Introduction to Biochar

The International Biochar Initiative (IBI) defines biochar as “a solid material obtained from the thermochemical conversion of biomass in an oxygen-limited environment” (IBI, 2015). Biochar, made from agricultural and forest waste, is a porous material with a large surface area, making it an effective soil amendment, natural water filter, and absorbent. When sequestered, it can remain in the soil for hundreds of years (Lehman et al.)

Biochar Benefits

- Improves soil water holding capacity (drought resilience), aeration, and nutrient availability
- Provides habitat for soil microorganisms
- Sequesters carbon for hundreds of years
- Prevents nutrient leaching

Biochar and Nutrient Retention

- **Cation Exchange Capacity (CEC):** Biochar can hold onto positively charged nutrients, like calcium (Ca2+), magnesium (Mg2+), and potassium (K+), making them available to plants and less likely to leach out with water. (Dey, et al., 2023)
- **Surface Adsorption:** The large surface area of biochar allows it to bind nutrients, preventing them from being washed away. (Ding et al., 2017)
- **Microbial Habitat:** Biochar provides habitat for beneficial soil microorganisms, which can help to cycle nutrients and make them more available to plants (Jindo et al., 2012; Steiner et al., 2015)
- **Reduced Runoff:** Biochar can reduce surface runoff—a major cause of nutrient leaching—by improving soil water retention.
- **Reduced Emissions:** It can reduce NH3, CH4, and N2O emissions in compost from commercial broiler/poultry litter compost (Akdeniz 2019) (Ameloot et al., 2013) (Agyarko-Mintah E, et al., 2023)

Recent studies show that biochar, when used on-farm as a soil amendment, helps soil retain the carbon created from biomass through pyrolysis as a stable carbon source in the soil for thousands of years (Lehmann 2007, Hadroug 2019, Ghanim et al 2016). In addition, to adding carbon to the soil, biochar has been shown to increase stabilization of pre-existing carbon content in the soil by 64.9-68.8% through a negative priming effect (Lu et al 2014) that decreases carbon off-gassing by 40% and increases soil microbial biomass by 18% (Hoffman-Krull 2019, Liu et al 2016).

Some Key Resources in addition to live links in document:

Lehmann, Johannes (2007). “Bio-energy in the black,” Front Ecol Environ. Volume 5, Issue 7, pp 381-387. https://www.css.cornell.edu/faculty/lehmann/publ/FrontiersEcolEnv%205,%20381-387,%202007%20Lehmann.pdf

Akdeniz N. A systematic review of biochar use in animal waste composting. Waste Manag. 2019 Apr 1;88:291-300. doi: 10.1016/j.wasman.2019.03.054. Epub 2019 Mar 30. PMID: 31079642.

Agyarko-Mintah E, Cowie A, Singh BP, Joseph S, Van Zwieten L, Cowie A, Harden S, Smillie R. Biochar increases nitrogen retention and lowers greenhouse gas emissions when added to composting poultry litter. Waste Manag. 2017 Mar;61:138-149. doi: 10.1016/j.wasman.2016.11.027. Epub 2016 Dec 8. PMID: 27940078.

Keiji Jindo, Miguel A. Sánchez-Monedero, Teresa Hernández, Carlos García, Toru Furukawa, Kazuhiro Matsumoto, Tomonori Sonoki, Felipe Bastida,
Biochar influences the microbial community structure during manure composting with agricultural wastes, Science of The Total Environment,Volume 416,2012,Pages 476-481,ISSN 0048-9697,https://doi.org/10.1016/j.scitotenv.2011.12.009

About Carbon Chicken Project LLC

Carbon Chicken Project LLC, (CCP) is a regenerative agriculture company that upcycles poultry litter into high-quality, sustainable soil amendments using biochar. Their flagship product, CarbonChicken80:20, is composed of 80% composted chicken litter and 20% inoculated biochar, and is marketed as a premium, organic soil conditioner that enhances soil structure, water holding capacity, nutrient uptake, and sequesters carbon, while reducing reliance on chemical fertilizers. Website: https://carbonchicken.store

This product was developed over 10 years of biochar/compost research and development by CEO Jody Hardin, COO Richard Ims, CFO Turner Tomlinson, Dr. Bill McCoy and Mark McCoy, Hayden McIlroy, Dr. Jay McDonald, Dr. Srinivas Jayanthi, Sterling Sellers, Kristen Efurd, Toua and Mia Yang, Angie Albright, and a diverse science team based in Northwest Arkansas. The Carbon Chicken Project LLC is headquartered at the Carbon Chicken Innovation Farm, 13893 White Oak Rd., Fayetteville, AR. 72704.