CAOS: Climate-smart Agriculture on Organic Soils

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What are peatlands?

→ plant material accumulated over millennia under water saturated conditions

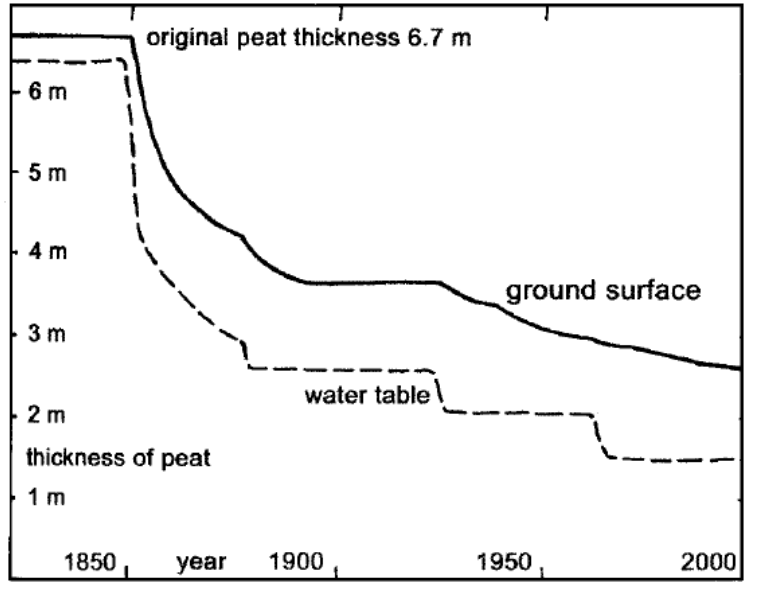
→ fed by rainwater only (bogs) or surface water, groundwater and rainwater (fens)

→ soil organic matter content: 30 to ≈100 %

→ Central and Northern Europe: drained for agriculture and forestry

What happens when peatlands are drained?

- Subsidence
  - loss of buoyancy → consolidation
  - mineralisation (= CO_2 emission)

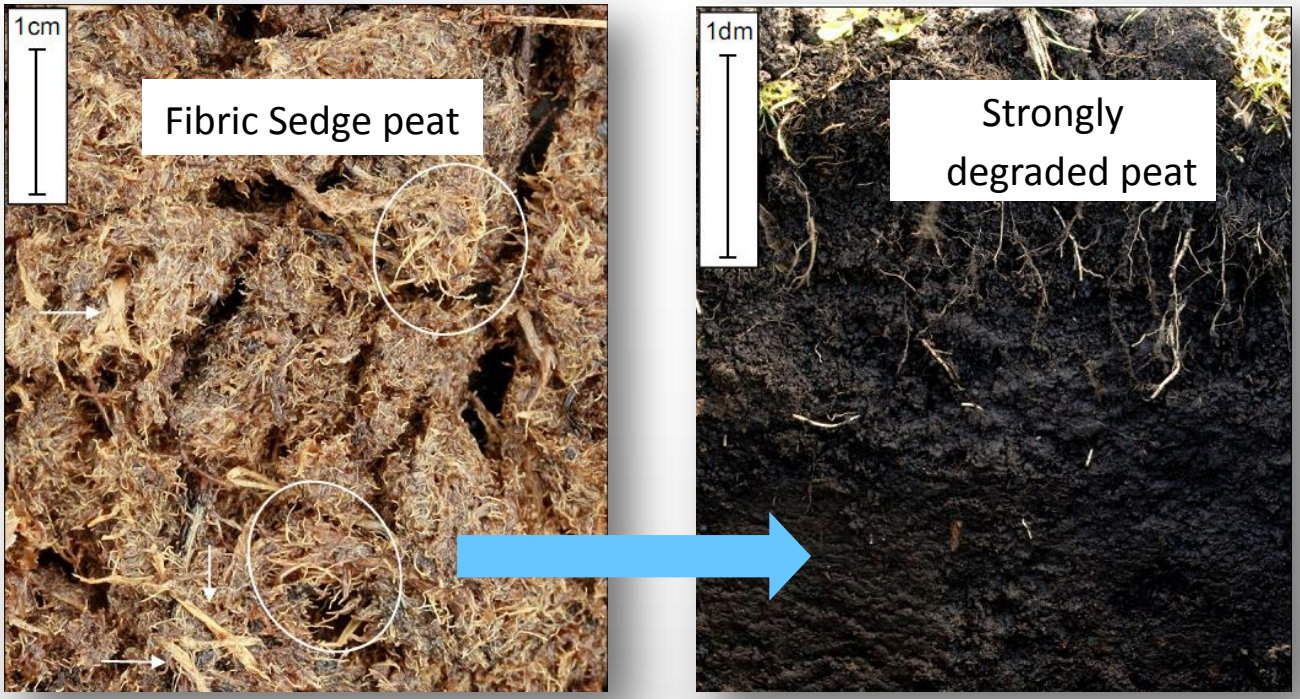


Holme fen (GB)

(Source: Waltham, 2000; Mercian Geologist; photo: wikipedia.org)

What happens when peatlands are drained?

