

Restoring heathland from agricultural fields: from art to technique

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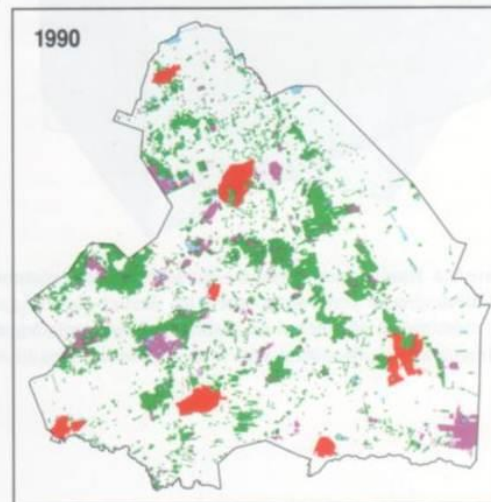
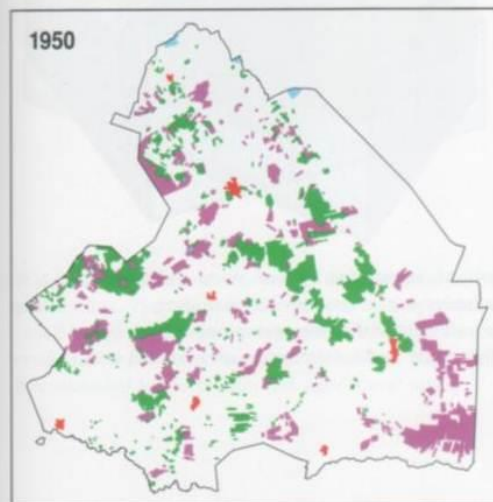
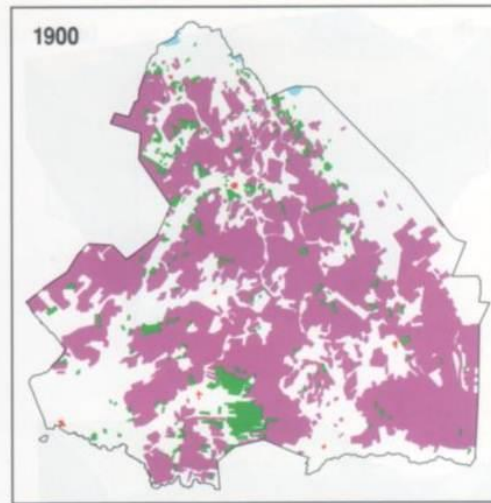
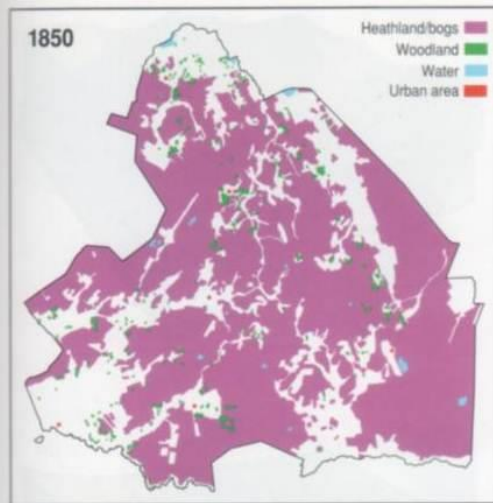
Arrie van der Bij
Maaïke Weijters
Jan Frouz
Leo Norda

Kempen near Antwerp

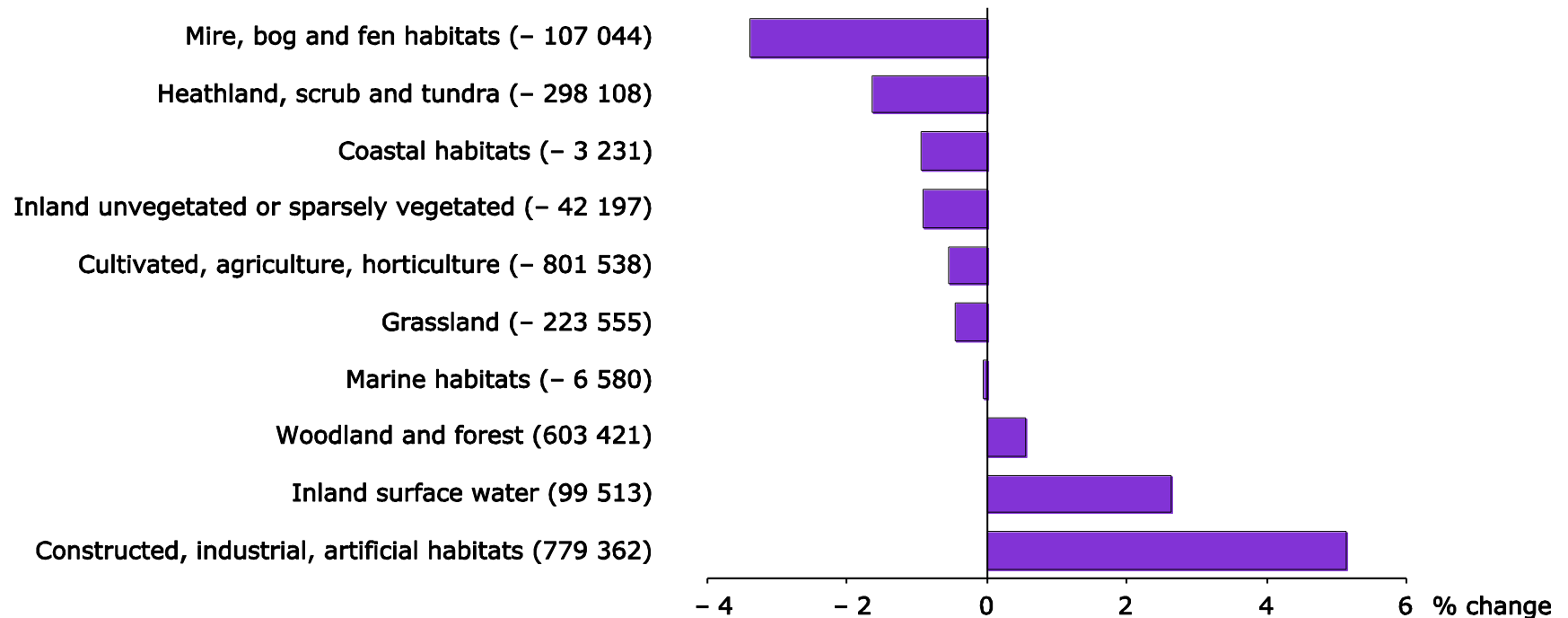


Burny, J. (1999) *Bijdrage tot de historische ecologie van de Limburgse Kempen (1910-1950)*. Natuurhistorisch Genootschap in Limburg, Maastricht

Changes



Habitat change EU 1990-2000





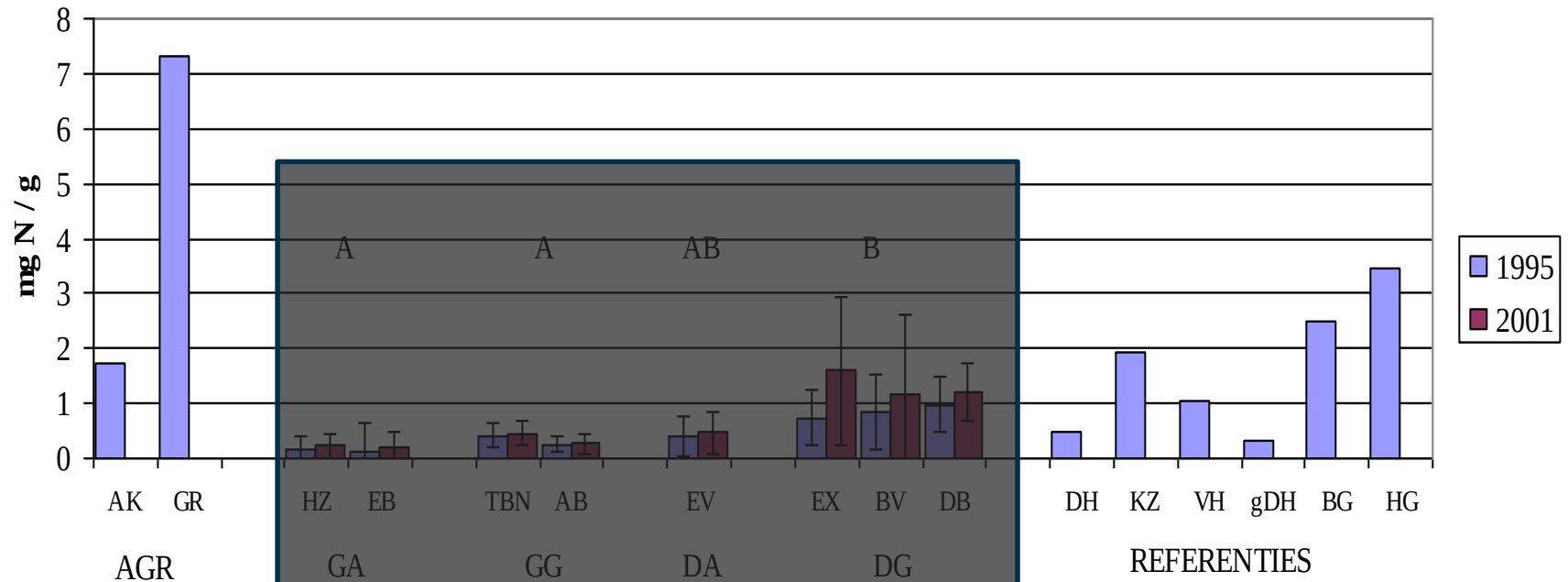
Research Group
Ecosystem Management
University of Antwerp



