

Supplementary data

Table S1. Wavelength used for ICP-OES analysis with detectable limits and calibration details

Element	Wave length (nm)	BDL ($\mu\text{g g}^{-1}$)	Coefficient of correlation (r)	% RSD	Spike recovery (%)
Al	396.152	0.005	0.9997	1.05	92–106
Fe	238.204	0.0046	0.9996	1.1	90–105
Mn	259.372	0.0016	0.9988	0.96	93–108
Zn	213.85	0.0018	0.9995	0.35	88–104
Cu	324.752	0.0097	0.9998	0.85	89–110
Cd	228.802	0.0027	0.9999	0.58	85–102
Cr	267.716	0.0071	0.9999	1.22	85–104
Pb	220.353	0.042	0.9995	0.76	83–109
As	188.979	0.015	0.9999	2.34	88–112

Table S2. Standard analytical procedures adopted for the analysis of soil samples

Sl. no.	Parameters	Unit	Method used	References
1	Soil particle size	mm	International pipette method	57
2	Bulk density (BD)	Mg m^{-3}	Keen Raczkowski cup method	58
3	Particle density (PD)	Mg m^{-3}	Keen Raczkowski cup method	58
4	Porosity	%	$(1 - \text{BD}/\text{PD}) \times 100$	59
5	pH (1:2.5)		Glass electrode pH meter	58
6	Electrical conductivity (EC) (1:2.5)	dSm^{-1}	Conductivity meter	58
7	Organic carbon (OC)	%	Wet oxidation method	58
8	Available sulphur	mg kg^{-1} soil	Turbidometry method	60
8	Available nitrogen	kg h^{-1}	Alkaline permanganate method	61
9	Available phosphorous	kg ha^{-1}	Brays No. 1 method	58
10	Available potassium	kg ha^{-1}	Flame photometry method	58
12	Exchangeable cations	$\text{meq } 100 \text{ g}^{-1}$	Extracted with a neutral 1N NH_4OAc solution; Na^+ and K^+ were determined flame photometrically and Ca^{2+} and Mg^{2+} by Versenate titration method	58
13	Exchangeable acidity	$\text{meq } 100 \text{ g}^{-1}$	Volumetric Titration Method	62
14	Cation exchange capacity (CEC)	$\text{meq } 100 \text{ g}^{-1}$	Distillation Method, extracting the soils with neutral 1N NH_4OAc	58
15	Soil microbial biomass carbon (MBC)	mg kg^{-1} soil	Chloroform fumigation and extraction procedure	63
16	Soil microbial biomass nitrogen (MBN)	mg kg^{-1} soil	Chloroform fumigation and extraction procedure	63
17	Dehydrogenase activity	$\mu\text{g TPF g}^{-1} \text{ soil } 24 \text{ h}^{-1}$	Amount of TPF formed after incubating soil in closed test tubes at 37°C for 24 h.	64
18	Phosphatase activity	$\mu\text{g pNP g}^{-1} \text{ h}^{-1}$	Hydrolysis of p-nitrophenyl phosphate (pNPP) $\rightarrow$ p-nitrophenol (pNP).	65
19	Urease activity	$\mu\text{g NH}_4\text{-N g soil}^{-1} 2 \text{ hr}^{-1}$	Estimation of NH_4^{++} released after incubation of soil with urea and amidase solution, respectively, for 2 h at 37°C	66

Table S3. Descriptive statistics of physico-chemical and biological properties in surface and subsurface soil samples of study area in Chintamani, Karnataka, India