- Subsidence and mineralisation
- Changes of the peat properties



(Source: www.mire-substrates.com)

What happens when peatlands are drained?

- Subsidence and mineralisation
- Changes of the peat properties
  - water repellence, reduced infiltration and ponding
  - changed pore size distribution
  - erosion

(*Photo: www.yppartnership.org.uk*)

What happens when peatlands are drained?

- Subsidence and mineralisation
- Changes of the peat properties
- Water quality problems
- Peat fires
- Loss of biodiversity

(*Photo: http://www.esa.int/esaKIDSen/SEMWOR9ATME_Earth_1.html*)

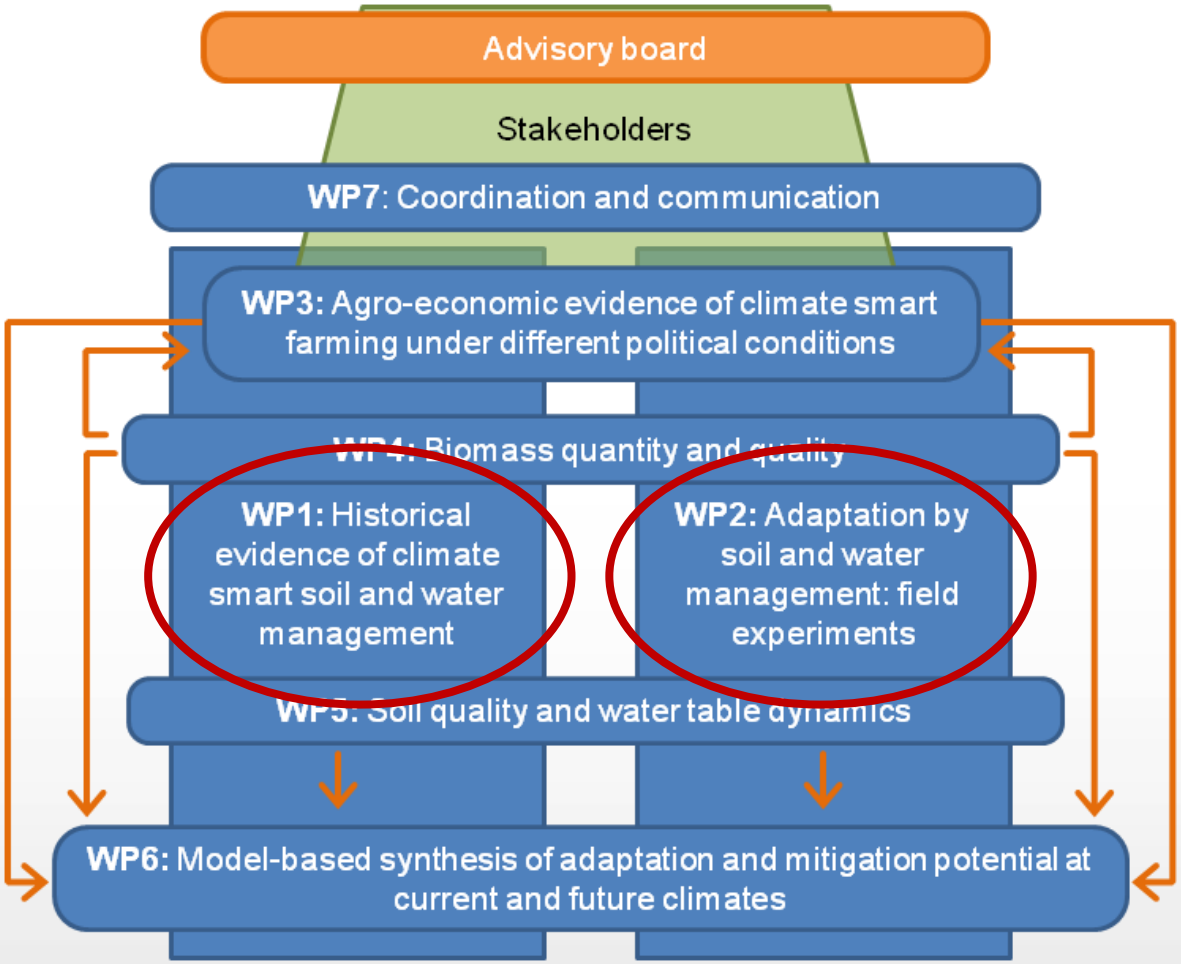
Why are peatlands important for the climate?

