FENLAND SOIL

SUSTAINABILITY | OPPORTUNITY | INNOVATION | LEARNING

Peat Meadows in The Netherlands

Fenland Soil Conference

17-19 April, 2023

Ely, United Kingdom

Dr. Joost A. Keuskamp,

Biont Research / Utrecht University

The Netherlands Research Program On Greenhouse Gas Dynamics In Peatlands And Organic Soils

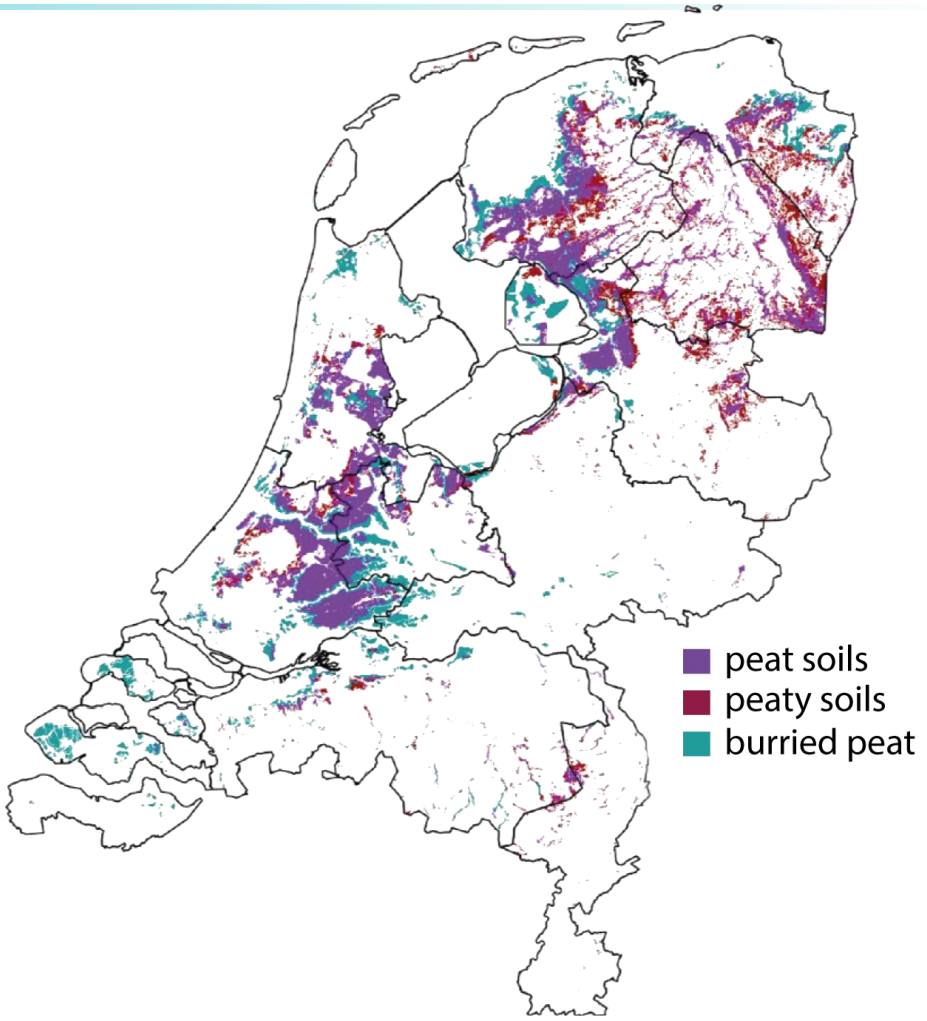
Gilles Erkens, Ralf Aben, Jan van den Akker, Sanneke van Asselen, Merit van den Berg, Jim Boonman, Alex Buzacott, Daniel van de Craats, Gijs van Dijk, Wietse Franssen, Christian Fritz, Sarah Faye Harpenslager, Mariet Hefting, Rudi Hessel, Tom Heuts, Saskia Hommes, Jordy van ‘t Hull, Ronald Hutjes, Ko van Huissteden, Siem Jansen, Joost Keuskamp, Judith van der Knaap, Hans Koning, Henk Kooi, Bart Kruijt, Ron Lootens, Roel Melman, Laura Nougues, Bas van de Riet, Ype van de Velde, Gerard Velthof, Simone Weidner, and many others

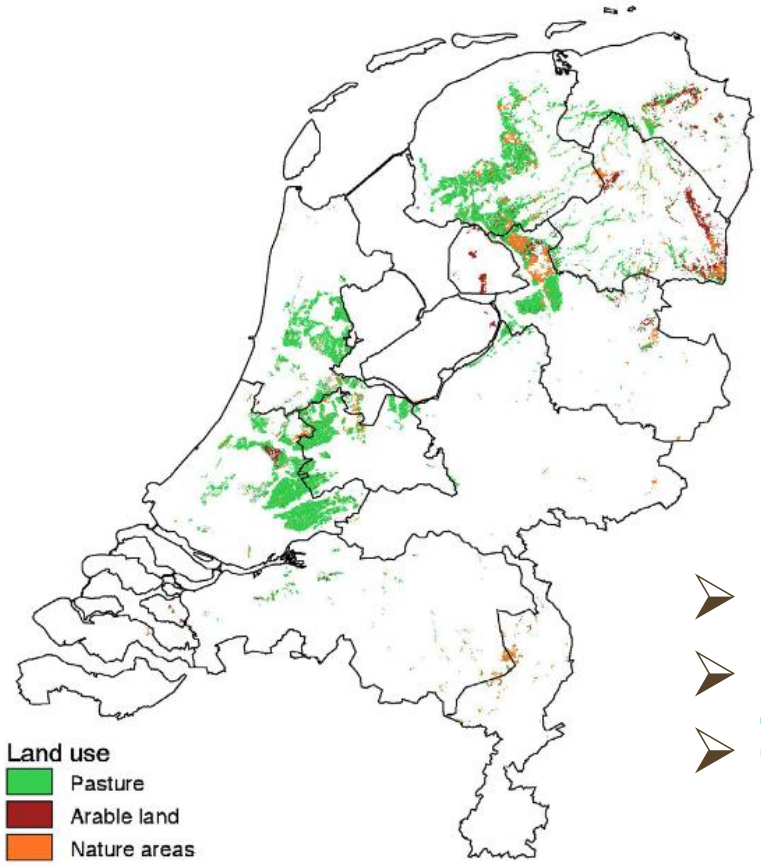
Peat Innovation Program The Netherlands, Theme: Clay in Peat

Joost Keuskamp, Mariet Hefting, Maaike van Agtmaal, Minne Holtrop, Frank Lenssinck, Ruud van Uffelen, Thom van der Sluis, Jochim Deru, and many others

Peatlands in The Netherlands

- ~9% surface are
- Peat thickness 0.5 (North) – 8 m (West)





- 80 % in use for grazing
- Drained with ditches, up to a depth of 20-100 cm
- 50 % of emission of agricultural soils.

