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NATURAL RESOURCES
INSTITUTE FINLAND

Tehokkaat ohjauskeinot ilmasto- ja vesistöpäästöjen vähentämiseksi ojitetuilla turvemailla

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Luonnonvara- ja biotalouden tutkimus 21/2022

Maa- ja metsätalouden kannustinjärjestelmien ilmastovaikutukset

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Luonnonvara- ja biotalouden tutkimus 100/2023

Tehokkaat ohjauskeinot jatkuvapeitteisen metsänkasvatuksen edistämiseksi runsasravinteisilla turvemailla

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LUONNONVARAKESKUS

Luonnonvara- ja biotalouden tutkimus 76/2022

Tehokkaat ohjauskeinot maa- ja metsätalouden ilmastovaikutusten edistämiseksi

Heikki Lehtonen, Aino Assmuth, Kauko Koikkalainen, Antti Miettinen, Antti Mutanen, Raisa Mäkipää, Mika Nieminen, Janne Rämö, Antti Wall, Henrik Wejberg ja Esa-Jussi Viitala

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LUONNONVARAKESKUS

yle Uutiset Areena Urheilu Valikko

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Metsät

Kuusivaltaisten, rehevien soiden avohakkuista luopumalla saataisiin leikattua hiilidioksidipäästöjä merkittävästi

Luonnonvarakeskuksen selvityksen mukaan hakkuumääriä ei tarvitsisi kuitenkaan pienentää, vaan ne kohdennettaisiin toisin.

Nykytila ja haasteet

- 5 Mha turvemaista on ojitettu, niistä 90 % puuntuotantoa varten.
- Lähes kaikki Etelä-Suomen rehevät turvemaat (korvet) on ojitettu.
- On arvioitu, että noin 1 Mha ojitetuista turvemaista ei sovellu puuntuotantoon
    - passiivinen ennallistaminen (ennallistumaan jättäminen)
- Suurimmalla osalla paksuturpeisista turvemaista on merkittäviä ravinnepuutoksia tai ravinne-epätasapainoja (K, P, B)
    - tarvitaan toistuvia lannoituksia 10-30/40 vuoden välein
    - lisäongelma: tärkeitä niukkoja ravinteita katoaa puunkorjuussa
- Uusi tutkimustieto
    - Haitalliset päästöt vesiin ojitetuilta turvemailta ovat huomattavasti suurempia ja kestävät kauemmin kuin on aikaisemmin tiedetty.
    - CO_2 (ja N_2O) päästöt turvemaiden maaperästä voivat olla erittäin suuria avohakkuiden (ja niitä seuraavien kunnostusojitusten) jälkeen.
- Lähes 25 % puuvaroista, puuston kasvusta ja suurimmasta ylläpidettävästä hakkuusuunnitteesta sijaitsee turvemailla, erityisesti Pohjois- ja Länsi-Suomessa.

