



The Alchemy of Living Soil

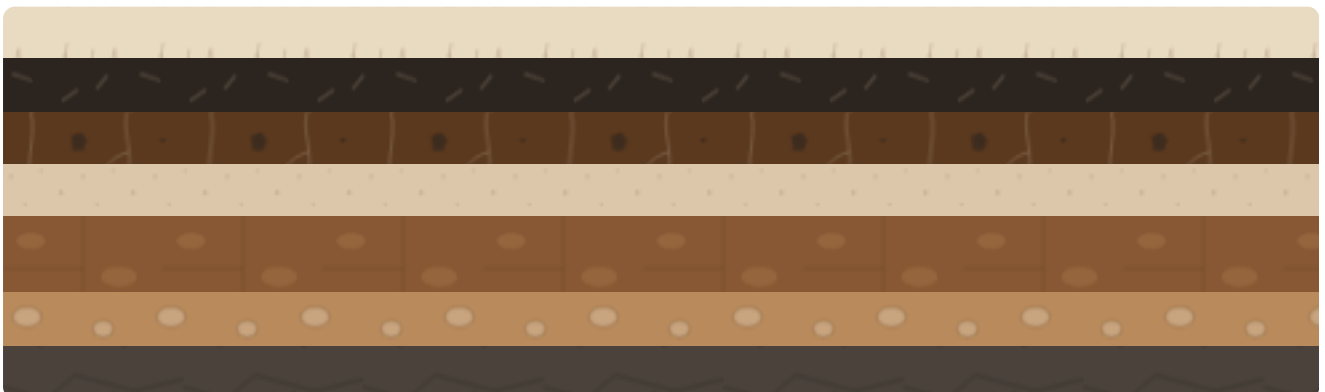
Loamistry

WORKING PAPER NO. 1 · VERSION 0.1

Regenerating Earth begins beneath our feet

Living soil, biochar and open soil knowledge: the founding case for Loamistry

PREPARED BY Joel and Karthik, co-founders	DATE 22 October 2026
STATUS Seed stage: a not-for-profit in the making	VERSION 0.1, open to comment and challenge



ABSTRACT

Every garden, farm and patch of bush grows from soil, and soil is the part of a landscape that's easiest to overlook. Loamistry is a proposed Australian environmental not-for-profit for soil regeneration: careful field research, practical biochar work and soil knowledge shared in the open.

This paper sets out why we start with soil, what the science says about the carbon that leaves soil and the carbon that stays, what the Amazon's ancient dark earths (*terra preta*) can teach, and how we intend to measure our own work before we claim anything for it. It describes a beginning. Every program here is proposed, and Loamistry is not yet an established organisation.

**HORIZON O · THE ORGANIC LAYER**

Leaf litter and decomposing plant matter on the surface: where everything that falls begins to become soil.

1 Why soil

1.1 The proposition

Loamistry grows out of hands-on work designing, planting and caring for productive gardens, work that has widened over time to include plant genetics, environmental observations, weather monitoring and long-term land stewardship. Running through all of it is the soil. Whatever the landscape is (tropical, temperate, degraded or already productive), understanding its soil comes first in deciding how to regenerate it.

The greatest leverage may not be in planting more trees, but in restoring the soil systems that allow entire ecosystems to thrive.

Loamistry would regenerate and study the foundation that every garden grows in. Its aim isn't to promote particular soil amendments or a style of farming. The aim is to understand living soil better, and to make that knowledge and its practical benefits easier for everyone to reach.

1.2 Vision and mission

VISION

A world where living soils are restored, understood and stewarded as the foundation of flourishing ecosystems, resilient food systems and healthy communities.

MISSION

To advance soil regeneration through applied research, biochar innovation, environmental education, ecological restoration and the open sharing of practical knowledge.

1.3 The name

Loamistry (said *LOHM-iss-tree*): *the art, science and philosophy of cultivating living soil*. It's a coined word, and these are the associations we chose it for, not an etymology:

ELEMENT	WHAT IT BRINGS
Loam	Fertile ground, the physical foundation of plant growth
Alchemy	Transformation, renewal, elemental processes
Chemistry	The science of minerals, carbon, nutrients and soil reactions
Mystery	The soil life and processes we can't see
Ministry	Service and care for the living world

Alchemy provides the metaphor. Soil science provides the method.

Regeneration provides the purpose.

In classical alchemy the *Magnum Opus*, the Great Work, is a slow process of refinement. In soil it is literal: waste wood becomes biochar, residues cycle back into the ground, and degraded ground can, under the right conditions, come alive again. Loamistry is secular in its public work and welcomes every scientific, cultural and philosophical view.

