Published in Predict

Will Lockett Following
Jul 24 · 5 min read ★ · Listen

Biochar — WikiCC

Biochar: The Ultimate Carbon Capture Technology?

This revolutionary tech could be what we need to save the world.

Humanity has to repent for its decades of climate sins. We have reaped this world of all it can give us in order to build our modern societies, and left it choking under a thick smog of carbon. But this debt to nature will need to be paid in the coming decades. Brutal and extreme weather awaits us, enough to decimate crops, crash ecosystems, and scorch the Earth. Thankfully, if we can repair the damage we have inflicted on the planet, we won't have to incur this biblical wrath. Our chosen method of repentance so far has been carbon capture, but for years now, this technology has been far too expensive and unscalable to make a difference. That is, until now. A new method called biochar promises to make carbon capture a genuine planet-saving technology. So, can biochar save the world?

The Intergovernmental Panel on Climate Change's (IPCC) most recent report stated that we need to adopt carbon capture technology to meet our targets of limiting climate change to 1.5°C. This was a bit of a damning blow, given our current carbon capture technology is woefully unprepared in comparison to where it needs to be. It is too expensive, hard to scale, and takes up vital energy and land resources.

Take Climeworks, which is widely considered one of the leaders in this field. Their incredible carbon capture sites are cutting edge and have the potential to herald in this new era of carbon capture. But it currently costs a whopping $1,200 for them to capture a single tonne of carbon dioxide. For some comparison here, the average American car produces 4.6 tonnes of carbon dioxide a year, so it would cost $5,520 just to offset a single car! Or, as there are 276 million cars in the US, it would cost over $1.5 trillion a year to offset

them altogether. There are other companies offering cheaper alternatives, at around $600 per tonne of carbon dioxide, but even with these reduced prices, it would still cost thousands to offset a single car's carbon emissions and an extortionate amount to offset all the cars in the US.

Also, bear in mind that this is the cost to offset only the US private transportation sector's carbon, which accounts for around 1% of the global annual carbon emissions. To reach that magical 1.5°C limit, we need to be wholly net carbon neutral by 2050! Can you imagine how much it would cost to use this technology to neutralise the rest? It would be enough to bankrupt every developed nation several times over!

This is where biochar comes in. Biochar is the name given to plant matter that has undergone pyrolysis, where it is heated up to several hundred degrees Celsius in an anoxic (no oxygen) environment. The organic carbon-rich molecules in the plant matter undergo some rather unique chemical changes that make the biochar chemically very similar to coal.

This process effectively locks away the carbon, making it biologically inactive. In other words, microbes can't come along, break it down, and release the carbon back into the environment as greenhouse gasses. But biochar can still be used to boost ecosystems.

You see, healthy soils contain a tonne of carbon and nutrients. In fact, soil contains three times more carbon than the atmosphere. However, modern farming practices have depleted the soil's carbon content by up to 70%! But

because biochar is full of carbon and nutrients, it can be buried in these unhealthy low-carbon soils and restore them to their previous glory. As a nice bonus, biochar's carbon stays trapped in these soils for around 2,000 years, safely preventing it from entering the atmosphere.

So biochar actually has two ways of capturing and storing carbon dioxide. There is the first, more direct way, where plants grow and build their bodies out of carbon dioxide from the air and then are harvested, with the excess plant matter being turned into biochar, which is buried in the soil. Then there is the boost in plant life that the biochar nourishes, which also pulls more carbon out of the atmosphere.

This double action, combined with super-efficient pyrolysis machines, means that biochar carbon capture can cost as little as $30 per tonne of carbon dioxide! At that price, it would only cost $138 to offset an average US car's annual carbon emissions.

Suddenly, carbon capture technology is cheap enough to meet our massive demands. But there is a slight catch — namely, burial site capacity and raw material bottlenecks. Let me explain.

Soils can't accept too much carbon. An excessive amount will cause them to become oversaturated and inhospitable. This means that even though we could, in theory, create enough biochar to offset all our emissions, we wouldn't have anywhere to put it. What's more, we are also limited as to how much plant matter we have available. For biochar to be effective, it needs to

be made using plant matter that is a byproduct of current farming. If we need to start farming specific crops purely for the production of biochar to boost carbon capture, it becomes far too expensive and can cause other problems including habitat loss and food supply chain issues.

This is why recent studies estimate that biochar can only capture around 2 gigatonnes of carbon dioxide annually by 2050, which is around 5% of humanity's current yearly emissions.

Now don't get me wrong, reducing our annual emissions by 5% without breaking the bank is a significant step forward! But it is a way off from the net zero target needed to avert a climate disaster.

Fortunately, we are also taking steps forward to advance biochar carbon capture. Nottingham University in the UK is doing a massive research project to find ways that biochar can capture even more carbon without expending additional energy. This is taking the form of English farms using biochar as a fertiliser and analysing how the soil develops in relation to how much biochar is used and what variety of crops are planted. There is also the option of using GM crops to increase the plant matter byproduct yield of farms, allowing for more biochar to be produced, and even schemes looking to use old abandoned mines as alternative biochar storage sites.

So is biochar the ultimate carbon capture technology? Can it save the world? Well, yes, I think so. It utilises nature, farmland, and unused byproducts without impacting on our food production, habitat loss, or energy resources.

It seems the most harmonious with our lives and the wider global ecosystem. That, combined with its killer low price, means it can, at the very least, make a massive impact in our efforts to save the world. If scientists can find a way to boost biochar, it has the potential to be a spearhead technology in saving the world.