Target 2 of the EU biodiversity Strategy: Ecosystem maintenance and restoration

By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems

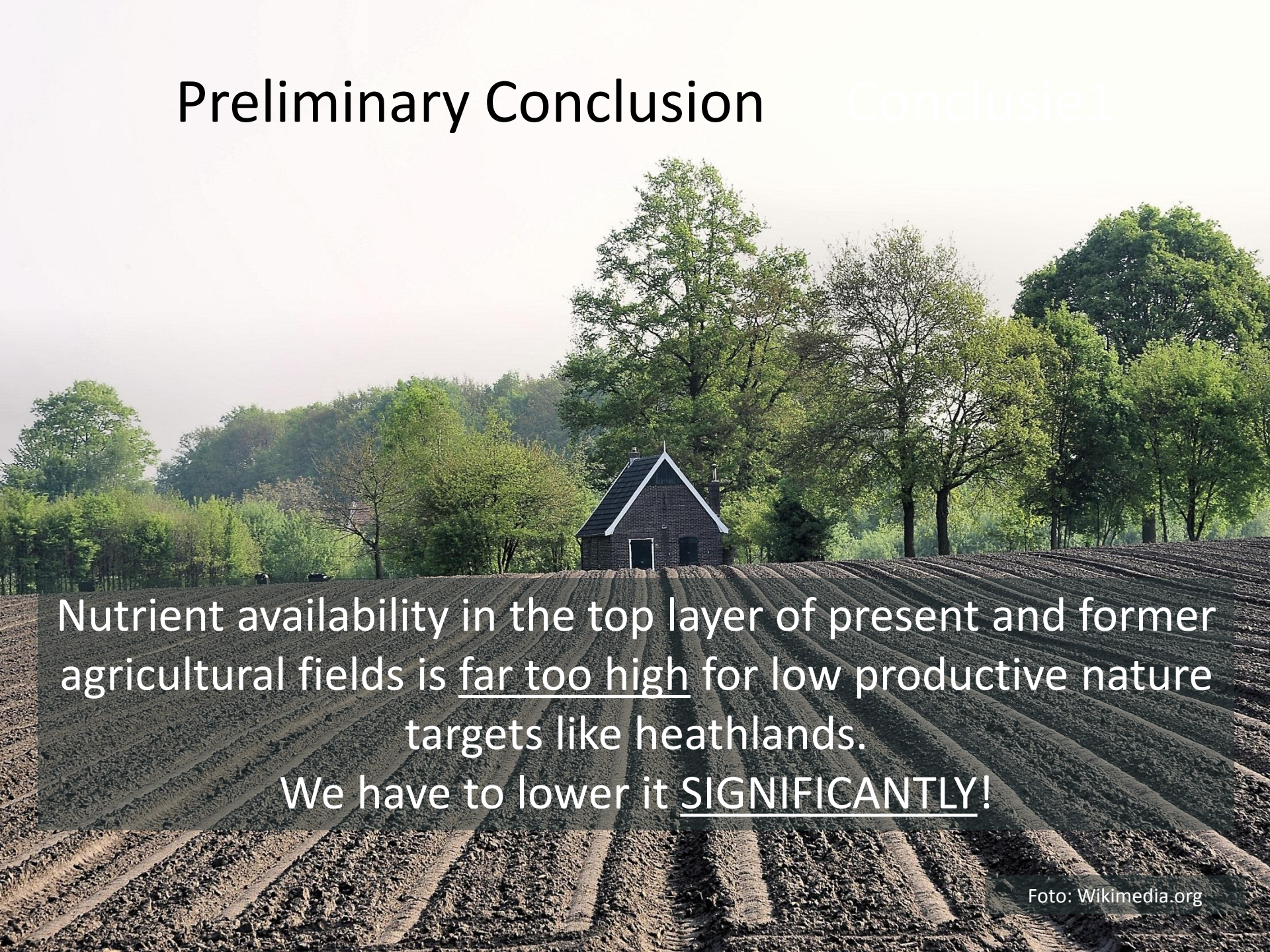
Ntotaal



AGR=agriculturally used; REFERENTIES=target vegetation.

Preliminary Conclusion

Conclusie 1



Nutrient availability in the top layer of present and former agricultural fields is far too high for low productive nature targets like heathlands.
We have to lower it SIGNIFICANTLY!

Techniques to lower nutrient availability



Foto: Wikimedia.org

Grazing by large herbivores

Unfortunately, the amount of nutrients removed is rather low. Recent research in other low-productive systems suggests that such grazers may actually **ENHANCE** nutrient availability. This could be the case here, too



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Agriculture, Ecosystems and Environment

journal homepage: www.elsevier.com/locate/agee

Do moose redistribute nutrients in low-productive fen systems?

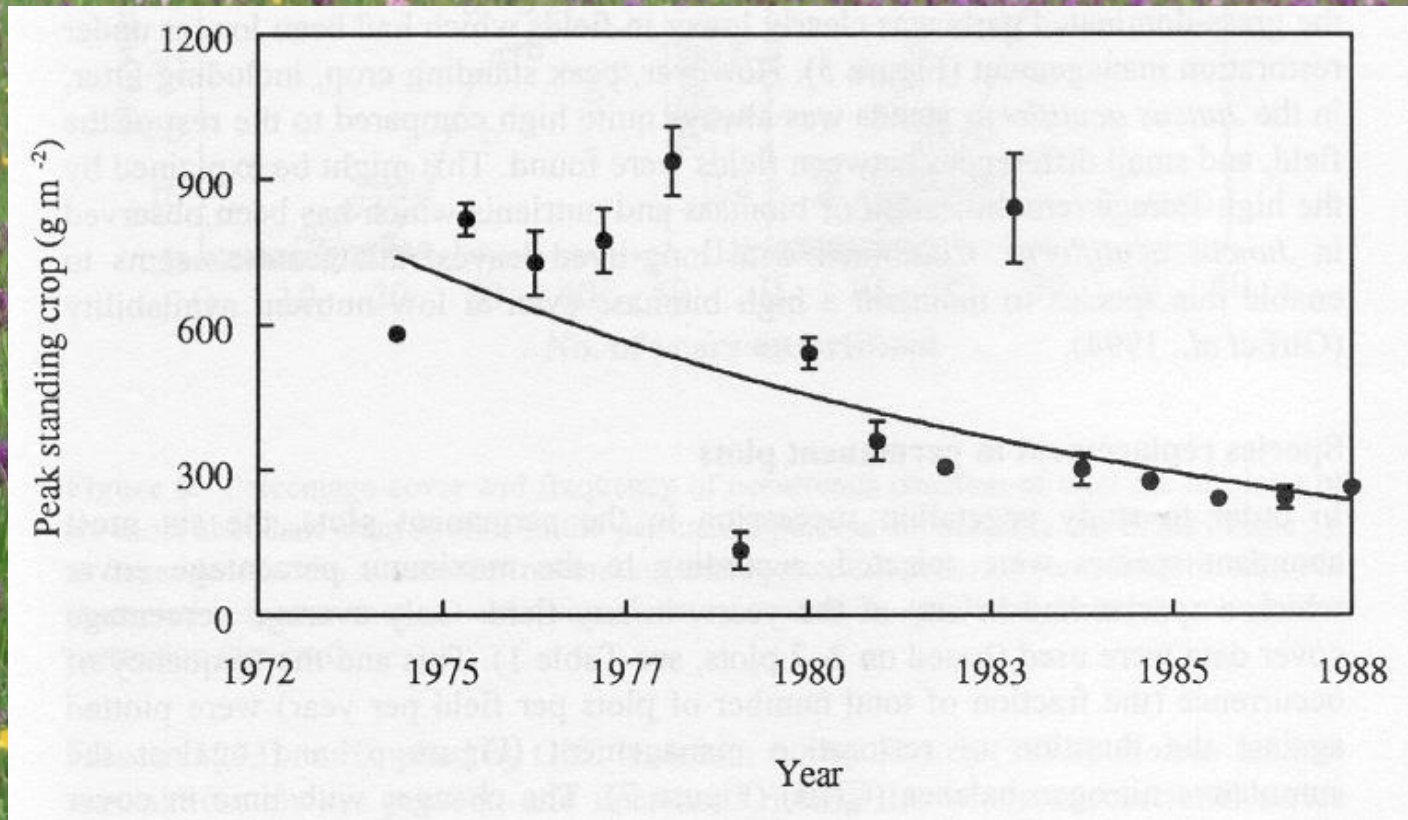
D.P.J. Kuijper^{a,*}, K. Devriendt^b, M. Bormans^b, R. Van Diggelen^b



