EGU General Assembly 2020 Online, 4-8 May 2020
SSS9.4 Challenges for competitive and sustainable EU-China agricultural systems
under increasing pressures on soil and water resources

Policy scenarios for agriculture that enhance soil ecosystem services in Europe and China

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Introduction

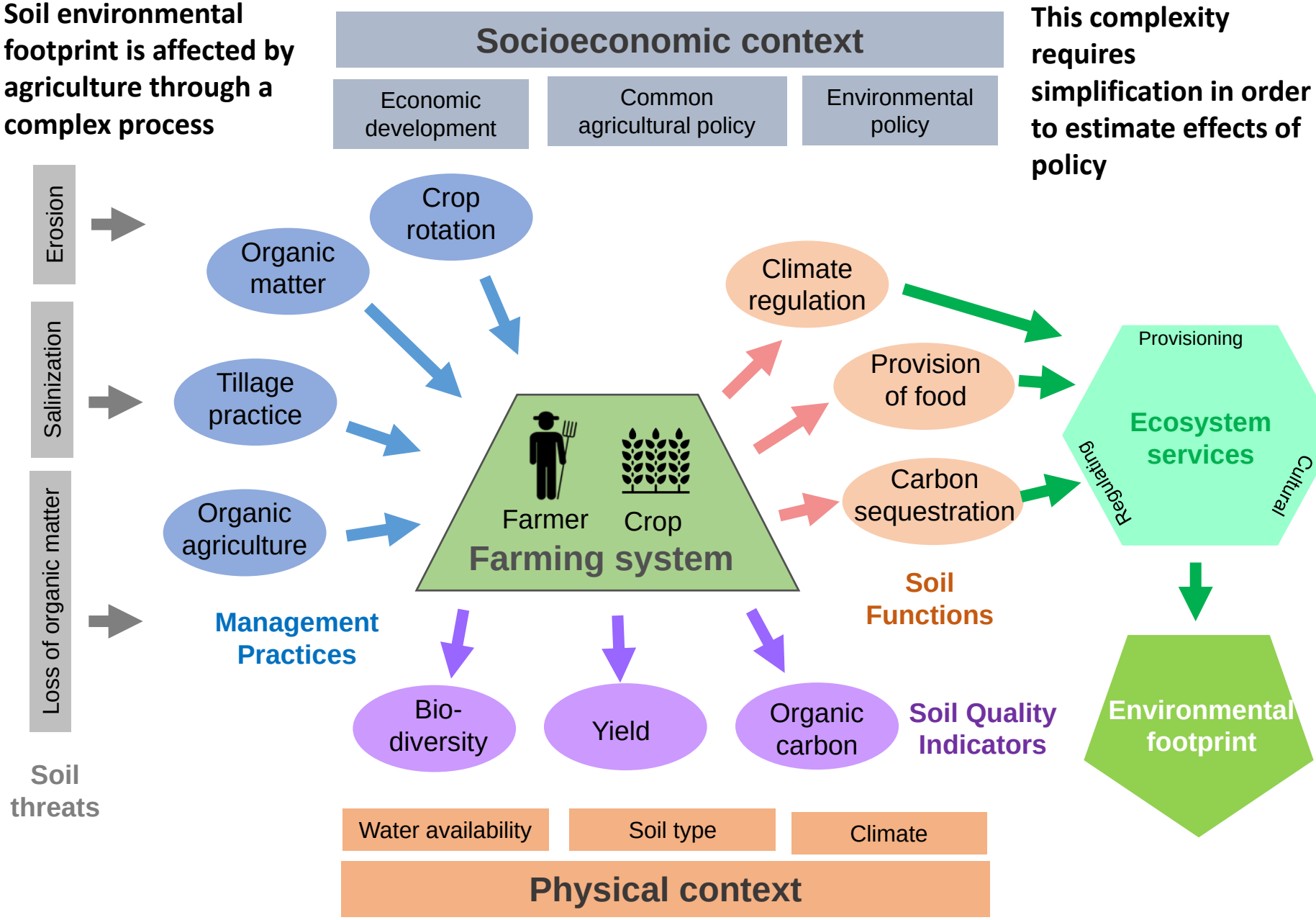
- **Agricultural management practices (AMPs)**
  - Are influenced by policy decisions
  - Affect soil environmental footprint

- **Develop policy scenarios**
  - Multi-actor approach to capture different views
  - Formulation in operational terms: implementation of AMPs
  - Three policy scenarios, focused in Europe and China

- **Estimate effect of scenarios at continental scale**
  - Upscaling model: from local to continental effects
  - From AMPs to soil quality indicators to soil environmental footprint

A complex system

Soil environmental footprint is affected by agriculture through a complex process



This complexity requires simplification in order to estimate effects of policy

Multi-actor approach for policy definition

Multi-actor approach accounts for a variety of factors influencing policy design

Institutions

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Politics

Government

CAP

Stakeholders

Farmers

Finance

Science

Technology

Suppliers

Scenario identification

Scenario 1 – Expected

Based on current societal trends and policies

Maintains the observed tendency in the implementation of beneficial agricultural management practices