1.4 Values

Regeneration

Leave the landscapes we work in in better ecological condition over the long term.

Stewardship

Land care is an ongoing responsibility, not a single intervention.

Scientific integrity

Measure results, question assumptions and publish findings accurately.

Reciprocity

Share knowledge and benefits with the communities who contribute to the work.

Accessibility

Soil education for everyone, not only commercial farms and research institutions.

Humility

Know the limits of what's known; learn from evidence, experience and the knowledge of place.

Intergenerational responsibility

Decide with the ecological inheritance of future generations in mind.

A

HORIZON A · TOPSOIL*Mineral soil darkened by humus, where most roots and most soil life are found.*

2 Living soil

Soil isn't inert dirt. Within a handful of living soil, minerals, carbon, water, microorganisms and organic matter meet in countless relationships that sustain life on land. Carbon is the thread that ties them together.

2.1 The carbon cycle: a fast loop and a slow lock

Plants draw carbon dioxide from the air and turn it into sugars, wood and roots. When leaves, prunings and mulch fall to the ground, soil life eats them, and most of that carbon is breathed back out within years. That's the fast loop, and it's what keeps soil alive. A smaller share is held for decades to centuries as humus bound to clay. Biochar adds a slow lock: wood heated with little oxygen, whose carbon is mostly in a form that soil life can barely break down.

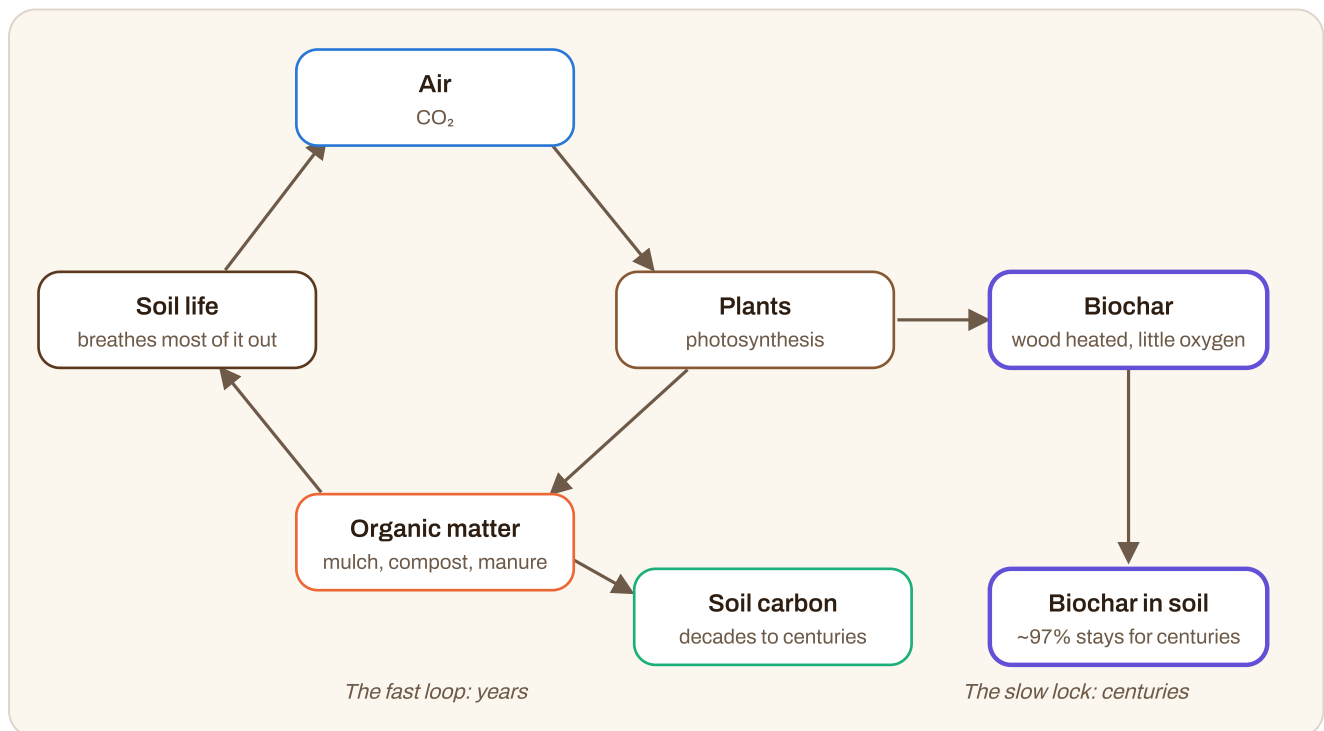


Figure 1. The carbon cycle in soil. Soil life returns most fresh carbon to the air within years; biochar's carbon persists for centuries.¹

2.2 What we feed it

Each thing we add to soil does a different job, and its carbon lasts a different time. None is right everywhere.