Mowing with standard
or adapted equipment

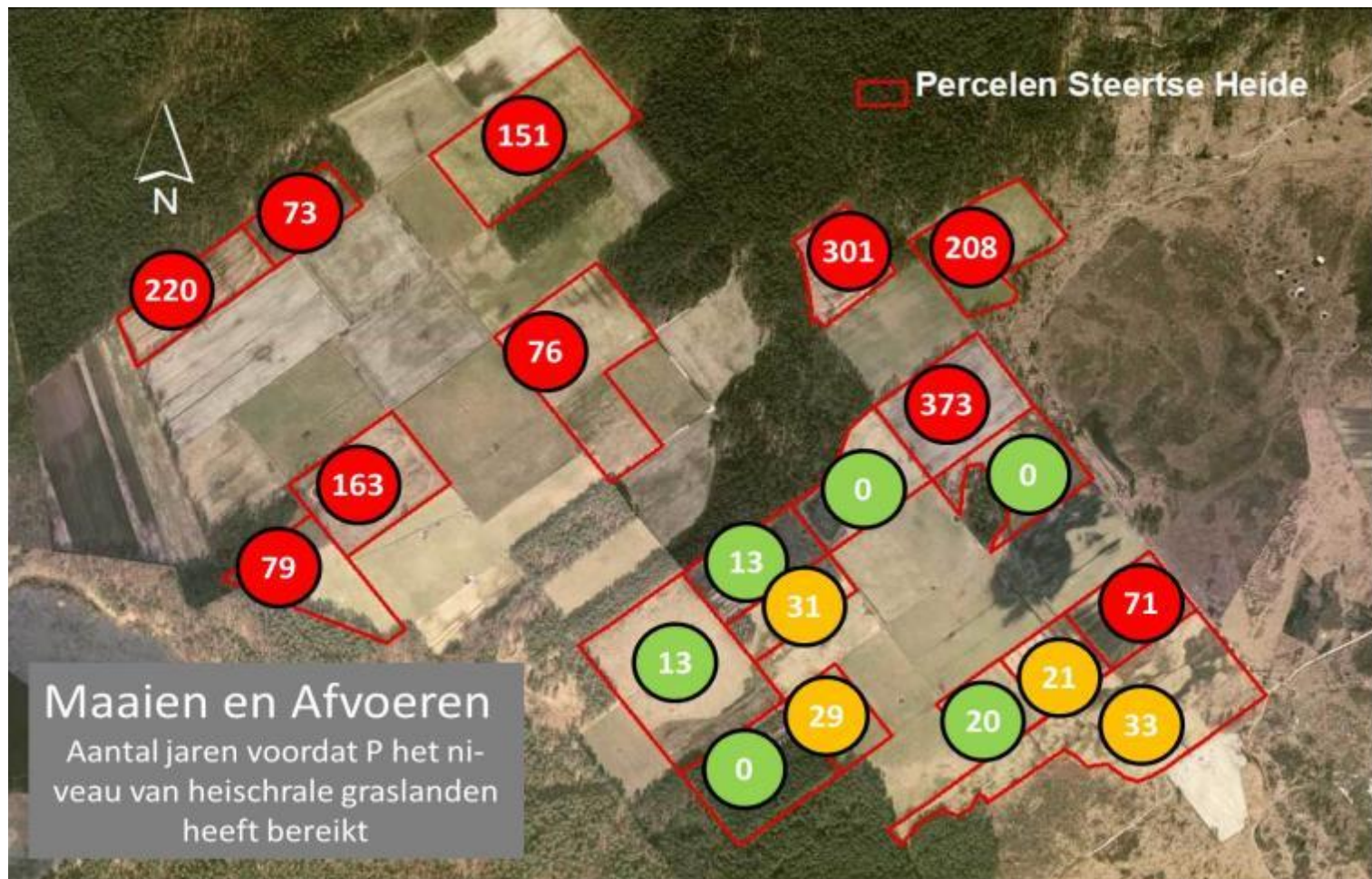
It works but takes time

Changes in productivity



Olf & Bakker 1991

Example: Model simulation impoverishment Steertse Heide



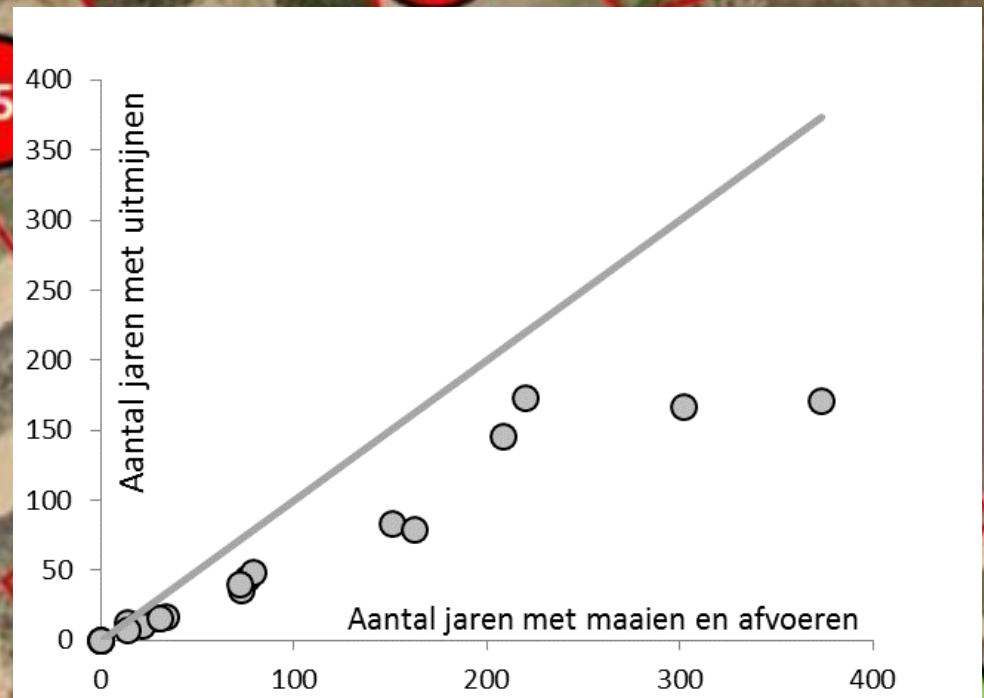
Nutrient mining

Model analysis of the effect of mining on the time needed to develop optimal conditions for Nardion grassland

Uitmijnen

(100 kg N per ha per yr)

Aantal jaren voordat P het niveau van heischrale graslanden heeft bereikt



ontwikkeling+beheer natuurkwaliteit

o+bn



Top soil removal: fast solution?

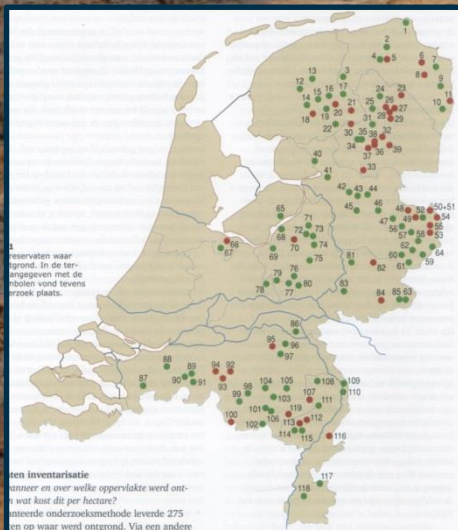
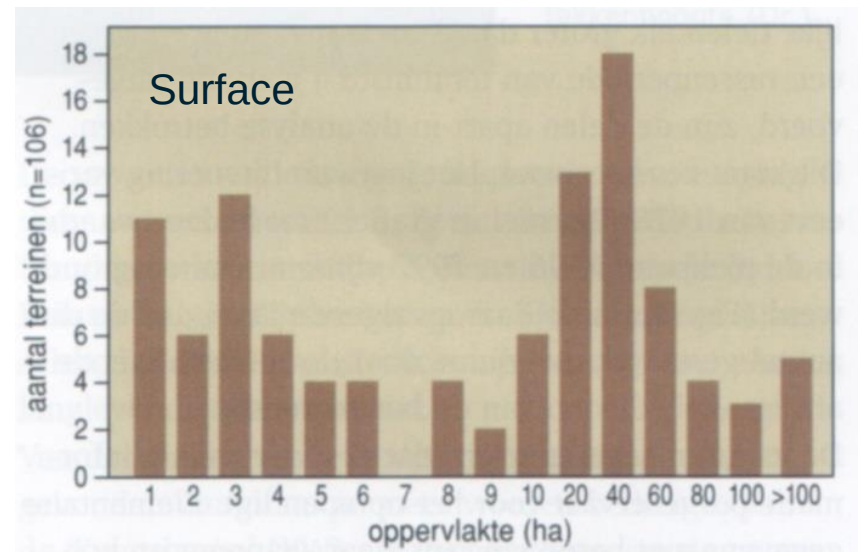
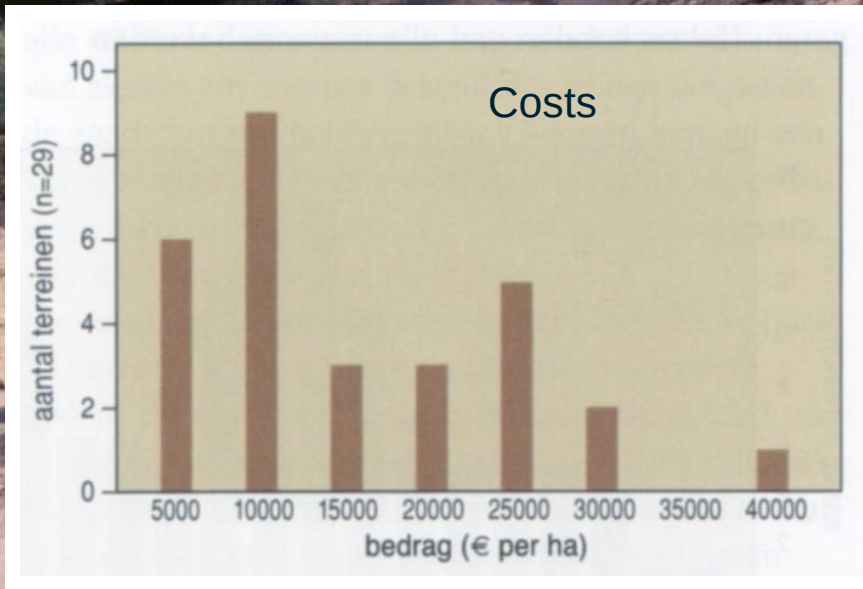


Foto Jaap van Roon



These are often **BIG** projects 2011/06/23

With high cost.....

