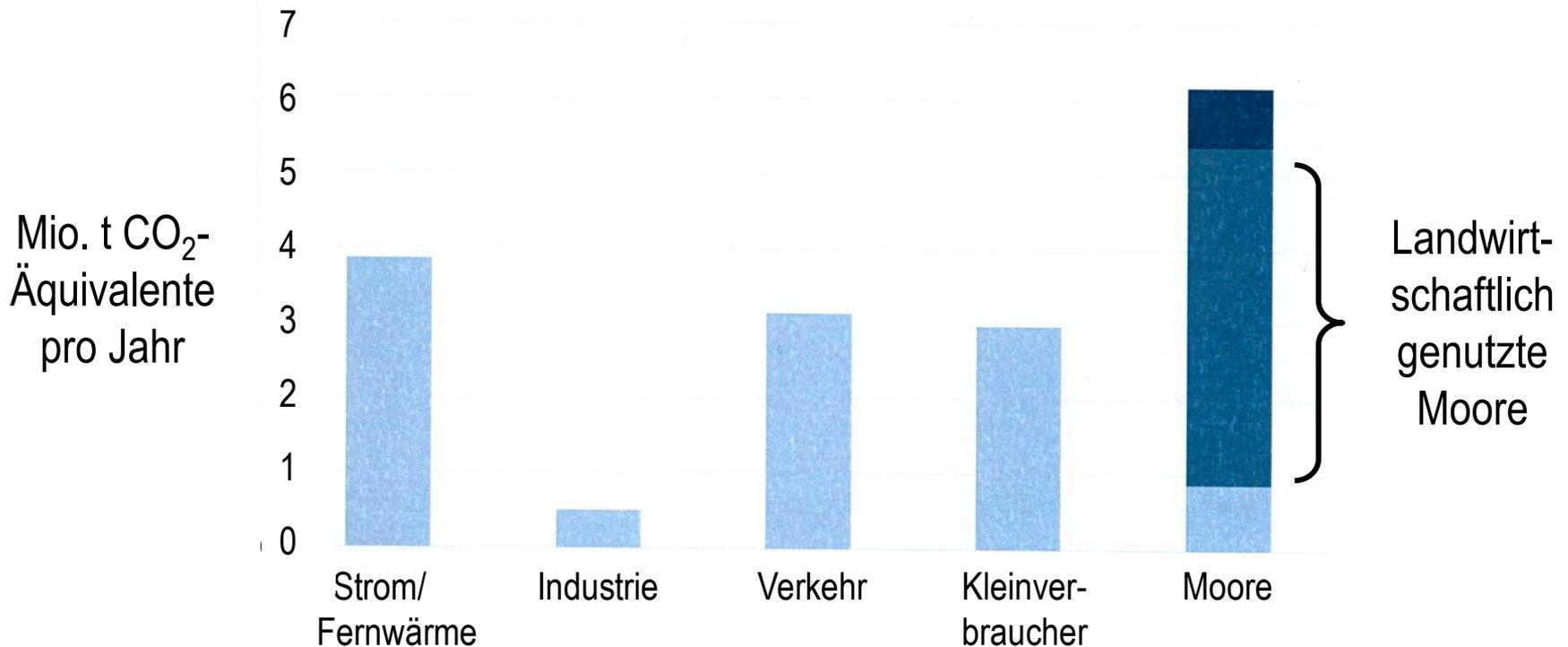


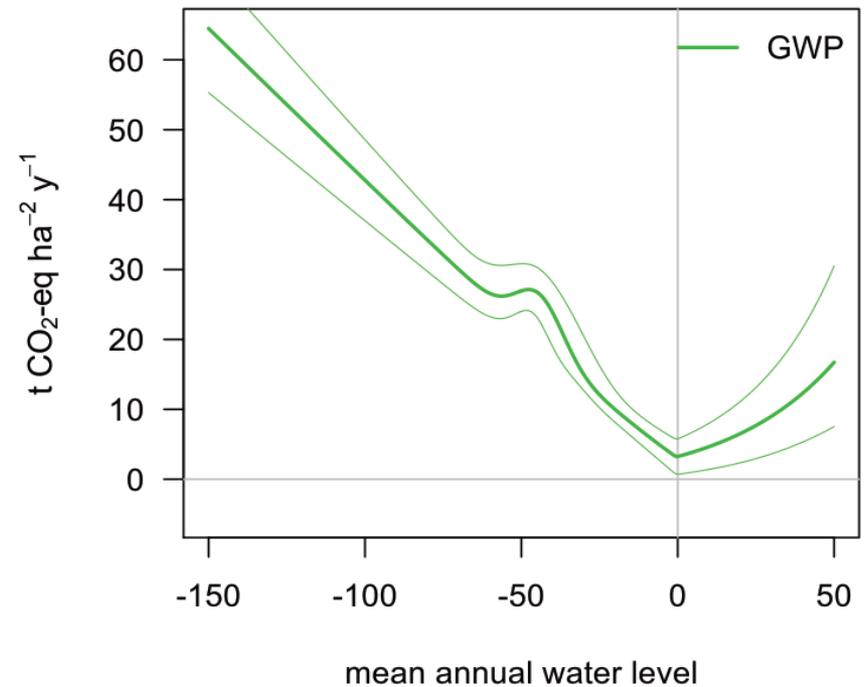
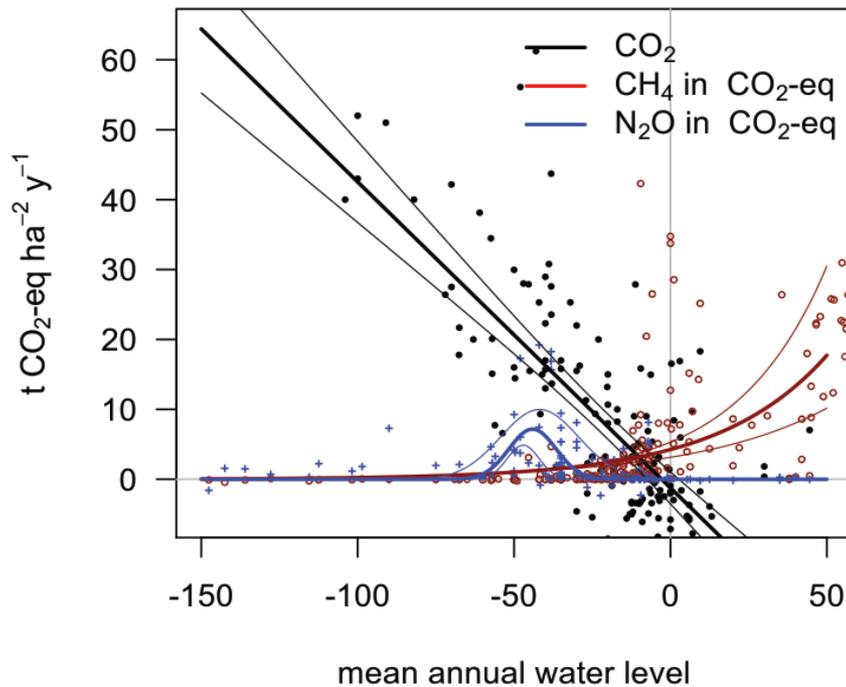
THG-Emissionen aus Paludikulturen: Drei Fallstudien aus Norddeutschland