Scenario 2 – Regional Targets

Targeting policy intervention to the most degraded soils

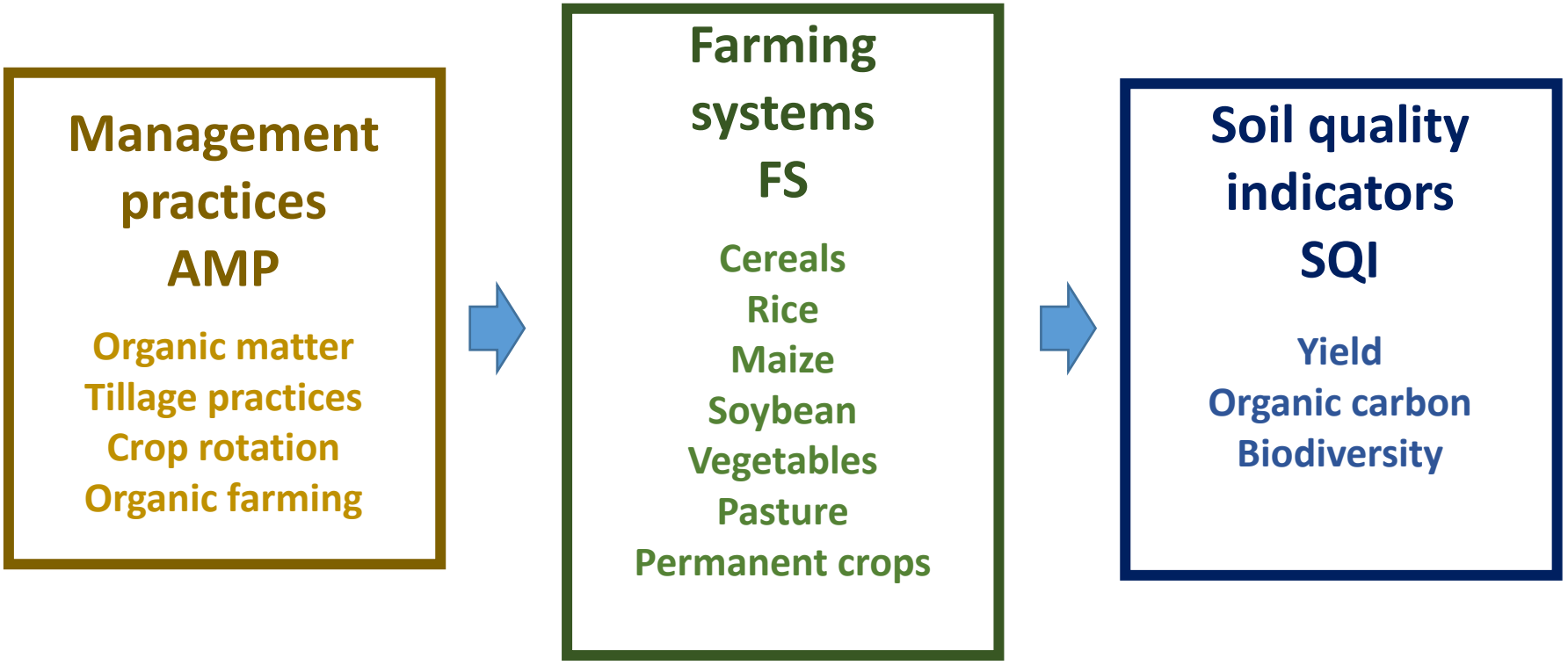
Assumes the same rate of implementation of agricultural management practices, but considers that policy efforts are focused on areas where soil threats are more active and soil quality indicators are poorer

Scenario 3 – Towards 2050

Towards the goal of carbon neutral agriculture by 2050

Assumes an intensification on the rate of implementation of agricultural management practices as a result of public policies

Upscaling model conceptualization



The upscaling model relates beneficial agricultural management practices to improved soil quality indicators

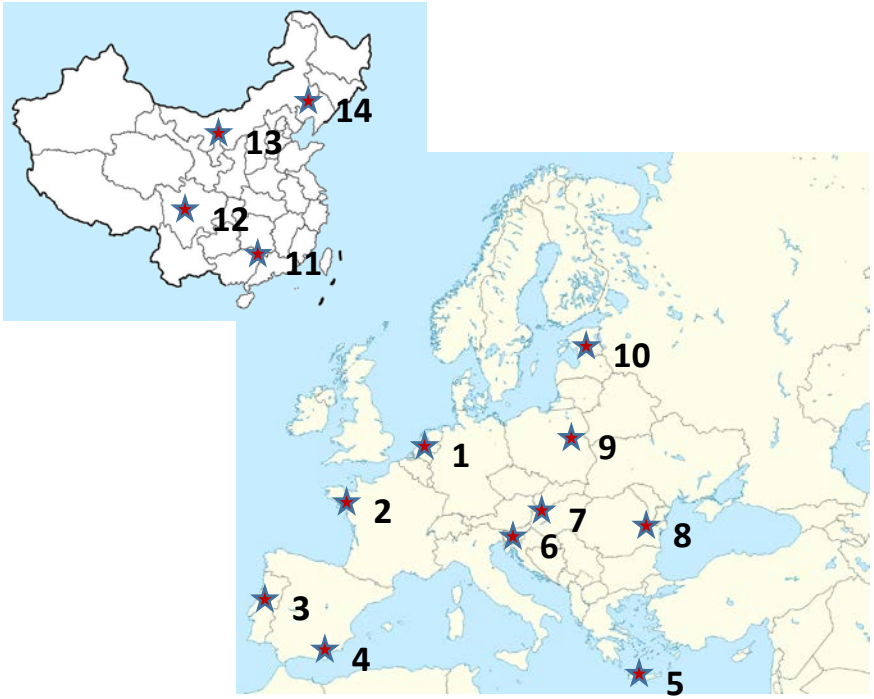
The linkage is established through experiments where the management practice is applied to the soil during a long period