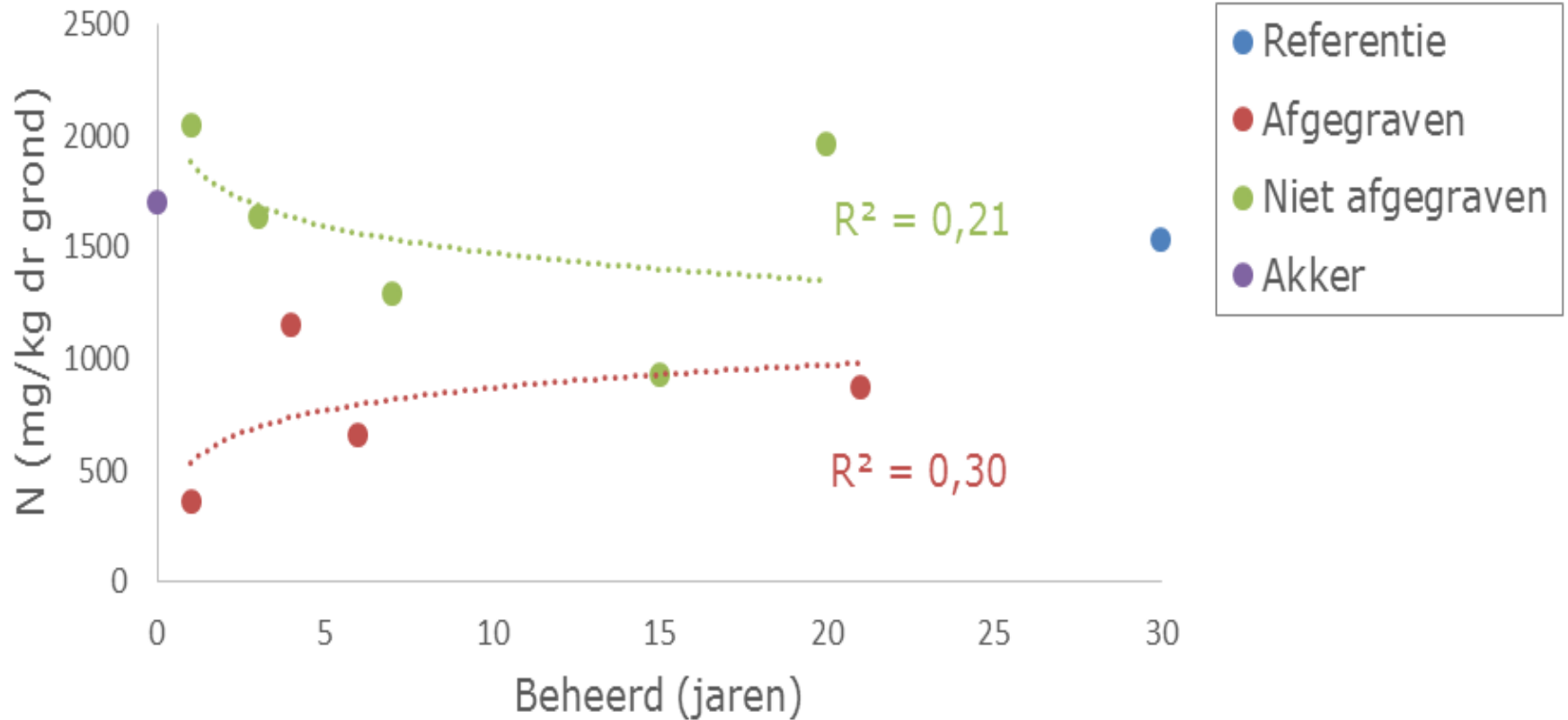


Te onderzoeken percelen

10

Nutrients

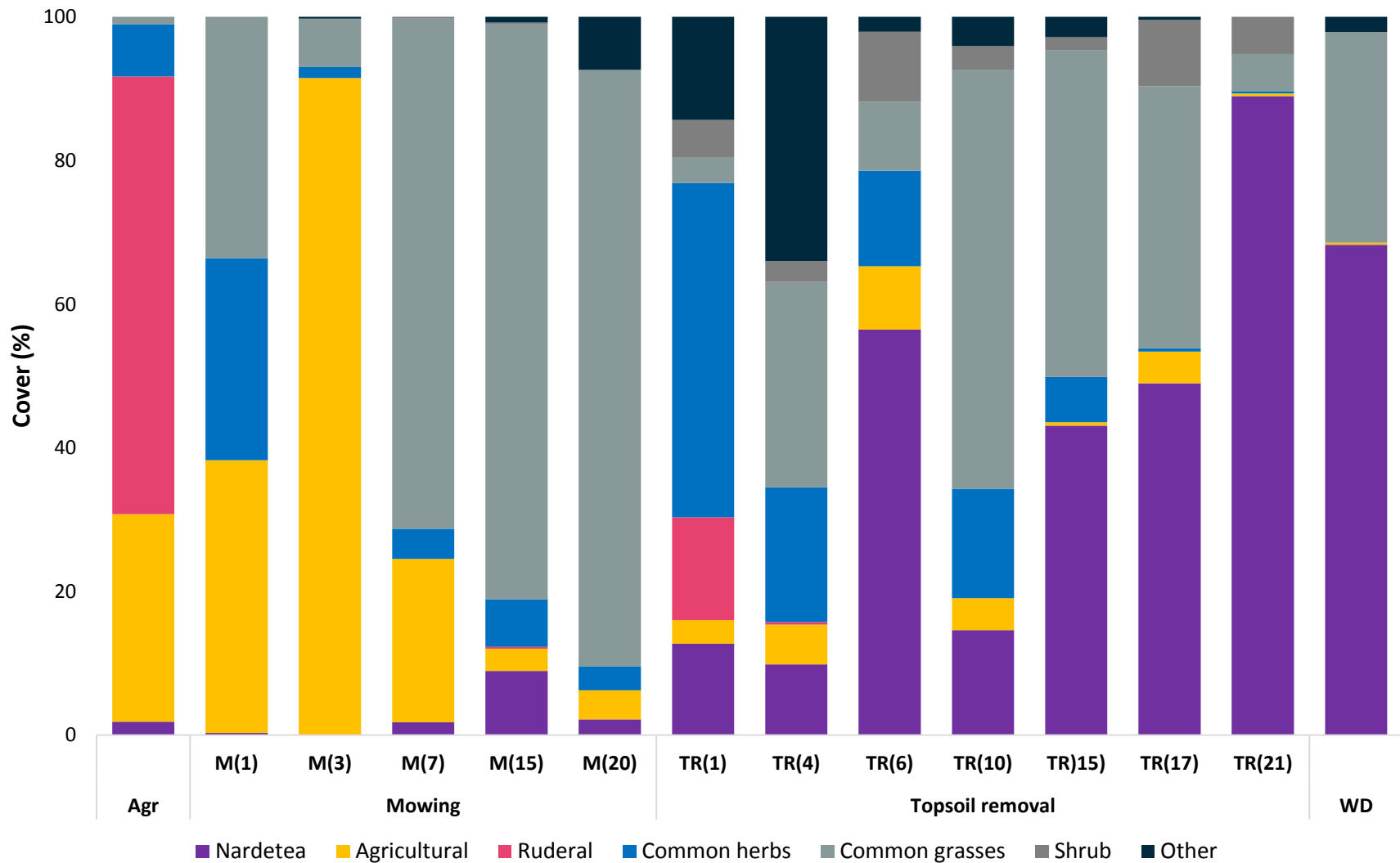
N_{totaal}

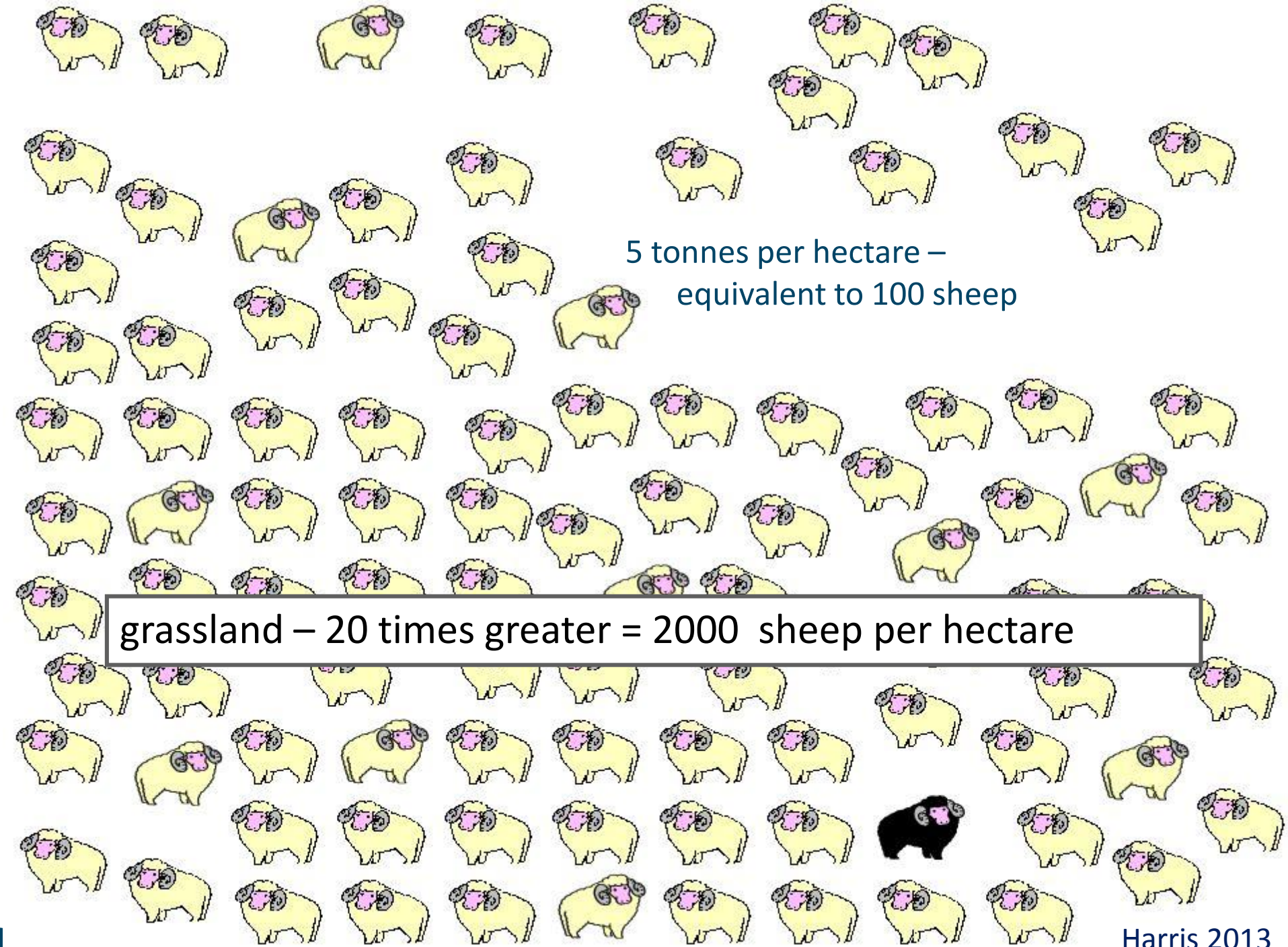


Te onderzoeken percelen

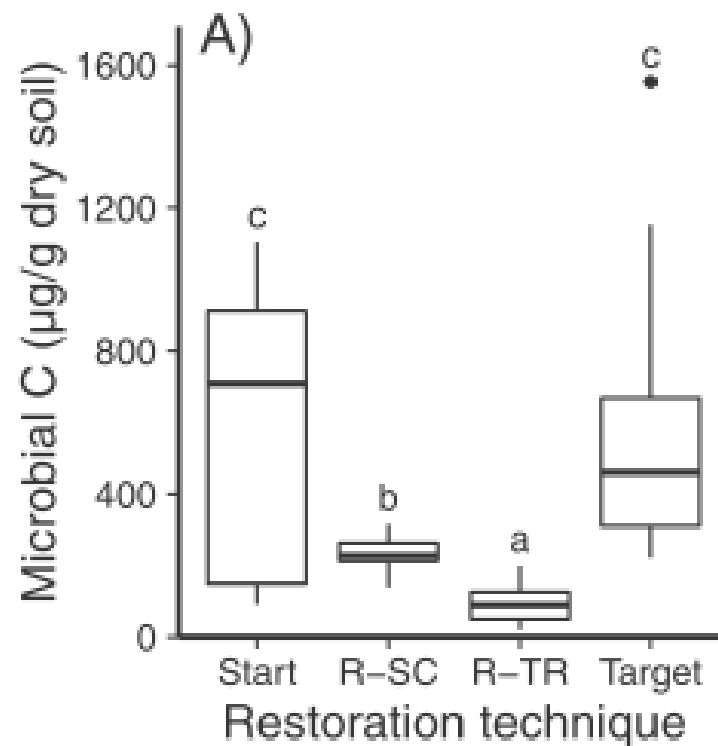
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Vegetation



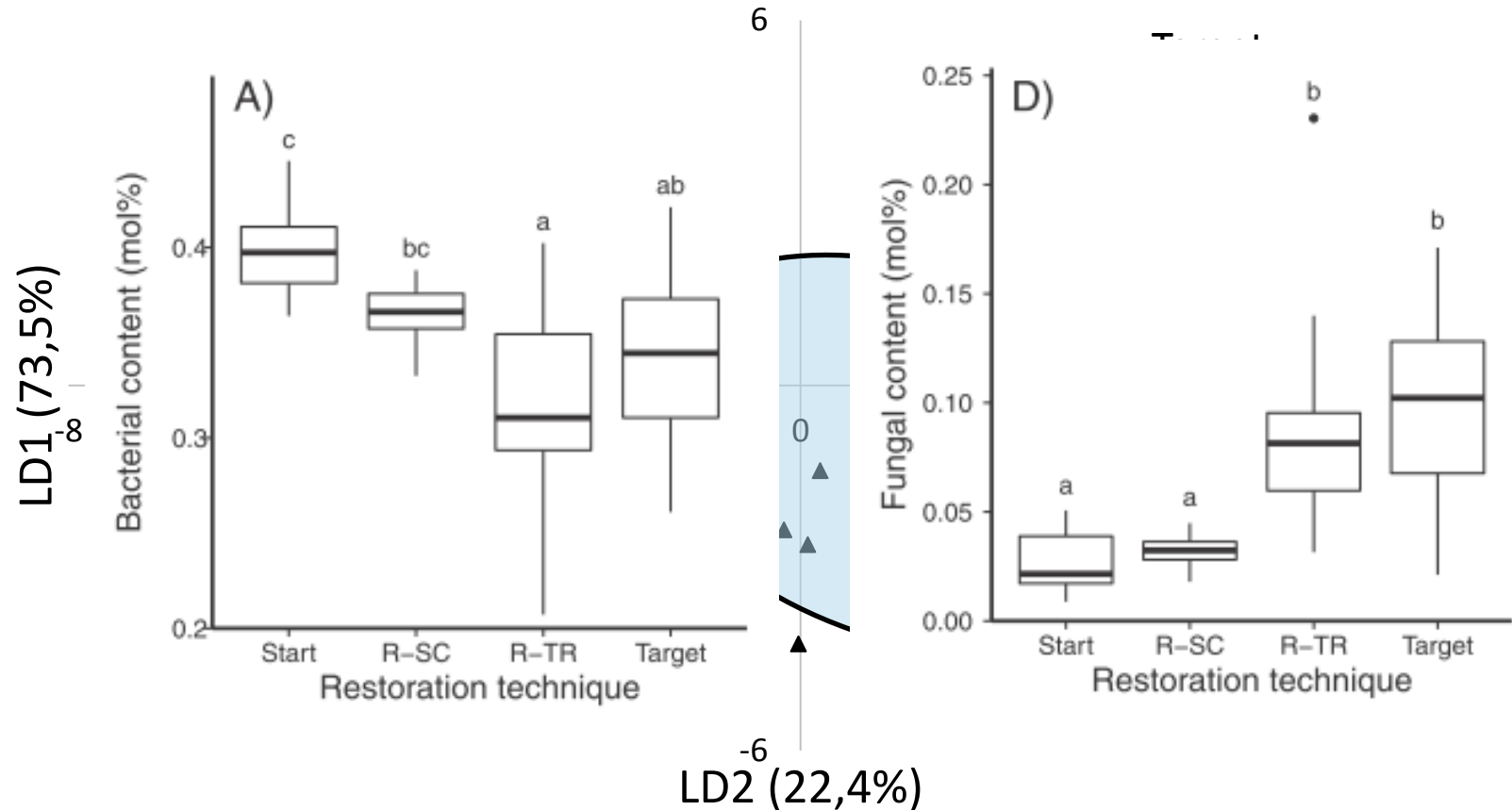


Microbial biomass in 14 restoration projects after a decade



Composition microbial community

Restoration techniques





Fungal channel “Miners”

- High C/N
- pH acid
- Litter on the surface

