

Can Planting a Trillion New Trees Save the World?

To fight climate change, companies and nonprofits have been promoting worldwide planting campaigns. Getting to a trillion is easier said than done.

By Zach St. George

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On a hot morning in April, near the start of Brazil's dry season, four women and two men walked single file across a sodden field at the edge of Engenho, a village in the northern part of Goiás State. They wore long sleeves and wide-brimmed hats to protect against the sun, and leather gaiters and gloves to protect against snakes. In a plastic tub, they carried an entire forest.

The women and men who made up this team of tree planters were all Kalunga, descendants of enslaved people who centuries ago fled into the Brazilian *cerrado*, the vast region of grasslands, savannas and open woodlands that covers much of the country's southern half. Nestled amid Goiás's forbidding mesas, Kalunga villages remained largely isolated from the outside world until the 1980s. Anthropologists arrived first, then teachers. The planting team's leader, Damião Santos, a trim, meditative man of 37 years, remembers when the first tourists showed up, attracted by nearby waterfalls. More and more, clay tiles and brick were used as building materials in place of the traditional spars and fronds of the buriti palm. Electricity came to the village. Then, a year ago, an organization appeared in the region, offering trees.

In the middle of the field, Santos stopped and pointed. There, nestled between tufts of grass, were three trees. They were several inches high and had two leaves each. Trees of similar size and shape were all around, Santos said. This wasn't really a field; it was a forest. As we walked, I tried to avoid crushing it.

Finally, we reached a part of the field that was still a field. The planters dropped their packs and set to work. With a small, one-handed hoe, a planter opened a hole in the wet earth, which parted with a squelch. A second planter took one of the trees — some of which had leaves and roots and were the height of a half-used pencil, others of which were the size and shape of a marble — and tucked it into the hole. Each tree, situated about a pace away from its neighboring trees, took less than a minute to put in the ground. Santos said that over the last three weeks, the team had planted some 30,000 trees.

The group behind this effort, the California-based Eden Reforestation Projects, had hired Santos and the other villagers to plant the trees because it believed that doing so would reduce poverty in the region while helping to alleviate both the local problem of deforestation and the global problems of biodiversity loss and climate change. As the slogan on the back of Santos's T-shirt put it: "*Plante árvores. Salve vidas*": "Plant trees. Save lives." In a broader sense, the nonprofit was paying residents of Engenho to plant trees because individual and corporate donors, especially in the United States and Europe, wanted people in other parts of the world to plant trees. The idea that planting trees can effectively and simultaneously cure a host of the world's most pressing maladies has become increasingly popular in recent years, bolstered by a series of widely cited scientific studies and by the inspiring and marketable goal, memorably proposed by a charismatic 13-year-old, of planting one trillion trees.



Damião Santos, right, and tree planters hired by Eden Reforestation Projects with seedlings. Lalo de Almeida for The New York Times

The growing demand for tree-planting is reflected in the ranks of the tree-planting organizations. In a study published last year in the journal *Biological Conservation*, a group of researchers led by Meredith Martin, a North Carolina State University forest ecologist, found that the number of tree-planting groups working in the tropics has increased by nearly 300 percent since the early 1990s, to more than 170. Most of that increase came in the last decade. The number of trees those organizations have reported planting, meanwhile, has increased by nearly 5,000 percent, although further information about these trees, including about how many of them still exist, is generally scant.

Some of the tree-planting outfits are nonprofits, like Eden. Others seek profits. Some plant the trees themselves, as Eden does, while others play intermediary roles, collecting and disbursing donations to organizations that plant the trees. Many of the companies offer trees at prices well within the reach of the average American or European consumer. One Tree Planted promises to plant one tree for each dollar it receives in donation. So do Earth Day; the National Forest Foundation; Grow Clean Air; ReTree; #TeamTrees; One Dollar, One Tree; and Trees4Trees. Plant-for-the-Planet has 1-euro trees. Just One Tree and (more:trees) each offer 1-pound trees. Trees for the Future will plant a tree for 25 cents, on average. Eden will do it in most places for as little as 15 cents. (The trees being planted in Engenho cost 33 cents apiece.)

