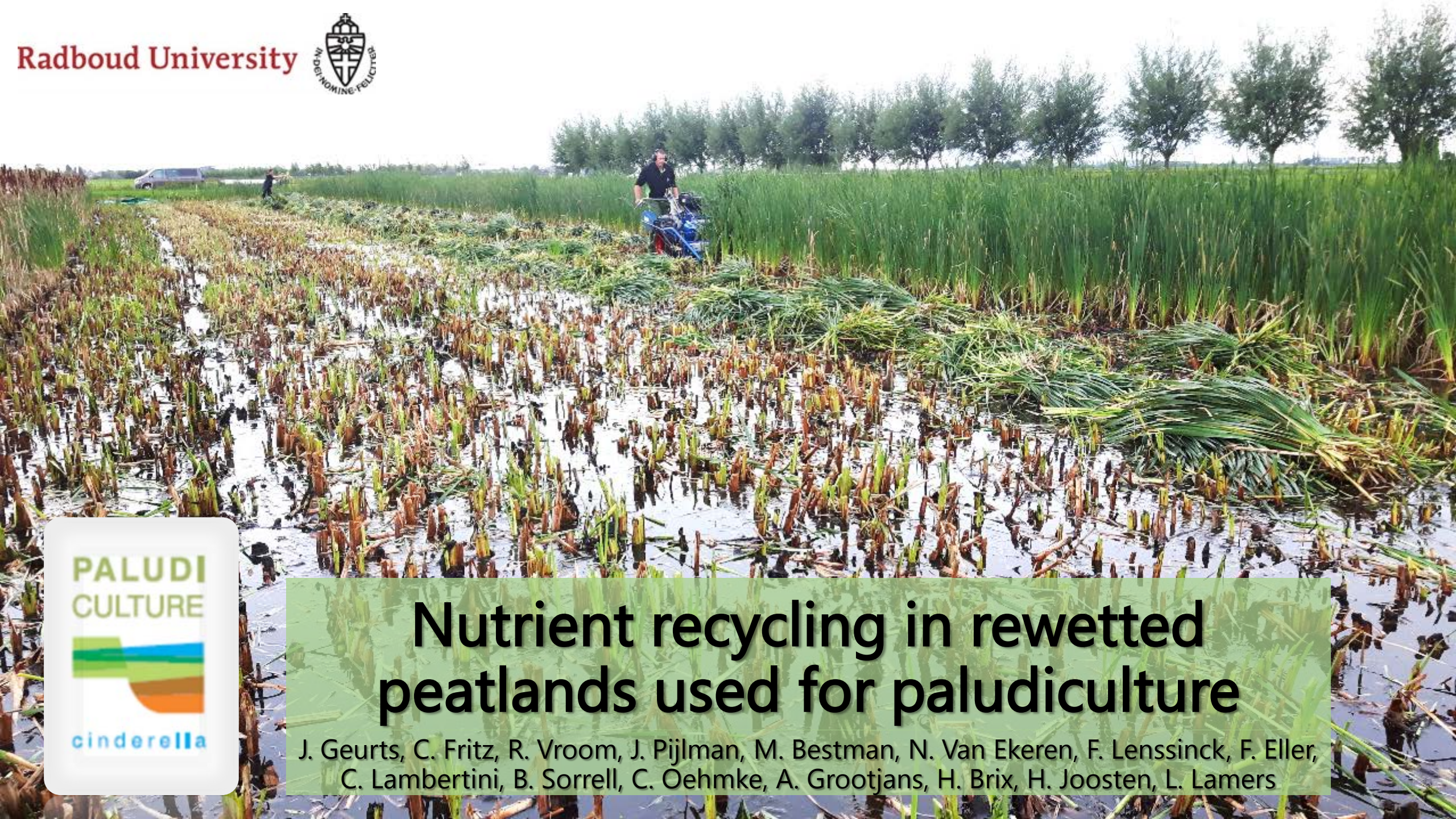
Radboud University



PALUDI CULTURE

cinderella

Nutrient recycling in rewetted peatlands used for paludiculture

J. Geurts, C. Fritz, R. Vroom, J. Pijlman, M. Bestman, N. Van Ekeren, F. Lenssinck, F. Eller, C. Lambertini, B. Sorrell, C. Oehmke, A. Grootjans, H. Brix, H. Joosten, L. Lamers

Growing problems in the Netherlands

- reduction of CO_2 and N_2O emissions from peatland farms
- increasing frequency of salt water intrusion
- decreased stability of dikes in drained peatland areas
- cost of drainage increases
- water retention areas needed (drought prevention / storm run-off)
- water quality (high N and P pollution in peat areas)

