



Mongabay Series: Global Forests

Dollars and chainsaws: Can timber production help fund global reforestation?

by Gianluca Cerullo on 5 January 2023

- As global reforestation commitments grow, how will companies, governments and communities pay to restore forest ecosystems and help sequester carbon over the long-term?
- One option: Grow and sell timber on the same plots of land where reforestation work is underway, as exemplified by pioneering restoration projects in Brazil's Atlantic Forest, where a single harvest of fast-growing eucalyptus

*grows up amid restored native trees.
Eucalyptus sales then help pay for
long-term restoration.*

- *Another approach is to concurrently grow tree plantations and forest restorations on separate, often adjacent, plots of land, with a large portion of the profits from timber harvests going to support the long-term management of the reforestation projects.*
- *But some scientists and forest advocates worry that projects or businesses that become overreliant on timber revenues to finance restoration could undermine an initiative's environmental benefits, and lock in unintended harvesting within native ecosystems. Experts ask: Can we truly pay for new trees by cutting others down?*

Pedro Brancalion is used to the roar of chainsaws. For years, he's heard loggers tearing down rainforest giants in the Brazilian Amazon, and listened as ancient trees were toppled and yanked from the Atlantic Forest's remaining fragments. But this time the *rip-roar* of machinery and *thwack* of falling trees means something very different.

This time, instead of chainsaws sounding a rainforest's demise, they provide the soundtrack to its rebirth.

Brancalion's restoration project on Brazil's Atlantic coast is reviving lost rainforest, with a twist. Like other ecological restoration efforts, his work involves the planting of thousands of tree seedlings of dozens of native species in a plan to resuscitate a dwindling ecosystem. But there's a big difference here: Along with every few native plantings, his team sinks a surprise into the ground: Eucalypts.

These represent an exotic group of tree

species, mostly originating from Australia. In Brazil, they're usually confined to the monocrop plantations that stretch homogenously to the horizon, rather than here, on land slated for reforestation.

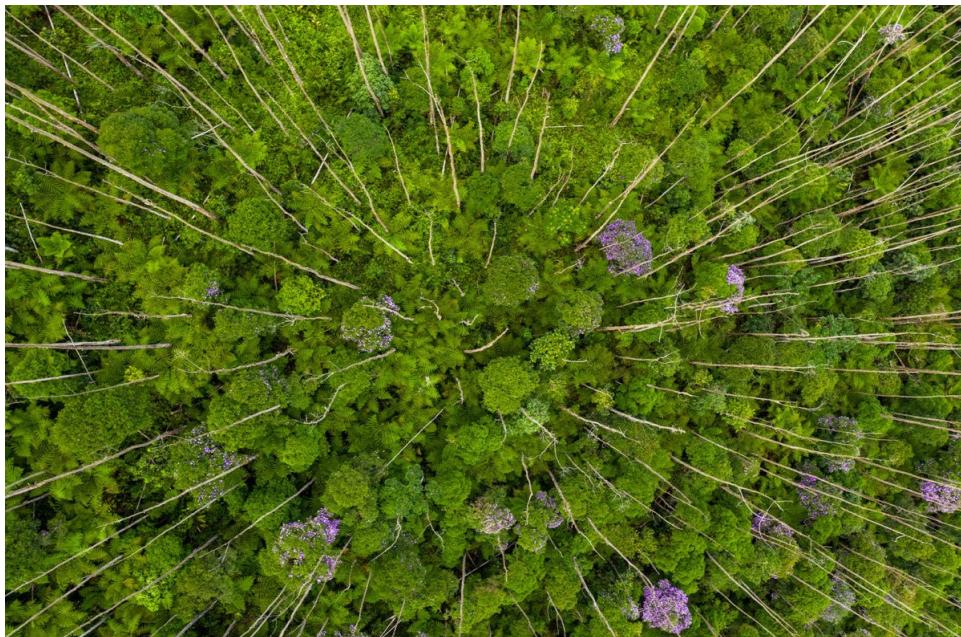
But after five years, the result is a spectacular juxtaposition that holds promise for the future of forests. Tall, thin, harvest-ready eucalypts, primed for a commercial timber harvest, overtop the chaotic ecology of a regrowing, floristically diverse rainforest.