A. Günther, V. Huth, M. Hoffmann, G. Jurasinski, K. Albrecht, J. Augustin, S. Glatzel

Beispiel Mecklenburg-Vorpommern



Wiedervernässung verringert Emissionen



Jurasinski et al. 2016 in „Paludiculture. Productive use of wet peatlands“ (Wichtmann et al., eds.).



**Hat diese neue Landnutzung Auswirkungen auf die Emissionen
wiedervernässter Moore?**

Drei Feld-Experimente in Norddeutschland

Zwei Jahre Messungen
des CO_2 -, CH_4 - und
 N_2O -Austausches mit
Gassammelhauben



■ Sphagnum



■ Erle



■ Röhricht

Rostock

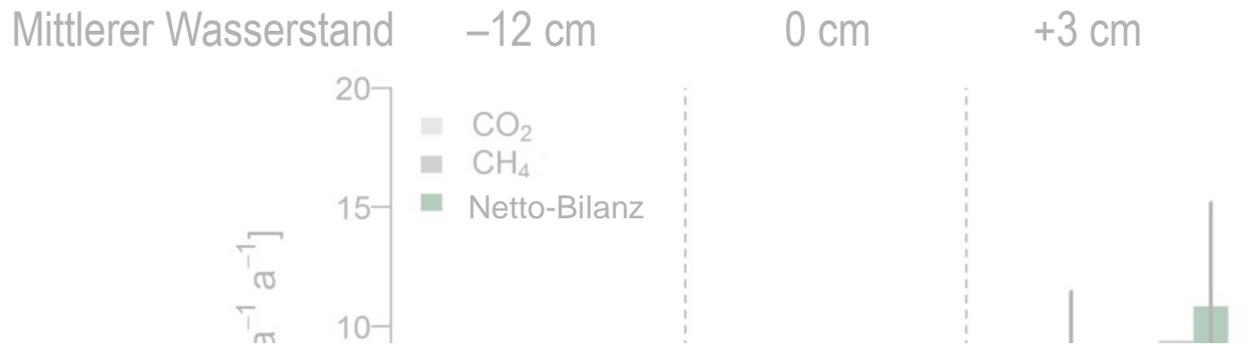
ZALF ●

Schilfrohr

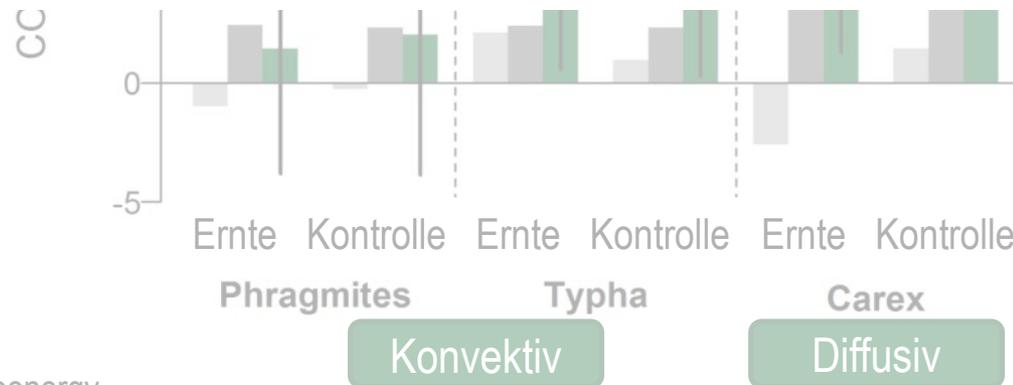
Rohrkolben



Ändert die Ernte die THG-Bilanzen auf der Fläche?



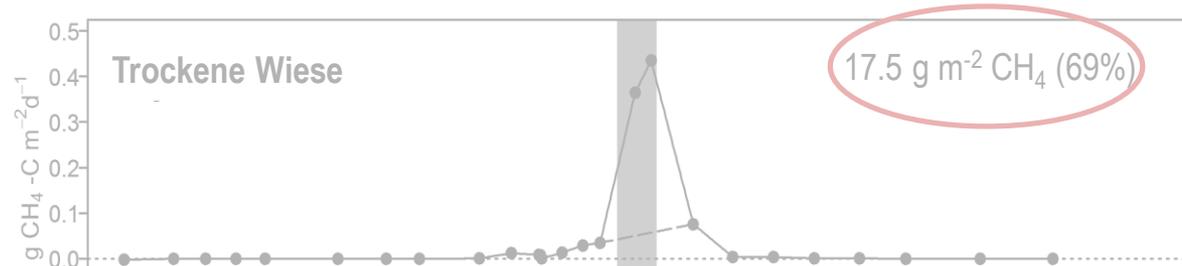
Ernte von Röhrichtpflanzen hat keine negative Auswirkung auf den THG-Austausch im Feld