Picture by Tobias Dahms

Nutrient mobilization after rewetting

- top soil removal

  expensive / undesirable

- Paludiculture = solution:

  harvest fast-growing

  Paludicrops to remove

  nutrients from soil/water

  → reduce leaching

Paludiculture

Greenhouse experiments → field experiments → pilots on ha scale

Co-operation in the CINDERELLA project

Picture by Tobias Dahms

ERNST MORITZ ARNDT
UNIVERSITÄT GREIFSWALD
Wissen lockt. Seit 1456

Radboud University

AARHUS UNIVERS

HÖGSKOLAN I HALMSTAD

PALUDI CULTURE
cinderella

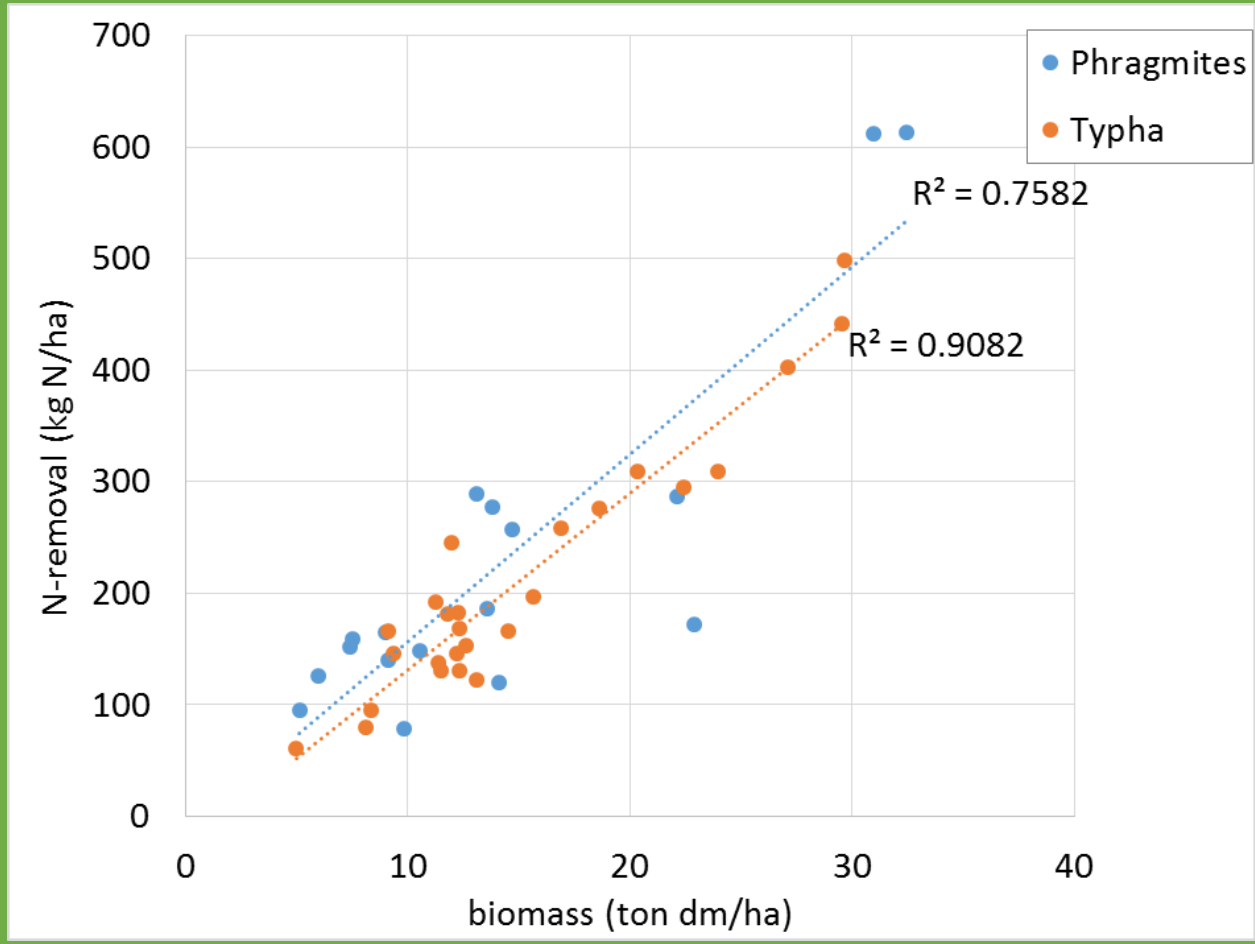
Joint field sites in NL, D, DK, S

- > 400 sublocations/biomass samples/soil samples
- **Typha latifolia**, T. angustifolia, **Phragmites**, and Glyceria
- Selection: healthy stands, peat soil, harvest in Aug/Sept, >5y
- 50 locations left after selection
- No clear soil indicators

