scherer et al. (2023)



C: conventional; O: organic

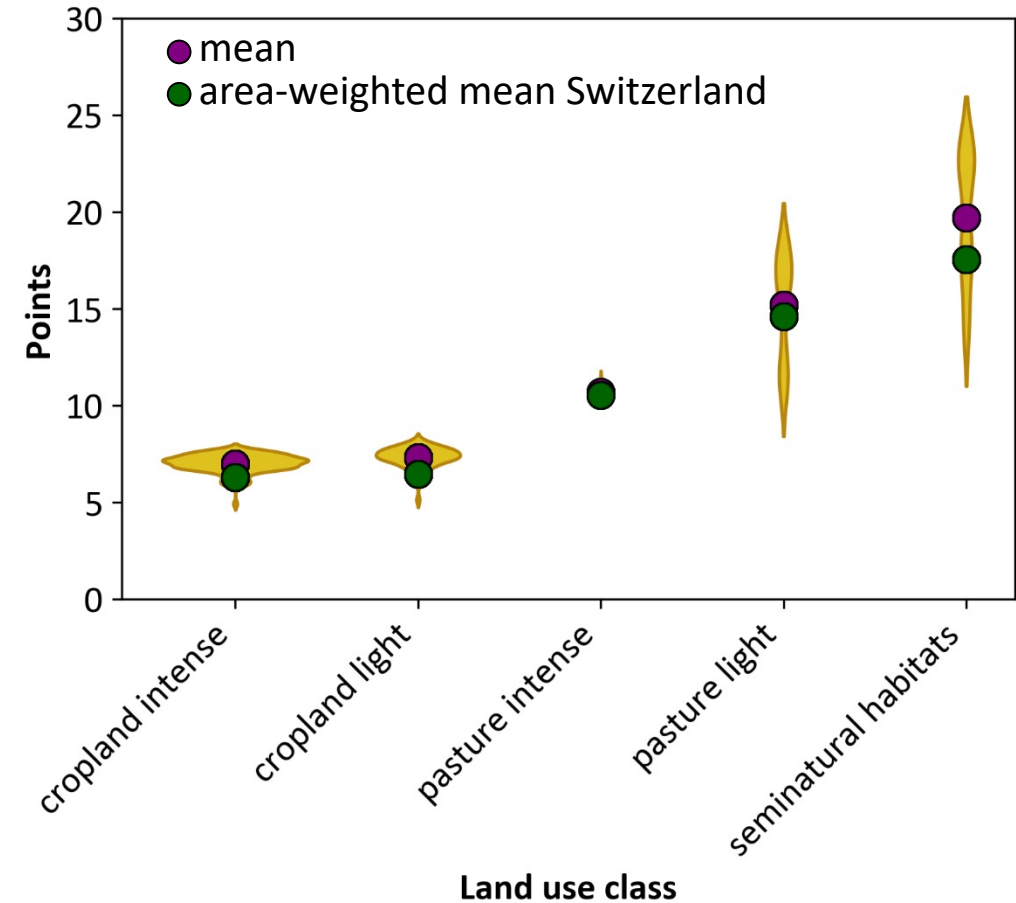


# BD points for crops and management intensities

Land use class <sup>1)</sup>	Management intensity
Cropland intense	Annual crops: Conventional, fungicide-free, herbicide-free, pesticide-free
Cropland light	Annual crops: Organic, conservation strips
Pasture intense	Permanent grassland: Intensive, medium-intensive, low- intensive
Pasture light	Permanent grassland: Extensive, organic
Mean of Cropland minimal Pasture minimal	Seminatural habitats: Annual and perennial wildflower strips, field margins, reeds and bog area

<sup>1)</sup>as proposed by Scherer et al. (2023)

