



Transition Town Vincent
My Healthy Soils Project

Biochar for Community Gardens



Website

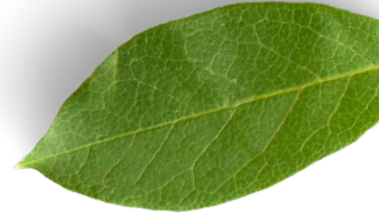


<https://transitionaustralia.net/projects/my-healthy-soils/>



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Introduction

Soil and terrestrial vegetation are carbon sinks with around two thirds of the terrestrial carbon pool sequestered in soil (ASOE, 2021). Charcoal a.k.a. biochar is a form of resistant carbon which naturally makes up around 10% of soil organic matter with humus e.g. compost/mulch making up 50% and particulate making up about 2-25% (DPIRD, 2022).

Clearing, development and management of land for intensive land uses such as agriculture and urban have resulted in the loss of significant amounts of terrestrial carbon with Australia listed as number 3 (behind China and the United States) among countries with the highest loss of soil organic carbon (ASOE, 2021).

Significant efforts are being made particularly in the agricultural sector to restore terrestrial carbon, however, in the urban environment this is largely ignored. The My Healthy Soils project aims to empower local residents and others to increase soil organic carbon (SOC) and health while providing other benefits including recovering resources from organic waste, reducing water use and improving plant health and associated vegetation and canopy cover.

Vision



Residents are empowered to transform their urban yards into carbon sinks while creating a cool, healthy and more sustainable living environment.





Why this workshop?

Biochar and FOGO compost was first used by the Transition Town Vincent (TTV) in their community food forest to enhance water use efficiency and promote healthy trees. Water use is a particular issue for the site due to sandy soils, exposed aspect and reliance on hand watering by volunteers.

The results after the first year have been very good with only 2 out of 30 plants dying and all other plants growing at an overall average of over 25%. Partly because of this and the other benefits of biochar, the TTV have initiated the My Healthy Soils project which aims to provide residents with the knowledge, skills and resources to transform their gardens from carbon sources to carbon sinks, while enjoying benefits of healthy gardens.





What is biochar?

Biochar is a type of charcoal usually made from plant materials (biomass) and used as a soil amendment plus a multitude of other uses (e.g. water filtration, odour mitigation, detoxifier, chemical spill kit, etc). It is usually produced through a process called pyrolysis, where biomass is heated in a reduced oxygen environment.

This process not only produces biochar but also releases gases and oils that can be used as energy sources and a smoke condensate (wood vinegar) which also has a wide range of uses. Biochar is a form of resistant carbon which can persist in the soil from 100's to 1,000's of years.





Why biochar?

Biochar can be made from a wide range of biomass waste resources but is particularly suited to vegetation based biomass e.g. fruit tree thinnings. By creating biochar from these resources, the carbon is 'locked in' and the emission of greenhouse gases which would otherwise occur through decomposition or incineration is avoided. For this reason, biochar is recognised as a negative emission technology (or a carbon sink) by the International Panel of Climate Change (IPCC).

Biochar also has a range of physical, chemical and biological qualities which makes it so useful, particularly as a soil amendment. One is its large surface area. For example, one teaspoon of wood biochar has enough surface area to cover a one hectare football field. This porosity significantly adds to its water holding capacity which can be up to 700% its mass.





Features & Benefits

01.

Enhanced soil fertility

Increases the nutrient-holding capacity of soil, making nutrients more available to plants and reducing the need for chemical fertilizers.

02.

Improved soil structure

Helps to improve soil structure by increasing aeration and water retention. This leads to better root growth and healthier plants.

03.

Increased water retention

Holds water within its porous structure, making it available to plants during dry periods.

04.

Carbon sequestration

It is a stable form of carbon that can remain in the soil for hundreds to thousands of years.

05.

