Maatregelen in natuurterreinen: Een zaak van PASsen en meten??

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Target 1 of the EU biodiversity Strategy: Nature Conservation

By 2020, 100% more habitat assessments and 50% more species assessments under the Habitats Directive show an improved conservation status compared to current assessments

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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

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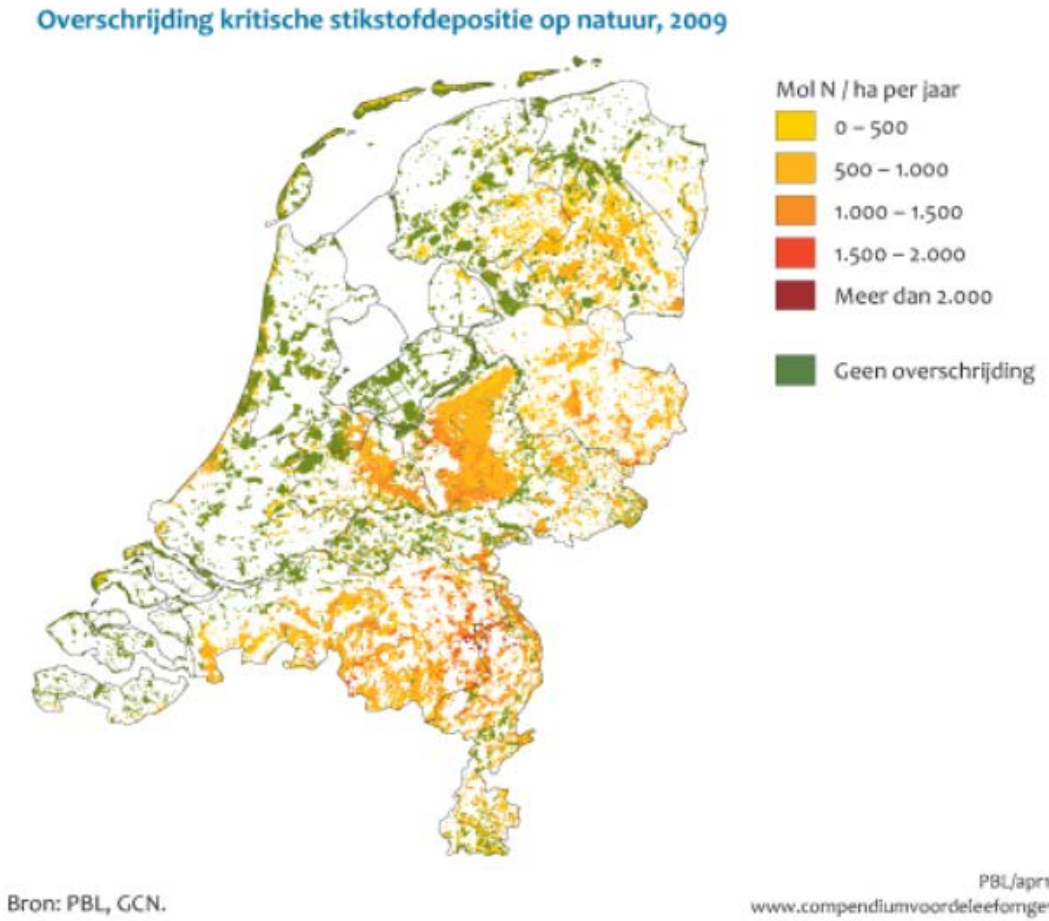
Nature area exceeding Critical Load for nutrients (situation 2011)



What happens when the Nitrogen supply increases?

— Nitrogen pool size increases

— Nitrogen decomposition rate increases

Van der Bij et al. 2016

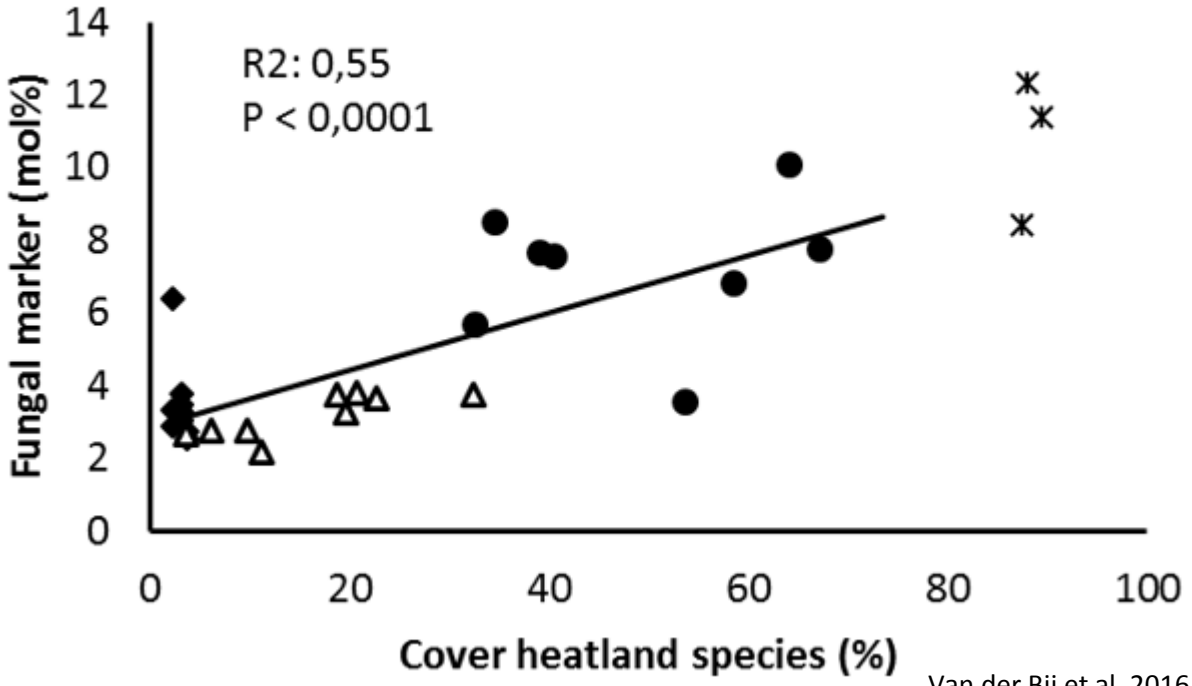
Fungal channel “Miners”

