Figure 8. Biochar is highly porous carbon that adds to soil fertility.

BIOCHAR

WHAT IS IT?

Biochar is a renewable soil amendment that builds healthy forest and agricultural soils. It is a type of charcoal that is what's left over after carbon-based natural materials such as forestry, agricultural residues, manures and biosolids are baked at about 500-degrees Centigrade (900 °F) in a low oxygen environment. This pyrolysis method converts the feedstock of organic matter into a type of charcoal that is fine-grained and porous. This product has a huge surface area compared to its visual size that has multiple uses. This clean and stable material is 70% carbon that can remain undecomposed in the soil for decades or longer.

CSI Center for Sustainable Infrastructure

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MOST COMMON USES?

- Biochar enhances soil structure for plant roots, nutrients, and air
- Biochar is used as an amendment to compost and fertilizers
- Biochar increases water retention
- Biochar increases porosity of the soils
- The fine grain, porosity, and surface area is a good habitat for microbes that add to soil fertility.
- It is used in many non-soil applications such as animal feed, compost, building materials, filter media stormwater and erosion control

HOW IS IT MADE?

- Feedstocks of many types of biomass of various moisture content can be turned into biochar by using pyrolysis, a low-oxygen baking process.
- Example feedstocks include waste woods such as forestry slash, branches, twigs, agricultural wastes such as pits, nuts, shells, crop residues and manure, hemp wastes, or organic industrial process wastes like coffee husks.
- Unstable carbon in decaying plant material that might be released to the atmosphere in normal decomposition is instead converted to a stable version of carbon that can be stored for decades in the soil.
- These feedstocks are baked in pyrolysis plants or other thermal processes with low oxygen environment
- Feedstock for biochar is lean organic wastes such as wood wastes and agricultural wastes with a high lignin content.
- Half of the energy in the feedstock is converted to combustible gases and oils which can be converted power or to heat other processes such as greenhouses

DESTINATION/FATE

- Biochar is a powerful soil amendment and media for fertilizers and soil microfauna. In Mason County, Washington the Mason Conservation District is making biochar and then adding nitrogen, phosphorus, potassium and other micro-nutrients. The biochar is mixed with compost, worm castings, or by soaking it in a compost tea or some other nutrient source that can be absorbed.
- Biochar converts unstable carbon sources into stable carbon forms that can be stored in the soil for centuries.
- Because of its absorbency, biochar can retain nutrients and water in the soil
- Biochar has additional specialty uses and is used now most predominantly used as a soil amendment.
- Biochar added to fish fertilizers in Raymond improves fertilizer use in vegetable crops.

CONCERNS

- Pyrolysis can emit hydrogen and methane and CO2. Some processes seek to use the hydrogen and methane as syn-gas to fire the pyrolysis burner.
- A project in Washington State is seeking to use the waste heat and CO2 from the process to heat commercial greenhouses where the heat and CO2 augment plant growth.

OPPORTUNITES FOR INTEGRATION

- Produce biochar as a co-product of biomass heat and power.
- Carbonize biosolids to destroy antibiotics and chemical residues such as PFAS or PFOS and enhance compost or soil amendments.
- Carbonize residues to conserve and filter stormwater such as copper from brake linings which kills salmon fry in estuaries.