




RESEARCH CENTRE

Restoring ecosystem functions & reversing land subsidence by growing *Sphagnum* on highly degraded eutrophic peat soils

Bas van de Riet - Eva van den Elzen - Niels Hogeweg
Merit van den Berg – Gijs van Dijk - Fons Smolders - Leon Lamers

✉ b.vanderiet@b-ware.eu

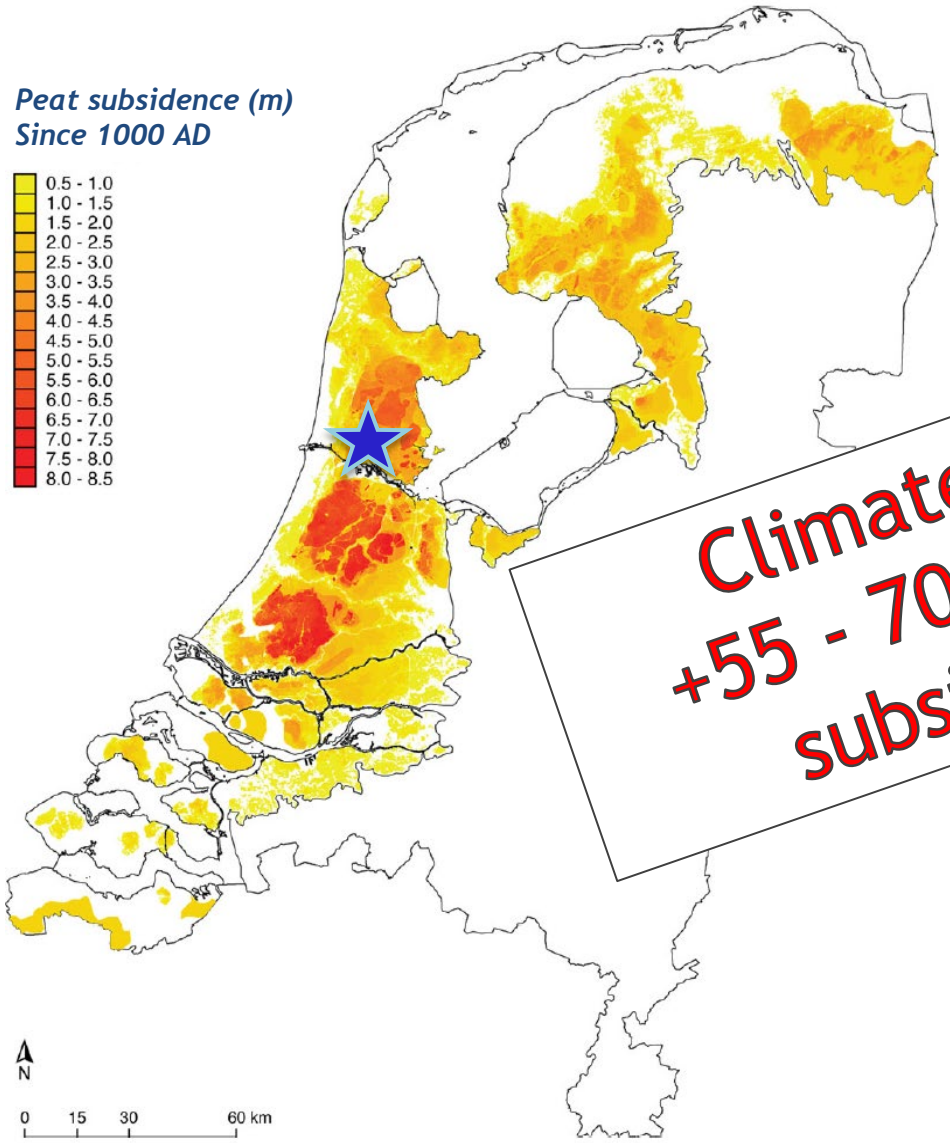
greenbusinessclub.nl

BIOGEOCHEMICAL WATER-MANAGEMENT & APPLIED RESEARCH ON ECOSYSTEMS

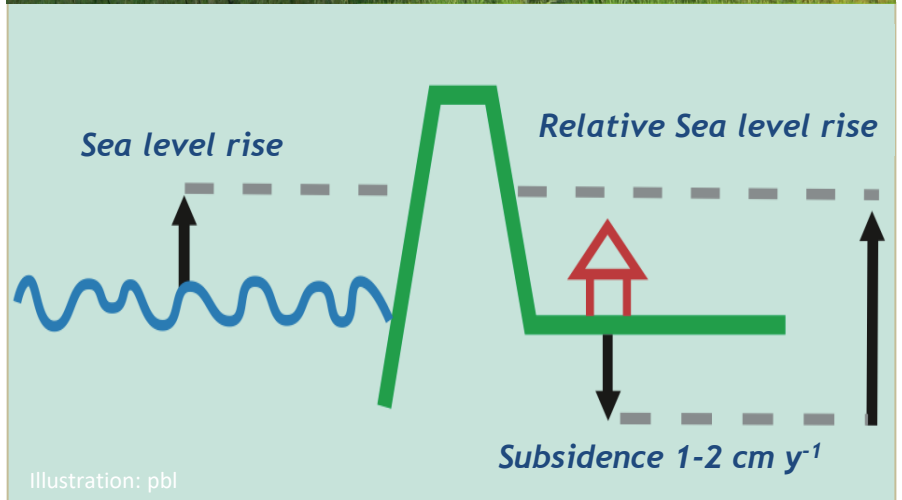
Drainage & subsidence in the Netherlands

