Soil Health
BENCHMARKS

Soil Health

Understanding, Monitoring and Valuing

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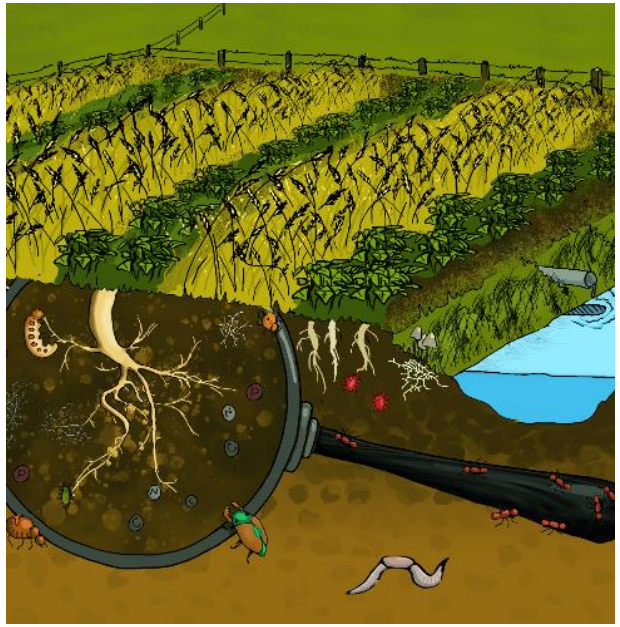
> Soil health is the ability of a soil, at a specified point in time, to function as a vital living system, within natural or managed ecosystem boundaries and land-use boundaries, to sustain plant and animal productivity and health, maintain or enhance water and air quality and to further provide soil-based ecosystem services in the long-term without (increased) trade-offs between ecosystem services.

van den Elsen, E. et al. (2022) A framework to assess soil threats, soil functions and soil-based ecosystem services. EJP Soil – SERENA D2.1.

Soil Health BENCHMARKS Perspectives

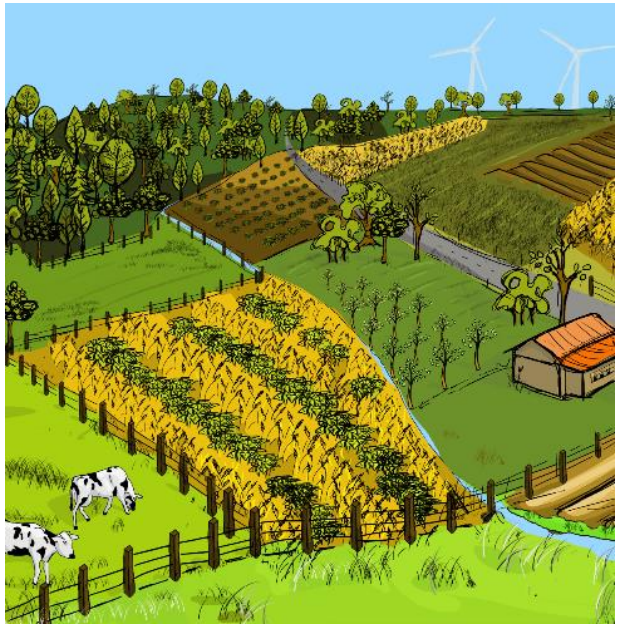
Creamer et al., Soil Biology and Biochemistry 2022

Pictures created by: www.mybesign.nl



Scientific

To define the role of soils in supporting a range of functions/ecosystem services



Farmer – Local/Living Lab

Understanding which combinations of management practices support healthy multi-functional soils

Policy – National to Pan-European

Regulating the management of soils to ensure healthy soil ecosystems across Europe.


Policymakers
Industries
NGO's
Researchers
Consumers
Farmers
Status
Certifica-
tion
Warning
system
Decision
Support
Trends
Incentivization

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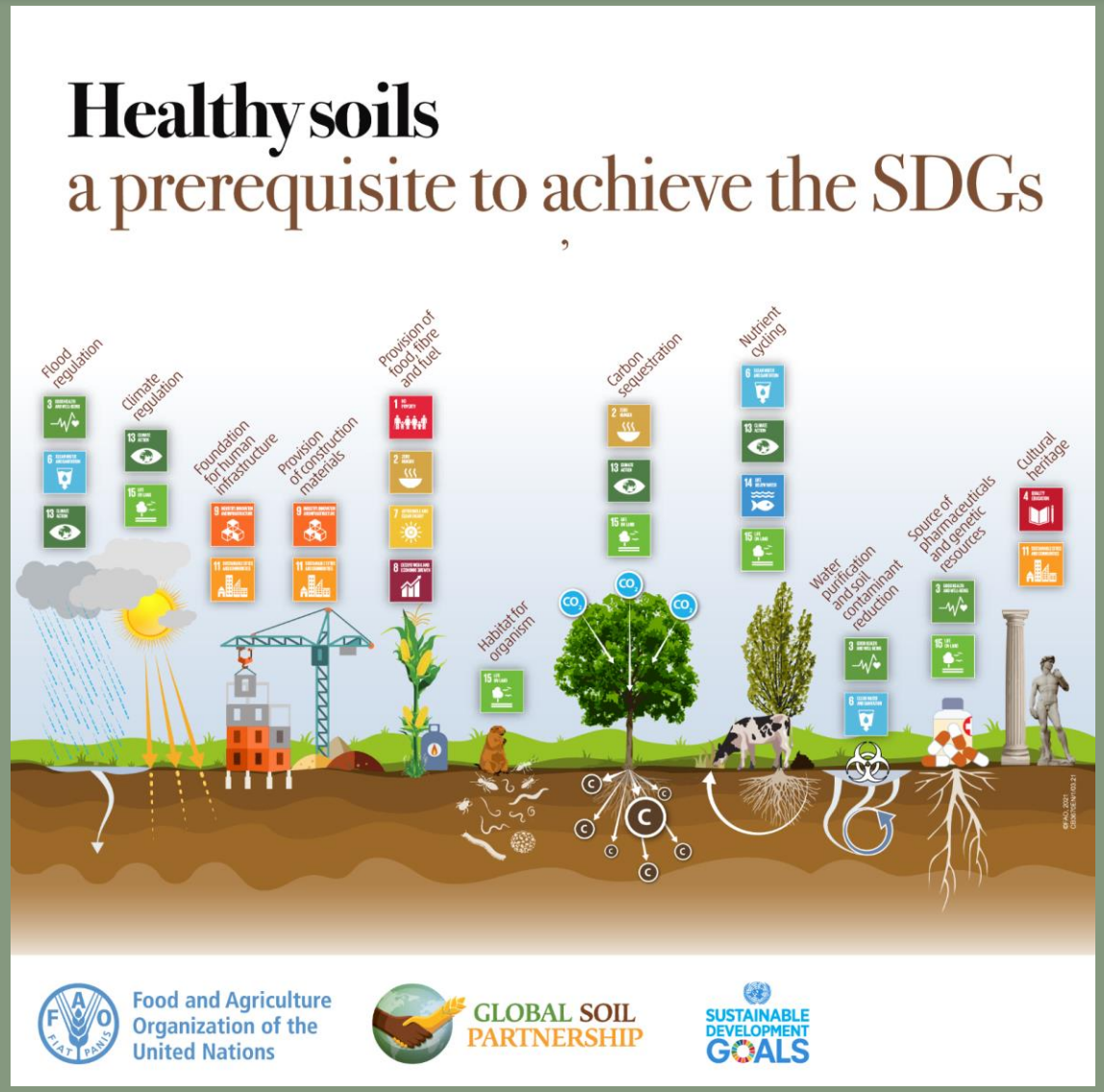
Global Perspective:



10 Ecosystem services and 12 SDGs supported by healthy soils (source: FAO)

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European Policy Perspective:

Over **60%** of European soils are unhealthy and scientific evidence shows that this is getting even worse. Unsustainable use of EU natural resources, in particular the degradation and pollution of soils, is one of the major drivers of the climate and biodiversity crises. In particular, soil degradation has already cost billions of euro - an estimated over **€50 billion per year due to the loss of essential services they provide.**

EUROPEAN
COMMISSION

Brussels, 17.11.2021
COM(2021) 699 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

EU Soil Strategy for 2030
Reaping the benefits of healthy soils for people, food, nature and climate

{SWD(2021) 323 final}

5 JULY 2023

Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Soil Monitoring and Resilience_COM_2023_416_final and ANNEXES

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Private Business Alliances:

wbcsd

Regen10 to work with over 500 million farmers to scale regenerative food production by 2030

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Farmer Perspective:

https://www.heroes-world.de/en/grandfarm/

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Scale of Assessment for monitoring soil health:

1. Purpose
2. Context
3. The importance for standardisation/comparability
4. Cost
5. Assessment type

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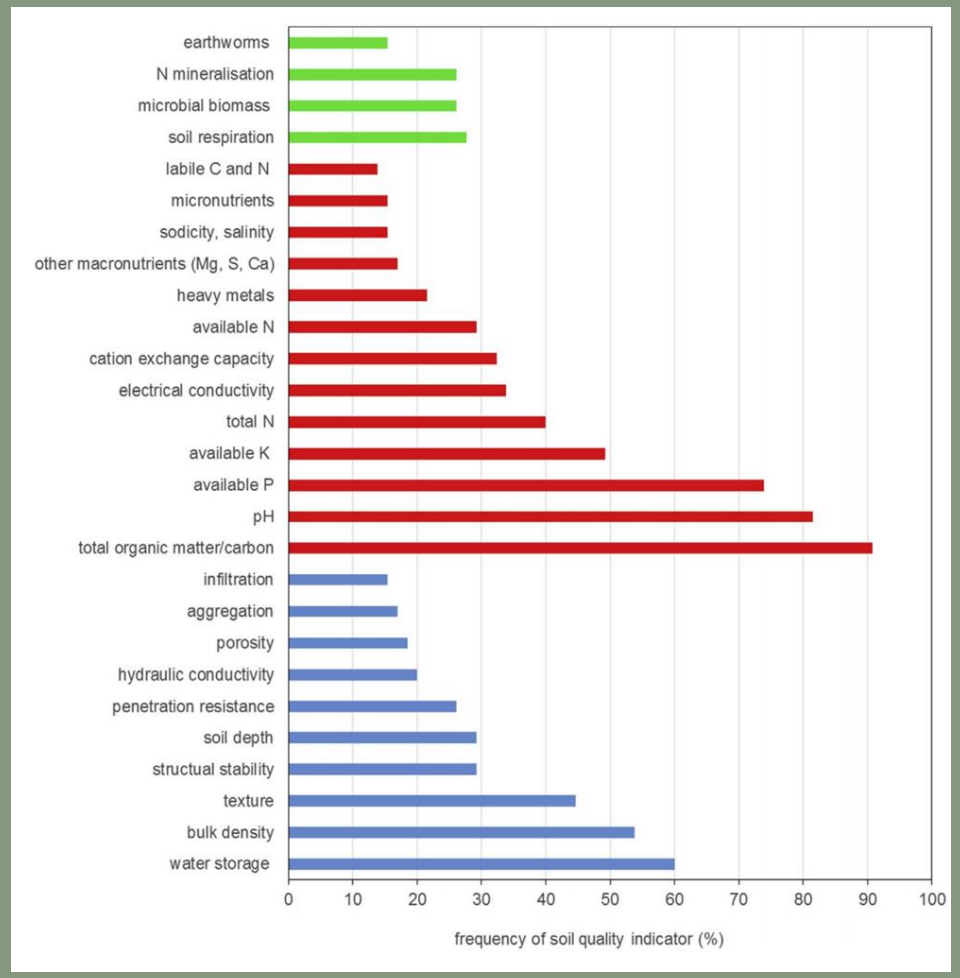
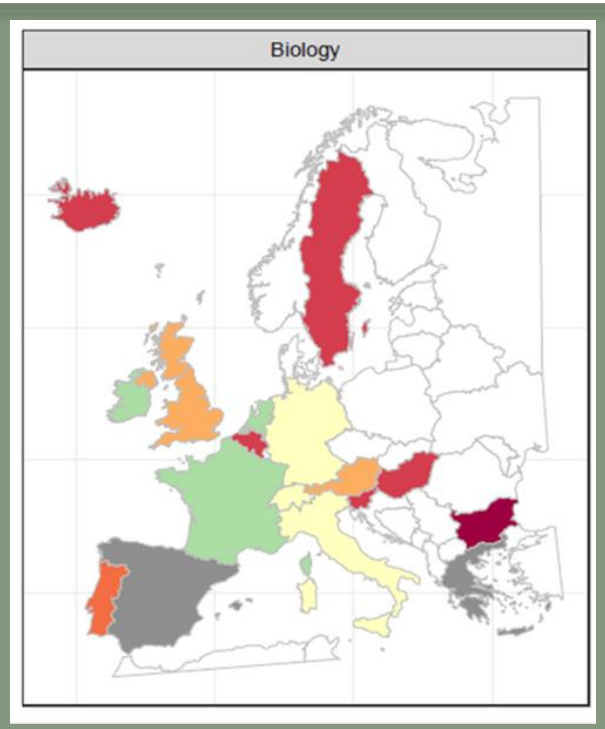
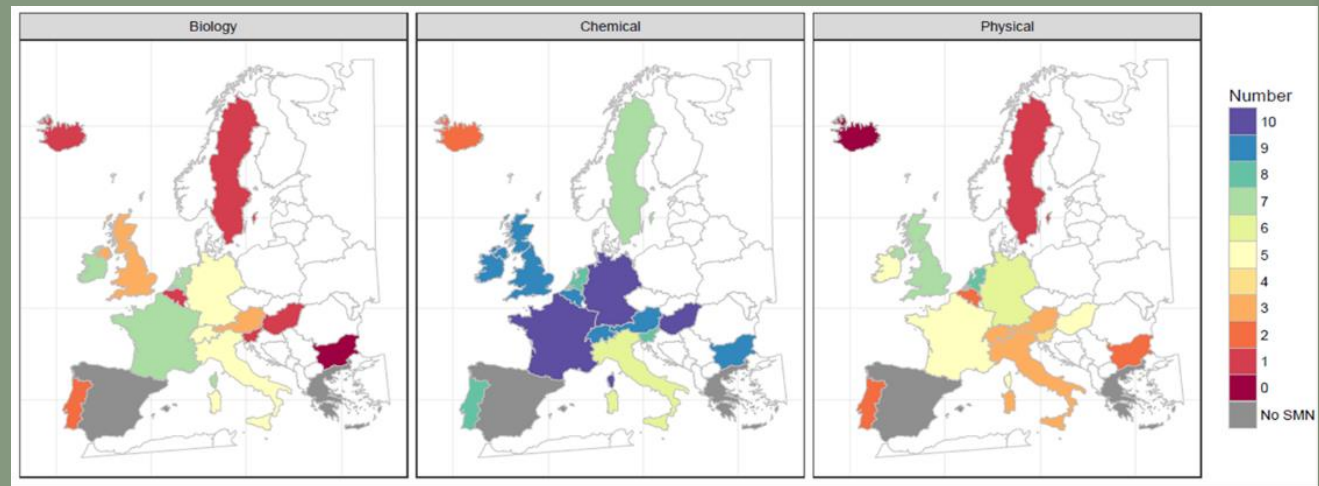
What do we know so far..



Bunneman et al., 2018
ISQAPER Project - EU

Van Leeuwen et al., 2017
LANDMARK Project - EU





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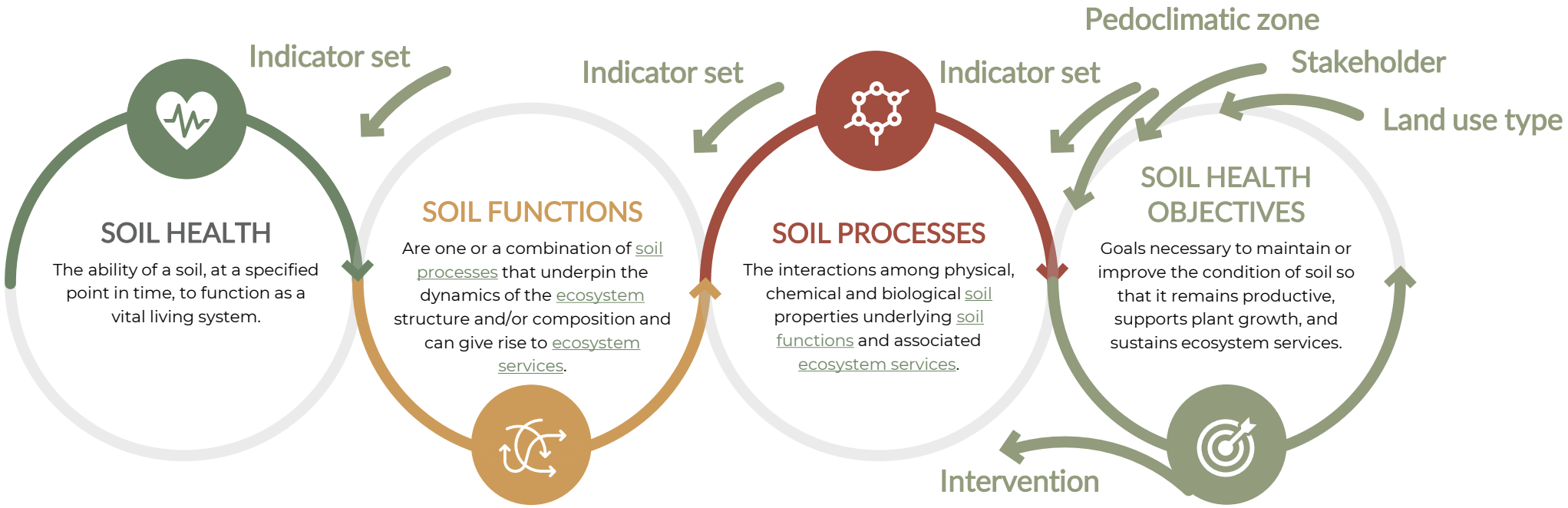