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

Bacterial Channel “Opportunists”

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

Cover heathland species - fungi



Van der Bij et al. 2016

Techniques to mitigate the effects of enhanced nitrogen availability should either

- Decrease size of the N-pool AND (OR?)
- Lower N-availability by shifting from bacterial to fungal channel OR
- Lower the ambitions

Techniques to lower N-pool size:

"Classical" farming techniques:

—Grazing

—Cutting without fertilization

—Burning

"Restoration"techniques:

—Sod cutting/top soil removal

—Inversion of soil profile

Techniques to lower decomposition rate:

—Increase C/N ratio

Grazing

—Very efficient for changing vegetation structure
— Removes only a minimal amount of nitrogen (generally < 2%)

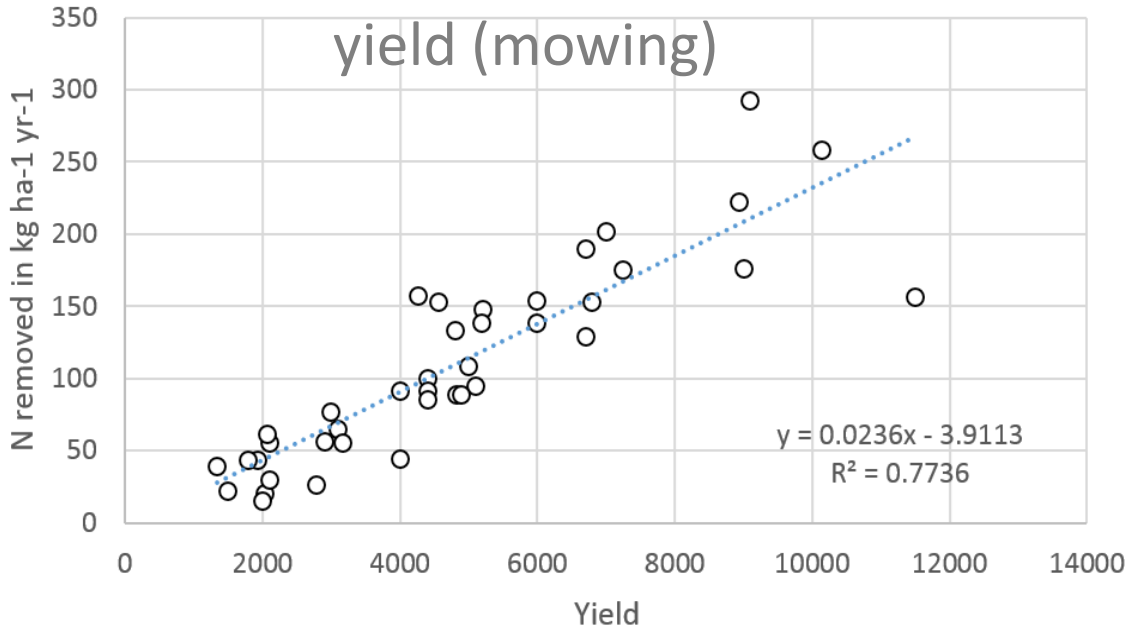
Mowing with standard equipment


1 year


5 years

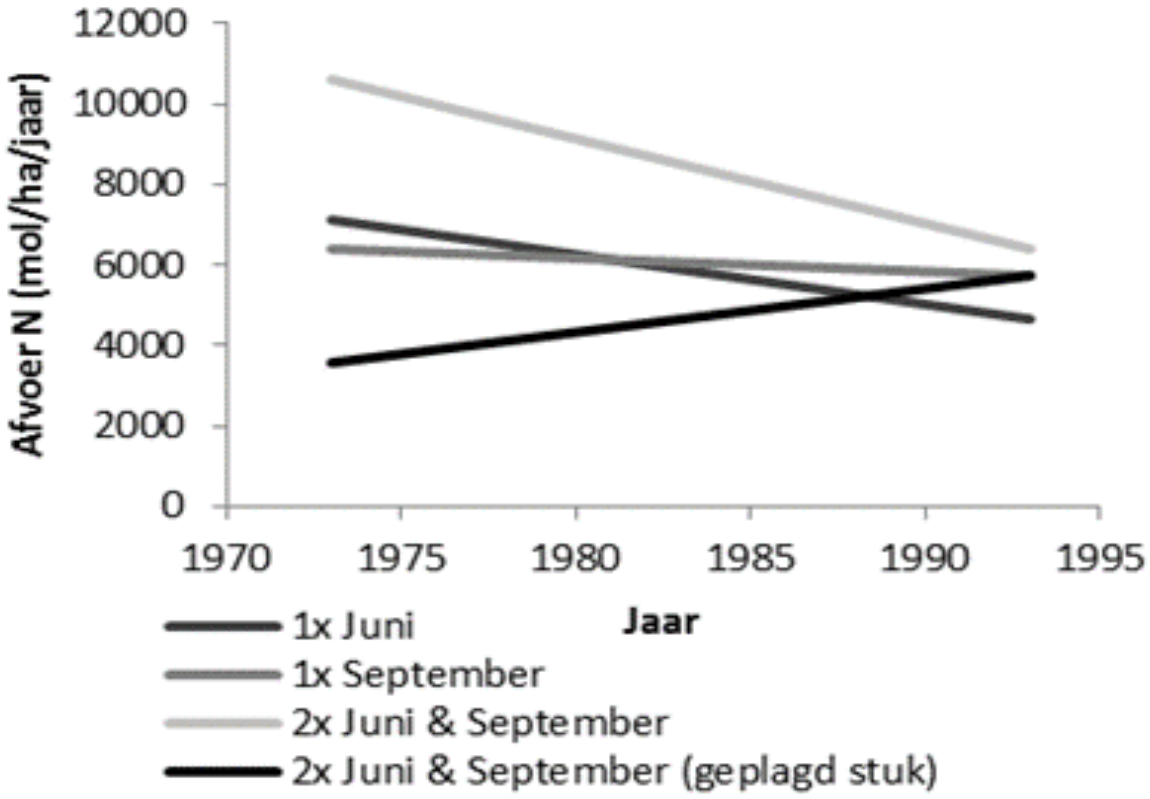

12 years

N removal as a function of yield (mowing)