The act of planting a tree is easy to envision and, as a solution to threats like climate change, biodiversity loss and global poverty, seems almost magically simple. The tree planters have at times overstated just how simple their task is, but in nearly all cases their claims seem to be motivated not by ill intent but by a conviction that planting trees is indeed an effective solution to all manner of problems — that the cause is so worthy and urgent as to excuse small exaggerations and mischaracterizations and the frequent conflation of the word “trees” with less-impressive words like “seeds” and “seedlings.”

For Santos, the appearance of Eden in the area was all but a miracle, he said. The population of Engenho had grown from just 150 people when he was a boy to more than 800 today, he said, severely straining the patches of forest that the villagers relied on for building supplies and fuel. Santos had been part of a recent grant-funded effort to map the 39 Kalunga settlements, along with the region's springs. He had hoped the map would also eventually be used to guide reforestation, although it seemed unlikely that there would be money. Then, last year, Eden arrived, offering to pay villagers to plant trees. "It seemed like a dream," Santos said. "I even joked with them that it sounds too good to be true."



A villager in Engenho, a village in the northern part of Goiás State, preparing palm leaves to build a roof. Engenho's population has grown over the past few decades, straining the patches of forest that the villagers relied on for building supplies and fuel. Lalo de Almeida for The New York Times

In a world of grasshopperish myopia, planting trees has long been a symbol of antlike forethought. "For what more august, more charming and useful, than the culture and preservation of such goodly plantations: That shade to our grand-children give," the British forester John Evelyn wrote in the 1660s, quoting Virgil. Similar quotations are attributed to sages like Voltaire and Warren Buffett. A frequent saying on the websites of tree-planting companies is a venerable so-called Chinese proverb: "The best time to plant a tree is 20 years ago; the second-best time is today."

Planting trees became even more virtuous with the realization of the threats posed by anthropogenic climate change. What had been one of trees' most mundane features — that they are composed largely of carbon — became one of their most important. The 1997 Kyoto Protocol, an international treaty to limit carbon and other emissions, led first to the sale of carbon credits from low-emitting companies to high-emitting companies, then to the creation of carbon

credits based on natural carbon sinks, including some forests. These forest-based credits allowed companies to offset their emissions and provided a continuous revenue stream to the holders of the credits, so long as the carbon remained locked away.

From a marketing perspective, though, carbon credits have several disadvantages. They require expensive third-party verification. They are abstract. Their transactions tend to happen in metric tons and hectares, the unit of measurement favored by professional foresters. The word “hectare” has never appeared in an inspiring quote. Individual trees, on the other hand, can be grasped by even the most ill-informed consumer, can be quickly added together into fantastic-sounding sums and, in theory at least, provide all the same carbon-storing, climate-mending benefits of more carefully vetted carbon credits. They lend their planters an air of wisdom, even saintliness.

In 2004, Wangari Maathai, a professor of veterinary anatomy and member of Kenya’s Parliament, won the Nobel Peace Prize for her role as the founder of the Green Belt Movement, which, beginning in the late 1970s, paid rural women to plant trees around their villages. The effort, an educational and environmental project, spread to other countries in eastern Africa, and by Maathai’s count, had planted more than 30 million trees by the time she won her prize. In 2006, Maathai launched a billion-tree campaign, with the United Nations Environment Program and others, called Plant for the Planet.

Her public success inspired a 9-year-old German boy named Felix Finkbeiner. In a presentation to his fourth-grade class in 2007, he proposed that children should plant one million trees in every country on Earth. “That was the biggest number I could come up with, or something,” Finkbeiner told me, when I spoke with him in 2019. Soon after, his class planted a crab apple tree outside the school. Word of Finkbeiner’s proposal spread across Germany, then abroad, coalescing into a children’s movement also called Plant for the Planet.

By 2010, it said it had planted its millionth tree. The next year, when he was 13, Finkbeiner spoke before the United Nations, as part of its International Year of Forests. It was then that he suggested a finish line. “It is now time that we work together,” he said. “We combine our forces, old and young, rich and poor, and together we can plant a trillion trees.” Maathai died that September, and in December, the United Nations handed leadership of its billion-tree campaign to Finkbeiner’s Plant-for-the-Planet (which at some point added hyphens to its name). A few years later, it became the Trillion Tree Campaign.

