AMAZON SOIL CARBON · POLICY BRIEF · 2026

Burned Amazonian forests hold significant soil carbon stocks — yet remain unrecognised by carbon credit programmes

Forest fires and agricultural conversion are depleting soil carbon across Amazonia. New experimental evidence from Mato Grosso in southern Amazonia shows that even repeatedly burned forests retain substantially more soil carbon than land converted to agriculture, yet this carbon pool has no financial protection under existing standards such as Verra's Verified Carbon Standard (VCS).

Author and contact: Prof. Ted Feldpausch, University of Exeter. Brief based on research from Naval, Feldpausch et al. (2025), Catena 254: 108924. · Mato Grosso, Brazil · Soil depth 0–30 cm · Last fire event 2010; soils sampled 2019.

Key terms. Carbon (C) — measured here as megagrams of carbon per hectare (Mg C ha^{-1}); one megagram is one tonne. **Verra / VCS** — Verra is the non-profit that runs the Verified Carbon Standard (VCS), the world's most widely used voluntary carbon-credit programme. **Reservas legais (legal reserves)** — the share of native forest that Brazilian law requires every rural property in the Amazon to keep standing.

AT A GLANCE · SOIL CARBON LOST AS FOREST BECOMES FARMLAND

Intact forest

Undisturbed legal reserve

50.5

Mg C ha^{-1}

Baseline

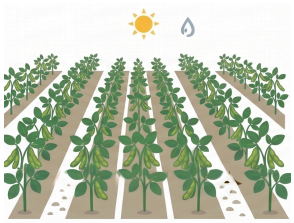
Burned forest

Repeatedly burned 2004–2010

~42

Mg C ha^{-1}

–16% to –19%



Cropland

Soybean rotation, no-till since 2008

31.4

Mg C ha^{-1}

–38%

Soil carbon in the top 30 cm. Burned forest still holds about 36% more soil carbon than cropland.

01 · SOIL CARBON STOCKS (0–30 CM DEPTH)

Agriculture removes twice as much soil carbon as repeated fire

Key findings

- Burned forest soil carbon is **36% higher** than agricultural land.
- Fire damage to the soil **persisted at least 9 years** after the last burn.
- Fire frequency did not significantly change how much soil carbon was lost.

LAND USE	SOIL CARBON STOCK	VS INTACT
Intact forest Undisturbed · legal reserve	Baseline	**Baseline** reference
Burned annually Forest · 2004–2010	–16%	**–16%** –8.0 Mg C ha^{-1}
Burned triennially Forest · 2004, 2007, 2010	–19%	**–19%** –9.7 Mg C ha^{-1}
Long-term agriculture Soybean rotation · no-till since 2008	–38%	**–38%** –19.1 Mg C ha^{-1}

Carbon stocks corrected by the equivalent soil mass method, with intact forest as the reference. Sampling: N = 11 points per forest site; n = 6 for agriculture.

02 · THE DEFORESTATION MULTIPLIER

Converting forest to agriculture destroys carbon equivalent to 115% of the original aboveground stock

Deforestation eliminates 100% of the aboveground biomass carbon, equivalent to one entire forest. It then triggers a further 38% loss of soil carbon. In total, the Amazon ecosystem loses carbon worth about 1.15× the original forest's aboveground pool.

INTACT FOREST

Aboveground carbon
~125 Mg C ha^{-1}

Soil carbon (0–30 cm)
50.5 Mg C ha^{-1}

Total: 175.5 Mg C ha^{-1}

→

AFTER DEFORESTATION & AGRICULTURE

Aboveground carbon lost
–125 Mg C ha^{-1} (–100%)

Soil carbon lost
–19.1 Mg C ha^{-1} (–38%)

Soil carbon remaining
31.4 Mg C ha^{-1}

Total lost: –144.1 Mg C ha^{-1}

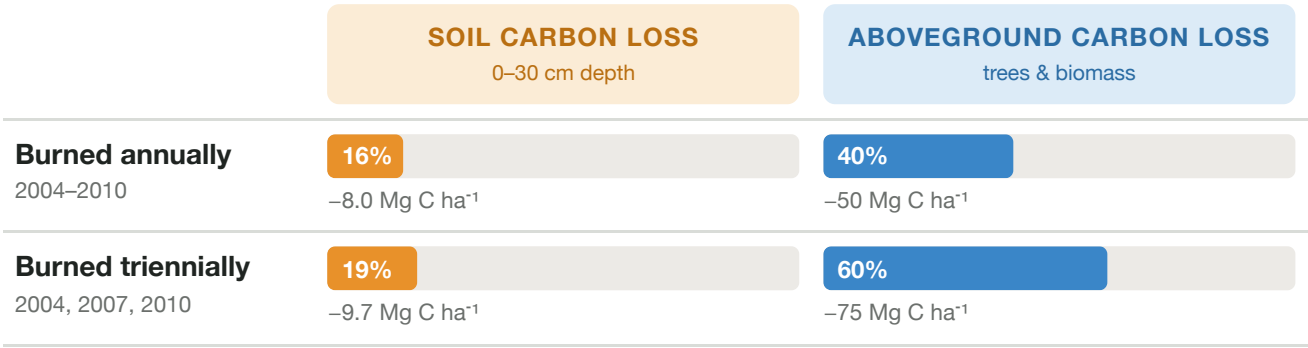
WHAT DOES THAT MEAN IN EVERYDAY TERMS?

