**We’ve all heard about the catastrophic destruction of large parts of the Amazon rainforest in recent decades, haven’t we? It looks like it’s had quite a rollercoaster ride ever since the military junta decided to build the Trans-Amazonian Highway right through the middle of it back in the late seventies. That enabled them to incentivise Brazilians from the rest of the country to move in, chop down trees, and cultivate the land for farming and cattle rearing.**

**By the mid-nineties it was all getting a bit out of hand, and there was rapidly growing opposition to the initiative among the Brazilian public, who had not failed to notice the devastation that was happening right on their own doorstep. That ultimately led to the election of Luiz Inácio Lula da Silva** **in two thousand and three. During his first term as President, deforestation dropped by seventy percent to the lowest rate since records began. After Lula left office in twenty ten though, there was a gradual creep back upwards for a few years, followed by a very sharp uptick when a right-wing supporter of unregulated logging, mining and industrial agriculture got voted into power. Thankfully the Brazilian public realised their mistake and, in a move that few would have predicted, they voted Lula da Silva back in for a second term. Lula is now reinstating the regulatory policies that were so successful the first time around, so with any luck we may start to see the graph line falling once again. And now, new research suggests the Amazon could be a catalyst for similar levels of forest restoration in other parts of the world too, thanks to a phenomenon you may already know as Terra Preta or Black Earth. A team of Brazilian scientists has just published a comprehensive analysis of this remarkable soil, and I have to say, the results have been pretty amazing!**

**Hello and welcome to Just Have a Think**

**According to the Smithsonian Magazine, human beings were living quite happily in the Amazon rainforest for about ten thousand years or so, before we Europeans turned up and started making a bloody nuisance of ourselves.**

**Over generations, those indigenous folks learned how to enrich the otherwise fairly poor and unproductive soil, so that they could grow their own food and sustain a lifestyle in total balance with all the other ecosystems that surrounded them. Think of it like a scene from Avatar, but with less of the blue.**

**They achieved this soil transformation by adding charcoal from their cooking and refuse fires, and by spreading in animal bones, broken pottery, compost, and manure. I imagine it was very much a trial-and-error thing for a while, but over the course of many hundreds of years, they ended up with a very dark and extremely nutrient-rich soil that is now officially known as Amazonian Dark Earth or ADE, but actually referred to by most people as black earth, or Terra Preta.**

**The authors of this new paper conducted experiments to see if they could bring degraded soil from croplands back to life by adding some of the good stuff from the Amazon. The plan was to simulate the conversion from pasture land to forest restoration by taking the degraded soil as their control, and adding just twenty percent of ADE to see what results they could achieve compared to a one hundred percent ADE soil. The researchers set up thirty-six four litre pots inside a greenhouse with an ambient air temperature of thirty-four degrees Celsius. That’s a fair bit warmer than the current average Amazon temperature, which sits somewhere between twenty-two and twenty-eight degrees Celsius, but the team were keen to mimic the likely temperatures that’ll become prevalent as global warming continues throughout the course of this century.**

**Twelve of the pots contained just the degraded soil, another twelve had an 80:20 mix of degraded soil and ADE, and the remaining twelve contained a hundred percent ADE. Each pot was initially planted out with a grass species called Urochloa brizantha, which I’ve obviously never heard of, but which the horticulturalists among you may recognise as Palisade Grass. That’s apparently a common forage plant for livestock in Brazil. After sixty days of growth, the grass in each pot was chopped right back so that only its roots remained. That gave the research team a substrate that mimicked soil conditions in regions that had been targeted for reforestation.**

**Then it got a bit more convoluted, so bear with me...**

**Each group of twelve pots was divided into three sub-groups of four pots. The first group of four was planted out with seeds from a tree species called Cecropia pachystachya, otherwise known as Ambay Pumpwood. This is a species that typically first colonizes any new area of forestation. The next group of four pots received seeds from a secondary tree species called Peltphorum dubium, and the final set of pots got seeds from what the scientists call a climax species…their words, not mine… called Cedrela fissilis or Cedro Blanco.**

**So now they had three different plant types, in three different types of soil, each with four replications. Then they went away and let nature do its thing for ninety days.**

**At the end of that phase, the researchers measured plant height, and root size, and collected the aerial part of the plants to measure dry-matter production, which is apparently the most important characteristic when measuring plant development .The plant tissues were dried in an oven at sixty degrees Celsius for forty-eight hours, then weighed and analysed to evaluate the amount of organic matter, its pH level and the content of key soil health indicators including phosphorus, potassium, calcium, magnesium, aluminium, sulphur, boron, copper, iron, manganese, and zinc. They also assessed the soil texture and sent some of it off for DNA extraction and for what they refer to as ‘downstream molecular procedures.’**

**So, let’s cut to the chase then, shall we? What the researchers discovered was that the trees species planted in soil with only a 20% addition of ADE, showed a very similar level of performance to the tree species planted in a hundred percent ADE, and significantly higher than the tree seeds planted in the degraded control soil.**

