# Soil from oil

## is biochar the magic bullet we've been hoping for?

Anxiety over ecological damage from energy use and otherwise wasteful ways is only heightened by band-aid fixes and the dearth of real, long-term solutions. One approach, however, promises not only to manage fossil fuel emissions but to improve and extend agricultural land in the process. As **Duane Pendergast** explains, 'slash and char' horticultural efforts of past generations of Amazon dwellers – and the carbon rich charcoal still contained in soil now known as "terra preta" (dark earth) – has finally captured the research imagination.

Fossil fuel emissions are poised to become a resource instead of an environmental liability, or so suggests developing evidence that charcoal in soil supports the biotic processes that increase soil productivity, thereby promoting still more growth and creating a feedback system enhancing the biosphere's ability to remove carbon dioxide from the atmosphere.

Diagrams of the carbon cycle show huge quantities of carbon have been retained over the eons in soils and fossil fuels. Agriculturalists on the prairies looking to sequester more carbon in the soil evolved the "no-till" technique (leaving behind plant material such as stocks and roots). Soil enrichment and carbon sequestration are also to be gotten from composting. But both no-till and composting are limited because carbon-bearing organic material in soil decomposes, producing and releasing greenhouse gases to the atmosphere rather quickly.

What's needed is an agricultural system that converts part of the plant growth it controls into charcoal for addition to the soil. In essence, new research reveals we may be able to 'make' soil from oil and other fossil fuel resources as we proceed through the fossil fuel age to a new age of sustainable abundance and plenty.

### One giant footprint for mankind

The paucity of information from just four or five years ago toward such a breakthrough is gone. Indeed, the current rush of ideas is too much for easy evaluation. Enthusiastic climate scientists, engineers, farmers, and gardeners from all over the world have discovered – and no doubt also reinvented – the terra preta concept and its potential linkage to managing greenhouse gases. New papers and articles in technical publications are in print. Even sober science magazines such as *Nature* and *Scientific American* have featured the concept over the past year.

Perhaps the best way to convey the growth of interest and enthusiasm in the field is to point readers to the newly established terra preta discussion list and website (http://terrapreta.bioenergylists.org), currently

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the primary online location for technical discussions on the "intentional use of charcoal in soil." Enthusiasts there have coined the term "neo terra preta" to describe modern systems that would capitalize on the invention of those Amazonian natives.

The site identifies many technical papers and discusses a vast array of topics related to the production and use of char (the solid substance remaining after partial combustion has released light gases and tar from a high-carbon material) from bio-material both to enhance soil and to establish a carbon sink. Contemporary soil scientists explain possible beneficial effects of soil-bound char; engineers discuss various designs for the production of char, sometimes in conjunction with hydrogen and/or bio-oils for energy. It's pointed out that humans already control a large fraction of the biosphere's production of organic material and that the biosphere already contains and circulates carbon far exceeding what's released in emissions from burning fossil fuel. Farmers and gardeners, meanwhile, are producing and using charcoal in experiments to evaluate the effects on crop yields.

Now, enthusiasm and optimism are indeed essential ingredients to move new technologies forward. Notice the near-evangelical zeal with which Danny Day of the Eprida Foundation suggests we're seeing the "stumbling steps of a brand new species evolved to stabilize (the) recurring imbalance" of climate cycles. Day believes the burgeoning human population, including some three billion now-impoverished farmers, is key to planetary survival and prosperity. All that's needed is to get them working on terra preta.

Such optimism is very refreshing, contrasting sharply with rhetoric that depicts mankind as a form of plague blindly destroying the planet. But neither optimism nor enthusiasm can take the place of the solid science, research, and development needed to form a firm basis for developing modern terra preta techniques.

A quick browse through the new store of information on the subject raises many significant questions. How will the air pollution from historical charcoal production techniques be managed? Could clean new charcoal production techniques be developed by industrial societies? Does charcoal really provide an

environment conducive to the development of soil by enhancing biotic action? What is the proper mix of durable charcoal and other organic material to provide a soil building environment? Is the application of charcoal to soil beneficial outside the tropics? How can energy required for charcoal production be integrated with other human energy needs?

It is precisely the job of science to find answers to these questions.

**Neo terra preta in Alberta?**

The bulk of evidence for the soil enhancing effects of charcoal comes from tropical countries. Dr. Marco Rondon, a native of Colombia now employed by Canada's International Development Research Centre (IDRC), sees promise for applications to rehabilitate degraded lands in the tropics and intensification of agriculture on the hillsides of South America, Asia and Africa, where land is scarce and not very fertile. His concept extends that of terraced agriculture initiated in the Andes and elsewhere centuries ago.

Much remains to be done to confirm terra preta benefits, particularly in temperate climates. Alberta seems, though, to have the right conditions to spur such research. Google Earth shows large areas affected by oilsands mining operations. Photos show total local soil devastation – that land's soil will need to be re-established. Oilsands operations will proceed on a very long timescale but evaluation and development of terra preta could proceed in parallel. David Layzell of Biocap Canada Foundation thinks neo terra preta "is a very credible alternative – with significant potential for Canada." Sustainable Development Technology Canada's mandate includes the development of technology to sequester carbon from biomaterial while enhancing soil. Meanwhile, Alberta's "Climate Change and Emissions Management Fund" provides for a potential source of funding. If global warming is coming, perhaps land currently degraded by oilsands operations could become our breadbasket.

Human ingenuity has worked wonders to boost the life-supporting productivity of our planet, shown fundamentally in our development of agriculture and use of energy. Doomsayers are telling us that global warming will make earth uninhabitable. What delicious irony if it turns out that humans can turn a problem identified with their agriculture and fossil fuel use into an asset to remove limits to the planets future. AO