NutriBudget

Optimisation of nutrient budget in agriculture

WP3: Monitoring Farm Sustainability via NutriKPIs

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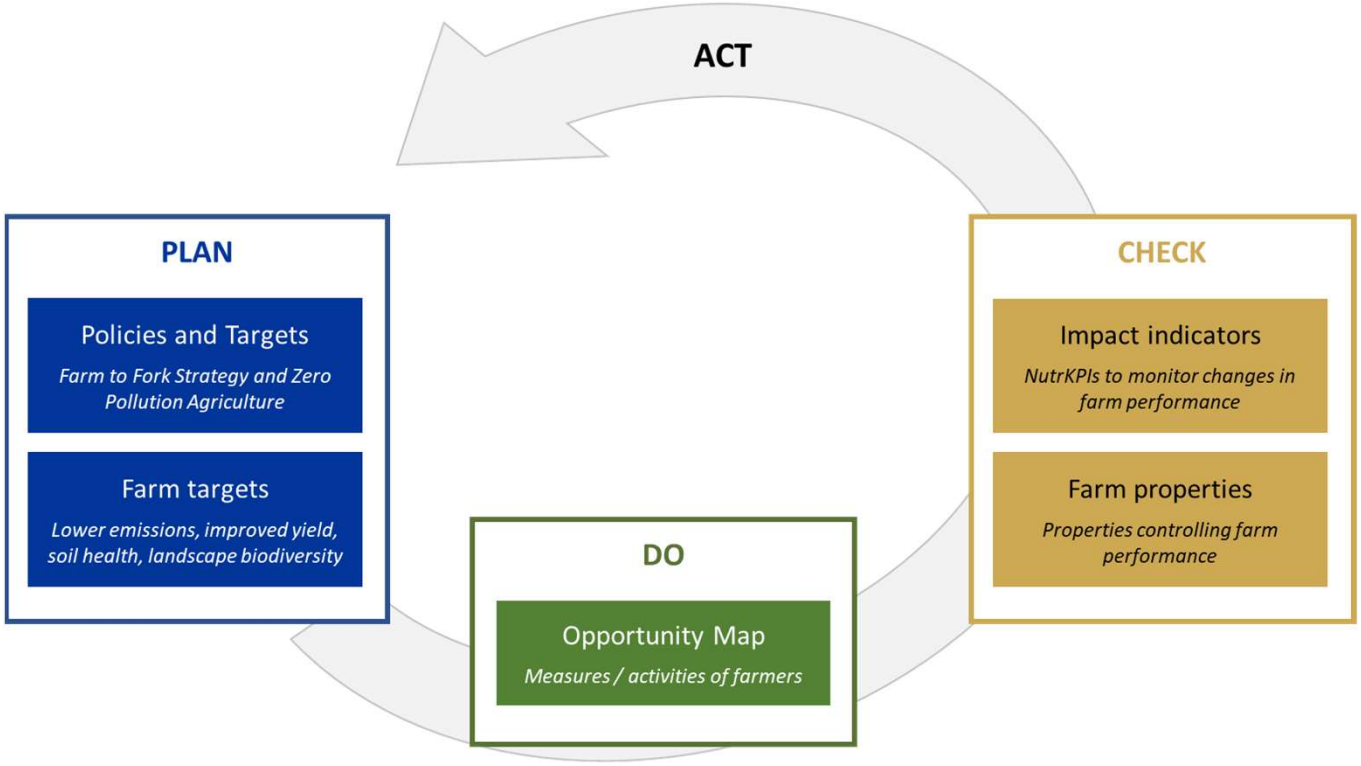
Funded by
the European Union

Development of NutriKPIs for NutriBudget

Main objective: guide farm management

to develop a holistic framework integrating existing (and new) indicators to monitor agronomic and environmental performance of farming systems over time to support sustainable agricultural production on various spatial scales.

Relevance Critical Performance Indicators: support PDCA



What are the KPIs being monitored?

- Pressure indicators: related to activities / external factors affecting the nutrient flows and properties of an agroecosystem
- Effect indicators (state and impact): agroecosystem properties that change due to impact of altering management
- Performance indicators: properties reflecting the performance of agroecosystems in view of targets, limits and goals.

