ENERGY

Biochar: Panacea or peril?

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Green Right Now

Biochar has emerged over the last couple years as a ray of hope on the otherwise bleak horizon of the planet's environmental future. It has been hailed as a possible solution to climate change, world hunger, and rural poverty — though doubts are being raised in some quarters.

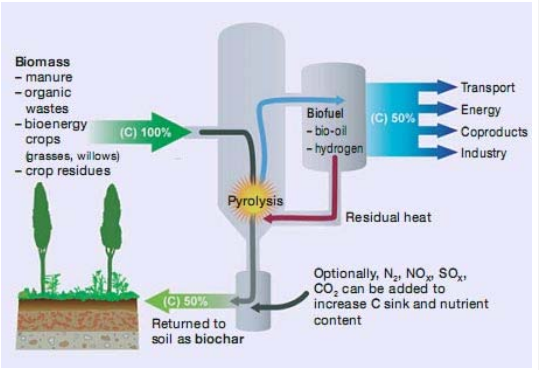
Last year, some of the world's most eminent biochar experts gathered for a biochar conference at the University of Massachusetts-Amherst to discuss this ancient technology that is getting a new look by scientists, governments and investors. To the packed audience, this promising technology sounded like a panacea for a whole host of problems. Biochar, the speakers said, could soak up large amounts of carbon from the atmosphere, supercharge soil fertility to feed the world's hungry, promote jobs and economic opportunities for farmers, safely get rid of animal and plant waste, heat buildings greenly, and slash the kind of fertilizer use that is creating vast dead zones in coastal waters from nitrogen runoff.

"We see the synergisms in terms of food security, energy security, rural economic development and climate change working together," the USDA's David Laird explained between conference sessions. Laird runs the biochar research program at the agency's National Laboratory For Agriculture and The Environment in Ames, Iowa.

Created by burning plant matter or animal wastes at low temperatures (pyrolysis), biochar has been around for centuries. The ancient indigenous civilizations of the Amazon may have supported their large populations on the rich soil, called "terra preta", they created when they made charcoal – soils far more fertile than even those naturally occurring in the rainforest. These soils not only yield more crops, they also – critically for our warming planet — store carbon, sequestering it in the ground where it can be kept safely out of the atmosphere for hundreds or even a thousand years.

But can what the ancients did be replicated today?

Critics charge that the Amazonian *terra preta* was built up slowly over centuries in a process we still don't understand. They question whether we know how to make biochar stable enough to sequester carbon over the centuries we will need to bring the earth's atmosphere back within pre-fossil fuel era limits.



Biochar and the carbon cycle (Image: Cornell University)

But Cornell soil scientist Johannes Lehmann, author of the definitive scientific study of biochar, said in an interview last week that the evidence is getting stronger that biochar can store carbon in the soils safely over the long term. "Biochar is stable," he says. "Charring prolongs the life and increases the stability by 1.5 and 2 orders of magnitude; instead of half of the carbon in the soil decomposing in ten years, it will take a thousand years to decompose."

How long it really takes depends on where you are, Lehmann cautioned. "For a leaf falling in Alaska, the carbon will normally stay in the soil in a hundred years (without charring); in Nigeria, it will only stay a week," he says "but the critical point is that charring increases stability everywhere."

David Laird says the problem is that biochar is not a simple system. "We think of charcoal and immediately we think of having a barbecue in the backyard and a bag of charcoal. But the reality is, there are many different forms of charcoal." There's good char and bad char, he told me – and what may be good on one type of soil may be bad for another – something biochar entrepreneurs need to know to make sure they use the right kind of char under the right conditions. "We need to think about char by soil, by crop, by climate interactions, and ultimately optimize systems that work."

But other problems may not be so easily remedied by providing better scientific information to entrepreneurs. Climate change journalist George Monbiot set off a fierce debate last year when he lambasted biochar as more hype than hope and charged that "charleaders" like NASA climatologist Jim Hansen and scientist James Lovelock (creator of the Gaia Hypothesis) would be "pyrolising the planet in the name of saving it."

The problem stems not so much from the science as from the business model for biochar. Bringing biochar into the market for trading carbon credits – which is being considered by the United Nations Framework Convention on Climate Change (UNFCCC) for inclusion in UN Certified Emission Reductions (CER) and Clean Development Mechanism (CDM) – would kickstart biochar production on an industrial scale. It would create a market for biochar carbon offsets that polluters would buy. That means biochar companies would need enough biomass to fuel their

furnaces – and their bottom lines. That could mean more than a billion hectares worldwide devoted to biochar.

Where would the biomass on such a massive scale come from? From monocultural tree plantations, which could take over arable land, be carved out of existing natural forests, or displace pastoralists and nomads from so-called "marginal" lands – lands that don't have a commercial value on the global market, but that provide habitat for diverse species and sustenance for the largely poor people who depend on them. And if native forests are cut down to feed biochar furnaces, their ability to capture carbon out of the atmosphere will be lost.

Johannes Lehmann says carbon trading mechanisms must look at the full life cycle of the biochar getting the credits. For example, is it displacing natural forests without replacing them? Is it being transported long distances using fossil fuels? Is it using more energy to produce char than it saves? Is it staying long enough in the soil? He advocates using agricultural waste, like rice straw in India, which is already being burned but not being turned into char or being returned to the soil.

But biochar doesn't have to be produced on a large-scale commercial basis in order to accomplish the wonders for which it's been touted. Small farmers all over the world can pyrolize their agricultural waste, turn it into energy for heat and use it to enhance soil fertility. Small-scale biochar technology is not expensive – you can build a tin-can pyrolizer in your garage, and backyard inventors are creating models that can be used on the small to medium scale for farms and communities.

Municipal governments can use it to turn garbage into compost and energy. Portable biochar furnaces could, for example, be leased from local manufacturers in western states to turn forests devastated by the pine bark beetle into usable fertilizer. (They may have to compete with those who want these dead pine trees for biofuel).

The real question is: Will biochar become a feedstock for profits by global companies who use their clout to water down or kill environmental regulations? Or will it be a feedstock fueling solutions to humanity's most pressing problems? The jury is still out.

For more about biochar see these resources:

- International Biochar Initiative — This association will hold its third annual conference in Rio de Janeiro in September.
- Biochar in the Soil — A IBI report on how biochar enriches soil.
- Biochar and the Mitigation of Climate Change — A report by Dr. Johannes Lehmann.

Francesca Rheannon writes about sustainability and corporate social responsibility. She is a contributing writer for CSRwire.com and co-manages the CSRwire blog, Talkback. She is also host and producer of the weekly radio show and podcast, Writers Voice.