Biochar

From Appropedia

The earth absorbs around 18 times the amount of carbon emitted by humans each year.[W] However, about the same amount (one figure given is 99.9%) of this carbon is released to the atmosphere through decomposition. This cycle can be closed by a process known as pyrolysis, in which biomass is heated in the absence of oxygen, creating charcoal and locking carbon in the form of **biochar**.[W]

Locking carbon away from the atmosphere and the carbon cycle described is referred to as carbon sequestration. Biochar can potentially lock away carbon carbon for hundreds or even thousands of years. If a real commitment were made, massive reductions in atmospheric carbon could be achieved - locking

down carbon emissions and increasing the wealth of our soils. In conjunction with other geoengineering projects, biochar may truly hold the key to saving our earth from climate catastrophe.

Biochar is also an effective and ecologically friendly soil amendment. It may also have applications in energy production and as a dietary supplement for animals.

Its production was practiced by pre-Columbian Amazonian natives (*"terra preta"*), and natural processes appear to have created a similar affect in other parts of the world, creating rich soils.

Biochar is not a solution on its own, but it appears to be an important element in comprehensive solution. *See Measures to stop global warming.*

Contents

- 1 Background
- 2 The Biochar Economy
- 3 Biochar in the Appropriate Technology context
- 4 Suitable Feedstocks
- 5 Specifics
- 6 Criticism
- 7 Links

Background

Note: This page was transwikified from Open Source Ecology (http://openfarmtech.org/) - please help adapt it to Appropedia.

According to the International Biochar Initiative (http://www.biochar-international.org/aboutbiochar.html) :

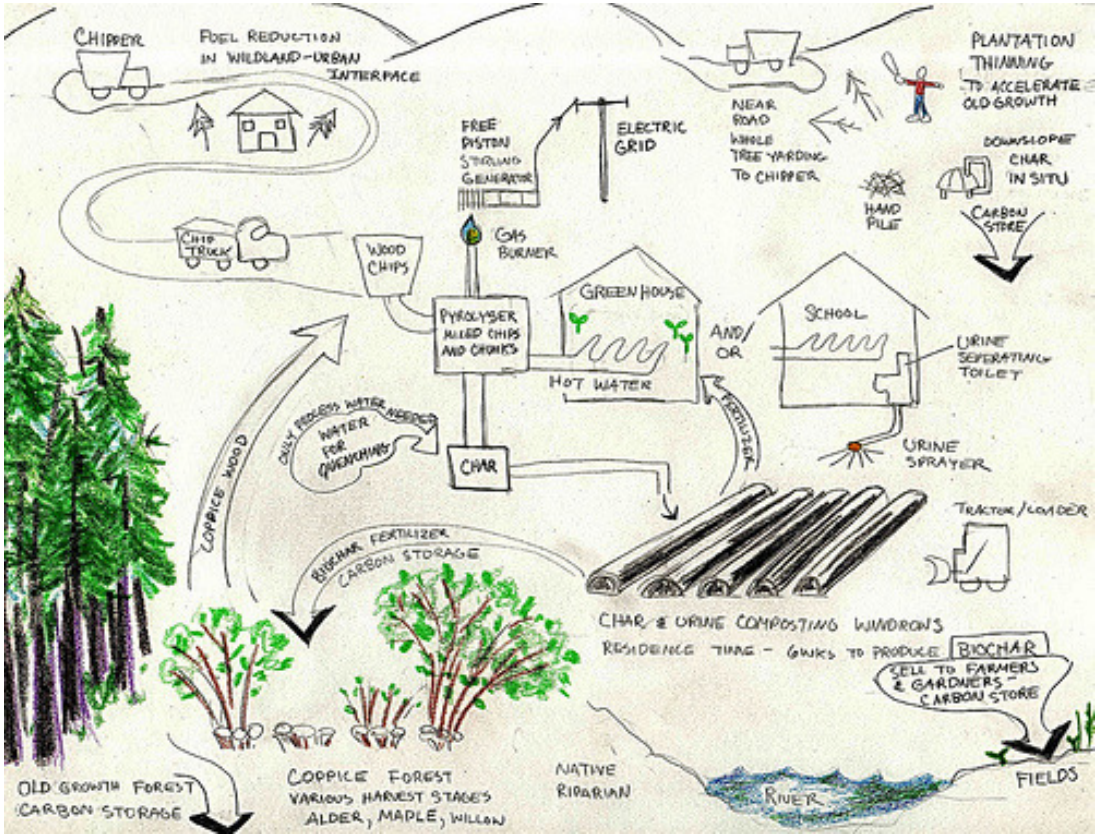
Biochar is a fine-grained charcoal high in organic carbon and largely resistant to decomposition. It is produced from pyrolysis

