SoilMan

Ecosystem services of soil biota in agriculture

biodiversa

Outcomes from the first year of SoilMan

Deborah Linsler

Stakeholder-Workshop, 27 February 2018, Brussels

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Outline

Project structure

- Farm-based management practices relevant to SoilMan
- Case study regions

Meetings with farmers in Germany, Spain, France, Sweden, Romania

- Focus group, questionnaire, card ranking
- Take away messages from the focus groups

Long-term field trials

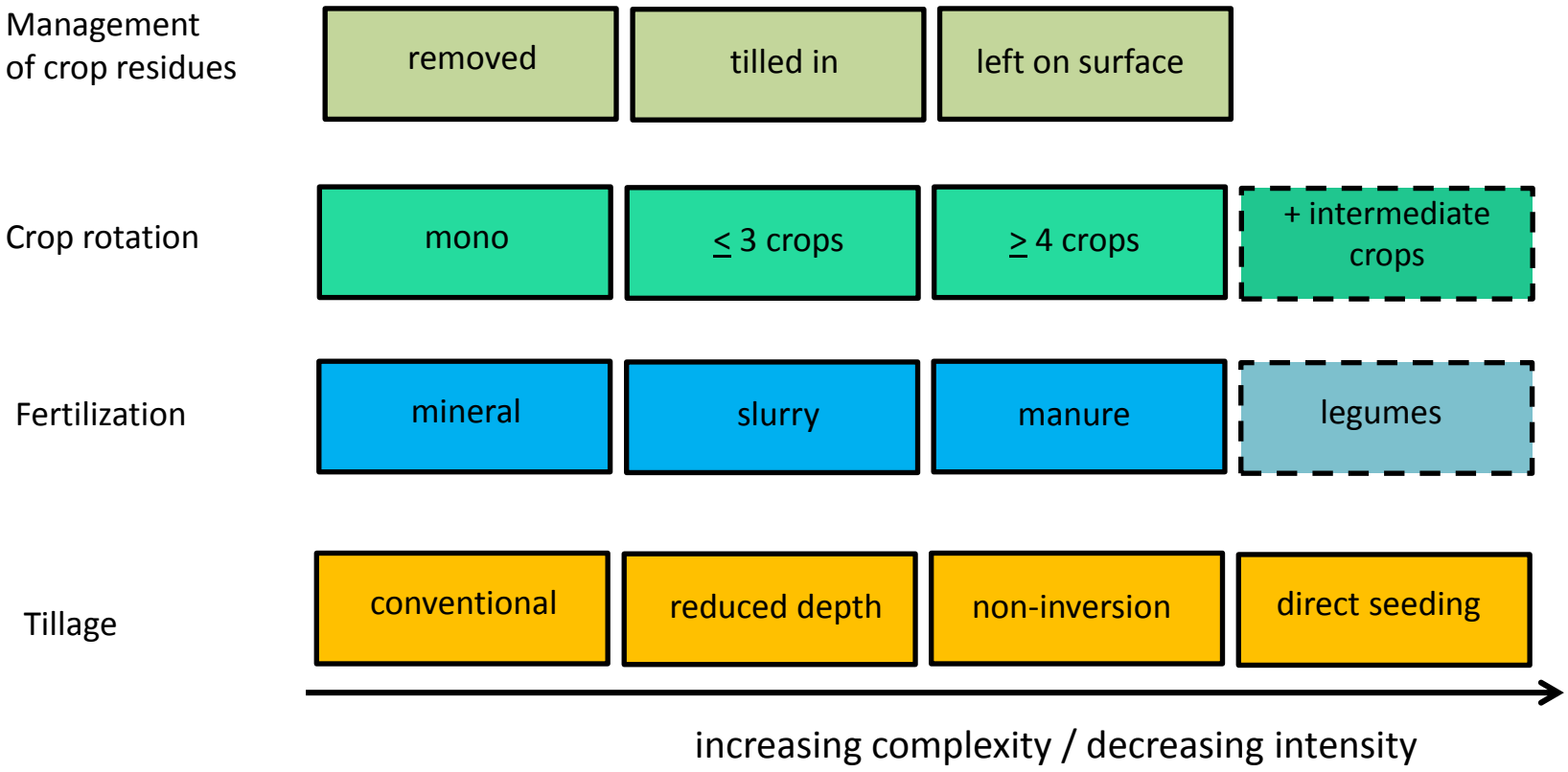
- Organisation
- Sampling and first outcomes