When Brancalion's team chainsaws down these non-native sentinels and sells their wood as timber, they recoup up to 75% of the costs of regenerating the rainforest. And, according to recent research

(<https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.13513>), they do so without inhibiting the regeneration of the complex understory — the rainforest of the future — as it grows skyward below.



A landscape containing native forest in the process of natural regeneration in the understory of a eucalyptus plantation. The project is located in Parque das Neblinas in Brazil's São Paulo state, in the Atlantic Forest biome, and demonstrates the potential of using natural regeneration beneath intercropped harvestable eucalyptus trees to form new forests. Image courtesy of Paulo Guilherme Molin/Federal University of São Carlos.



Native regeneration under 50% dead standing eucalyptus trees in Brazil's Atlantic Forest. Image courtesy of Paulo Guilherme Molin/Federal University of São Carlos.

Plugging the reforestation funding shortfall

As massive-scale tree-planting and restoration commitments ramp up globally, restoration practitioners, governments and scientists are increasingly grappling with the same problem Brancalion's project aims to tackle: In a world of seemingly shallow pockets, how does humanity pay for the mass reforestation (<https://www.sciencedirect.com/science/article/abs/pii/S1389934116304580>) needed to address our biodiversity and climate crises? So far, the long-term finance sources needed to bankroll what the United Nations has dubbed the "Decade on Ecosystem Restoration" (<https://www.decadeonrestoration.org/>) have remained elusive, outshone by the sparkle and glitz of tree-planting promises. But while it takes just hours to chop a forest down, and mere days to replant one, it can take decades for those seedlings to grow to

adulthood. So long-term restoration goals need long-term funding.

That financing is likely vital to projects like the U.N.'s 10 pioneering restoration initiatives (<https://www.unep.org/news-and-stories/press-release/un-recognizes-10-pioneering-initiatives-are-restoring-natural-world>) recognized at the COP15 biodiversity summit in December 2022, which includes the U.N. Trinational Atlantic Forest (<https://www.decadeonrestoration.org/stories/un-recognizes-effort-restore-south-americas-atlantic-forest-special-award>) restoration target to recover 1 million hectares (2.5 million acres) by 2030 and 15 million hectares (37 million acres) by 2050 — an ambitious goal that won't come cheap.

Brancalion offers a common sense financing solution: "People have destroyed native ecosystems to make money, and they should also make money when restoring an ecosystem," he says.

He suggests that while there are many potential funding sources for forest restoration, two stand out for their potential to go big: "The most viable options in my perspective are the generation of carbon credits and timber production."

To date, carbon credits — a scheme that allows carbon polluters in one locale to offset their emissions by buying up the carbon drawn down by ecosystem conservation and restoration projects elsewhere — have largely fallen short of expectations. Analysts say that's mostly because they've failed so far to fetch the kinds of prices needed to finance wide-scale restoration.

In the meantime, while waiting for carbon credits to become more viable, Brancalion is pursuing that other solution. He believes that timber production could act as a critical funding stream for reforestation, as it's doing

in his own pioneering Atlantic Forest project.

Timber is particularly attractive as a funding source, he says, because of the high revenues it generates, and the opportunity to create jobs locally and all along the wood supply chain.



A restoration practitioner plants native tree species within a tree plantation in Yangambi, Democratic Republic of Congo. Experts say that timber produced in tree plantations could offer an important source of revenue for restoration projects, and may in some cases reduce harvesting pressure within remaining natural forests. Image by Alex Fassio/CIFOR-ICRAF via Flickr (CC BY-NC-ND 2.0).