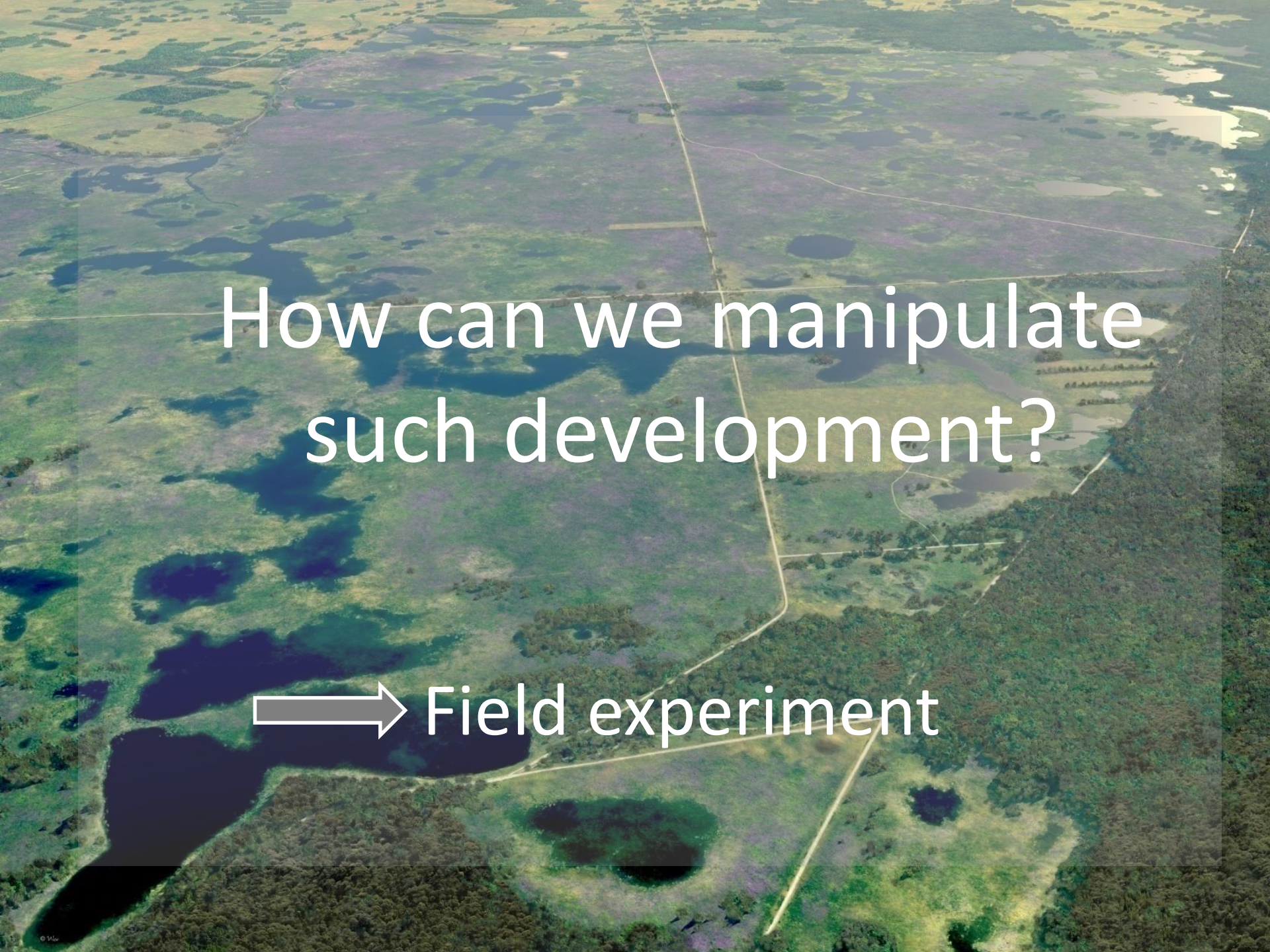


Bacterial Channel “Opportunists”

- low C/N
- pH neutral
- Litter incorporated into soil



Preliminary conclusion: soil organisms
could play an important role in heathland
restoration

An aerial photograph of a wetland landscape. A straight road runs vertically through the center. The landscape is a mix of green, brown, and blue patches, indicating different vegetation and water levels. There are several small ponds and larger areas of standing water. The text "How can we manipulate such development?" is overlaid in white, sans-serif font.