Field network

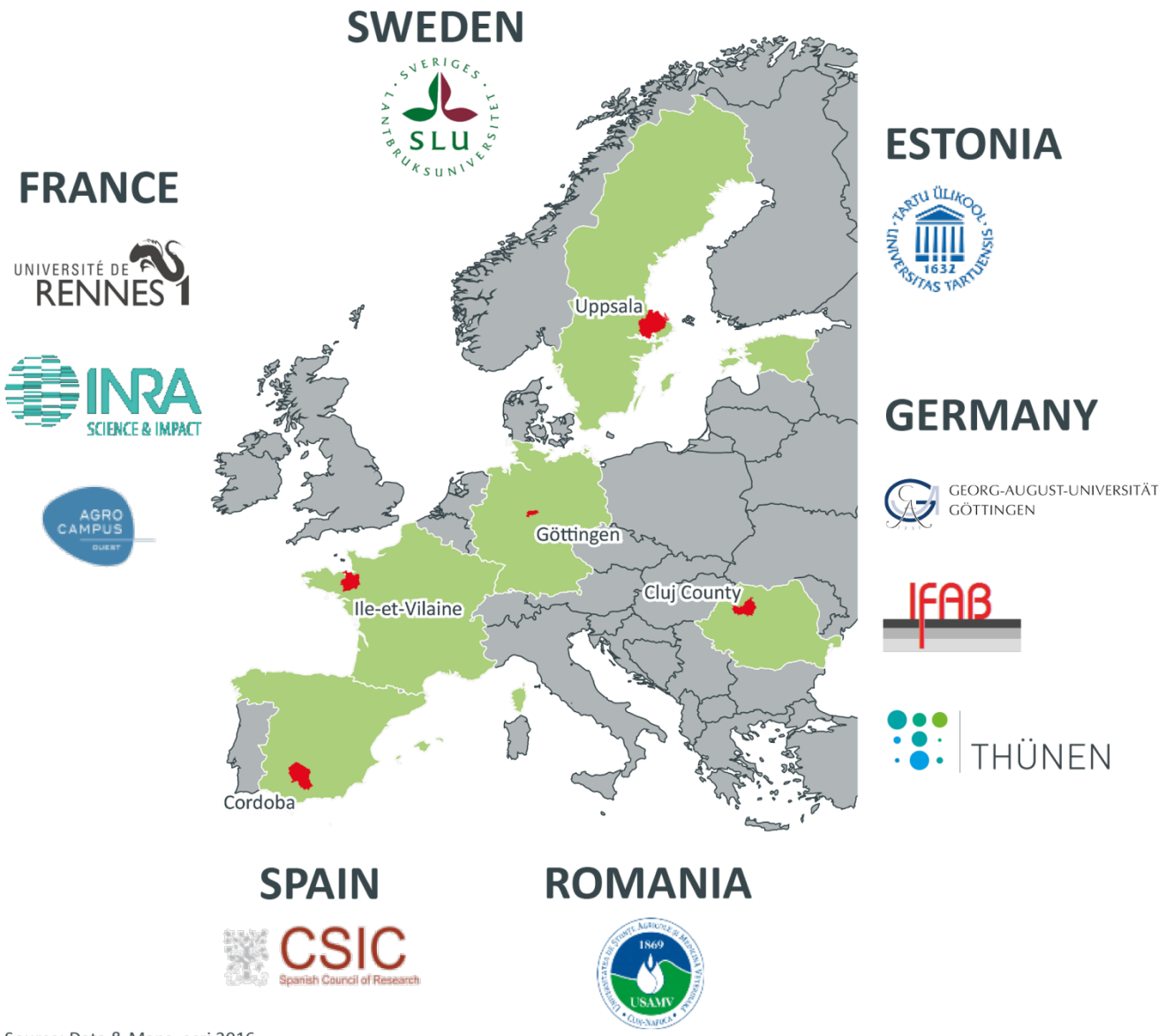
The SoilMan project

- conducts **a systematic ecological, economic and political assessment** of soil biodiversity in typical European agricultural systems
- assesses the **impact of soil management practices** on the provision of ecosystem services by soil organisms
- identifies indicators to **quantify soil functions and** multiple soil-related **ecosystem services** in different biogeographic regions in Europe
- provides ways how to **incentivise farmers to better protect soils** and shows how to further **valorise soil-based ecosystem services** through policy
- develops **recommendations for the agricultural sector** on sustainable soil management practices to make the best use of soil biota with regards to profitability and societal demands