The Re.green example

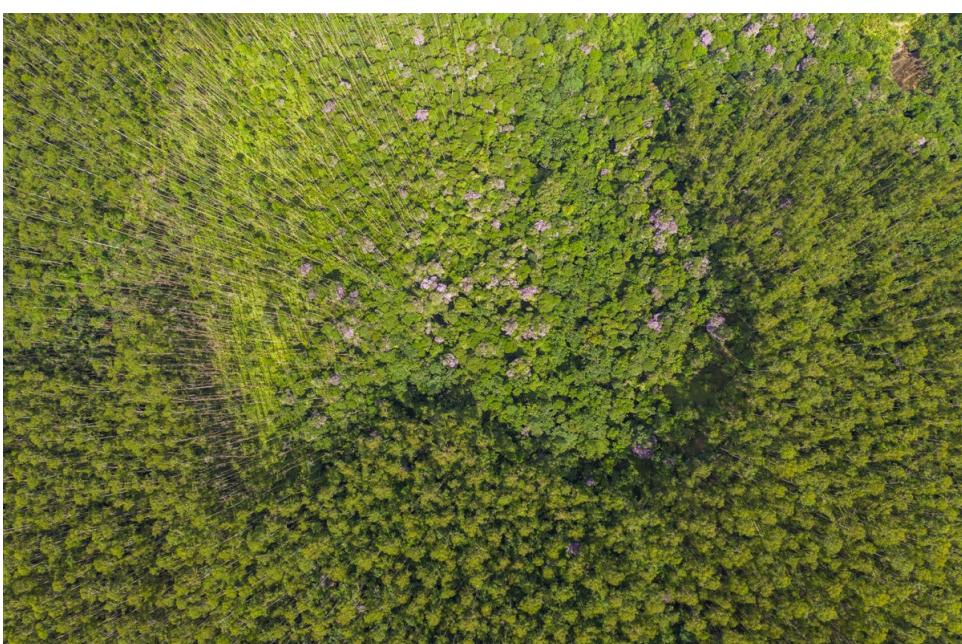
While the timber-native ecosystem interplanting reforestation technique has yet to go large scale, eucalypt companies have already demonstrated proof of concept by using Brancalion's interplanting system to restore more than 500 hectares (1,200 acres) of Brazilian Atlantic Forest.

But it's not only timber companies that are supporting interplanting timber trees to fund restoration. Fernando Gardon, a researcher with Brazilian restoration company Re.green (<https://www.re.green/what>), also believes wood production can be a vital ally to

restoration.

Rather than relying on fast-growing eucalypts, Re.green plans to use a mixture of carbon credits and the harvesting of native hardwood species to pay for the regeneration of a nearly Qatar-sized area covering a million hectares of degraded pastures in the Brazilian Amazon and Atlantic Forest biomes.

To achieve this goal, Gardon says Re.green will plant native tree species valued for their wood, including monkeypot (*Cariniana legalis*), West Indian locust (*Hymenaea courbaril*) and *afata* (*Cordia trichotoma*) — all grown alongside a wider pool of native plants. Then, in 15 to 30 years' time, depending on how fast the timber trees grow, Re.green will carry out a single harvest of these species and sell the wood, leaving the land and native growth to regenerate in perpetuity thereafter.



An aerial view of a restored landscape containing native forest regenerating in the understory of a eucalyptus plantation (south of the image), regeneration under dead standing eucalyptus trees (center-west), regeneration under 50% dead standing eucalyptus trees (center-east) and regeneration with complete removal of eucalyptus (center). The area is located in Parque das Neblinas in São Paulo state, Brazil, and offers an example of how interplanting valuable timber species among regenerating forest might offer a way of funding ongoing restoration efforts. Image courtesy of Paulo Guilherme Molin.

According to the company website(<https://www.re.green> /what), this timber will be processed in company-owned sawmills and then sold to high-end consumers in domestic and foreign markets.

"Thus, the planting of timber helps both in financing the restoration and in improving environmental quality for natural regeneration, as it provides a much more favorable environment for natural regeneration than ... degraded pasture, for example," Gardon says. Viewed through an economist's lens, at least, combining forest restoration and wood production does seem to make sense. Earning money from timber is a time-proven business model replicated the world over, and will continue to be in the future, with humanity's wood demand set to grow by as much as 30% (<https://www.sciencedirect.com/science/article/pii/S000632071732075X>) by 2050. But can a new era of ecosystem restoration truly be financed by one of humanity's oldest tree-clearing behaviors? Can we pay for new trees by cutting others down?



Chainsaws for sale at a market in southeast Nigeria's Cross River state — a landscape facing increased threats from illegal logging. Proponents of using timber production to fund restoration underscore that harvesting timber from purpose-grown commercial trees raised within restoration projects is an ecologically sound management practice, and very

different from simply sourcing wood from native rainforest ecosystems, which harms biodiversity. Image by Gianluca Cerullo.

Assessing a tree's environmental and financial worth

One study recently published

(https://www.science.org/doi/10.1126/science.abl4649?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%20pubmed) in the journal *Science* compares the environmental benefits of different restoration approaches worldwide, from regrowing native forests, to investing in short-rotation single-species timber plantations.