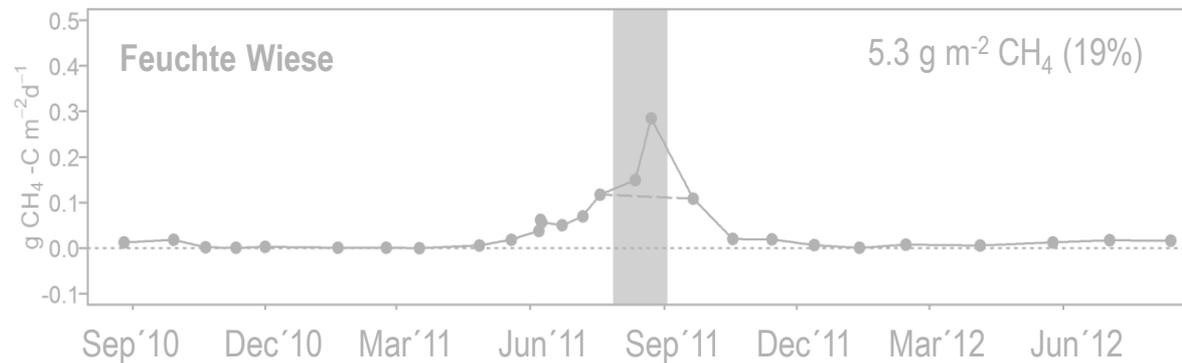


50 metres

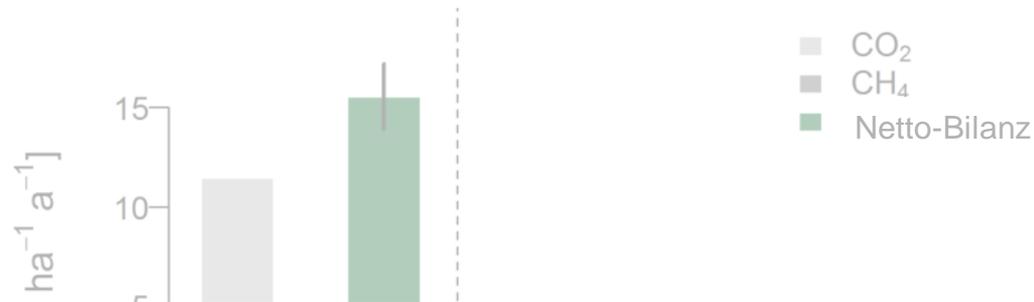
Resistenz gegenüber Überflutung



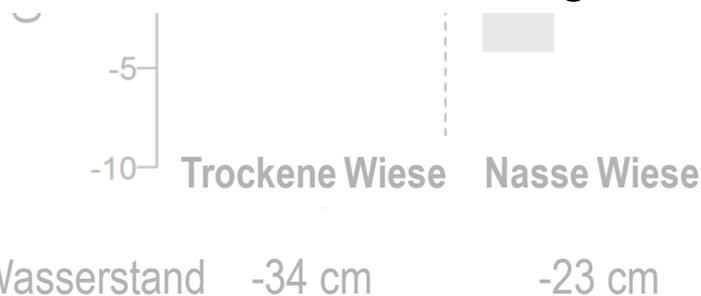
Paludikultur als Möglichkeit der Anpassung an den Klimawandel?



Einfluss verschiedener Nutzpflanzen im Feld



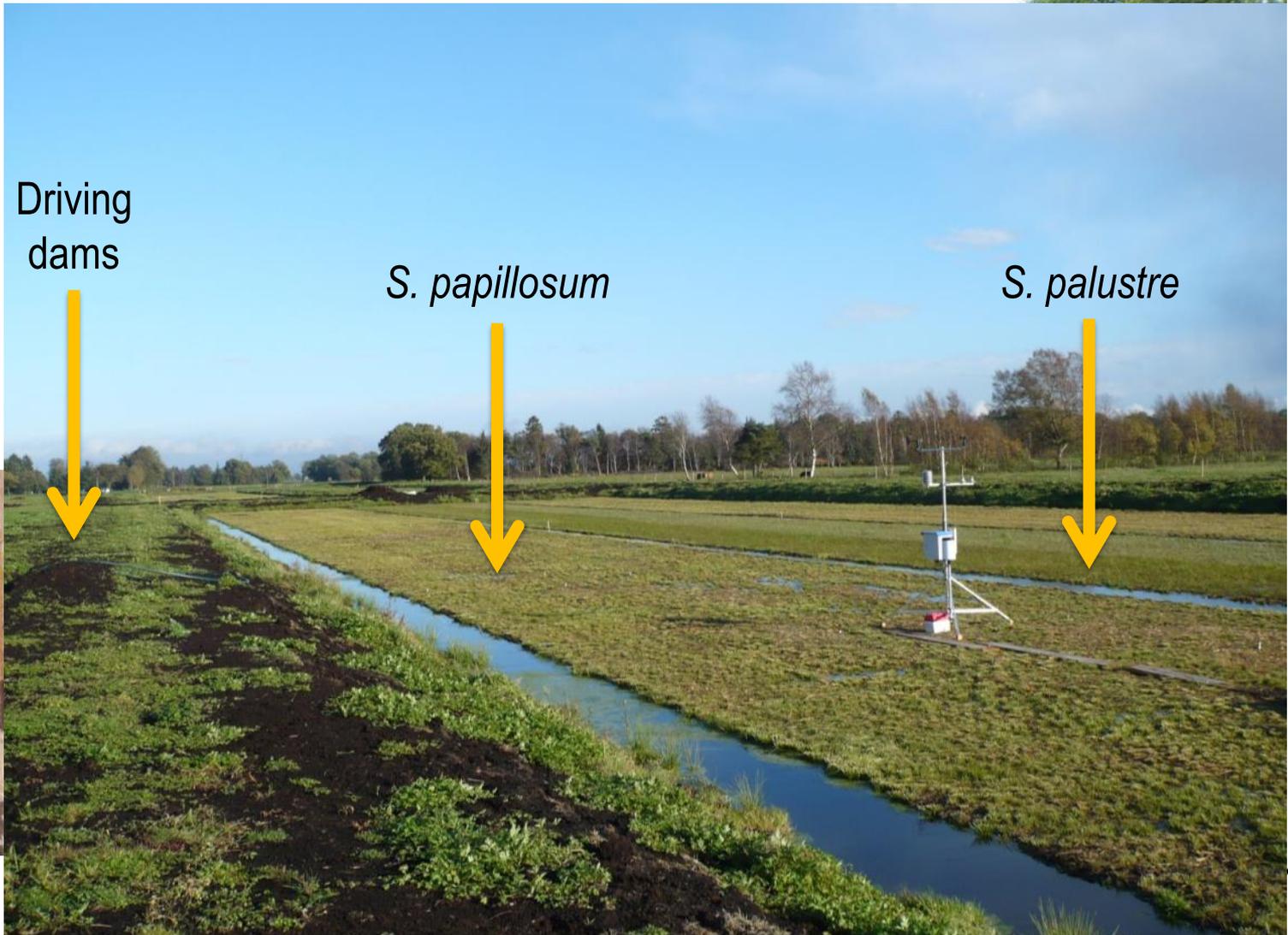
Erlenanbau kann die THG-Bilanz im Vergleich zu krautigen Nutzpflanzen verringern