On-farm management practices



Project partners



Case study regions

Wheat fields
in winter time

Göttingen / Lower Saxony, Germany

Cordoba / Andalusia, Spain

Uppsala, Sweden

Ile-et-Vilaine / Brittany, France

Turda / Cluj, Romania

Focus groups

Discussions with groups of farmers

Organised in collaboration with regional farmers‘ organisations

Focus groups are an open exchange with 6 to 16 farmers based on specific questions targeting:

- Crop production (crop rotations, (temporary) grassland, cover crops, changes over the last 10 years)
- Soil management and fertilisation
- Agricultural policy (constraints, agri-environmental measures)
- Future of crop production (chances, possibilities and risks)

Focus groups

Questionnaire

All participants were asked to fill out a questionnaire providing details about their farm on an anonymous basis

Card ranking

Each focus group was asked to rank cards with terms under the headings: management practices, soil functions, ecosystem services

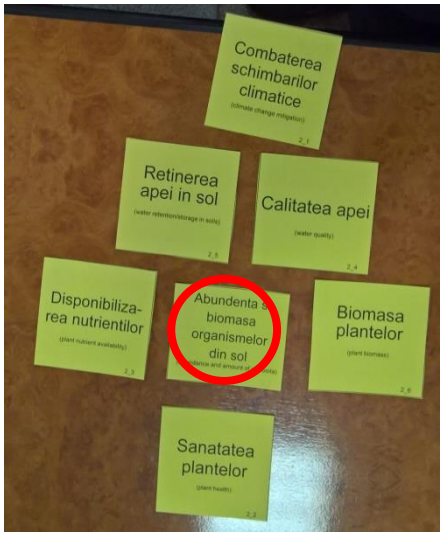
Focus groups

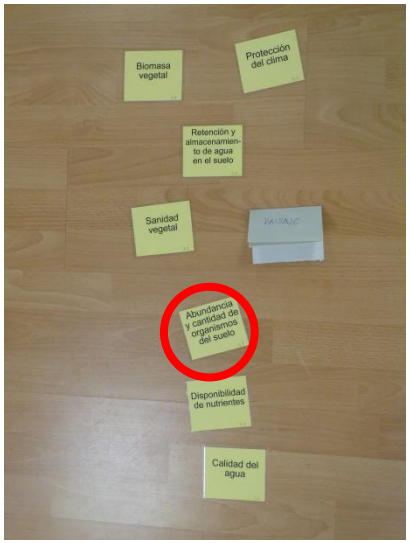
Card ranking – Introductory questions

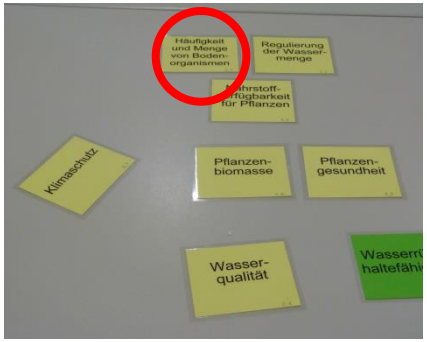
Please rank the management practices by taking into account their beneficial effects on soil life?

If you are looking on your own soil(s), which soil function is of particular importance, when thinking about soil life / soil fertility?

In your opinion, which of the ecosystem services are most associated with life in soils / soil fertility?







Take away messages from focus groups

- Crop rotations are often recognized as too narrow, but economic constraints hamper shift to additional crops
- Growing area of wheat is mainly limited by agronomic reasons (disease pressure, work load, sowing period)
- Many farmers apply reduced ploughing frequency and / or depth of ploughing over the last years
- Today farmers focus more on crop needs and crop management; precision farming gets more important
- Several farmers are engaged in agri-environmental measures

Messages from farmers about soil biodiversity

- Addressing soil biodiversity is difficult – you can't see it
- Microorganisms are also soil management engineers
- Detoxification is an automatic process of the soil
- Earthworms are fed with cover crops and organic fertilisers
- More biodiversity means also a higher occurrence of pathogens and diseases
- There are plenty of earthworms thanks to shallow non-inversion tillage, you can find them everywhere in autumn
- Weather is by far the most important factor for on-farm decisions compared to soil biota

Long-term field experiments

Country	Tillage	Rotation
Sweden	Uppland	Ångermanland
Germany	Garte Süd	
Romania	Turda	
France	Effel	Lusignan
Spain	La Hampa	

Field sites

Tillage		Tillage depths
Conventional tillage	Plow	25 – 30 cm
Minimum tillage	Rotary harrow, chisel, cultivator	6 – 12 cm
No-tillage		Max. 4 cm

Rotation	
Mostly annual crops	Permanently annual crops One year of grassland
Short-term grassland	Three years of grassland
Long-term grassland	Five years of grassland Six years of grassland

What will/have we measured?