Local information for current situation

- Was gathered from cases studies analysed in iSQAPER project

Expected % increase of implementation in case study sites				
CS	**OM**	**Till**	**CR**	**OF**
1 (FR)	4.0	1.3	4.0	2.3
2 (NL)	3.3	2.3	3.3	3.3
3 (PT)	4.0	2.3	4.0	3.3
4 (ES)	4.0	2.3	2.3	5.0
5 (GR)	3.3	3.3	1.7	4.0
6 (SL)	4.0	2.3	3.3	3.3
7 (HU)	4.0	1.7	1.7	1.7
8 (RO)	1.0	2.7	4.0	1.0
9 (PL)	4.0	0.7	2.7	3.3
10 (EE)	2.7	4.0	1.3	1.7
11 (Qi)	4.0	1.7	1.7	1.7
12 (Su)	2.7	4.0	1.7	1.7
13 (Zhi)	2.7	3.3	2.7	1.7
14 (Gon)	1.7	4.0	3.3	1.7

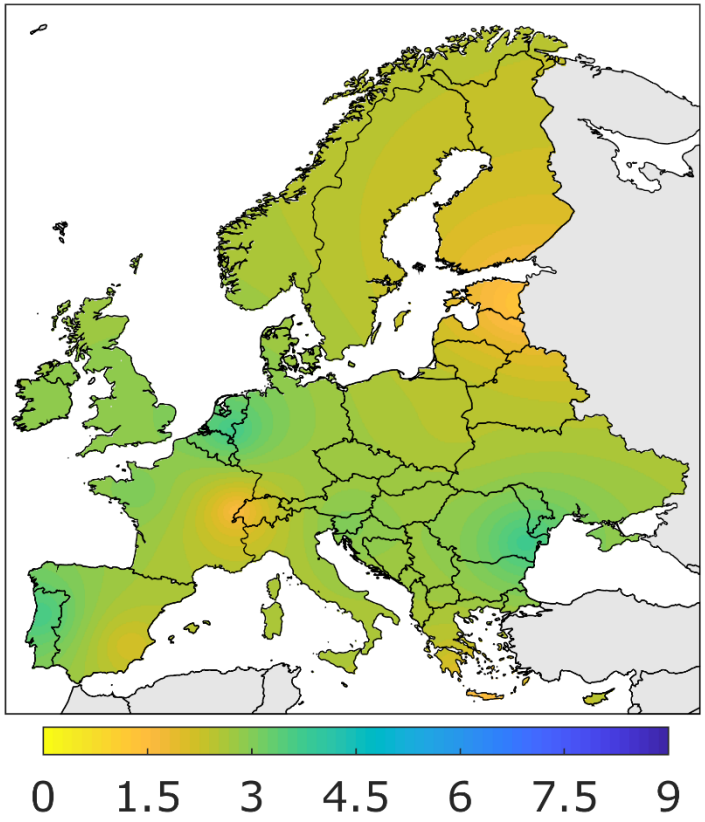
iSQAPER
Interactive Soil Quality Assessment



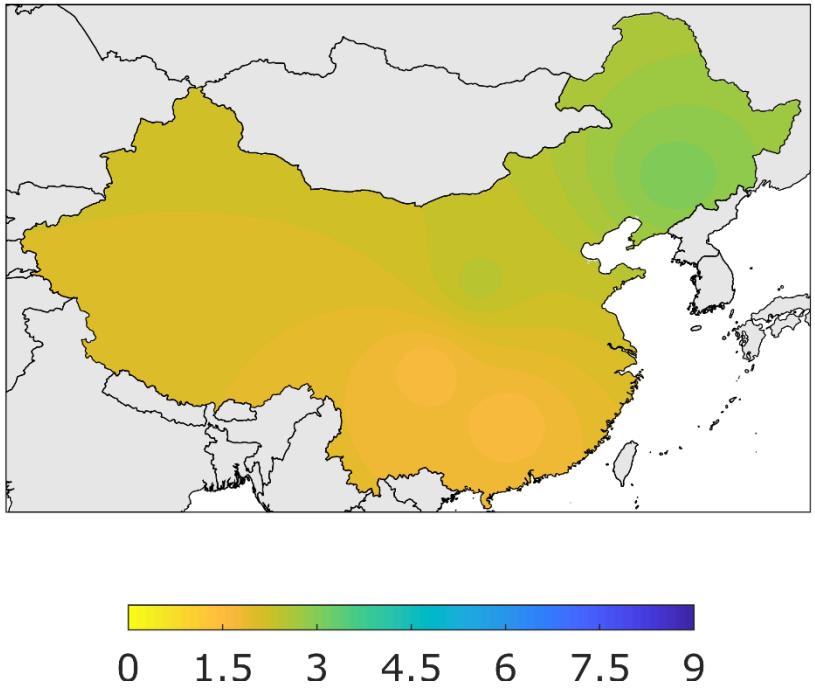
Case study sites provided information on the expected implementation of AMPs

