

maccybiochar

September 2023

A Task Group of the Macclesfield Community Association Inc.

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59,176 litres biochar made; 29.838 tonnes of CO₂ removed.

WHAT IS MACCY BIOCHAR ABOUT?

Maccy Biochar is all about:

- fighting climate change by reducing atmospheric carbon dioxide
- reducing Macclesfield's carbon footprint and
- improving local soils.

Carbon is captured (temporarily) by all plants by the process of photosynthesis.



The carbon dioxide (CO₂) in the air is split into carbon and oxygen. The carbon goes into building the wood. And the oxygen is emitted for us to breathe. However sooner or later plants give back carbon to the atmosphere (eg. when they are burned and when they die and rot); whereas biochar is stable and lasts for thousands of years in the soil (as proved by the Terra Preta soils of South America).

SO WHAT IS BIOCHAR?

Physically biochar is similar to charcoal made from wood. But unlike wood charcoal, biochar is not used as a fuel. If it was we would simply be recombining the carbon with oxygen to make carbon dioxide again. But like most charcoal, biochar is made from biomass eg tree litter. Here is a typical wood pile on a local farm.



HOW IS IT MADE?

Biochar is made by cooking dry wood with little or no air (so-called pyrolysis) at high temperature (400-600°C). There are many different ways to do this. Some are high tech. such as retorts and screw feeders, and some are low tech. We use a low-tech method using flame-capped kilns.



During pyrolysis the combustible gases (methane, carbon monoxide and hydrogen) emitted are burned **cleanly with no smoke** at high temperature (eg 2000 degrees C). This leaves behind a char consisting only of carbon, ash (the mineral content) and some residual volatiles. When the kiln is full the contents are thoroughly quenched with fresh water. Here is the finished char after quenching and bagging.



Our biochar is typically 75% - 80% carbon depending on the type of wood that is pyrolysed. (Hardwood is best). The remainder is residual ash (the mineral content that does not burn) and residual volatiles (hydrocarbons that have not completely burned away).

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HOW DOES BIOCHAR REDUCE GREENHOUSE GASES?

Each carbon molecule captured has removed one molecule of CO₂ from the atmosphere. Because of the atomic structure of CO₂ this means that each mass unit of Carbon captured has removed just over 3½ mass units of CO₂.

(Atomic weights: C =12; O =16; So CO₂ = 44; So 12 units of C divert 44 units of CO₂. So 1 unit of C removes 3.66 units of CO₂.)

So 1 tonne of carbon removes 3.66 tonnes of CO₂.

And because we can easily measure the carbon content of the biochar (75 – 80%) then we can calculate how much CO₂ each tonne of biochar has diverted from the atmosphere. **Typically 1 tonne of biochar removes 2½ tonnes of CO₂.**

HOW DOES THIS HELP REDUCE MACCY'S CARBON FOOTPRINT?

Currently the biochar we make is not able to be accredited as a legal carbon offset. There is simply no accreditation body in Australia that is set up to do that for small producers like us. So we can only “claim” carbon offsets in the figurative sense. We use the Australian National Greenhouse Accounts Factor for South Australia (currently 0.25kgCO₂/kWh) and average household electricity consumption (6000kWh/annum) to estimate the number of local households we have rendered carbon neutral. For example if we remove 10 tonnes of CO₂ per annum that represents offsetting the electricity consumption of approx. 5 households (without solar panels). Not a lot but a start!

HOW DOES BIOCHAR HELP THE SOIL?

Biochar is extremely porous and so can hold about 3-5 times its own weight of water. When mixed into the soil in small proportions (5-10% by volume) moisture and water-borne nutrients are held and encourage growth of micro-fungi and other living organisms.

Biochar particles are also extremely tough and so do not readily break down in the soil. The porosity of the soil is therefore increased which assists with aeration which in turn also helps to improve the health of soil life.

All this helps to improve plant yields; reduce water consumption; and reduce the need for fertilisers. In turn the multiplier effect of increasing soil life is to further increase soil carbon and therefore fertility.

As the biochar does not readily break down it will remain in the soil for many hundreds of years. So the benefits to the soil are ongoing.

OTHER BENEFITS OF BIOCHAR

Other benefits include:

- reduction of methane emissions from compost and mulch;
- reduction of methane emissions from cattle when added to cattle feed;
- reduction of nitrous oxide emissions from soils when used to reduce inorganic fertiliser use;
- reduction of animal disease when added to the diet;
- adsorption of contaminants from drinking water (an old bushman's trick);
- adsorption of odours (eg from food scraps for composting; smelly socks; vent pipes etc, etc).

WHAT HAVE WE DONE SO FAR?

A steering committee was formed at a public meeting in January 2019 to drive the project in Macclesfield. The committee has since then:

- undertaken extensive community consultation;
- set up a website <https://www.maccybiochar.com>;
- held an Open Day to demonstrate the operation of the kilns;



Here is Greg Marlu at our 2019 Open Day.