- drained peatland emit large amounts of CO_2 und N_2O
  - ca. 40% of the emissions from agriculture and LULUCF from ca. 8% of the area
  - 4.5 % of the German GHG-budget
  - approx. 45 Mio t CO_2-equivalents (NIR, 2010) ≈ all flights in Germany
- especially re-wetted peatlands may emit CH_4

Wet management systems – benefit from synergies

- Controlled drainage with active water management is a climate smart option for agricultural production on organic soils under current and future climatic conditions.
- Wet organic soils can be used as risk insurance in dry periods while reducing GHG emissions → adaptation!
- Wetness adapted crops with stable yields are needed.
- Proof by on farm-experiments and historical evidence of successful wet management systems is required.

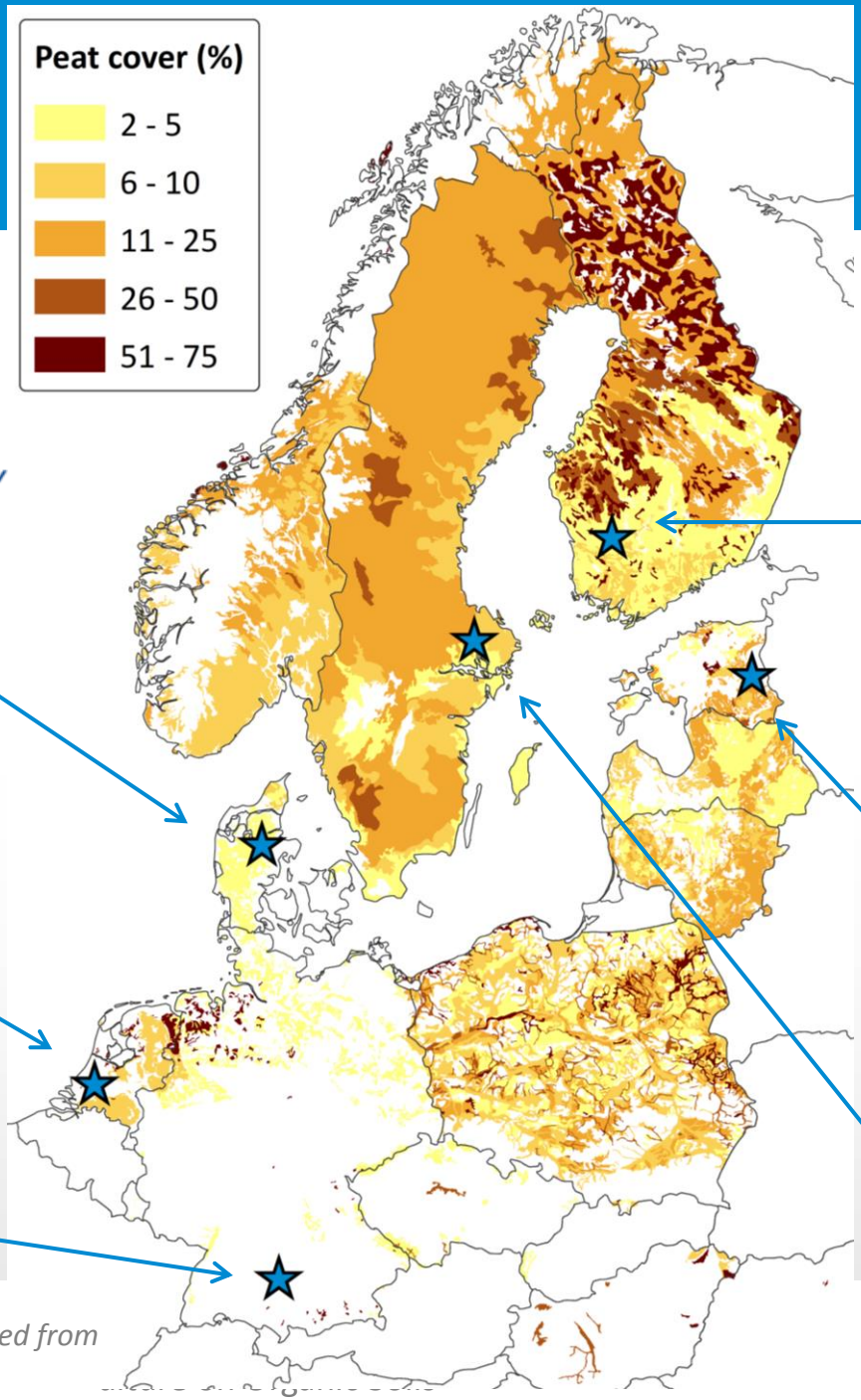
Project Structure



Field experiments

- Field experiments with soil and water management testing different techniques of controlled drainage and subirrigation
  - greenhouse gas measurements with manual closed chambers
  - detailed analysis of hydrology (WP5) , biomass (WP4) and soils (WP5)
  - trafficability (WP5)
  - hydrological and plant growth modelling (WP6)