It wasn’t clear, though, whether Earth could hold a trillion more trees — or even how many it already had. “There was very little information on those questions,” Finkbeiner told me in 2019. It happened that a founding member of Plant-for-the-Planet, Gregor Hintler, was the roommate of Thomas Crowther, then doing postdoc work at the Yale School of Forestry. Hintler prevailed upon Crowther to help investigate. In 2015, Crowther, Hintler and a group of colleagues published their answer in the journal *Nature*. Using a blend of satellite images, artificial intelligence and extrapolation, they estimated that Earth held roughly three trillion trees, about half its total when people first began practicing agriculture, about 10,000 years ago. Furthermore, they concluded something like 15 billion trees were still being cleared each year, for a net loss of about 10 billion trees annually. The paper sparked a large number of media reports. My blog post for *Nautilus Magazine* was among them. While the *Nature* paper did not discuss whether the world could fit another trillion trees, the implication was clear. As Hintler told me at the time: “We can now say there’s plenty of space.”



A plant from which Eden separates seeds to plant in Goiás. Lalo de Almeida for The New York Times

In 2019, Crowther was the senior author of a second study, published in *Science*, that further accelerated the tree-planting movement. Led by Jean-François Bastin, then a member of the lab that Crowther leads at the Swiss federal institute of technology in Zurich, the study estimated that an additional 0.9 billion hectares of Earth's surface could support forests and woodlands. If all those hectares were allowed to grow to maturity, they could store some 205 gigatons of carbon — or what Crowther estimates to be one-third of the carbon that people have released into the atmosphere to date. In the study's abstract, the authors wrote that their research “highlights global tree restoration as our most effective climate change solution to date.” (Looking back on the controversy that would result, Crowther would later say, “I wish we'd communicated things with better skill.”)

Many of the people I spoke with called the *Science* paper a tipping point. Greenhouse Communications, a marketing company hired by Crowther's lab, reports on its website that the *Science* article spawned more than 700 media reports. A CBS News headline: “Planting a trillion trees could be the ‘most effective solution’ to climate change, study says.” A Guardian headline: “Tree planting ‘has mind-blowing potential’ to tackle climate crisis.” An A.P. headline: “Best way to fight climate change? Plant a trillion trees.” In 2020, President Trump promised American support for the World Economic Forum's Trillion Tree Initiative, “to protect and restore one trillion trees by 2030.” This was not to be confused with the Trillion Trees Campaign run by Plant-for-the-Planet, nor with the Trillion Trees program, initiated in 2016 by the World Wildlife Fund, the Wildlife Conservation Society and BirdLife International. Many countries made their own pledges, including well-treed Canada, which pledged to plant two billion trees, and nearly treeless Saudi Arabia, which pledged 10 billion trees. Celebrities joined the effort, including Jane Goodall, Gisele Bündchen and Elon Musk, who for a period in 2019 changed his Twitter display name to “Treelon.”

After years of struggling to secure funding, numerous tree-planting organizations saw their fortunes turn around. Maxime Renaudin founded Tree-Nation in 2006. “When I started planting trees, I had to explain to everybody why, why would it make sense to plant trees,” he told me. “Over the course of the years it became completely redundant. If I tried to start explaining why planting trees, people would just stop me and say, ‘Yeah, I know.’”

Many scientists watched the growing popularity of tree-planting with unease. The problem isn’t with tree-planting in theory. Nearly everyone agrees that planting trees can be a useful, wholesome activity. The problem is that, in practice, planting trees is more complicated than it sounds. “Tree-planting is viewed as this panacea that can spur economic development, it can fight climate change, it can contribute to wildlife habitat, even health benefits, water protection, all of these things,” says Meredith Martin of North Carolina State. “Of course you can get some benefits in all of those realms with planting trees, but depending on the species you use, there’s just going to be trade-offs in terms of how effective it is.”

Martin and her colleagues collected data from the websites and annual reports of 174 organizations that plant trees in the tropics; 682 different species of trees were mentioned. “That feels like a lot, but there’s maybe 50,000 tree species in the tropics,” Martin says. Most of those species were named only once. By far the most widely mentioned species were familiar tree crops, like cacao, coffee and mango — good for economic development, less so for storing carbon or supporting biodiversity. In a 2019 study, researchers found a similar pattern in restoration plans that had been published for the most part in response to the Bonn Challenge, whose mission is to reforest 350 million hectares of degraded and deforested land by 2030. In the 24 national plans that had been made public by then — 61 countries now support the goal — nearly half the land involved was slated to be turned into plantations of fast-growing commercial trees. The carbon these monocultures store is mostly released in a decade or so, when the trees are harvested, the researchers wrote.

