

## List of Abbreviations

ADE	Amazonian Dark Earths
AEC	anion exchange capacity
Al	aluminium
AM	arbuscular mycorrhizal fungi
ANOVA	analysis of variance
APEC	Asia-Pacific Economic Cooperation
As	arsenic
ASTM	American Society for Testing Materials
B	boron
BC	black carbon
BCSM	biosphere C stock management
BD	bulk density
BECS	bioenergy with carbon storage
BET	Brunauer, Emmett and Teller equation
BPCA	benzene polycarboxylic acid
BTU	British thermal unit
C	carbon
Ca	calcium
CaCO <sub>3</sub>	calcium carbonate/calcite
CaHPO <sub>4</sub>	calcium phosphate
CaO	calcium oxide
Ca <sub>10</sub> (PO <sub>4</sub> ) <sub>6</sub> (OH) <sub>2</sub>	hydroxyapatite
CaS	calcium sulphide
CaSO <sub>4</sub>	calcium sulphate/gypsum
CBA	cost-benefit analysis
CCBA	Climate, Community and Biodiversity Standards
CCX	Chicago Climate Exchange
CCS	carbon dioxide capture and storage
CDM	Clean Development Mechanism
CEC	cation exchange capacity
CH <sub>3</sub>	methyl group
CH <sub>4</sub>	methane
C <sub>2</sub> H <sub>4</sub>	ethane
CIMMYT	International Centre for Maize and Wheat Improvement
Cl	chlorine
C/N	carbon/nitrogen ratio

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CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> e	carbon dioxide equivalents
CP	cross-polarization
Cr	chromium
CrO	chromium oxide
Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>	acid dichromate
CTO	chemo-thermal oxidation
CTO-375	chemo-thermal oxidation at 375°C
Cu	copper
CV	coefficient of variation
DC-ox	dichromate oxidation
DEA	denitrification enzyme activity
Defra	UK Department for Environment, Food and Rural Affairs
DM	dry matter
DNA	deoxyribonucleic acid
DOC	dissolved organic carbon
DP	degree of polymerization
dS	deci-Siemens
DSC	differential scanning calorimetry
EC	electrical conductivity
EDS	energy-dispersive X-ray spectroscopy
EELS	electron energy loss spectroscopy
EGME	ethylene glycol monoethylene ether
EM	ectomycorrhizae
EPA	US Environmental Protection Agency
EPR	electron paramagnetic resonance
ESEM	environmental scanning electron microscope
ETS	European Union Emissions Trading Scheme
EU	European Union
Fe	iron
FeCO <sub>3</sub>	siderite
Fe <sub>2</sub> O <sub>3</sub>	haematite
FeS	iron sulphide
FFT	fast Fourier transform
FoRTS	Forest Residues Transportation Model
FW	fresh weight
g	gram
G8	group of 8 leading industrialized nations
GC-MS	gas chromatography–mass spectrometry
GHG	greenhouse gas
GPP	gross primary productivity
GW	garden waste
GWC	greenhouse warming commitment
H	hydrogen
Ha	hectare
H/C	hydrogen/carbon ratio

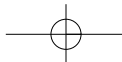
## LIST OF ACRONYMS AND ABBREVIATIONS xxix

HCO <sub>3</sub> <sup>-</sup>	hydrogen carbonate
He	iron
H <sub>2</sub> O	water
HPO <sub>4</sub> <sup>2-</sup>	hydrogen phosphate
H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>	dihydrogen phosphate
H <sub>3</sub> PO <sub>4</sub>	phosphoric acid
hr	hour
H <sub>2</sub> S	hydrogen sulphide
HSE	UK Health and Safety Executive
HTP	hydrothermal processing
HTT	highest (heat) treatment temperature
IBI	International Biochar Initiative
IPCC	Intergovernmental Panel on Climate Change
IR	infrared
IRMS	isotope ratio mass spectrometry
ISO	International Organization for Standardization
J	joule
JI	Joint Implementation
K	Kelvin
K	potassium
KCl	sylvite
KOH	potassium hydroxide
K <sub>2</sub> S	potassium sulphide
K <sub>2</sub> SO <sub>4</sub>	potassium sulphate
K-W	Kruskal-Wallis statistic
L	litre
lb	pound
m	metre
MCL	maximum contaminant level
MEA	multilateral environmental agreement
Mg	magnesium
MgO	magnesium oxide
min	minute
MmBtu	million British Thermal Units
mmolc	millimol charge
Mn	manganese
MNS	mineral, nitrogen and sulphur
Mo	molybdenum
MRT	mean residence time
MWe	megawatts of electricity
N/N <sub>2</sub>	nitrogen
Na	sodium
NaCl	sodium chloride
NaClO	sodium hypochlorite
Na <sub>2</sub> CO <sub>3</sub>	sodium carbonate
Na <sub>2</sub> O	sodium oxide
NaOH	sodium hydroxide