Clearing **one hectare** of forest for agriculture releases about **528 tonnes of CO_2** — the same as roughly **190 return flights between São Paulo and London**. The soil carbon alone accounts for about **25 of those flights**.

03 · FIRE FREQUENCY EFFECT

Soil carbon is resilient to fire frequency — aboveground carbon is not

Annually and triennially burned forests showed statistically equivalent soil carbon loss. Yet aboveground carbon loss rose 50% with triennial burns, climbing from 40% to 60% of the original aboveground carbon. Soil and vegetation carbon dynamics are decoupled under fire.



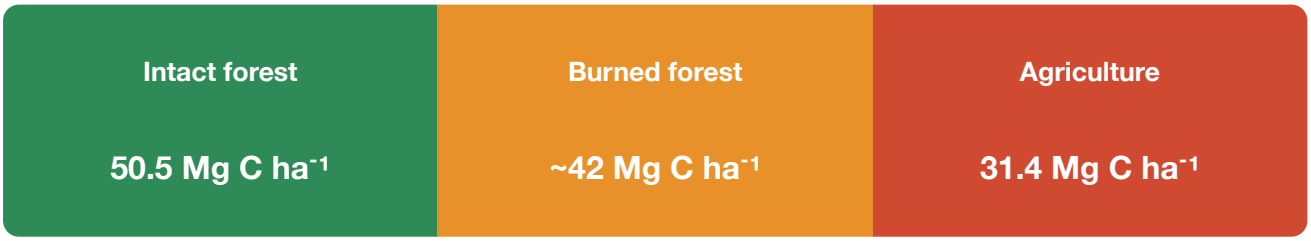
Soil carbon bars scaled to intact forest soil carbon (50.5 Mg C ha^{-1}); the difference between fire frequencies is not significant ($p > 0.05$). Aboveground carbon bars scaled to intact forest aboveground carbon (~125 Mg C ha^{-1}); source: Brando et al. (2019).

04 · THE POLICY GAP

Burned forests protect more carbon than agriculture, but receive no credit

Repeatedly burned Amazonian forests store approximately 36% more soil carbon than land converted to agriculture, and this pool persists for at least nine years after the last fire. Yet no existing soil carbon credit standard — including Verra's Verified Carbon Standard (VCS) or agribusiness sustainability certification schemes — recognises or compensates landowners for protecting degraded but carbon-rich forests within their legal reserves (*reservas legais*) or on private land. Without a financial incentive, burned forests face continued pressure for agricultural conversion.

SOIL CARBON GRADIENT ACROSS LAND-USE TYPES — NO CREDIT STANDARD EXISTS



A gradient-based soil carbon credit standard could cover all three land-use types — rewarding protection of intact forest most, but also recognising burned forests as a significant intermediate stock with far greater carbon value than agriculture.

CALL TO ACTION · FOR POLICYMAKERS AND CARBON STANDARD BODIES

Develop a soil carbon credit standard for the Amazon that recognises burned forests

Amazonian soils store approximately 70 Pg C in the upper metre. Providing financial protection for burned forests under a tiered soil carbon credit scheme would slow deforestation at the agricultural frontier, limit greenhouse gas emissions, and support the livelihoods of landowners maintaining degraded but carbon-rich forests.

01

Develop tiered soil carbon credits covering intact, burned, and agricultural land — with a Verra / VCS methodology tailored to the Amazon.

02

Invest in wildfire prediction, detection, and suppression infrastructure to protect the soil carbon stocks in Amazonia.

03

Halt agricultural expansion into burned legal reserves (*reservas legais*) — where soil carbon stocks are still 36% higher than on converted land.

Author and contact: *Prof. Ted Feldpausch, University of Exeter.*

Brief based on research from Naval, Feldpausch et al. (2025). Impacts of repeated forest fires and agriculture on soil organic matter and health in southern Amazonia. Catena 254: 108924. doi:10.1016/j.catena.2025.108924

Everyday-terms conversion uses carbon × 44/12 to obtain CO_2, and ~2.8 t CO_2 per economy passenger for a return São Paulo–London flight (~18,900 km).

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