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Biochar: A Carbon Negative Model for UMass Amherst

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Biochar: A Climate Negativity Model for UMass Amherst

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Abstract:

Biochar is a charcoal by-product of pyrolysis production of biofuels from biomass, which offers the potential for long-term, affordable carbon sequestration. Biochar in Amazonian soils have been found to be stable in the soil for hundreds to thousands of years. New pyrolysis technologies currently being developed may have the potential to be used in the future with the new UMass co-generation Central Heating Plant to produce syngas for powering plant turbines, while at the same time producing biochar for carbon sequestration, yielding a carbon negative system. Other benefits of biochar include increased soil fertility and crop yield, stimulation of the soil microbial community and mycorrhizae, prevention of soil release of NO₂ and CH₄ (potent greenhouse gases), and, according to one study, the potential to reduce greenhouse gases by 10% or more worldwide.

Terra Preta: 2000 years old soil experiment



⇒ Anthropogenic origin

Glaser et al. (2001)

Advantages to Biochar

- Climate change mitigation
- Replaces fossil fuel with biofuel
- Inexpensive carbon sequestration
- Fixes CO₂, prevents soil release of NO₂ & CH₄
- Potential to reduce GHG emissions 10% or more
- Improves soil
- Increases crop yield
- Stimulates soil community: plant-friendly microbes & mycorrhizae
- Creative use of agricultural and forestry waste



Increased crop yields



BestEnergies agricultural trials

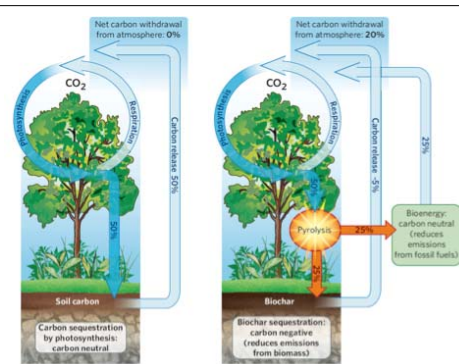


Stimulates Soil Community

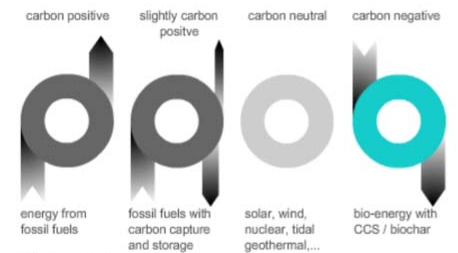
Isolates from the Surface of Charcoal

Isolate	% Similarity to Database Hits
<i>Garima proteobacterium</i>	96%
<i>Veitovrax paradoxus</i>	94%
<i>Pseudomonas sp</i>	94%
<i>Arthrobacter sp</i>	97%
<i>Pseudomonas putilla</i>	98%
<i>Bacillus cereus</i>	96%
<i>Bacillus sp.</i>	95%
<i>Bacillus drontensis</i>	97%

http://biochar-international.org/images/O_Neill_Bacteria_in_Amazonian_Dark_Earths.pdf



Carbon balance of energy from different systems



Source: Biopact
<http://www.biochar.org/joomla/images/stories/Pechoelbrennen/KoploUNCCD.pdf>

Pyrolysis plant BEST Energies, Australia