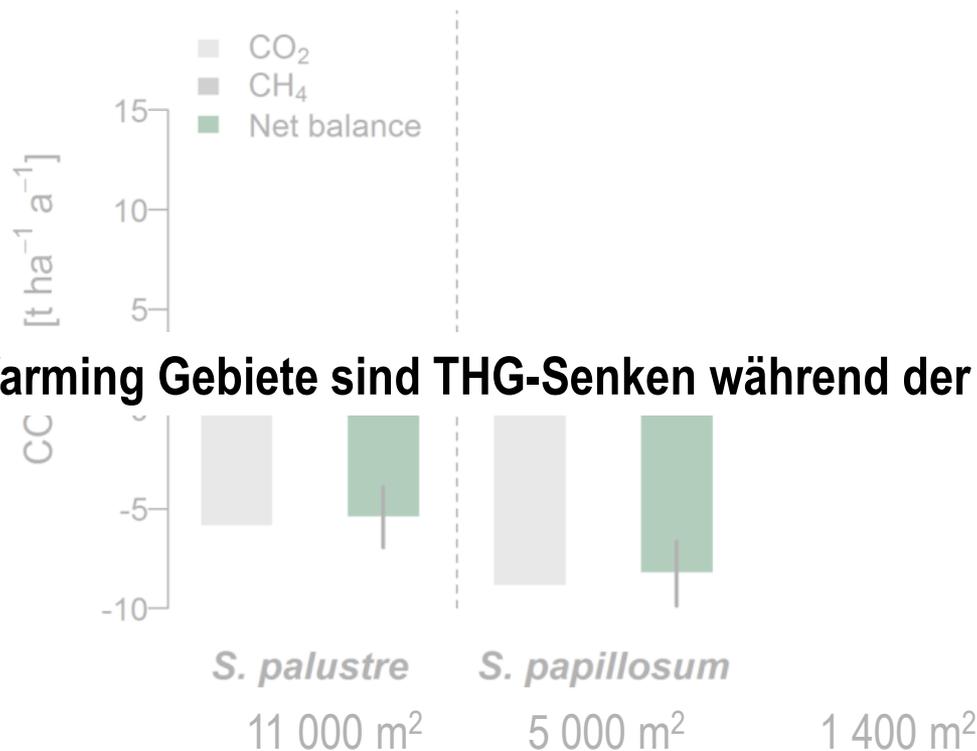
Driving
dams

S. papillosum

S. palustre

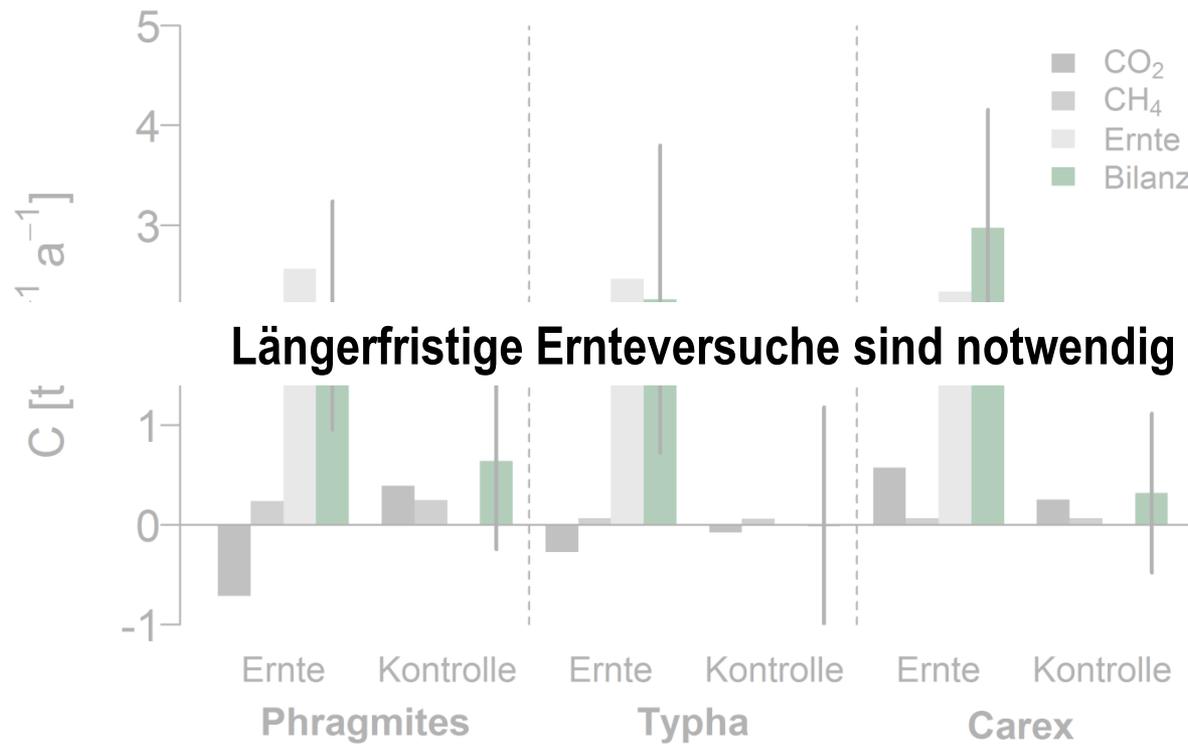


Feld-Emissionen einer jungen *Sphagnum* Kultur

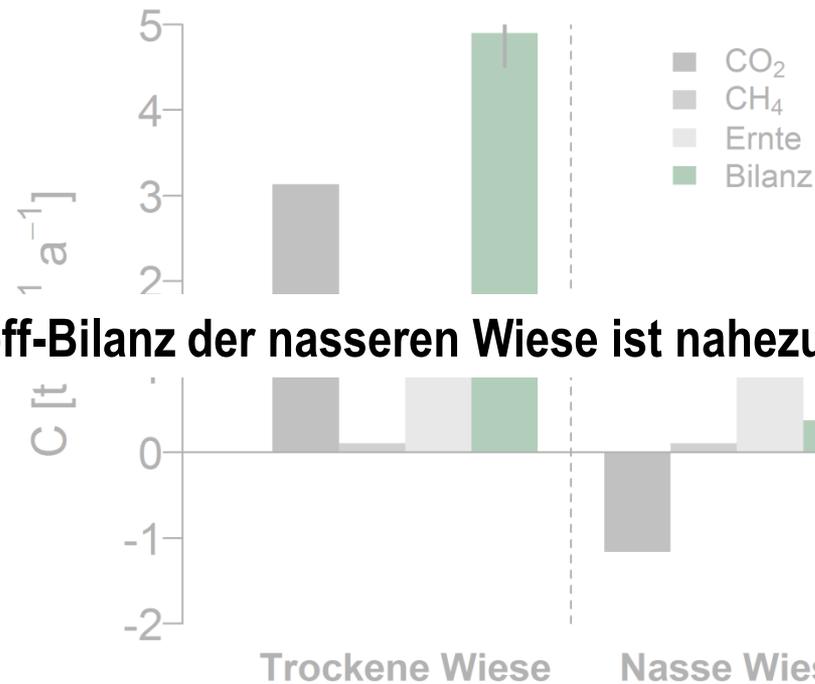


Sphagnum farming Gebiete sind THG-Senken während der Etablierungsphase

Ist die Nutzung torfschonend?

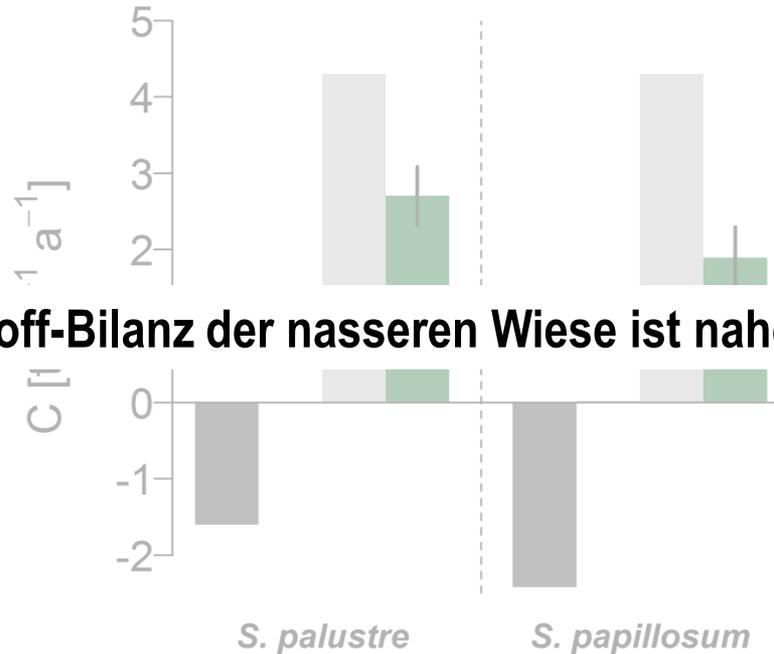


Ist die Nutzung torfschonend?



Die Kohlenstoff-Bilanz der nasseren Wiese ist nahezu ausgeglichen

Ist die Nutzung torfschonend?



Die Kohlenstoff-Bilanz der nasseren Wiese ist nahezu ausgeglichen

