

Planting a Cooler Climate

A little noticed sentence in President Trump's State of the Union speech was that the U.S. would join the Trillion Trees Initiative. He didn't mention climate change – most people like trees anyway, and the link was obvious. But planting trees to combat climate change is so seductively simple that it must be impractical. A trillion trees is a lot, and mentioning it in a prime time speech will have caused at least half the country to dismiss a political gimmick.

So we looked at the plausibility of harnessing nature to consume the excess CO₂ humans are generating.

To grow, trees require CO₂ and water, which through photosynthesis they convert into carbon and glucose to form the tree, and oxygen which they emit. Growing 1 ton of wood requires around 1.55 tons of CO₂. By atomic weight, carbon is 27% of a CO₂ molecule. A dry tree is typically around 50% carbon.

Of course trees vary enormously in size. The University of Arkansas Division of Agriculture publishes a handy guide for estimating the weight of a tree given the measured circumference.

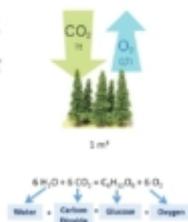
From this, we estimate that the average hardwood tree weighs 3.4 tons dry, or about 3.1 metric tonnes (the unit that's used for CO₂ emissions). Assuming it grows over 100 years, it'll require half its weight in carbon (1.55 tonnes), which will be extracted from 5.7 tonnes of CO₂ (i.e. 1.55 divided by 0.27).

Wood as a carbon sink

In order to grow, a tree needs carbon dioxide from the air. The tree grows by photosynthesizing carbon and carbon dioxide in the atmosphere every second. The tree's own building material comes from the carbon in carbon dioxide, at the same time releasing oxygen back into the atmosphere.

In order to grow, one kilogram of wood needs about 1.58 kilograms of carbon dioxide from the air. The carbon of which is stored in the tree. About half of that is carbon. A cube of wood is just 1 cubic meter of wood stores 1 tonne of CO₂.

Photosynthesis is a biochemical process in which plants use sunlight to produce oxygen from CO₂ and water with the help of solar energy, and other glucose which the plant uses for nutrition. The molecules of water (H₂O) and one of carbon dioxide (CO₂) from an oxygen molecule is added to glucose.



The world generated 33 gigatonnes of CO₂ last year. Divided by the 5.7 tonnes consumed by the average tree, planting 5.8 billion trees would, over their life, consume all the CO₂ emissions of last year.

Is this possible? Earth currently has 3.04 trillion trees, so we'd need to increase the stock of trees by just 0.19% per annum to take a giant step towards combating global warming.

Last year, one million Indians planted 220 million trees in a single day, as part of a government campaign against global warming. Ethiopia planted 353 million trees in 12 hours.

America plants 1.6 billion trees a year – half by forest product companies. Costs are estimated to be as low as 30 cents a tree.

Even if this analysis is out by a factor of 10X, that would still leave the world needing to add 1.9% to global forests every year – certainly viable if embraced as a solution.

Planting trees is labor-intensive. But two companies, Droneseed and Dendra Systems, are developing plans to use drones that can plant seeds on hundreds of acres a day, versus the two acres that a professional tree planter typically covers. You can watch two interesting videos explaining how here, and here.

So it would seem that a global effort to add around 6 billion new trees every year is achievable.

Articles like World losing area of forest the size of the UK

each year, report finds in the UK's Guardian stoke fears of enormous global tree loss. Brazil is widely criticized for deforestation in the Amazon, but overall the portion of the world covered with trees has been growing. This is partly because a warming planet is raising the tree-line in mountainous areas, and allowing forests to creep into tundra.

Environmental extremists have instinctively rejected the Trillion Trees Initiative, for mostly predictable reasons: it doesn't require overhauling our energy supply, or erecting millions of windmills, solar panels and tens of thousands of miles of ugly high voltage electricity lines. It seems so much more attractive than the Green New Deal.

Renewables, nuclear and natural gas are all part of the solution to climate change, along with adding billions of trees. Burning natural gas produces water and carbon dioxide, the two inputs trees need to grow. Burning coal releases nitrogen oxides, sulfur dioxide, particulate matter, mercury and other hazardous substances that the local population inhales. Everyone should be able to agree that coal use must drop.

Most of the criticism of the Trillion Trees Initiative stems from concern that it'll weaken the case for dramatic interventions to the economy promoted in the Green New Deal. That's precisely why it's appealing.