Yield and nutrient uptake

- High biomass yield and nutrient removal by *Phragmites* and *Typha*
- Higher N loads (run-off) promote biomass production
- **But**: als significant biomass (10 t dm/ha) at low N loads

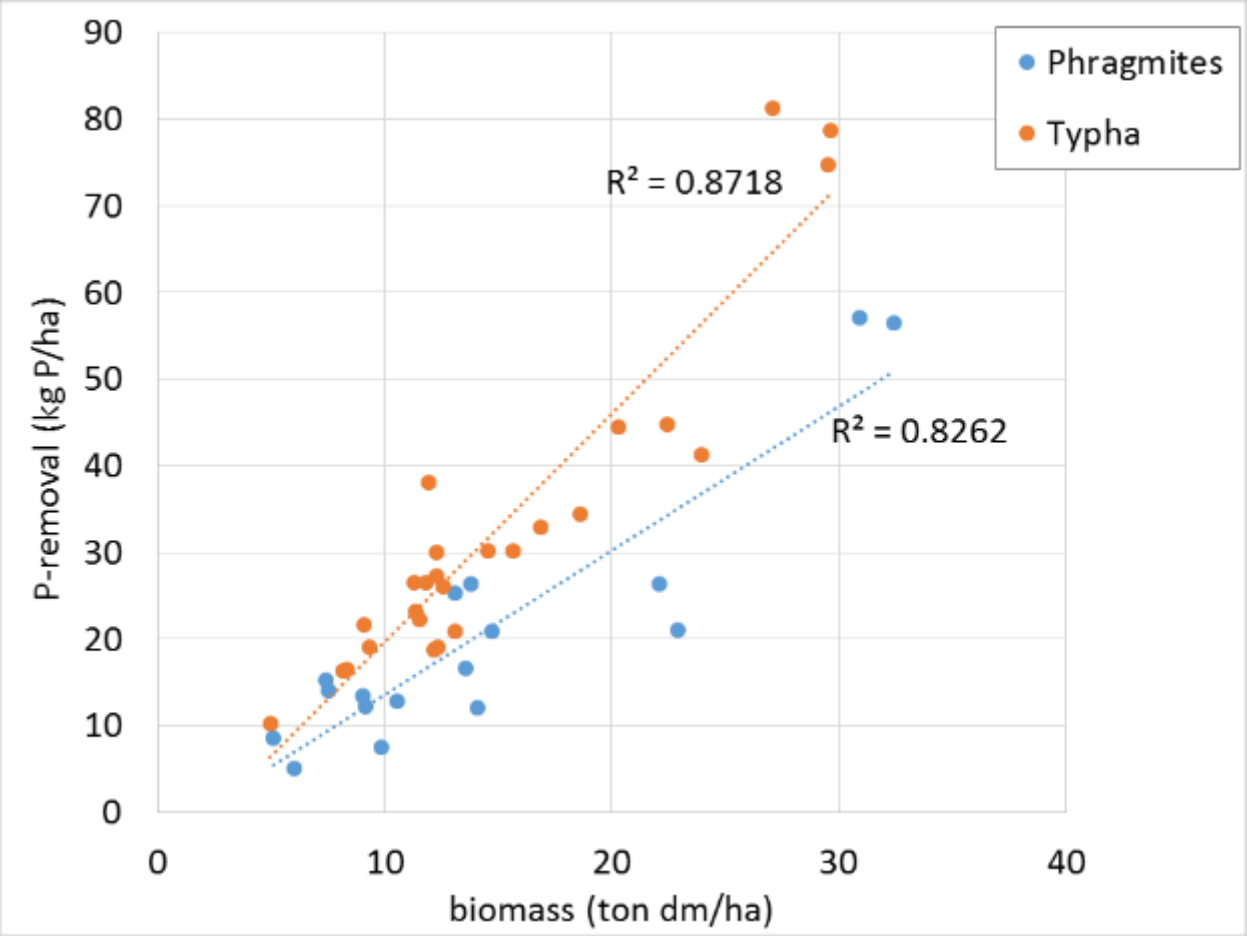
- Land et al. (2016): 300-340 kg/ha
- Mitsch et al. (2000): 400 kg/ha