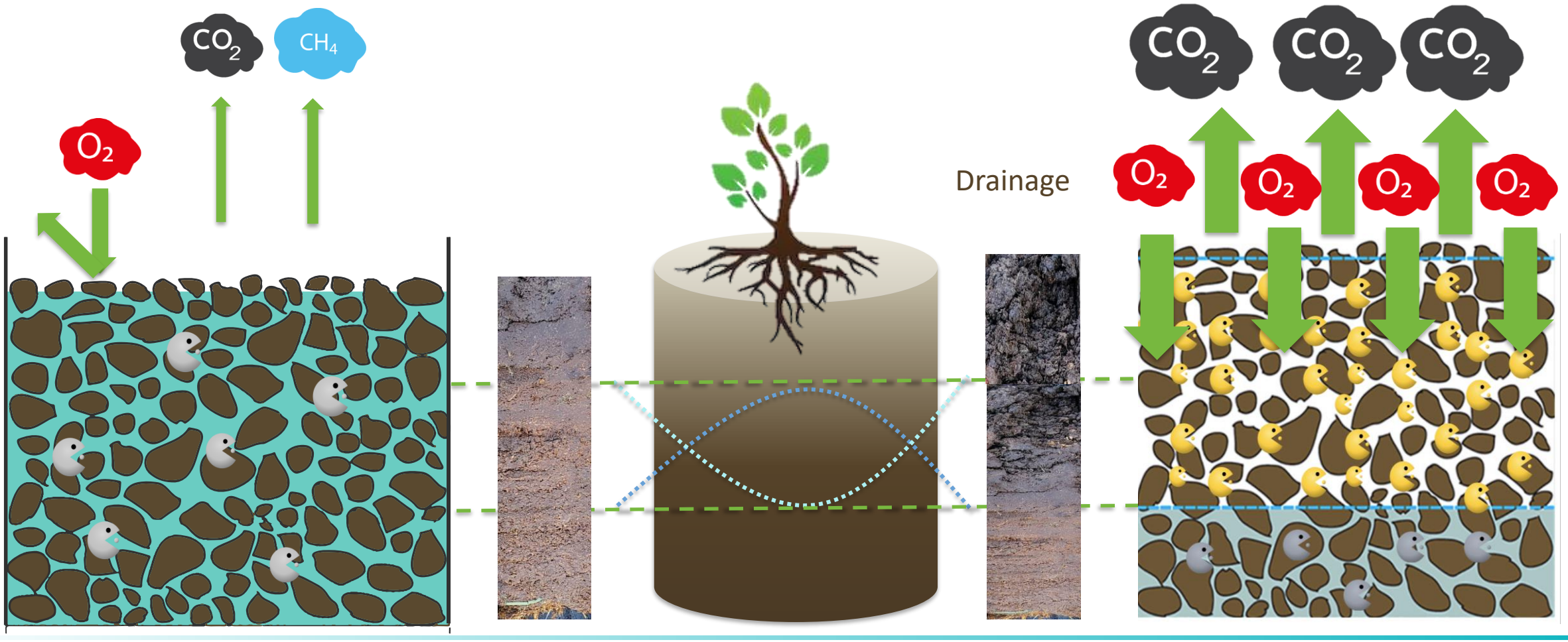

Source: commonland


Source:NOBV

Peat profile with intact and oxidised peat

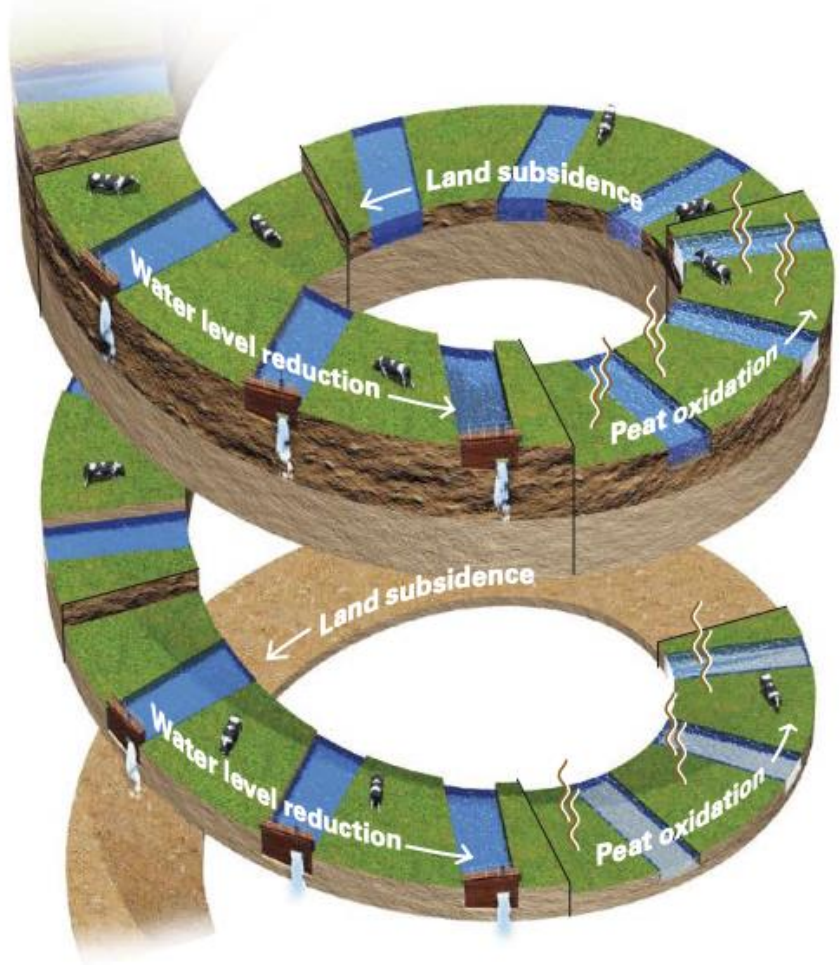
Rouveen, Duygu Tolunay (E&B, UU)