AMENDMENT	WHAT IT DOES	HOW LONG ITS CARBON LASTS	WATCH OUT FOR
Wood-chip mulch	Shades and cools the soil, holds water, feeds fungi as it breaks down	Mostly back to the air within about 5 years; about a tenth lingers in the soil for decades	Can lock up nitrogen at the surface for a while; keep it off stems
Compost	Adds nutrients and organic matter, and feeds soil life	Already partly decomposed, so longer than fresh residues, but it still turns over in years to decades	Quality depends on what went in; test bought compost for contaminants
Biochar	Holds water and nutrients, gives soil life a home, raises pH a little	About 97% persists, with a mean residence time of about 556 years	Charge it with nutrients first: raw char pulls nutrients from the soil
Manure	Nitrogen, phosphorus, potassium and organic matter	Like compost when composted; faster when fresh	Fresh manure can burn plants and carry weed seeds and pathogens
Lime, gypsum and rock minerals	Lime raises pH; gypsum improves sodic clays; rock dusts add slow minerals	Minerals, not organic carbon	Test first: they fix a measured problem, not a guess

Mulch figures from the RothC soil-carbon model; biochar from a meta-analysis of decomposition studies.^{1,2}

E

HORIZON E · THE LEACHED LAYER*Water moving down washes clay, iron and organic matter out of this layer, leaving it pale.*

3 What leaves, what stays

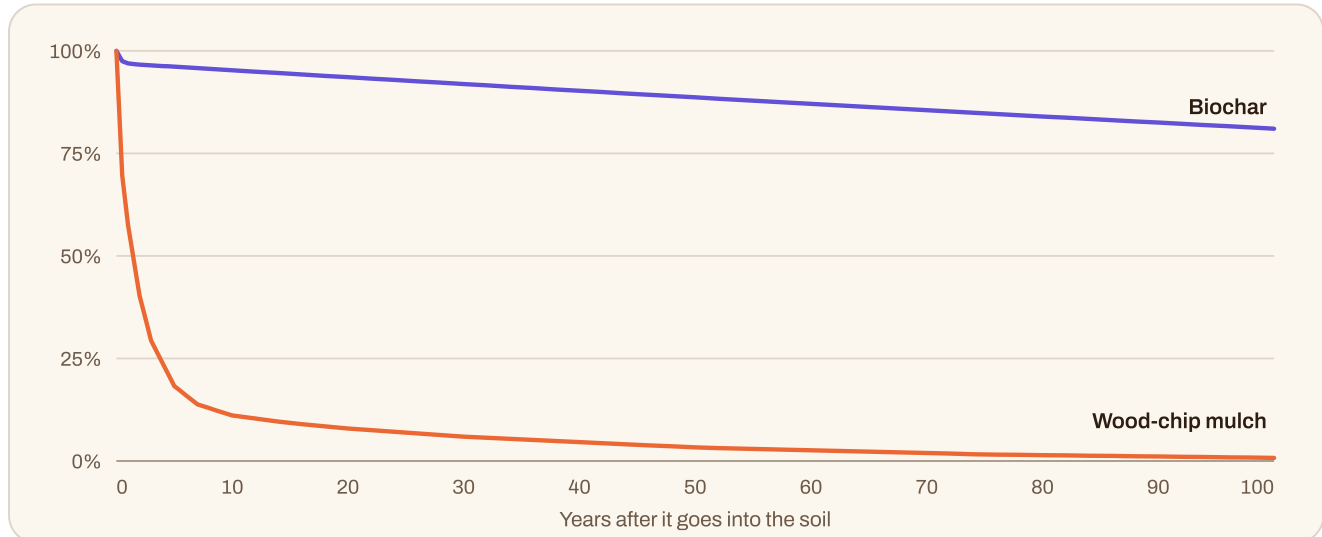
Most of the carbon we put into soil doesn't stay there. That isn't failure: it's how living soil works. But it changes what we can honestly say about building soil carbon.

