POPFULL

Soil carbon assessment as part of a total carbon balance of a bio-energy culture with fast-growing poplar

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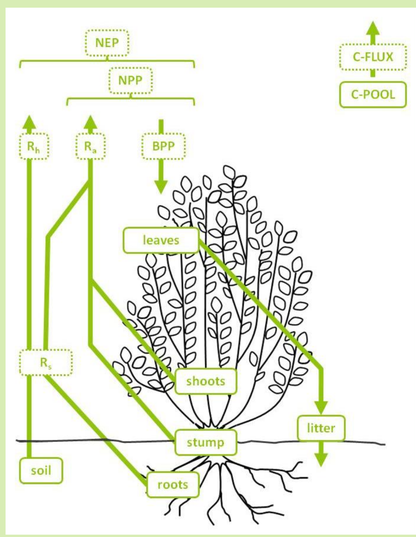
POPFULL - Soil Survey March 2010

- GOAL: Quantifying initial soil carbon stock of experimental site
- Soil survey repeated in 2013/2014
  → changes in carbon stock after 4 years SRC culture

site characteristics

- located in Lochristi, Belgium
- agro-pedological region: sandy region
- formal landuse (since ±1800): agriculture (Fig. 1)
  - → 8.83 ha cropland, mainly cornfield
  - → 5.41 ha pasture



Total ecosystem-carbon balance

- quantifying all C-pools (incl. above- and belowground plant biomass and soil carbon)
- quantifying all C-fluxes (incl. photosynthesis and respiration)

} making up C-balance by calculating NEP

- upscaling to plantation and yearly level
- validating against eddy-covariance data

Material and methods

- 110 sample locations, spatially distributed over land uses and planting area of 4 poplar clones of interest (*Grimminge, Koster, Skado, Wolterson*)
- bulk density and loose soil samples at 15 cm-interval depths untill -90 cm by core sampling (Eijkelkamp Agrisearch equipment, Netherlands)
- determination of carbon (C) and nitrogen (N) concentrations by dry combustion (NC element analyser, Carlo Erba Instruments, Italy)





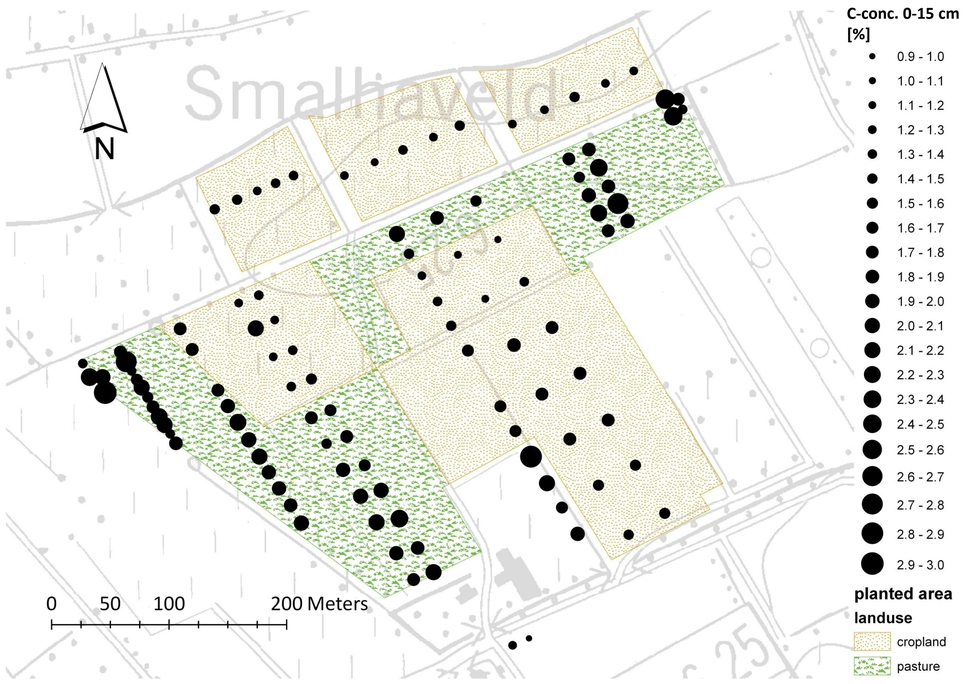


Fig. 1: Soil carbon concentrations [mass %] in 0-15 cm indicated by dot size. Sample locations distributed over landuses and planting area of clones of interest.

