



World Forum on  
Urban Forests  
Mantova 2018



LIFE15 ENV/IT/000225



# Soil characteristics assessment in demonstration plots prior de-sealing actions

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Consiglio Nazionale delle Ricerche  
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Forlì



San Lazzaro

The SOS4LIFE  
project

is  
regenerating  
three urban  
sites,

transforming  
paved surfaces  
into green  
spaces.







The compensation is made with topsoil taken from new building sites or works at agricultural water drainage systems.



Sampling of the topsoil for analysis





Also the technosol, which is the substrate under the asphalt of the sealed squares, has been analyzed.







Preparation of demonstration plots to test the the evolution of soils





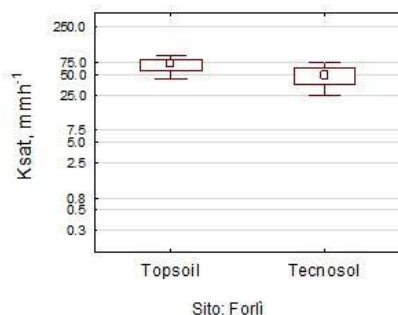


.. and plant growth performance.

Species selected: *Viburnum tinus* and *Eleagnus ebbingei*.

# Physical and hydrological characteristics of topsoils and technosols

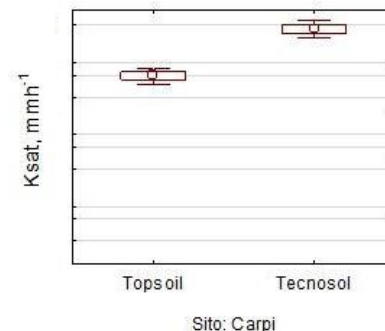
Forlì	Topsoil	Technosol
TXT USDA	Loam	Sandy loam
Moisture (%)	0.31±0.05	0.33±0.03
Bulk Density (g/cm <sup>3</sup> )	1.43±0.032	1.42±0.068



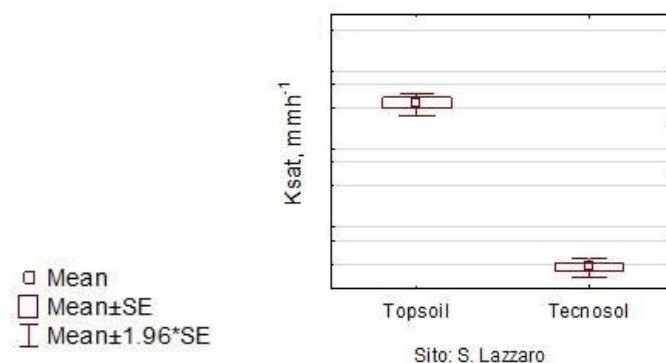
Technosols are slightly lighter than topsoils.

Topsoils in Forlì and San Lazzaro have a higher infiltration rate and drain more readily.

Carpi	Topsoil	Technosol
TXT USDA	Loam	Clay loam
Moisture (%)	0.27±0.02	0.23±0.01
Bulk Density (g/cm <sup>3</sup> )	1.16±0.047	1.04±0.116



San Lazzaro	Topsoil	Technosol
TXT USDA	Sandy loam	Sandy clay loam
Moisture (%)	0.23±0.01	0.19±0.01
Bulk Density (g/cm <sup>3</sup> )	1.392±0.006	1.311±0.025



# Chemical characteristics of topsoils and technosols

	San Lazzaro		Carpi		Forlì	
	Topsoil	Technosol	Topsoil	Technosol	Topsoil	Technosol
N% tot	0.07	0.15	0.1	0.02	0.05	0.11
C% tot	2.06	3.74	1.06	3.44	2.85	3.66
N% org	0.05	0.17	0.1	0.01	0.05	0.1
C% org	1.39	2.1	0.47	1.7	1.19	1.73
C/N	19.9	14.0	4.7	85.0	23.8	15.7
Organic matter (%)	2.4	3.6	0.8	2.9	2.1	3.0
pH H2O	8	7.9	8	8	7.8	8.1
ECe 1:2.5 (µS/cm)	330.3±11.2	328.5±11	340.3±1.3	266.5±16.6	283.5±12.9	253±76