3.1 Most carbon goes back to the air

Spread a tonne of wood-chip mulch and soil life gets to work at once. By the soil-carbon model RothC, run for a subtropical site at 20 °C, about half of the mulch layer is gone in a year and almost all of it within five. About a tenth of its carbon is held in the soil itself, peaking after three to five years and fading over the following century.² Biochar behaves differently. About 3% breaks down within months, and the other 97% has a mean residence time of about 556 years.¹

Figure 2. How much of the carbon is still there

— Biochar — Wood-chip mulch



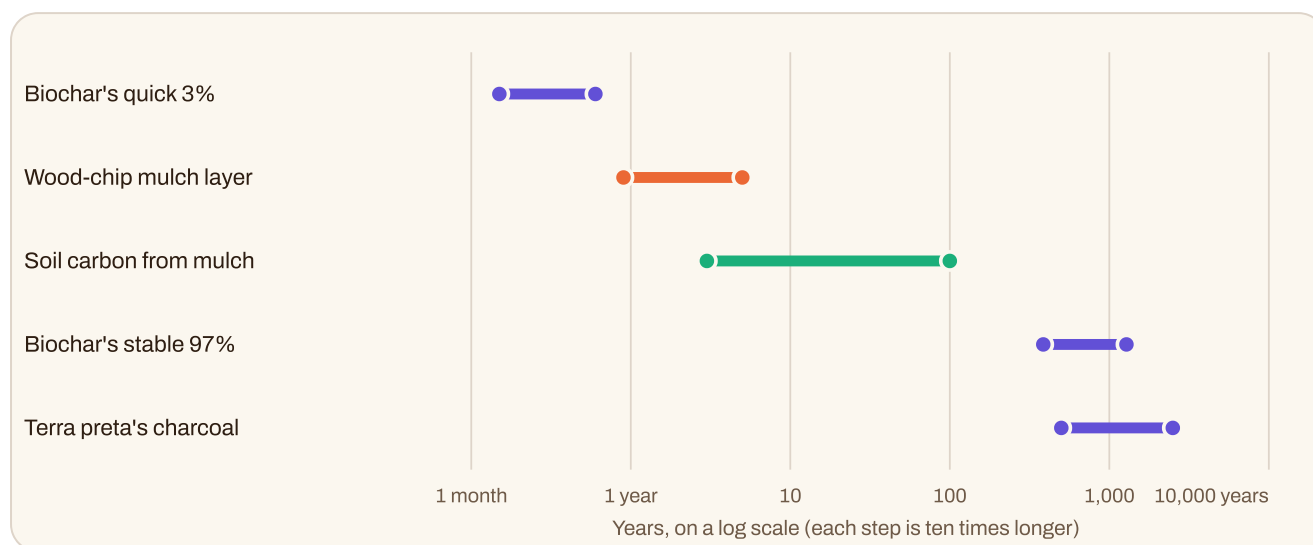
Biochar: 3% gone within months, 97% with a mean residence time of about 556 years.¹ Mulch: RothC at 20 °C and 25% clay, worked into the soil; mulch left on the surface probably keeps less.²

3.2 From months to millennia

Set side by side on a scale where each step is ten times longer than the last, the pools of soil carbon span from months to thousands of years.

Figure 3. How long each kind of carbon lasts in soil

— Mulch — Soil carbon — Biochar



Compost isn't on the chart: it's already partly decomposed, so it lasts longer than fresh mulch, but no single figure fits it.

3.3 A caution on carbon claims

Not all the carbon in biochar is automatically equivalent to verified, permanent removal of carbon from the atmosphere. Before Loamistry makes any quantified climate claim, it will need separate, defensible carbon accounting. Until then we describe what persists in soil, not what the climate gains.

B

HORIZON B · SUBSOIL

Where what washed down from above accumulates: clay, iron, aluminium and humus.

4 Terra preta: soil that accumulates

4.1 The black earth people made

Terra preta, Portuguese for "black earth", is the dark, fertile soil found in patches across the Amazon basin, where the natural soils are old, weathered and poor. People made it, roughly 500 to 2,500 years ago, and it's still fertile today.⁴

WHAT WENT INTO IT

- Charcoal from cooking fires and smouldering, low-oxygen burns
- Ash, bone and fish remains
- Food scraps and plant waste
- Human and animal waste
- Broken pottery