Radboud Universiteit

B ware RESEARCH CENTRE



Climate change =
+55 - 70% increase in
subsidence rate

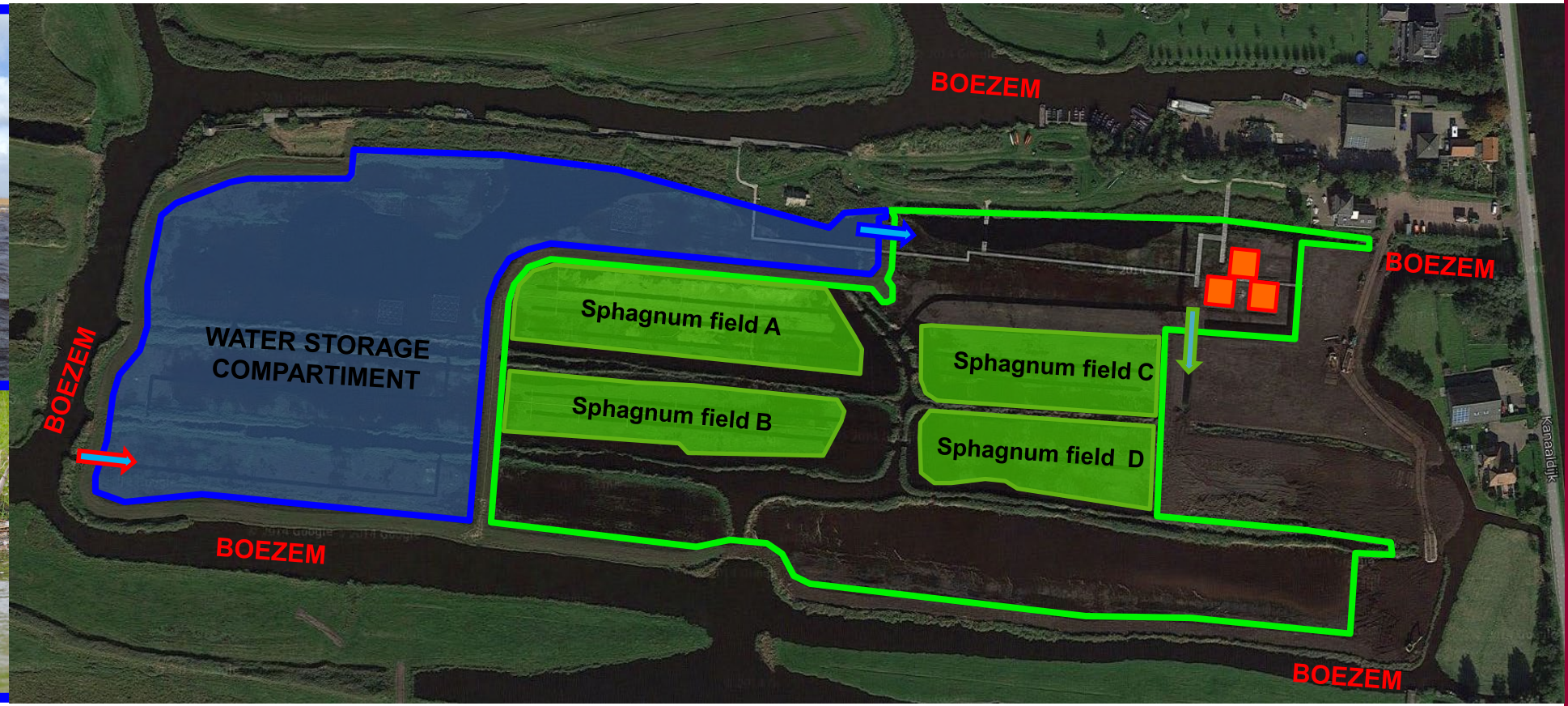


Erkens et al., 2016; Querner et al., 2012

BIOGEOCHEMICAL WATER-MANAGEMENT & APPLIED RESEARCH ON ECOSYSTEMS

Omhoog met het Veen/AddMire NL (2013-2017)

Radboud Universiteit



Landschap Noord-Holland

Goals

- stop peat oxidation & restore peat forming vegetation
- compensate natural values (*Sphagnum* dominated vegetation)
- restore ecosystem services (C-sequestration, biodiversity, etc.)

