



Greenhouse gas emissions from agriculturally managed organic soils

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Agriculturally managed organic soils



Wauwil (LU) © Swisstopo



Berner Seeland © G. Brändle, Agroscope



How sustainable is this management?



Flooding in the Berner Seeland
© G. Brändle, Agroscope



Cracking on an agriculturally managed organic soil (BE)



Driving machinery becomes problematic Rüthi (SG)



The substrate disappears (literally) into thin air
Witzwil (BE) © Agroscope



How sustainable is this management?



CHF 25,000 / ha to renew
drainage

(Béguin & Smola 2008, FOAG)

Total cost of CHF 425 000 000 to
renew drainage of organic soil
surfaces

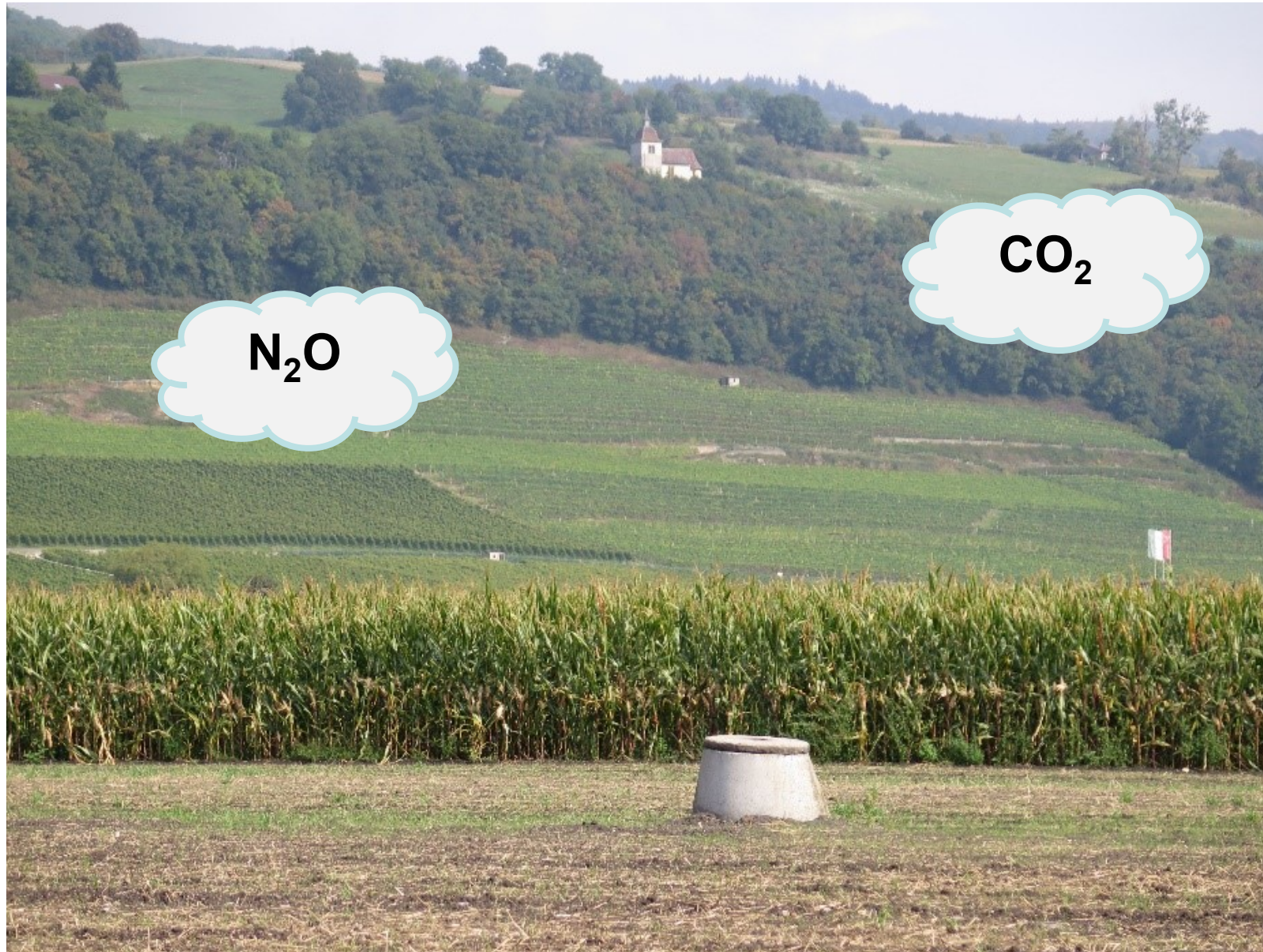
Assuming a lifespan of 50 years...