Distribution of BD points with mean and area-weighted mean





# Biodiversity loss through land occupation: Adaptation of CFs by management effect

## Method:

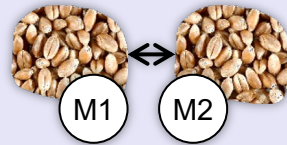
Biodiversity points:

$$\text{Deviation} = \text{BDpoints}_{\text{land use class}} / \text{BDpoints}_{\text{crop, management}}$$

CFs for land occupation in Switzerland from Scherer et al. (2023):

$$\text{CF}_{\text{Occ, CH, corrected SALCA}} = \text{CF}_{\text{Occ, CH}} * \text{Deviation}$$

## Example for application:



Species loss of a specific crop and management in Switzerland, per kg of product:

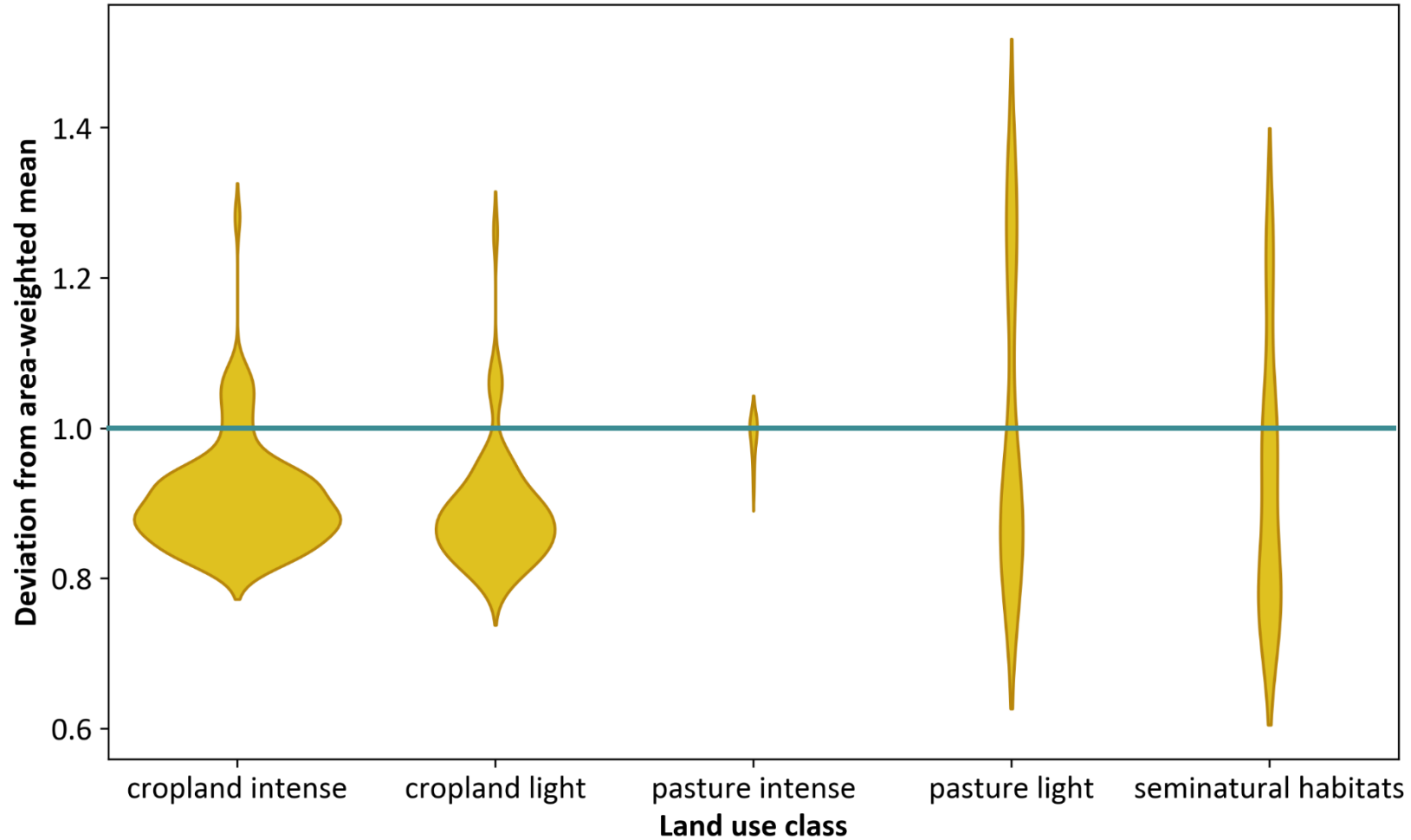
$$\text{PDF}_{\text{crop, management}} = \text{CF}_{\text{Occ, CH, corrected SALCA}} * \text{land occupation}_{\text{crop, management}}$$