Zusammenfassung

Paludikultur hatte keine negativen Auswirkungen auf die Feld-Emissionen der untersuchten Systeme.

Die hohen Wasserstände scheinen große Kohlenstoff-Verluste effektiv zu verhindern.

Nächste Schritte:

- Analyse eines gesamten Produktionszyklus von *Sphagnum* farming und Erlenanbau
- Längerfristige und größermaßstäbige Feld-Experimente der Schilf-Paludikultur

→ Bewertung der Klimarelevanz von Paludikultur-Produkten (Life-cycle Analyse)

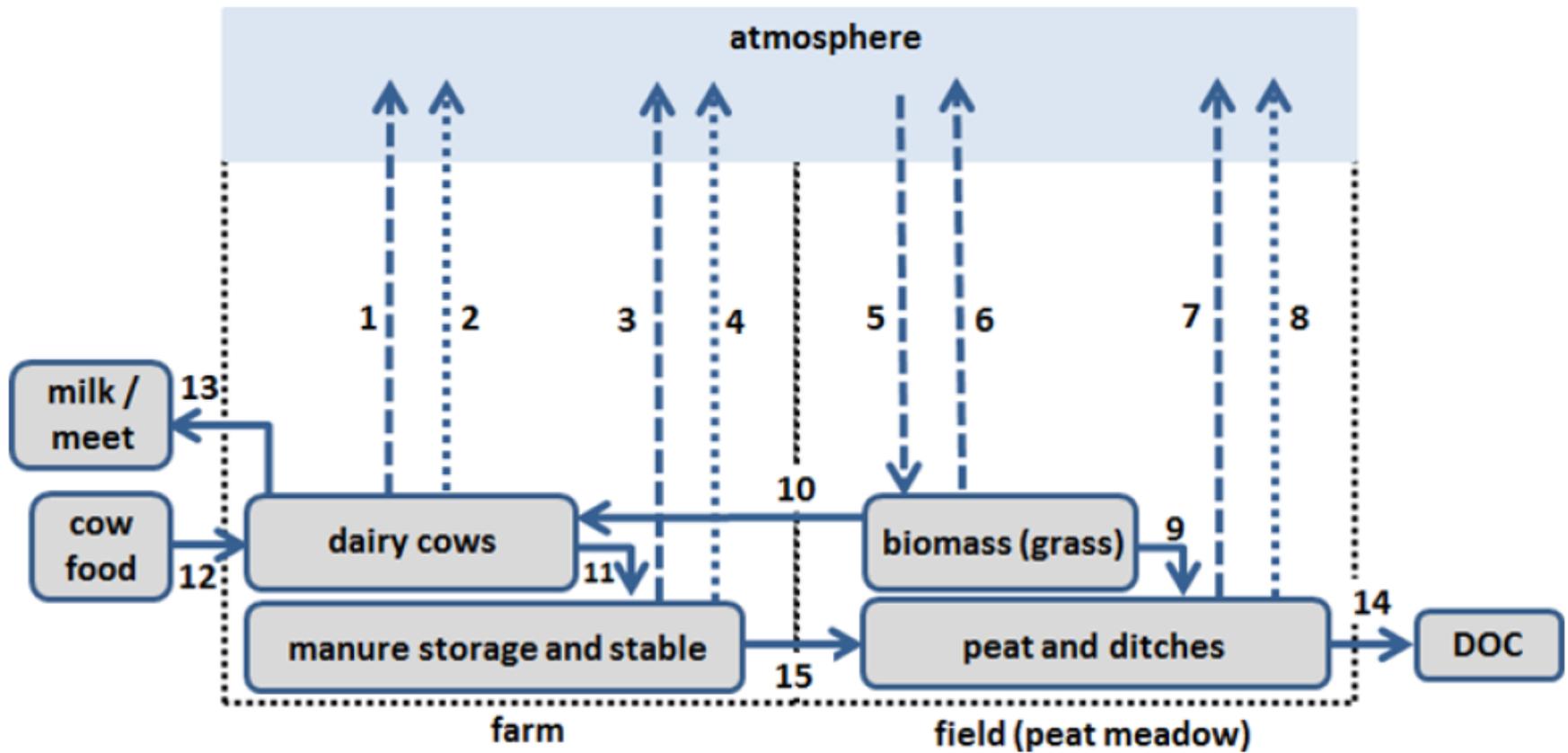
Thank you!

