Biochar

Biochar is a way of using organic material from agricultural and forestry wastes to make charcoal using a controlled burning process called pyrolysis. The end result is a useful soil amendment that shows promise for carbon sequestration and soil fertility as well as having applications for bioenergy production. Biochar is used to increase crop yields and reduce or eliminate the need for synthetic fertilizers while restoring depleted soil and improving carbon sequestration, especially in conjunction with other regenerative farming methods.

Benefits

- Improves degraded soil
- Improves soil microbiology
- Improves soil water retention
- Increases soil pH
- Retains soil nutrients in the soil—reduces carbon dioxide and nitrous oxide emissions
- Can reduce the need for fertilizer
- Can increase crop yields
- Increases carbon sequestration
- Provides an efficient way to deal with farm waste

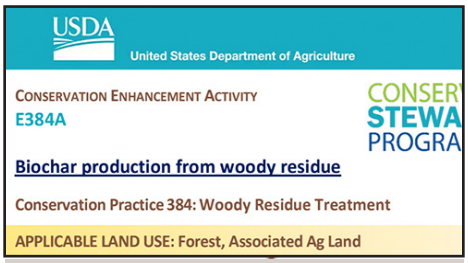
Potential Considerations

- Expense and time to learn to make it properly and in sufficent quantities
- May be too expensive for large operations
- Works best in depleted acidic soil, may not be desirable for crops that prefer a lower pH
- Best to use lightly and test results—it retains nutrients so in excess it could reduce nutrient availability to plants
- Need to avoid using materials that could contaminate your soil

California State University Chico
Center for Regenerative Agriculture and Resilient Systems

Resources

Biochar Overview
From the USDA Agricultural Research Service, Soil and Water Management Research: St. Paul, MN. https://bit.ly/3chyABx



Biochar production from woody residue
Conservation Practice 384: Woody Residue Treatment
https://bit.ly/3UAFdWw

Innovations in Biochar
NRCS webpage on making biochar from animal manure and woody debris. Includes multiple links to how to make and use it.
https://bit.ly/3xOZ7Ef

Biochar Formulation as a Soil Amendment in the Agricultural, Forestry, and Environmental Sectors

On-demand webinar by USDA NRCS. It covers methods of biochar creation, surface characterization procedures, and benefits of using biochars to solve problems in the agriculture, forestry, industry and the environment.

https://bit.ly/3ppQs2v

Research on Biochar

Laird D. *The charcoal vision: A win–win–win scenario for simultaneously producing bioenergy, permanently sequestering carbon, while improving soil and water quality.* Agronomy Journal 100, 178-181, 2008. https://bit.ly/3xdEKLp

Lehmann J. *Bio-energy in the black.* Frontiers in Ecology and the Environment 5, 381-387, 2007. https://bit.ly/3x359Ls

Lehmann, J., etc., *Nutrient availability and leaching in an archaeological Anthrosol and a Ferralsol of the Central Amazon basin: fertilizer, manure and charcoal amendments*, Plant and Soil 249, 343-357, 2003. https://bit.ly/2SaXf3W

Lehmann, .J, etc., *Bio-char sequestration in terrestrial ecosystems – a review*, Mitigation and Adaptation Strategies for Global Change 11, 403-427, 2006. https://bit.ly/3igS1yp

Liang, B. , et al: 2006, *Black carbon increases cation exchange capacity in soils*, Soil Science Society of America Journal 70: 1719-1730. https://bit.ly/3z5gmxe

Sombroek, W., Nachtergaele, F.O. and Hebel, A.: 1993, *Amounts, dynamics and sequestering of carbon in tropical and subtropical soils*, Ambio 22, 417-426. https://bit.ly/2SbOlDr

Learn more about soil amendments at The Center for Regenerative Agriculture and Resilient Systems
https://bit.ly/3oBjzj8