Drainage causes peat oxidation



Land subsidence and drainage

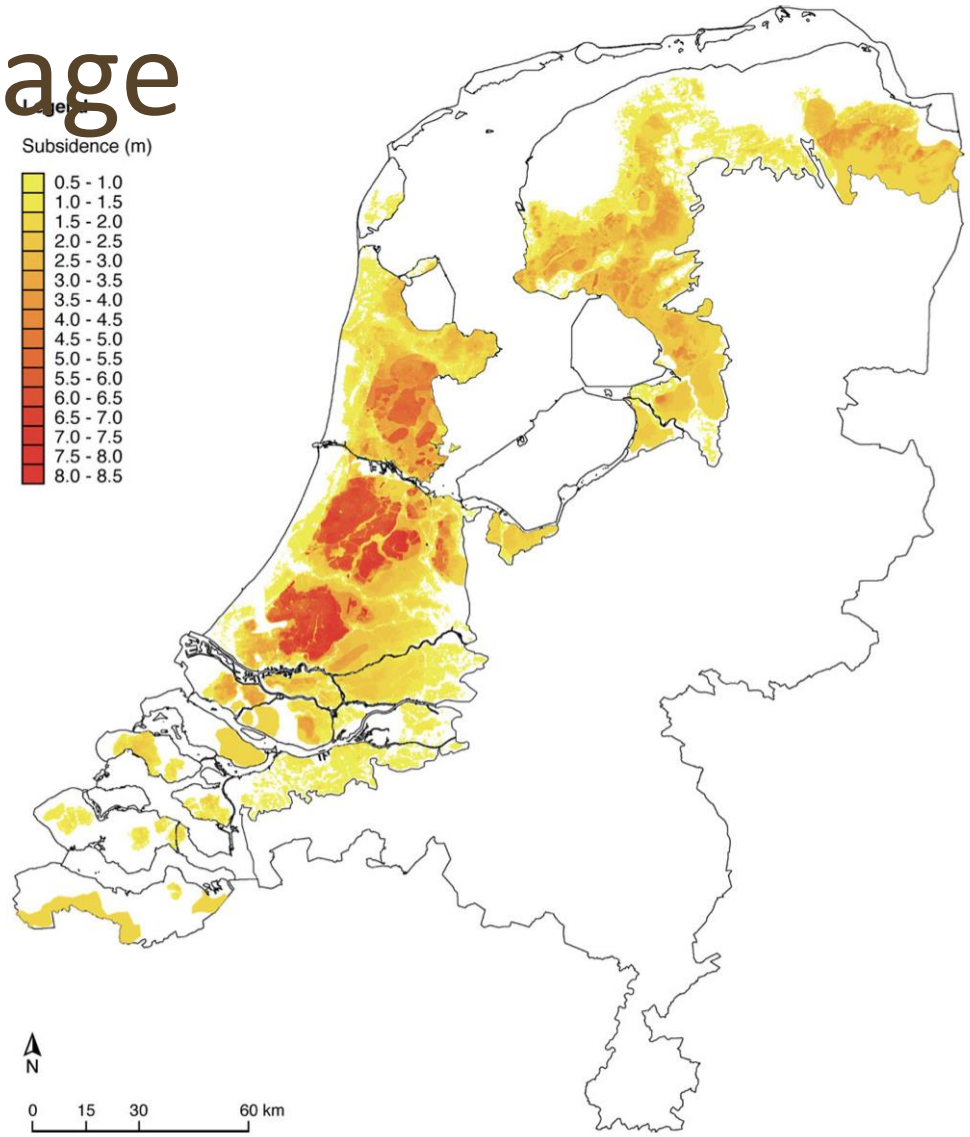
- Subsidence rate of .2~2.5 cm/y.
- Keeping constant groundwater levels, requires lowering of ditch water levels so that peat oxidation and CO_2 release continue at a constant pace.



Source council for the environment and infrastructure, The Netherlands

Land subsidence and drainage

- Subsidence rate of .2~2.5 cm/y.
- Keeping constant groundwater levels, requires lowering of ditch water levels so that peat oxidation and CO_2 release continue at a constant pace.
- Cumulative effect of the past 1000 years up to 8 m.

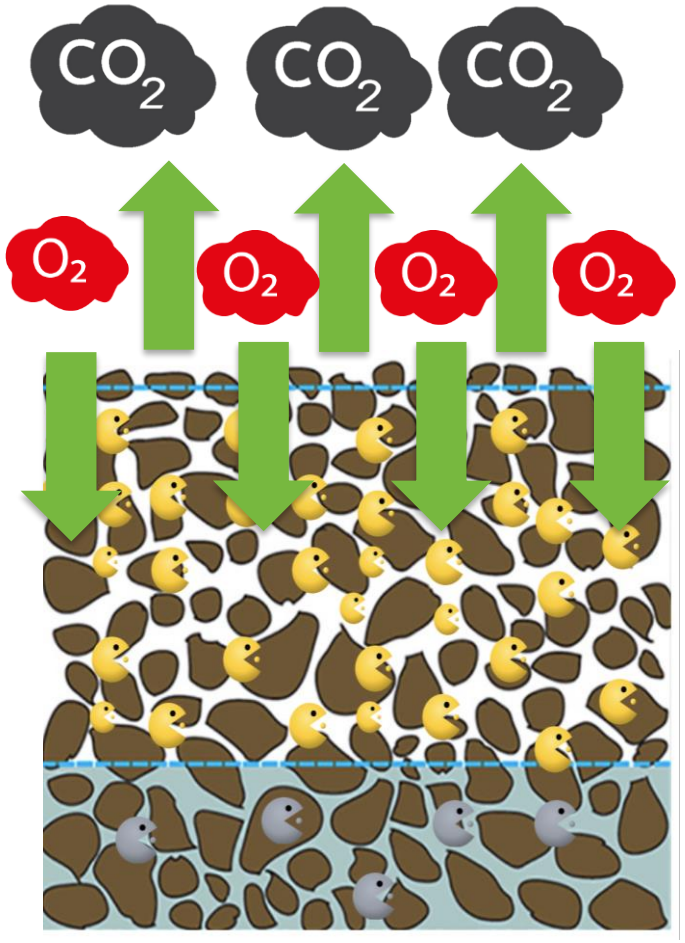


➢Damages to infrastructure alone are estimated to be **5 billion euros** in the coming thirty years

LOSS
Living on Soft Soils
Subsidence & Society

Source Erkens et al. 2012

GHG emissions from peatlands



- CO_2, CH_4, N_2O
- Emission: ~5.6 Mton CO_{2eq} yr^{-1}
  (Ruyssenaars et al., 2020)

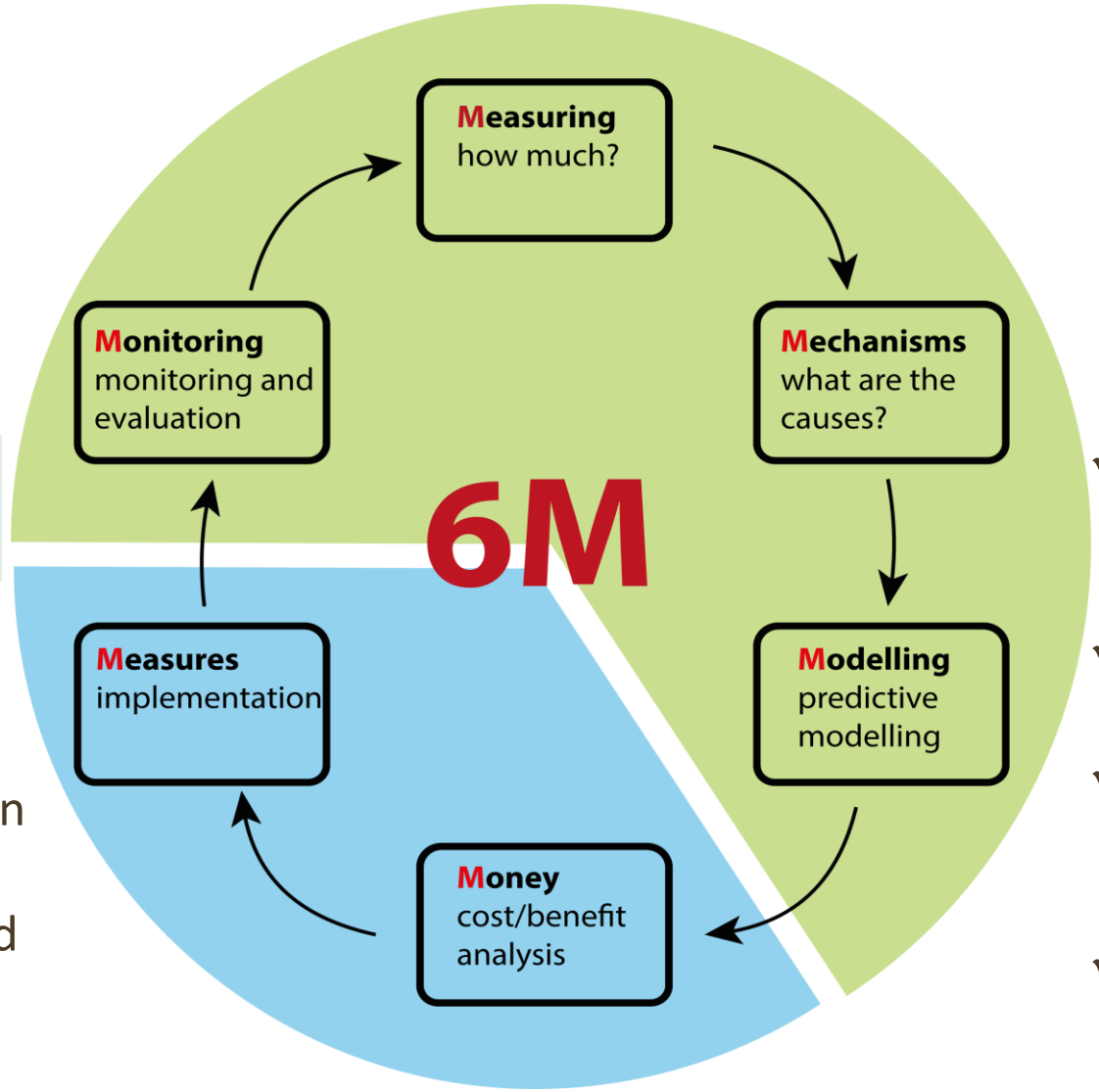
- National climate law and climate agreement:
  Reduction of 1 Mton CO_{2eq} yr^{-1} in 2030