	D.L. 152/2006 thresholds						
As*	20	0	0	0	0	0	0
Cd*	2	0	0	0	0	0	0
Cr*	150	34.05	55.3	43.76	50.23	36.07	49.14
Cu	120	19.07	24.96	33.8	68.71	19.92	32.76
Ni*	120	31.94	47.7	40.35	49.37	33.99	37.37
Pb*	100	21.36	14.24	7.663	180.6	27.7	14.49
V	90	43.81	43.87	38.36	49.69	47.12	41.63
Zn*	150	34.56	35.48	40.69	64.97	30.99	35.95

\* Potential Toxic Elements

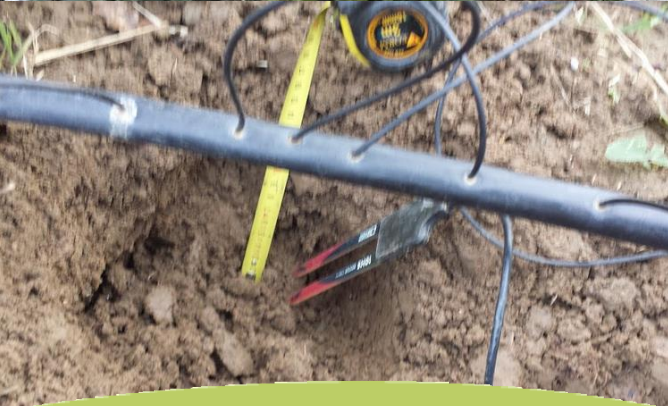
Surprisingly, technosols are generally rich in organic matter, in nitrogen and carbon. However topsoils have a better C/N ratio. Regarding contaminants, only the technosol in Carpi recorded Pb > Law threshold.



# Soil moisture, plant growth and physiology



- Leaf gas exchange, photosystem II efficiency during the vegetative period
- Leaf chemical analysis



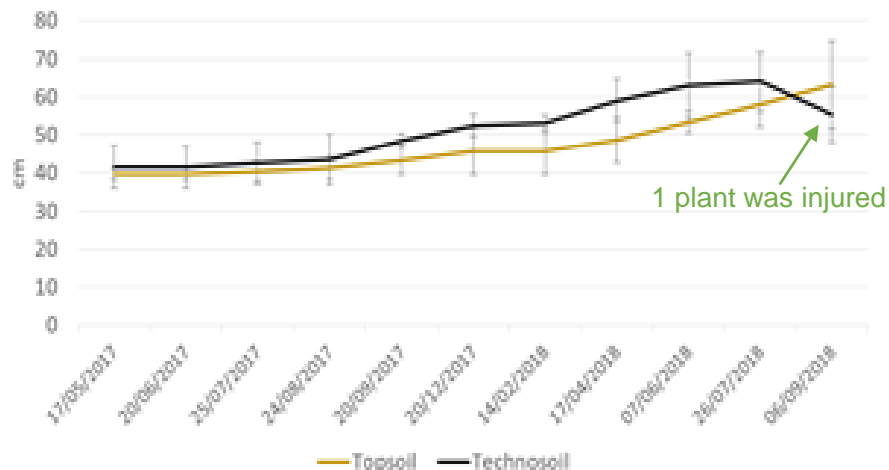
- Plant growth at regular intervals
- Soil moisture and temperature continuous measurement





