What's Biochar Worth?

- Biochar is being sold as a soil amendment for $500 per ton or $12.50/50 lbs. plus shipping.
- Carbon credits sold by sequestering carbon from biochar production are economically competitive when carbon prices reach $38/ton CO_2e. Carbon sells at +$35 in European markets.
- Syngas and bio-oil markets are evolving. To date, most pyrolysis manufacturers retain these by-products for on-site energy production.
- Forest fire hazard reduction is another avoided cost , however it's difficult to financially quantify.
- Costs, savings and benefits vary by region and situation. Studies of community-sized operations with multiple stakeholders predict a return on investment within three years. Industrial size applications are more costly.
- Current research focuses on the avoided costs from biochar's ability to: nourish soils and increase crop yield, protect water quality; protect air quality from avoided burning; and the production of alternative energy while co-producing pyrolysis by-products.
- As biochar technology becomes more wide-spread and carbon prices increase, the economics will further improve.

For More Information on Biochar

The International Biochar Initiative (IBI) provides for the international exchange of information and activities in support of biochar research, development, demonstration and commercialization. It advocates biochar research and applications around the world.

Learn more at www.biochar-international.org.

USBI
www.biochar-us.org

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[1] "Terra Preta"—certain dark highly fertile soils found in the South American Amazon thought to be purposefully created by pre-Columbian Indians 500-2500 years ago.

[2] Cornell University, Soil Fertility Management. Dept. www.css.cornell.edu/faculty/lehmann/research/biochar/biocharmain.html

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[5] International Biochar Initiative. www.biochar-international.org/aboutbiochar/informationaboutbiochar.html

A nation that destroys its soils, destroys itself.
Franklin D. Roosevelt

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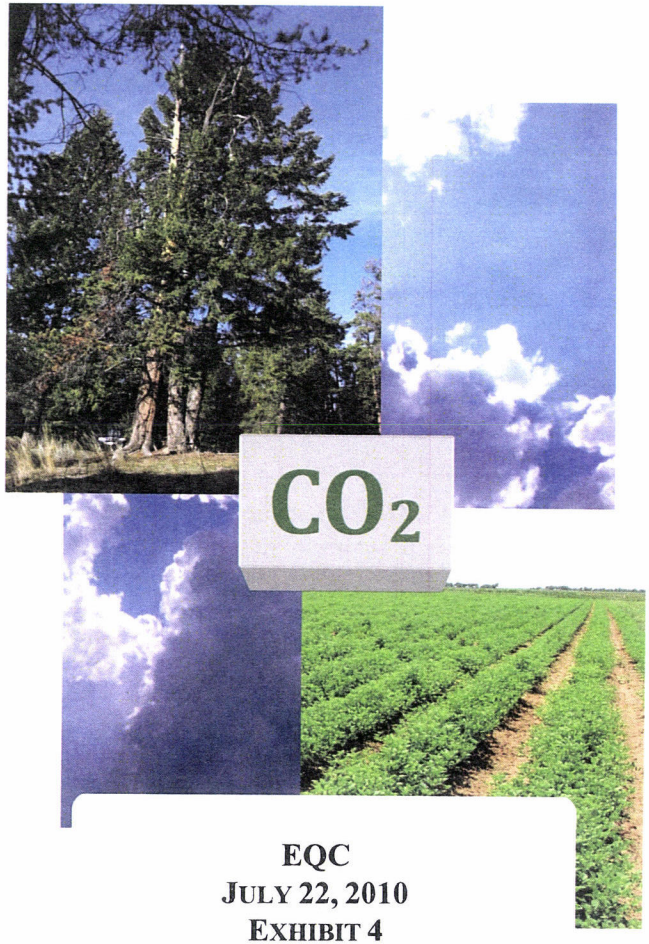
An Introduction To Biochar



EQC
July 22, 2010
Exhibit 4

What's So Amazing About Biochar?

It nourishes soils, protects water quality, provides market value to biomass waste, creates energy, reduces GHG emissions and sequesters CO_2 for thousands of years!

What is Biochar?

A Zero Waste Solution — Biochar is a fine-grained charcoal made by pyrolysis. Pyrolysis means heating biomass (wood, manure, crop residues, solid waste, etc..) with limited to no oxygen in a specially designed furnace that captures all emissions, gasses and oils for reuse as energy.