Soil biota

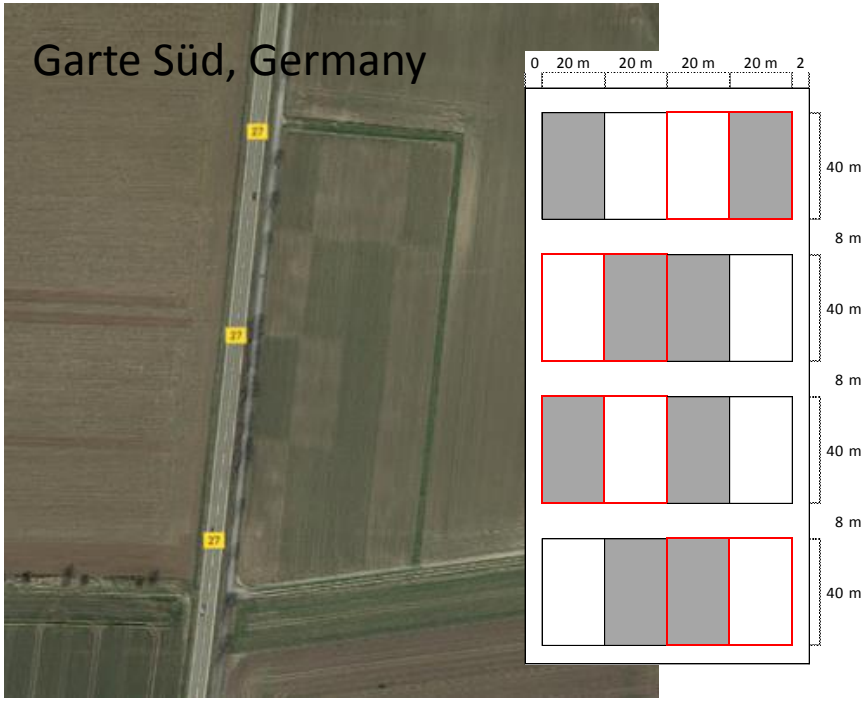
- Earthworms
- Gastropods
- Collembolans and mites
- Enchytraeids
- Fungi
- Bacteria
- Microbial biomass
- Microbial functional diversity
- Genetics of earthworms and gastropods

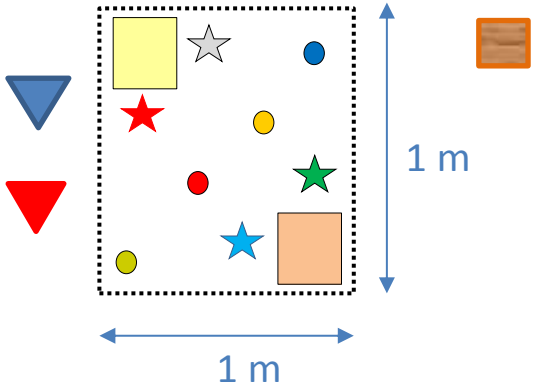
Soil parameters (related to ecosystem services)

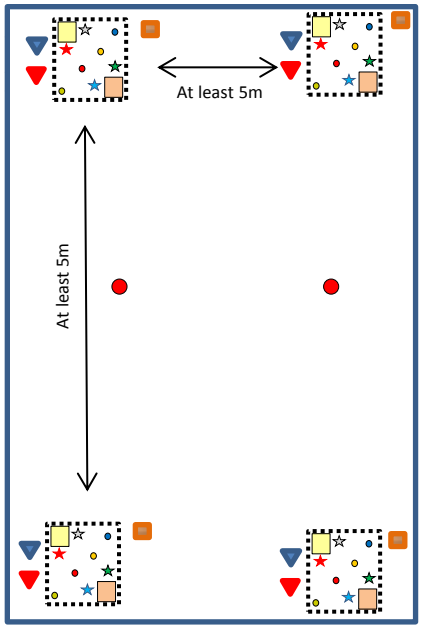
- Aggregate stability
- Infiltration rates
- Decomposition of organic material
- Pathogen suppression

Parameters

- Gastropods
- Earthworms
- Enchytraeids
- Collembolans and mites
- Bacteria and Fungi
- Microbial biomass
- Microbial functional diversity
- Soil chemical analysis
- Aggregate stability
- Soil physical analysis
- Soil suppressiveness
- Infiltration measurement