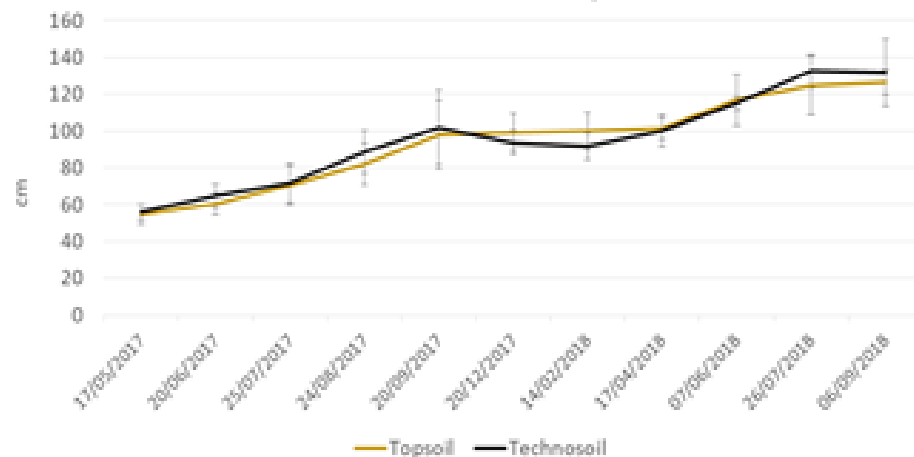
# Plant growth in Forlì

Accrescimento - V. tinus



Average growth (top vs. tec.): 2.4 vs. 1.4 cm/month

Accrescimento - E. ebbingei



Average growth (top vs. tec.): 7.2 vs. 7.6 cm/month



2017



2018

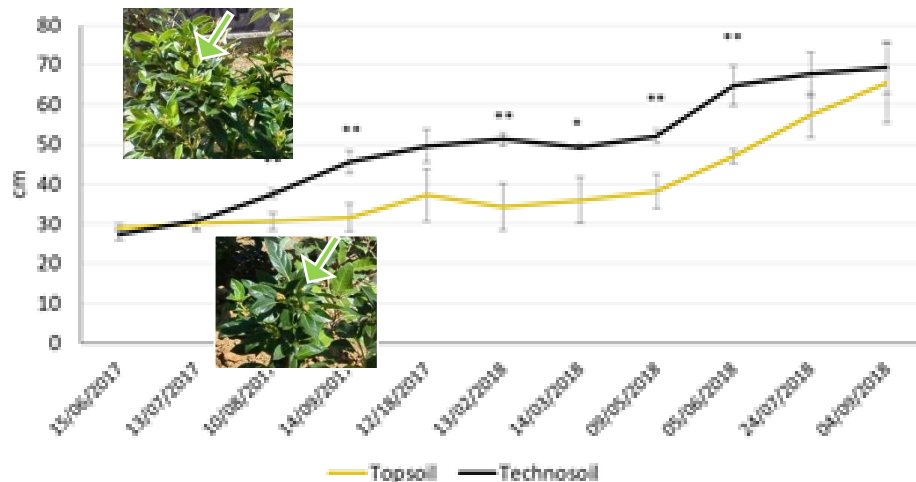
Technosol

Topsoil



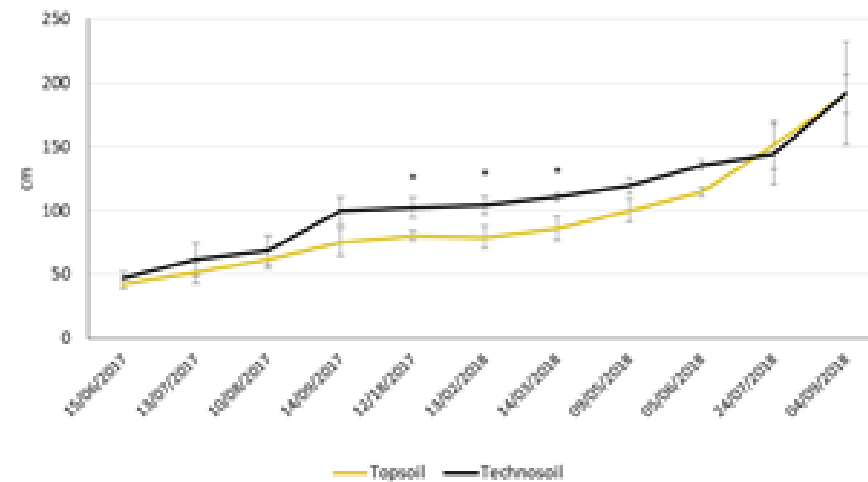
# Plant growth in Carpi

Accrescimento di viburno - Carpi



Average growth (top vs. tec.): 3.6 vs. 4.2 cm/month

Accrescimento E. ebbingel - Carpi



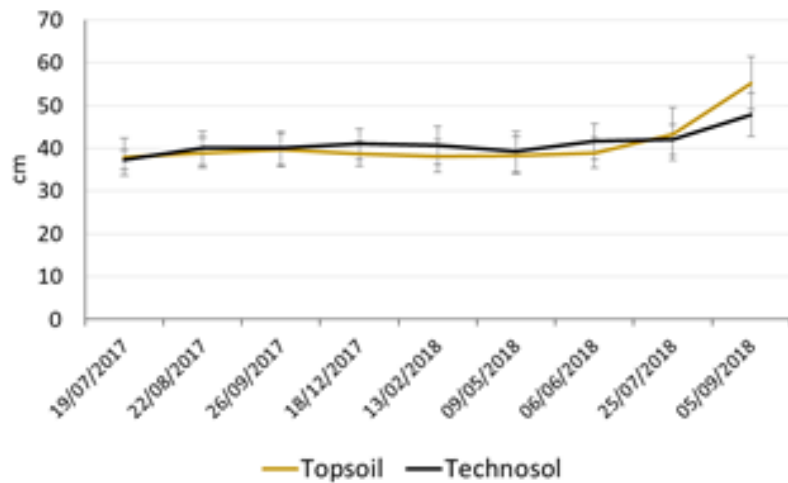
Average growth (top vs. tec.): 14.8 vs. 14.5 cm/month