BIOGEOCHEMICAL WATER-MANAGEMENT & APPLIED RESEARCH ON ECOSYSTEMS

Site construction: Sphagnum fields

Radboud Universiteit

BIOGEOCHEMICAL WATER-MANAGEMENT & APPLIED RESEARCH ON ECOSYSTEMS

Site construction (2013): Sphagnum fields

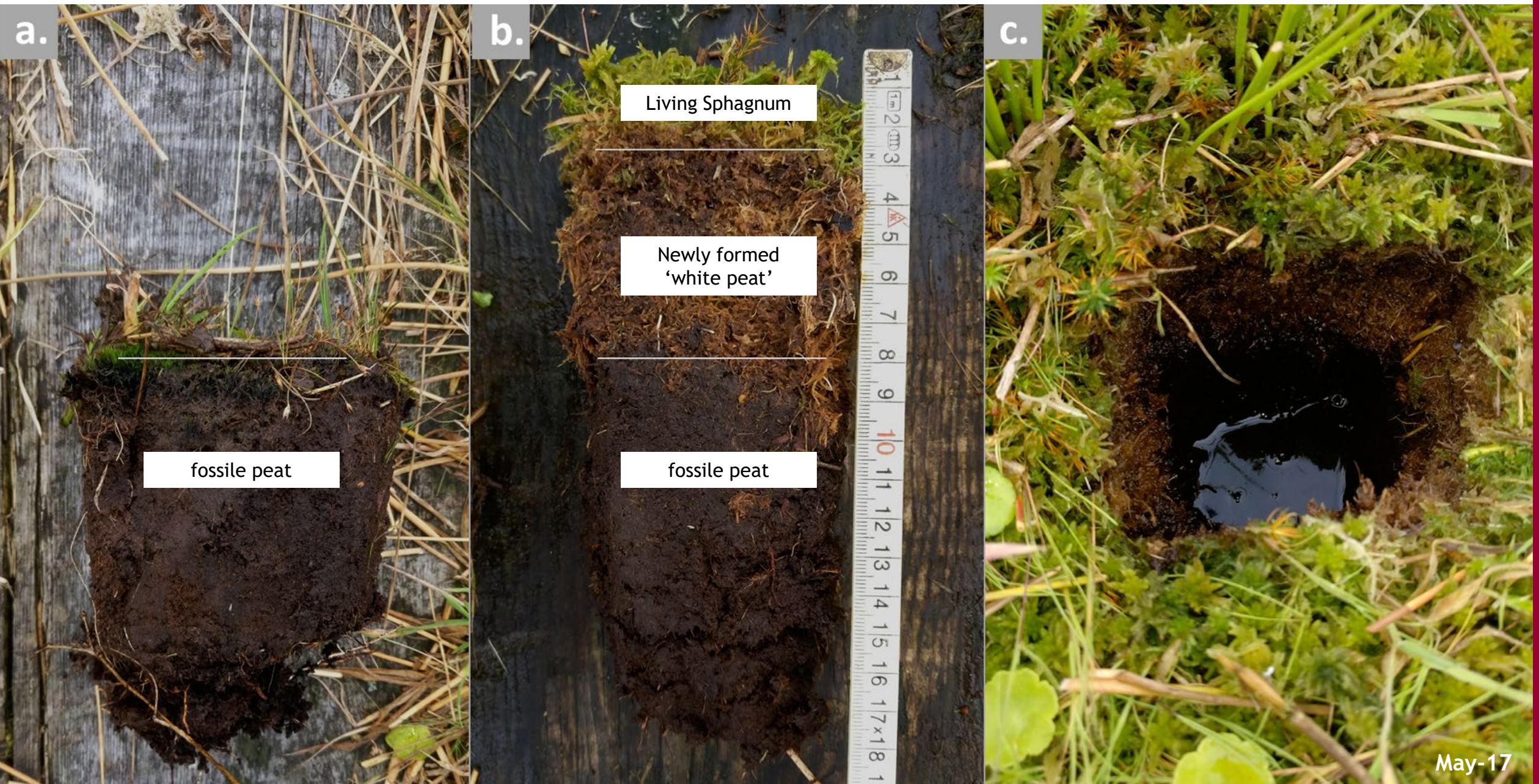
Radboud Universiteit

Water level raised
Application of *Sphagnum* fragments

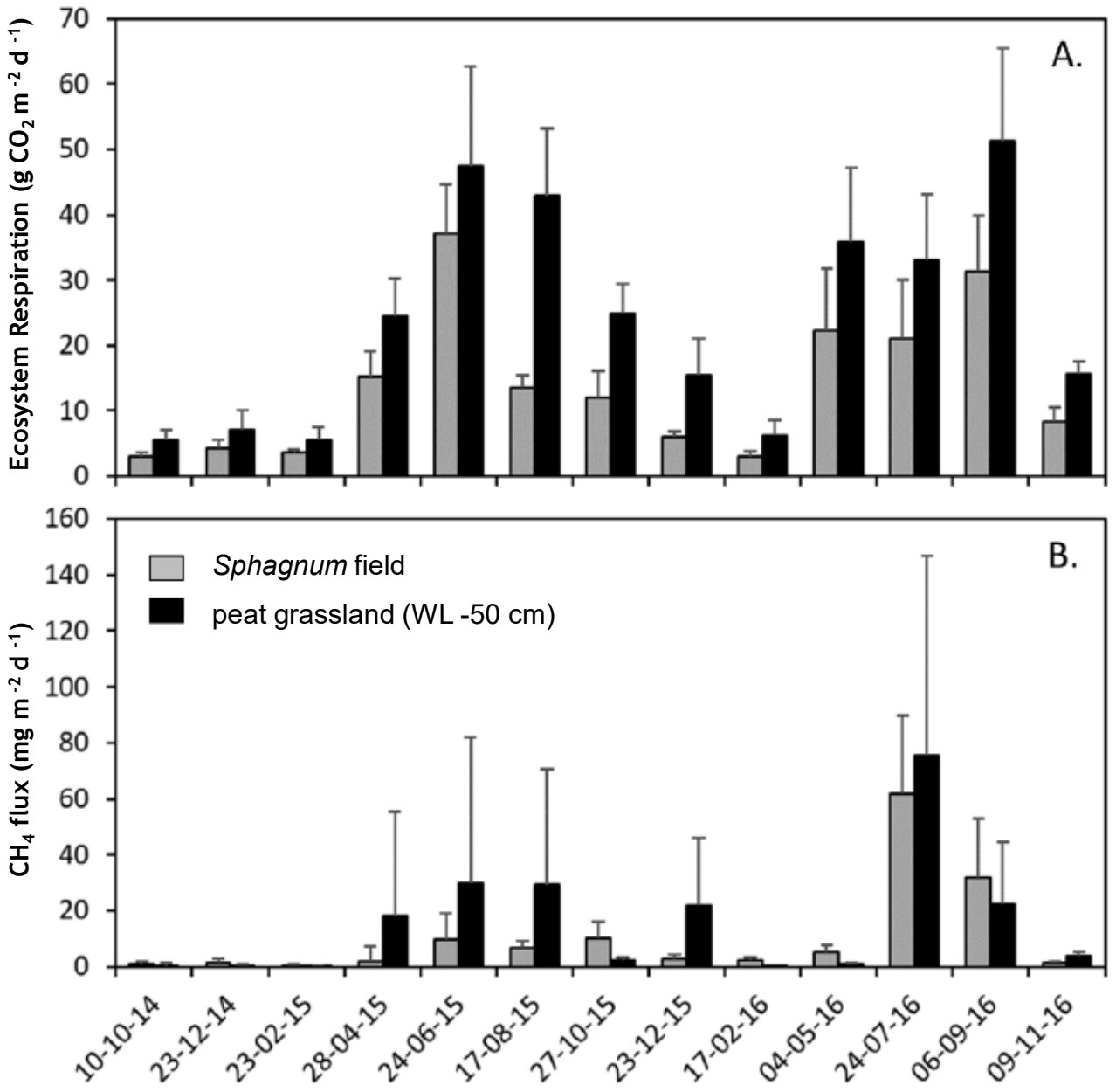
BIOGEOCHEMICAL WATER-MANAGEMENT & APPLIED RESEARCH ON ECOSYSTEMS

BIOGEOCHEMICAL WATER-MANAGEMENT & APPLIED RESEARCH ON ECOSYSTEMS