Up to 70×

more black (charcoal) carbon than the soils around it³

500–2,500 years

since it was made, and still fertile⁴

Self-renewing

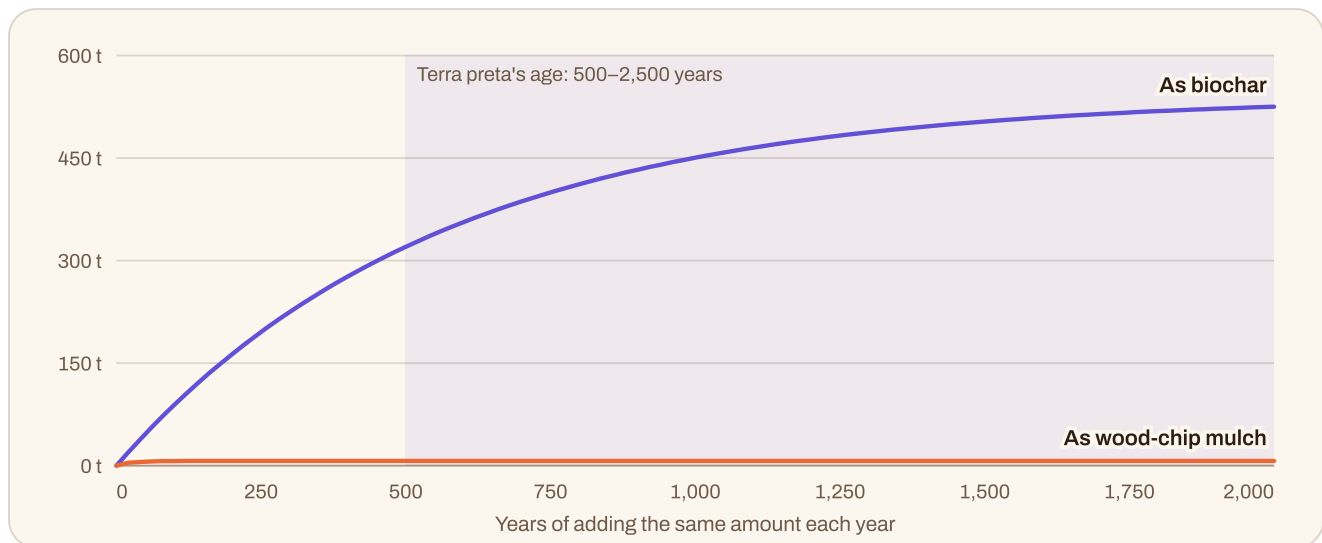
the charcoal holds nutrients and water and houses soil life, so the soil kept its fertility long after people stopped adding to it

4.2 Building soil over centuries

Charcoal is what made it last. Fresh organic matter feeds soil life and then mostly returns to the air within years; charcoal stays for centuries and keeps holding what the organic matter brings. So each year's biochar adds to the last. Add the same tonne of carbon every year as mulch and the soil's store levels off within decades. Add it as biochar and the store keeps building for centuries: the slow build that made terra preta.

Figure 4. Building soil carbon: one tonne of carbon added every year

— As biochar — As wood-chip mulch



Mulch levels off within decades at about 7.0 t, because it keeps returning to the air. Biochar keeps building for centuries, towards about 539 t. The same factors as Figure 2.

4.3 One tool, not a cure-all

Loamistry's terra preta-style amendment is the same old pairing: biochar with compost and mulch. But biochar is one tool within soil regeneration, not a universal solution, and how it's made and used matters as much as whether.

- **Charge it first.** Raw biochar pulls nutrients from the soil. Soaking or composting it with a nutrient source first lets it give instead of take.
- **Match it to the soil.** It raises pH a little, and what it does depends on the soil and the char: it doesn't help everywhere. NSW DPI's guide to when it works, and when it doesn't, is a good primer.⁶
- **Make it safely.** Fire, smoke, carbon monoxide, fine particles and contaminated feedstock are real risks. Production follows fire and environmental rules, with records for every batch.

C

HORIZON C · PARENT MATERIAL

Weathered rock and sediment, little touched by soil life: the material the soil above is made from.

5 The work

What Loamistry proposes to do, beginning with careful field research and growing only as capacity and evidence allow.

5.1 From soil to society

Our theory of change runs in four steps. It's a theory to investigate, not a promise: each step sits further from what we can measure directly. Better soil test results don't prove that food is more nutritious or people healthier.

01

Soil regeneration

Better structure, biology, organic matter, nutrient cycling and water infiltration

02

Ecological functioning

Stronger plant establishment, habitat and resilient vegetation

03

Resilient food systems

Agricultural resilience, nutrient efficiency, less erosion, productive perennials

04

Community wellbeing

Over time: food security, environmental quality and education

5.2 Five connected programs

All five are proposed, and meant to grow in order: research and biochar first, the observatory last.

I

The Living Soil Laboratory

Applied research and environmental monitoring

Soil baselines, field and lab assessments, and treatment comparisons at participating sites, with transparent field reports.

II Biochar Alchemy

Production, characterisation and practical research

Local feedstocks, production methods, quality records and soil measurements, with independent scientific guidance.

III The Soil Commons

Shared knowledge and public education

Sampling guides, test interpretation, biochar guidance, field protocols and open research summaries, while private and culturally restricted records stay protected.

IV The Stewardship Guild

Community participation and learning

Workshops, field days, biochar demonstrations and mentoring with qualified partners. Informal at first, not accredited training.

V The Living Soil Observatory

Long-term environmental intelligence

Soil trends alongside rainfall, temperature, vegetation and management records, grown through reliable protocols, not by piling up devices.