Results

- decrease in C-concentration with depth (Fig. 2)
- upper soil layer:
  - lower C-conc. in cropland (Fig. 1 & 2) due to removal of crop residues
  - higher density in cropland (Fig. 3) due to soil compaction and surface sealing
- average carbon contents (Fig. 4) at 0-90 cm of **115 Mg C ha^{-1}** in pasture and **124 Mg C ha^{-1}** in cropland

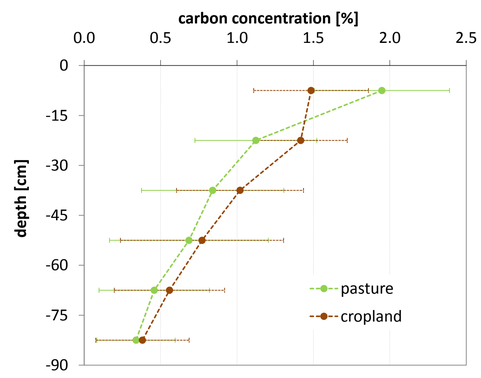


Fig. 2: Soil carbon distribution down to 90 cm depth, averaged wihin landuse category. Error bars indicate standard deviation.

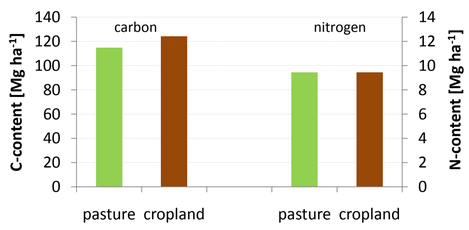


Fig 4: Average soil carbon (and nitrogen) content at 0 - 90 cm depth.

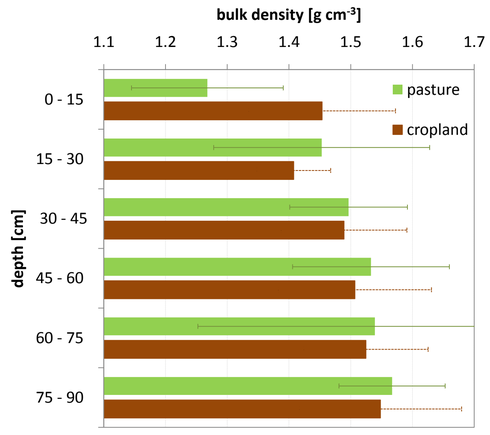


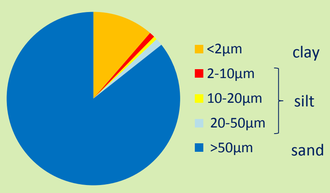
Fig 3: Average bulk density at depths 0 - 90 cm. Error bars indicate standard deviation.

soil characteristics

		CROPLAND 0-30 cm		CROPLAND 30-60 cm		PASTURE 0-30 cm		PASTURE 30-60 cm	
C	[%]	1.45	(0.24)	0.90	(0.45)	1.54	(0.31)	0.76	(0.46)
C:N	[-]	12.2	(1.72)	14.8	(6.24)	11.1	(1.78)	13.1	(6.24)
pH – KCl	[-]	5.5	(0.4)	5.9	(0.9)	5.1	(0.6)	5.6	(0.5)
P	[mg/100g soil]	28	(14)	9	(7)	19	(8)	6	(7)
K	[mg/100g soil]	17	(9)	12	(10)	10	(7)	5	(3)
Mg	[mg/100g soil]	13	(3)	14	(5)	14	(3)	11	(4)
Ca	[mg/100g soil]	111	(24)	103	(38)	103	(38)	99	(33)
Na	[mg/100g soil]	1.3	(0.5)	1.8	(0.7)	1.4	(0.5)	1.1	(0.3)

*Values between brackets indicate standard deviation

texture: loamy sand



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