



Emission factors of CO₂ in forest and agriculture lands

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Internation conference:

Climate change mitigation in organic soils in agricultural and forest lands

13th June, 2024

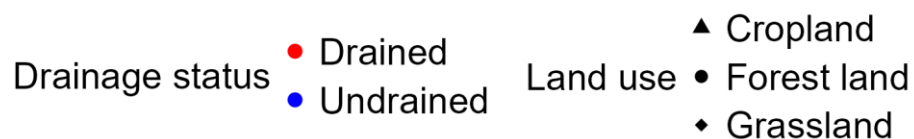
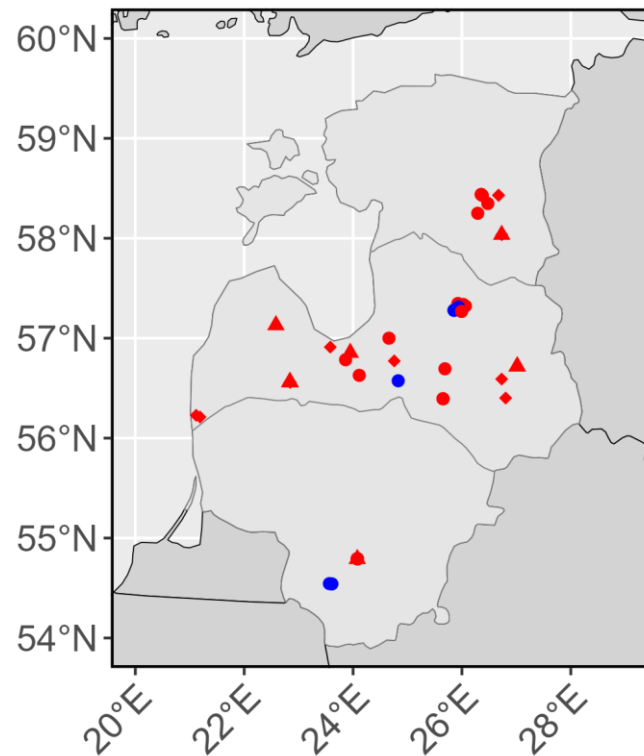
EU LIFE Programme project

“Demonstration of climate change mitigation potential of nutrients rich organic soils in Baltic States and Finland”

LIFE OrgBalt, LIFE18 CCM/LV/001158



Study sites

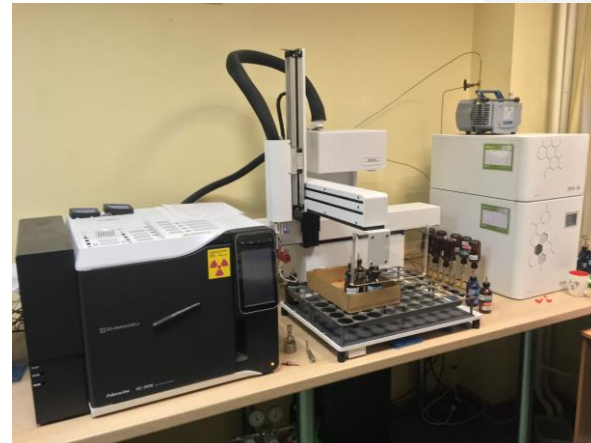


	Forest land		Grassland	Cropland
Drainage status	Undrained	Drained	Drained	Drained
Count, n	7	19	12	8
Organic layer, cm	170±49	81±47	46±25	43±19
Mean WTL, cm	12±4	60±25	51±25	78±36
Dominant tree specie, crop or management	Black alder Silver birch Norway spruce	Black alder Silver birch Norway spruce Scots pine	Perennial grass	Wheat Rapeseed Maize Beans

*Uncertainty expressed as a standard deviation

Carbon balance monitoring period: 24 months

Empirical data acquired



C input to soil:

- Foliar fine litter;
- Ground vegetation (aboveground and belowground);
- Fine roots of trees