Sampling earthworms

Hole: 25 x 25 cm
Soil out of the hole was taken for handsorting
AITC solution (10 L) was filled in the hole and all earthworms coming to the surface were collected

Sampling enchytraeids

Soil corer ⌀ 5 cm
Sampling in 5 cm steps in 0-30 cm
Extraction in the lab
Evaluation of the Enchytraeids with microscop

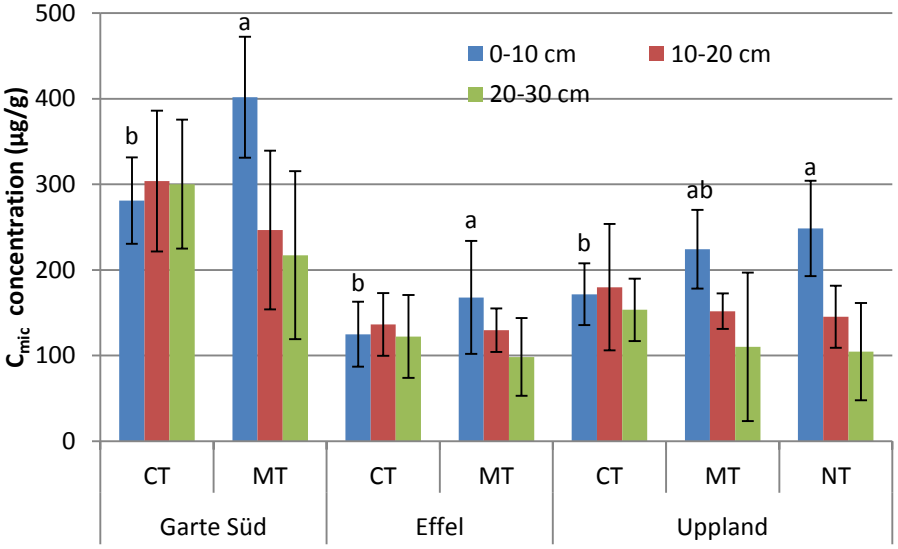
Sampling for microbial biomass

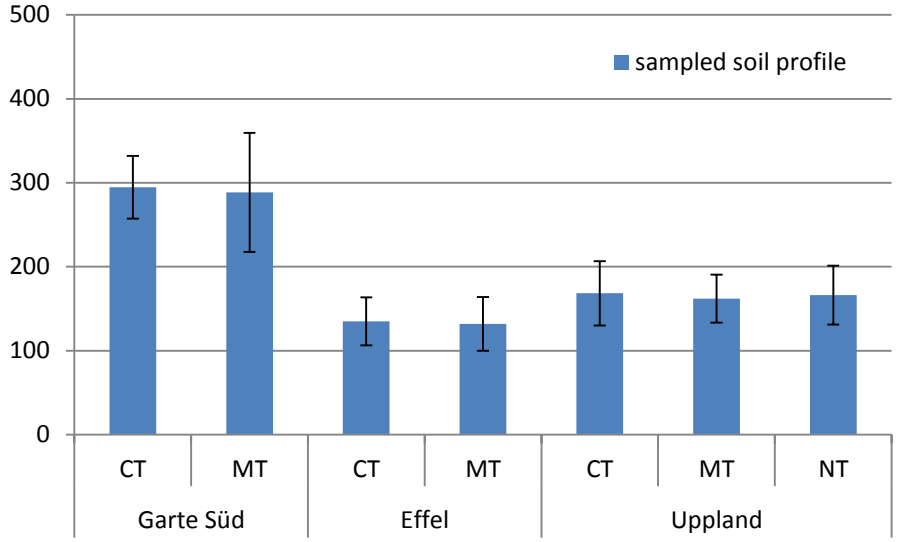
Soil corer ⌀ 5 cm
Sampling in 10 cm steps in 0-30 cm
Analysis with Chlorofom-Fumigation-Extraction