...the drainage of organic soils
costs CHF 500 / ha / year

Laying down drains in Gals (BE) in 1976. ETHZ-pics © Hans Krebs



How sustainable is this management?



Corn on organic soil
Cressier (NE)



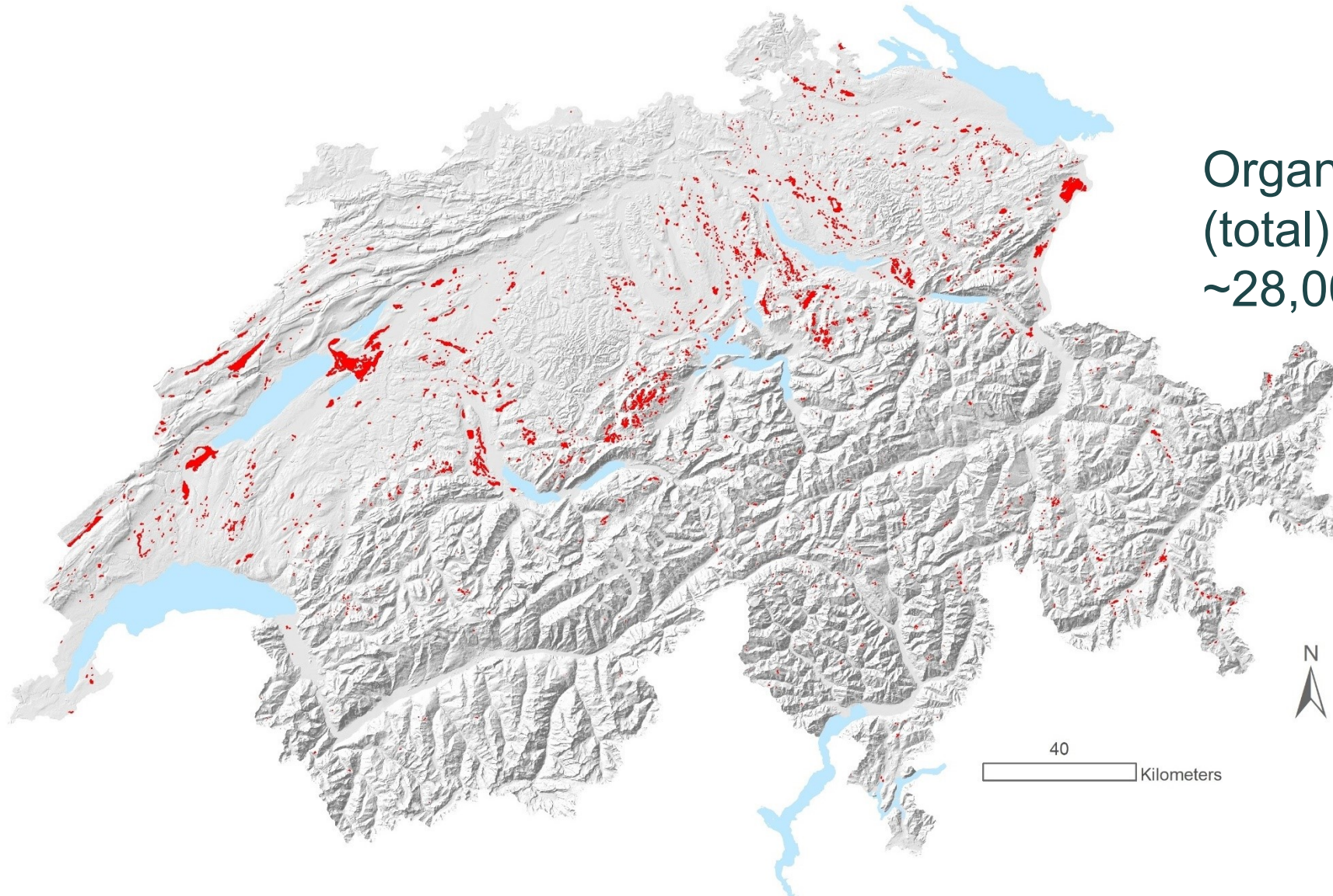
Greenhouse gas emissions

Emissions = EF (CO₂, N₂O, CH₄, dissolved organic C) x surface

= *ca.* 30 – 51 t CO₂-eq. / ha / year x surface



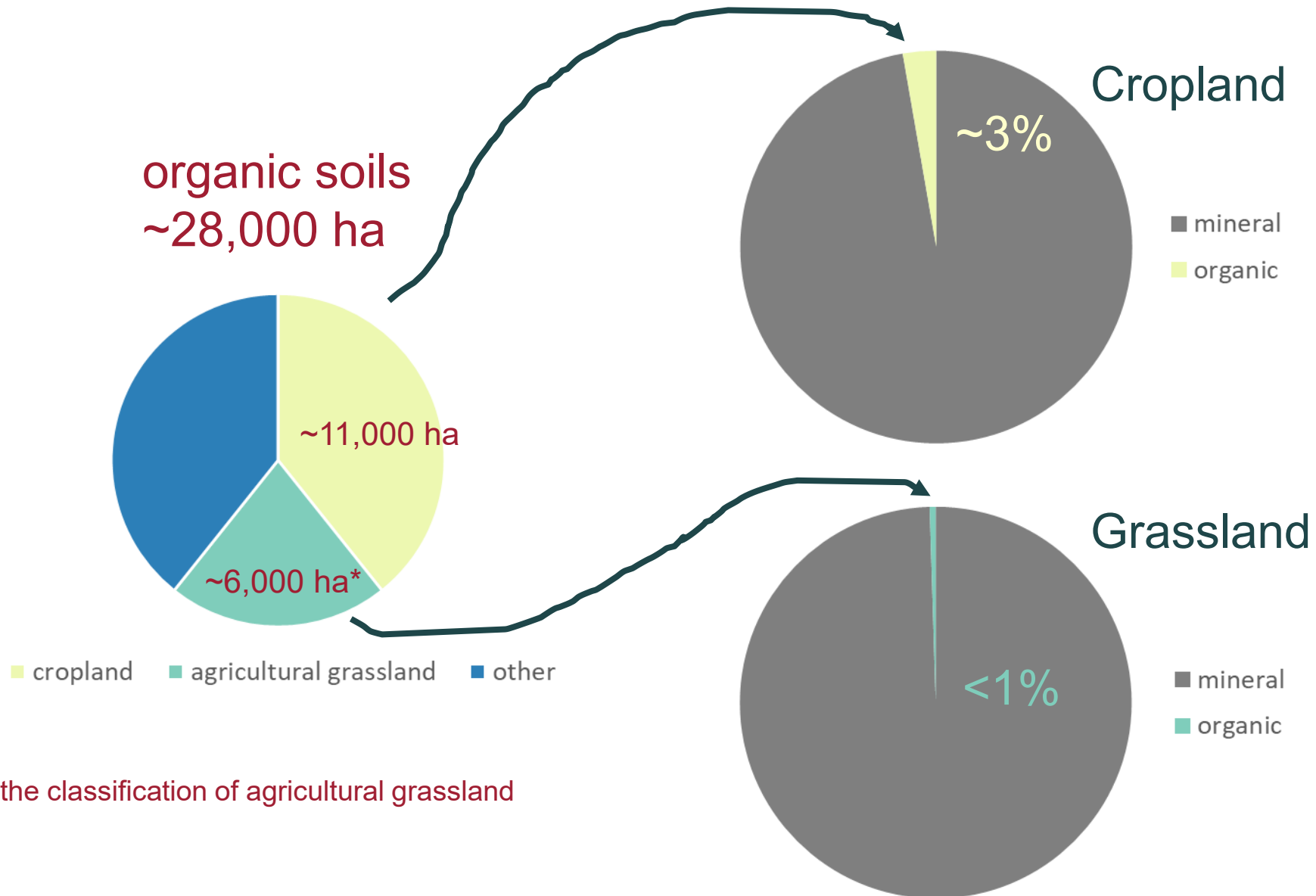