On almost all counts, native forests win out, hands down. They're better for wildlife, better for soils, better for water conservation, and better for storing carbon. And for local traditional people relying on ecosystems and the environmental services they provide, the message is clear: A tree plantation is not a forest.

But on one resource metric — economics — timber plantations buck the trend, outperforming even natural woodland. Timber plantations (and the neat rows of monoculture commercial trees that grow within them) produce more timber and more money.

"I think a key point coming out of our assessment is that there [are] trade-offs between environmental and production goals in forest restoration, and to hope that [forest] restoration delivers on all goals would likely be wishful thinking," says Fangyuan Hua, the study's lead author. But Hua views the hyperproductivity of commercial trees — grown for their wood — as a double-edged

sword when that model is used to meet national reforestation commitments.

There are, Hua notes, already warning signs (<https://www.nature.com/articles/d41586-019-01026-8>) that timber plantation profiteering schemes could hijack the global reforestation agenda. Many countries are banking on old habits (<https://news.mongabay.com/2021/09/should-tree-plantations-count-toward-reforestation-goals-its-complicated/>) of planting timber monocultures and calling them forests in order to shortcut their reforestation and restoration commitments under the Paris climate accord (<https://unfccc.int/topics/land-use/workstreams/land-use--land-use-change-and-forestry-lulucf/lulucf-afforestation-and-reforestation>) and the Convention on Biological Diversity (<https://www.cbd.int/>) (a treaty whose 190 national signatories again just pledged themselves this past December at COP15 in Montreal (<https://www.nytimes.com/2022/12/19/climate/biodiversity-cop15-montreal-30x30.html>) to the goal of preserving 30% of the world's natural lands and waters by 2030).

"Personally, I do not see plantations as true 'forests' and I do not think counting them toward forest restoration acreage is meaningful," Hua says.

However, if the large profits from wood production can be redirected toward the higher cause of repairing nature, Hua says, then hybrid techniques like the one being demonstrated by Brancalion could prove an integral source of largely untapped restoration finance.



Farmers in Odisha, India, plant eucalypt seedlings. Fast-growing commercial timber trees, including many species of Eucalyptus, are a mainstay of timber plantations in the tropics. Experts say such species, grown either among or alongside regenerating native species, could play a significant role in plugging restoration funding shortfalls. However, experts also say that paying close attention to power and land rights is key to ensuring that local people benefit from restoration, as historically many timber-focused plantings have failed to achieve social benefits. Image by the World Agroforestry Centre/Ashok Sahoo via Flickr (CC BY-NC-ND 2.0).

Striking a bargain between natural forests and tree plantations

Hua foresees two clear avenues for how wood production can help restore native ecosystems: "One [option] is using revenue from timber production to fund — and even facilitate — subsequent restoration on the same plot of land," she told Mongabay.

This approach, Hua says, is showcased by Brancalion's project, where the income from cutting down intercropped eucalypts helps offset subsequent restoration costs, without getting in the way of forest recovery.

Another option for simultaneously getting wood and woodlands, says Hua, is to achieve

the goals of timber production and forest restoration on different parcels of land. Then, having focused on creating high-yield, high-profit timber plantations on designated timberlands, governments or restoration companies can refunnel a large portion of their timber profits back into restoring native ecosystems located on different parcels. Such an approach, involving landscape-level coordination across competing land uses, is currently rare. So Hua suggests that active mechanisms and monitoring be put in place to ensure the money made from wood harvesting really flows into recovering nature.

Forrest Fleischman, who researches forest and environmental policy at the University of Minnesota, cautions that policymakers managing coupled timber-native forest projects would need to consider who would benefit from a restoration. "Unfortunately, in most of the world, inequalities in land-owning and decision-making power are large. So frequently, the people who bear the costs of reforestation (losing livelihoods in agriculture or pastoral activities), are not the same as those who benefit (e.g., firms profiting from timber harvests many years in the future)," he told Mongabay.

Whichever ways managers try to reconcile restoration and timber production goals, both Gardon and Hua agree that a significant secondary benefit of any restoration-derived wood production is that it can help reduce logging pressure on remaining natural forests. Currently timber harvesting of natural lands is a leading driver of species extinction risk, particularly in tropical nations in the developing world.

But there are also dangers of becoming overreliant on timber as a financial driver of restoration. "The risk of any single source of funding for environmental good is it could be

unstable" over time, Hua says. "Particularly for a funding source that's tied to profitable land use, as timber production is, there is the added risk of perverse incentives."