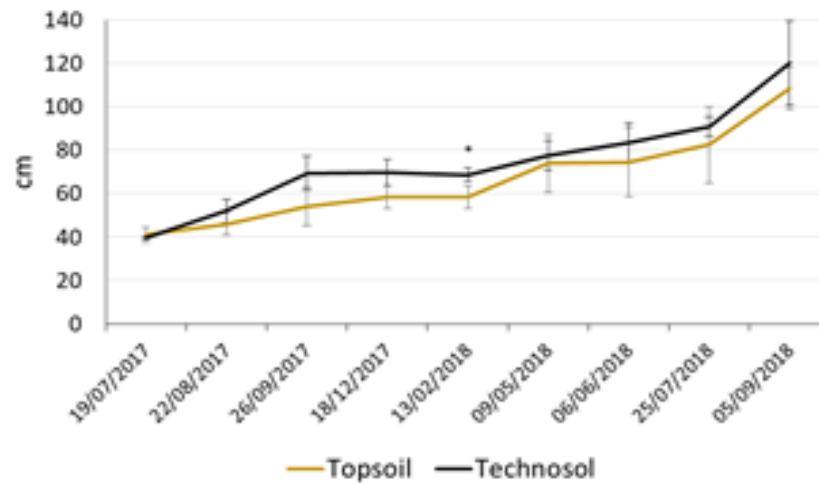
# Plant growth in San Lazzaro

Accrescimento V. tinus



Average growth (top vs. tec.): 2.2 vs. 1.4 cm/month

Accrescimento - E. ebbingei



Average growth (top vs. tec.): 8.4 vs. 10 cm/month



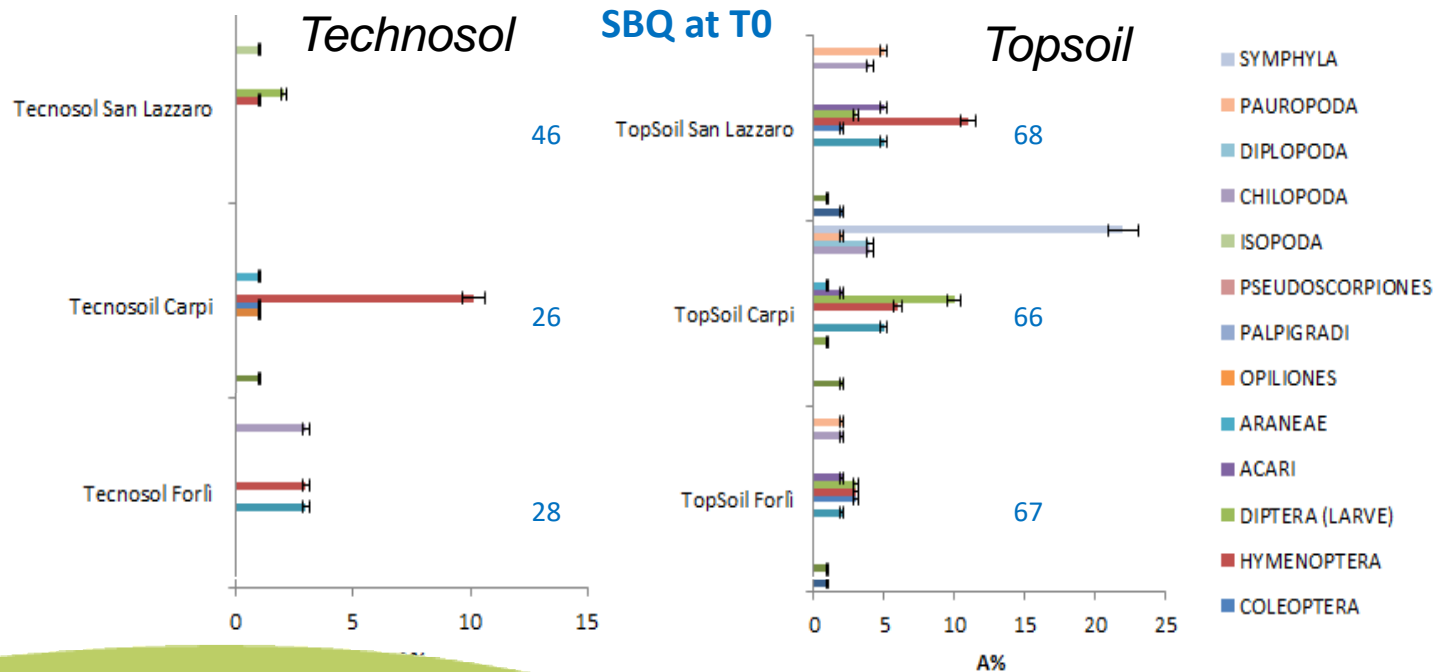


# Soil biological quality (SBQ) & fertility



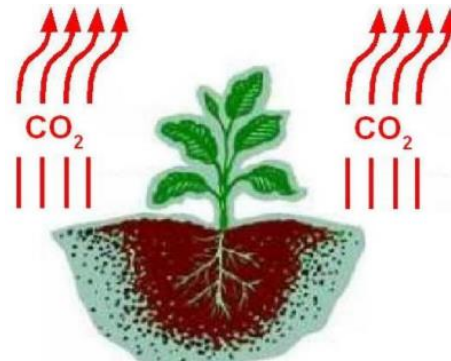
SBQ is given by the eco-morphology of soil meso-fauna <2mm and its quantity (Parisi et al., 2001)

SBQ values in forest:  