Methodology: literature review & QuickScan

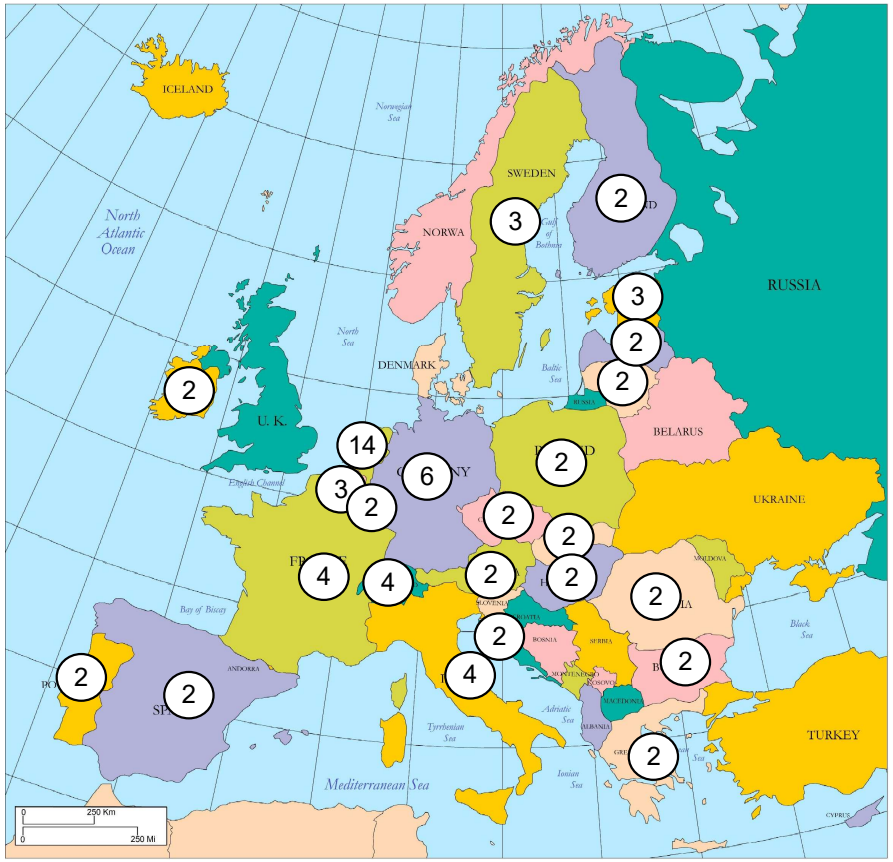
- Evaluate existing KPI tools (n = 35) and frameworks
  - number of indicators
  - relationships with ecosystem services (e.g. policy and agronomic targets)
  - presence and underpinning of thresholds / targets
  - applicability (soil types, land use, country)
  - scalability, integrality, usage

- Tool selection
  - CAP, FAO, OECD schemes
  - public and private tools and certification schemes
  - farm management tools

- Design an integrative framework to assess NutriKPIs
  - Including derivation of target

