



Using Biochar as an Agricultural Soil Amendment in Northern Arizona: A Field Testing Guide

March 2024



Sustainable
Communities
Program

Background

Biochar is produced by burning woody material in a controlled, low-oxygen environment. It has been widely used in some regions of the world as a soil additive, where it has been shown to increase both nutrient retention and water retention.

Biochar accomplishes this because it has a highly complex structure of pores that store nutrients and water. Biochar is also a very stable form of carbon, making it an effective means of storing carbon in soils for the long term—an important consideration at a time of climate change.

But biochar has not been widely tested in Northern Arizona, where producing it may be a viable way to use some of the large quantity of woody material removed from pine forests during thinning operations. Currently, much unmarketable material is burned onsite in slash piles, a practice that increases fire danger and causes smoke impacts. Turning that material into biochar may be a better way to go, and several proposals to produce biochar at a large scale are in development in Northern Arizona.

NAU's Ecological Restoration Institute has produced a test batch of biochar and is currently testing its use in forest restoration applications. The Rural Foods Pathways Project aims to set up similar experiments in agriculture. Experienced Northern Arizona growers who are willing to experiment with biochar can help build a knowledge base about best practices. We hope you will use your biochar in this spirit of developing and sharing regionally relevant knowledge.

Suggestions for use

Based on tests and experiments in other parts of the U.S., here are some suggestions on how to use your biochar:

1. Soak biochar in water to remove salts, which can contribute to soil alkalinity. One commonly cited practice is to soak the biochar (keeping it covered) with water for several days, draining and replacing the water every 24 hours. A single soak appears to remove about 30% of salts, and each additional soaking with fresh water removes more salt.
2. Mix biochar with compost before application. A ratio of 1 part biochar to 10 parts compost (by volume) is commonly cited. This ensures that organic material is pre-mixed into the biochar before you apply it to your soil.

3. Age the mixture. Keeping the mixture moist, let it age for one to three weeks before application. This allows nutrients from the compost to infiltrate pores in the biochar, and enables microorganisms to adapt.
4. Apply as you would compost. Be sure that the mixture is moist when applied; when dry, a mixture containing biochar can produce hazardous and annoying dust. It's best to apply a biochar mixture in such a way that it does not simply lie on the soil surface. Consider applying a layer while building a new growing bed; covering the biochar-compost mixture with another layer of another material; or using the mixture to line planting holes for perennials. The goal is to avoid small, dry biochar particles subject to being carried by wind.
5. Observe—for a while! Pay close attention to what's happening in the field or garden. Some reports indicate that biochar takes a while to show an impact, so effects may not be readily apparent until later in the growing season, or even a year later.
6. Experiment! It's especially helpful, if you have the space, to compare what happens with a bed charged with biochar, and a similar one that's untreated. Or try experimenting with a few different mixtures of biochar and compost, or other sources of organic material such as aged manure. Any changes you observe will be of high interest to other growers!
7. Report back—we want to hear about your observations! What you observe on your farm or in your garden may help other growers improve their operations.

Learn more

Biochar Basics: An A-to-Z Guide to Biochar Production, Use, and Benefits (USDA Rocky Mountain Research Station 2022): https://www.fs.usda.gov/rm/pubs_journals/rmrs/sycu/2022/sycu_54_2022_05_biochar_basics.pdf

Biochar for Arid and Semi-arid Agricultural Soils (New Mexico State University Cooperative Extension Service, 2018): <https://pubs.nmsu.edu/circulars/CR690/>

Biochar Guidelines for Agricultural Applications: Practical insights for applying biochar to annual and perennial crops (United States Biochar Initiative, 2023): <https://biochar-us.org/biochar-crop-application-guidelines>

Biochar in Utah Agriculture (Utah State University Extension and Utah Plant Pest Diagnostic Laboratory): <https://projects.sare.org/wp-content/uploads/factsheet-Biochar-Ag.pdf>

Guide to Making and Using Biochar for Gardens in Southern Arizona (University of Arizona Cooperative Extension, 2017): <https://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1752-2017.pdf>

Find other fact sheets, presentations, and more: <https://biochar-us.org/welcome-biochar-learning-center>

Contact

The Rural Foods Pathways Project is an initiative of Northern Arizona University's Sustainable Communities Program and is funded by the Sustainable Economic Development Initiative of Northern Arizona. This guide was researched and written by Sufyan Suleman and Peter Friederici, and reviewed by Dipita Ghosh.

Contact us: ruralfoods@nau.edu; Peter.Friederici@nau.edu; Dipita.Ghosh@nau.edu.