150<SBQ<250

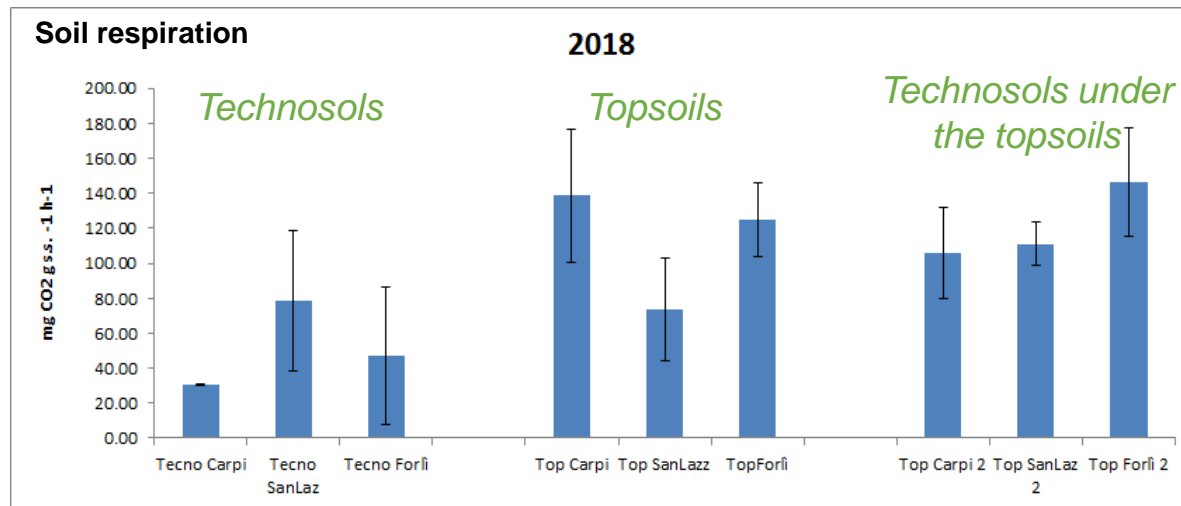




# Soil respiration



Soil respiration is given by the metabolic activity of roots and microorganisms.



Topsoils produce more CO<sub>2</sub> due to a higher microbial biomass (data not shown).



# Brief conclusions

- Topsoil characteristics play an important role, to be considered at the moment of plant species selection and irrigation scheduling;
- To a certain extent, technosols can also be used as substrates.