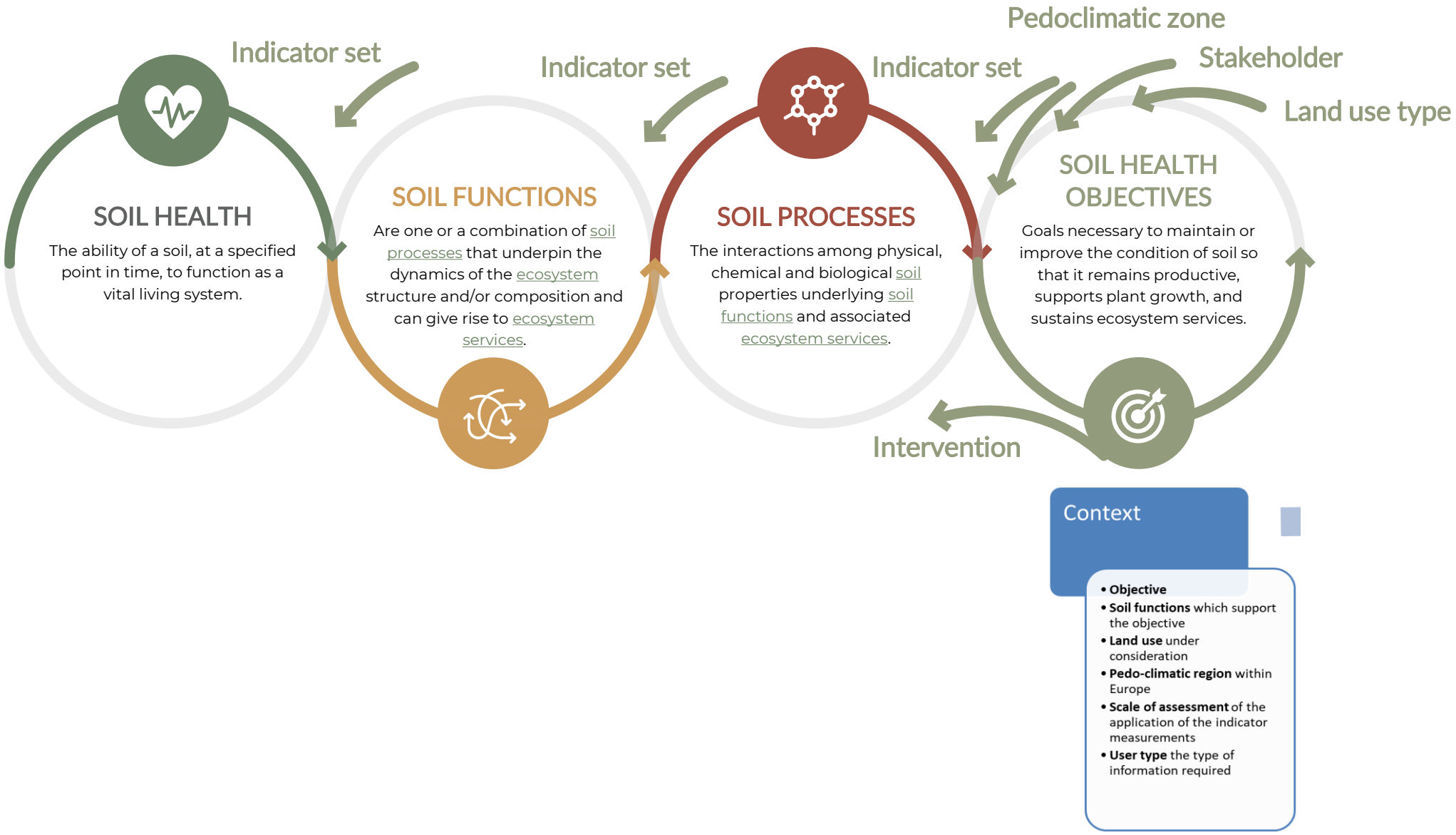
Indicator set
Indicator set
Indicator set
Pedoclimatic zone
Stakeholder
Land use type
SOIL HEALTH
The ability of a soil, at a specified point in time, to function as a vital living system.
SOIL FUNCTIONS
Are one or a combination of soil processes that underpin the dynamics of the ecosystem structure and/or composition and can give rise to ecosystem services.
SOIL PROCESSES
The interactions among physical, chemical and biological soil properties underlying soil functions and associated ecosystem services.
SOIL HEALTH OBJECTIVES
Goals necessary to maintain or improve the condition of soil so that it remains productive, supports plant growth, and sustains ecosystem services.
Intervention
Context
• Objective
• Soil functions which support the objective
• Land use under consideration
• Pedo-climatic region within Europe
• Scale of assessment of the application of the indicator measurements
• User type the type of information required

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Context

- **Objective**
- **Soil functions** which support the objective
- **Land use** under consideration
- **Pedo-climatic region** within Europe
- **Scale of assessment** of the application of the indicator measurements
- **User type** the type of information required

Monitoring Metrics

- **Practice** – defines which management practices can be implemented to respond to the objective set out in the context.
- **Result** – are useful to monitor and report a change in the short term as a result of the implementation of a practice/new technology.
- **Outcome** – are useful to monitor and report the extent to which the intervention / initiative has delivered on its goals.