Ecosystem CO_2 balance in drained peatland forests

source

sink

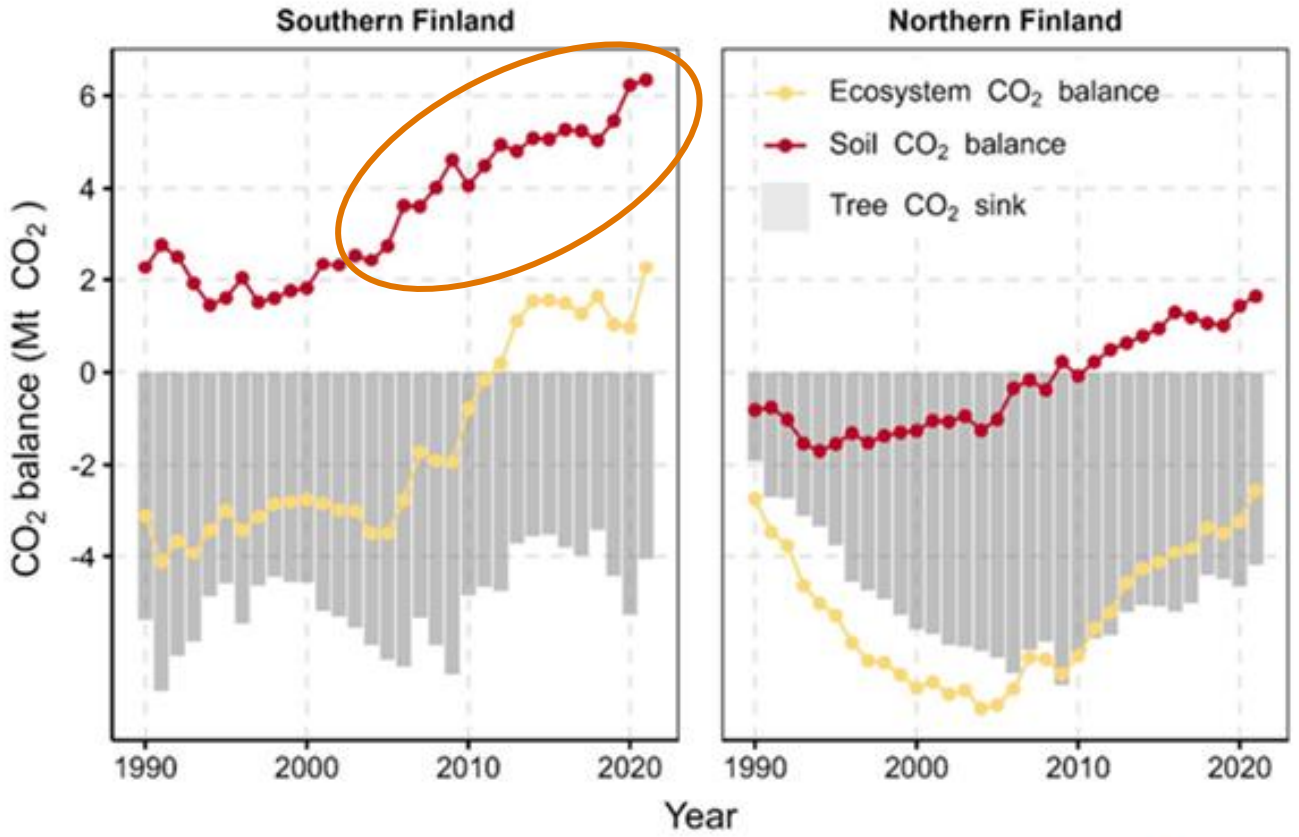