An Ancient Soil Conditioner — Biochar has been used in agriculture for more than 2,500 years.[1] Biochar is now being reintroduced to modern horticulture as a safe, sustainable soil amendment.

How Does Biochar Enhance Soil and Protect Water Quality?

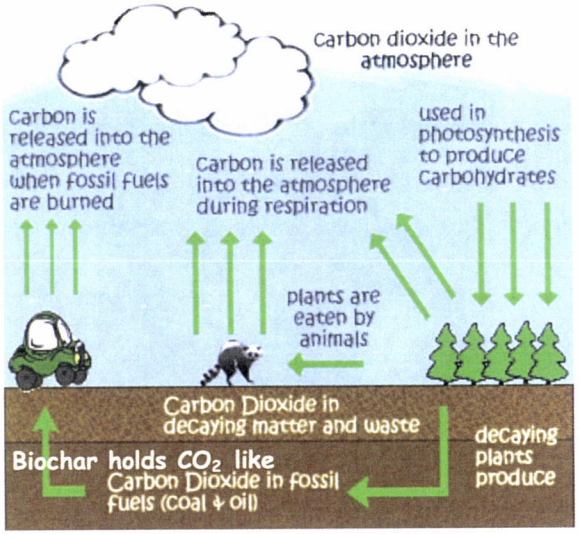
Increased Nutrient and Water Retention — Biochar outshines all other organic soil material in its ability to attract and retain water and nutrients, as well as hold phosphorous and agrochemicals.[2] So plants are healthier and fertilizers leach less into surface- or groundwater.

Persistence — Biochar is relatively inert; therefore, far more persistent in soil than any other organic soil additive.[3] Because biochar persists 100's to 1000's of years, all its benefits of nutrient and water retention and overall soil porosity last unlike common fertilizers and conditioners.

Less Fertilizer Needed — When added to soil, biochar improves plant growth and crop yields while it reduces the total fertilizer needs. Nitrous oxide (NO_2) released from certain fertilizers is 310 times more potent a greenhouse gas than CO_2. Biochar-conditioned soils have 50-80% reductions in NO_2 emissions.[4]

How Can Biochar Fight Climate Change?

Burning fossil fuels releases excessive CO_2 into the air, trapping heat in the Earth's atmosphere. Also, decomposition or open burning of biomass releases CO_2 back into the atmosphere. Minimizing human-caused CO_2 and taking CO_2 out of the atmosphere are ways to combat climate change.



A Perfect Circle Solution — Burning biomass through pyrolysis to produce energy (heat and power) instead of using fossil fuels is a carbon neutral process; it neither adds to the climate change problem nor reverses it.

Biochar holds 50% of the biomass' carbon. When biochar is applied to soil, that carbon is sequestered for centuries. Thus biochar reduces the overall atmospheric CO_2 by removing carbon from the active cycle and sequestering it. Biochar also enhances plant growth, which takes more CO_2 out of the atmosphere. Overall, these benefits make the biochar process carbon negative[5] as long as biomass production is managed sustainably.

What Else Do We Get By Making Biochar?

Biochar production is fully scalable. Pyrolysis ovens are becoming available in all sizes, mobile and stationary: from cooking stoves or furnaces for household use in developing countries, to on-site mobile ovens for forest restoration, to industrial-sized units for power generation and heating in the rural-urban interface.

Combined Heat and Power (CHP) — Heat and power produced during pyrolysis can generate electricity and provide heat for individual homes or industries and communities.

Biofuels — Combustible gases, including hydrogen, are captured during pyrolysis. This *syngas* is a valuable fuel that can be sold or used on-site for energy production. *Bio-oil* is another valuable energy product produced during pyrolysis.

Solid Waste Conversion — Tipping fees, the loading of landfills and open burning are avoided because bio-waste becomes a marketable product. This also reduces CO_2 and methane emissions from landfills.

From Waste to Income A once worthless and costly byproduct (in most cultures) is now a valuable resource. Through biochar, biomass becomes a sustainable and value-added product for urban and rural agriculture and forest communities while creating jobs, improving soil and reducing forest fire hazards.

Carbon Offsets — Carbon credits are valuable assets for sale or trade in the offset and cap-and-trade markets.