How can we manipulate
such development?

→ Field experiment

Research team



6 Cooperating Institutions from 4 countries



Also a BIG project

Experimental setup



Dry heathland experiment

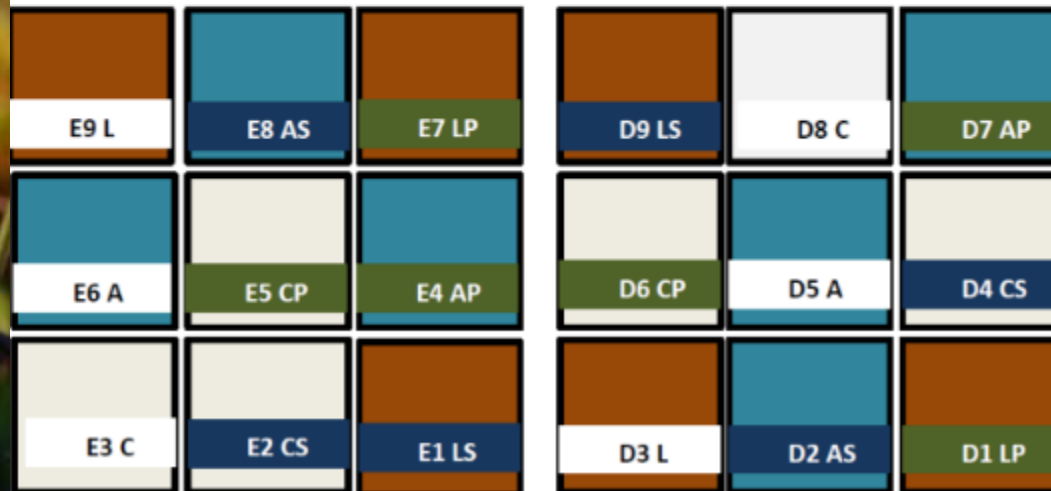
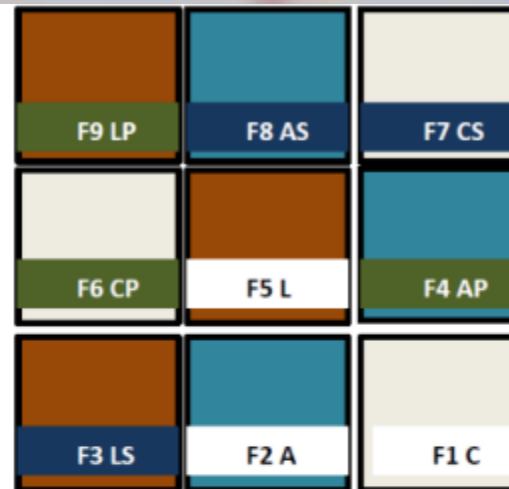
L=Liming 2000 kg/ha

A=Acidifying 1500 kg/ha

C=Control (no treatment)

P=Plant material

S=Soil material



- Gradient in soil pH
- Gradient in addition of biota

Foto Hans Dekker



October 2011

Bovenaanzicht Noordenveld experiment – 2014



Vegetation

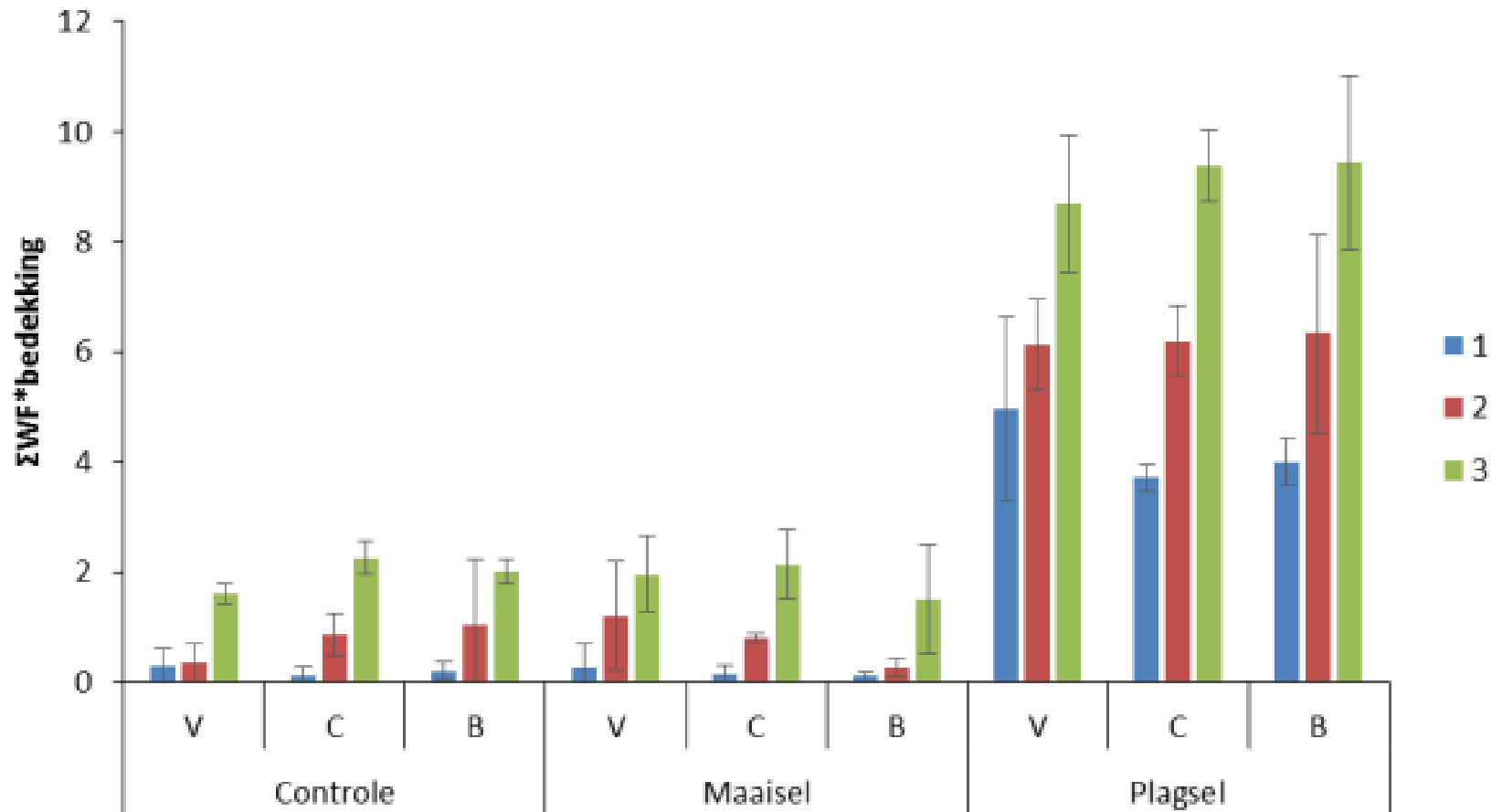
The image shows a vast field of low-growing vegetation, likely heath or scrub, with numerous small purple flowers in bloom. The foreground is filled with this dense, green and purple ground cover. In the background, the field extends to a flat horizon under a bright sky. A single person is visible in the distance, providing a sense of scale to the large area.