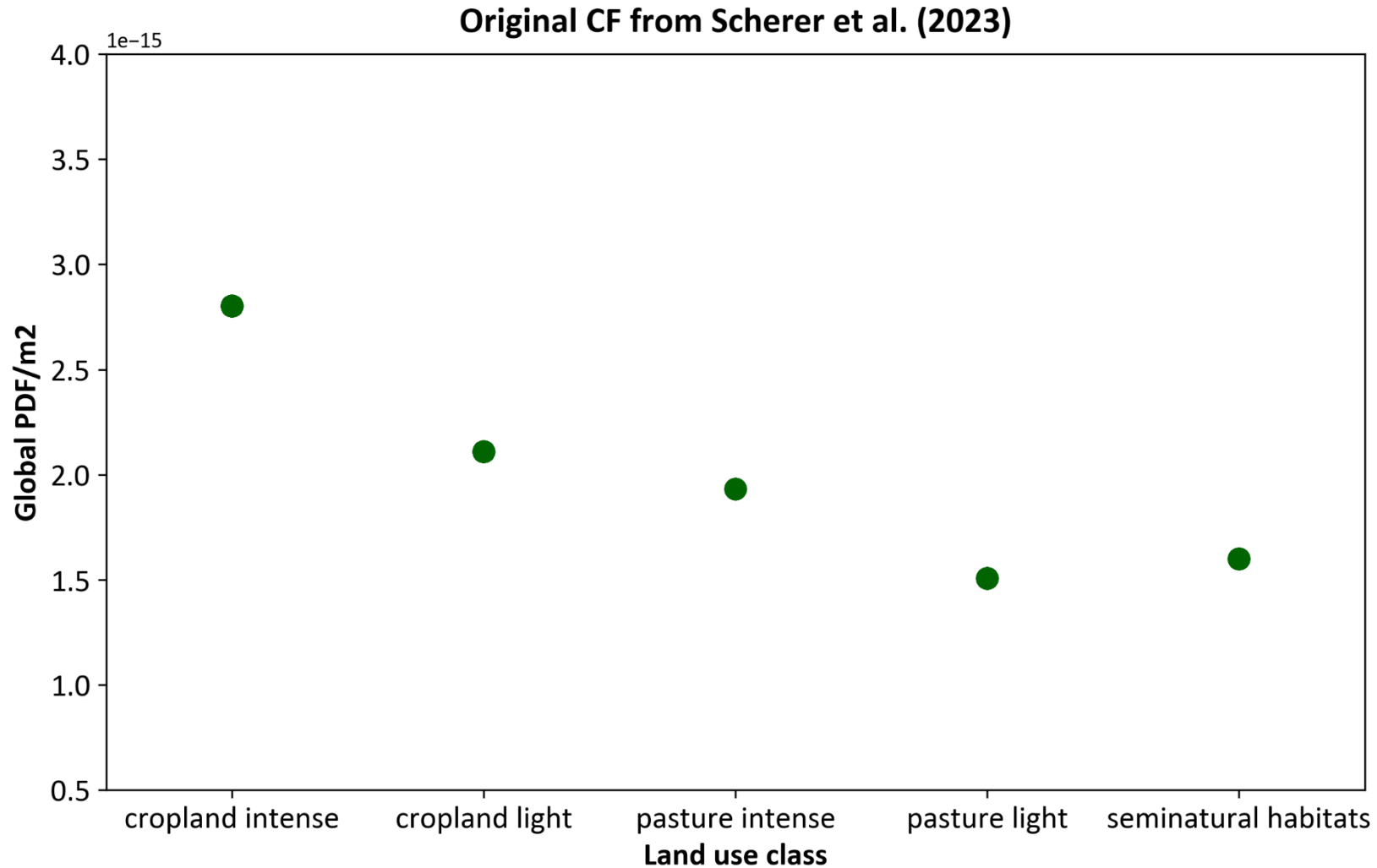
# Biodiversity points: Distribution of Deviation