5.3 The Living Soil Pilot

Loamistry's first flagship project, proposed to begin at one consenting site and grow to three as capacity develops. Its question:

Under what conditions does locally produced biochar improve measurable soil properties and plant performance, compared with other appropriate soil management?

With a qualified soil scientist's input, a demonstration trial would compare four treatments side by side, in replicated, randomised plots under the same management:

1

Existing management

An untreated or locally appropriate control

2

Compost

Or another appropriate organic amendment

3

Prepared biochar

Defined feedstock, process and application rate

4

Biochar + compost

The combined, terra preta-style treatment

Each plot would be measured before treatment and at planned intervals, such as six and twelve months:

GROUP	EXAMPLE MEASUREMENTS
Chemical	pH, electrical conductivity, available nutrients, exchange characteristics
Carbon	Organic carbon concentration and, where justified, carbon stocks
Physical	Texture, bulk density, infiltration and aggregate stability
Biological	Selected biological indicators, where affordable and interpretable
Ecological	Ground cover, plant establishment and biodiversity indicators
Productivity	Growth, survival and harvest where applicable
Management	Biochar feedstock, production conditions, rates, methods and costs

Every biochar batch gets its own record: feedstock, date and method, process temperature where it can be measured, dry mass, lab quality results, how it was charged, and where and at what rate it went. The first public output would be **The Loamistry Living Soil Baseline Report, Volume I**: soil conditions, methods, first applications and the monitoring plan, published before we claim any restoration outcome.

5.4 Numbers that mean something

Soil tests only help if they're read well and taken the same way each time. The scale every other number depends on is pH.

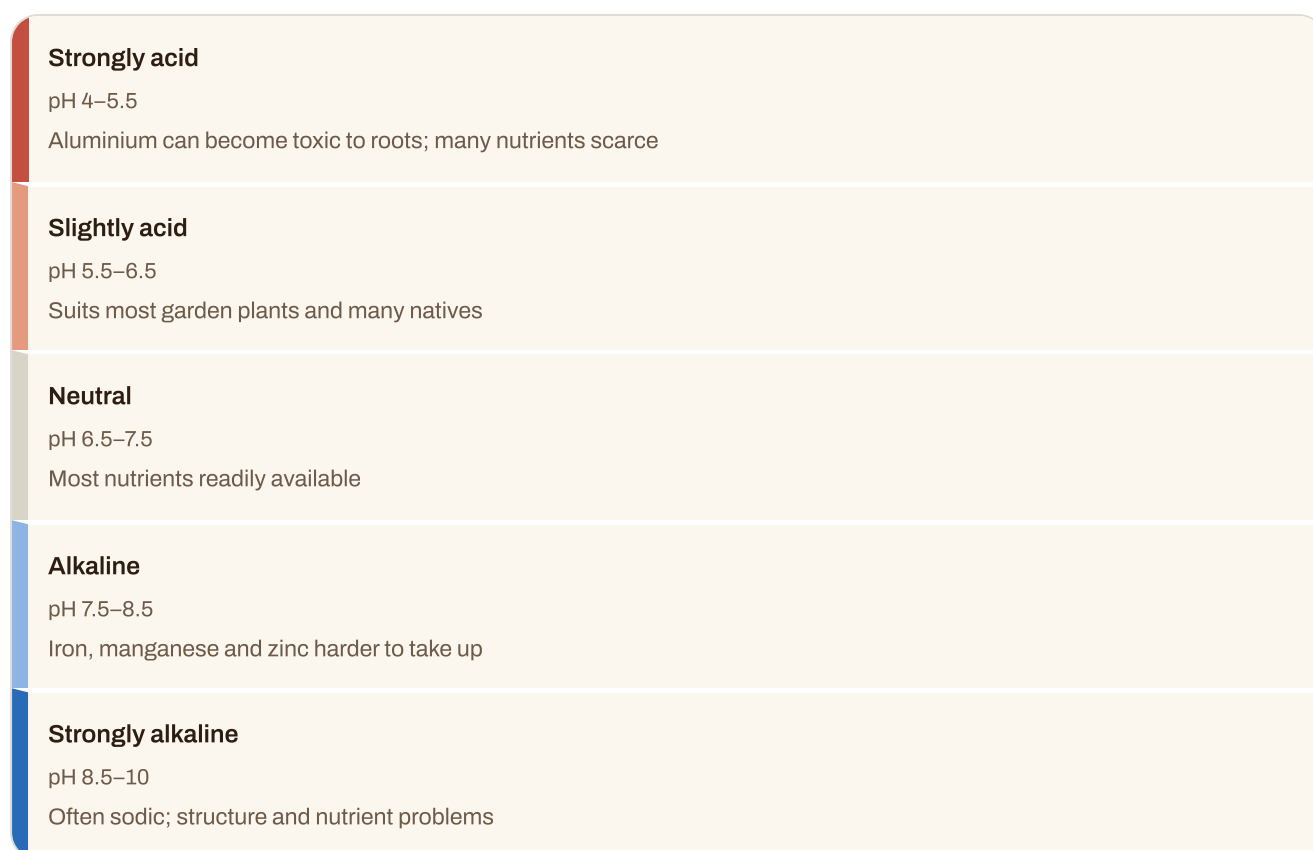


Figure 5. The pH scale for soil, measured in water. A calcium chloride test reads about half a unit lower.⁵