Already in many countries, timber production is intrinsically linked to harmful overharvesting of natural ecosystems, corrupt land deals and contract handouts, and boom-and-bust profit cycles that put timber barons before workers or communities.



An elephant roams through a recently cleared eucalyptus plantation in northern Borneo. Monocrop timber plantations should not count toward reforestation commitments, many scientists say. However, the profits made from growing commercial trees — either within purpose-grown plantations or when integrated inside reforestation projects — could be a key source of funding for meeting large-scale reforestation promises worldwide. Image courtesy of Daniel Kong.

The dangers of overreliance on timber profits

When it comes to timber production, money figuratively does grow on trees. But it's never as simple as plucking banknotes apple-like from branch tips.

For companies and communities alike, investing in future timber rewards can be a

highly speculative enterprise, involving large upfront costs with outcomes taking years to materialize. And there's always the risk that people's timber investments can be destroyed before harvest by fires, pests, illegal logging, extreme climate events, or improper management practices.

Add to that the ecological costs of producing wood. These vary depending on how harvesting and reforestation are carried out, and on which timber species are planted where. Fast-growing exotic species planted in inappropriate places (<https://www.nature.com/articles/s41893-022-00904-w>) — eucalypts placed in natural grasslands or drylands, for example — can suck up large amounts of groundwater, increase the risk of fires, and create edge effects that sometimes penetrate hundreds of meters (<https://www.sciencedirect.com/science/article/pii/S0378112722002717>) into native forest, ultimately disrupting natural ecosystems.

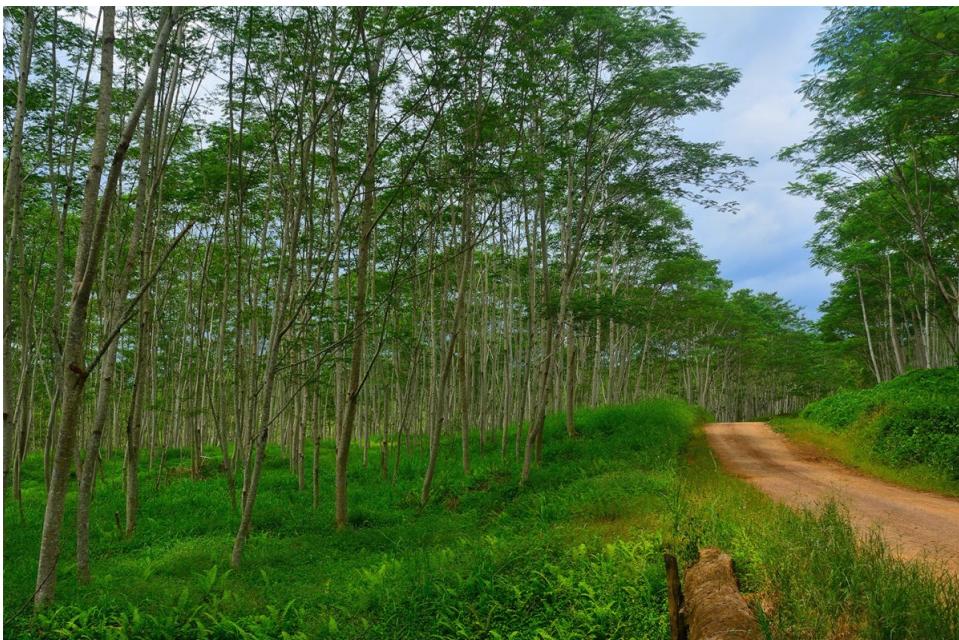
Certain commercial tree species also risk going rogue and invading adjacent natural habitats, undercutting biodiversity, as has happened (<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0072>) with acacia species overrunning fragments of the Atlantic Forest.

However, perhaps the biggest irony at the heart of using wood to pay for reforestation is that in many cases it may mean that people end up aggressively logging within the very systems they're seeking to restore.

This isn't necessarily a problem where timber harvesting and restoration activities are on separate blocks of land, or where the harvesting itself doesn't damage regeneration in the remaining forest.

Responsible harvesters can employ a variety of best practices to reduce the damage of timber

extraction in restored areas. Restoration company Re.green, for instance, intends to use directional felling to reduce the crushing of non-target vegetation when cutting down trees selected as timber within planted areas, according to Gardon.



