The Biochar Promise: Sacred Shrines and Skinny Chickens

Contributed by Albert Bates
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Editor's note: Albert Bates' ongoing research and networking around the world have resulted in an optimistic message. He agrees there's no way that collapse of suburbia and business-as-usual can be avoided. But with ecovillages, permaculture, biochar and all manner of caring for the Earth, he knows we can do a lot better than to wait for the results of more fossil foolery and an attempted technofix to maintain the global corporate economy.

"The real voyage of discovery consists not in seeking new landscapes but in having new eyes" -- Marcel Proust

In the world of climate policy, the argument has been shifting. It used to be between a few global warming Cassandras and hoards of global warming deniers, and that arguing got, well, pretty heated. The deniers long ago lost their argument to the hard science of the matter, so the debate has boiled down to the preventionists versus the mitigators.

The sunlight reaching the Earth has followed an 11-year solar cycle of small ups and downs, but there has been no increase. Over the past 30 years, global temperature has risen markedly, but still is only little more than 1 degree above normal. Each added degree will produce dramatically more effects.

Preventionists are looking for either very painful emission reductions, like zero, yesterday, or else some technical fix -- nuclear fusion, or orbiting mirrors, say -- a silver bullet that would let us go on spending more of Earth's capital than one generation has any right to.

Mitigators have given up any hope that we can arrest or reverse climate change now, but have some hope we can either slow it down or, if not, be able to get out of its way.

Susan Solomon, one of the United States' top climate scientists, pointed out at a recent conference that the driest parts of the USA can expect to get still drier as the Earth warms. We already have about 15% less rain in the Southeast than normal (this year aside), and we know that the last time it was this dry, about 15 to 18% below normal, we had the Dust Bowl. Solomon thinks we could reach more than 20% drier than average in the very near future. The Southeast now gets 29% less spring rain most years than it did in 1970.

Number of Days per year with Peak Temperature over 90°F

By the end of the century, Middle Tennessee will have more than 120 days of temperatures above 90, up from 15 twenty years ago, and 30-60 now. Texas will have more than 100 days above 100°F.

Observed and Projected Temperature Rise

By the end of the century, mid-continental temperatures will rise between 2.5 and 13 degrees, on average, depending to a large extent on what happens in Copenhagen at the climate negotiations.

The UN Framework Convention on Climate Change that was adopted many years ago said that the member nations should make every effort to "avoid serious or irreversible damage." Solomon says we recently passed that point. Because of the long time that greenhouse gases stay in the atmosphere, even if we halted all emissions immediately, the planet will continue to warm for at least another 600 years.

In the past 20 years, most of Tennessee has moved at least one agricultural zone to the southward, and some parts have moved as many as 3 zones. That means we can plant earlier and harvest later, which I suppose is a good thing. It also means that we are now ideal habitat for armadillos, fire ants and scorpions, all of which are pushing our possums up into Ohio.

Of course it is much worse for the trees, which can't just uproot and move north. In earlier years we have seen blights claim white oaks and dogwoods. This year we are losing more hickories from the weather fluctuations that make droughts, extreme rainfalls, late frosts and early thaws more frequent.

Mitigation is not about rushing to relocate our families to Nova Scotia or Terra del Fuego, as the famous ecologist, James Lovelock, has been suggesting. For now at least, mitigation is painting roofs white to reflect sunlight back into space, saving greywater, and building drought-resistant shelterbelts to cool the microclimate around our homes.

Albert Bates and Agriculture Secretary Tom Vilsack at the North American Biochar Conference.

Some of us are not ready to give up on prevention quite yet. I recently attended the North American Biochar Conference to learn more about the possibility for lowering temperature by reversing the carbon flow from the soil to the atmosphere.

One gram of charcoal (a piece about the size of a pencil eraser), it turns out, has a surface area of 500 to 1000 square centimeters (imagine a cube about the size of a piece of letterhead paper on each of its six sides) because of all its micropores.

Biochar is charcoal derived, without flaring, from sustainable sources (typically products that would otherwise be burned or allowed to decay to GHG without any control). Because of the micropores, it acts like a coral reef in the soil. If it is turned in a nutrient pile (any compost will do) before being tilled into the ground, it becomes immediately colonized by soil microbes, much in the same way coral reefs are populated by all manner of marine life. The microbial products attract fungi, which benefit the roots of plants, carrying nutrients from the "reef" to where they will do the most good.

Besides stimulating the health of the soil, the char and its fungal conduits also provide a reservoir for soil moisture, soaking up water from oversaturated areas and giving it back to dry areas. All this, and changing the residence time of carbon in the soil from a few years to hundreds, or even thousands, and we have a chance to stop the warming.

And that has the potential to do more, quickly and safely, than all the LED light bulbs and hybrid cars we can possibly

replace, or buying a lakeside cottage in Alaska.

Some years ago, scientists working at the International Charcoal Cooperative Association in Tochigi Prefecture, Japan, were called to rescue the black pines of the Izumo Taisha Shrine that were dying of acid rain. By filling a shallow trench between trees with fertilized biochar, they were able to fully recover the trees within a few years.

Pines at the Izumo Taisha Shrine before, during and after application of biochar.

Many of these same scientists also experimented with methane reduction from animal husbandry. After initial success in adding charcoal to cattle feed, and eliminating ruminant off-gassing from both ends, they began working with poultry. They starved chickens until they were hungry enough to begin pecking and eating biochar, after which the subjects routinely consumed the black chips without further stress, with the result that the chickens thrived, the coop smelled sweeter, the poop was even more fertile than before, and methane output was greatly reduced. The results, as reported to the First Asia Pacific Biochar Conference held on the Gold Coast, Australia in May, 2009, were fifteen ears per stalk of corn and 250% yield increases for a variety of field crops after using biochar made from pyrolyzed chicken litter.