anke.guenther@uni-rostock.de



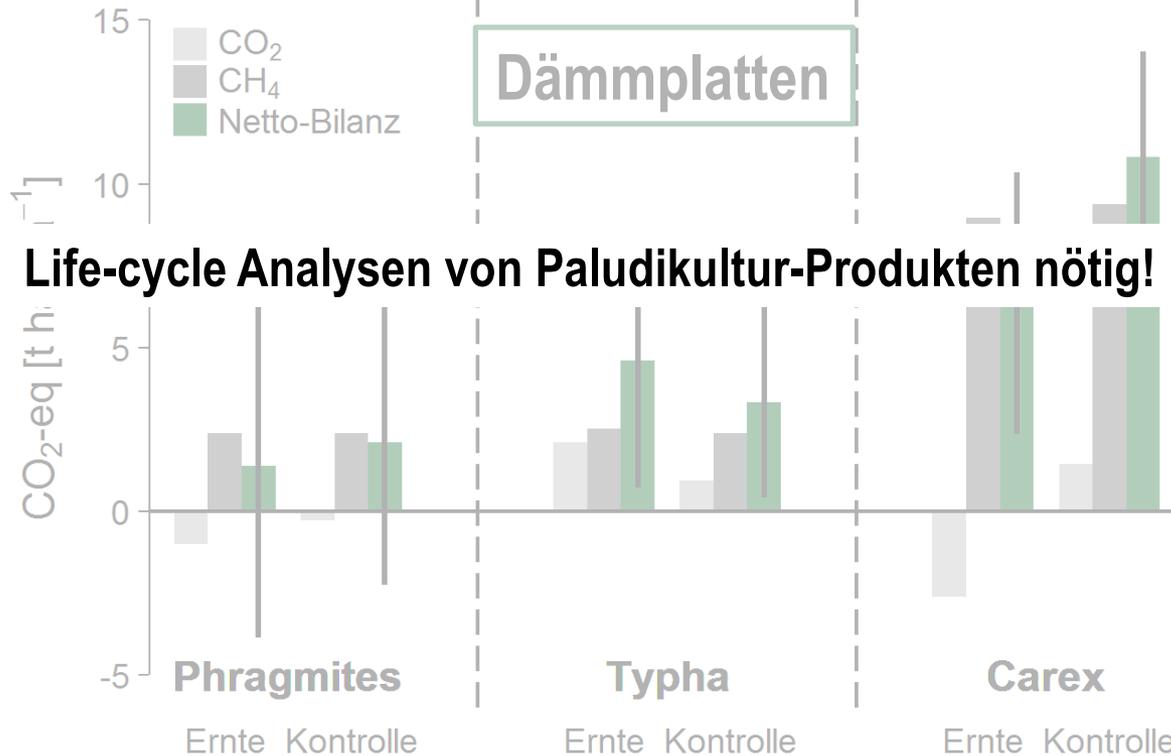
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- Günther A, Huth V, Jurasinski G, Glatzel S (2015) The effect of biomass harvesting on greenhouse gas emissions from a rewetted temperate fen. *Global Change Biology Bioenergy*, 7, 1092–1106.
- Günther A, Jurasinski G, Albrecht K, Gaudig G, Krebs M, Glatzel S (2017/2018) Greenhouse gas balance of an establishing *Sphagnum* culture on a former bog grassland in Germany. *Mires and Peat* 20 (2), 1–16.
- Hiraishi T, Krug T, Tanabe K, Srivastava N, Jamsranjav B, Fukuda M, Troxler T (2014) 2013 Supplement to the 2006 Guidelines for National Greenhouse Gas Inventories: Wetlands. Intergovernmental Panel on Climate Change (IPCC), Geneva, Switzerland.



Wie soll die

werden?