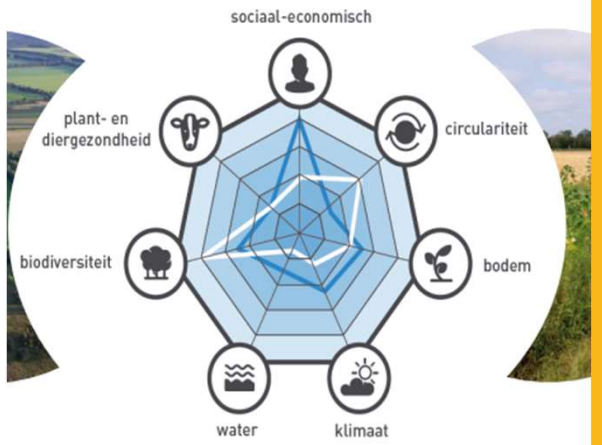
Good examples?
Please share

The KPI frameworks and tools assessed



Example KPI framework Netherlands

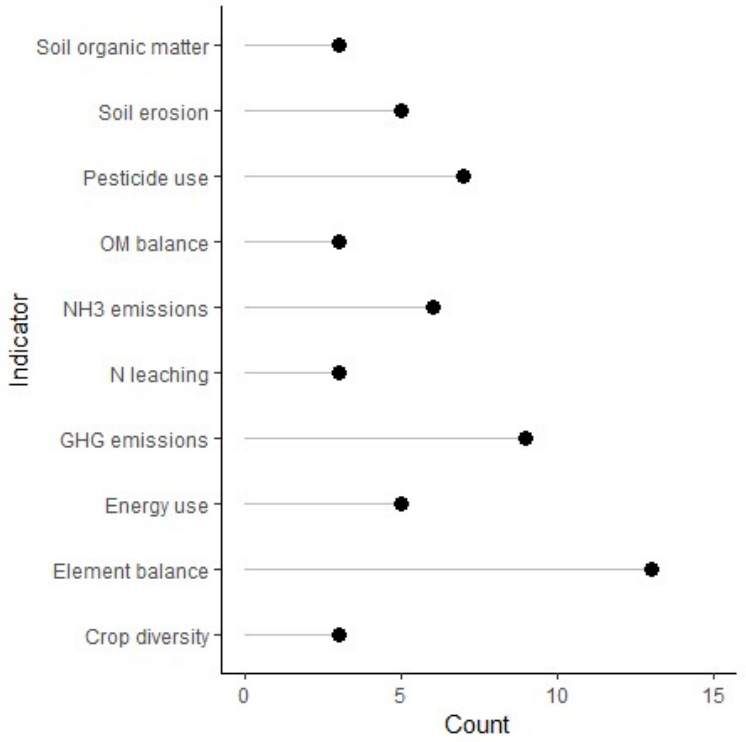
Target(s)	Indicator	Thresholds
Agronomic performance	Crop yield	From literature, crop databases
Circularity nutrients	Nutrient use efficiency	From field experiments
Resilience to climate change	Buffer capacity soil	From long-term experimental datasets
Water quality	Nutrient surplus	From policy goals WFD and ND
Soil health	OSI score	From agronomic knowledge base plus long-term datasets
Biodiversity	Pesticide use / remote sensing based indicator	From literature



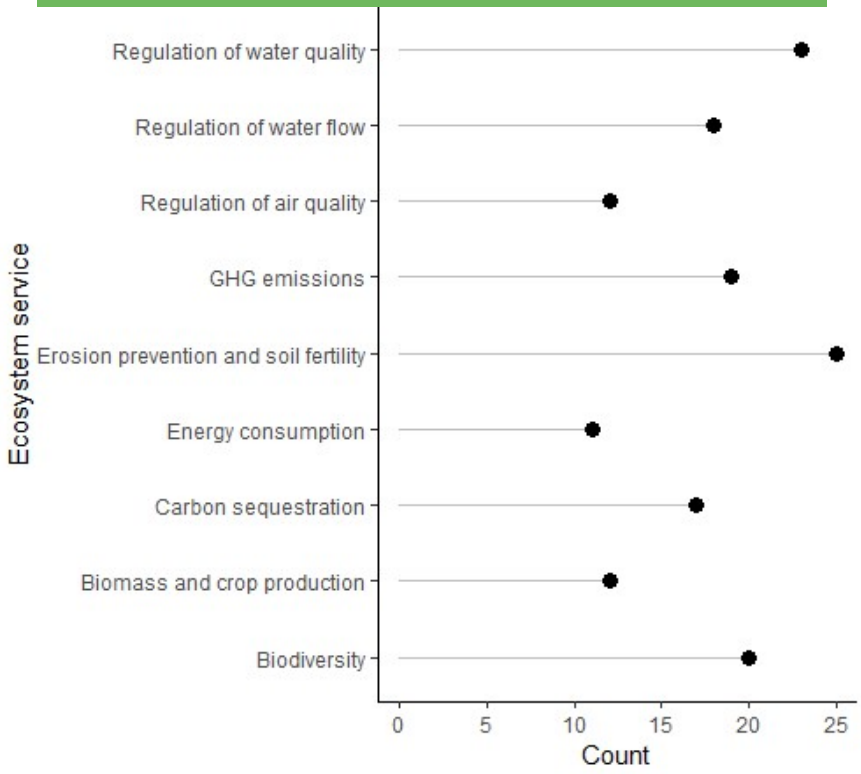
KPIs might have simple proxies that can filled in by an user / farmer using a simple score form.