Greenhouse gas emissions



Organic soils
(total):
~28,000 ha



Greenhouse gas emissions



* Depends on the classification of agricultural grassland



Greenhouse gas emissions

Emissions = EF (CO₂, N₂O, CH₄, dissolved organic C) x surface

= *circa* 30 – 51 t CO₂-eq. / ha / year x surface

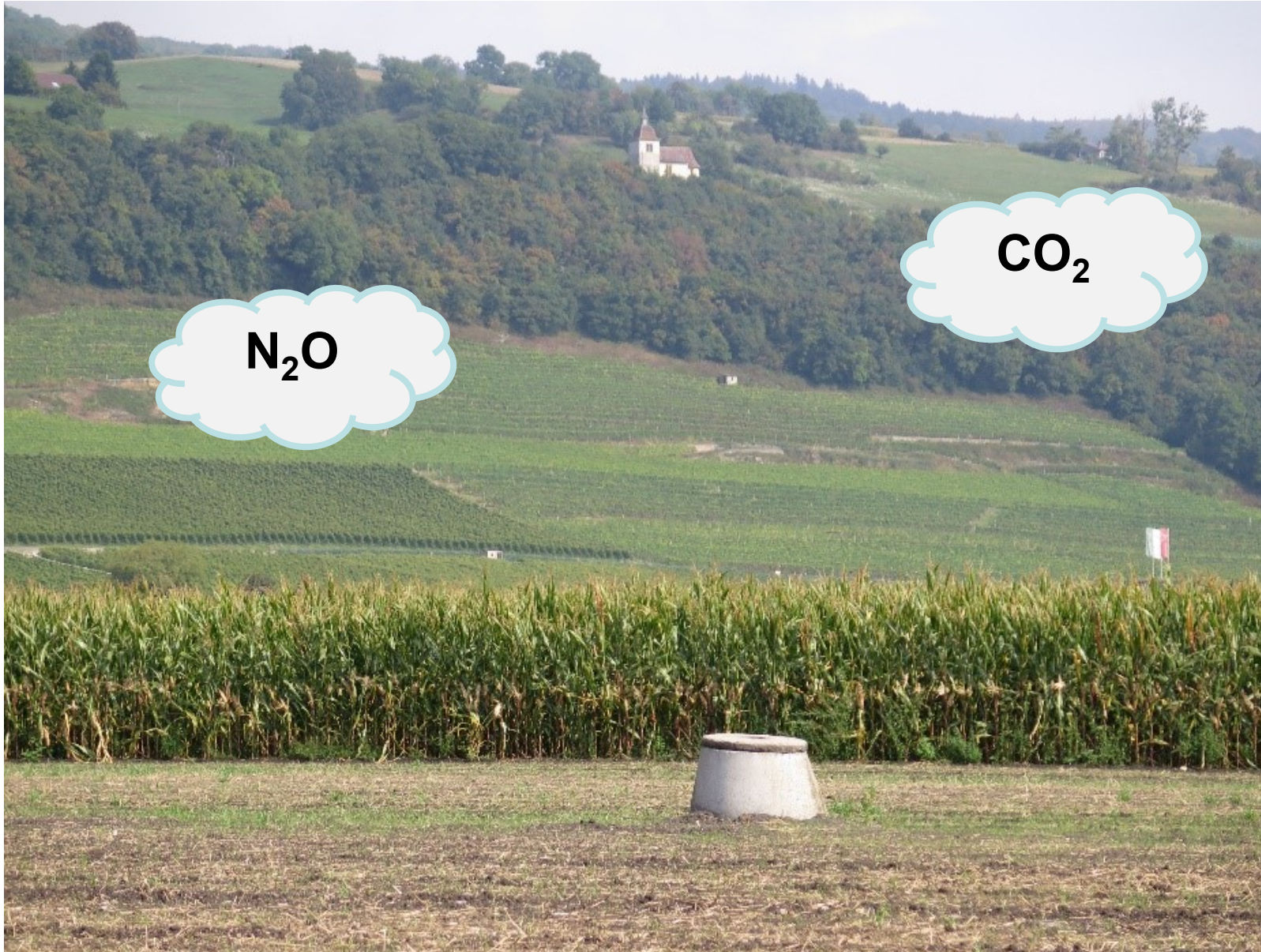
= annual emissions for agriculturally managed organic soils: *circa* 520,000 – 890,000 t CO₂-eq.

= equivalent to *circa* 8 – 15% of GHG emissions from agriculture sector

(Emission factors from BAFU 2020 and IPCC 2013; emission factors may vary depending on nutrient status and drainage depth assumed)



How can we improve the situation?



Corn on organic soil
Cressier (NE)

Options: Cover sanding?

- + Relatively cheap
- + Simple to apply
- + Eases cultivation and increases production

? Does it protect the organic soil from further decomposition?