Reduction of contaminants

Can bind harmful substances, such as heavy metals and pesticides, reducing their availability in the soil and minimizing their uptake by plants

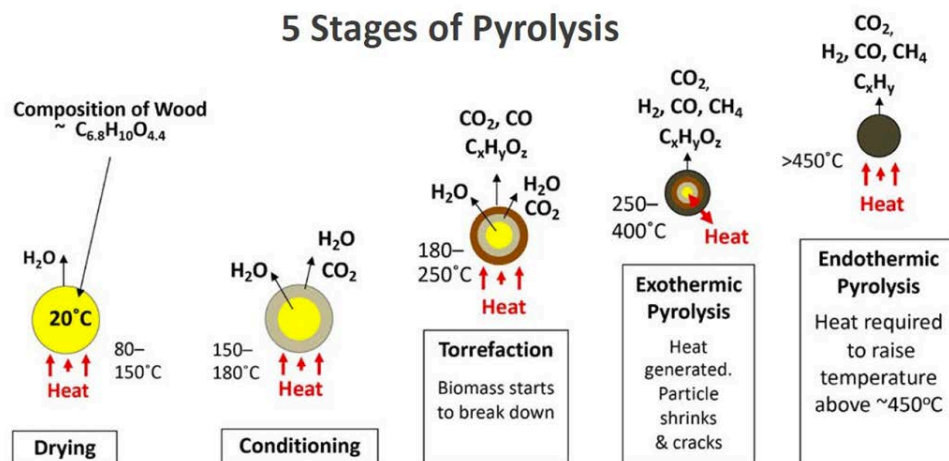




What is pyrolysis

The usual process for making biochar is by a process called pyrolysis where the biomass is heated to high temperatures in a reduced oxygen environment.

As the biomass heats up it releases gases such as methane and nitrous oxide which can be combusted, adding to the heat. Pyrolysis occurs from between 250-800 degrees Celsius. Biomass type and size, temperature and time can be controlled to engineer biochar with particular qualities.



Source: Joseph, S. & Taylor, P. (2024) A farmer's guide to the production, use and application of biochar. ANZBIG



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How to make biochar

There are many ways of making biochar. Some involve items you may have at the community garden, such as a BBQ oven (e.g. Weber) or fire pit. With the fire pit, biochar can be made by quenching the fire with water (or soil) before the wood turns to ash.



Another way is to put the biomass e.g. dried grass, leaves, sticks, mulch, wood chips etc into a steel canister containing small holes and char the biomass in there. This can also be done in a BBQ oven. TTV have also made a couple of special biochar ovens, called Top-Lit UpDraft (TLUD) biochar ovens which can be obtained from the tool n things library (as can the steel canisters).

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How to make biochar

Gather Biomass: Collect plant materials like grass, wood chips, crop residues, or other organic waste and dry (<20% moisture).