On August 1st, in Dunlap, Tennessee, Mantria Industries has opened a Carbon Fields project, designed to make enough biochar to offset the carbon footprint of a 3000-home eco-community the company is building in the scenic Sequatchie Valley. Initially operating on woody wastes from landfills and sawmills, hundreds of hectares are being sown with fast growing bamboo, switchgrass and elephant grass. After being pelletized and pyrolyzed, the biochar produced will fertilize field and forest. The recaptured heat and gases of production will generate two megawatts of green energy, more than enough to power the eco-community in a carbon-negative way.

Mantria is only rolling up its first sleeve, however. In Hohenwald (Swiss-German: "High Forest") Tennessee, it is building an 8- or 16- or 32-megawatt facility to pyrolyze the woody wastes the town is currently trucking 150 miles away to a landfill to bury (and decay into greenhouse gases). By intercepting this tax-dollar drainage, Mantria will capture a cash flow of tipping fees, electricity sales, and revenues earned placing its new, EternagreenTM brand biochar into garden centers from Schenectady to Shenzhen. If Copenhagen and Congress approve cap-and-trade, the carbon credits Mantria generates could be another income stream.

The first question I had for Mantria CEO Troy Wragg was, "But is this sustainable?" He was unhesitant, enthusiastic, and emphatic. "Absolutely," he said. There are currently 250,000 tons of wastes per year being trucked out of Lewis County alone. If you look at the surrounding counties, that number multiplies. Is it 8-, 16- or 32-megawatts? The Hohenwald recycling center is scalable.

Even at the smallest scale, 8-megawatts is 8 times more than Hohenwald (pop. 3000) needs to meet current residential and commercial electric demand. The Tennessee Valley Authority is paying Mantria for the surplus kilowatts, which it

intends to sell through its Green-Power Switch program. If Mantria were so inclined, it could even give away the power to local residents -- with all the other revenue streams, it is too cheap to meter.

And Mantria is not alone. Biochar Systems can deliver a ready-to-run pyrolysis plant on a 1.8 ton skid that can take 500 kg per hour from any landfill, sawmill, or poultry farm, and, with a clean, GHG-free airflow, deliver biogas, power, and biochar fertilizer back to you. More competitors are popping up around the world. A system is available to make green energy of this type at almost any scale.

Ever since biochar started getting traction in the UN climate talks and the endorsement by climate activists James Lovelock, Jim Hansen, and Bill McKibben, opponents like Biofuelwatch and Vandana Shiva have been throwing up red flags about genetically modified forest monocultures being planted to fuel a vast biochar industry, displacing indigenous peoples and pumping up a carbon-trading Ponzi scheme to replace the recently exploded commoditized-mortgage-and-credit-default-swap bubble. This attack has now ramped up to the point where it has effectively derailed biochar's inclusion in the UNFCCC language that is slated for ratification in Copenhagen this December.

Traveling from the Mantria ribbon-cutting in Tennessee to the North American Biochar Conference in Boulder this August, we arrived to discover that, much to our delight, biochar advocates had risen like the Rocky Mountains to receive the challenge and raise the vision. Each day of the conference, roundtables met to discuss criteria for sustainability, how to characterize biochar and what to require of manufacturers. It was quickly apparent that at least in Australia, and likely elsewhere as well, there are enough profits to be made in charing wastes from poultry and paper that just those two sources could support the installable output of the emerging char-industries for many years to come.

Potential earnings from biochar made from paper or poultry wastes (in Australian dollars).

Sustainable Obtainable Solutions founder and former USFS forester Gloria Floria introduced draft standards that would compel producers to commit to full Life Cycle Assessment for energy, water and carbon footprints. The draft mandates would also require the biochar industry to optimize plant, animal, benthic and microbial biodiversity, improve forest health and habitat, and assist open and transparent citizen involvement in the construction, operation and monitoring of facilities and farms. A policy committee will continue to work on these standards between now and the next International Biochar Initiative meeting in Rio de Janeiro in 2010.

In Boulder, David Yarrow, biochar pioneer, small farmer and permaculture trainer in New York and New England, unveiled a vision of a community-centered biochar lifestyle that obtains fertility, fuel and food in an ecologically responsible cycle between humans and the living natural world. The three economic drivers for biochar development are farm products (including fertilizer, fuels and power); climate services; and carbon-negative community. That third driver is the greening of the human habitat to deliver carbon-negative housing and workplaces -- the whole built environment.

All of this is to say biochar is about putting the earth back into the black. To quote Geoffrey P. Glasby at the University of Göttingen, Germany, "How ironic that a civilization capable of tracing the origin of the universe from 10-43 seconds after its formation and putting a lander on Titan does not have the rigor and self-discipline to sustain itself for as long as the ancients managed to do." It seems likely now that a combination of climate reality and peak everything may yet alter our destructive trajectory, hopefully in time. We are relearning some ancient wisdom about soil care, and, with appropriate humility, we are starting to power our homes from the back end of a chicken.

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Albert Bates, author of Post-Petroleum Survival Guide and Cook Book (New Society Publishers), directs the Ecovillage Training Center in Summertown, Tennessee at The Farm. The original article appeared here: http://peaksurfer.blogspot.com/2009/08/sacred-shrines-and-skinny-chickens.html