TEST	WHAT IT TELLS YOU	READING IT	HOW
pH	Acidity or alkalinity, which controls which nutrients plants can take up	Most garden plants do well around pH 6–7 in water	Lab test, or a field kit for a quick check
Electrical conductivity	Salt in the soil	Low is good; rising EC means salt building up	Lab test or EC meter
Organic carbon	How much organic matter the soil holds	Many Australian soils sit below 1–2%; watch the trend over years	Lab test
Nutrients	Nitrogen, phosphorus, potassium and others available now	Read against crop- and soil-specific ranges	Lab test
CEC	How many nutrients the soil can hold, like the size of a pantry	Sands low (under about 5); clays and organic soils high (over about 20 cmol/kg)	Lab test
Texture	Sand, silt and clay: drainage and water holding	Doesn't change; it's the context for every other number	Ribbon test by hand, or a jar test

TEST	WHAT IT TELLS YOU	READING IT	HOW
Infiltration and structure	How fast water soaks in, and how crumbly the soil is	Faster infiltration and stable crumbs mean healthier structure	Ring infiltration test; slake test
Soil life	A quick sign of biological activity	More earthworms per spadeful is generally better	Count worms in a spade-sized block

SAMPLING SO CHANGES ARE REAL

- 1 **Same spot, same season.** Sample at the same time each year, ideally before amending.
- 2 **A composite sample.** 10–20 small cores across the area in a zigzag, mixed into one.
- 3 **The same depth.** Usually 0–10 cm for surface soil; record it and keep it.
- 4 **The same lab and method.** Results from different labs or methods aren't directly comparable.
- 5 **Record everything.** Date, place, depth, cores, and what was applied and when.

General guidance only: read results against the soil- and crop-specific ranges in the standard interpretation manual, and ask the lab.⁵

5.5 Measuring impact

Credibility will come from showing benefits, not from counting biochar batches or workshop attendance. Our claims get more cautious the further they sit from direct measurement:

01 Activities and outputs

What we did: sites assessed, samples analysed, trials established, workshops run, reports published, batches documented.

02 Measured environmental outcomes

What changed: soil properties, infiltration, plant survival, ground cover and carbon trends, against controls.

03 Long-term contribution

What we hope to influence: ecological resilience, stronger stewardship, wider use of what works, better public understanding of soil.

R

HORIZON R · BEDROCK

The solid rock beneath it all, on which every layer above rests.