Partners & Sites



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Keressaare

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Broddbo

(Background map: Peat cover in Europe, modified from Montanarella (2006), Mires & Peat 1)

THÜNEN

Controlled drainage and subirrigation: Experience from the Netherlands

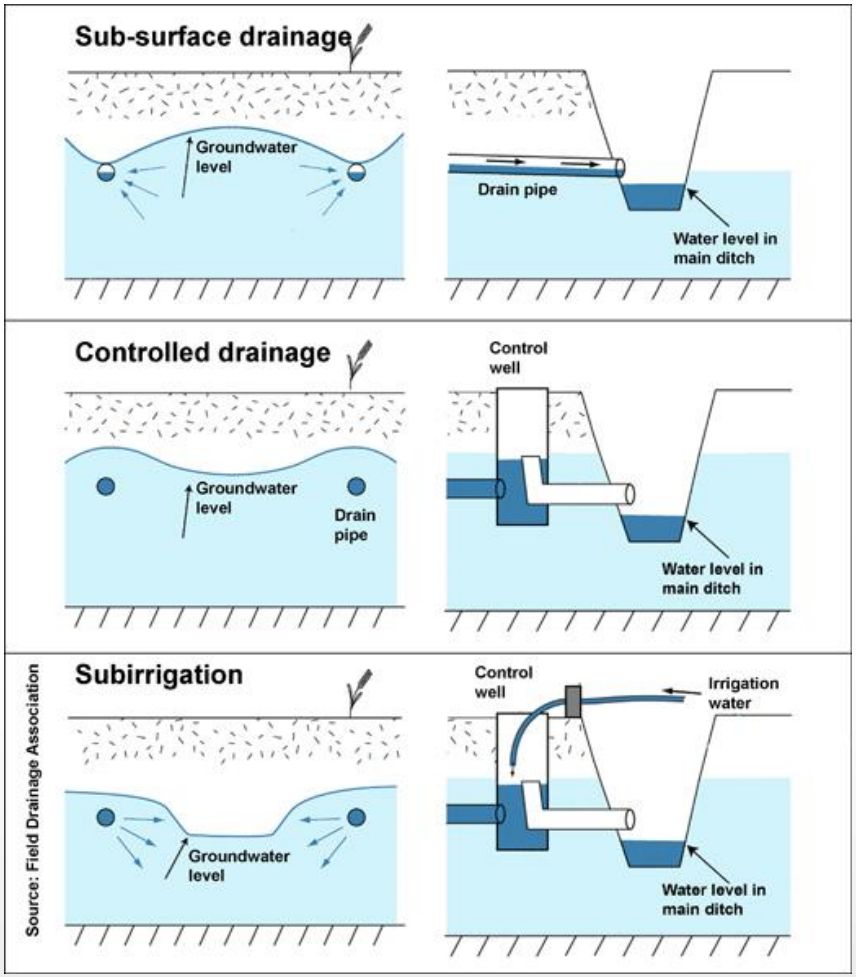


Figure: www.balticdeal.eu/measure/controlled-drainage

Photos: J. van den Akker (Alterra)

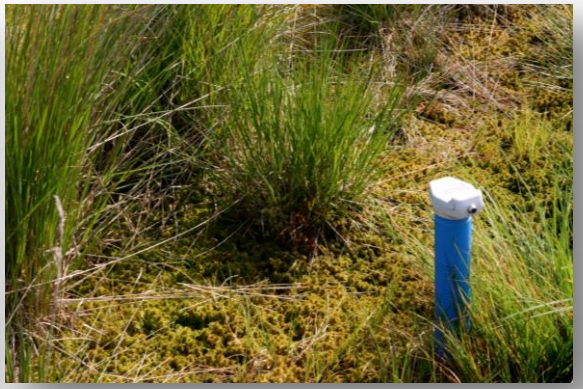
- Subsidence was reduced by around 50 %
- Improved trafficability and less trampling
- around the same yield

Historical evidence

- Farm surveys for long-term agro-economic data, management practices and future management options
- Soil quality and subsidence
- Groundwater table measurements

→ analysis and evaluation of past management strategies

→ development of future storylines



Biogeochemical & economic data analysis

- Political, agronomic and socio-economic analyses: identification of barriers and incentives for wet management
- Determination of quantity and quality analysis of the harvested biomass used for food, feed or energy purposes.
- Integration of process-based water dynamic and crop growth models, statistical models of greenhouse gas mitigation and water quality and economic models to synthesize results and to evaluate the adaptation potential under climate change scenarios.
- Bi-directional involvement of stakeholders and practitioners (interviews, stake-holder workshops) to facilitate knowledge exchange within and across countries.

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GEFÖRDERT VOM

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