Reconstructed soil made from waste materials

Description

This soil was constructed entirely from waste materials produced as a result of maintenance operations (green waste, composted bark) and industrial extractions (sand, lignite clay).

This was an organic-rich soil comprising green waste (32.5 %), composted bark (32.5 %), waste sand (25 %) and lignite clay (10 %).

Intended use: growth horizon; assessed using an agricultural seed mix.

Deployments: Eden Project, Cornwall, UK
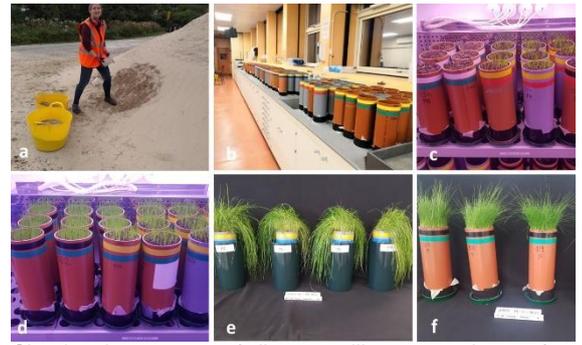
Charting the progress of climate resilience experiments for ReConSoil project using this soil. a – collection of waste sand; b – preparation of experimental scenarios; c – exposure of cores to climate pressures under controlled conditions; d – growth of plants under climate pressure scenarios; e – mature growth of planted cores ; f - mature growth of planted cores 2. (© ReCon Soil)

Fertility

The soil has high concentrations of the macronutrients C, N, P and K (nm = not measured)

Physical properties

		Unit	Result	Interpretation
bD [a]		g.cm^{-3}	0.595	*Low (due to high organic and low mineral contents)*
Soil moisture content at field capacity		%	29.6	*high water storage*
WHC [b]			88.1 ± 10.2	high
Particle size distribution	< 2μm	g.kg^{-1} dry mass	10	
	2 – 50μm		393	*Sandy Loam*
	50 – 2000μm		598	
	organic matter content		108	medium
Illite + smectite		%	nm	
Aggregate stability		MWD[c] (mm)	nm	

(a) bD = bulk density ; (b) WHC = Plant-Available Water Holding Capacity ; (c) MWD : mean weight diameter

Chemical properties

	Unit	Result	Interpretation
pH	-	7.65	*alkaline*
CEC Metson	meq.100g^{-1}	5.76	*Within range for SL soil*
Total CaCO$_3$	g.kg^{-1} dry mass	nm	
Total C		185 ± 1	medium
Organic C		108 ± 9.6	
Total N		10.2 ± 0.2	high
C/N		22.6 ± 0.4	high
P Olsen		nm	
Conductivity	μS.cm^{-1}	nm	

* soils with organic carbon above 12-18 % are generally calssified as organic soils

Chemical composition* (nm = not measured)

	Unit	Result		Unit	Result	Interpretation[c]
Al	mg.kg^{-1}	nm	As	mg.kg^{-1}	nm	-
Ca		22.0 ± 4.7	Ba		nm	-
Fe		9.5 ± 1.1	Cd		nm	-
K		63.4 ± 3.9	Cr		nm	-
Mg		5.2 ± 1.9	Cu		nm	-
Mn		nm	Mo		nm	-
Na		nm	Ni		nm	-
P		104 ± 4	Pb		nm	-
Si		nm	Se		nm	-
Ti		5.3	Zn		57	-

* concentration in extracted aqueous solution

Mechanical preparation of soil to ensure heterogeneity (© ReCon Soil)

Microbiology

Microbial diversity

Fluorescien diacetate measurement to assess microbial abundance. 158 ± 11 to 293 ± 88 mg Fl g^{-1} hr^{-1}

Plant Growing and plant health

- **Reconstructed Soil 3**

Yield (t.ha^{-1})

Result	Interpretation
13.3	< 16.5 t.ha^{-1} of UK average

Plant analysis (trace elements)

	Unit	Result	Interpretation
As	mg.kg^{-1}	2.21	Lower risk
Cd		0.05	Medium risk
Cr		0.87	Medium risk
Cu		6.58	Lower risk
Pb		0.81	Lower risk
Zn		27.89	Lower risk

- **Reconstructed Soil 3 (mix with 10 % biochar)**

Yield (t.ha^{-1})

Result	Interpretation
17.0	> 16.5 t.ha^{-1} of UK average

Plant analysis (trace elements)

	Unit	Result	Interpretation
As	mg.kg^{-1}	1.35	Lower risk
Cd		0.06	Medium risk
Cr		1.01	Medium risk
Cu		6.30	Lower risk
Pb		2.31	Lower risk
Zn		28.12	Lower risk