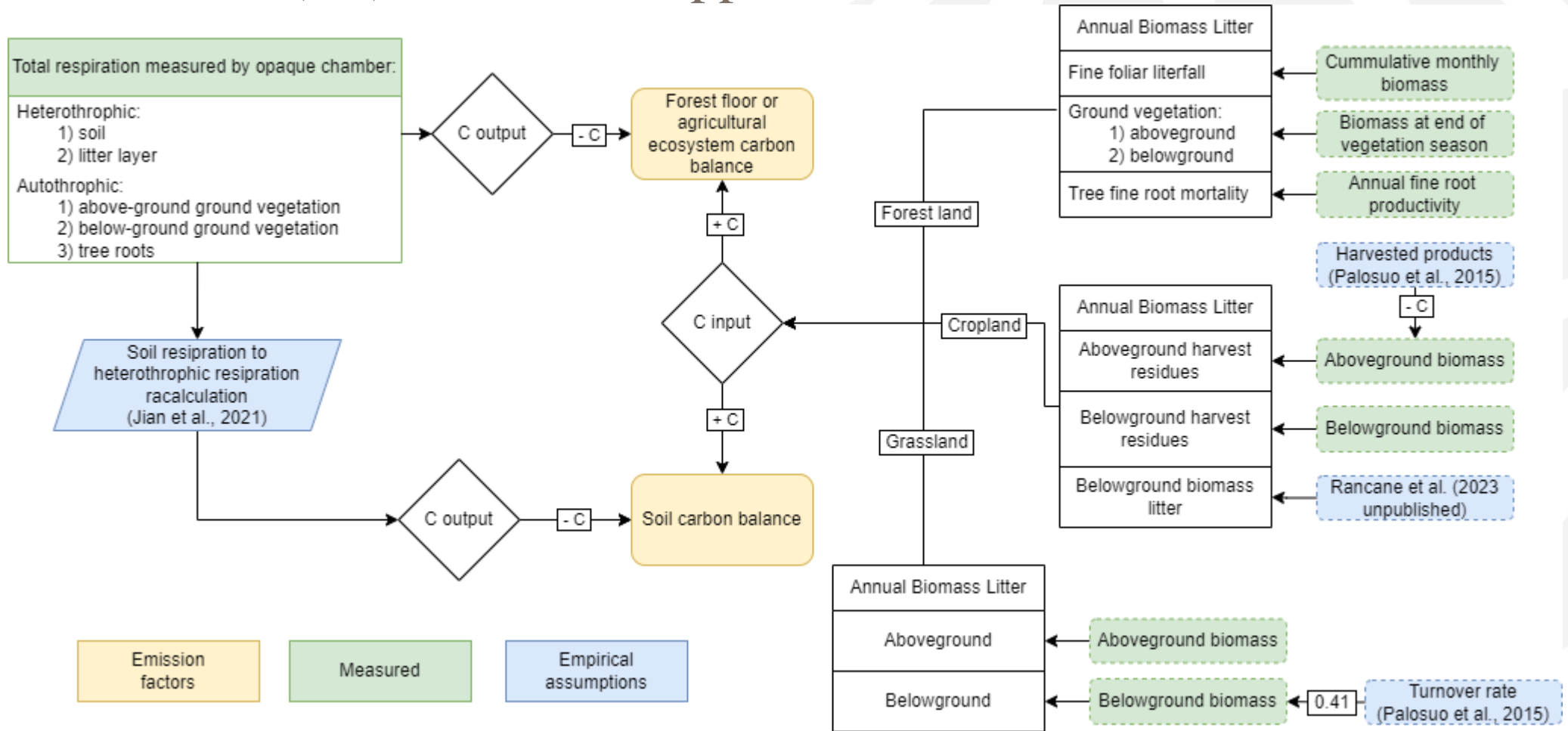
Soil CO₂ emissions:

- Heterotrophic respiration
- Total respiration

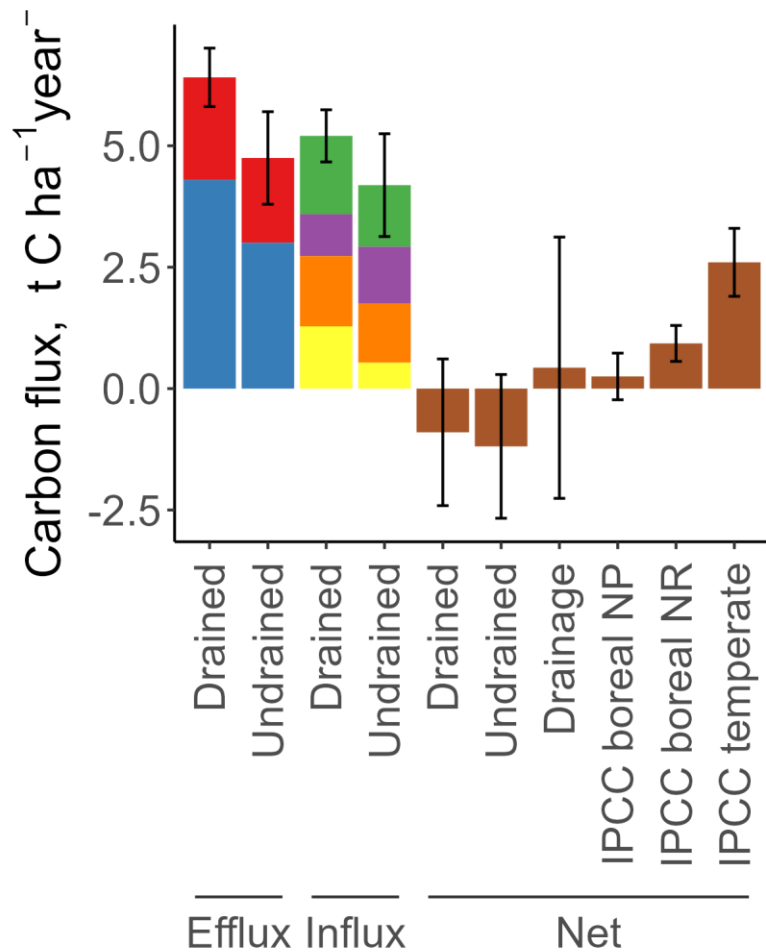
Auxiliary data:

- Soil and air temperature
- Water table level
- Soil and water physical and chemical parameters

