Bodemindicatoren voor Landbouwgronden in Nederland (BLN)

BETER BODEMBEHEER

A set of indicators to measure soil quality of agricultural soils in NL

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Webtalks Germany & the Netherlands | 26 Oct 2020 | How we measure soil quality & functions

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Why to measure soil quality?

- “Meten is weten” = “Measuring is knowing”

- National Program Agricultural soils:
    - Agricultural soils are sustainably managed in 2030
    - A zero measurement of soil quality will be done in 2020
        - Comprehensive, common and uniform
    - Set of indicators need to be identified

Current standard measurements by farmers of soil quality in NL

- Targeted at improving crop production
    - Soil fertility
    - Visual soil assessment
    - Plant parasitic nematodes only when needed

→ Practical but not a comprehensive measurement of soil quality

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6 challenges in a comprehensive measurement of soil quality

6 challenges in a comprehensive measurement of soil quality

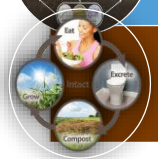
1. Diversity in land use

Primary Productivity

Water purification and regulation

Carbon sequestration and regulation

Provision of functional and intrinsic biodiversity



Provision and cycling of nutrients

6 challenges in a comprehensive measurement of soil quality

1. Diversity in land use

2. Diversity in soil functions

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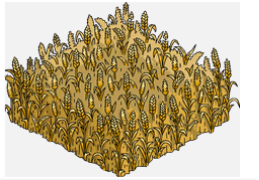
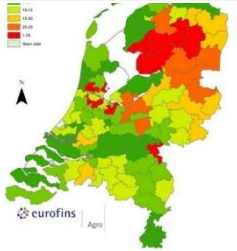
6 challenges in a comprehensive measurement of soil quality



Field

Farm



Country

1. Diversity in land use

2. Diversity in soil functions

3. Soil variation in space and time

4. Difficult to measure soil properties good, cheap and fast

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6 challenges in a comprehensive measurement of soil quality

Soil management	Soil Quality: Good	Soil Quality: Bad
Good		
Bad		

1. Diversity in land use

2. Diversity in soil functions

3. Soil variation in space and time

4. Difficult to measure soil properties good, cheap and fast

scales

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6 challenges in a comprehensive measurement of soil quality

6. Difference between soil quality and soil management

1. Diversity in land use

5. Diversity in spatial scales

2. Diversity in soil functions

4. Difficult to measure soil properties good, cheap and fast

3. Soil variation in space and time

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Bodemindicatoren voor Landbouwgronden in NL
BLN-indicator set

- Integral soil quality review:
  - Several functions: production, climate, water, biodiversity, ...
- From a scientific perspective:
  - Indicators with accurate and reliable measurement methods
  - Added cheap and fast alternative methods
- Selected for national use, for the ministry of Agriculture

Bodemindicatoren voor landbouwgronden in Nederland (BLN)

	Nr	Indicator	Unit	Classical method	Alternative
OM	1	Organic matter content and carbon content	%	Loss on ignition & Dumas	NIRS
	2	Stable organic matter fraction	%	Oxidation in permanganate (POXC)	n.a.
	3	Labile organic matter fraction	mg kg^{-1}, g ha^{-1}	Hot water extraction (HWC)	n.a.
Fysical	4	Water holding capacity	%, mm	Sandbox / pressure pan	Based on texture & OS%
	5	Aggregate stability	-	Wet sieving method	n.a.
	6	Texture	%	Pipet method	NIRS
	7	Penetration resistance	MPa	Penetrometer	
	8	Dry bulk density	kg m^{-3}	Mass after drying 105° C	Based on OS%
Chemical	9	Acidity (pH)	-	Extraction in $CaCl_2$	
	10	Total nitrogen	g kg^{-1}, kg ha^{-1}	Kjeldahl	NIRS
	11	Potential mineralisable nitrogen (PMN)	mg kg^{-1}, g ha^{-1}	Anaerob incubation	NIRS
	12	Phosphate status (P-Al, P-$CaCl_2$, Pw)	mg 100 g^{-1}, g kg^{-1}, kg ha^{-1} mg 100 ml^{-1}	Extraction in ammonium lactate-acetic acid, $CaCl_2$ resp. water	NIRS + Extraction in $CaCl_2$
	13	Potassium status (K-getal, K-CEC, K-$CalCl_2$)	mg 100 g^{-1}, $mmol^+$/kg, g kg^{-1}, kg ha^{-1}	Extraction in HCl & oxalate acid	NIRS + Extraction in $CaCl_2$
Biological	14	Nematod numbers and diversity (incl. plantparasitic nematods)	# taxa, # 100 ml^{-1} grond	Microscopy	PCR
	15	Bacteria & fungi biomass	µg kg^{-1}	PLFA	NIRS
	16	Earthworm numbers and diversity	# m^{-2}, kg m^{-2}	Visual	n.a.
	17	Visual soil assessment	Various	Visual	n.a.