➢ National climate law and climate agreement: Reduction of 1 Mton CO_{2eq} yr^{-1} in 2030

VIPNL

INNOVATIONS FOR FUTURE-PROOF PEATLANDS

- ✓ Innovative measures
- ✓ Practical implementation
- ✓ Agronomic practices and monetary benefits
- ✓ Farmers, waterboards, provinces



Nationaal Onderzoeksprogramma Broeikasgassen Veenweiden

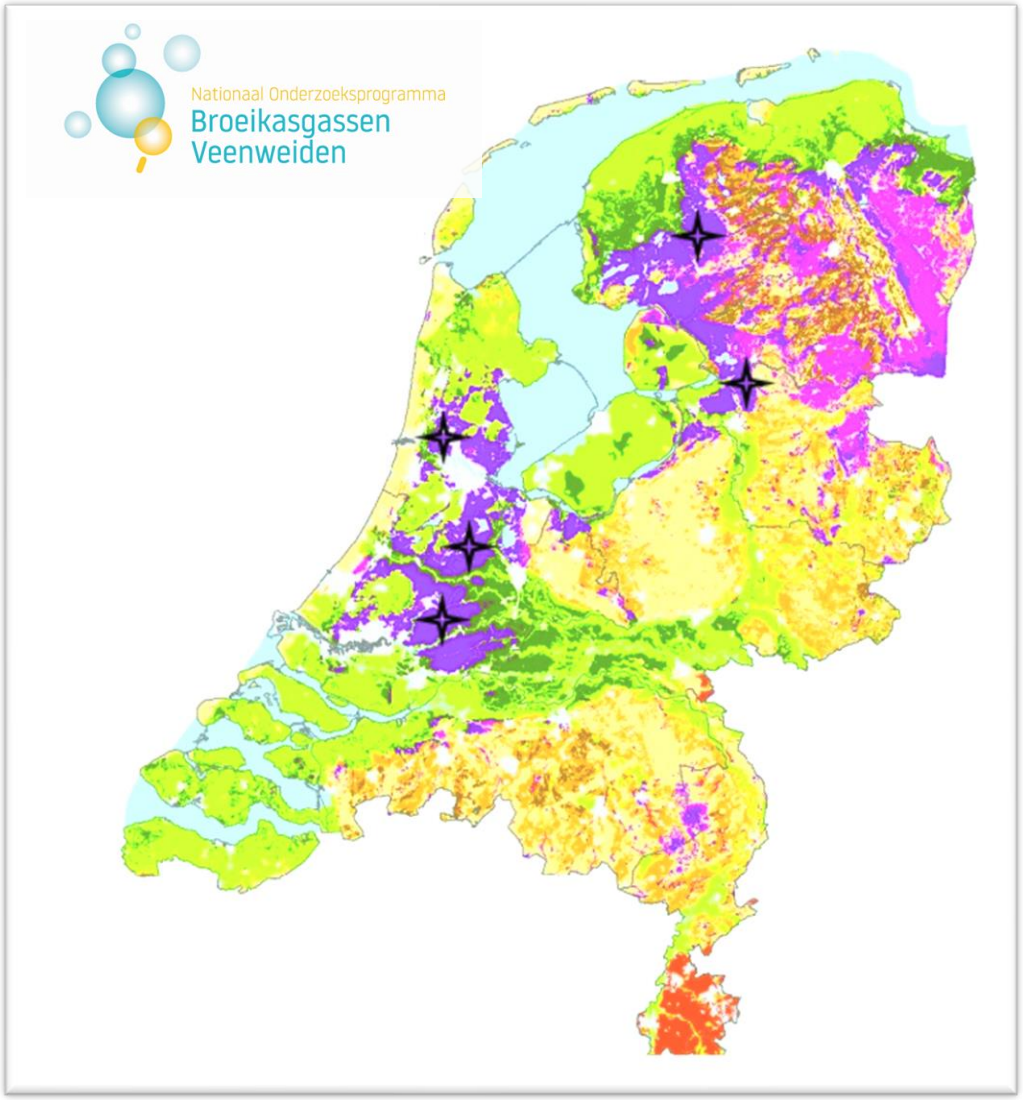
NOBV
National research program

- ✓ Monitor the effectivity of existing measures
- ✓ Nationwide monitoring network
- ✓ Mechanistic understanding of peat oxidation and its drivers
- ✓ Numeric modelling for upscaling and reporting