VIP: Untersuchungsregion

Moore a. d. Übersichtskartierung
des Landes Mecklenburg-Vorpommern

Legende

- Kreisfreie Städte
- Städte
- Kreisgrenzen
- Untersuchungsregion

Moorflächen nach

Zustand/ Entwässerungsgrad (Stand: 1998)

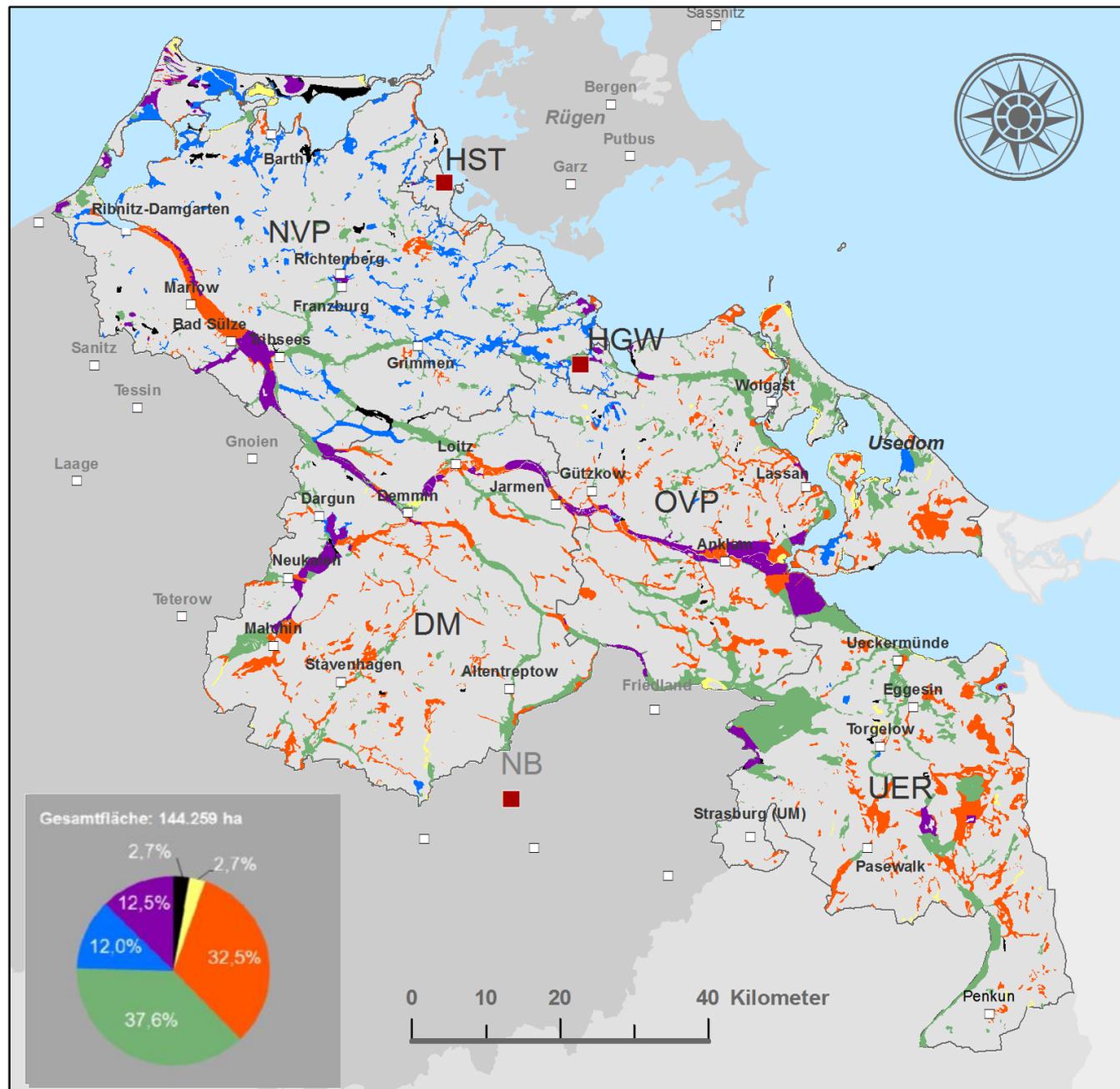
- unbekannt
- naturnah/ unentwässert
- mäßig entwässert
- stark entwässert
- extrem entwässert
- Moorschutz-/ Renaturierungsprojekte
(Stand: 10/ 2010)

Quellen:

1. LUNG-M-V (11/ 2010):
Moorübersichtskartierung, Moorschutzkonzept,
Moorschutzprojekte
2. Datenbestände des Geographischen
Instituts der Universität Greifswald
3. Topographie (Städte): Openstreetmap

Gebietsstand: 30.11.2010

Bearbeitung: Enrico Stahlkopf



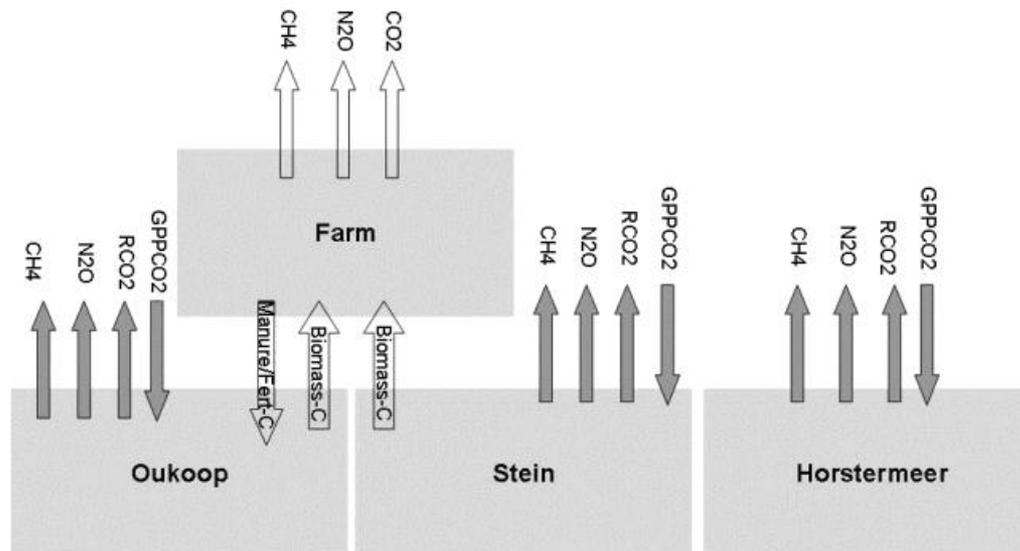


Figure 1. Ecosystem and farm-based GHG fluxes (CO_2 respiration (RCO_2), CO_2 gross primary production or photosynthesis (GPPCO_2), CH_4 and N_2O) and carbon fluxes ($\text{CO}_2\text{-C}$), $\text{CH}_4\text{-C}$, manure and fertilizer C, biomass C that are being considered in the current study for Oukoop, Stein and Horstermeer. White arrows are farm-related fluxes and dark-grey arrows are ecosystem fluxes.