Spatial analysis

Δ Crop Rotation in Europe (%)



Δ Crop Rotation in China (%)



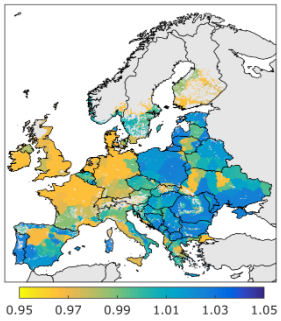
Upscaling local estimates

Local information was upscaled through spatial analysis

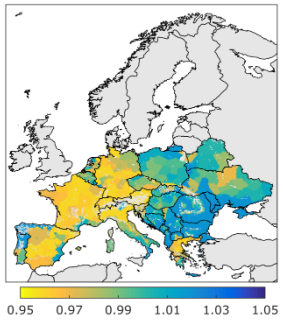
Upscaling model

Results by farming system

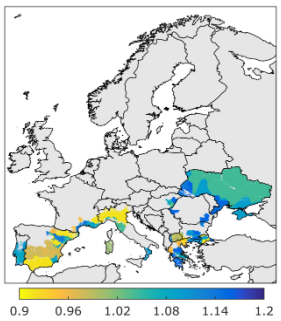
Cereal



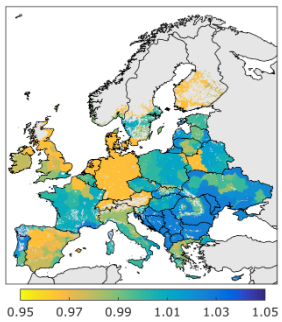
Maize



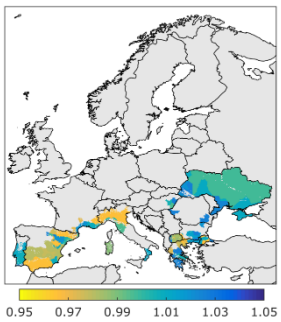
Soybean



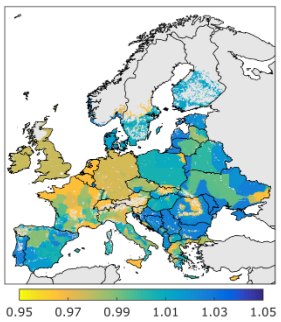
Vegetables



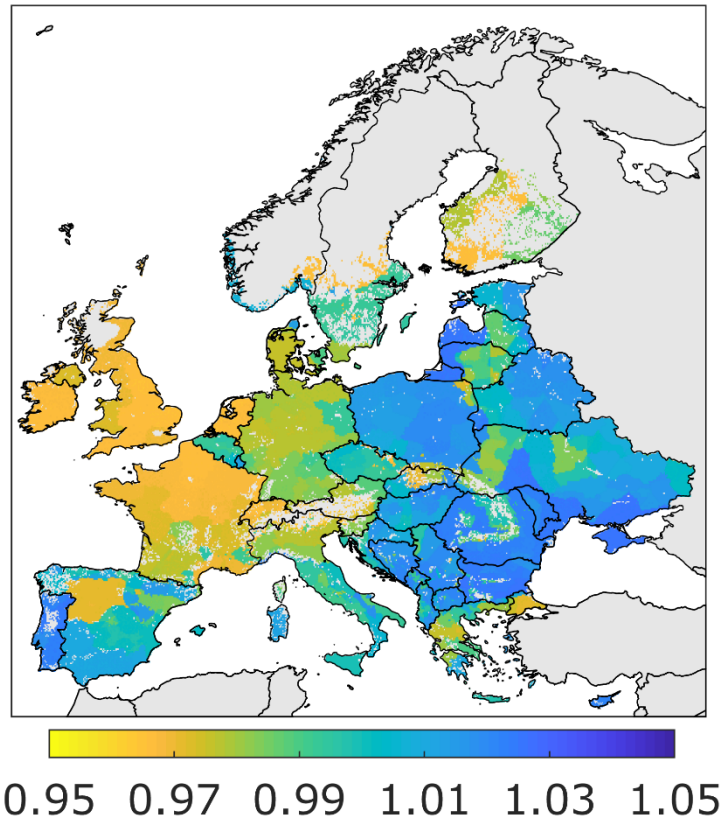
Rice



Permanent



Integrated results

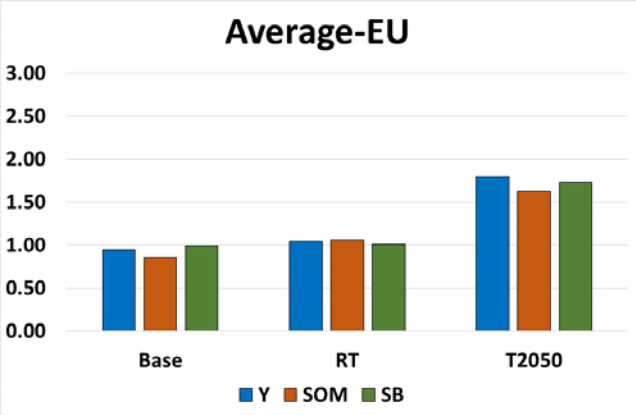


Average % increase in yield for 10% increase in organic farming

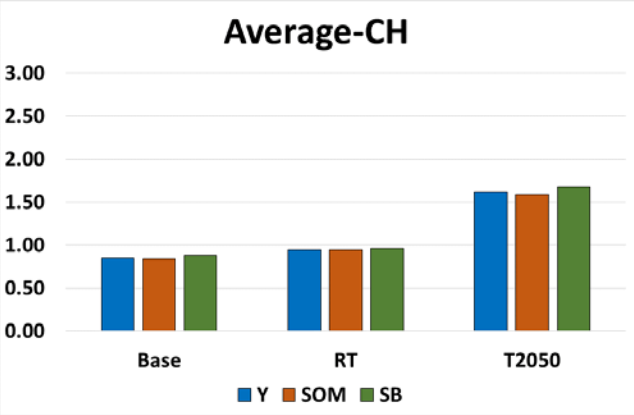
The upscaling model (presented in SSS10.5) provides an estimate on the improvement of soil quality indicators as a result of long term application of beneficial agricultural management practices