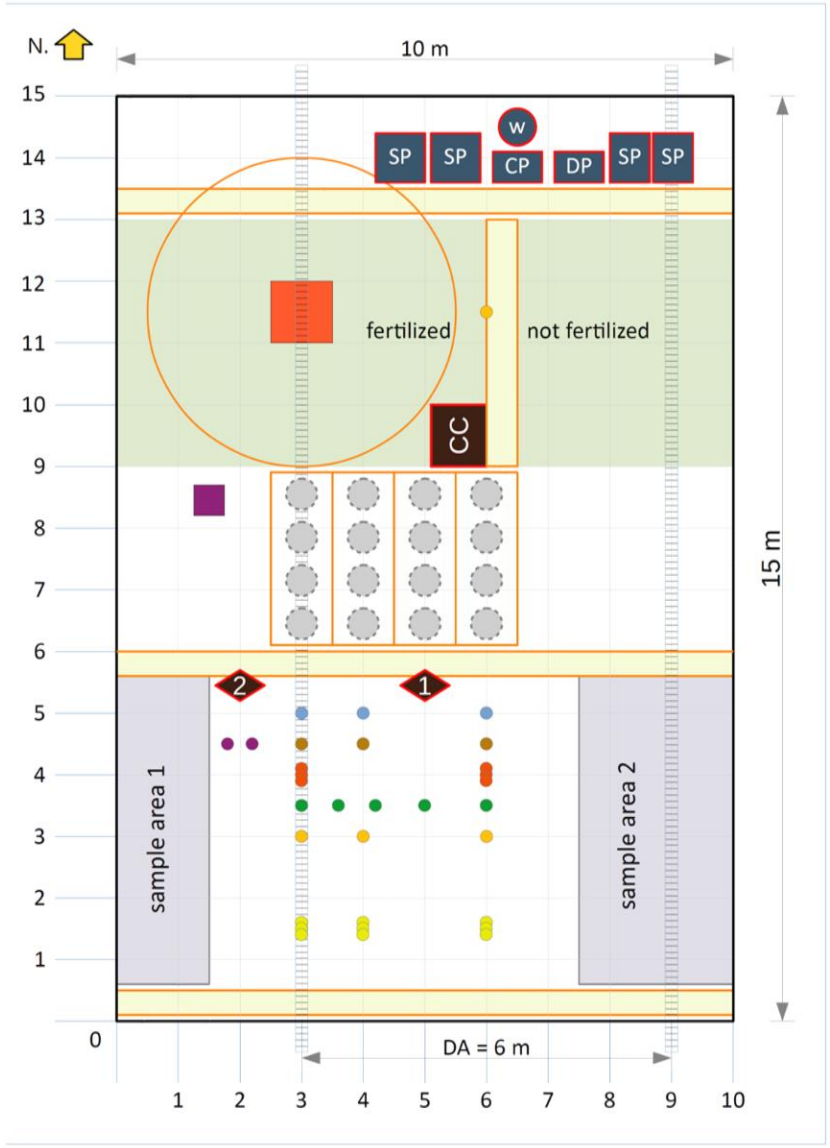
After Erkens en Stauthamer, 2012

NOBV research program

- Nationwide monitoring network
- Evaluating the effectiveness of *current* measures
- Mechanistic understanding
- Modelling for upscaling and reporting



NOBV Monitoring sites



Continous monitoring of:

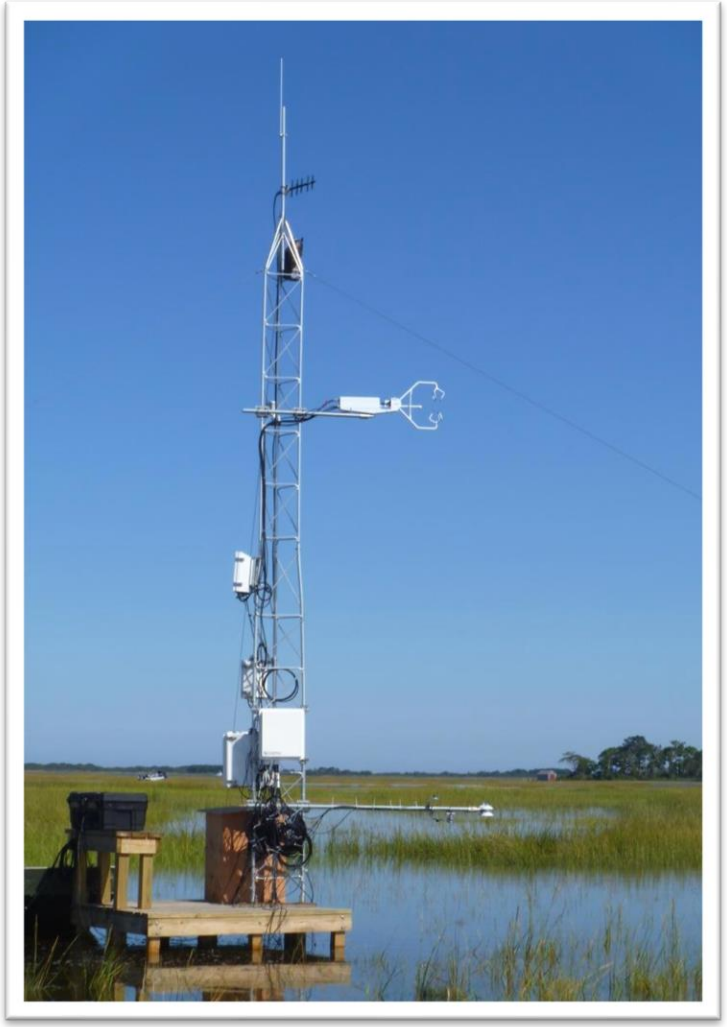
- GHG emission
- Land subsidence
- Ground water table
- Redox conditions
- Pore water quality
- Grass production

Paired between measure and control

Coherent and complete set of parameters for process-based modelling

Nationaal Onderzoeksprogramma
Broeikasgassen
Veenweiden

GHG Measurements at different scales



- For parametrisation (lab) and validation of models at different scales

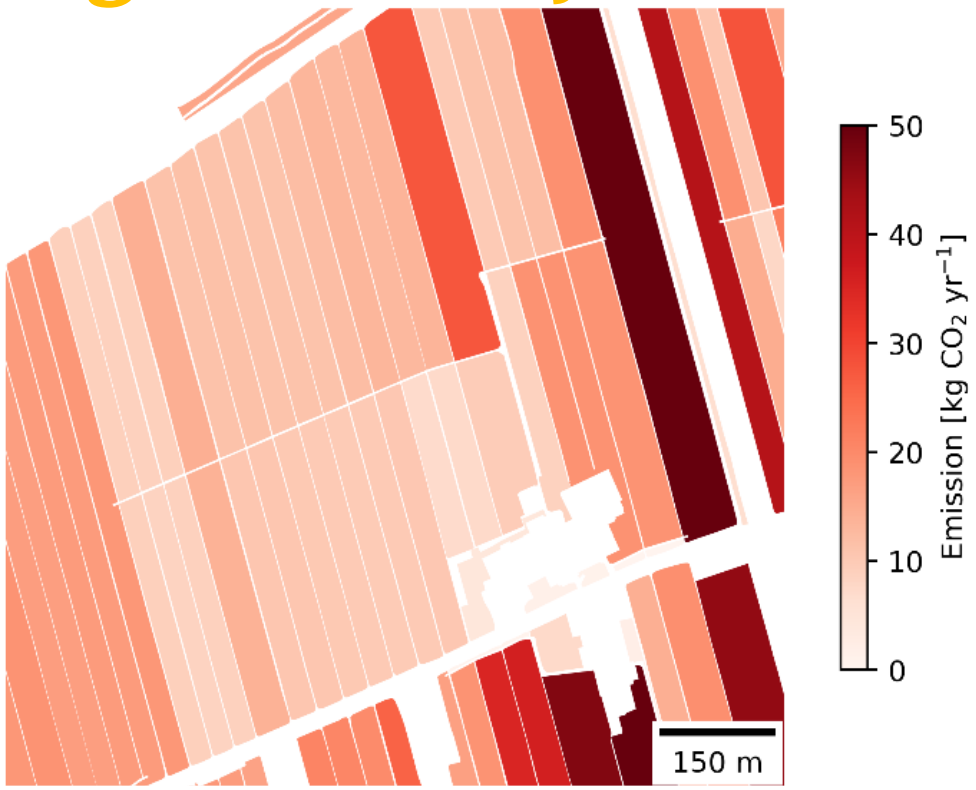
Modelling emissions for policy making

SOMERS model ensemble and registration system

- **Watertable** depth as a function of drain water levels, peat type, WIS, and parcel width.