Yield and nutrient uptake

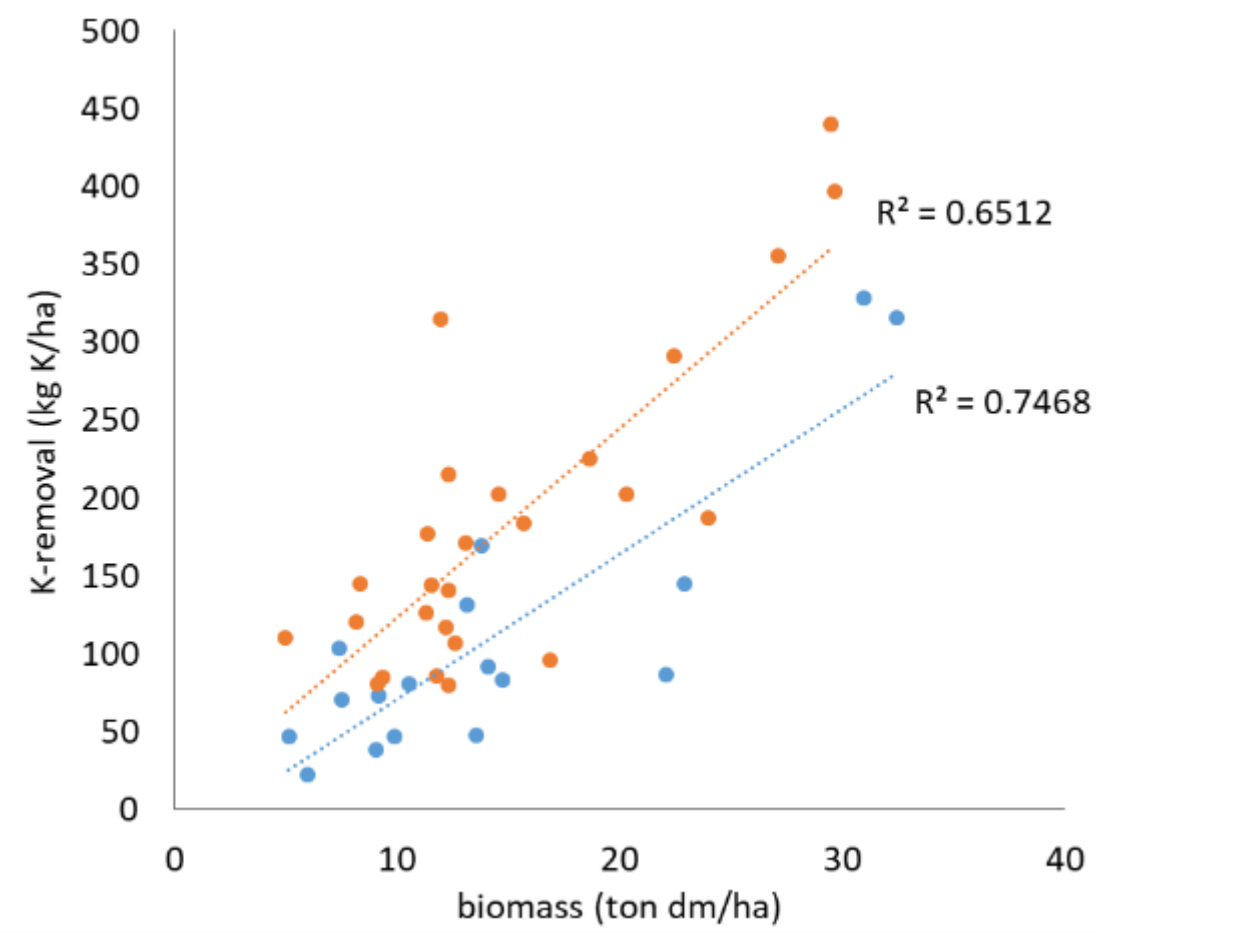
- Higher P uptake Typha (N:P 5-8) than Phragmites (N:P 10-12)