Surface soil (0-20cm)								Sub-surface soil (20-40cm)					
	Unit	Minimum-maximum	Mean	median	SD	skewness	kurtosis	Minimum-maximum	Mean	median	SD	skewness	Kurtosis
Sand	%	68.30-85.20	73.57	73.19	3.25	1.66	4.43	61.84-75.75	69.04	69.12	3.04	0.14	-0.05
Silt	%	5.46-14.02	10.26	9.97	1.65	-0.10	0.38	8.56-16.46	12.44	12.64	1.74	-0.36	0.14
Clay	%	8.55-19.72	16.15	16.35	2.23	-1.56	3.62	12.79-22.71	18.53	18.24	2.05	-0.07	0.25
BD	(Mg m ⁻³)	1.10-1.80	1.39	1.37	0.16	0.57	0.46	1.30-1.60	1.47	1.48	0.08	-0.14	-0.87
PD	(Mg m ⁻³)	1.63-2.69	2.30	2.30	0.24	-0.56	0.13	2.07-2.88	2.46	2.48	0.18	-0.08	-0.36
Porosity	%	20.48-50.36	39.39	39.73	4.44	-1.37	6.34	33.41-48.01	40.24	40.23	2.77	0.2	0.91
pH		4.86-7.00	6.19	6.29	0.50	-0.52	-0.22	4.45-6.87	5.6	5.75	0.5	-0.23	0.16
EC	(dS m ⁻¹)	0.27-2.01	0.82	0.76	0.39	1.16	1.13	0.46-2.22	1.16	1.16	0.42	0.65	-0.13
CEC	Meq 100g ⁻¹	6.80-15.73	9.31	8.77	1.91	1.87	4.17	7.57-15.60	10.46	10.41	1.49	1.06	2.49
Available N	kg ha ⁻¹	74.58-582.92	197.87	182.52	92.41	1.61	4.79	50.78-398.86	124.05	111.34	67.40	2.00	4.99
Available P ₂ O ₅	kg ha ⁻¹	17.05-132.47	51.81	46.74	21.63	1.28	2.72	10.01-76.04	29.34	23.61	17.36	1.33	0.89
Available K ₂ O	kg ha ⁻¹	96.08-708.36	305.54	242.25	187.96	0.86	-0.58	87.32-364.51	172.82	147.66	69.71	0.78	-0.11
Available S	mg kg ⁻¹ soil	13.10-40.08	23.37	21.61	6.57	0.71	-0.24	8.15-28.93	17.56	16.87	5.38	0.47	-0.55
Exchangeable Ca ²⁺	meq 100g ⁻¹	2.48-6.04	4.33	4.44	0.94	-0.31	-1.03	0.47-3.28	2.16	2.2	0.63	-0.29	-0.51
Exchangeable Mg ²⁺	meq 100g ⁻¹	1.09-4.94	2.48	2.41	0.88	0.70	0.34	0.77-4.76	1.42	1.37	0.6	3.63	19.62
exchangeable K ⁺	meq 100g ⁻¹	0.21-0.45	0.33	0.33	0.06	0.11	-0.37	0.06-0.29	0.17	0.17	0.05	0.23	-0.41
Exchangeable Na ⁺	meq 100g ⁻¹	0.10-0.29	0.16	0.16	0.04	1.03	1.41	0.13-0.38	0.27	0.27	0.06	-0.24	0.21
SOB		4.37-11.12	7.30	7.36	1.47	0.21	0.15	2.70-5.79	4.02	3.95	0.8	0.06	-1.03
Exchangeable H ⁺	meq 100g ⁻¹	0.44-1.76	1.13	1.00	0.31	0.41	-0.66	0.65-2.66	1.37	1.36	0.38	1.05	2.41
Exchangeable Al ³⁺	meq 100g ⁻¹	0.41-0.70	0.53	0.53	0.07	0.05	-0.65	1.23-1.27	1.24	1.24	0.01	1.87	3.93
Exchangeable acidity	meq 100g ⁻¹	1.03-2.29	1.66	1.58	0.3	0.49	-0.62	1.89-3.90	2.62	2.60	0.37	1.06	2.49
Organic Carbon	%	0.37-1.06	0.67	0.67	0.16	0.21	-0.35	0.30-0.91	0.55	0.54	0.13	0.3	-0.1
Microbial Biomass Carbon	mg kg ⁻¹ soil	288.38-515.00	402.59	400.31	54.96	0.03	-0.54	302.65-483.00	387.89	386.95	36.99	0.14	0.09
Microbial Biomass Nitrogen	mg kg ⁻¹ soil	13.24-28.61	19.62	19.10	3.52	0.72	0.42	14.09-27.60	18.88	18.67	2.59	0.83	1.61
Urease activity	µg NH ₄ -N g soil ⁻¹ 2 hr ⁻¹	19-39.27	27.76	27.58	4.31	0.51	0.92	5.93-20.40	12.77	12.89	3.92	-0.2	-1.04
Dehydrogenase activity	µg TPF g soil ⁻¹ 24 hr ⁻¹	6.31-11.26	8.13	8.10	0.94	0.78	1.13	1.90-7.63	3.65	3.21	1.38	1.25	1.38
Acid phosphatase activity	µg PNP g soil ⁻¹ hr ⁻¹	16.14-26.05	19.14	18.52	2.09	1.35	1.79	4.08-14.10	7.76	7.05	2.18	1.25	1.29
Alkaline phosphatase activity	µg PNP g soil ⁻¹ hr ⁻¹	9.64-24.82	13.85	13.05	3.09	1.82	3.58	3.55-11.69	7.49	7.47	1.85	0.2	0.28