- **Emissions** as a function of soil moisture and temperature

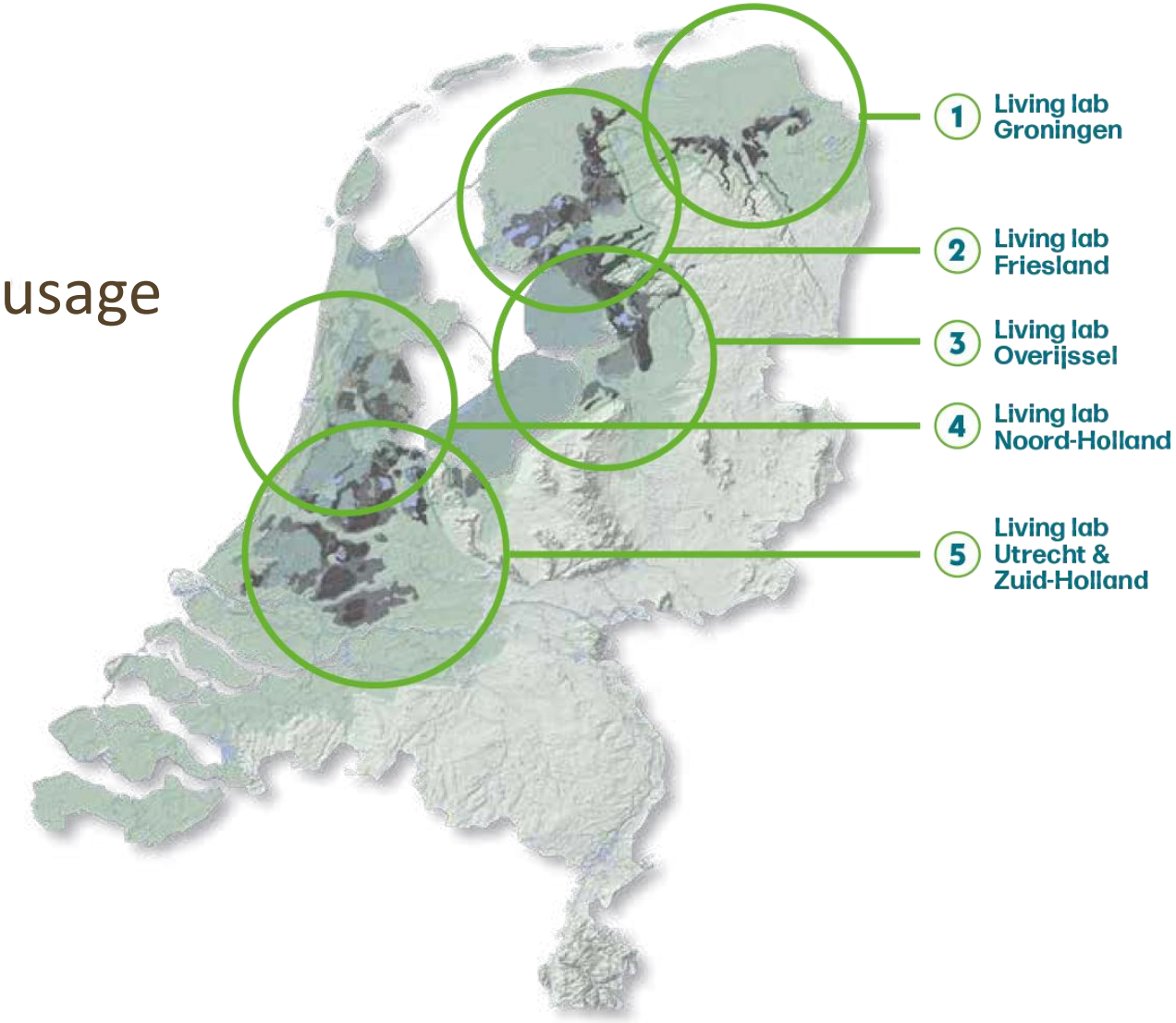
- **'Calculation rules':** Indication of C-mitigation to expect from measures for a certain location



Somers modelling team

INNOVATIONS FOR FUTURE-PROOF PEATLANDS

- Sustainable and economically viable usage of peatlands.
- Innovative measures for current and alternative agricultural practices.
- Locally focused
- From research to implementation