Upscaling model results

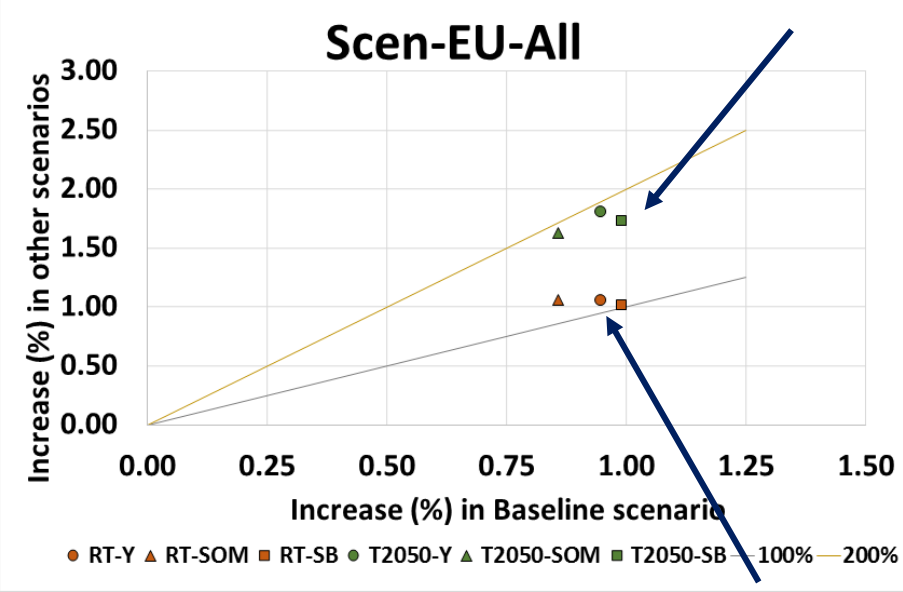
Europe

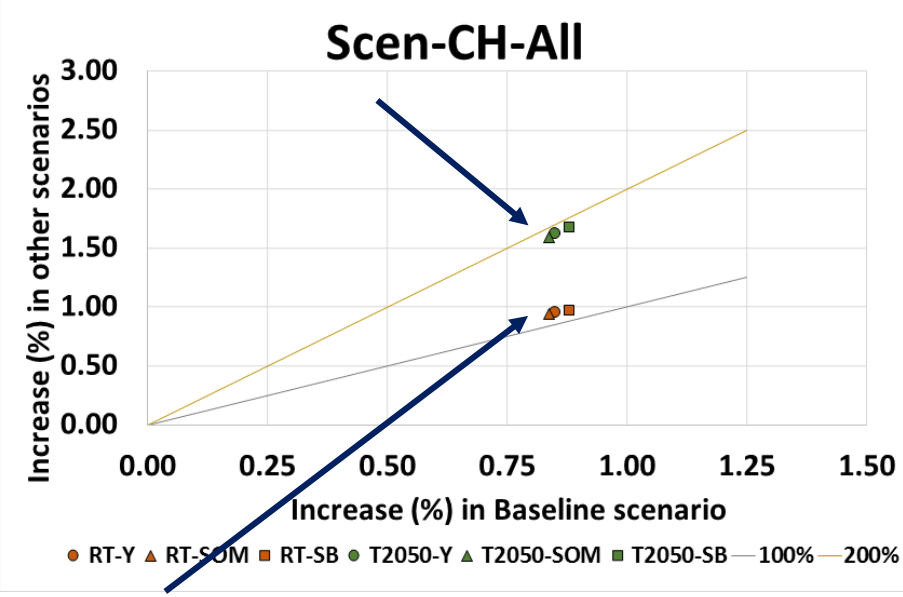


China



T2050 almost duplicates Expected baseline

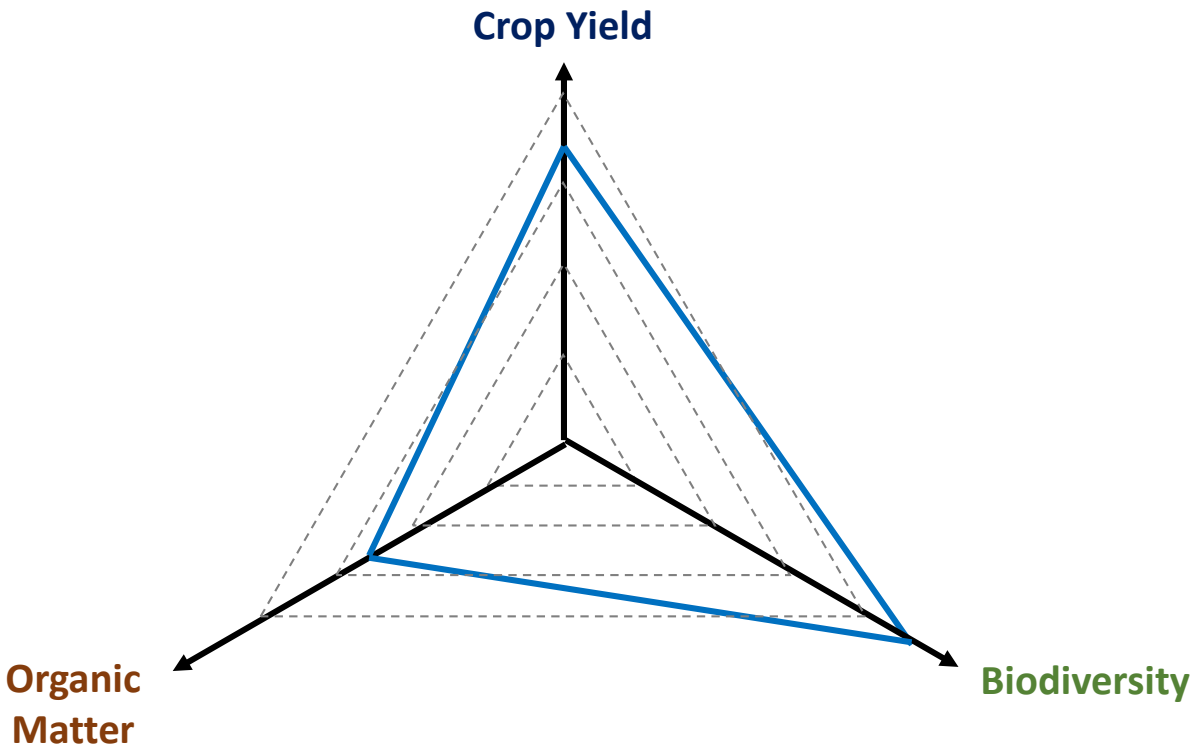




Regional Targets improves over Expected baseline

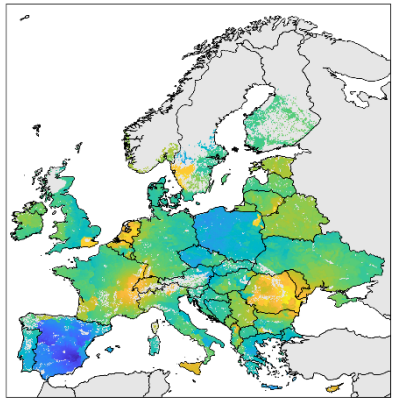
Analysis of environmental footprint

- Environmental footprint is considered to be proportional to the area of the triangle formed by the three ecosystem services linked to soil quality indicators