- Land et al. (2016): 30-45 kg/ha
- Mitsch et al. (2000): 50 kg/ha



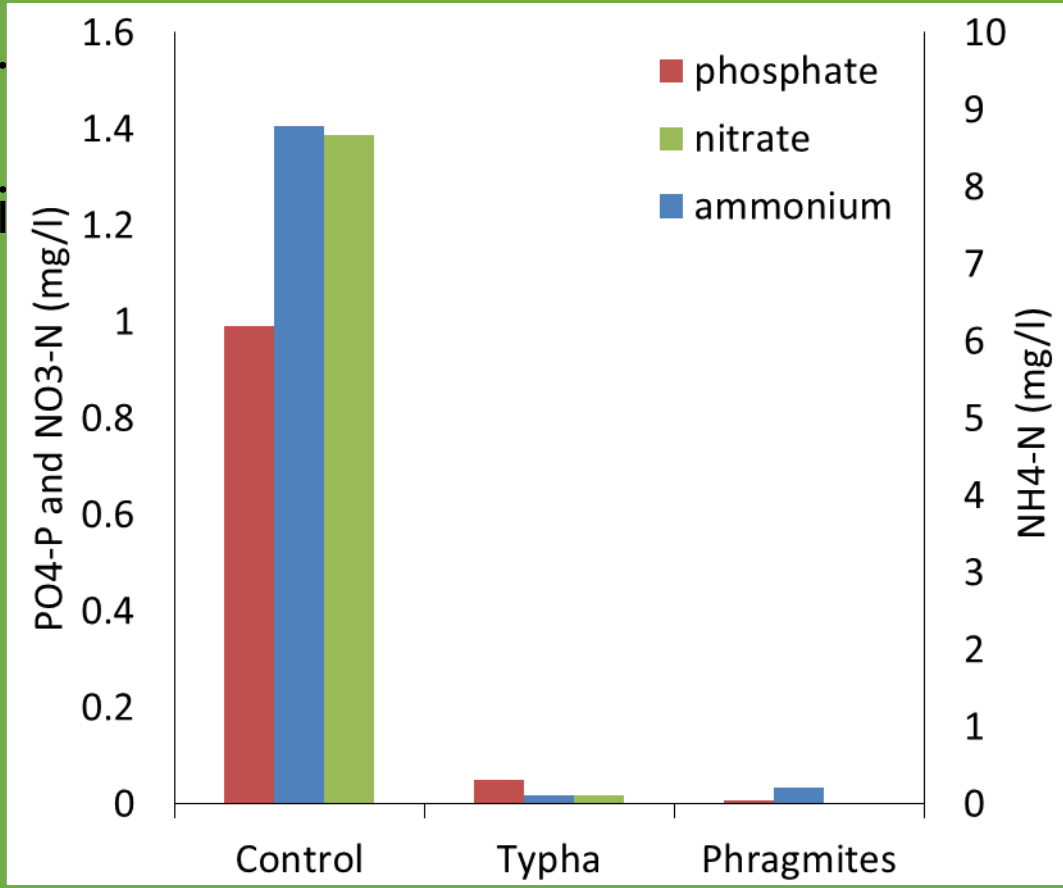
Yield and nutrient uptake

- Higher P uptake Typha (N:P 5-8) than Phragmites (N:P 10-12)
- & higher K uptake Typha
- Possible limitation by K / Ca / Mg under investigation



Yield and nutrient uptake

- High water purification potential (esp. Typha)
- Nutrients rapidly taken up by vegetati → prevents leaching



Project Peat, Fodder & Fibre

0.5 ha pilot field with *Typha latifolia* + smaller experimental plots with other Paludicrops (Zegveld, NL)

Radboud Universiteit Nijmegen

LOUIS BOLK INSTITUUT

VEENWEIDEN INNOVATIECENTRUM

Project Peat, Fodder & Fibre

0.5 ha pilot field with *Typha latifolia* + smaller experimental plots with other Paludicrops (Zegveld, NL)

Radboud Universiteit Nijmegen

LOUIS BOLK INSTITUUT

VEENWEIDEN INNOVATIECENTRUM

Project Peat, Fodder & Fibre

0.5 ha pilot field with *Typha latifolia* + smaller experimental plots with other Paludicrops (Zegveld, NL)

Radboud Universiteit Nijmegen

LOUIS BOLK INSTITUUT

VEENWEIDEN INNOVATIECENTRUM

Project Peat, Fodder & Fibre

0.5 ha pilot field with *Typha latifolia* + smaller experimental plots with other Paludicrops (Zegveld, NL)

→ Talk of Jeroen Pijlman

Project Peat, Fodder & Fibre

0.5 ha pilot field with *Typha latifolia* + smaller experimental plots with other Paludicrops (Zegveld, NL)