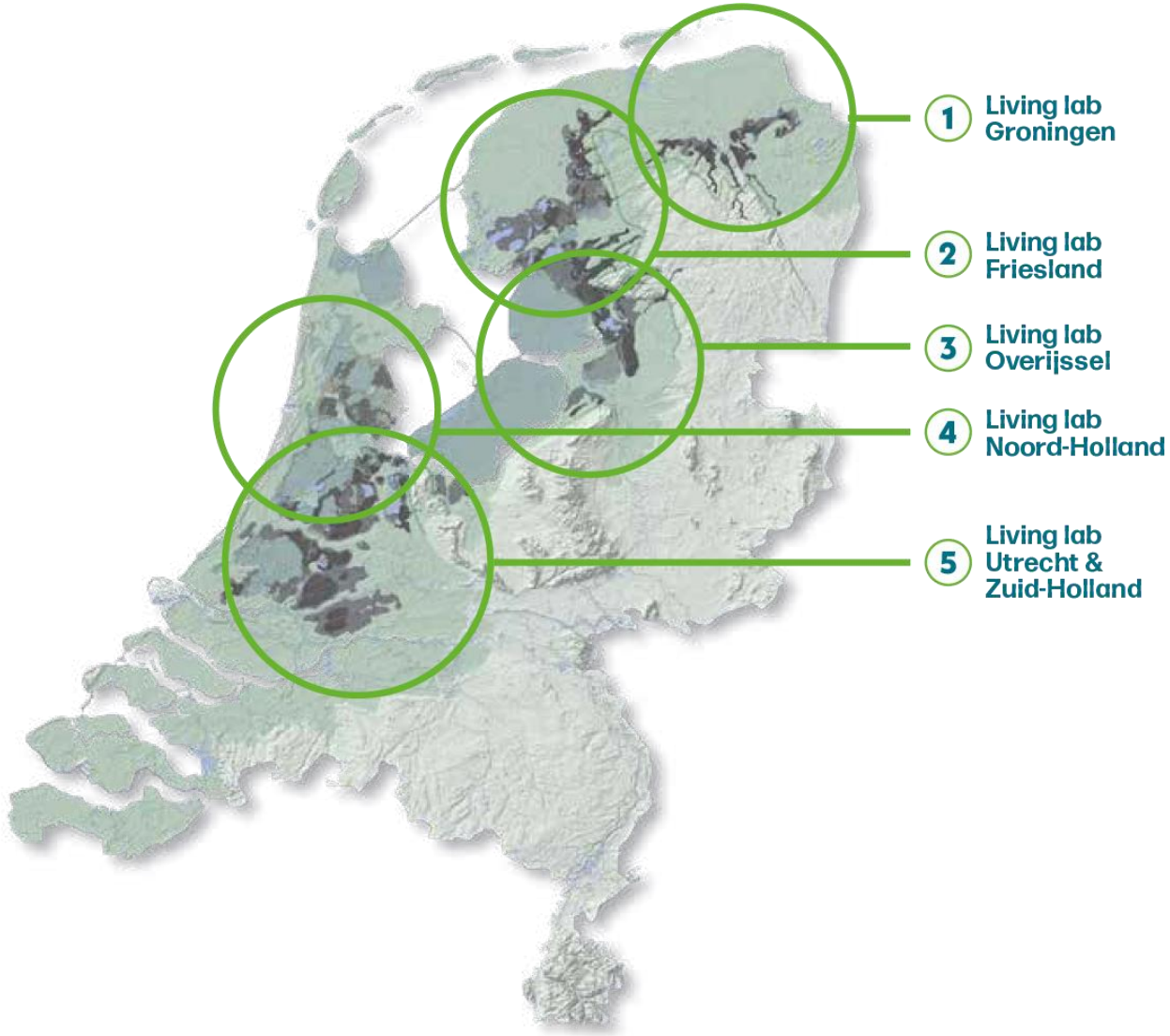
INNOVATIONS FOR FUTURE-PROOF PEATLANDS

A
CLAY IN PEAT

B
WET CROPS

C
FARMING IN HIGH WATER TABLE AREAS

D
PEAT MOSS



INNOVATIONS FOR FUTURE-PROOF PEATLANDS

A CLAY IN PEAT

Goals:

- Decrease peat oxidation in the oxidised zone.
- No large investments
- 'Business as usual'

How:

- Thin layer of clay (1cm) on top of the peat
- Natural mixing (bioturbation)
- Clay sourced from infrastructural works

Proeftuin Krimpenerwaard

FROM FIELD-SCALE TO LAB-SCALE

- 20 demosites in collaboration with farmers, contractors and local authorities.

FROM FIELD-SCALE TO LAB

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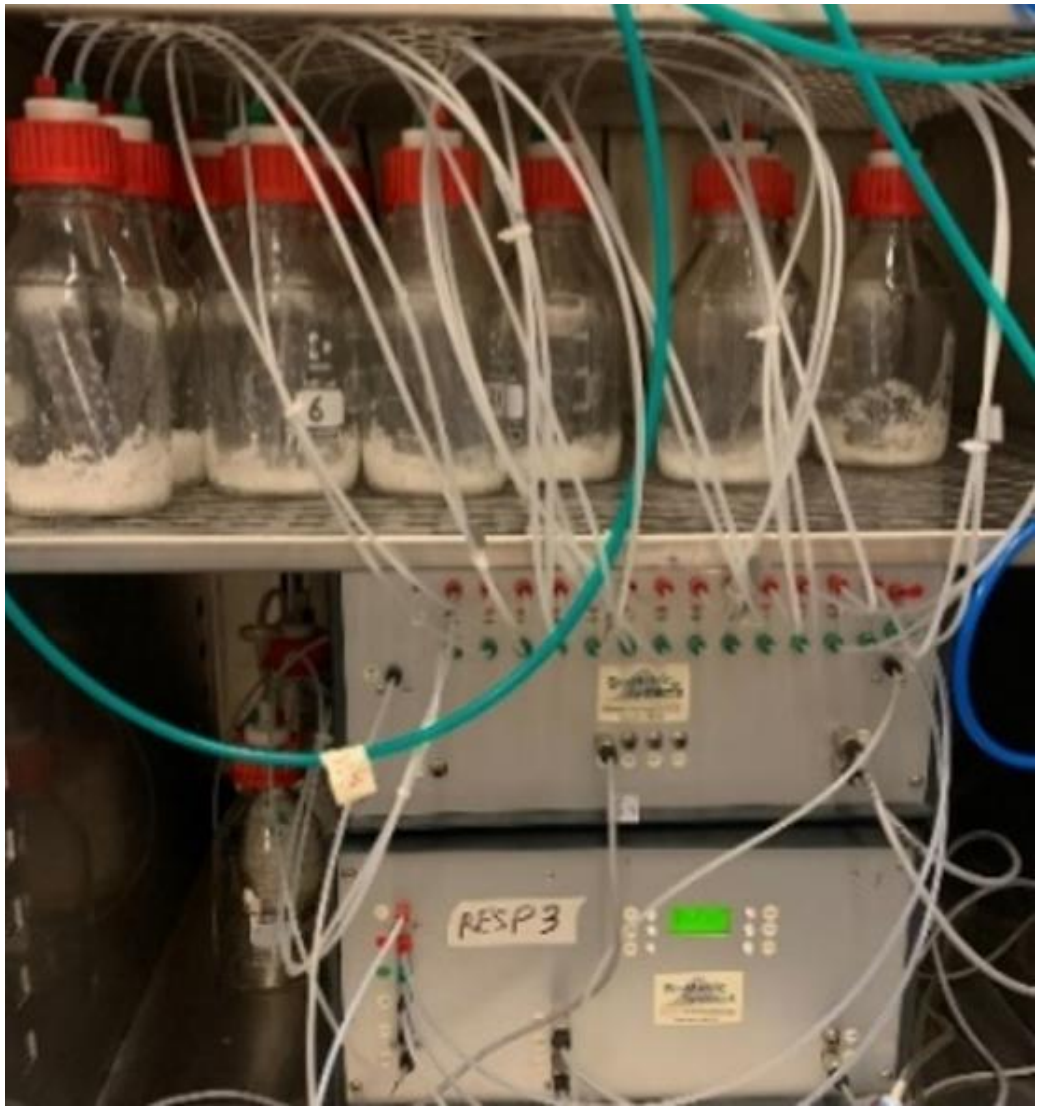
- Small-scale ‘clay palettes’ to test different clay types

FROM FIELD-SCALE TO LAB-SCALE

- 20 demosites in collaboration with farmers, contractors and local authorities.
- Small-scale ‘clay palettes’ to test different clay types
- Laboratory experiments to test effectiveness under controlled conditions