Perhaps a bigger question is where a trillion trees could be planted. The day after my visit to Engenho with Damião Santos and other Eden Reforestation employees, I met a group of scientists a couple of hours to the south, in the Parque Nacional da Chapada dos Veadeiros. Located on a high plateau, the park is a mosaic of open grasslands and savanna, the latter a tangle of brushy plants and compact, leathery trees that offer little shade. Flat-sided mountains bound an otherwise unobstructed sky. The area is known for its views of the stars and other celestial bodies; the nearby town of Alto Paraíso has an Área 51 restaurant and shops that sell crystals, dream-catchers and alien accouterments.



The Parque Nacional da Chapada dos Veadeiros in Brazil. Lalo de Almeida for The New York Times

In the park, we met Claudomiro de Almeida Cortes, who used to work on a wildland fire crew with Damião Santos. As he talked, Cortes worked a head of grass between his fingers, collecting its pinprick seeds in his palm. He became interested in the cerrado's flora during his time on the fire crew. In 2017, he started Cerrado de Pé, a nonprofit that works to restore former pasture and other degraded ecosystems in and around Chapada dos Veadeiros. Behind Cortes was one such restored area. Instead of the lush, even green of the surrounding pastures, the vegetation here was a mottled dun, many-textured, thin and low to the ground. The roots of the cerrado plants went deep, reaching down to the water table. "It is an upside-down forest," Cortes said. Cerrado de Pé's planters had sown nearly 200 species of native grasses, sedges, rushes, herbs and bushes, plants of all sizes and shapes. Scientists estimate that the cerrado is home to some 12,000 species of plants, many of which are found nowhere else.

Some local conservationists were alarmed when Eden appeared in northern Goiás State and announced its plans to plant trees — and only trees. In June 2021, the ecologists Rafael Oliveira and Natashi Pilon attended a meeting of local officials to evaluate environmental project proposals, including a presentation by Eden. "They said they would create job opportunities," Oliveira said, describing Eden's message. He and Pilon said they were shocked. Much of the cerrado has been turned to pasture or farmland, fractured by roads and human settlements, but in northern Goiás State, it remains largely intact. "They chose one of the most conserved areas in the cerrado to plant trees," Pilon said. Oliveira said that he told Eden's representatives, "You came to the wrong place."

Stephen Fitch, Eden's founder, told me that, to the contrary, the cerrado ecosystems of northern Goiás were not as pristine as often assumed, and that the Kalunga had identified large areas of degraded forest in their territories that would benefit from Eden's trees. "I don't mean to be defensive, but one of the things we encounter on a regular basis is people sitting in the academy critiquing people who are actually doing something," Fitch says. After planting trees around the village of Engenho, Eden plans to expand into other Kalunga villages.



Adelice da Silva collecting chuvaireinho seeds as part of a grassland-restoration project in the Parque Nacional da Chapada dos Veadeiros in northern Goiás. Lalo de Almeida for The New York Times

Scientists who study savannas, prairies and other grasslands say the dispute is a familiar one. There are large areas of the world where the climate could support forests, but where there are not forests. Some of these areas formerly held forests; others did not. Grassland scientists say tree-planting advocates have tended to view all those areas as equally ripe for reforestation. These experts argue that such areas are not degraded forests, but rather ancient, biodiverse and carbon-rich ecosystems, worthy of protection in their own right. “There’s a peculiar forest fetish and obsession, which I think is traced back to Europe, possibly Germany,” says William Bond, professor emeritus of ecology at the University of Capetown, South Africa, who studies grasslands. “I think it’s a massive misunderstanding of the natural world.”

Grassland scientists were dismayed when the World Resources Institute, a research nonprofit, published its 2011 “Atlas of Forest and Landscape Restoration Opportunities,” which purported to show where people could restore forests and degraded land. “It largely looked like a map of the savannas and grasslands of the world,” says Joseph Veldman, a Texas A&M University ecologist who studies grasslands, savannas and forests; in a 2015 study, he and his co-authors wrote that the W.R.I. map misidentified nine million square kilometers of “grasslands, savannas and open-canopy woodlands” as “deforested or degraded.” By directing the attention of tree-planting campaigns toward those grasslands, he thought, the map could threaten the existence of countless species and ecosystems. (The World Resources Institute, for its part, says that the atlas was intended to raise global awareness and does not call for planting trees in grasslands.)