KPI assessments

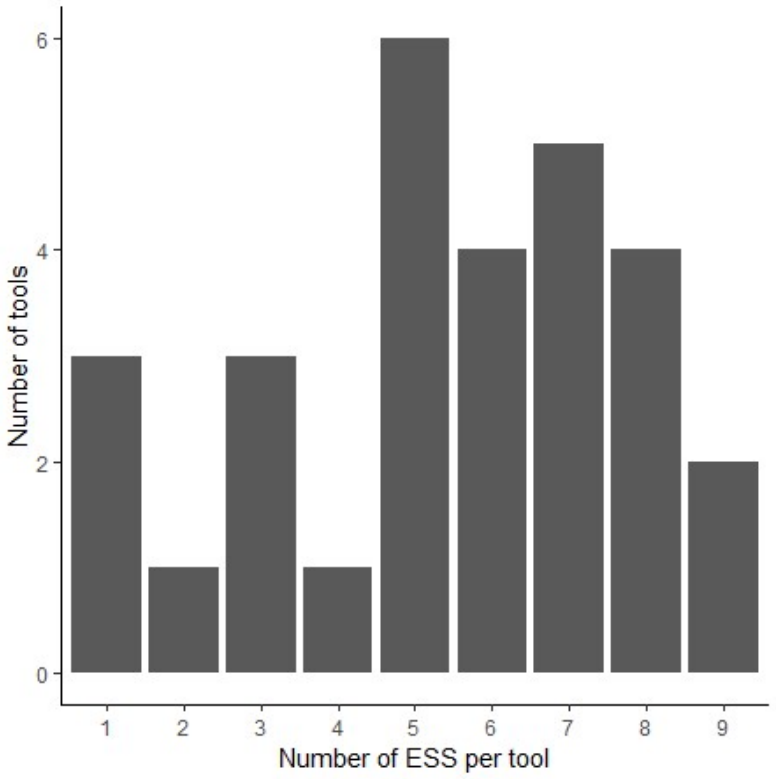
Top-10 indicators in use

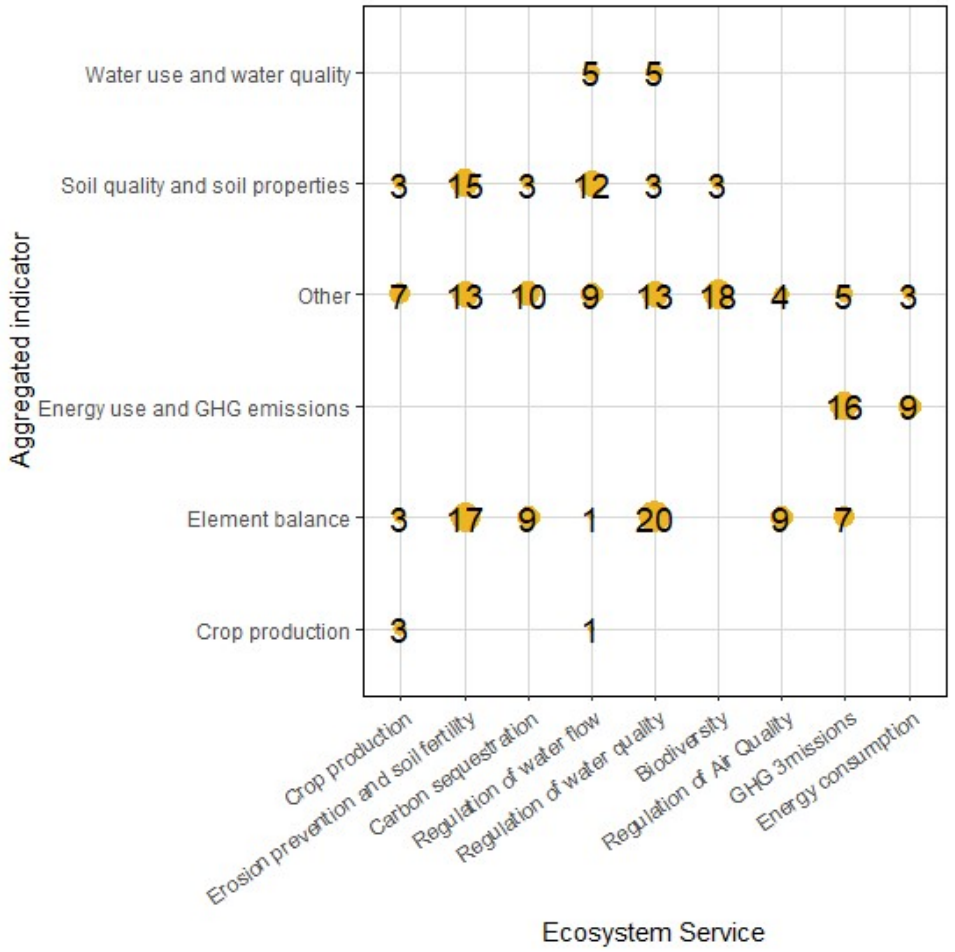


Ecosystem Services in use



Overview KPI tools: indicator vs. ESS





In summary: the current KPI tools show that

- KPI is a buzz word. Most of the documents claim that they are