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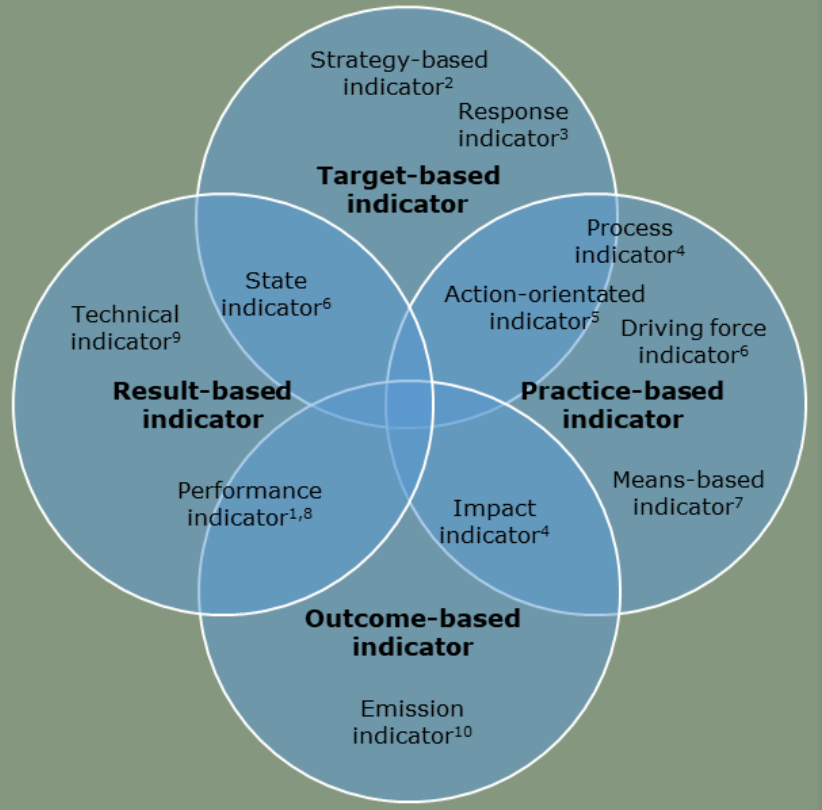
An indicator is a measure by a single or a set of variables that reflects the state or level of a phenomenon of interest.

- ***Practice-based indicators*** **show the degree of implementation of interventions (i.e. practices, activities, new technologies), for example:**
  - at farm-level: implementation of a practice e.g. sowing of cover crops;
  - within a value chain: number of farms using cover crops;
  - within policy: number of farmers that avail of agro-environmental and climate measures under the Common Agricultural Policy.

- ***Result-based indicators*** **show the consequences or quality of the interventions, and therefore whether the intervention(s) applied had the desired effect in the midterm, by quantifying for example:**
  - at farm-level: area of ground cover throughout the year;
  - within a value chain: average area ground cover in the supplying region;
  - within policy: change in area of national ground cover (reduction of bare soil).

- ***Outcome-based indicators*** **show if the intervention has delivered on its original goals, in the end term, for example:**
  - at the farm-level: a change in soil organic carbon content;
  - within the value chain: a change in the carbon footprint of products;
  - within policy: a change in national net GHG emissions.



Schreefel et al. 2024 Perspective paper: How to monitor the 'success' of agricultural systems? Global Food Systems Journal