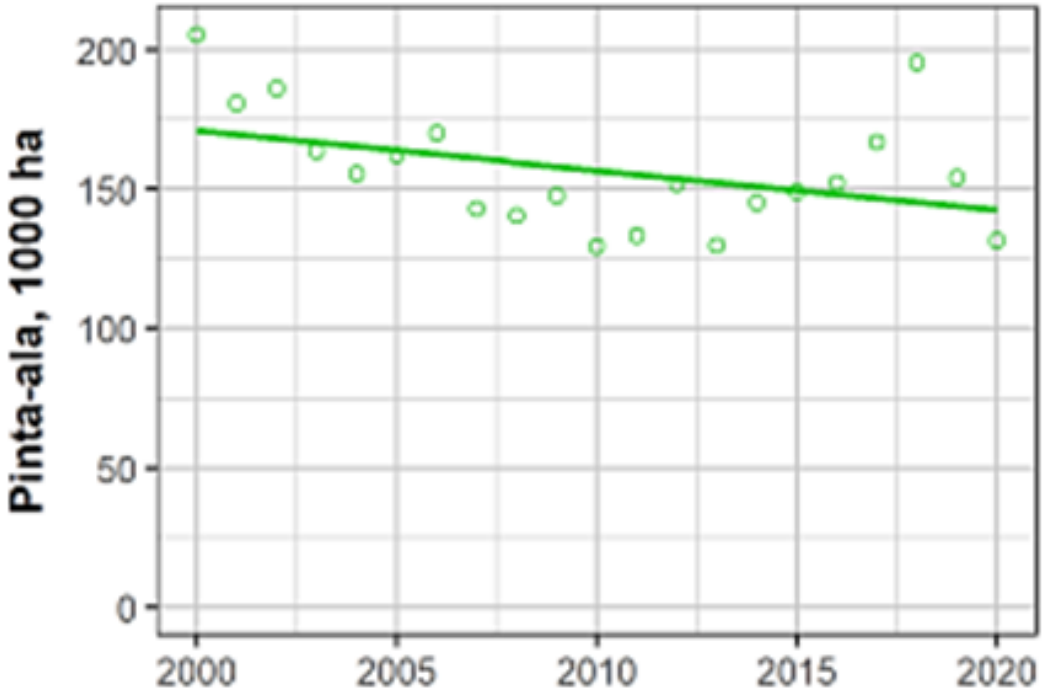
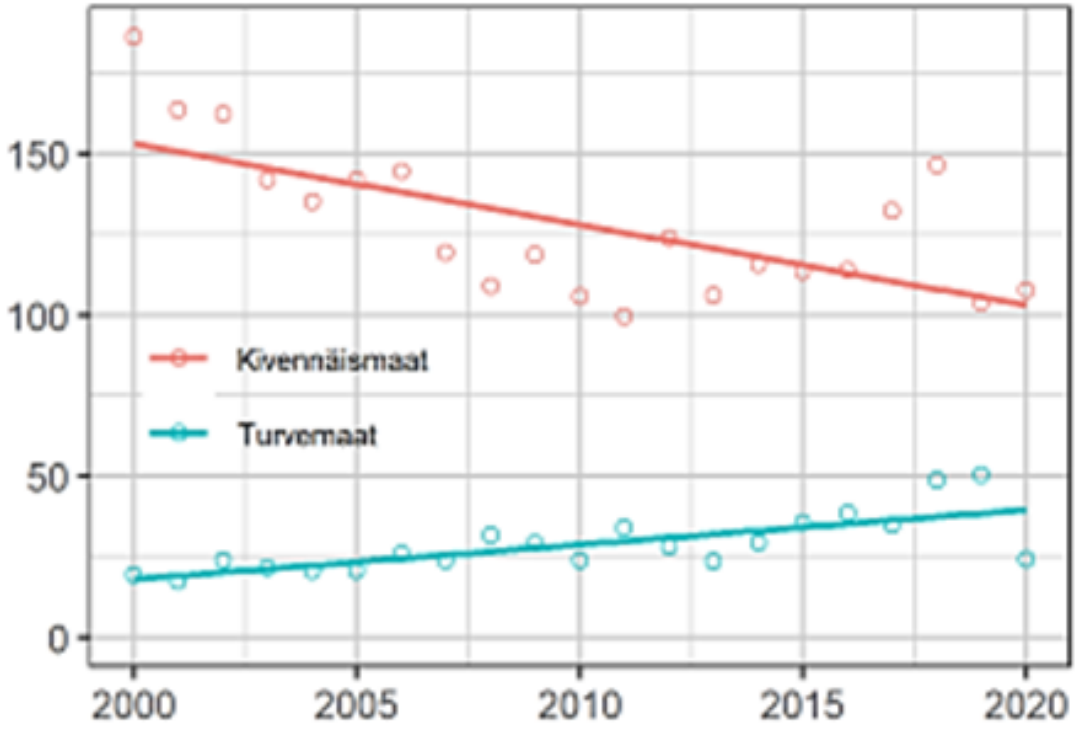