*An exotic, industrial tree plantation in northern Borneo.
Image courtesy of Daniel Kong.*

By contrast, the logging of secondary forests that are naturally regrowing on former agricultural lands or pastures could further imperil already threatened biodiversity, especially in regions lacking primary forest cover, says conservation biologist Filipe França from the University of Bristol, U.K. "Our long-term ecological research project in Amazonia ... monitors forest plots within two regions where secondary forests are the last refugia ... the last hope to maintain forest-associated [native] species," França tells Mongabay. "I would expect that logging [these] secondary forests poses a risk for biodiversity."

In the end, experts largely agree that everything comes down to responsible management. Brancalion emphasizes the importance of distinguishing between logging

trees growing naturally in wild ecosystems and those that were intentionally planted with the express intention of future harvests. "Whereas harvesting native trees in a forest fragment is usually part of a process of converting a native ecosystem into an anthropogenic land use, harvesting planted trees can be part of the opposite process, of reconverting an anthropogenic land use into a native ecosystem," he explains.

But even forest restoration-oriented harvests, while managed well in the present, could pose unforeseen risks to native ecosystems in the future if governments or reforestation companies build, and then need to feed, expensive wood-hungry sawmills in an ongoing way.

Building expensive timber-processing infrastructure in an area poses a risk of locking in overharvesting of regenerating forests far into the future — or, worse still, promoting logging within native forests not originally threatened by extraction.

"This risk may be avoidable if the long-term sustainability of wood production is considered up front, but this is not always done," says Fleischman. "Many countries heavily subsidize the construction of wood-processing facilities to foster an industry without considering the long-term sustainability of those investments."



A species of dung beetle, *Coprophanaeus lancifer*, found in the Brazilian Amazon. Recent research has shown that forest-dwelling beetles are vulnerable to edge effects caused by exotic plantations, even when living deep in primary forest habitat. Researchers also warn that harvesting of timber within secondary forests regenerating naturally on former cattle ranches or cropland could compromise biodiversity, especially in areas with low primary forest cover. Image courtesy of Filipe França.

There are no wooden bullets

Some people will doubtless feel uncomfortable with plans to rely on old-style methods of tree harvesting to fund a new generation of restoration. For sure, just as restoration itself is not a "silver bullet

(<https://www.sciencedirect.com/science/article/pii/S259033222003232>) for solving the biodiversity and climate crises, there are no "wooden bullets" for funding reforestation. Wood production is just one in a portfolio of options available for financing restoration efforts, and it won't always be the best one, with each project needing to be assessed on a case-by-case basis.

According to Fleischman, deciding whether or not a restoration project should include commercial timber production involves a

complicated set of trade-offs, all of which should be considered carefully in advance at the site level to understand the implications. And every restoration process should also have at its heart the participation of local people, Fleischman adds — a prerequisite that many reforestation projects, with their typical top-down management structures, fail to uphold.

He points to the example of Chile (<https://link.springer.com/article/10.1007/s00267-015-0594-x>), where consolidated land ownership by large entities means that the people who benefit from timber production are big landowners rather than local people, and to his own research (<https://india.mongabay.com/2022/05/wrong-trees-in-wrong-places-wastes-tree-plantation-budget-finds-study/>) in northern India showing that there can be limited benefits of tree planting to local people.

More generally, Fleischman believes that restoration will only happen when the people involved value forests.

"Timber production is one of the most important and easily monetizable values humans have in forests, so it is likely that timber production will play a central role in global forest restoration," he says. "But that does carry some risks and we can manage those by paying attention to power and rights."

For Brancalion, land, not trees, is at the crux of the forest problem, with land being the scarcest resource available for restoration. As a result, he says, we need to find varied ways to transform restoration into an economically competitive land use that can overcome the profitability of more degrading activities. "In this context, well-established commercial trees, exotic or native, may play an important role in leveraging investments in restoration."

Gianluca Cerullo is currently a Ph.D. student at the University of Cambridge, where part of his research focuses on reforestation and the impacts of tree plantation expansion across Brazilian biomes.

Banner image: Project participants planting native species seedlings in the Itapu Restoration Trail, as part of Brazil's effort to help meet the world's ambitious restoration commitments made under the Bonn Challenge. The ongoing management of such projects requires long-term financing. Image by Raquel Maia Arvelos/CIFOR via Flickr (<https://www.flickr.com/photos/cifor/40333737714/>) (CC BY-NC-ND 2.0 (<https://creativecommons.org/licenses/by-nc-nd/2.0/>)).