assessing or reviewing KPIs but in practice the indicators are usually not KPIs.
- Indicators are clearly linked to ESS but it is not systematic, often lack integrality, trade-offs are not addressed and quantification
- KPI frameworks and tools fail to include costs and benefits on both short and long-term
- Indicator thresholds do not have a science based (and quantitative) link with ESS; weakly related to specific (env) targets or to changes / recommended management practices

Define targets for C and nutrient budgets

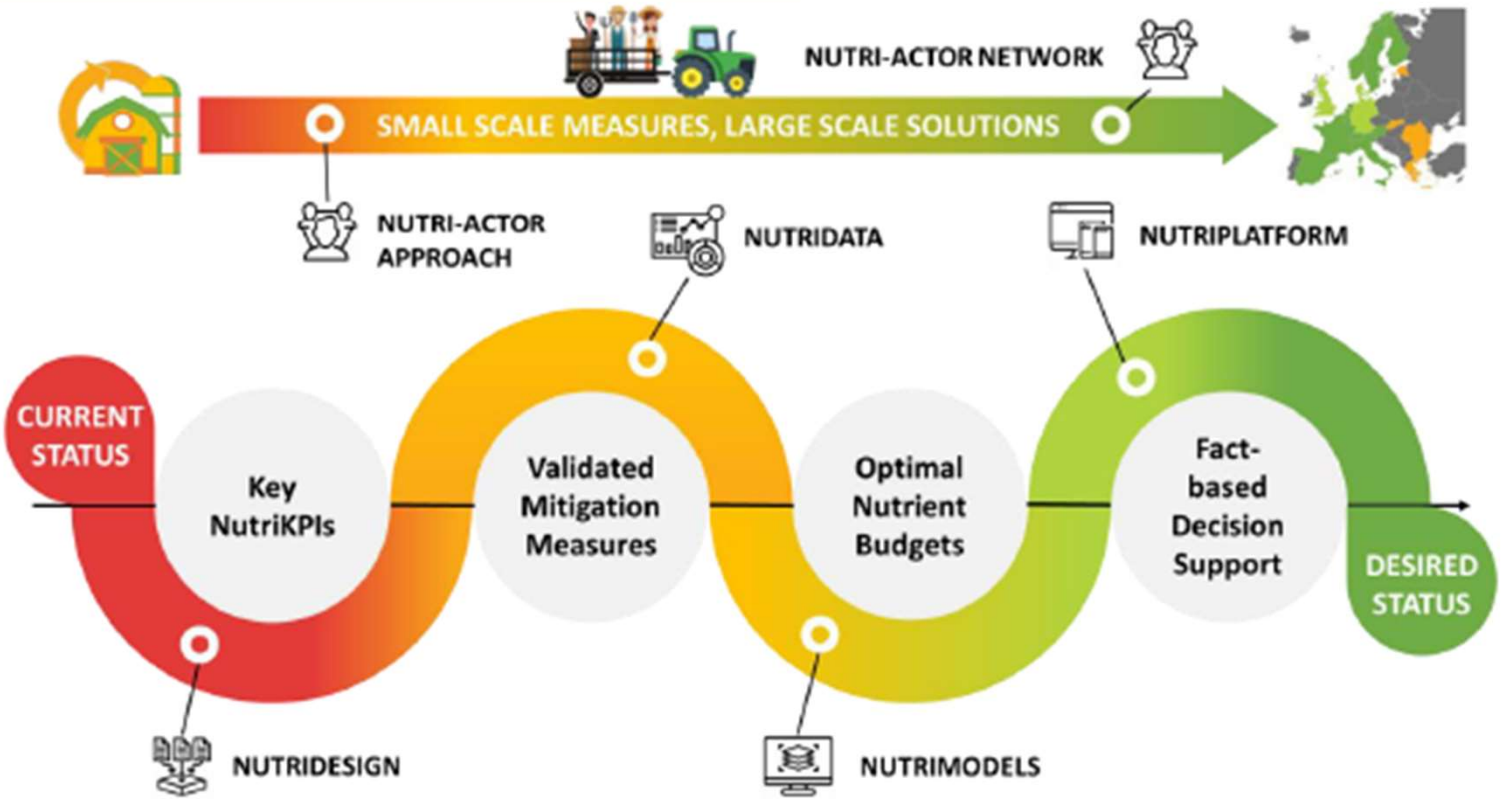
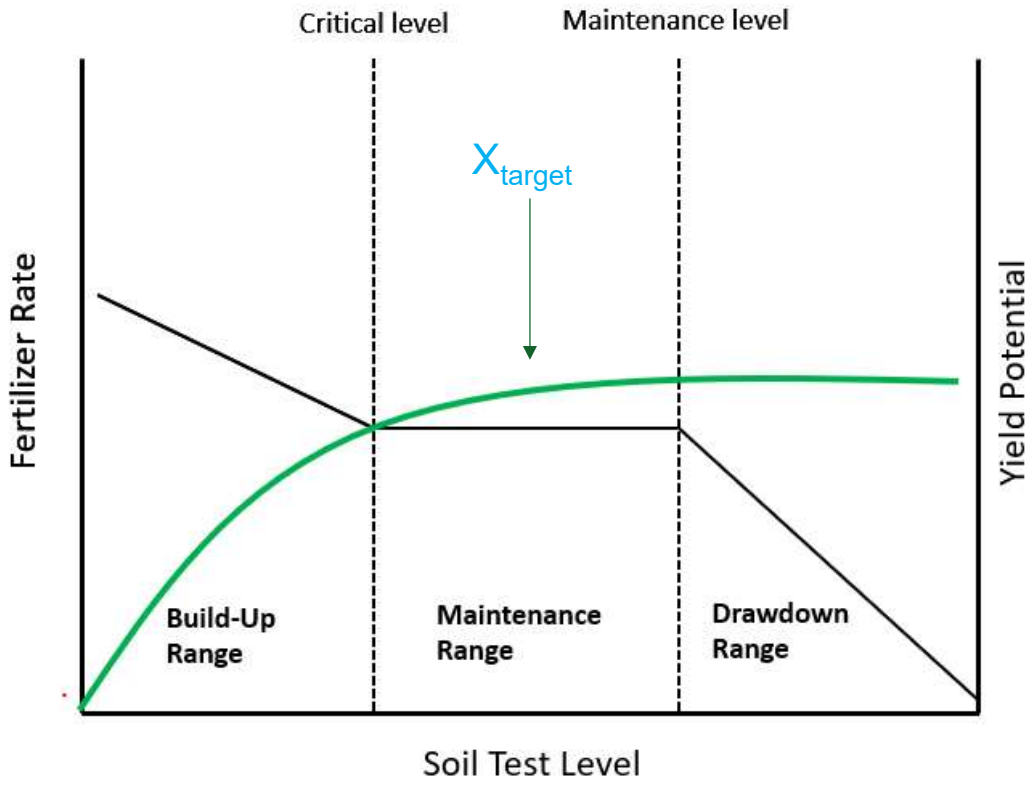