Figure 9. Changes in tree CO_2 sink (grey bars), soil CO_2 balance (red line) and whole ecosystem CO_2 balance (yellow line) (Mt CO_2 yr^{-1}) in drained peatland forests in southern and northern Finland across the GHG inventory reporting period (see Fig. 1 for the two regions). Note that no other GHGs than CO_2 is included in the calculated balances.

Alm et al. (2022)

Uudistushakkuiden (avohakkuiden) määrä turvemailla lisääntyy





Study questions

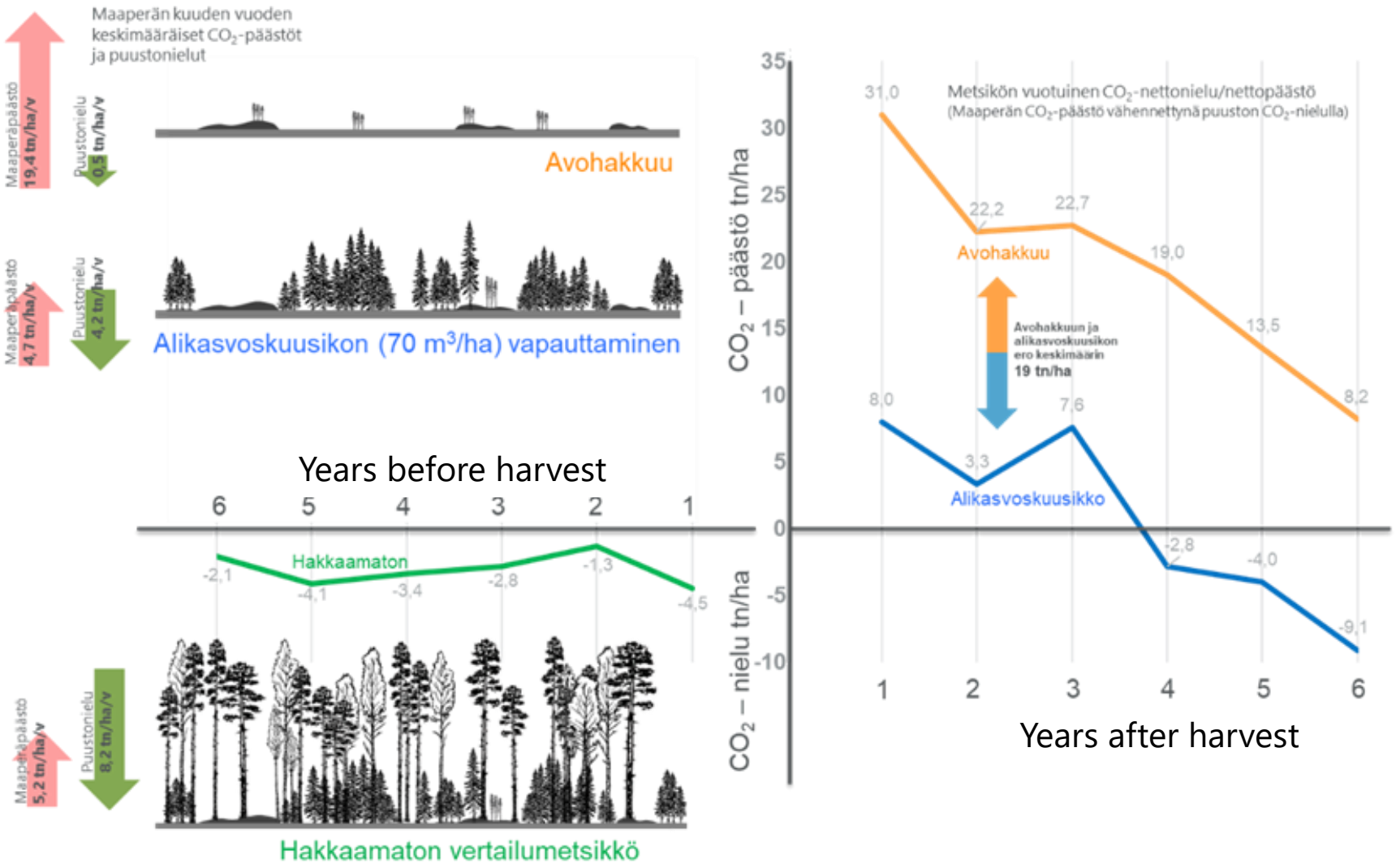
1) **How much emissions (water and GHG) could be reduced** if landowners adopted an alternative management regime instead of clearcuts (and DNM) on herb-rich peatlands?
2) If the emission reduction potential is significant, **what actions could be taken and incentives developed** to encourage NIPF owners to shift their forest management regime?
3) What would be the **effect of this shift on e.g. timber growth and timber supply**? [*MELA calculations*]
4) **Are NIPF owners willing to participate in new type of subsidy schemes** that are based on payments for ecosystem benefits? What is sufficient level of payment for different owner groups? [*Landowner survey, including choice experiment*]