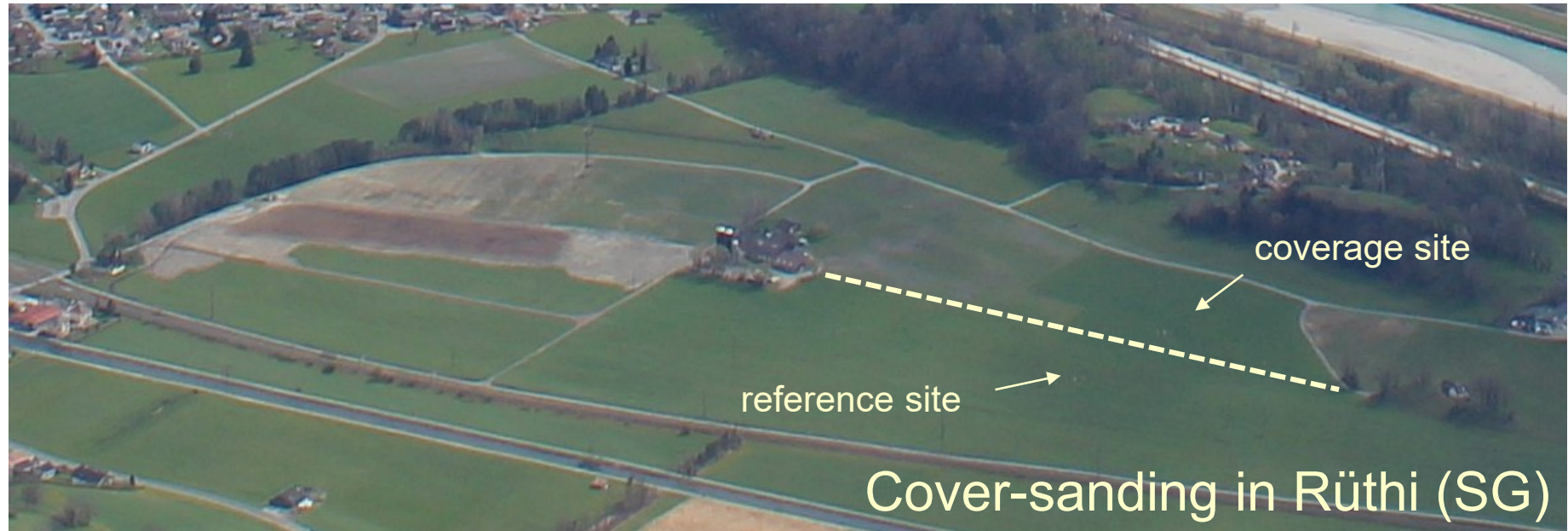
Cover-sanding in Rüthi (SG)



Options: Cover sanding?

Total annual N_2O emissions reduced significantly at the coverage site (by 90%)
(Wang, Paul, Jocher, Alewell & Leifeld; in prep.)

Preliminary results: the reduction in CO_2 emissions depends on the year, probably due to differences in summer rainfall
(Paul, Wang, Ammann, Jocher, Alewell & Leifeld; in prep.)





Options: Paludiculture?

- Management of wetlands for production (forest or agricultural)
- Aim: Preserve the organic matter in the soil whilst generating an income
- Reduction in GHG emissions not well known

Project Ökologischer Nassreis-Anbau (Agroscope)

Umwelt/Pflanzen
Agroscope Transfer | Nr. 238 / 2018

Reisanbau im Mittelland auf temporär gefluteter Fläche möglich

Ein ökonomisch und ökologisch interessantes Nischenprodukt

September 2018

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Abb. 1 | Reis in der Grenchner Witi kurz vor der Ernte Ende August 2017.

Mit dem Klimawandel sind Landwirte und Landwirtinnen mit erschwerten Produk- bezüglich eine vielversprechende Möglich- keit. Das Ertragspotenzial beträgt vier bis



Options: Paludiculture?

Minimise GHG emissions
whilst maximising
production

Main experiment: 2022 +





Options: Paludiculture?



Preliminary results:
Methane and N₂O emissions
from flooded plots higher than
from plots with a water table
depth of -20cm....

...but productivity here will
probably be higher...

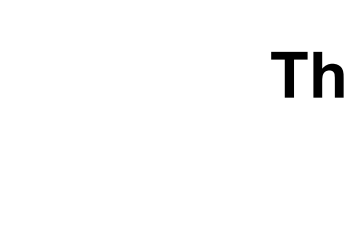
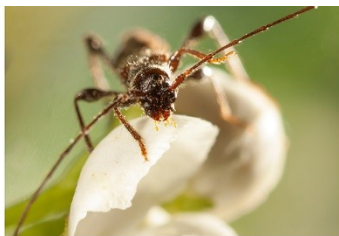
...and we haven't yet
measured CO₂ emissions.

Take-home messages

- Organic soils form a very small proportion of agricultural land...
- ...but these surfaces have very high GHG emissions
- They can be very productive but their management is unsustainable
- If we assume that agricultural land should remain productive, we have (only) a few alternative management options
- We need to know (much) more about the GHG emissions of these different management options



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Thank you for your attention

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