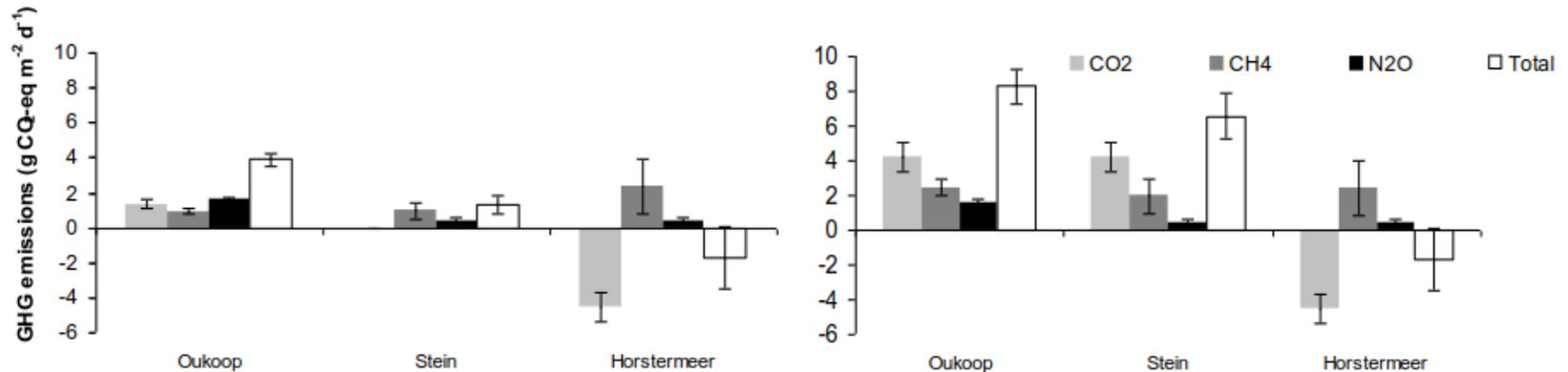


Figure 8. The GHG balances including CO₂, CH₄ and N₂O for the three sites: intensive (Oukoop), extensive (Stein) and restored (Horstermeer). The figure on the left represents ecosystem emissions, excluding farm-based CH₄ and CO₂ emissions, and on the right including farm-based CH₄ and CO₂ emissions, averaged over 2006, 2007 and 2008 (fluxes are given in warming potentials, g CO₂-eq m⁻² d⁻¹). All fluxes are given in g CO₂-eq m⁻² d⁻¹. The error bars for CO₂, CH₄ and N₂O represent the standard deviation of the mean for 3 years of measurements based on daily values.

Was passiert mit der geernteten Biomasse?



References

2 Four years of greenhouse gas flux measurements on a temperate fen soil used for cropland or grassland

ecosystem carbon balance (NECB), which was calculated by using equation 13 (Chapin et al. 2006). DOC was estimated to 26 kg C ha⁻¹a⁻¹ according to Moore (1987). Values of DIC, CO and VOC are assumed to be negligible and not considered.

$$\text{NECB} = -\text{NEE} + F_{\text{CO}} + F_{\text{CH}_4} + F_{\text{VOC}} + F_{\text{DOC}} + F_{\text{DIC}} + F_{\text{PC}}$$

equation 13

$$\text{NECB} = dC dt^{-1}$$

NEE = net ecosystem exchange (g CO₂-C m⁻² a⁻¹)

F_{CO} = net carbon monoxide absorption [or -efflux (negative sign)](g CO-C m⁻² a⁻¹)

F_{CH₄} = net methane consumption [or -efflux (negative sign)] (g CH₄-C m⁻² a⁻¹)

F_{VOC} = net volatile organic C absorption [or -efflux (negative sign)] (g VOC-C m⁻² a⁻¹)

F_{DOC} = net dissolved org. C input to the ecosystem [or net DOC leaching loss (neg. sign)] (g DOC-C m⁻² a⁻¹)

F_{DIC} = net dissolved inorganic C input [or net DIC leaching loss (neg. sign)] (g DIC-C m⁻² a⁻¹)

F_{PC} = net lateral transfer of particulate (nondissolved, nongaseous) C into the ecosystem [or out of (negative sign)], e.g. harvest (g PC-C m⁻² a⁻¹)

A widely-used technique to establish the climatic relevance of the greenhouse gas exchange at each site, expressed as CO₂-equivalents, is the global warming potential (GWP) methodology (equation 14) (Drösler 2005, IPCC 2007, Beetz et al. 2013). In general, the global warming

References

F_{VOC}	= net volatile organic C absorption [or -efflux (negative sign)] (g VOC-C m ⁻² a ⁻¹)
F_{DOC}	= net dissolved org. C input to the ecosystem [or net DOC leaching loss (neg. sign)] (g DOC-C m ⁻² a ⁻¹)
F_{DIC}	= net dissolved inorganic C input [or net DIC leaching loss (neg. sign)] (g DIC-C m ⁻² a ⁻¹)
F_{PC}	= net lateral transfer of particulate (nondissolved, nongaseous) C into the ecosystem [or out of (negative sign)], e.g. harvest (g PC-C m ⁻² a ⁻¹)

A widely-used technique to establish the climatic relevance of the greenhouse gas exchange at each site, expressed as CO₂-equivalents, is the global warming potential (GWP) methodology (equation 14) (Drösler 2005, IPCC 2007, Beetz et al. 2013). In general, the global warming potential over a time span of 100 years is taken (Drösler 2005). Positive values represent efflux of CO₂-equivalents into the atmosphere.

GWP balance [g CO₂-eq. m⁻²] = NEE · GWP_{CO₂} + F_{CH₄} · GWP_{CH₄} + F_{N₂O} · GWP_{N₂O} equation 14

GWP_{CO₂} = 1

GWP_{CH₄} = 72 (20 years), 25 (100 years), 7.6 (500 years)

GWP_{N₂O} = 289 (20 years), 298 (100 years), 153 (500 years)

2.2.6 Statistical analyses

Average values are arithmetic means +/- standard error.

Error analysis of CO₂ gas fluxes was conducted by calculating the standard error for each