Clearcut vs CCF: CO_2 balance, 6-year field measurements

Clearcut (harvest 270 m3/ha)

CCF (harvest 200 m3/ha)

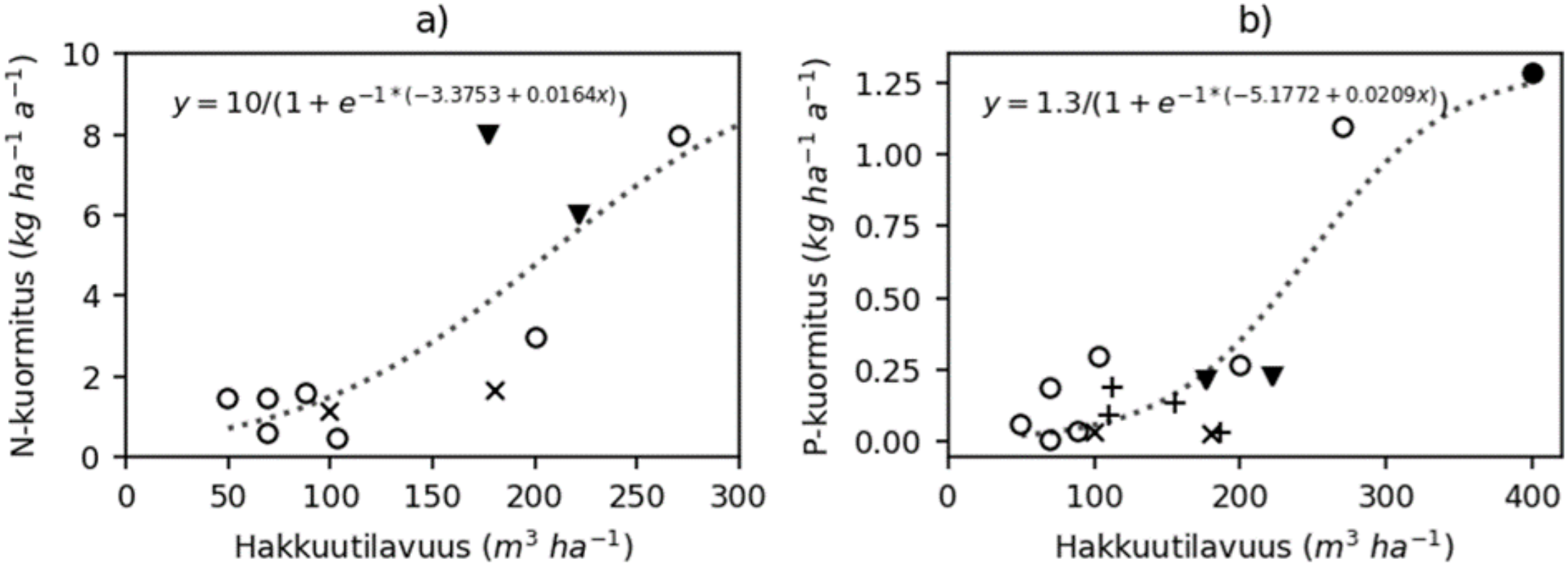
Control (no harvests)



CO_2-emissions after clearcut (8 yr period)

Years from clearcut	CO_2-emission, t/ha (Korkiakoski et al. 2023)	Clearcut area, ha/yr	Clearcut emissions, CO_2-t
1	31	50 000	1 550 000
2	22	50 000	1 100 000
3	23	50 000	1 150 000
4	19	50 000	950 000
5	14	50 000	700 000
6	8	50 000	400 000
7	5	50 000	260 005
8	1	50 000	55 720
Total CO2-emissions (50 000 ha)			6 165 725

N- ja P-päästöt vesiin hakkuun jälkeen



Study question #2. If the emission reduction potential is significant, what actions could be taken to make landowners shift their forest management regime to CCF?