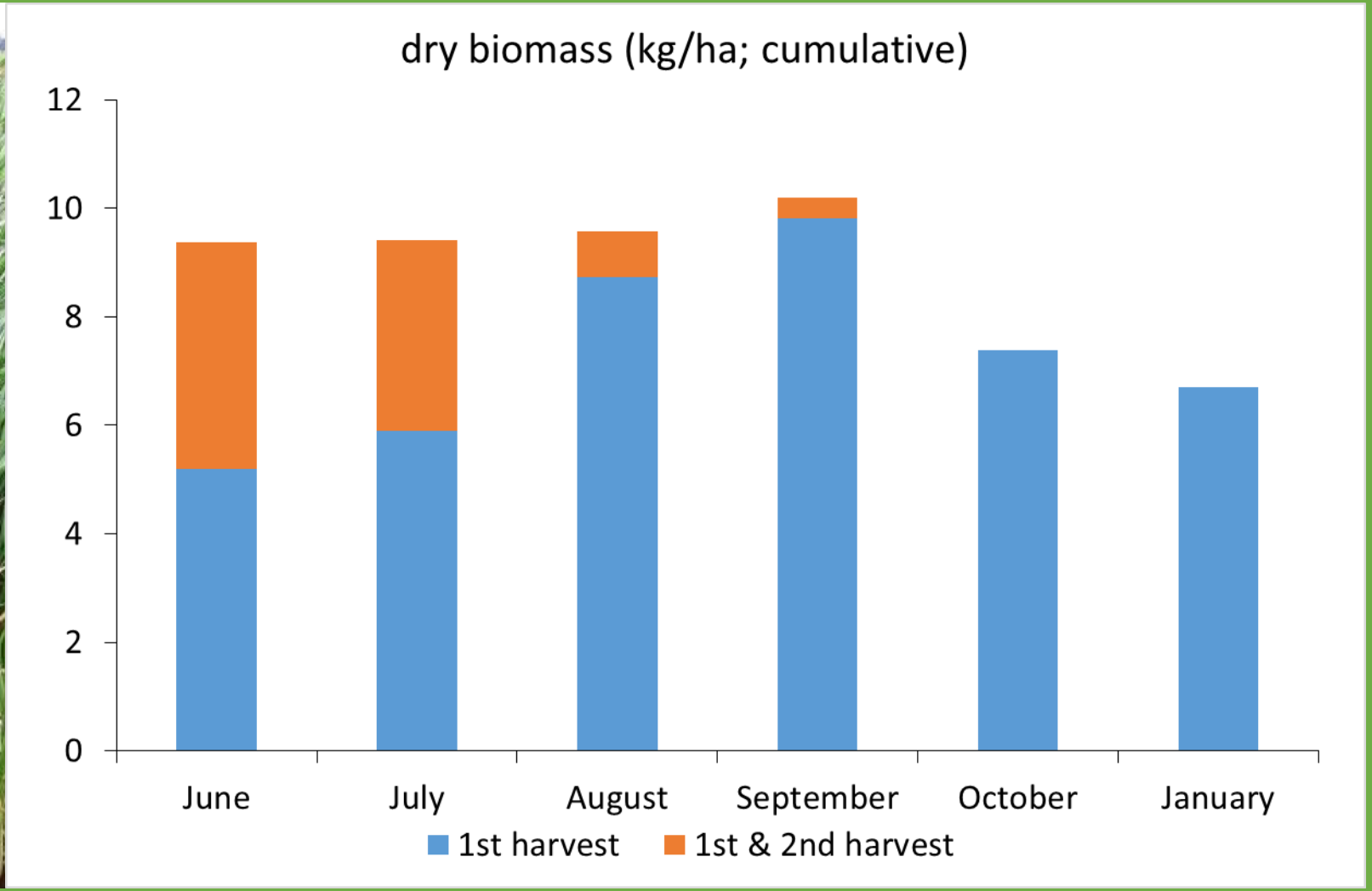
→ Talk of Jeroen Pijlman

Radboud Universiteit Nijmegen

LOUIS BOLK INSTITUUT

VIC ZEGVELD VEENWEIDEN INNOVATIECENTRUM

Effect of harvest period on *Typha*



Increasing yields by managing the N load