I. Schmoock

Results microbial biomass

Tillage

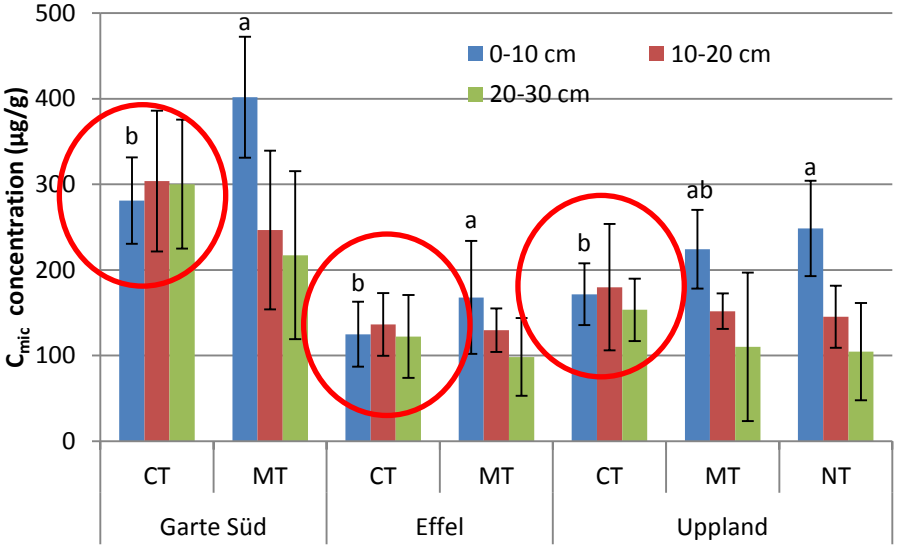


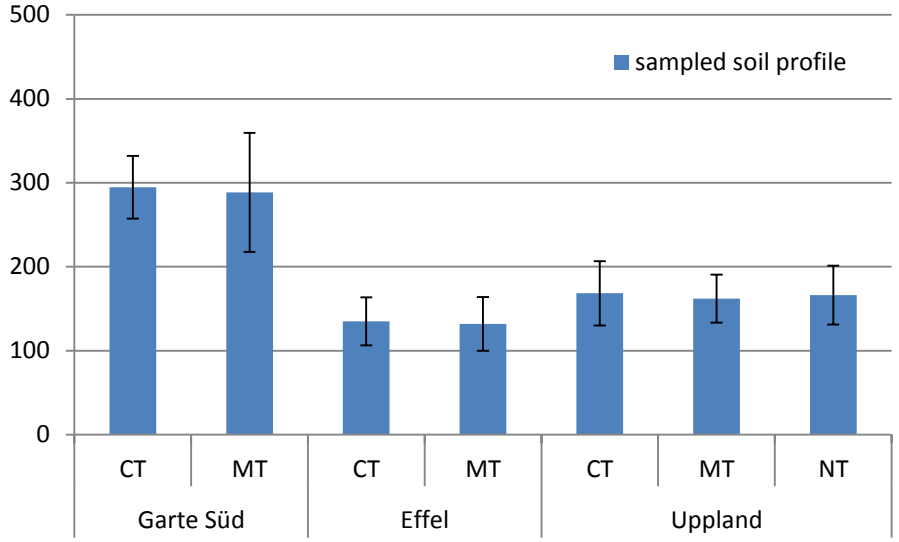


CT – Conventional tillage
MT – Minimum tillage
NT – No-tillage

Results microbial biomass

Tillage





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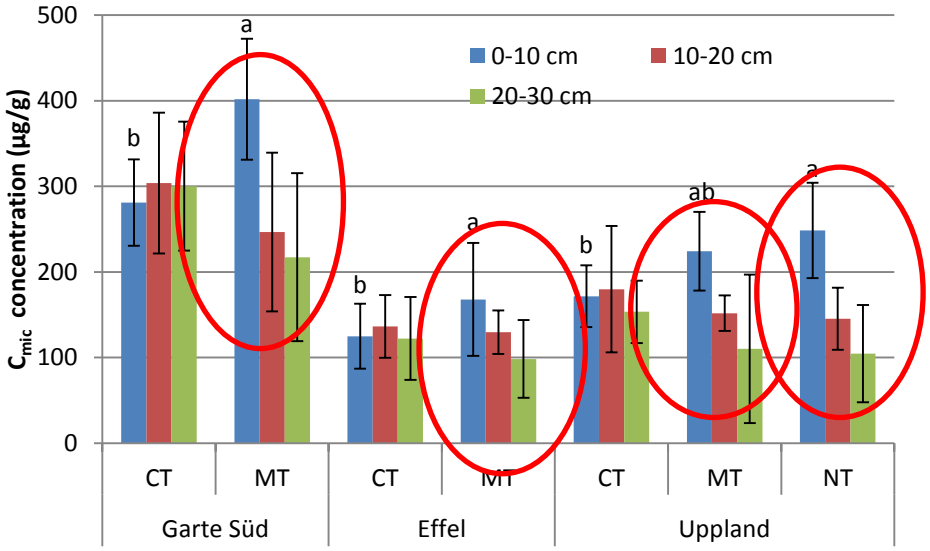