As the tree-planting movement’s momentum grew, grassland scientists protested in bold terms, delivered in letters and articles with titles like “Tyranny of Trees in Grassy Biomes” and “Grassy Biomes: An Inconvenient Reality for Large-Scale Restoration?” Then, in 2019, Jean-François Bastin and the Crowther lab published their paper in *Science*.

Veldman says that the study made the same mistake that he thought the World Resources Institute map made nearly a decade earlier, treating grasslands as degraded forests. Worse, he says, was that it drastically overestimated the climate-mending effects of planting trees. “They did the carbon-accounting equivalent of you or me buying a house for \$100K, fixing it up with \$50K of improvements, selling it for \$200K, then bragging about how we made \$200K in profit,” he says.

Veldman led nearly 50 scientists in a written response, which concluded that the estimates by Bastin et al. of potential carbon sequestration were “approximately five times too large.” Bastin, Crowther and their colleagues eventually offered a correction on several points, including their assertion that “tree restoration” was the best tool for climate mitigation. “This was incorrect,” they wrote, modifying their original statement to say that tree restoration was “among the most effective strategies to combat climate change.” Crowther maintains, though, that they did not consider grasslands to be degraded forests and that their carbon estimates were accurate. He points out that subsequent studies, including one published in May, have provided similar estimates.

Crowther says he was surprised by the widespread reaction to the paper — it was merely intended to highlight the potential scope of “natural regeneration of ecosystems,” he says — and dismayed that it was seen as justification for mass tree-planting. He notes that the world continues to lose trees at a far faster rate than it gains them and that planting trees can be a locally useful tool of restoration. But planting a trillion trees, he says, would be too much of a good thing.

However the study’s authors intended it, many tree-planters welcomed it enthusiastically, Robin Chazdon, an ecologist and the author of “Second Growth: The Promise of Tropical Forest Regeneration in an Age of Deforestation,” told me. “A lot of people were ready for this,” she says. “I mean, a lot of people were just ready for something to grab onto, like: ‘Oh, here’s the scientific report, we can just go with this. It feeds into our agenda very nicely.’”

Even if they did not mean to, average American consumers are likely to have contributed to the global tree-planting movement through their purchases. Trees are offered as a bonus alongside many goods and services, including home nut-milk makers, Prius lift kits, two-dimensional Christmas trees, whiskey, cannabis, CBD oil, vaporizers, woolen cat caves, velvet sneakers, socks that are meant to be worn outside without shoes, reusable menstrual pads, yoga mats, healing crystals, Coldplay tickets, a debit card, a search engine, a mobile-phone plan, a flat-rate energy plan, the honorary title of Scottish lairdship or ladyship, a visit to the Amazónico restaurant in Dubai, a visit to an ax-throwing venue in Michigan, “Lady Bug Lads” nonfungible tokens, “Crypto Barista” nonfungible tokens, wooden AirPods cases, wood-burning camp stoves, wood-burning pizza ovens, journals with wooden covers, journals with paper made not of wood pulp but of calcium carbonate and a literary journal. Amazon, Shell, HP, Mastercard, Nestlé, PepsiCo, Unilever and UPS are among the large and ubiquitous companies that have supported or pledged support for tree-planting efforts. “Climate change is an issue that is much bigger than one person, but when we work together, we can make a difference,” Amazon declared in a recent blog post announcing that the company was donating \$1 million in \$1 trees.

The trees appear as ever-increasing tallies on the websites of the tree-planting organizations. One Tree Planted claims to have planted more than 40 million trees. Trees for the Future claims 250 million trees. Earlier this year, on the website of the tree-planting search engine Ecosia, I watched, mesmerized, as over the course of five minutes the ticker showing the number of trees “planted by the Ecosia community” climbed steadily from 141,483,550 to 141,483,762. Tree, tree, tree, tree, tree. The tree-planting product tie-ins and corporate sponsorships and rapidly rising numbers give the impression of a movement that is barreling toward one trillion trees. But it is surprisingly difficult to tell where things really stand.