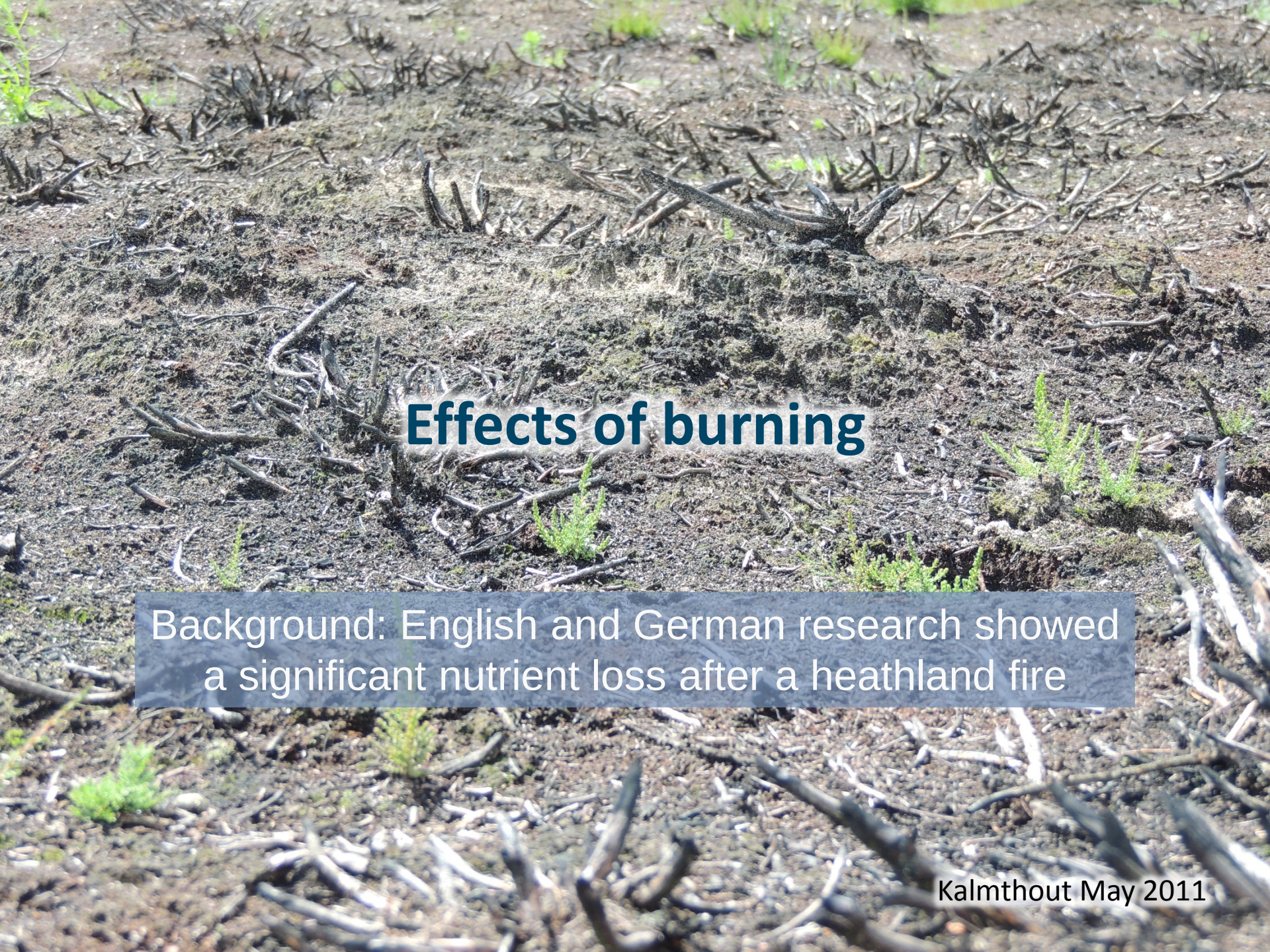


Based on data from Bakker 1989

Removal of N over time by mowing



Based on data from Altena & Oomes 1995



Effects of burning

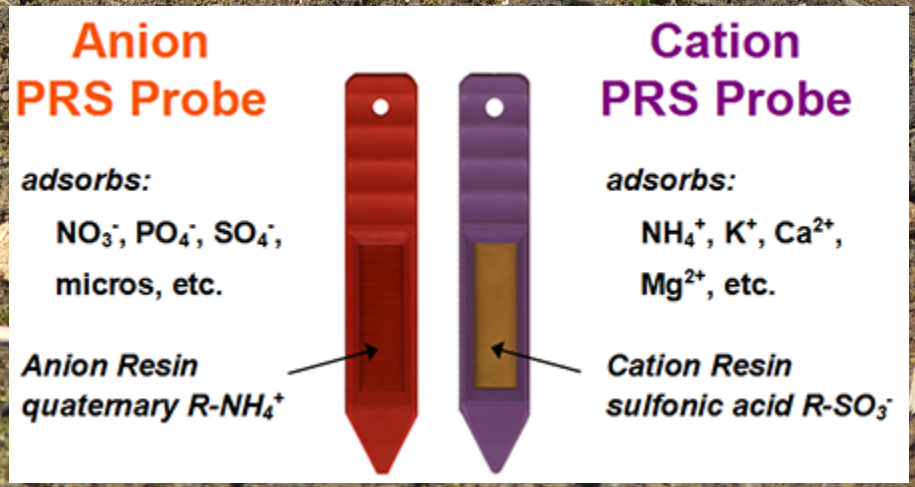
Background: English and German research showed a significant nutrient loss after a heathland fire