- 14 different measures were developed with stakeholders
  - Soft and hard
- 3 new type of state aid schemes were developed and introduced to the stakeholders:

1) State aid to a **specific CCF plan** in peatland forestry (DNM is not allowed except for special cases)
2) State aid to **CCF transition** in cases where this transition is not profitable for the landowner but is considered a viable option on the site in a longer term
   - Payment for lost income and/or additional costs
3) State aid to the landowners for the **environmental benefits** (**reduction of environmental harm)** that are achieved by changing the management regime from RF (clearcuts) to CCF in mature peatland forests.
   - EU state aid rules have allowed this type of environmental payments in forestry 1.1.2023 ->

Environmental benefit of reducing water emissions (CCF vs RF)

- Initial spruce stand 270 m3/ha
  - **Option A**: clearcut
  - **Option B**: three similar sites, CCF harvest 90 m3/ha in each
- Emissions: years 1-6 after harvests
- Emission unit prices based on literature (nutrient and sediment damage value):
  - Ne (N&P): 8,3 €/kg
  - SS: 2,13 €/kg (alternative 4,1 €/kg)
- Conservative estimate for the benefit (avoided environmental harm):
  - 1 159 €/ha

Emission	Interest rate 2 %, €/ha	Interest rate 3 %, €/ha	Interest rate 4 %, €/ha
Ne (N&P)	384	371	359
SS	804 (1 548)	788 (1 517)	773 (1 488)
Total, €/ha	1 188 (1 932)	1 159 (1 888)	1 132 (1 847)

Environmental benefit of reducing CO_2 emissions (CCF vs RF)

- Initial spruce stand 270 m3/ha
  - **Option A**: clearcut
  - **Option B**: three similar sites, CCF harvest 90 m3/ha in each
- Emissions: years 1-8 after harvests
- Emission unit prices
  - 2013-2022: 22 €/tCO2
  - 2018-2022: 37 €/tCO2
  - 2022: 81 €/tCO2
- Conservative estimate for the environmental benefit (avoided environmental harm):
  - 4 200 €/ha
- **Aggregate estimate (env. benefit: water & CO2)**
  - **5 359 €/ha**

Emission price, €/tCO2	Environmental benefit with interest rate 3 %
21	2 437 €ha
37	4 200 €/ha
81	9 132 €/ha

Landowner's economy (€/ha)

Management option	Timber income (immediate)	State aid to reduce emissions	Total
Clearcut	13 078	0	13 078
CCF	3 729	1 160 (water) 4 200 (CO_2)	9 089

Note:

- Calculation is only for 8 years. It should be extended to include regeneration, DNM and others costs; and differences in timber capital and future harvest cycles.
- Need for more reliable and flexible CCF models for regeneration, ingrowth etc. in peatland forestry.

Cost-effectiveness of a new type of state aid scheme (payments for environmental benefits)

- National forest inventory: 131 000 ha mature peatland forests with thick-layer peat on herb-rich sites (private nonindustrial forests)
- Assuming that this area is harvested during the next 10 years at a constant pace, the amount of potential regeneration harvests would be 13 100 ha/yr.
- If CCF was applied on all sites instead of RF and landowners would receive payments based on avoided environmental harm, this would require state aid 47 M€ per year.
- **CO_2 emissions would decrease 1 MtCO_2 per year, implying that the cost of emission reductions would be 47 €/tCO_2.**
- The corresponding figure in the ESR (Effort Sharing Regulation) sector is significantly over 100 €/tCO_2

Conclusions

- A new state aid scheme for peatland forestry entered into force 1.1.2024.
- Digging of ditches (DNM & new) is not supported directly. Instead, state grants financial support for "**comprehensive planning**" of peatland forest management (incl. DNM) and associated water protection measures.
- How much this will actually change practices in private peatland forestry remains to be seen.
- **From Finland's climate commitments perspective it is quite clear that new measures and financial incentives are needed to decrease soil emissions in peatland forestry.**
- **Same applies to water emissions**
- **Paying landowners for emission reductions through well-targeted schemes (for example on mature herb-rich sites) represents a new opportunity that merits careful consideration and piloting.**

Kiitos!