Results I : Sphagnum *development = 8-10 cm in 3.5 year*



Results II: greenhouse gas emissions



Thesis Van den Elzen, 2020

Reduction in CO_2-flux of ~758 g C m^{-2} y^{-1} !

Methane fluxes remain low after rewetting!

Rewetting + *Sphagnum* application: C-source -> sink

Eva van den Elzen

Results III: biodiversity

Radboud Universiteit

BIOGEOCHEMICAL WATER-MANAGEMENT & APPLIED RESEARCH ON ECOSYSTEMS

a.

Ranunculus flammula

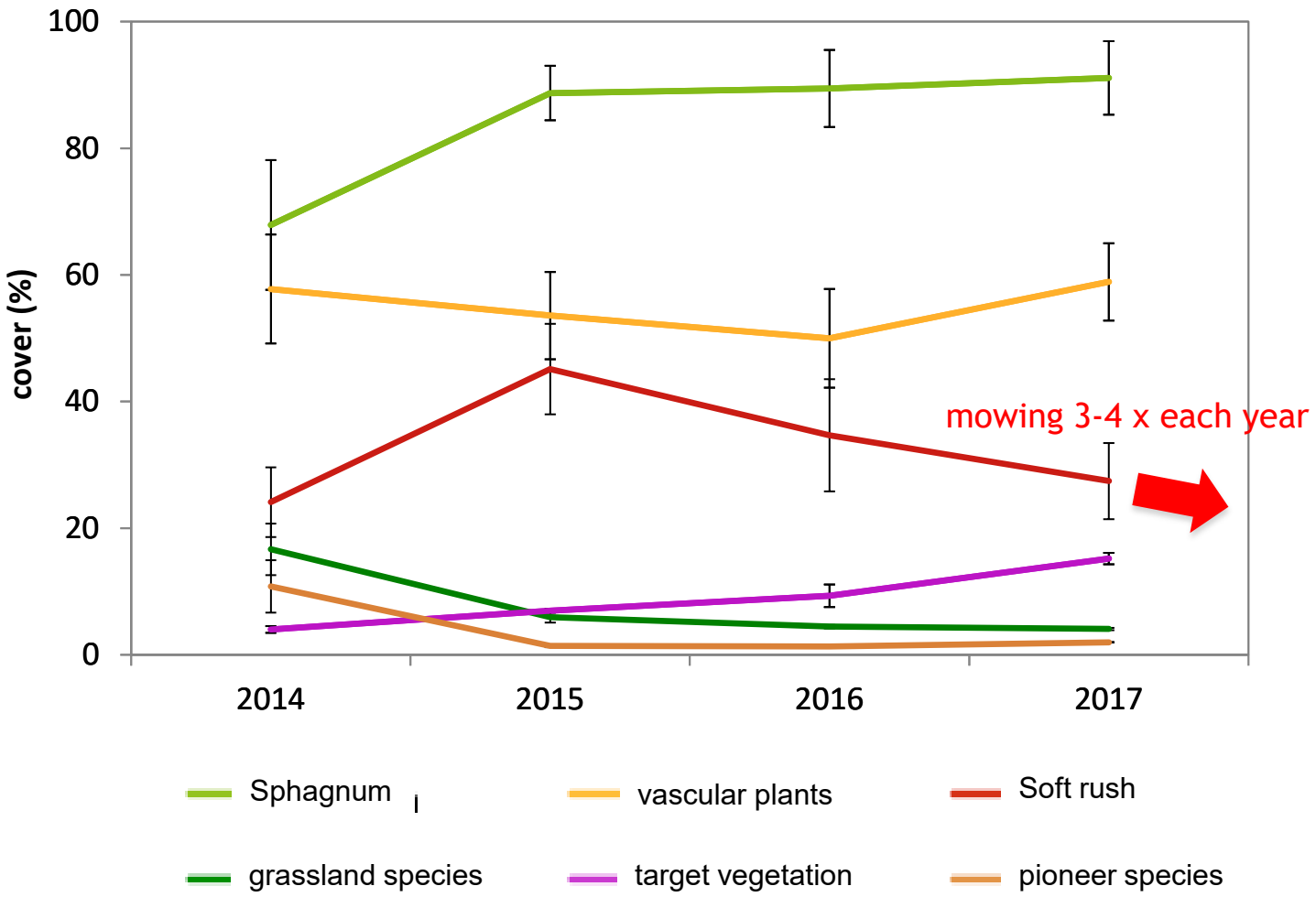
b.