Kalmthout May 2011

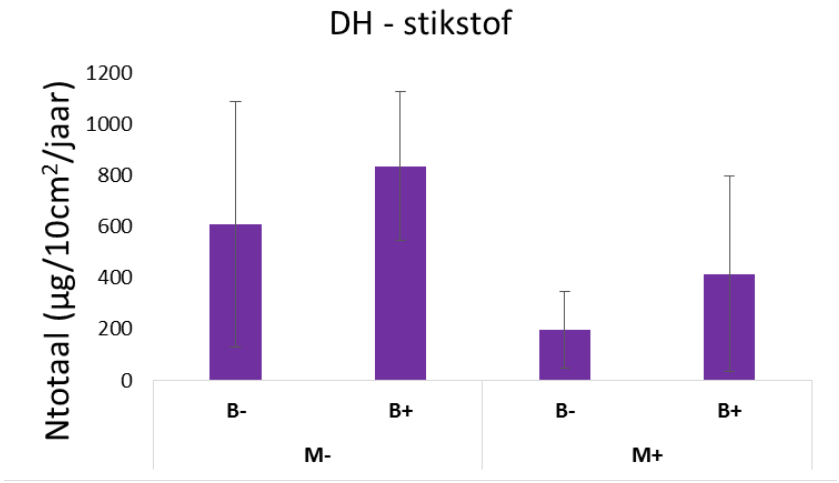
Estimated nutrient losses by wildfire in Kalmthout (2011)

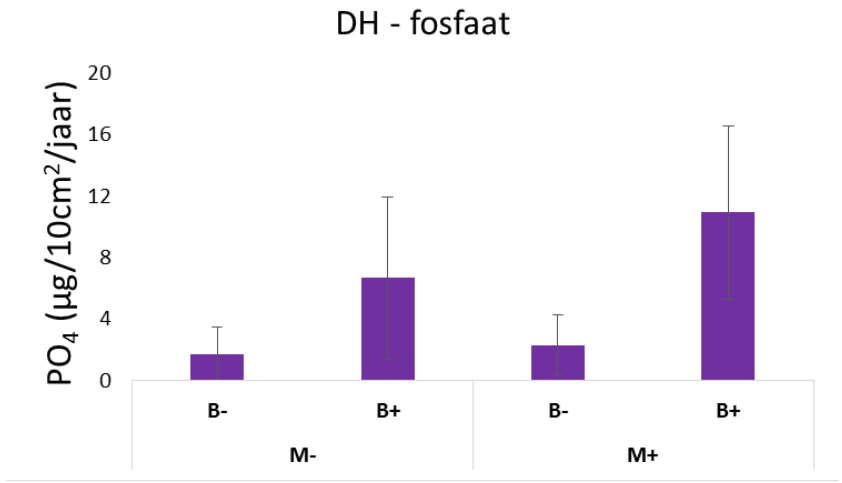
- Dry, non-degraded heath: 144 kg N and 7 kg P per ha;
- Dry, degraded heath: 96 kg N and 6 kg P per ha;
- Wet, non-degraded heath: 104 kg N and 2 kg P per ha;
- Wet, degraded heath: 50 kg N and 6 kg P per ha.
- N-deposition ca. 30 kg N ha^{-1} yr^{-1}
- This amounts to approximately 1% of the soil pool size (N) up to 1-5% (P)

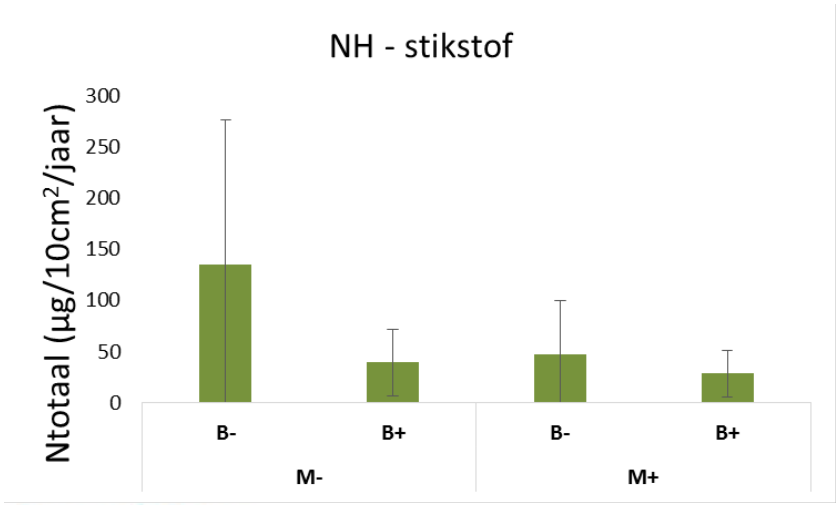
Nutrient availability – PRS-probes

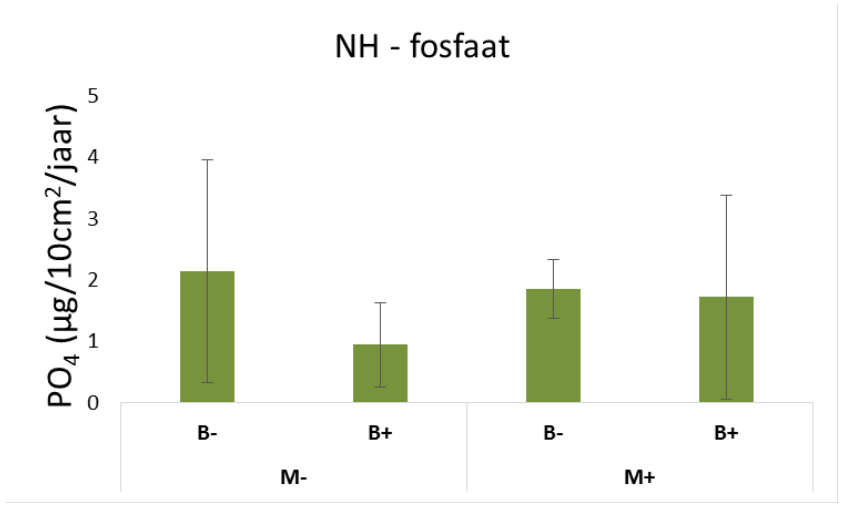


Nutrient availability – 2012









Conclusions "classical" methods:

- Grazing cannot compensate for the effects of additional Nitrogen addition if this is more than a few kg's per ha per year;
- Mowing without fertilisation can to some degree compensate for additional N but it takes a long time and is unlikely to lead to low productive vegetation
- Burning removes (small) part of the N-pool but leads also to more easily decomposable organic matter

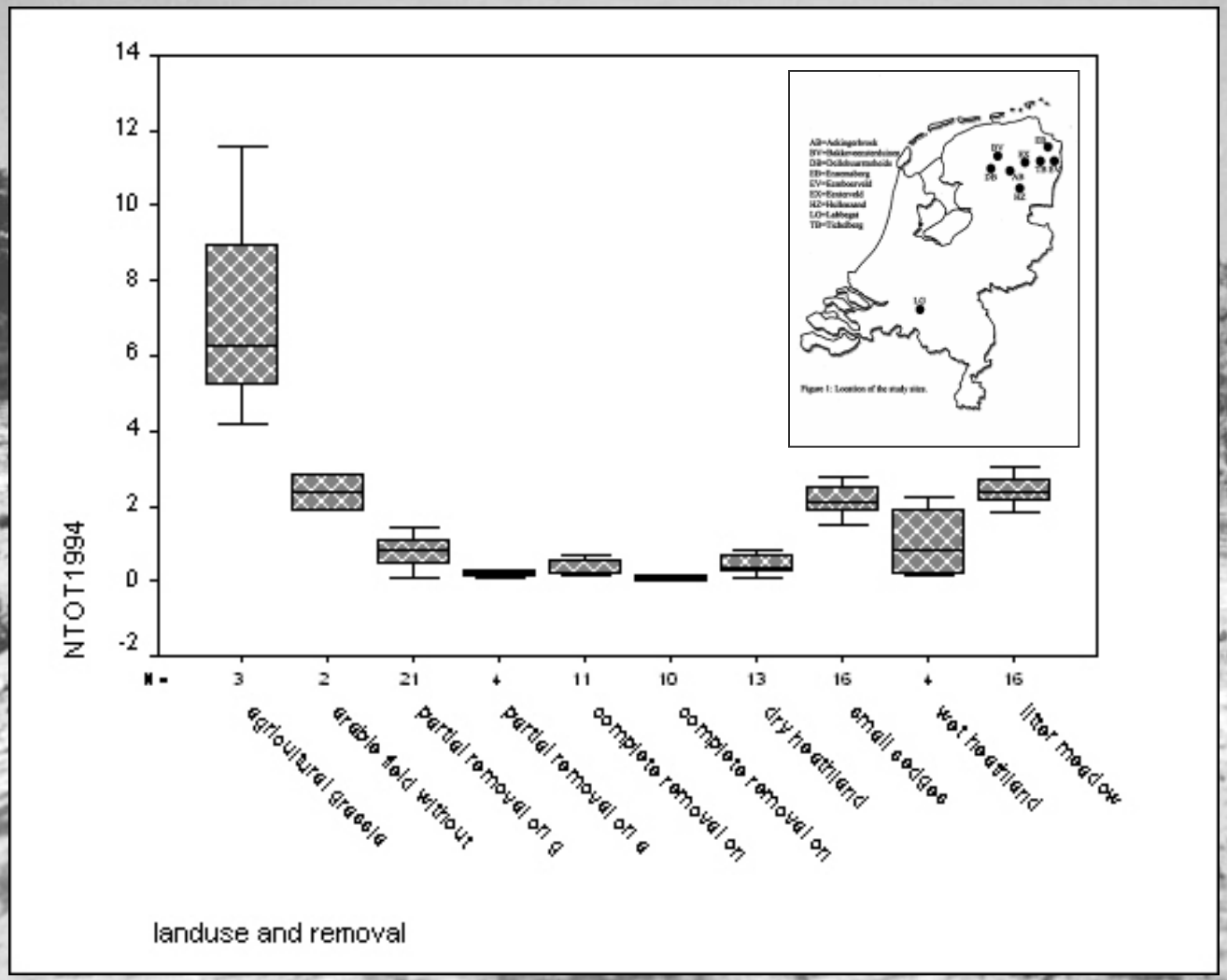
Altogether this implies that classical methods are insufficient to lower nutrient availability to such levels that the survival of nutrient poor communities is also guaranteed under conditions of increased N-deposition

Restoration techniques

Sod cutting/top soil removal: A fast solution?

Foto Jaap van Roon

Nitrogen in relation to removal depth and previous land use



Lowering nutrients alone is not enough. If you don’t do anything else the result is often something like this…..