Year 3

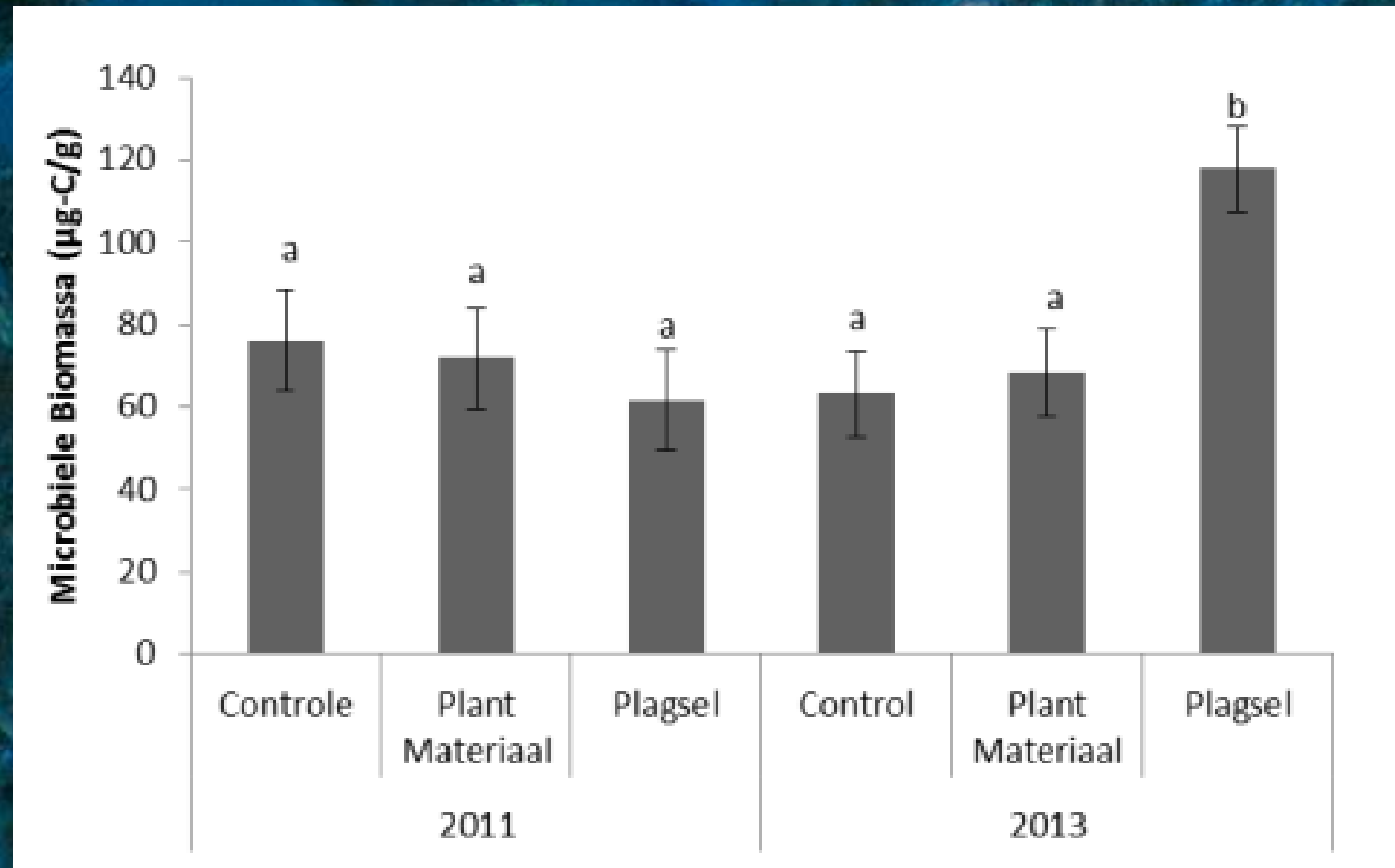
Foto Arrie van der Bij

Typical species

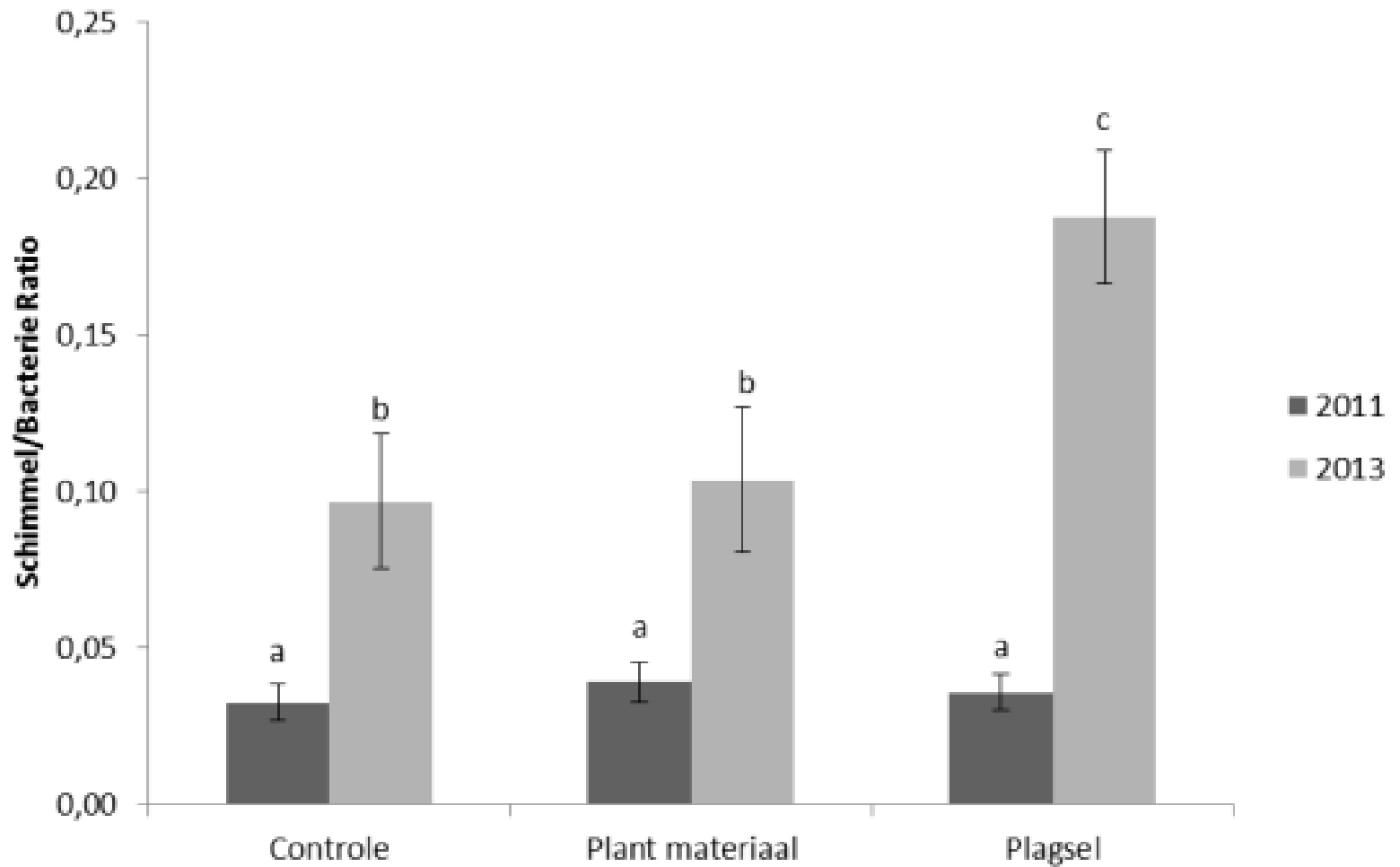
Droge proef



Micro-organismen



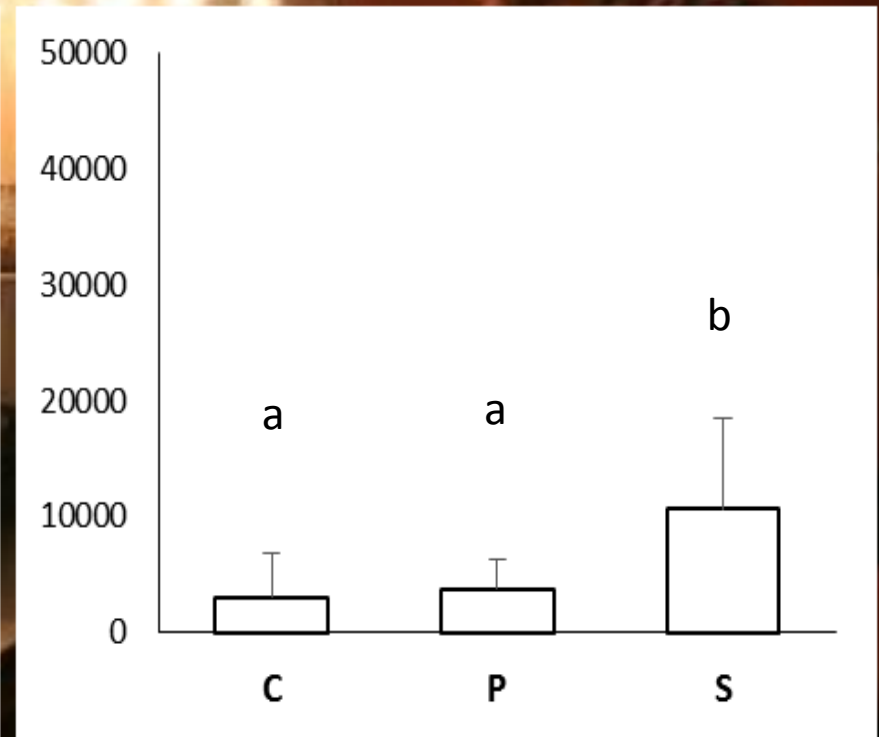
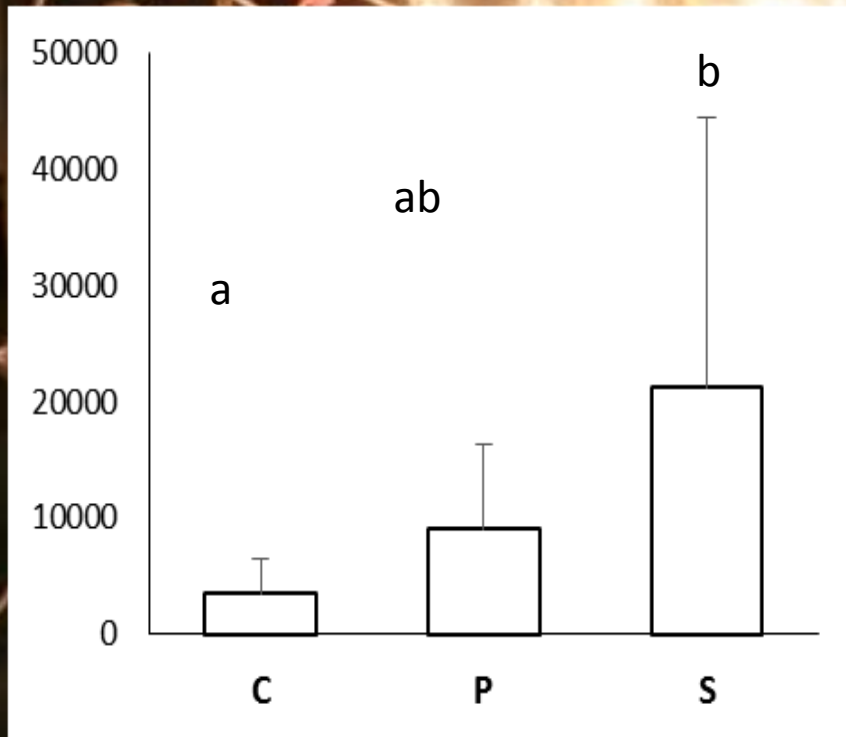
Fungi:Bacteria Ratio



Mites and Springtails

Mites
ind/m²

Collembola
ind/m²



C: control, P: plant; S: sods

Conclusions:

- Nutrients need to be lowered considerably when converting arable fields into heathland
- Top soil removal is an effective tool for this
- Both above and belowground communities are removed with such technique
- Rebuilding such community by adding topsoil from well-developed heathlands works well

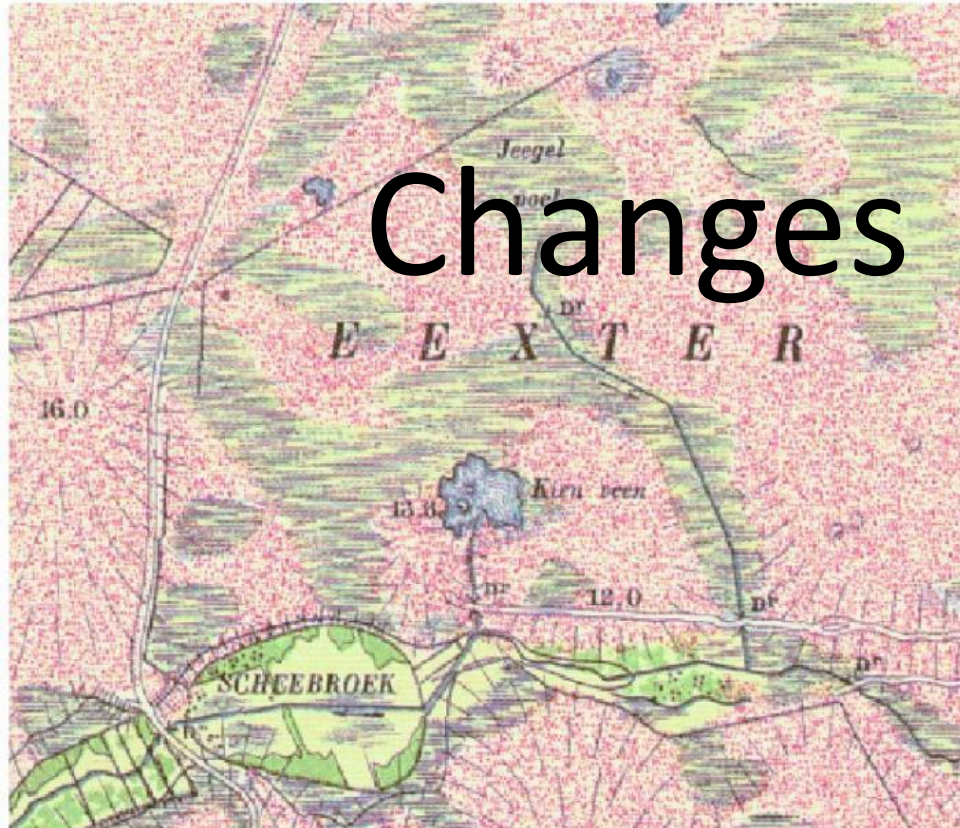
Heathland distribution in the past

Legend

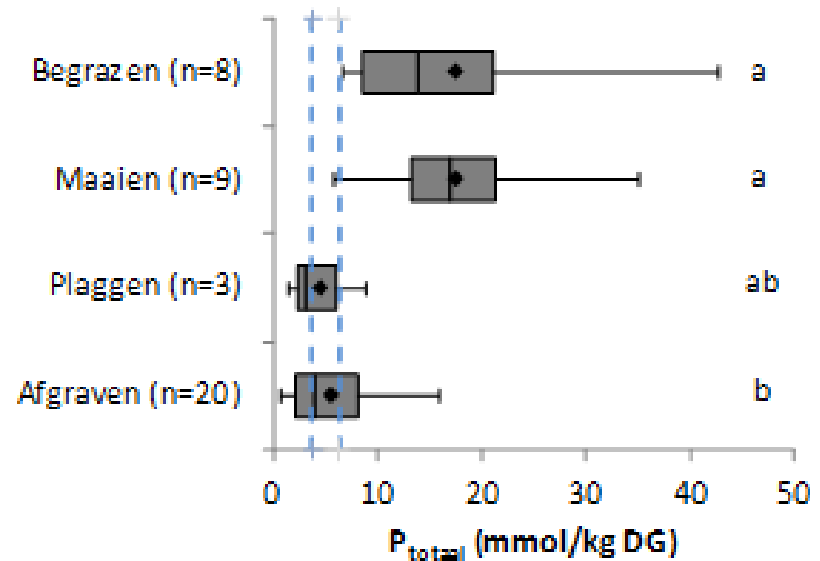
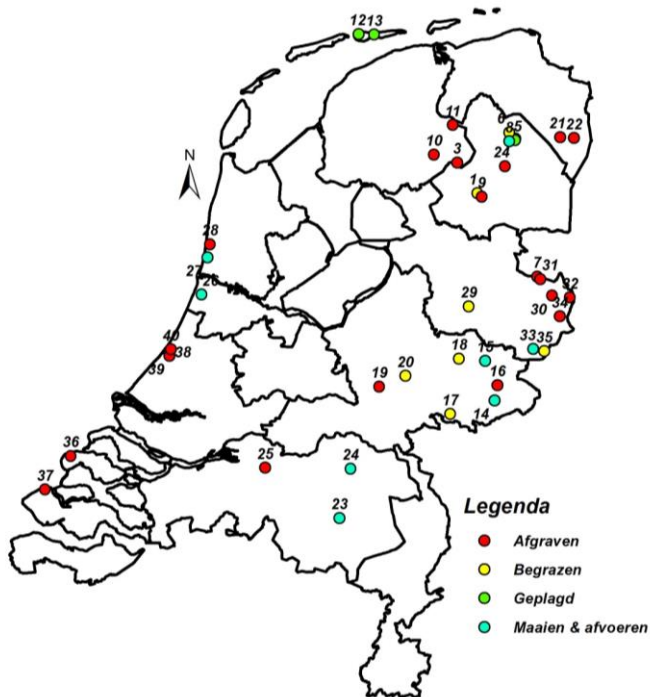
- Intensive farmed heathland
- Extensive farmed heathland
- Other land



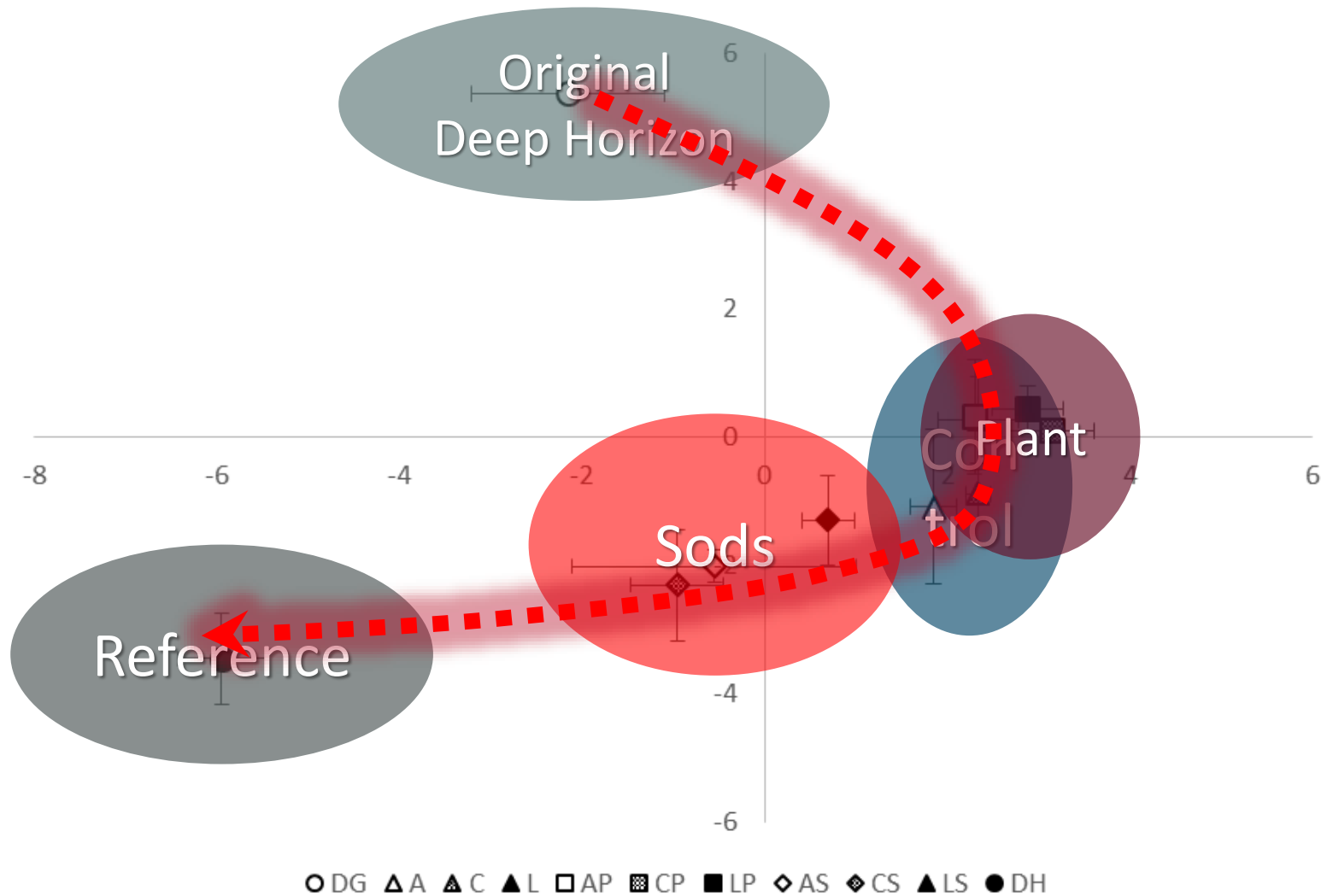
Changes in land use



Long-term effects of alternative restoration strategies



Results microbes – 2 years



Te onderzoeken percelen

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Vegetation - microbial community