Figure I – The Nutribudget Concept

Our aim: derivation of critical targets for nutri-budgets



Derivation of targets agronomy: example

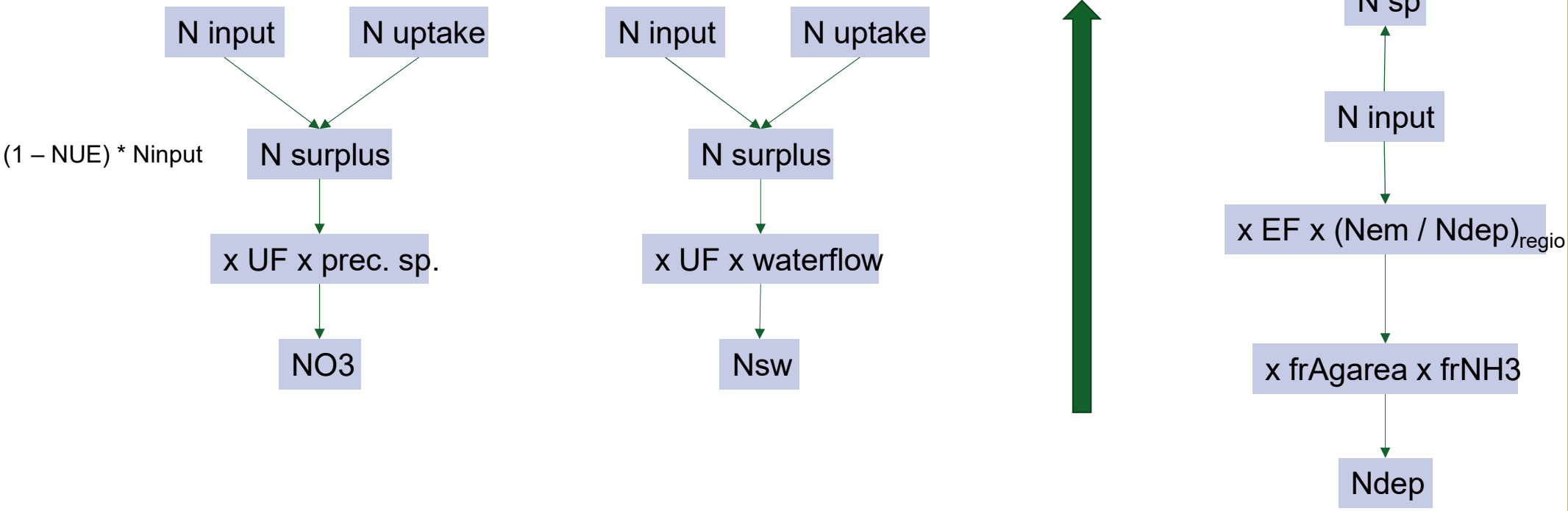
$X_{in} - X_{up} = X_{surplus} =$

ρ x depth x $(X_{target} - X_{current})/T_{target}$

+ $X_{loss\ (crit)}$ voor X erosion loss

So, target surplus can become positive and negative, depending on initial soil nutrient level

Critical N budgets, based on environmental targets



EF varies per manure type
plus application technology

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Our aim: derivation of critical targets for SOC

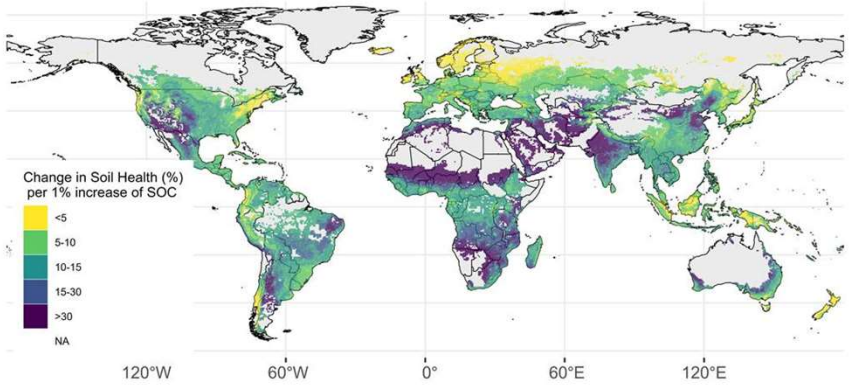
Step 1. Develop meta-ptfs for selected SHI

Step 2. Analyse SHI dependency of the meta-ptfs on SOC

Step 3. Derive critical targets / thresholds for each SHI

Step 4. Derive critical SOC levels for each SHI

Step 5. Derive critical SOC levels for optimum Soil Health



Selection NutriKPIs

Performance indicators in our context describe mainly gaps between a current and a targeted status with respect to e.g. nutrient inputs, surpluses, losses or contents/pools that cannot be measured but only calculated from effect indicators

NutriKPI	
1	Soil Nutrient Status: distance to (agronomic) optimum soil nutrient content
2	Soil Nutrient Surplus: distance to critical surpluses
3	Nutrient Use Efficiency: ratio of outputs divided by inputs (high as possible)
4	Emission Fraction: fraction of N and P being lost to air or water (low as possible)
5	Effect KPI for biodiversity index (high as possible)
6	Soil Quality Index (distance to optimum soil functionality)

Integrative NutriKPI framework

Policy and targets (including Farm to Fork / Zero Pollution Agriculture)

Agronomic Performance	Circularity	Water quality & quantity	Soil Health	Biodiversity	Crop & animal health	Socio-economic position farmer
Crop production	NUE system	nutrient loss, water storage	Soil fertility status	Diversification land use	Pesticide use, crop rotation	income
KPI: soil surpluses in view of multi-targets and farming system				KPI	KPI	KPI

Management Measures (Opportunity Map)

Thank you!!!