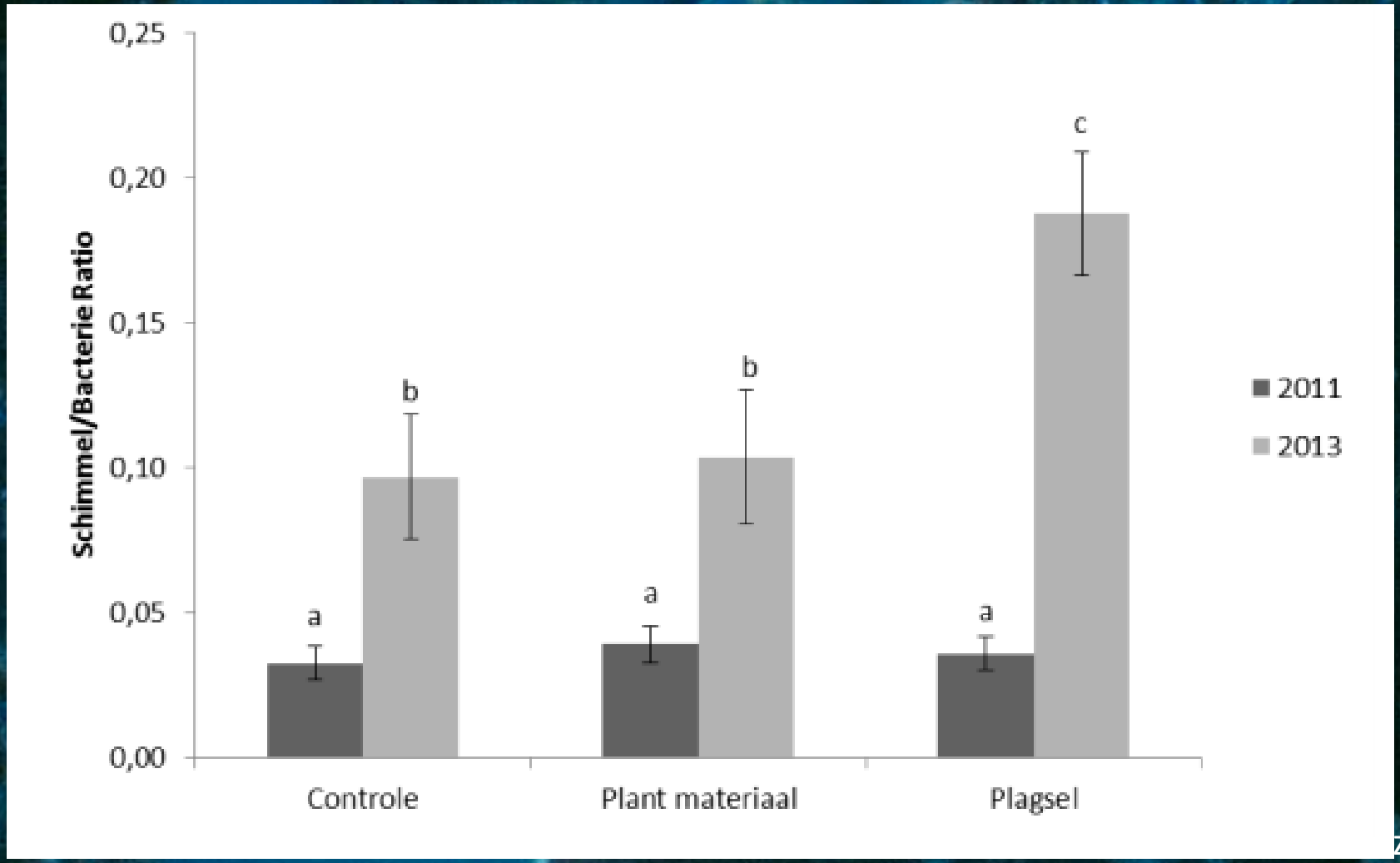

So we made a LARGE experiment in which we manipulated plant species availability and soil community availability
October 2011