Viola palustris

c.

Martijn Oud

Gallerina paludosa



d.

Peter Melman

Drosera rotundifolia

e.

Wikipedia

Dactylorhiza majalis

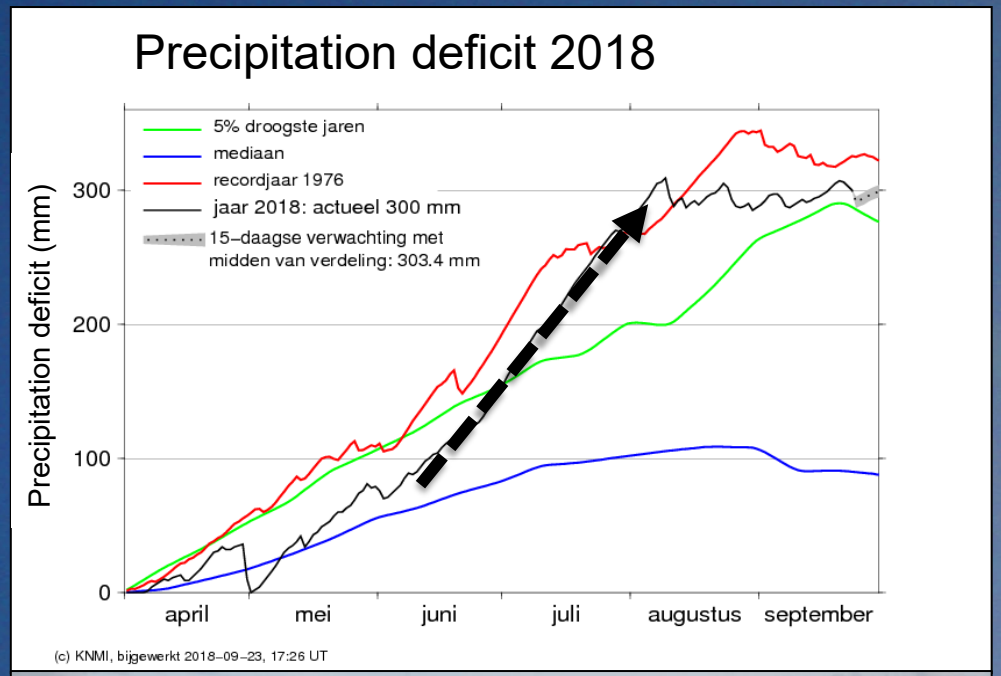
f.

Carex curta

Conclusions I

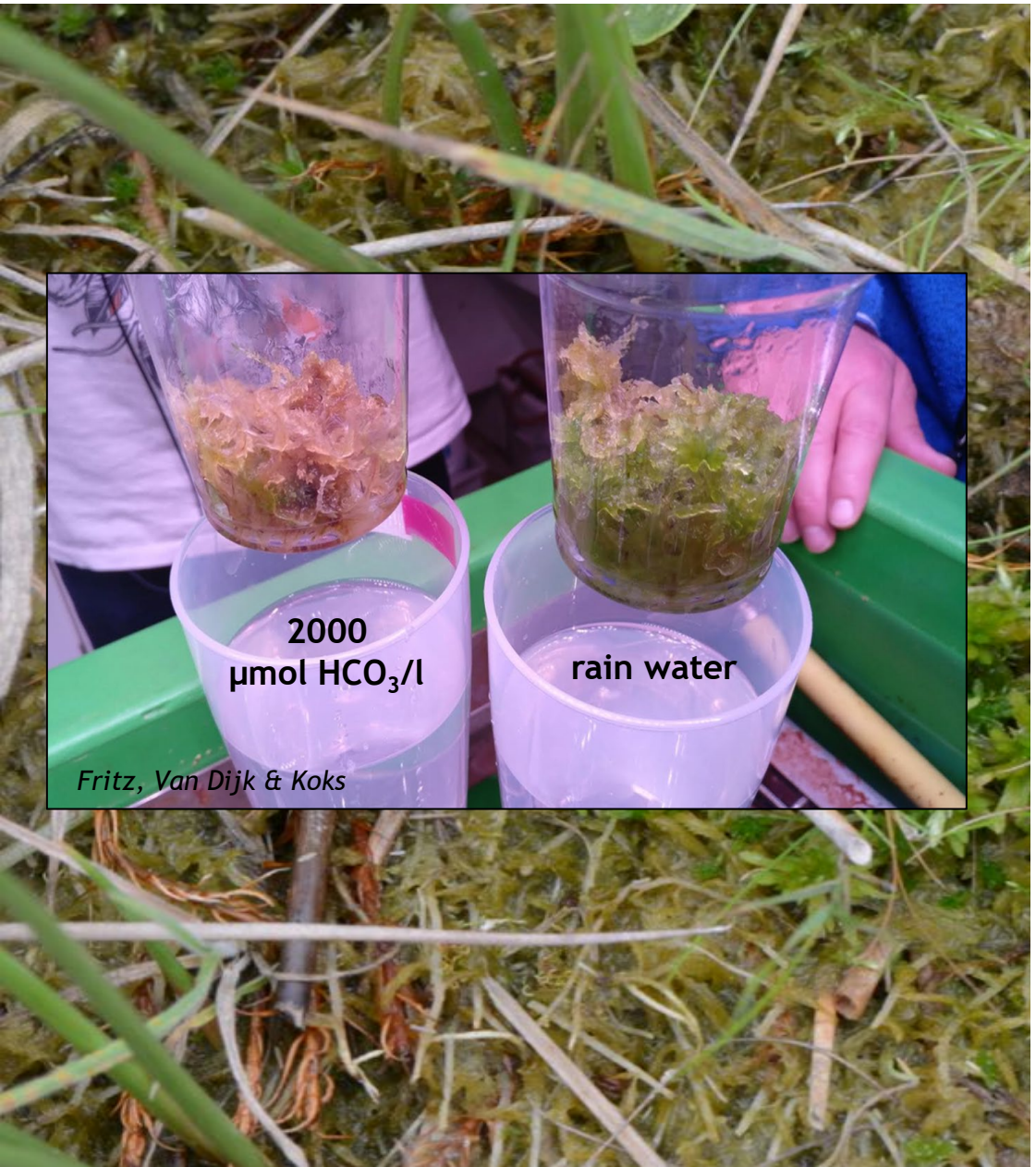
Sphagnum farming in strongly degraded peat polders:

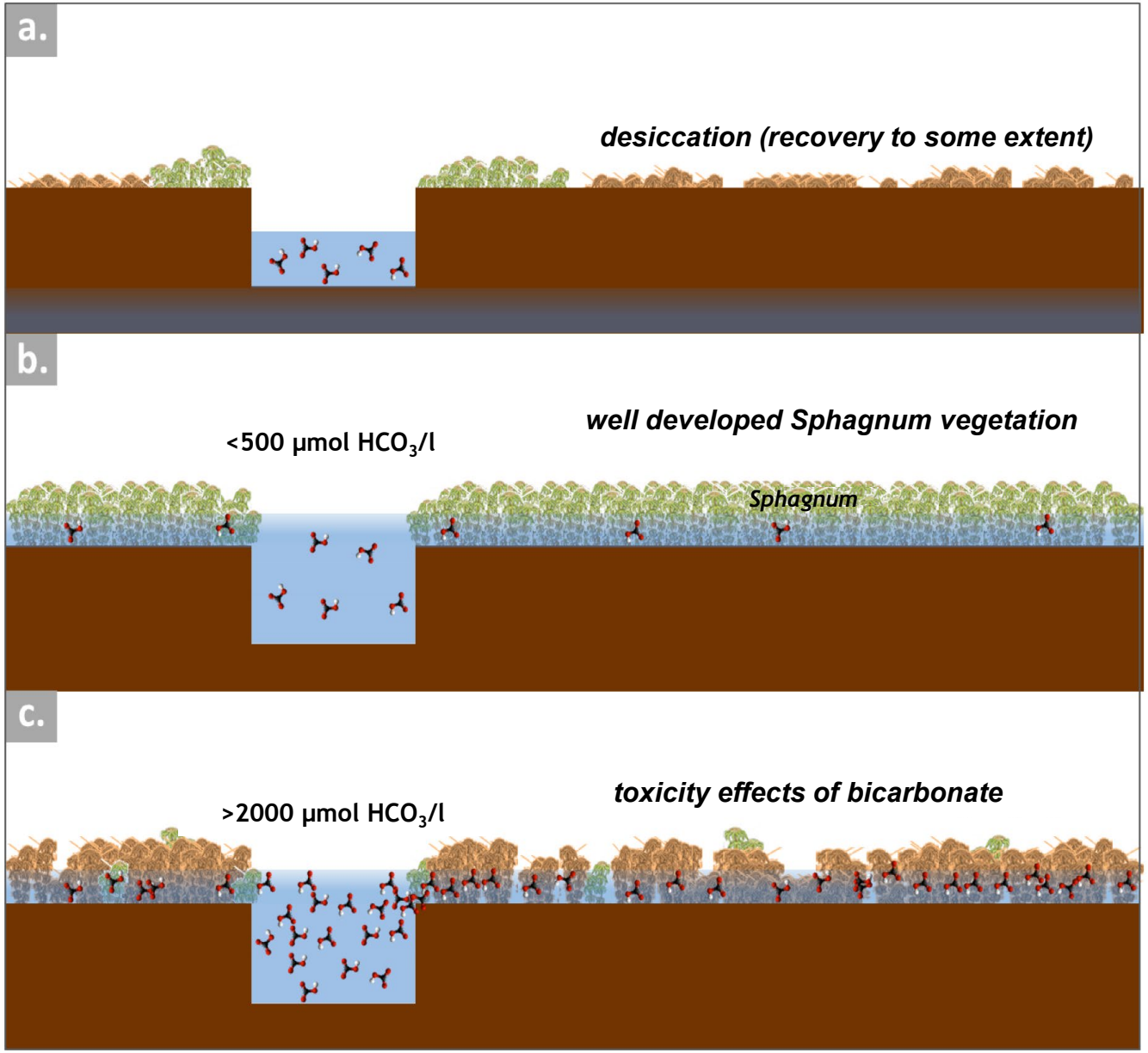
- ***Sphagnum* farming is possible** (!) and a suitable technique for restoring peat forming vegetation & fen habitat.
- The recently formed 'white peat' layer restores **hydrological properties**, supports establishment of typical fen species.
- **Methane emissions** remain low after rewetting & **total emission reduction** is approx. 28 ton CO_2-equivalents ha^{-1} y^{-1}.
- **Water quality** management is of primary importance for *Sphagnum* development: lots of water is present, **but it is too alkaline** for direct application on the *Sphagnum* fields.