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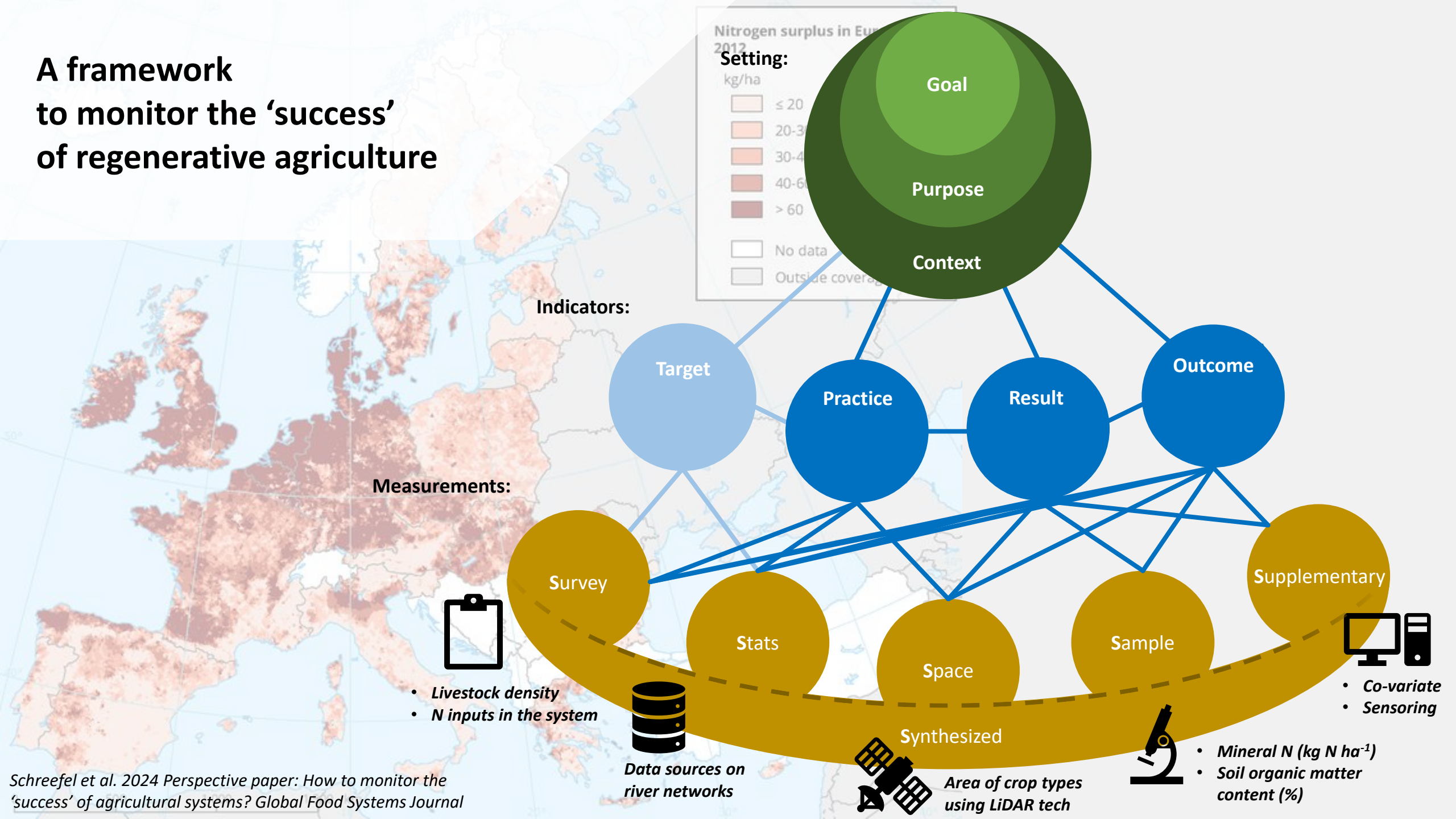
Indicator Measurements

- **Sample** – field and lab based measurement
- **Stats –** existing data on; soils, management practices, socio-economic factors & model derived measurements.
- **Space -** digital technologies, e.g. remote sensing, satellite technology, lidar, drones

A framework to monitor the ‘success’ of regenerative agriculture



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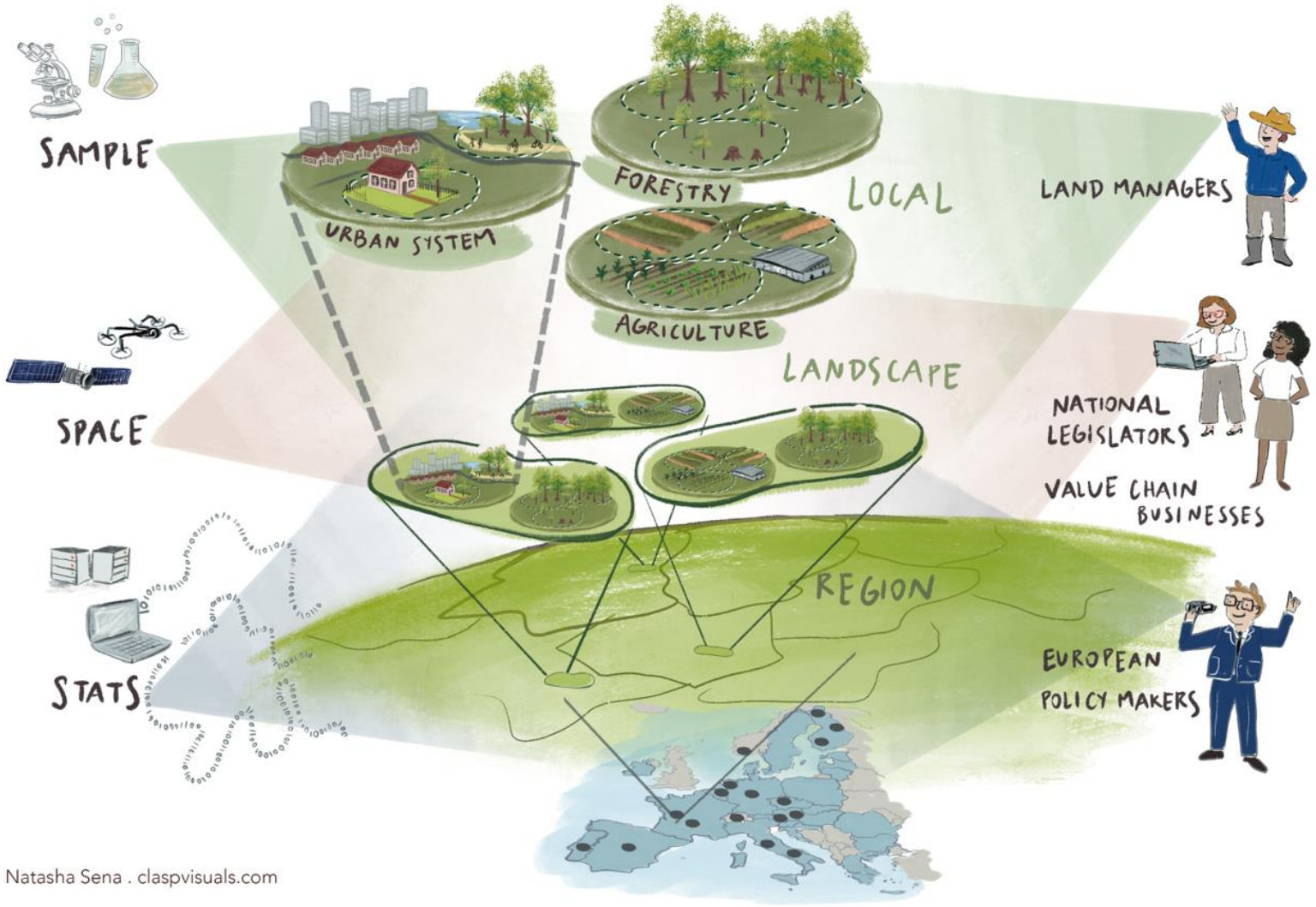
Scale of Assessment