Development vegetation

Year 3 with sods

Foto Arrie van der Bij

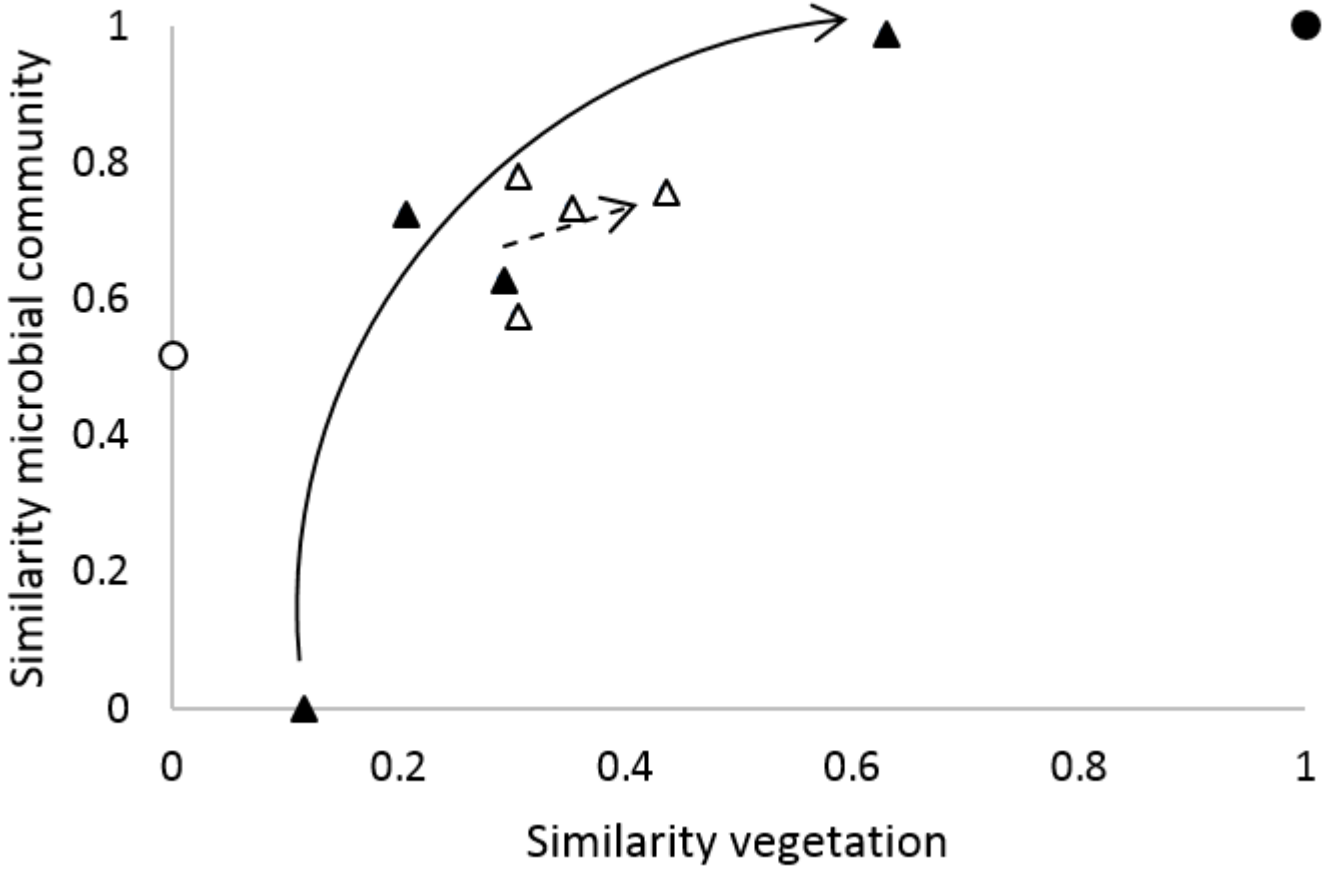
Fungi:Bacteria Ratio



Te onderzoeken percelen

10

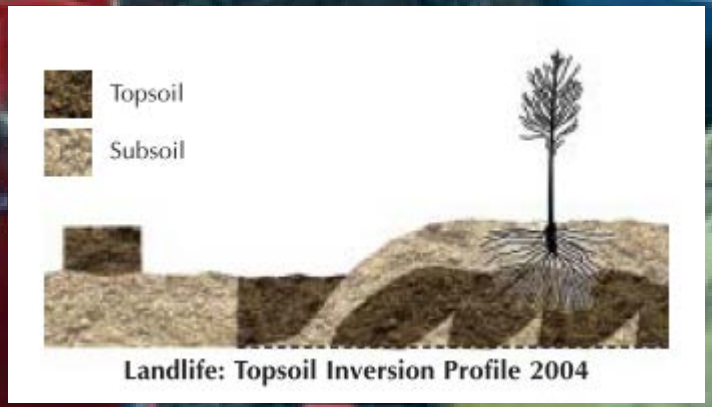
5



Van der Bij et al. 2013

Topsoil Inversion

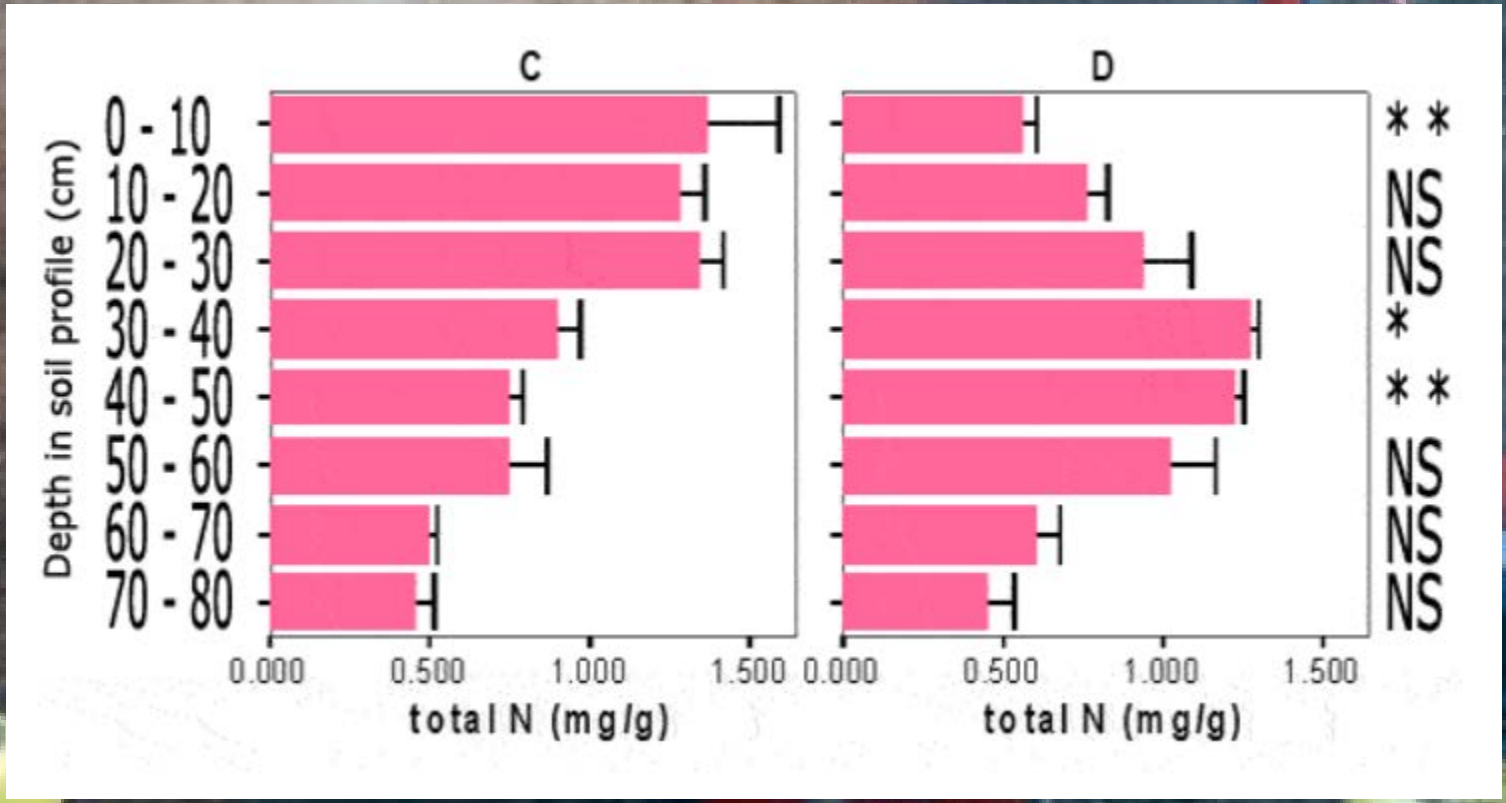
Inverted soil profile.