Simply adding together the published tree tallies won’t work, because of the complex web of relationships among the various tree-planting organizations and campaigns. Ecosia, for example, gets money from advertisements and then distributes it to planting partners, including Eden Reforestation Projects and Trees for the Future. All three organizations prominently display on their websites the number of trees they have planted, while they display much less prominently the workings of their various partnerships; the fact that tens or even hundreds of millions of the trees they count on their respective websites are probably the same trees, listed on Ecosia’s and a partner’s websites, is left to inference. “Ecosia, strictly speaking, is a tree-financing organization,” says Pieter van Midwoud, Ecosia’s chief tree-

planting officer. “When our tree planters say proudly how many trees they’ve planted, we’re not going to say, ‘No, you’re not allowed to say that, because the claim is with us.’ We had those discussions, but we found it too childish.” He adds that Ecosia counts trees for its own purposes, not to contribute to any grand total.

Further muddling the picture, the tree-planting movement’s eagerness to take credit for trees that have been planted can sometimes veer toward taking credit for trees that have not been planted. The website of the American chapter of 1t.org, for instance, reports that its various partner organizations have so far pledged to plant 50.9 billion trees by 2030. Of those trees, 48.2 billion were pledged by Eden, which claims to have “produced, planted and protected” some 977 million trees over the past 17 years. Eden operates on donations, and as of its most recently available tax filing, the 48.2 billion trees had not yet been paid for. Jad Daley, the president and chief executive of American Forests, which leads 1t.org’s U.S. chapter, says that the trees would assuredly be planted. “Everyone in this movement knows that one of the things that can really undermine our success is the perception that we’re celebrating ambition but we’re not actually delivering accomplishment,” he says. Stephen Fitch, Eden’s founder, says that his organization is expanding exponentially. It aims to plant a billion trees annually by 2024. “So the whole economies of scale and skill kicks in at an impressive rate,” he says.

An Eden Reforestation Projects team at work. Lalo de Almeida for The New York Times

An even bigger challenge in trying to judge the collective achievements of the global tree-planting campaigns stems from the fact that people are not really planting trees, which offer a host of benefits and are famously tough, capable of surviving for hundreds or sometimes thousands of years and of weathering all kinds of trials and insults. They are planting seeds or seedlings, which offer few benefits and are not tough at all. “Seedlings are like baby plants,” says Lalisa Duguma, an ecosystem-restoration expert based in Australia. “If we don’t care for babies, we know what happens.” In the early 1990s, when Duguma was in middle school in western Ethiopia, his class participated in annual

tree-planting campaigns. Every year, he recalls, the government provided seedlings for the class to plant, and all their planted seedlings always died. “Every year we are going to the same place to do the same activity,” he says. “There is no change on the ground.”

Seedlings die by drought, fire and flood. They are eaten, shaded out, stepped on. Often they die of simple neglect. The changing climate — which scientists predict will rearrange species and ecosystems — makes the long-term fate of any individual tree even more uncertain. While there are many examples of successful planting efforts, the scientific literature also includes numerous examples of tree-planting ventures that have resulted in few, if any living trees. From the outside, it can be hard to know which is which.

On the website of TIST, a tree-planting organization that offers \$1 trees, it’s possible to locate on various spreadsheets information about the age, species, location and trunk circumference of some 25.1 million trees. The organization conducts periodic audits of the trees for 30 years; if they die, they are removed from the tally. “We choose to focus on how many are alive,” says Ben Henneke, TIST’s co-founder. Few other tree-planting operations are so thorough. Meredith Martin and her colleagues found that less than a fifth of the 174 tree-planting organizations they examined mentioned any monitoring of their trees after planting, and only eight companies mentioned the survival rates of their trees. Karen Holl, a restoration ecologist at the University of California, Santa Cruz, suggests a conceptual shift. “We should be growing trees, not planting trees,” she says, “We need to think about whether those trees are surviving over time, because it’s going to take 10, 20 years, a century, before we really get the benefits that we want.”

I asked the heads of three trillion-tree organizations if anyone was keeping a global total of how many trees had been planted, or how many were still alive — whether we would, in fact, be able to tell when we had achieved the goal of a trillion trees planted. They all said no — and that planting a trillion trees was not the goal at all. Nicole Schwab, the executive director of It.org, told me that her organization aims to “conserve, restore and grow” one trillion trees. Reducing the achievements of the myriad organizations and individuals that make up the movement into a single figure would be both impossibly complex and misguided, she says. “From our point of view, the trillion is aspirational,” Schwab says. “We need to be bold, to raise ambition, to put in a system where whatever is pledged is going to be monitored. To me, that’s more important than actually counting toward a trillion.” John Lotspeich, the executive director of Trillion Trees, the collaboration between the World Wildlife Fund, the Wildlife Conservation Society and BirdLife International, told me that its goal is to protect existing forests, address the root causes of deforestation and restore degraded landscapes. While that may include planting some trees, he says, “our three organizations have not been about finding a free field somewhere and putting some trees there.”