Carbon balance (EF) calculation approaches



Forest land: soil and forest floor carbon balance

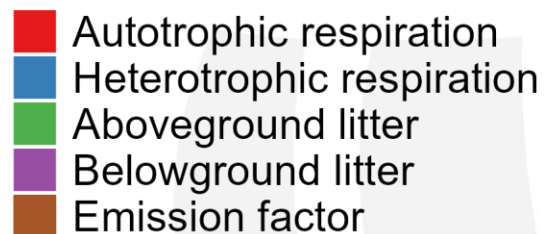
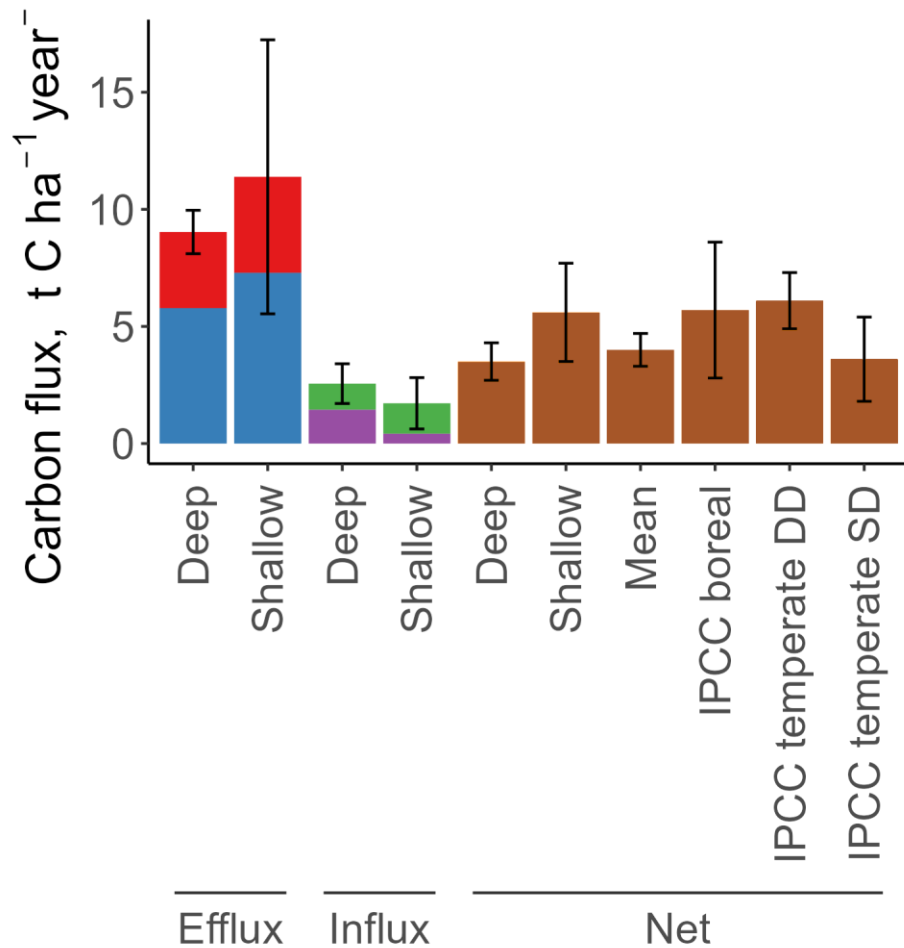


- Autotrophic respiration
- Heterotrophic respiration
- Fine foliar litter
- Aboveground ground vegetation
- Belowground ground vegetation
- Tree fine roots
- Emission factor

C flux	Drained	Undrained
Carbon flux, t CO ₂ -C ha ⁻¹ year ⁻¹		
R _{tot}	6.21±0.43	4.38±1.20
R _{het}	4.30±1.20	3.00±0.99
Influx	5.20±0.91	4.19±1.10
Emission factor, t CO ₂ -C ha ⁻¹ year ⁻¹		
Forest floor	1.05±0.98	0.48±1.61
Soil	-0.9±1.51	-1.19±1.48
Drainage impact	0.43±2.69	

*NP – nutrient poor soil
 NR – nutrient rich soil
 R_{tot} – soil and forest floor, incl. Ground vegetation, respiration
 R_{het} – heterotrophic respiration