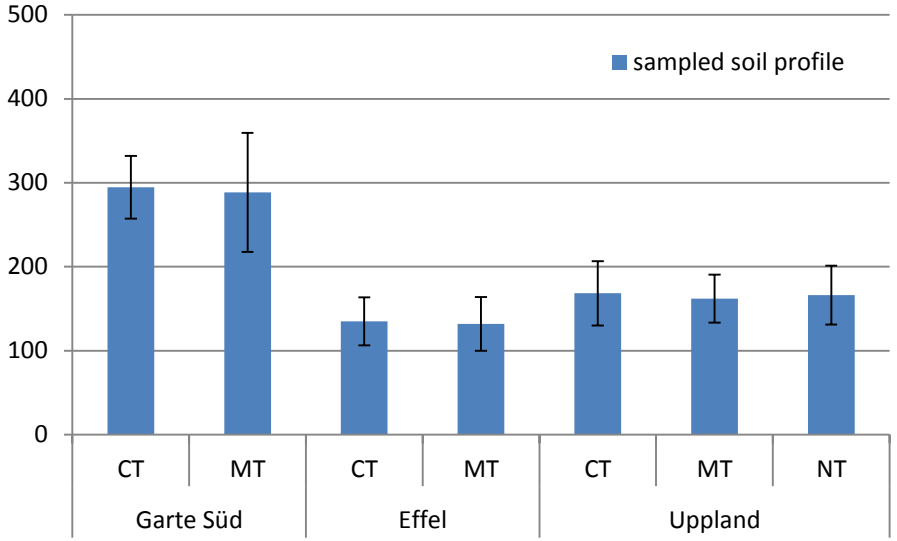

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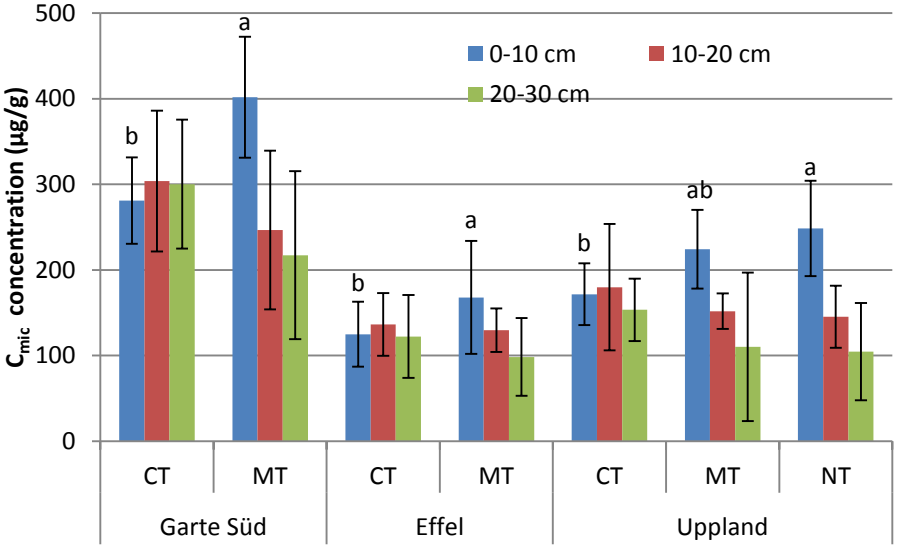