The third trillion-tree effort, Plant-for-the-Planet — still led by Felix Finkbeiner, who helped kick off the race toward a trillion trees with his 2011 speech at the U.N. — used to display what looked like a grand total on its website, a graph showing more than 13 billion trees planted by groups around the world. Sometime in the last year or so, the graph was removed. Finkbeiner, now studying for a Ph.D. in soil microbiology in the lab of Thomas Crowther, remains enthusiastic about the global movement. But the straightforward pitch of his youth is now laden with caveats and subtleties. “We probably would prefer to see ourselves as a forest-restoration movement instead of a tree-planting movement,” he told me. “I think that this trillion-tree frame still totally makes sense, because it gives people a rough sense of the scale of restoration potential. Obviously, it’s clear and simple and catchy.”

The race for a trillion trees can continue to motivate donors, but Finkbeiner says that his organization is no longer focused on counting trees. Ultimately, he believes, the movement’s success or failure in restoring the world’s forests will be judged not by the number of trees planted, but via satellite imagery, viewed over the long term, and discussed the old-fashioned way — in hectares.

On that April morning, as Eden’s team of tree planters continued transforming the field in Engenho into a future forest, Damião Santos drove me and two visiting Eden employees to see his vision of how that forest might look. A few miles south of the village, we parked on the edge of the red dirt road and crossed another brushy expanse, following muddy tire tracks. At the edge of the field, the open landscape turned suddenly to towering forest, a mix of hardwoods and buriti palms, with dense underbrush and draping vines. Water pooled among the roots, trickling from a nearby spring. Santos stooped to pick up a just-sprouted seed. He rolled it in his hands. When scientists say that people shouldn’t

plant trees in the Brazilian cerrado, he said, they spoke of grasslands and savannas, ignoring the scattered areas of dense forest like this one. These patches needed restoration, too, he said. That meant planting trees. In any case, the opinions of outside scientists were secondary — the Kalunga wanted the trees, and it was their land.

Later that day, in Engenho, I watched Eden Reforestation employees carefully counting piles of trees, working to provide the raw numbers that would eventually add to the steadily climbing tree tally on Eden's website. These trees had already fulfilled one of the tree-planting movement's promises, offering work to people in a place with few economic opportunities. It would take much longer to see whether the trees, which were really just seeds and seedlings, would grow up into the forest that Santos envisioned, providing the expected benefits to the local environment, or whether they and all of the billions or tens of billions of other seeds and seedlings that Eden and other groups had planted around the world would survive long enough to have any meaningful impact on biodiversity or the global carbon cycle. As a solution to the world's most pressing problems, the trees seemed both obviously useful and woefully uncertain. Even as countries, companies and individuals spend billions of dollars to fund tree-planting projects around the world, much about the trees themselves must be taken on faith.

The tree-planting visionaries, company founders and employees I spoke with insisted that they had learned the lessons of past failures, that they had dialed back their boldest claims, that they understood tree-planting to be just one solution among the many that are needed. "We know how complicated it is," says Jad Daley, the American Forests chief executive. "We know we have to get the science right, especially in a changing climate. They're saying, 'Well, if you're focused on a trillion trees, then you're not focused on these details of ecologically appropriate, climate-informed, community-centered reforestation,' which is factually false. To be honest, it's infuriating." Maxime Renaudin, the founder of Tree-Nation, agrees. The tree-planting movement is working toward greater accountability and transparency, he says. "It's more important that we make a few mistakes than do nothing," he says, referring to the broader movement. "We are talking about an urgent problem. Our focus should not be on perfection."

Certainly, any shortcomings of the tree-planting movement as a whole cannot be attributed to a lack of sincerity on the part of its members. As an employee of One Tree Planted told me: "At the end of the day, the best time to plant a tree was 20 years ago, right? The next best time is, like, as soon as possible." Indeed, Stephen Fitch, of Eden Reforestation Projects, says one of his biggest worries about the movement is that it's simply not moving fast enough. "We really need about a hundred Edens," he says, every one of them planting thousands, millions, billions of trees.

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