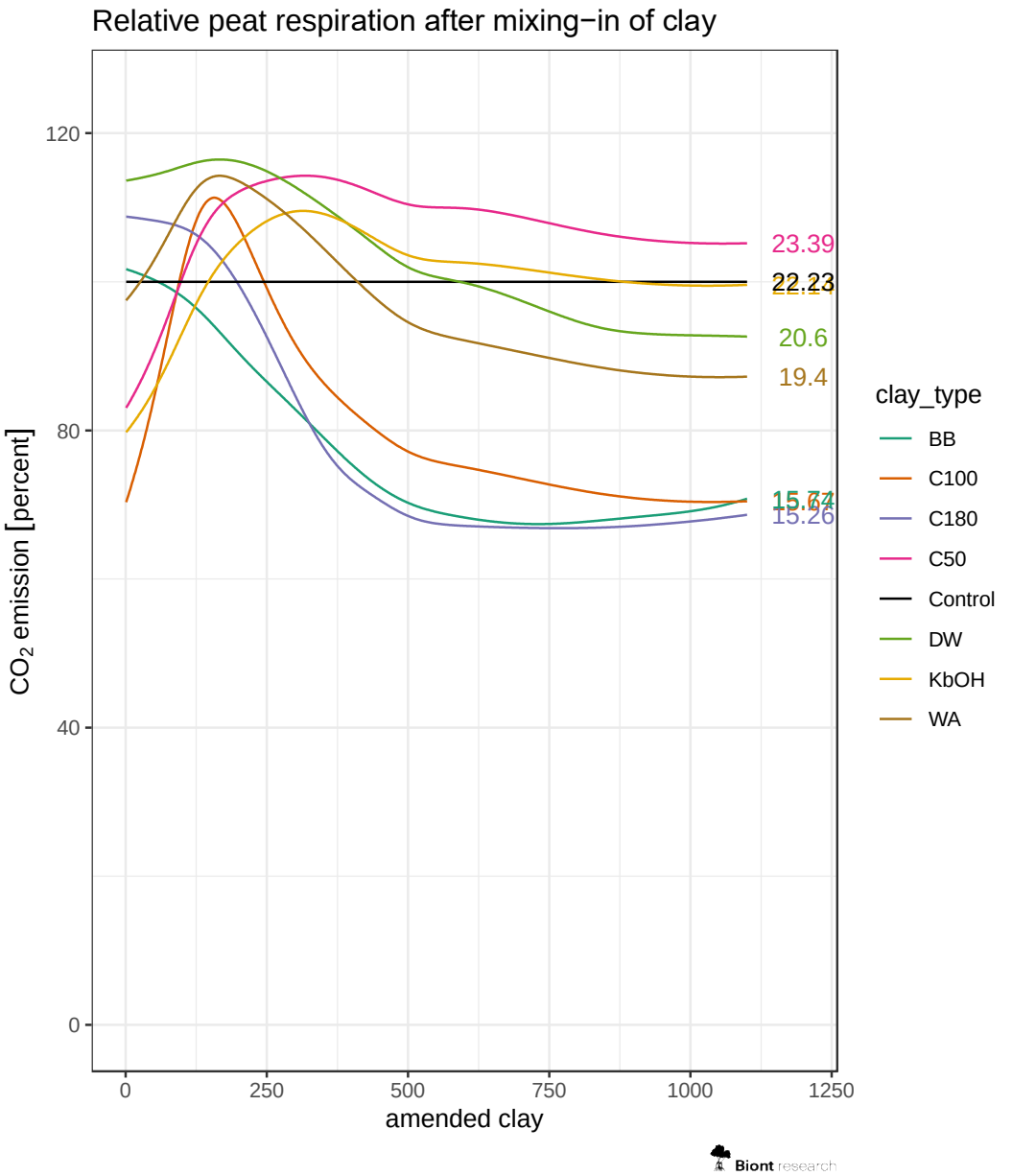


INNOVATIONS FOR FUTURE-PROOF PEATLANDS

A CLAY IN PEAT

LABORATORY INCUBATIONS

- Lab incubations show a decrease in CO_2 emission upto ~33% over a three year period.
- Reduction translates to a potential decrease of 2.3 tC/ha per clay application.



DEMOSITES (WORK IN PROGRESS)

Farmers

- Yield quality and quantity OK
- Bearing capacity at start of season
- Less severe draught periods

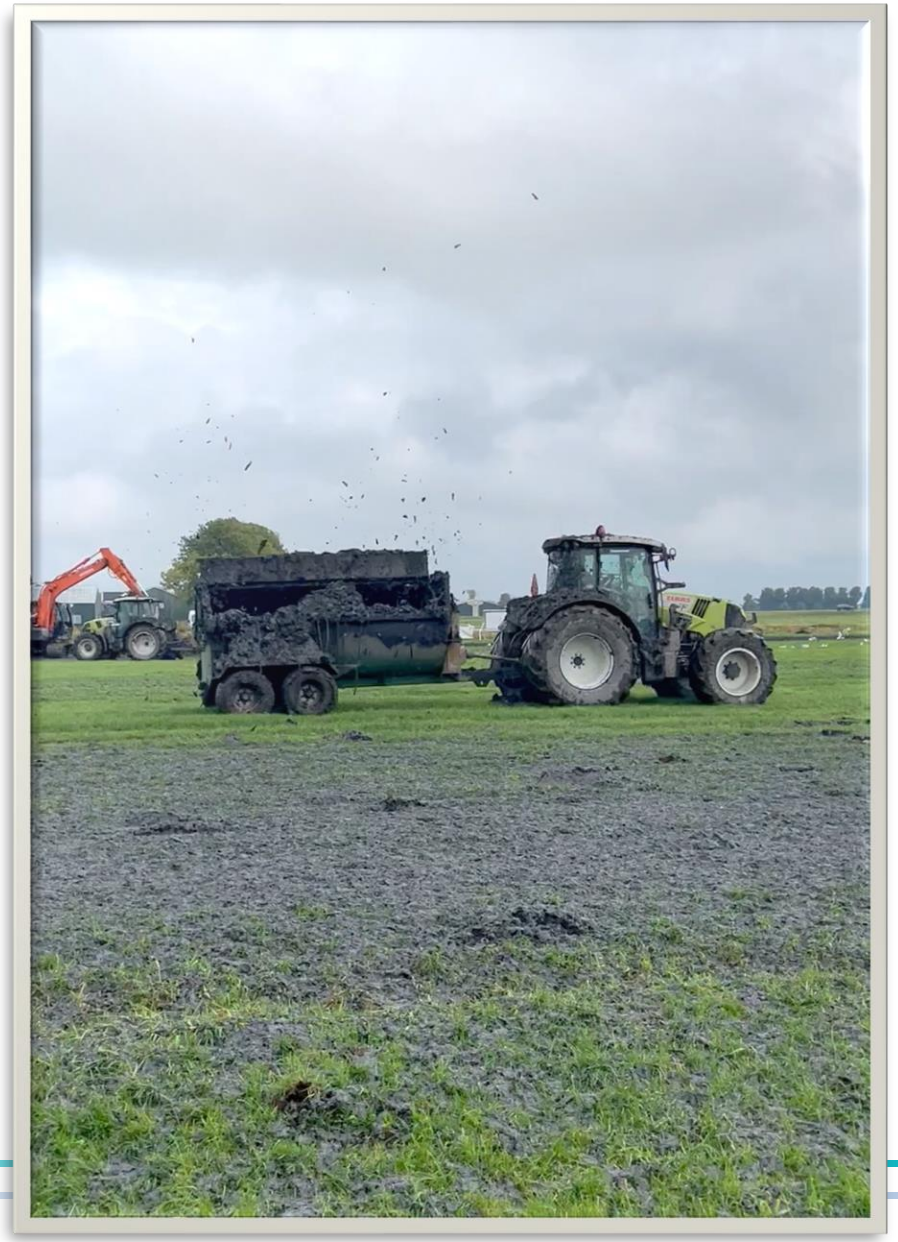
Contractors

- Doable with existing machinery
- Investigating new machines for upscaling
- Dosing across the fields needs improvem

FIRST CONCLUSIONS

- Potential to decrease peat oxidation
- Does not require large investments
- Farmers report no negative effects

- **How do lab results translate to the field?**



• THANK YOU ☺

Joost A. Keuskamp, Dr.
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Utrecht University

MORE INFORMATION ON PRESENTED PROJECTS

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