Landlife: Topsoil Inversion Profile 2004

http://wildflower.co.uk/projects/bng/research1.htm

Topsoil Inversion



Glen, E., J. Barker, L. Thompson, E.A.C. Price, S.J.M. Caporn, J. Carroll, M.L.M. Jones & R. Scott (2005) "Creative conservation on agricultural land using topsoil inversion."

Conclusions restoration techniques

- Topsoil removal and soil inversion appear to be more effective than classical methods in lowering nutrient availability quickly
- At the same time they require a large amount of additional actions making them very expensive
- They have additional disadvantages, e.g. by destroying the soil archive
- They cannot be used on a regular bases (soil inversion can only be used once) and must be followed by classical management

Foto Jaap van Roon

ADDITIONAL METHODS

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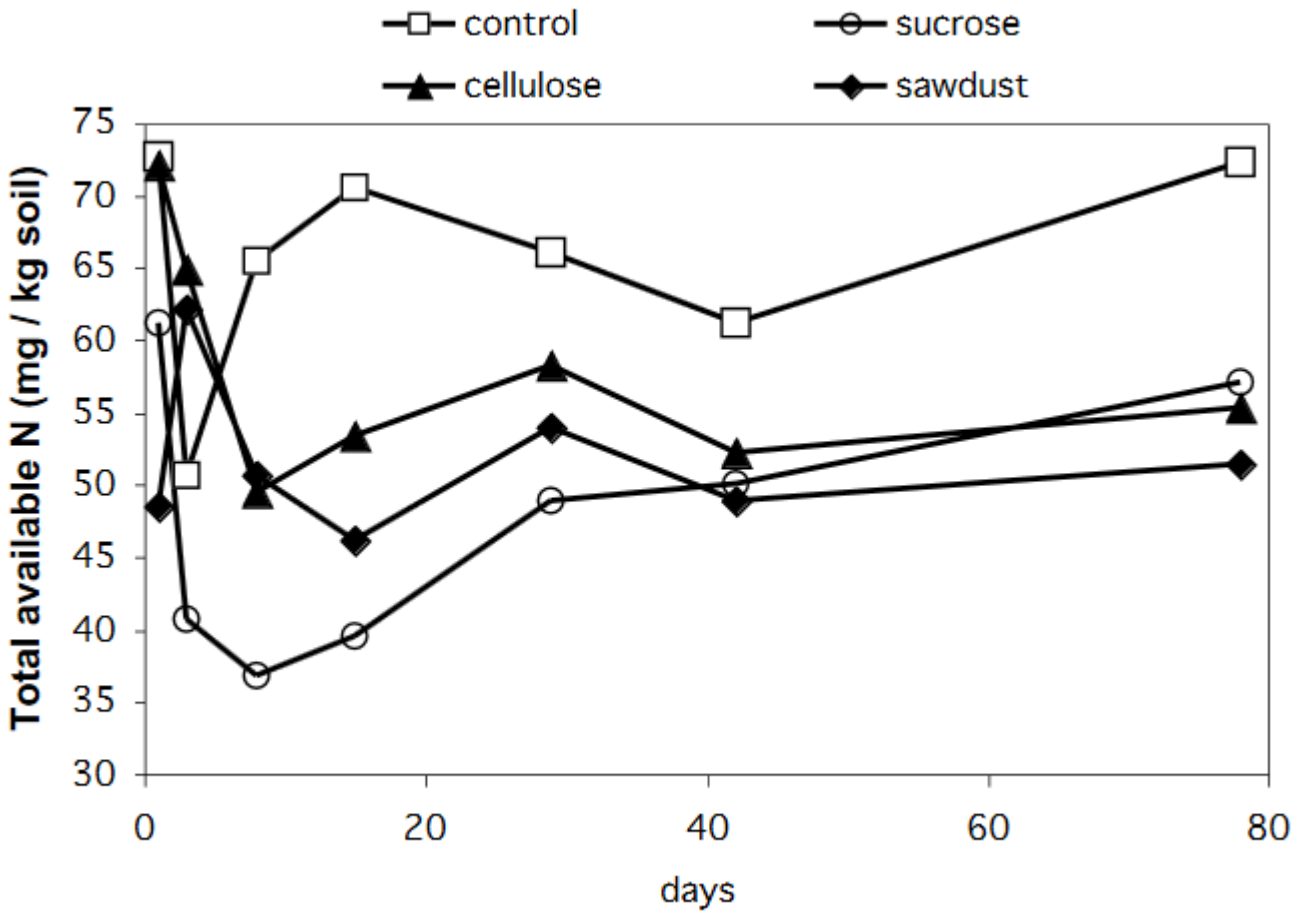

Török et al. (2000) Appl. Veg. Sci. 3: 7-14

Lower ambitions

Species-poor *Holcus* grassland

Enhancing the species richness of such sites might require some of the techniques mentioned before and could be very costly!

https://natuurfotosdrenthe.files.wordpress.com/2014/05/witbol-grasland.jpg?w=950

Finally

- Optimal techniques to lower nutrient availability differ from situation to situation and from target to target
- It may be especially difficult to compensate effects of increased nitrogen deposition on nutrient poor communities on poorly buffered soils
- Restoration-based techniques promise faster results but are very costly and have their own trade offs
- If we don’t invest much effort in improving the quality of existing nature we will not be able to reach the EU Biodiversity targets

Foto Hans Dekker