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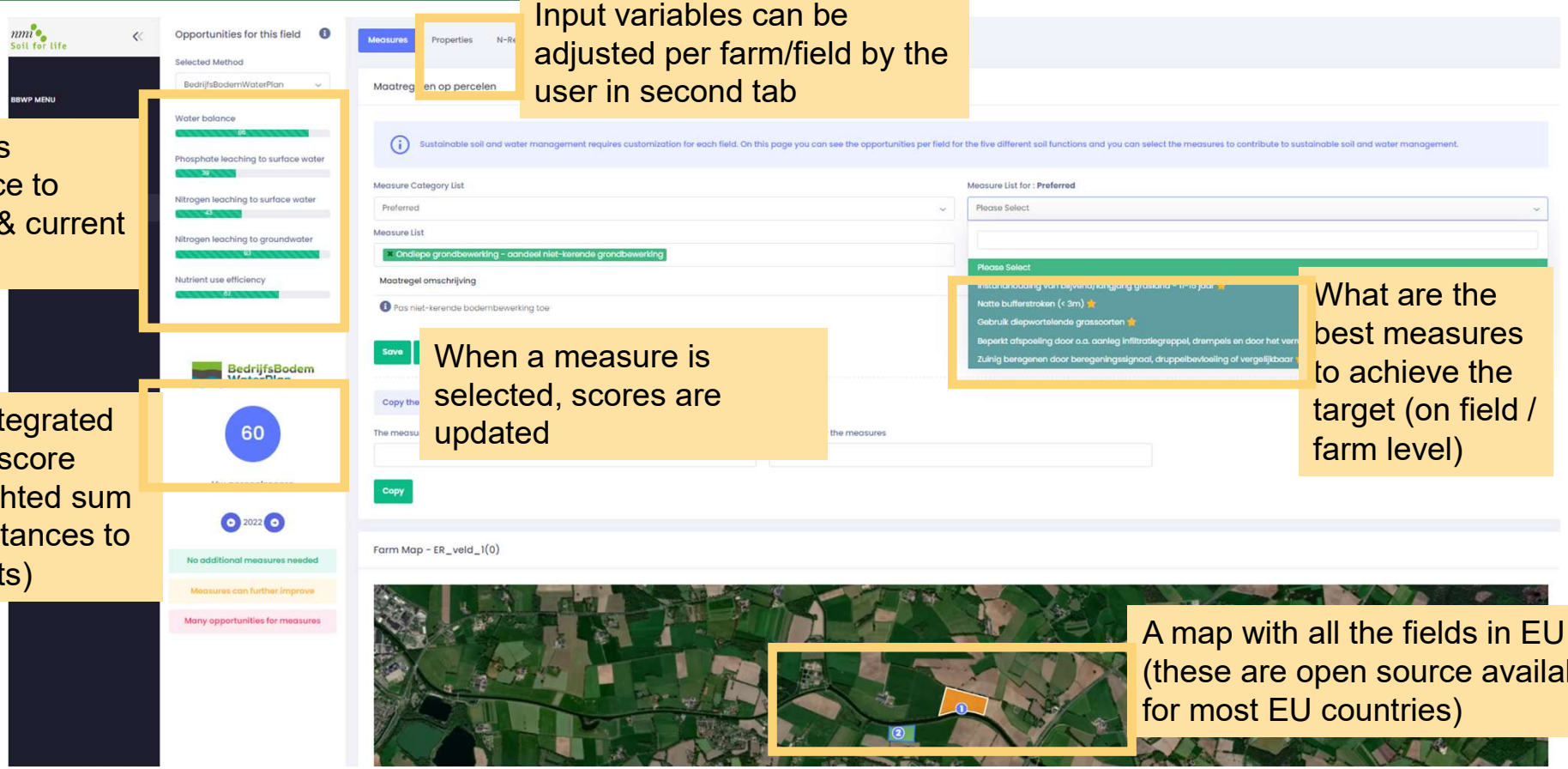
An example from an advisory tool of the NL

how to use KPI to improve sustainability of farming practices



Input variables can be adjusted per farm/field by the user in second tab

What is distance to target & current status

When a measure is selected, scores are updated

What are the best measures to achieve the target (on field / farm level)

An integrated farm score (weighted sum of distances to targets)

A map with all the fields in EU (these are open source available for most EU countries)

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