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- obtained an operating site on private property courtesy of Greg & Jacqui Goding;
- enlisted a membership of some 50 people of whom approximately 12 are active volunteers;
- produced about 60,000 litres of biochar resulting in a net capture of about 30 tonnes of CO₂;
- sold our raw biochar in bulk bags to local Councils, market gardeners, biochar retailers, and others;



Despatching our first bulk bag of raw biochar.

- worked with local vineyards;



- set up a mobile kiln for on-farm use;



- used a \$2000 Community Grant from the Mount Barker Council to have a larger kiln made for us by a local fabricator.



- conducted training courses and biochar workshops for many other community groups;
- donated biochar to Biggest Morning Tea charity auction;
- established Quality Control procedures; and
- achieved runner-up and finalist in the 2022 Premier's Climate Leaders Awards.

Below is a summary of our modest, but significant, achievement so far:

MACCYBIOCHAR SCOREBOARD at 31/08/23					
YEAR	2019-21	2022	2023	TOTAL	Units
BIOCHAR PRODUCED	40103	11043	8030	59176	Litres ²
CARBON CAPTURED	6223 ¹	1680	1012	8915	Kg
NET CO ₂ REMOVED	21.513 ³	4.919 ⁶	3.406	29.838	Tonnes
ELECTRICITY OFFSET	55.432 ⁴	14.055 ⁵	14.017 ⁷	83.504	MW _h
1. Re-calculated based on 3rd party biochar analysis dated 19/4/20 2. Includes 9859L from members. 3. Re-calculated based on 3rd party biochar analysis dated 28/1/21 4. Calculated based on Australian National Greenhouse Accounts Factors Oct. '20 (SA: 0.43 kgCO ₂ /KWh) 5. Based on Australian National Greenhouse Accounts Factors Aug. '21 (SA: 0.35 kgCO ₂ /KWh) 6. Re-calculated based on 3rd party biochar analysis dated 12/1/23. 7. Based on Australian National Greenhouse Accounts Factors Feb. '23 (SA: 0.25 kgCO ₂ /KWh)					

WOOD COLLECTION & DELIVERY

Our wood collection team provides a valuable community service by picking up tree litter from under trees on Macclesfield properties. Converting their litter to biochar ensures that the carbon they contain is captured while reducing the fire risk they

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pose during summer. But we do not seek biomass from bush-care or other sensitive sites.



Delivery and drop-off of dry tree litter (from twigs to 100mm dia.) is free of charge to Macclesfield residents and anyone with a Macclesfield PO Box; and a small fee for people living outside Macclesfield. Without the wood we cannot make biochar!

WHAT DO WE WANT NOW?

- **More biochar groups:** We want to inspire other local communities to set up their own biochar groups using a similar business model to ours so that together we can capture more carbon from the atmosphere and build a viable **carbon-negative biochar industry**.
- **Demonstration site:** We want to establish a permanent site where we can demonstrate our methods to the wider community; conduct biochar trials; and provide further education on applications for carbon negative biochar.
- **Accreditation:** We want to see government action to establish local accreditation bodies for small biochar producers to verify their carbon capture claims but not to create tradeable carbon offsets.
- **On-farm production:** We want to help local landowners make their own biochar to improve the biodiversity of their land and increase their soil organic carbon.
- **Biochar industry:** We want to cooperate with other community biochar groups to establish an SA Biochar Cooperative.
- **Net CO₂ removal:** We want to see accurate and credible labelling of biochar products to verify amount of net CO₂ removed by the products up to the point of sale.
- **Emissions reduction:** We want to see local communities acting together to achieve 5% reduction in emissions each year for the next 10 years.

HOW CAN YOU HELP?

- **Become a member!** Join the Group to stay informed about progress and help us with this initiative. Membership forms are available from the website or simply call us. Member benefits include bulk discount price for biochar; monthly biochar news bulletins; free wood litter drop-off; loan of small kilns for home use.
- **Volunteer** to collect wood and/or make biochar.
- **Drop off** your tree litter to our Shadygrove road site. Call Brian or Kelvin to arrange a time for drop-off.
- **Enrol** in one of our Training Courses.
- **Engage** us to run a Biochar Workshop for your group and/or advise you on how to set up a biochar group of your own.
- **Engage** us to make biochar on your property and avoid having to set fire to your waste wood heap.



ABOUT US

Maccy Biochar is a community-based, not-for-profit group set up to help make Macclesfield carbon neutral and is run entirely by volunteers. Our primary activity is the production of **carbon-negative biochar** from woody tree litter sourced from local households, businesses and landowners. The biochar we make is sold in bulk for local agricultural and other similar uses thereby ensuring that the carbon we have captured is properly sequestered and helping to improve local soil fertility for years to come.

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