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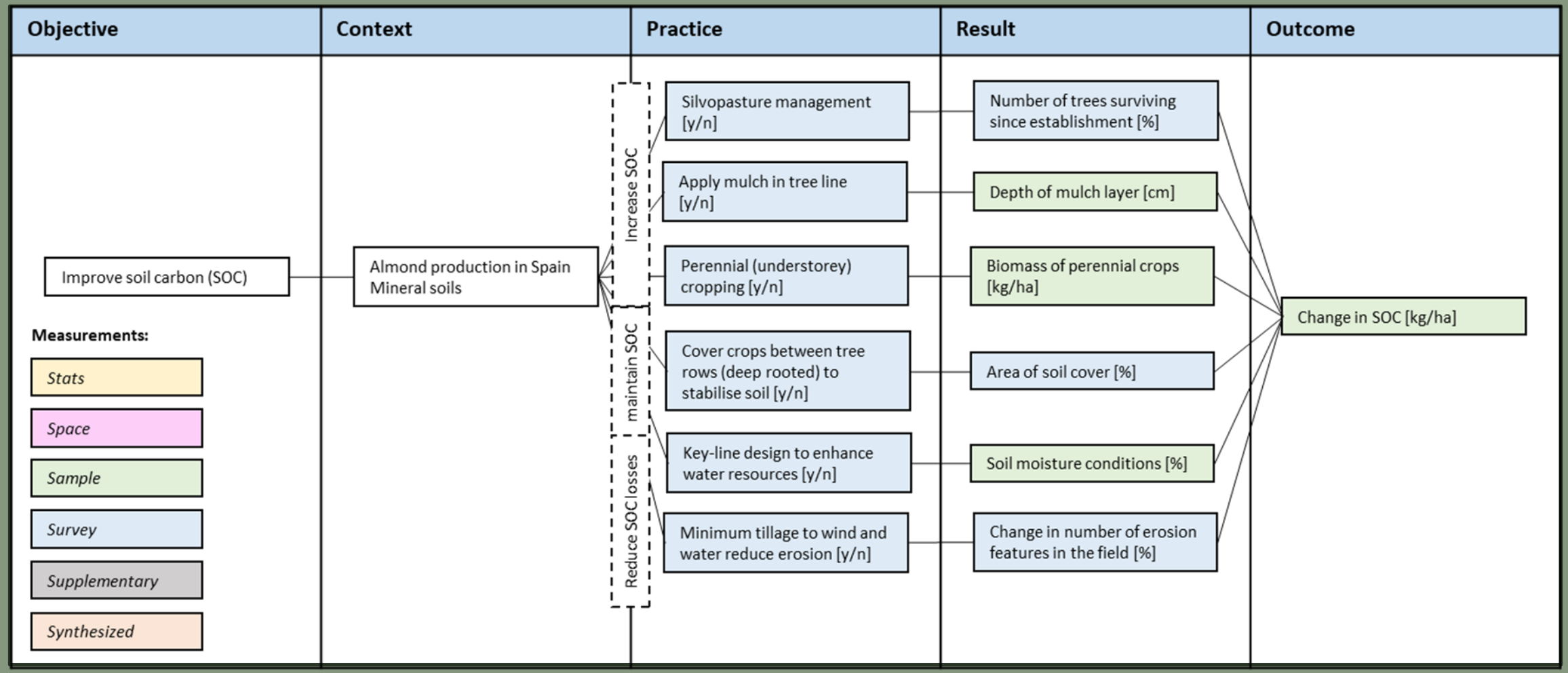
Scale of Assessment: Field

GOAL: Building resilience to climate change: the role of carbon in enhancing soil health in a degraded landscape



