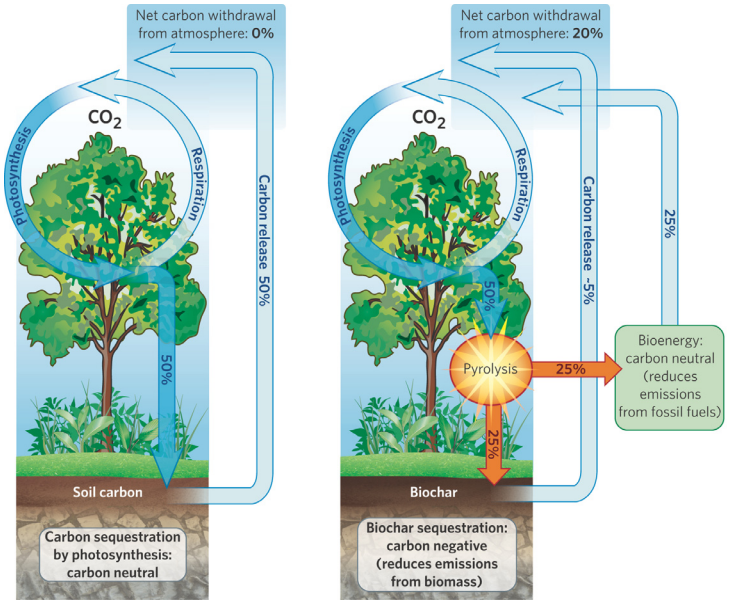
International Biochar Initiative

Biochar Can Be Carbon-Negative

How Can Biochar Be Carbon-Negative?

Fossil fuels are carbon-positive – they add more carbon to the air. Ordinary biomass fuels are carbon neutral – the carbon captured in the biomass by photosynthesis would have eventually returned to the atmosphere through natural processes – burning plants for energy just speeds it up. Biochar systems can be carbon negative because they retain a substantial portion of the carbon fixed by plants. The result is a net reduction of carbon dioxide in the atmosphere, as illustrated below.



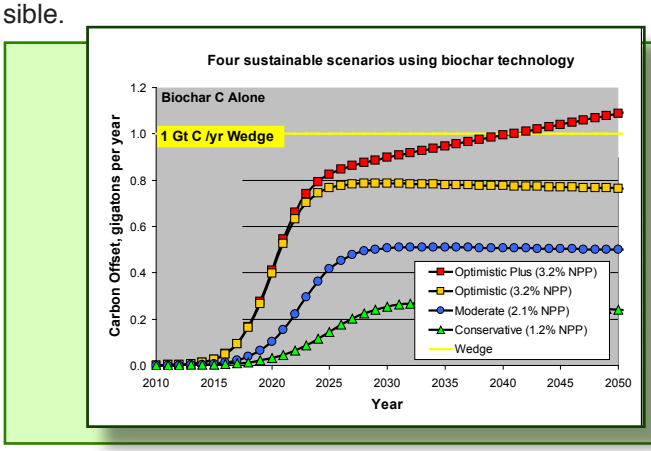
Biochar can sequester or store carbon in the soil for hundreds and even thousands of years. Biochar also improves soil fertility, stimulating plant growth, which then consumes more CO_2 in a feedback effect. And the energy generated as part of biochar production can displace carbon-positive energy from fossil fuels.

Additional effects from adding biochar to soil can further reduce greenhouse gas emissions and enhance carbon storage in soil. These include:

- Biochar reduces the need for fertilizer, resulting in reduced emissions from fertilizer production.
- Biochar increases soil microbial life which results in more carbon storage in soil.
- Because biochar retains nitrogen, emissions of nitrous oxide (a potent greenhouse gas) may be reduced.
- Turning waste biomass into biochar reduces methane (another potent greenhouse gas) generated by the natural decomposition of the waste.

How Much Carbon Can Biochar Remove from the Atmosphere?

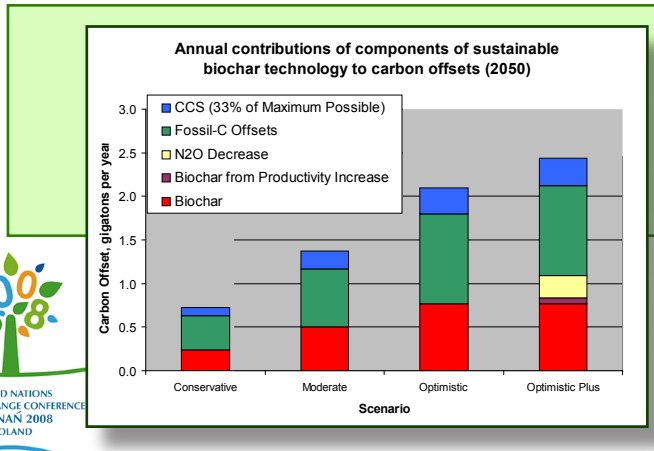
IBI has developed a simple model to predict the carbon removing power of sustainable biochar systems. The figures below show the results of this preliminary model. We expect these answers will change as more is learned about the impacts of biochar, but the model gives a sense of what is possible.



The figure above shows several scenarios that assume biochar production from waste biomass only, which is a small fraction of Earth's annual net primary production (NPP). Counting only the impacts of biochar burial in soil, and without considering the displacement of energy from fossil fuels, we can conservatively offset one quarter of a gigaton of carbon annually by 2030.

Optimistically, we could achieve one gigaton of offsets annually before 2050. In the "Optimistic Plus" scenario, we account for reductions in nitrous oxide emissions and for the feedback effect of increased biochar production that may arise from increased plant growth in soils enhanced with biochar.

The figure below shows additional carbon offsets possible if energy from biochar production displaces fossil fuel energy, and if CCS (carbon capture and storage) is used.



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