→ use N-rich surface water or farm run-off

→ 1 m of water with 5 mg/L = 50 kg N/ha

→ flow through system to reach higher values

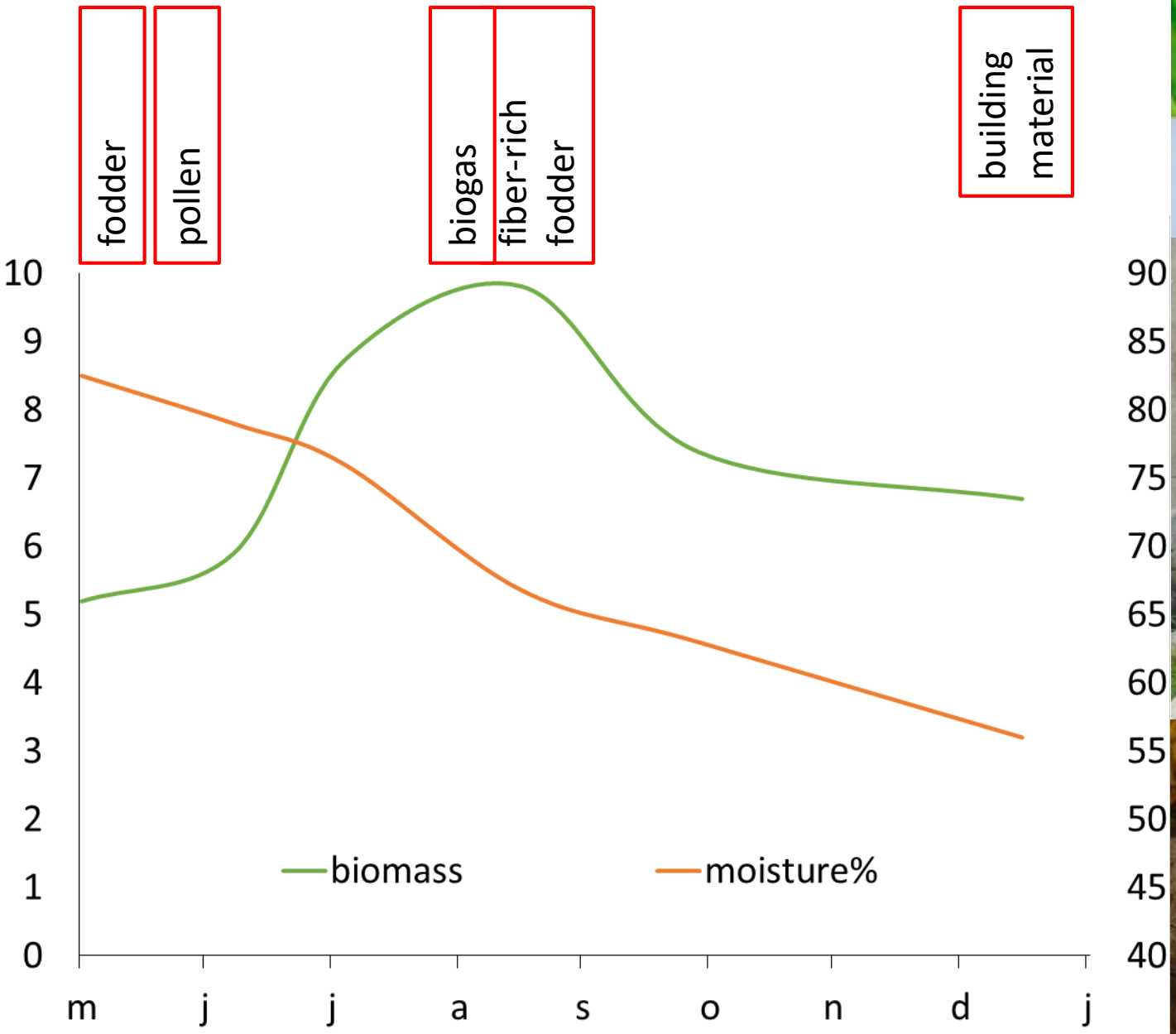
→ direct farm run-off = 100 mg/L N & 30 mg/L P (RWS/Deltares, 2016)