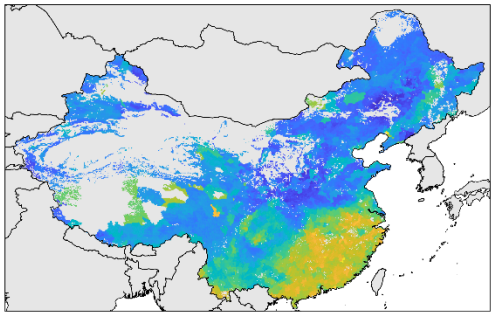


Improvement of soil environmental footprint

Expected

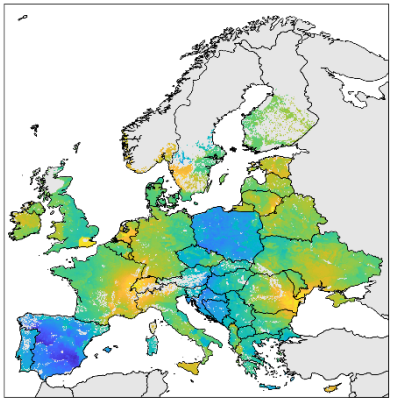


0.45 0.78 1.11 1.44 1.77 2.1

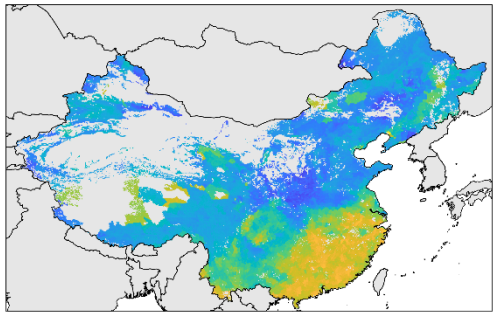


0.25 0.49 0.73 0.97 1.21 1.45

Regional Targets

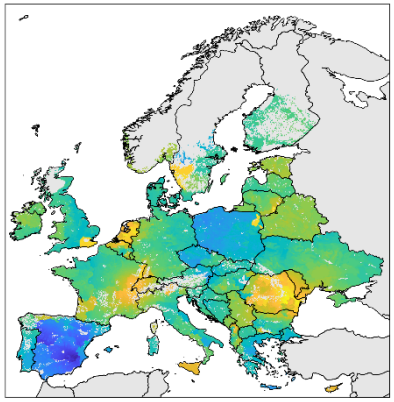


0.7 1.05 1.4 1.75 2.1 2.45

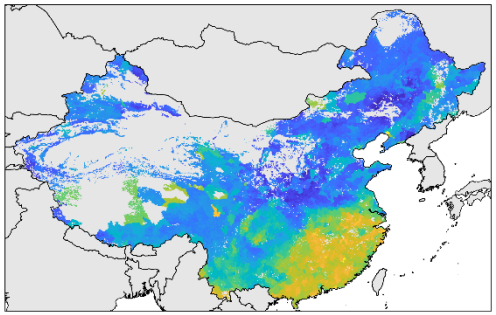


0.3 0.63 0.96 1.29 1.62 1.95

Towards 2050



1.65 2.69 3.73 4.77 5.81 6.85



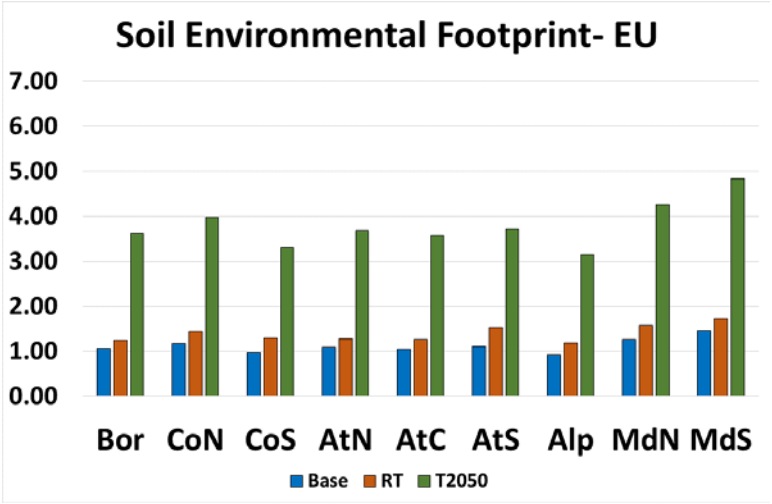
1 1.82 2.64 3.46 4.28 5.1

Soil Environmental Footprint

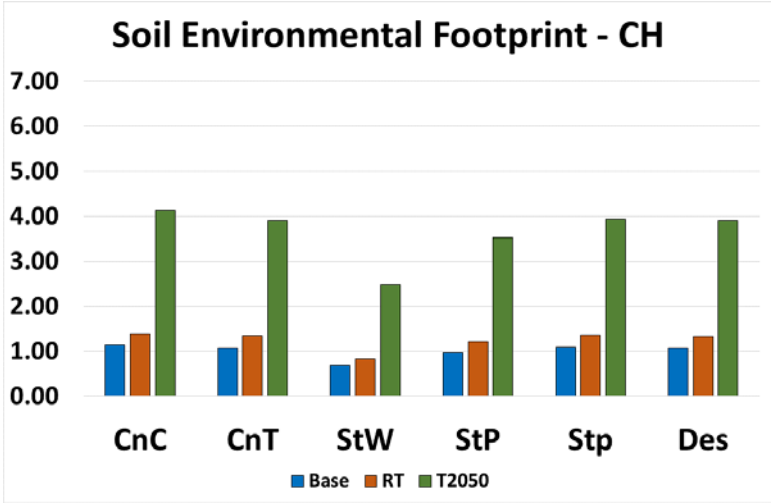
Qualitative classification

Qualitative category	Range of numerical values	Average increase of soil ecosystem services (%)
Very low	0-1	From 0 to 0.88
Low	1-2	From 0.88 to 1.24
Low-moderate	2-3	From 1.24 to 1.52
Moderate	3-4	From 1.52 to 1.75
Moderate-high	4-5	From 1.75 to 1.96
High	5-6	From 1.96 to 2.15
Very high	6-7	From 2.15 to 2.32