KNMI, 2018; wikipedia

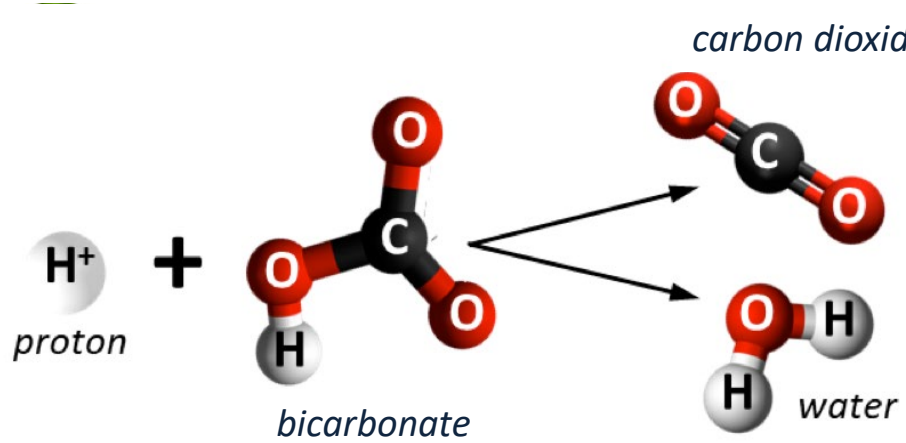
Water management: the dilemma during extreme drought events





Water management: the dilemma during extreme drought events

Experimental management measure

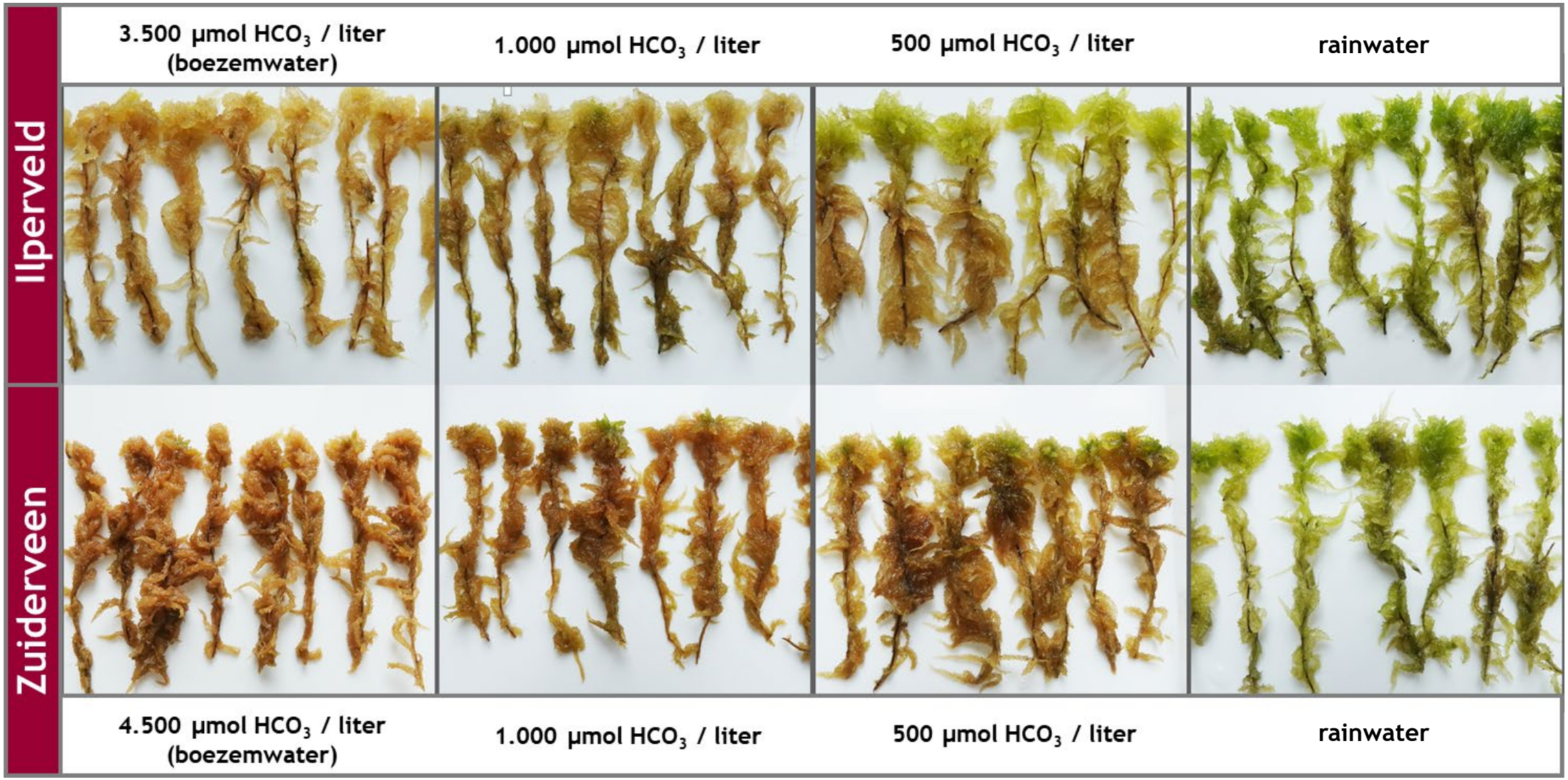


Surface water manipulation: addition of HCl

Radboud University

Bware RESEARCH CENTRE

Active surface water acidification helps to reduce the negative physiological effects of bicarbonate on Sphagnum



Experiment: Rosalie Dudink

BIOGEOCHEMICAL WATER-MANAGEMENT & APPLIED RESEARCH ON ECOSYSTEMS

Conclusions II

- It is important to make *Sphagnum* farming (more) resilient to **extreme drought events**, given the climate change projections.