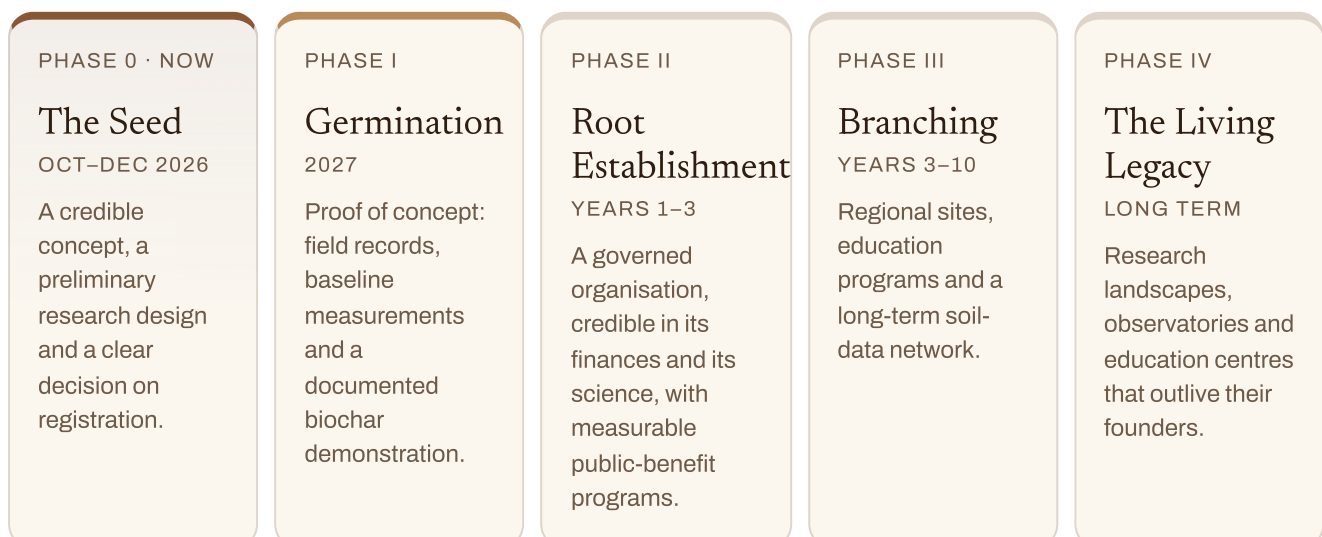
6 Bedrock

6.1 Principles

Measure what changes. Share what works. Learn from what doesn't.

- **Failures are findings.** A trial that shows no effect is a result to publish, not a failure to hide.
- **Evidence before claims.** Qualified advisers, controls, repeated measurements, accredited labs and transparent reports. Mystery can inspire inquiry; it's never a substitute for evidence.
- **Open, with care.** Research is shared openly. Personal details, private property records and culturally restricted knowledge are not, and communities keep control of knowledge that is theirs.
- **Public benefit, independently governed.** Loamistry would have its own independent board and its own money. Its findings are for everyone, and any work it pays for would be decided independently, at fair market rates, and recorded.
- **Grow only as fast as the foundations.** Begin with one narrow pilot, prove the method, build the governance, and branch out only when capacity is real.

6.2 A proposed path



Where things stand today, plainly:

MATTER	STATUS, OCTOBER 2026
Legal entity	Not yet established; Loamistry is a working name
Charity registration	Not yet applied for
Tax-deductible (DGR) status	A possible future goal
Governing board	Not yet formed; it will include independent members
Scientific adviser	Not yet appointed
Pilot site	Not yet confirmed
Funding	None; Loamistry is not accepting money

6.3 Learning in the open

Loamistry's two co-founders, Joel and Karthik, are studying soil science alongside the work, and sharing the journey as they go. Free courses and soil-test workshops come first; then a university soil unit each; then research skill built by doing, through the pilot, with a scientific mentor. The shared benchmark is the Soil Science Society of America's Fundamentals of Soil Science syllabus, and its two core textbooks are where we start: Weil and Brady's *The Nature and Properties of Soils* and its shorter companion, *Elements*.

6.4 Get involved

Loamistry isn't asking anyone for money. Until it's registered and can say exactly what a gift is for, it won't. What helps now is people:



Host a trial

If you steward land and would like baseline soil tests and a measured trial, tell us. Nothing starts without clear agreement on consent, data, access and how long monitoring lasts.



Advise or mentor

Soil scientists, agronomists and researchers: a qualified eye on the trial design is what makes the pilot credible. We'd value your challenge as much as your help.



Learn alongside us

Gardeners, growers and students: workshops and field days come later. For now, say hello, and tell us what you'd most like to learn about soil.

Write to us at info@loamistry.org.

Follow Loamistry on Instagram ([instagram.com/loamistry](https://www.instagram.com/loamistry)), Facebook ([facebook.com/Loamistry](https://www.facebook.com/Loamistry)) and LinkedIn ([linkedin.com/company/loamistry](https://www.linkedin.com/company/loamistry)).

6.5 Founding declaration

We believe that the flourishing of life begins beneath our feet.

Within every handful of living soil exists an extraordinary convergence of minerals, carbon, water, microorganisms, organic matter and countless relationships that sustain terrestrial ecosystems. These hidden foundations deserve our curiosity, care and stewardship.

We seek to transform our relationship with soil, from something overlooked or exploited into something understood, respected and responsibly stewarded.

We believe that meaningful regeneration begins with humility: observing the land, understanding its needs, testing our assumptions and remaining willing to learn. Our work is grounded in the conviction that scientific knowledge and a sense of wonder can coexist.

For the soil. For life. For generations.

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Loamistry is the working name of a proposed Australian environmental not-for-profit. It is not yet incorporated or registered as a charity, holds no DGR endorsement and does not accept donations. Every figure in this paper carries its source; estimates say so.

Loamistry acknowledges Indigenous peoples throughout the world, whose knowledge of the land and its soil has been built over countless generations of care. In Australia, we pay our respects to Aboriginal and Torres Strait Islander peoples, the Traditional Custodians of Country, and to their Elders past and present. Their relationship with the ground beneath their feet holds lessons we are still learning.



Loamistry · The Alchemy of Living Soil