Deviation of BD points from area-weighted mean



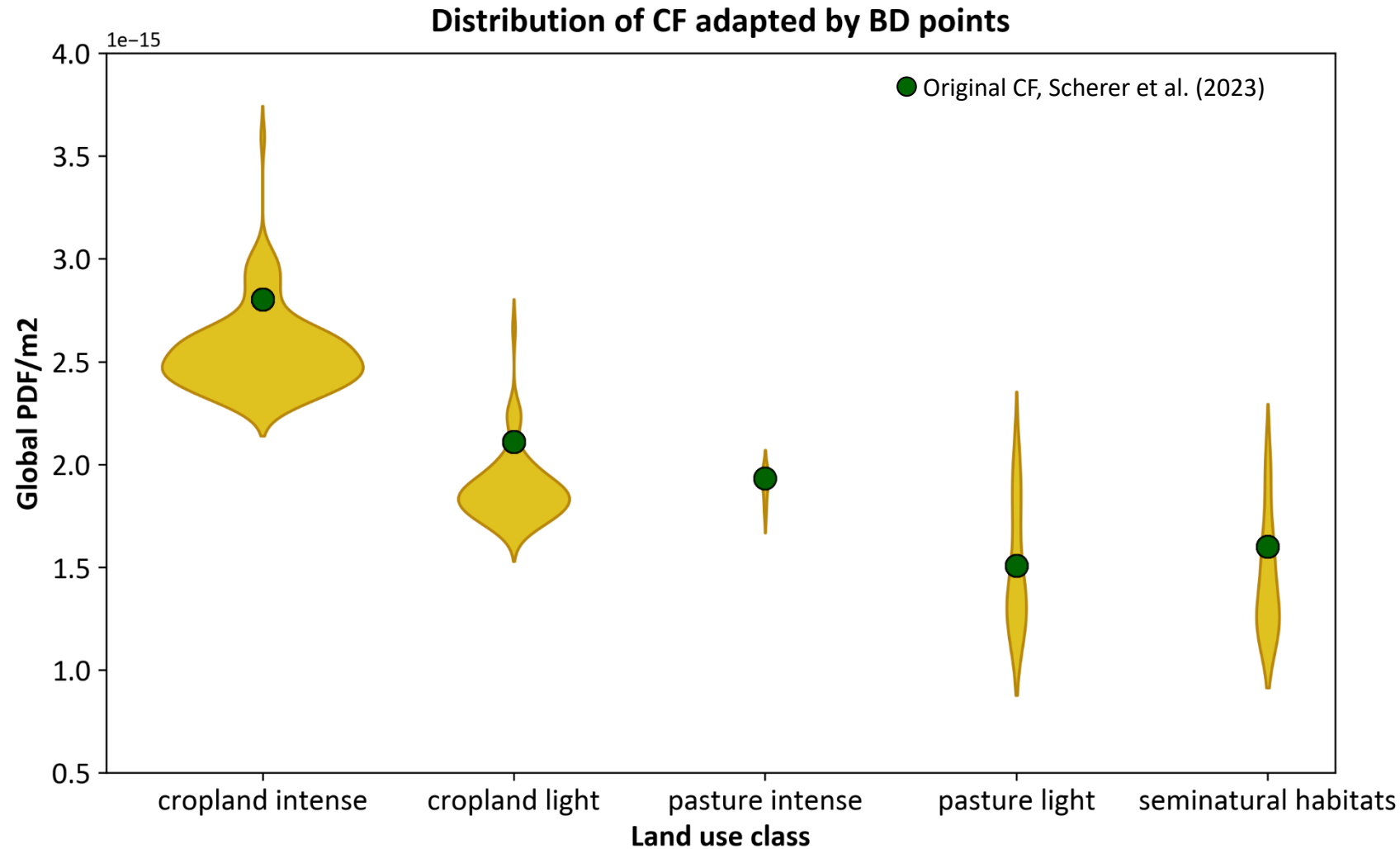


# Biodiversity loss through land occupation: CFs for Switzerland



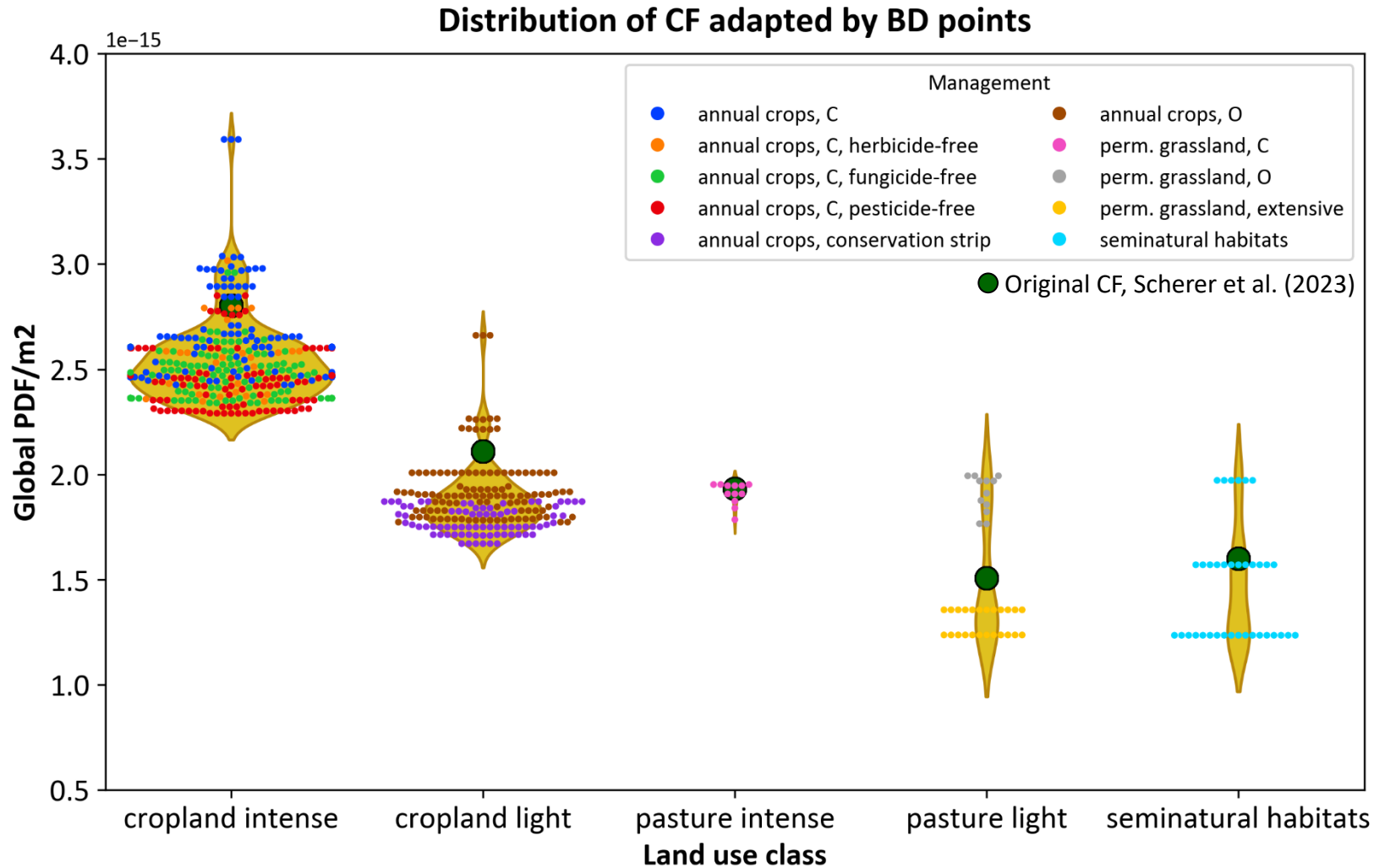


# Biodiversity loss through land occupation: CF adaptation by crop and management effect





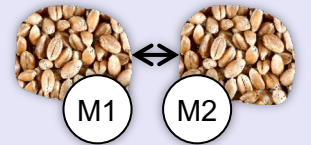
# Biodiversity loss through land occupation: CF adaptation by crop and management effect



## Example for application:

$CF_{corrected} * \text{land occupation}$

Winter wheat



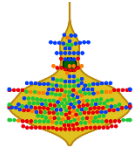
Management	PDF/m <sup>2</sup> (10 <sup>-15</sup> )	PDF/kg (10 <sup>-15</sup> )