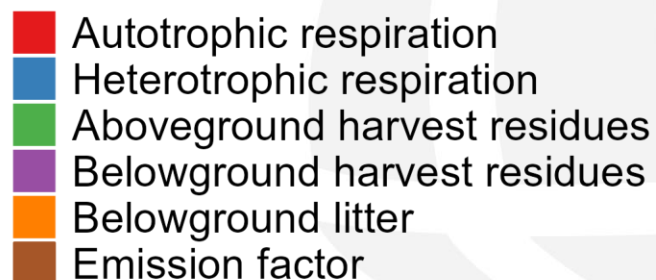
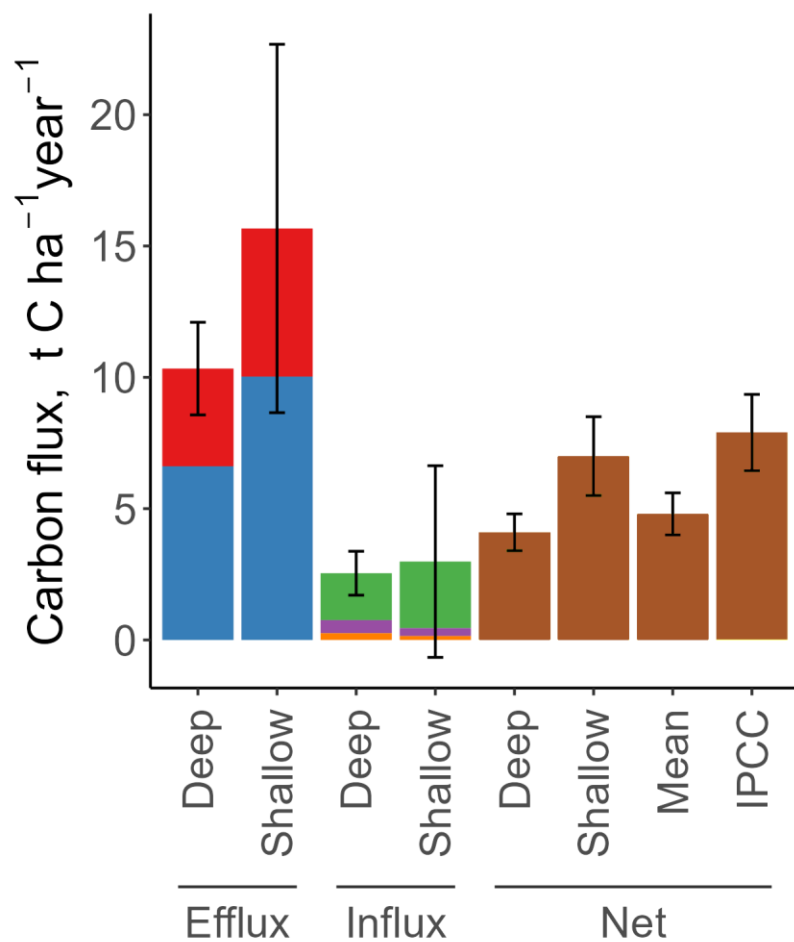
Grassland: soil and ecosystem carbon balance



C flux	Mean	Deep	Shallow
Carbon flux, t CO ₂ -C ha ⁻¹ year ⁻¹			
Reco	9.6 ± 0.8	9.0 ± 0.7	11.4 ± 2.7
Rhet	6.2 ± 0.5	5.8 ± 0.4	7.3 ± 1.7
Influx	2.1 ± 0.2	2.3 ± 0.3	1.7 ± 0.4
Emission factor, t CO ₂ -C ha ⁻¹ year ⁻¹			
Soil	4.0 ± 0.7	3.5 ± 0.6	5.6 ± 2.1

*Deep – deep organic soils
 Shallow – shallow highly decomposed organic soils
 DD – deep drained (mean WTL >30cm)
 SD – shallow drained (mean WTL <30cm)
 Reco – ecosystem respiration
 Rhet – heterotrophic respiration

Cropland: soil and ecosystem carbon balance



*Deep – deep organic soils
 Shallow – shallow highly decomposed organic soils
 Reco – ecosystem respiration
 Rhet – heterotrophic respiration

C flux	Mean	Deep	Shallow
Carbon flux, t CO ₂ -C ha ⁻¹ year ⁻¹			
Reco	11.7 ± 1.3	10.3 ± 1.2	15.7 ± 1.5
Rhet	7.5 ± 0.8	6.6 ± 0.8	10.0 ± 1.0
Influx	2.7 ± 0.3	2.5 ± 0.4	3.0 ± 0.5
Emission factor, t CO ₂ -C ha ⁻¹ year ⁻¹			
Soil	4.8 ± 0.8	4.1 ± 0.7	7.0 ± 1.5

Discussion



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