Europe

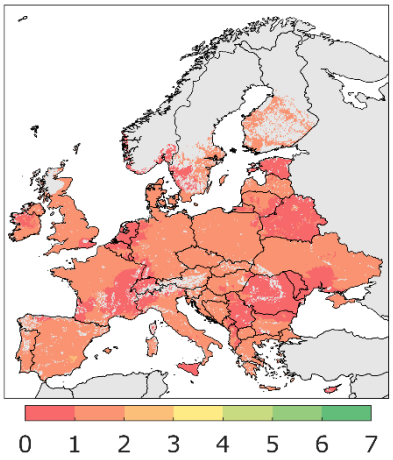


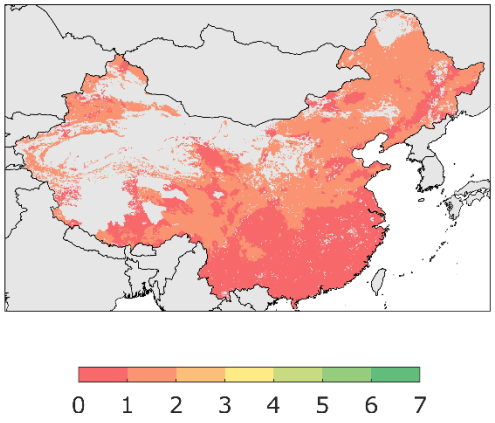
China



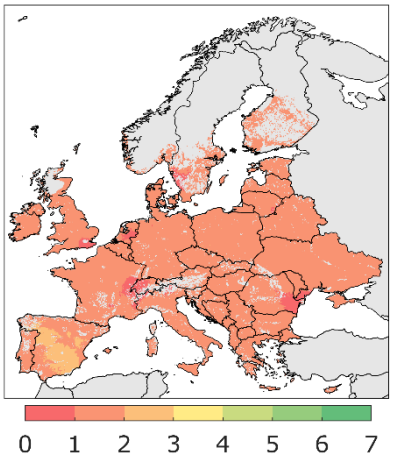
Qualitative classification

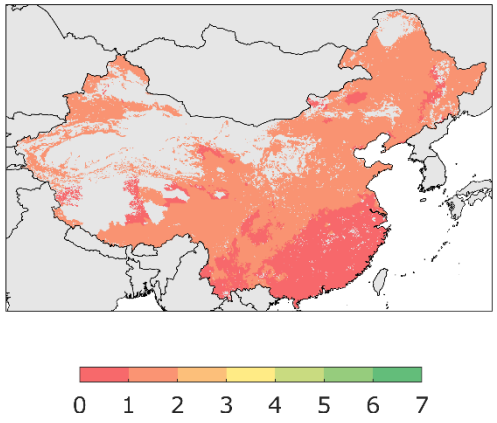
Expected



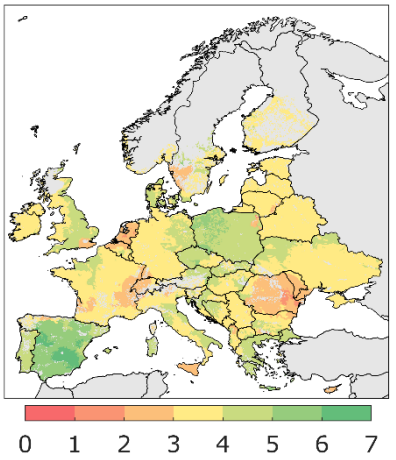


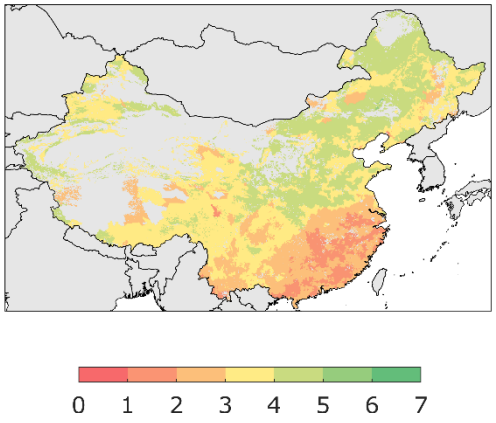
Regional Targets





Towards 2050





Soil Environmental Footprint

Conclusions

- **Regional Targets** improves Soil Environmental Footprint over **Expected** baseline with no additional effort, but
- **Towards 2050** really makes a change

	Europe	China
Expected	1.13	0.96
Regional Targets	1.41	1.19
Towards 2050	3.85	3.47