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Na <sub>2</sub> S	sodium sulphide
NdF	nitrogen derived from fixation
NEXAFS	near-edge X-ray absorption fine structure
NGO	non-governmental organization
NH <sub>2</sub>	amine
NH <sub>4</sub>	ammonium
Ni	nickel
NMHC	non-methane hydrocarbons
NMR	nuclear magnetic resonance
NO	nitric oxide
N <sub>2</sub> O	nitrous oxide
NO <sub>3</sub> <sup>-</sup>	nitrate
NOM	natural organic matter
NPK	nitrogen, phosphorus and potassium
NPV	net present value
NSW EPA	New South Wales Environment Protection Authority
NSW GGAS	New South Wales Greenhouse Gas Reduction Scheme
O	oxygen
O/C	oxygen/carbon ratio
OC	organic carbon
OECD	Organisation for Economic Co-operation and Development
OH	hydroxyl group
OTC	over-the-counter market
N	nitrogen
P	phosphorus
Pa	pascal
PA	pyrolygneous acid
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PGPR	plant growth promoting rhizobacteria
pH	hydrogen ion concentration
PL	poultry litter
PLFA	phospholipid fatty acid
PM	particulate matter
PO <sub>4</sub> <sup>3-</sup>	phosphate
ppm	parts per million
psi	pounds per square inch
PSRE	proton spin relaxation editing
QMS	quadrupole mass spectrometry
Rb	rubidium
RGGI	US Regional Greenhouse Gas Initiative
rpm	revolutions per minute
sec	second
S	sulphur
SAXS	small-angle X-ray scattering
SEM	scanning electron microscopy

Si	silicon
SiO <sub>2</sub>	quartz
SIR	substrate-induced respiration
SO <sub>4</sub> <sup>2-</sup>	sulphate
SOC	soil organic carbon
SOM	soil organic matter
SSB	spinning side band
STXM	scanning transmission X-ray microscopy
t	tonne
TEM	transmission electron microscopy
TG	thermogravimetry
TGA	thermogravimetric analyser
TG-DSC	thermogravimetry and differential scanning calorimetry
Ti	titanium
TiO <sub>2</sub>	titanium oxide
TOT/R	thermal/optical laser transmittance and reflectance
TPI	Tropical Products Institute
TSP	total suspended particulates
UK	United Kingdom
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
USDA	US Department of Agriculture
UV	ultraviolet
UV-ox	oxidation using ultraviolet light
V	volt
VCS	Voluntary Carbon Standard
VM	volatile matter
VOC	volatile organic compound
VS	volatile solid
v/v	volume per volume
W	watt
WHC	water-holding capacity
wt	weight
XPS	X-ray photoelectron spectroscopy
XRD	X-ray diffraction
wt	weight
yr	year
Zn	zinc
ZnCl <sub>2</sub>	zinc chloride
ZnS	zinc sulphide



### SI prefixes used in this book

n	nano ( $\times 10^{-9}$ )
$\mu$	micro ( $\times 10^{-6}$ )
m	milli ( $\times 10^{-3}$ )
c	centi ( $\times 10^{-2}$ )
d	deci ( $10^{-1}$ )
k	kilo ( $\times 10^3$ )
M	mega ( $\times 10^6$ )
G	giga ( $\times 10^9$ )
T	tera ( $\times 10^{12}$ )
P	peta ( $\times 10^{15}$ )
E	exa ( $\times 10^{18}$ )