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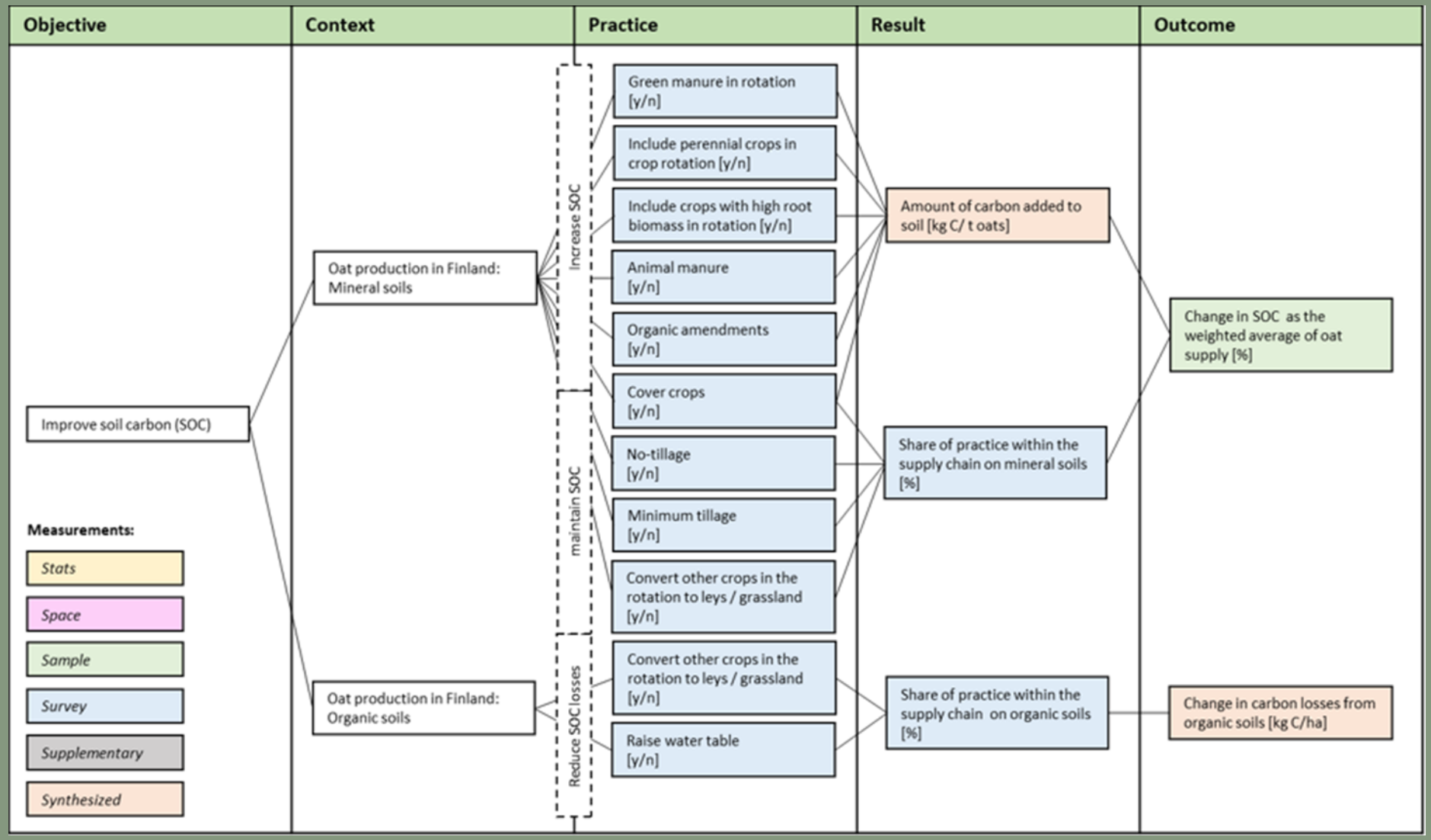
Scale of Assessment: Landscape- Value Chain

GOAL: Building resilience to climate change: the role of carbon as an example for reducing carbon losses from production



Schreefel et al. 2024 Perspective paper: How to monitor the 'success' of agricultural systems? Global Food Systems Journal

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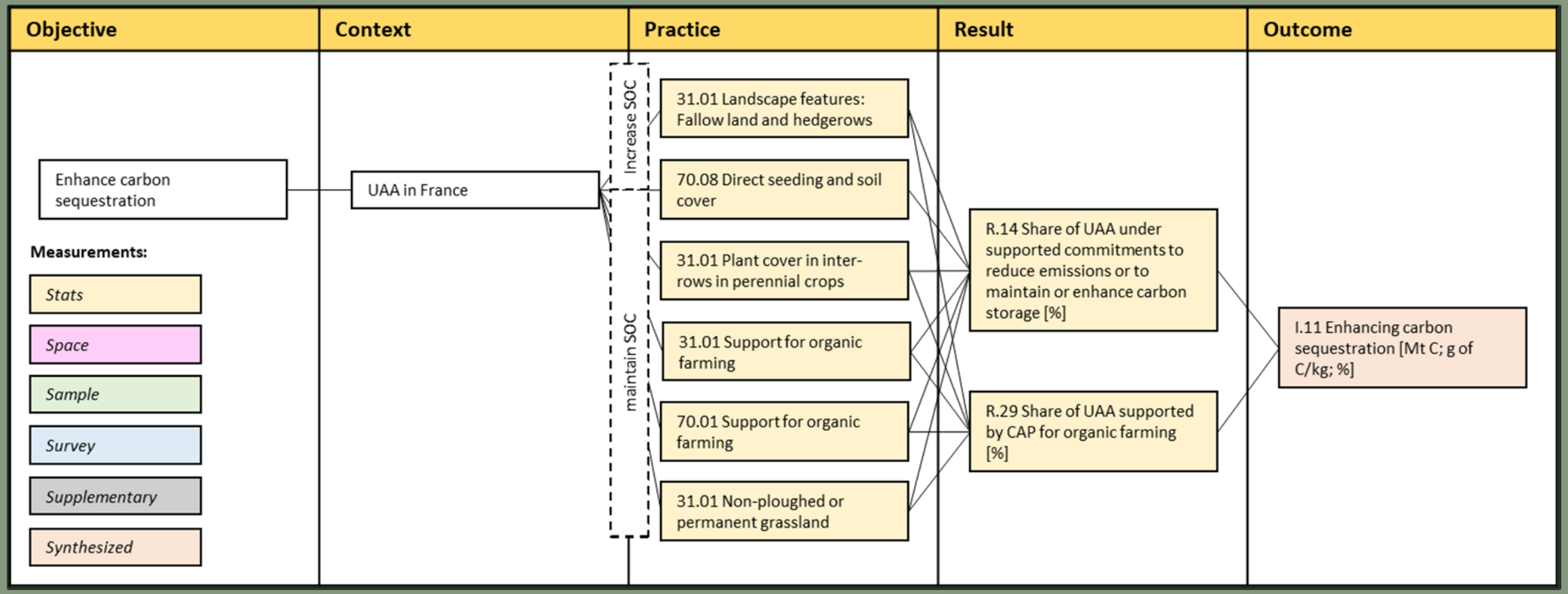
GOAL: Building resilience to climate change: the role of carbon sequestration in the French CAP National Strategic Plan



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