Conventional	2.89	3.34
Conventional, pesticide-free	2.38 (factor 0.8)	3.97 (factor 1.2)
Conservation strip	1.67 (factor 0.6)	6.42 (factor 1.9)



# Conclusions and outlook

- Important to go more into detail, as biodiversity impact differs for crops and managements
- Variability within one land use class can be considerable
- Our approach evaluates species loss of the foreground system in more detail and enables a combination of foreground and background systems

## Outlook:



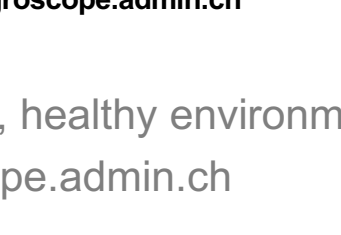
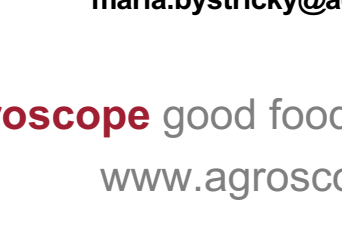
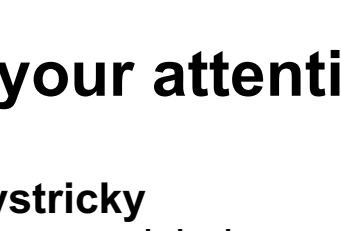
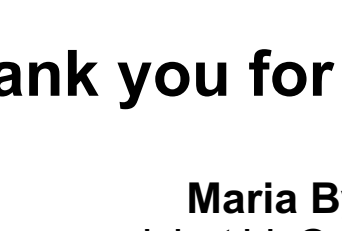
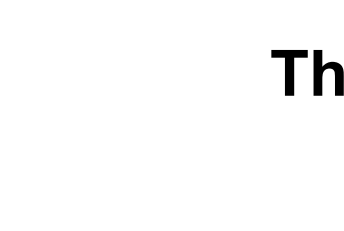
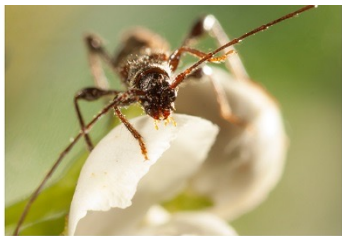
- Repeat analysis with other dataset:  
BD points from around 300 Swiss farms, available for each field



- Test the effect of different management intensities at farm level



- Test the effect of «extensifying» policy measures at sector level
- In both cases: What is the actual effect of correcting the CF when considering the overall species loss including imported goods?



**Thank you for your attention**

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