Bodemindicatoren voor lan… Nederland (BLN)

Routine measurements available at commercial laboratories

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Target values or reference values (partly) available

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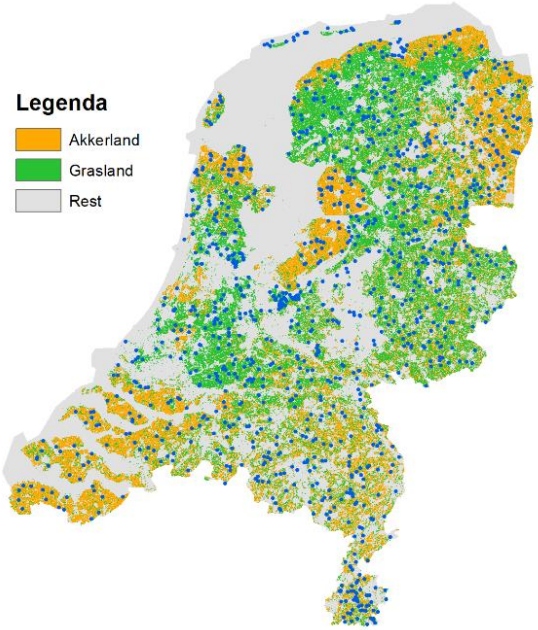
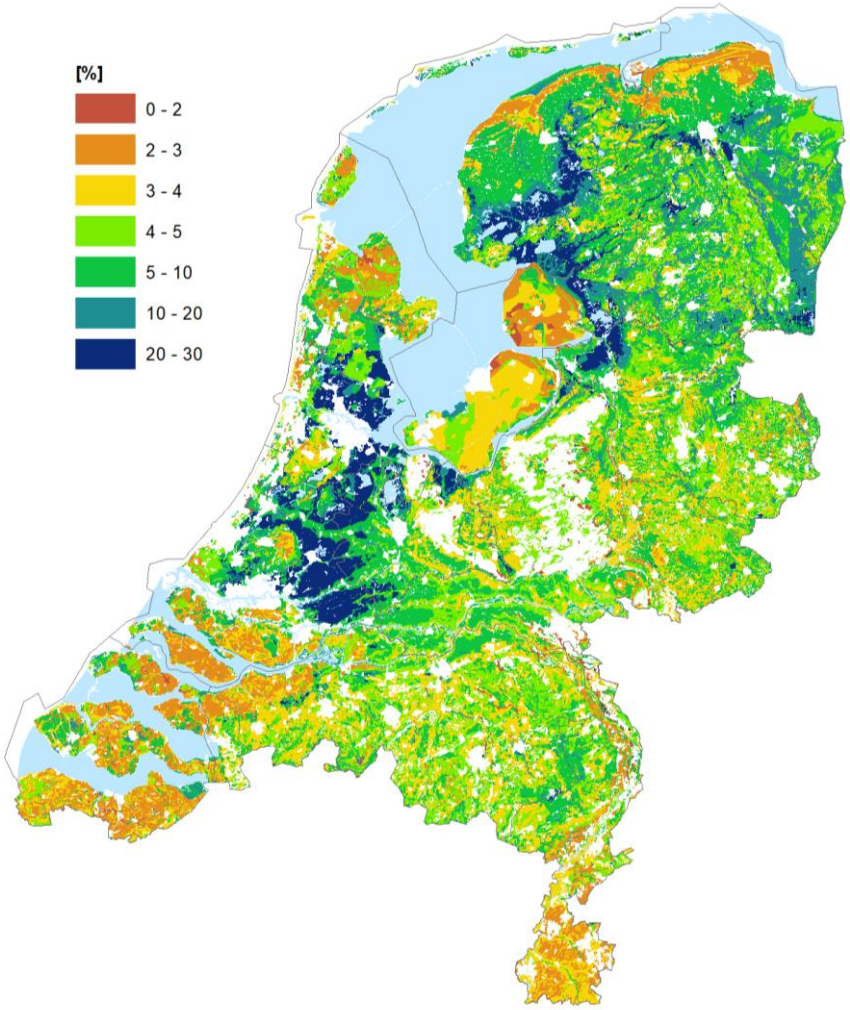
BLN-indicator 1.0, further developments

- Integral Soil Quality Measurements is possible
  - Not yet good, cheap and fast
  - Challenges for many indicators
- Further developments:
  - Testing in two research programs
    - Applicability, protocols, target and reference values
    - Alternative indicators and measurement methods
    - Develop methods for comprehensive assessment
  - Link soil quality assessment to soil management practices

Organic matter content 0-30 cm





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To conclude

- BLN-indicator set is the start of uniform soil quality assessment in the Netherlands
    - To do national soil quality measurements
    - Available for use in other tools
        - Open Soil Index, Soil Coalition
- Soil quality assessments are difficult but possible
    - Define and discuss targets of assessment
    - Know the restrictions of the assessment

Thank you for your attention