**Carbon stocks were increased, and there was a demonstrable improvement in microbial richness in the soil, which now contained several microorganisms that were beneficial to the trees. That means the folks engaged in reforestation projects, not just in the Amazon, but all around the world, don’t need to go to the almost impossible lengths of completely replacing native soil with Amazon Dark Earth. It turns out they can achieve just as significant improvements in soil health simply by using ADE as an additive. And in fact, the researchers recommend that, now each of the ingredients has been scientifically isolated and identified, the original soil should be left well alone, and instead it’s chemical and structural make up should be replicated in horticultural laboratories, so that there’s enough for everyone without having to plunder the original soils that have taken thousands of years to develop in the Amazon itself.**

**Environmentalists and some horticulturalists point out that , for millennia, before the Romans brought us the concept of sanitation, human beings all over the world were using their own waste to enrich soils to help them grow food. You could say it’s become something of a lost art if you like. No-ones suggesting you pop out back and start enthusiastically pooping all over your garden though. That might put a strain on your relationship with the neighbours, and in any case raw human waste contains quite a lot of pathogens that you don’t want anywhere near you, and certainly not in your soils. But after a proper amount of composting time, it becomes a material very high in many of the same nutrients found in tera preta which makes it an extremely good soil conditioner, especially if mixed with organic animal and plant matter and biochar, which is a type of charcoal made from biomass through a pyrolysis process that actually sequesters carbon dioxide from the atmosphere. There’s even a school of thought that suggests this practice may have represented an evolutionary advantage providing a nutrient pathway for humans to inhabit and develop regions of the planet that had depleted soil or, even almost no soil at all, like deserts for example.**

**Whatever the historical reality may have been, the modern reality is that restoring our landscapes holistically worldwide has now become a crucial element of climate mitigation.**

**This map from the website Global Forest Watch shows the areas of tree cover lost globally between two thousand and one, and twenty-twenty-one, mostly for logging and the production of wood pellets for the rapidly growing and definitely NOT carbon neutral biomass industry.**

**The good news is that reforestation initiatives ARE now gaining traction in many parts of the world.**

**In twenty-eleven, the Bonn Challenge was launched by the International Union for Conservation of Nature, with the goal of restoring three point five million square kilometres of previously degraded land by twenty-thirty. That’s an area ten times the size of Germany. To date there are sixty-one countries involved, across all the inhabited continents, with pledges covering about two thirds of that total. And it’s showing very tangible hard nosed economic benefits too. Every dollar spent on forest restoration is estimated to produce something like nine dollars in economic benefits to the country involved. The folks at the Bonn Challenge reckon that if fully implemented the initiative could result in an annual global gain of some seventy-six trillion dollars.**

**In twenty-twenty, Birdlife International, The Wildlife Conservation Society and the World Wildlife Fund launched their own initiative called One Trillion Trees, which I suppose is pretty self-explanatory really. The United States has made the bizarrely specific pledge to “conserve, restore and grow more than nine hundred and ninety-five million trees [] by twenty-thirty, and China has pledged to get more than seventy BILLION trees in the ground as part of their never-ending battle with the Gobi desert, and now as part of their drive towards net zero.**

**In Africa, eleven countries in the Sahel-Sahara region have joined forces to combat land degradation and restore native plant life to a landscape that WAS ONCE rich with biodiversity and vegetation.**

**This kind of ostensibly encouraging news does come with a couple of very important caveats though. Environmentalists have raised concerns that while promoting nature at large scales is definitely the right thing to do, the world must be careful that is doesn’t get distracted from the main task at hand, which is to decarbonize our modern way of life. That means keeping the pressure on the fossil fuel companies and agribusinesses to rapidly downsize their operations. And of course, if non-native species are indiscriminately planted, or if organisations engage in the dangerously misguided practice of creating vast swathes of mono-culture plantations that destroy biodiversity and wreck indigenous ecosystems, then we may find ourselves doing more harm than good.**

**There are real beacons of positivity in some parts of the world though. Costa Rica is a great example. Since nineteen-ninety-six the government has been making payments to rural areas to fight poverty and halt deforestation. The result of that initiative is that Costa Rica has seen its rainforests double in area, transforming itself from a country with one of the world’s highest deforestation rates in the nineteen eighties to a nation centred on ecotourism, attracting visitors with the opportunity to move between coastal marine reserves and cloud forest in a single day. That’s boosted the country’s economy and accelerated progress towards carbon-neutrality.**

**And hope is rising once again in Brazil itself. Deforestation in Brazil’s section of**[**the Amazon rainforest**](https://www.aljazeera.com/news/2022/11/16/at-cop27-brazils-lula-vows-halt-to-rampant-deforestation) **has apparently dropped by percent during the first month of Lula da Silva’s second term as President. Only time will tell if he can make that stick, but maybe, just maybe there are some signs that humanity is actually capable of doing the right thing from time to time.**

**That’s it for this week. Thanks, as always to our amazing Patreon supporters, who keep me going and enable me to keep ads and sponsorship messages out of all my videos.**

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**As always, thanks very much for watching! Have a great week, and remember to just have a think. See you next week.**