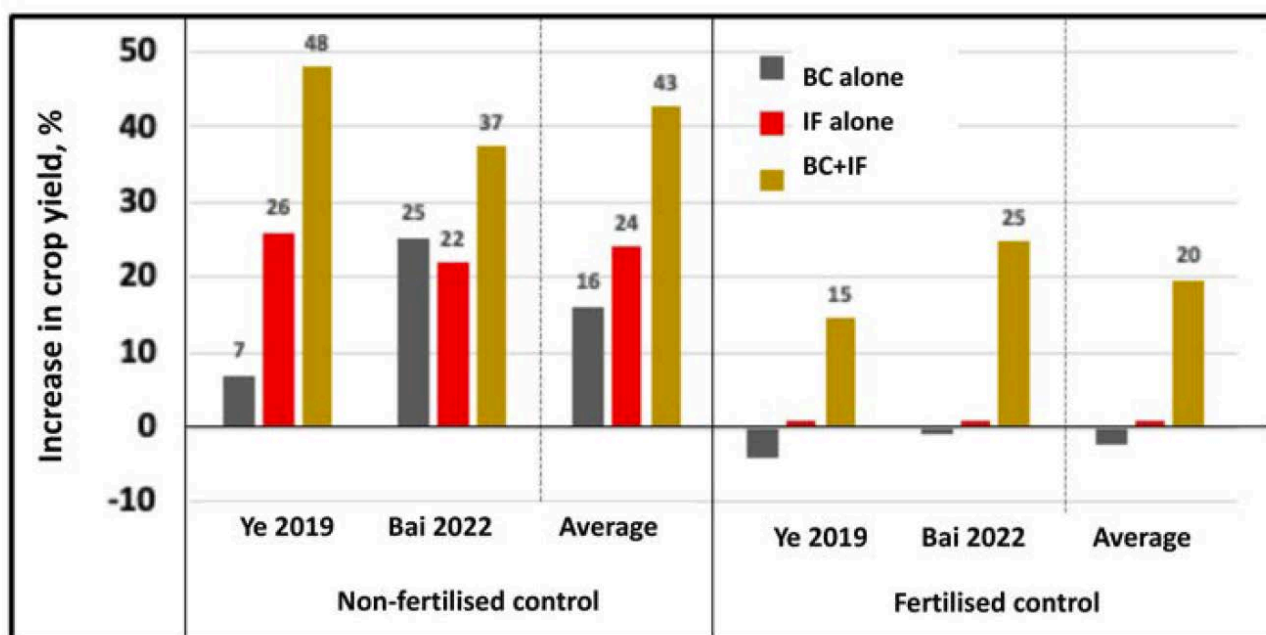
Pyrolyze the biomass: Put the biomass in a special container and heat it up without much oxygen. This creates biochar a.k.a. charcoal, gases and oil.

Cool, pulverise, and collect: Cool down the biochar e.g. using water or soil, and pulverise or crush it as finely as you can.



How to activate biochar

Biochar should be activated with organic or inorganic fertilisers for it to work optimally in the garden. If it isn't activated then it can pull nutrients away from plants and have a negative effect on their growth. As shown by this graph, biochar combined with fertiliser can result in significant long term improvements in yields averaging up to 48%.



Source: Joseph, S. & Taylor, P. (2024) A farmer's guide to the production, use and application of biochar. ANZBIG





How to activate biochar

01.

Mix with compost

Mixing the finished compost, an organic fertiliser, will charge the biochar with nutrients and improve its effectiveness. Mix and leave for about 2 weeks before using.

02.

Co-compost

Co-composting is when you mix biochar with organic matter to produce compost. Use a ratio of at least 10% biochar to organic matter.

03.

Feed to your worms

Feeding biochar to your worms is a great way of activating your biochar and enrich your castings

04.

Feed to the chooks

Include a sprinkle of biochar with the scraps you feed to the chooks to enrich their manure and keep them healthy

05.

Soak in liquid fertiliser

Soak the biochar in liquid nutrients such as worm juice, compost tea. Leave for about 2 weeks and then apply as a slurry.



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How to use biochar

Incorporate into garden beds, seedling trays, pots or planting holes:

Mix the activated biochar into your garden soil. Aim for a ratio of between 10-20% biochar to soil. For example, if you are amending a garden bed with 100 litres of soil, you would add 10-20 litres of activated biochar.

Incorporate into Trenches and Wells:

Incorporate activated biochar into wells or trenches around existing trees. Aim for a ratio of about 50% activated biochar to soil and between 0.5 to 1 metre away from the plant or under the drip zone.





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How to use biochar

Top Dressing

For existing garden beds, you can also sprinkle a thin layer of biochar on the soil surface and gently work it into the top few inches of soil. Give a good drink.

Water and Monitor

After applying biochar, water your garden thoroughly to help integrate the biochar into the soil. Monitor plant health and soil moisture levels regularly.



Acknowledgements



Professor Stephen Joseph



Australia New Zealand Biochar Industry Group (ANZBIG)



North Perth Community Garden



References



Stephen Joseph and Paul Taylor (2024) A Farmers guide to the production, use and application of biochar, ANZBIG



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DPIRD (2022) What is soil organic carbon



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Website

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Thank You.