Citations:

- Brancalion, P. H. S., Amazonas, N. T., Chazdon, R. L., van Melis, J., Rodrigues, R. R., Silva, C. C., ... Holl, K. D. (2020). Exotic eucalypts: From demonized trees to allies of tropical forest restoration? *Journal of Applied Ecology*, 57(1), 55-66. doi:10.1111/1365-2664.13513 (<https://doi.org/10.1111/1365-2664.13513>)
- Brancalion, P. H. S., Lamb, D., Ceccon, E., Boucher, D., Herbohn, J., Strassburg, B., & Edwards, D. P. (2017). Using markets to leverage investment in forest and landscape restoration in the tropics. *Forest Policy and Economics*, 85, 103-113. doi:10.1016/j.forpol.2017.08.009 (<https://doi.org/10.1016/j.forpol.2017.08.009>)
- Kok, M. T., Alkemade, R., Bakkenes, M., van Eerdt, M., Janse, J., Mandryk, M., ... Van Vuuren, D. P. (2018). Pathways for agriculture and forestry to contribute to terrestrial biodiversity conservation: A global scenario-study. *Biological Conservation*, 221, 137-150. doi:10.1016/j.biocon.2018.03.003 (<https://doi.org/10.1016/j.biocon.2018.03.003>)
- Hua, F., Bruijnzeel, L. A., Meli, P., Martin, P.

- A., Zhang, J., Nakagawa, S., ... Balmford, A. (2022). The biodiversity and ecosystem service contributions and trade-offs of forest restoration approaches. *Science*, 376, 839-844. doi:10.1126/science.abl4649 (<https://doi.org/10.1126/science.abl4649>)
- Lewis, S. L., Wheeler, C. E., Mitchard, E. T. A., & Koch, A. (2019). Restoring natural forests is the best way to remove atmospheric carbon. *Nature*, 568(7750), 25-28. doi:10.1038/d41586-019-01026-8 (<https://doi.org/10.1038/d41586-019-01026-8>)
- Fagan, M. E., Kim, D.-H., Settle, W., Ferry, L., Drew, J., Carlson, H., ... Ordway, E.M. (2022). The expansion of tree plantations across tropical biomes. *Nature Sustainability*, 5(8), 681-688. doi:10.1038/s41893-022-00904-w (<https://doi.org/10.1038/s41893-022-00904-w>)
- Costa, M. K. S., França, F. M., Brocardo, C. R., & Fadini, R. F. (2022). Edge effects from exotic tree plantations and environmental context drive dung beetle assemblages within Amazonian undisturbed forests. *Forest Ecology and Management*, 520, 120277. doi:10.1016/j.foreco.2022.120277 (<https://doi.org/10.1016/j.foreco.2022.120277>)
- Matos, F. A. R., Edwards, D. P., S. Magnago, L. F., Heringer, G., Viana Neri, A., Buttschardt, T., ... A. Meira-Neto, J. A. (2023). Invasive alien acacias rapidly stock carbon, but threaten biodiversity recovery in young second-growth forests. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 378(1867), 20210072. doi:10.1098/rstb.2021.0072 (<https://doi.org/10.1098/rstb.2021.0072>)
- Dooley, K., Nicholls, Z., & Meinshausen, M. (2022). Carbon removals from nature restoration are no substitute for steep emission reductions. *One Earth*, 5(7), 812-824. doi:10.1016/j.oneear.2022.06.002 (<https://doi.org/10.1016/j.oneear.2022.06.002>)
- Andersson, K., Lawrence, D., Zavaleta, J., &

- Guariguata, M. R. (2015). More trees, more poverty? The socioeconomic effects of tree plantations in Chile, 2001–2011. *Environmental Management*, 57(1), 123-136.
doi:10.1007/s00267-015-0594-x (<https://doi.org/10.1007/s00267-015-0594-x>)
- Rana, P., Fleischman, F., Ramprasad, V., & Lee, K. (2022). Predicting wasteful spending in tree planting programs in Indian Himalaya. *World Development*, 154, 105864.
doi:10.1016/j.worlddev.2022.105864
(<https://doi.org/10.1016/j.worlddev.2022.105864>)

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