Field trial - Acidifying surface water:

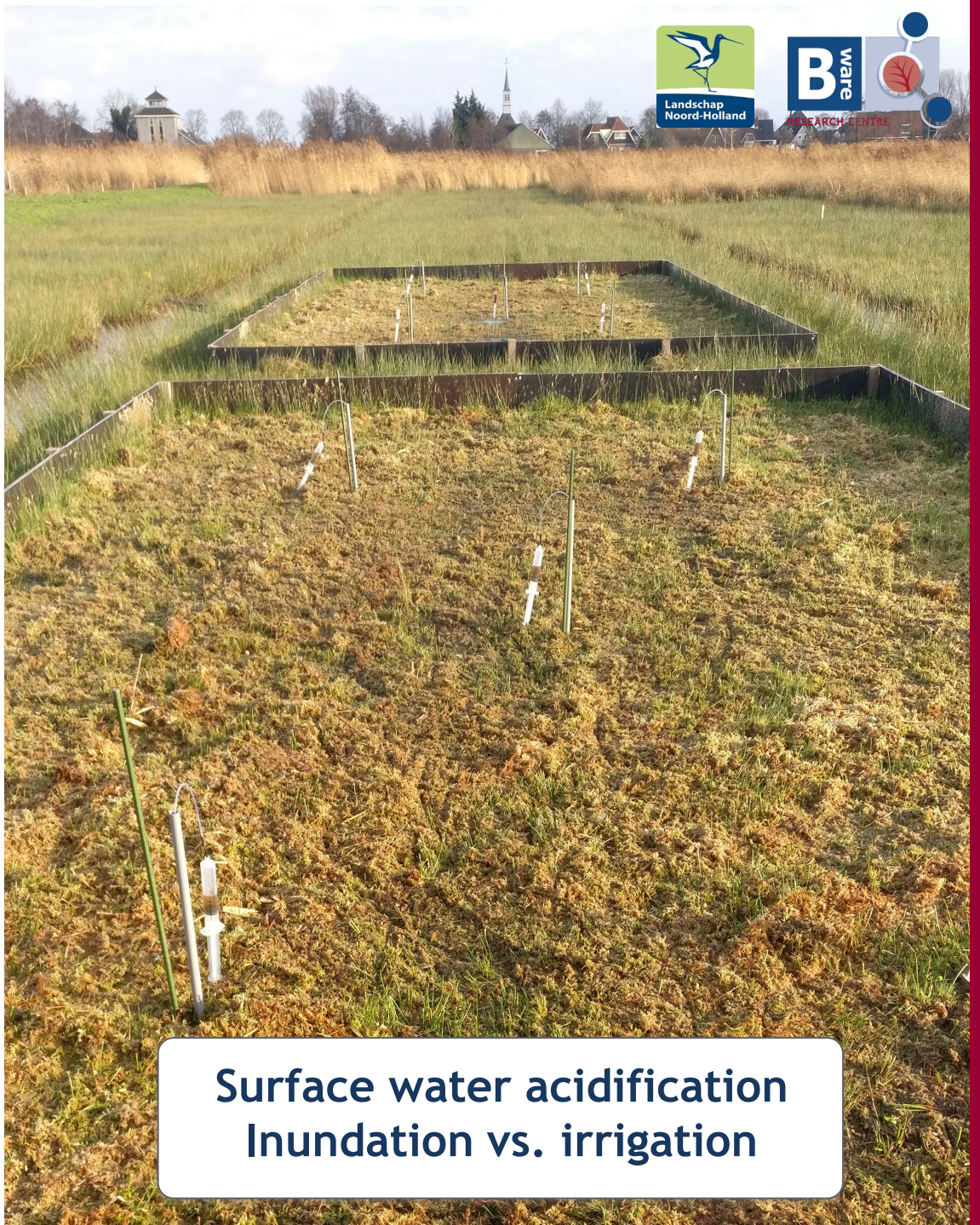
✓ .. might help us making the practice of *Sphagnum* farming **more widely applicable**, e.g. in large peat polders with alkaline surface water.

✓ .. could be a **temporal measure** needed until the *Sphagnum* layer is self-regulating.

✓ To be continued..


USDA/Lance Cheung

Kwakemaak.nl



Surface water acidification
Inundation vs. irrigation

Many thanks!

Hans Joosten
Greta Gaudig
Matthias Krebs
Sabine Wichmann
Ko van Huissteden
Henk Baars
Jaco Diemeer
Nico & Jolanda Dekker
Rosalie Dudink
Adam Koks
Christian Fritz
Jeroen Geurts
Ralf Temmink
Renske Vroom
Jelle Abma
Dirk Siebinga
Bas Rijs
Vrijwilligers Ilperveld

Radboud Universiteit Nijmegen

Landschap Noord-Holland

ERNST MORITZ ARNDT UNIVERSITÄT GREIFSWALD

Provincie Noord-Holland

NATIONALE POSTCODE LOTERIJ

BIOGEOCHEMICAL WATER-MANAGEMENT & APPLIED RESEARCH ON ECOSYSTEMS