→ Flexible water tables possible

harvest period and biomass use

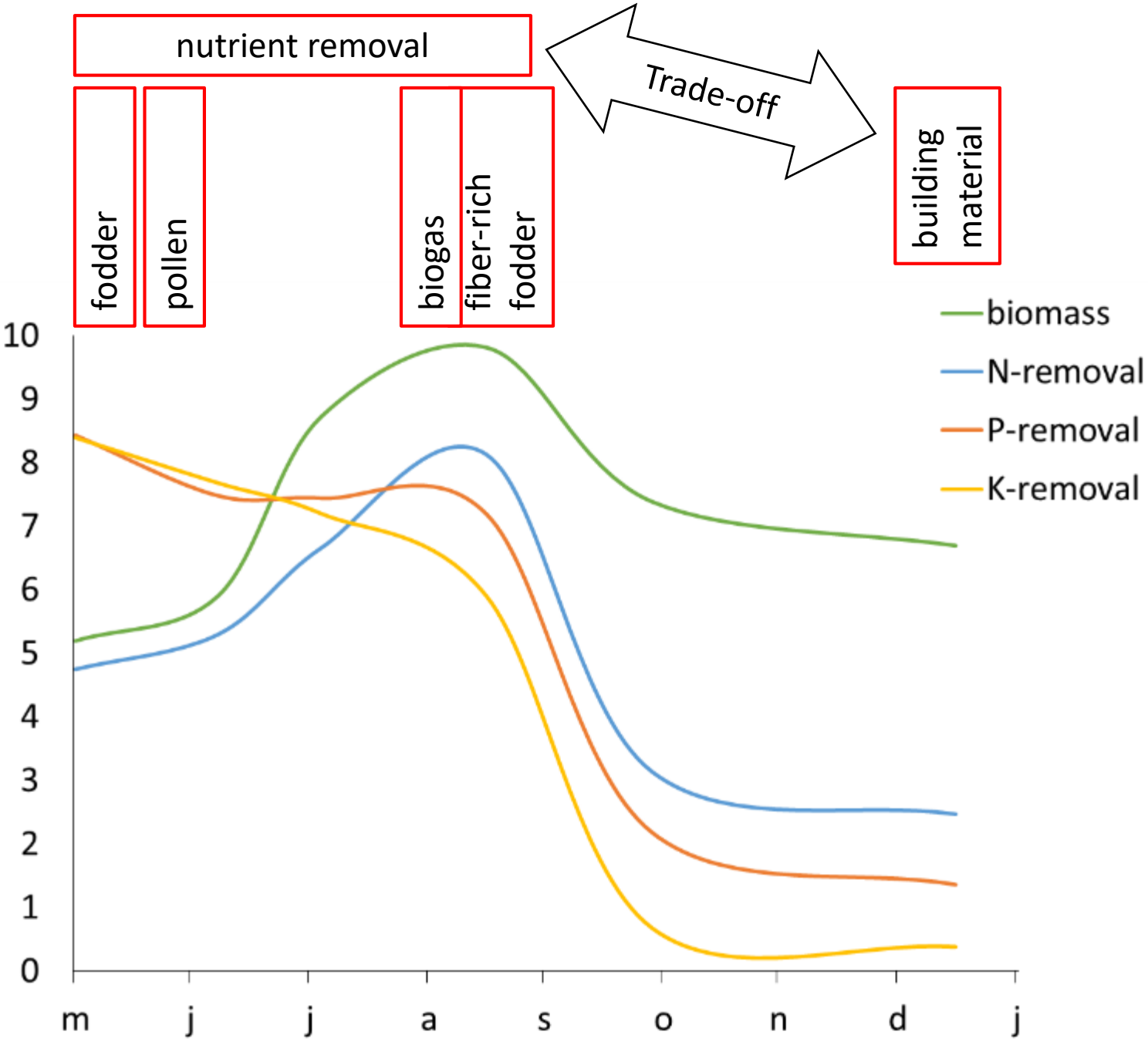
Flower Tea 100g / lot

Typha Angustifolia Tea 50g / bag



Flower Tea 100g / lot

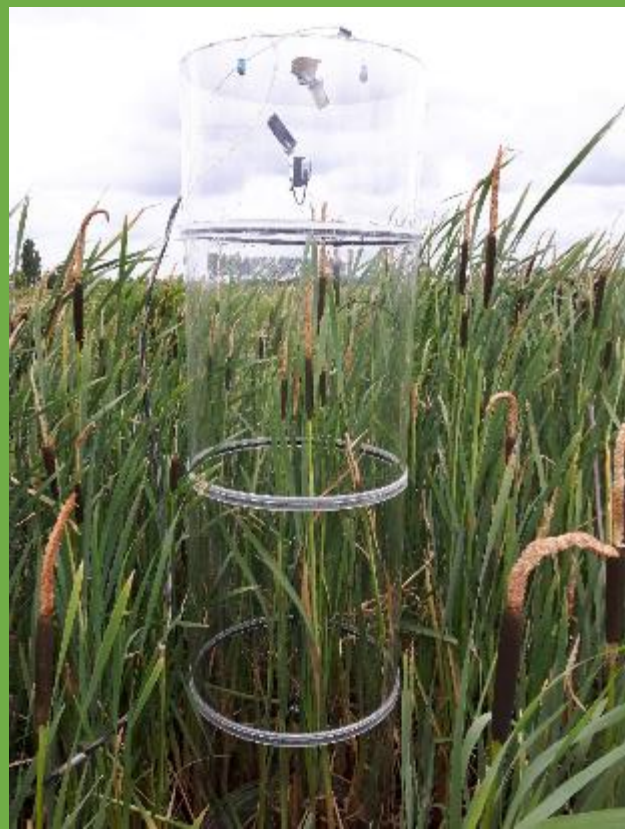
Typha Angustifolia Tea 50g / bag



Conclusions

Paludiculture:

- High necessity: soil subsidence & water level increase
- Possibilities for water purification and nutrient removal + other ESS
  - ❑ removal up to 600 kg N/ha and 80 kg P/ha
- Higher N load → more P extraction possible!
- Various options for biomass use:
  - ❑ depending on harvest period
  - ❑ multiple harvest possible → no cigars in winter harvest!



More to come

- Long-term effect of early / multiple harvest on regrowth and quality?
- Importance of K limitation?
- Application related management?

New Paludiculture pilots in the Netherlands

Bufferzone **Deurnese peel (province of Noord-Brabant)**

1.5 ha *Typha* and 5 ha *Salix*

Krimpenerwaard (province of Zuid-Holland)

Experimental area / showcase with *Typha latifolia, Phragmites, Sagittaria* and *Salix*


Thank you!