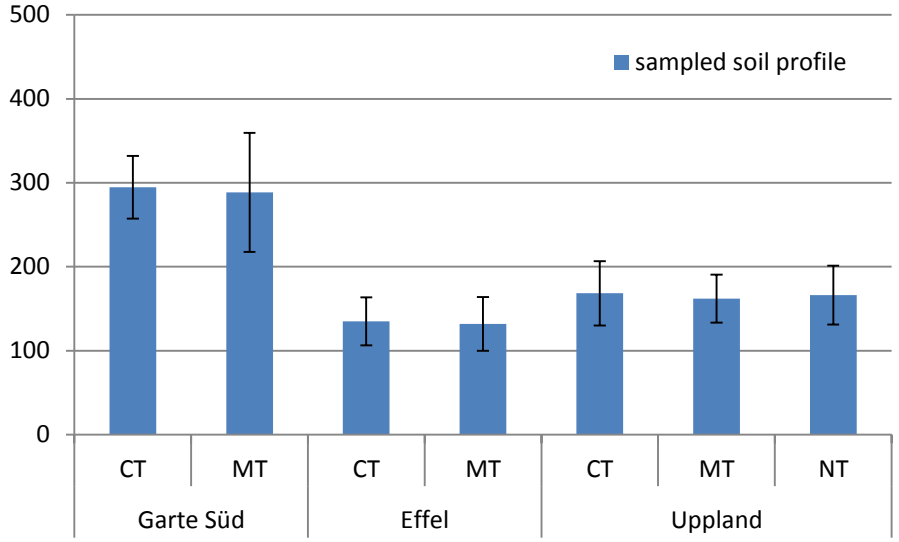

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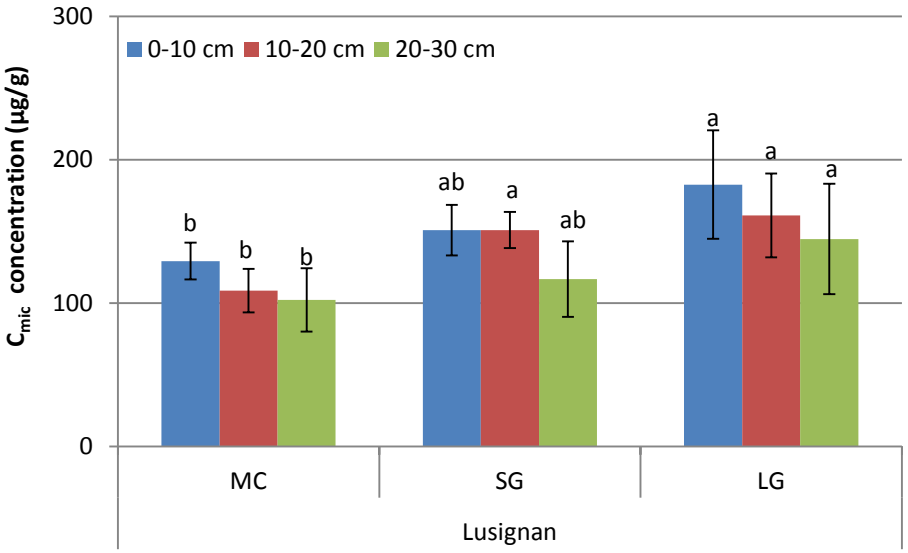
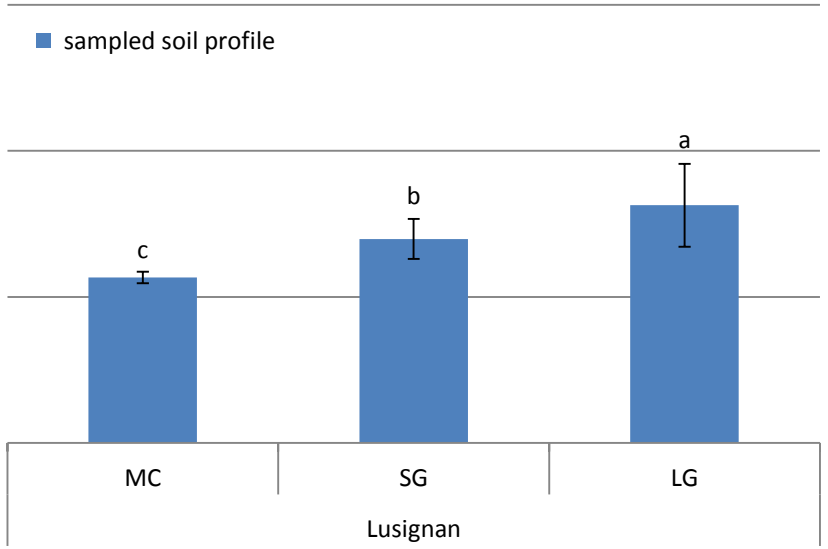
Results microbial biomass

Rotation





MC – mostly annual crop
SG – Short-term grassland
LG – Long-term grassland

To compare systems: The field network

Compare minimum and conventional tillage systems to make conclusions about reduced tillage in the “real world”.

Compare conventional, short-term organic and long-term organic farming systems.

The systems often differ in diseases (use of pesticides), crop rotations, crop varieties, tillage…

Tillage:
12 fields in France
14 fields in Romania

Organic farming:
16 fields in France
16 fields in Sweden

Thank you for listening!

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