of plant and waste feedstocks. As a soil amendment, biochar creates a recalcitrant soil carbon pool that is carbon-negative, serving as a net withdrawal of atmospheric carbon dioxide stored in highly recalcitrant soil carbon stocks. The enhanced nutrient retention capacity of biochar-amended soil not only reduces the total fertilizer requirements but also the climate and environmental impact of croplands. Char-amended soils have shown 50 - 80 percent reductions in nitrous oxide emissions and reduced runoff of phosphorus into surface waters and leaching of nitrogen into groundwater. As a soil amendment, biochar significantly increases the efficiency of and reduces the need for traditional chemical fertilizers, while greatly enhancing crop yields. Renewable oils and gases co-produced in the pyrolysis process can be used as fuel or fuel feedstocks. Biochar thus offers promise for its soil productivity and climate benefits.

Some of the world's most productive soils (e.g. Canadian prairies, Russian Chernozem (http://en.wikipedia.org/wiki/Chernozem) / or "black earth") are very rich in organic carbon. This is now

thought to be pyrogenic in origin, likely originating from prairie or forest fires. This carbon is often thousands of years old, demonstrating its stability in soil. For more extensive background on Biochar, please consult the Wikipedia entry on biochar (http://en.wikipedia.org/wiki/Biochar) .

The Biochar Economy



(image from Flickr user **visionshare** by CC license)

Biochar in the Appropriate Technology context

- Inexpensive soil amelioration for degraded land (i.e. biochar as a liming agent)
- Need less land = lower startup costs for a Sustainable Village
- Increased biomass productivity
- Efficient use of biomass waste for energy generation
- Reduced need for fertilizer input (e.g. manure)
- Combine biochar with vermicompost to make superb fertilizer.
- Pyrolysis gas can be used for energy and as a heat source
- Bio-oil and tars are also by-products of pyrolysis, can be turned into biodiesel
- Add charcoal to compost heap to speed up composting (probably works via enhanced microbial activity)
- Biochar for sale as a source of income for an emerging

community
- Combine with solar thermal heat source to make a *solar pyrolysis unit* for charcoal production
- Charcoal is useful for other purposes, e.g. metal smelting
- Charcoal as filter: it has very high absorptive capacities and therfore can be used for water purification and filtration, later become biochar; can also be used to filter pyrolysis gas itself, although it may not be suitable as biochar later (depending on feedstock and potentially hazardous polycyclic aromatic hydrocarbons produced during combustion)
- Lastly, charcoal powder can also neutralize smell when put into a composting toilet. Then it becomes biochar, ultimately.

Suitable Feedstocks

A variety of feedstocks can be used. Since these often constitute agricultural residues in rural communities, a form of waste is

turned into an asset. Possible feedstocks include:

- **agricultural leftovers:** straw, rice hulls, corn stalks, chicken/cattle poop
- **fast-growing biomass:** bamboo, switchgrass, miscanthus,
- **other:** leaf litter, grasses, macroalgae, bones (high P content),

Specifics

The pyrolysis temperature appears to be a critical factor determining char yield vs. energy yield (tradeoff). Flexi-pyrolysis units are being developed that can be set for either char yield or gasification yield. Dry biomass can be pyrolyzed at regular atmospheric pressure. For wet biomass, pyrolysis at higher pressure ("supercritical") may be necessary, requiring a

more sophisticated technical set-up.

A customised pyrolysis unit may be used to generate soil additive and to sterilise planting soil

When large chunks of wood are used as feedstock, the charcoal may need to be crushed before use (beware: coal dust explosion !). Many agrigultural feedstocks and leaf litter will not need to be pulverized but will readily break into smaller pieces by themselves. For information on small-scale gardening, please consult the Gardening with Biochar FAQ (http://biochar.pbwiki.com/) , an excellent resource.

Criticism

Critics are concerned that large-scale biochar production may increase deforestation. However, a variety of biomass feedstocks other than wood can be used (see above). Old-growth forest is likely not a good feedstock because of extensive pre-processing

that would be required. Small biomass pieces such as pellets or cherry pits make excellent feedstock.

Links

Wikipedia page on Biochar [1] (http://en.wikipedia.org/wiki/Biochar)

Gardening with Biochar FAQ [2] (http://biochar.pbwiki.com/)

BioEnergy Lists: Terra Preta (Biochar) [3] (http://terrapreta.bioenergylists.org/)

International Biochar Initiative (IBI) [4] (http://www.biochar-international.org/)

Biochar Fund [5] (http://biocharfund.org/)

Folke Günther's "the simplest of the simple" two-barrel charcoal

retort (http://www.holon.se/folke/carbon/simplechar/simplechar.shtml)

*Please add this page to one or more **categories**. See Appropedia:Categorization for more information on categories.*

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