MACCY BIOCHAR

December 2021

A Task Group of the Macclesfield Community Association Inc.
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40,103 litres biochar made; 21 tonnes of CO_2 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 (CO_2) 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 CO_2 from the atmosphere. Because of the atomic structure of CO_2 this means that each mass unit of Carbon captured has removed just over 3½ mass units of CO_2.
(Atomic weights: C =12; O =16; So CO_2 = 44; So 12 units of C divert 44 units of CO_2. So 1 unit of C removes 3.66 units of CO_2.)

So 1 tonne of carbon removes 3.66 tonnes of CO_2.

And because we can easily measure the carbon content of the biochar (75 – 80%) then we can calculate how much CO_2 each tonne of biochar has diverted from the atmosphere. **Typically 1 tonne of biochar removes 2½ tonnes of CO_2.**

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 0.43kgCO_2/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 CO_2 per annum that represents offsetting the electricity consumption of approx. 4 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 over 40,000 litres of biochar resulting in a net capture of over 20 tonnes of CO_2;
- 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;

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

- Conducted training courses and biochar workshops for various community groups;
- Donated biochar to Biggest Morning Tea charity auction;
- Established Quality Control procedures; and
- Become financially self-supporting.

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

MACCYBIOCHAR SCOREBOARD at 31/12/21

YEAR	2019	2020	2021	TOTAL	Units
BIOCHAR PRODUCED	1720	18451	19932	40103	Litres [2]
CARBON CAPTURED	222 [1]	2939 [3]	3062	6223	Kg
NET CO2 REMOVED	0.775	10.048	10.690	21.513	Tonnes
ELECTRICITY OFFSET	1.520	23.369 [4]	24.862	49.751	MWHr

1. Re-calculated based on 3rd party biochar analysis dated 19/4/20
2. Includes 6670L 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)

WOOD COLLECTION & DELIVERY

Our wood collection team provides a valuable community service by picking up tree litter from under trees on Macclesfield properties. These trees are a wonderful resource and we are grateful to have them. Converting their litter to biochar ensures that the carbon they contain is captured while reducing the fire risk they pose during summer. But we do not seek biomass from bush-care or other sensitive sites.

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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 NEXT?

- **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 biochar industry.
- **Accreditation:** We want to see government action to establish accreditation bodies for small and large biochar producers to claim carbon credits.
- **Demonstration site:** We want to establish a central site where we can demonstrate our methods to the wider community; conduct biochar trials; and provide further education on applications for carbon negative biochar.
- **Soil improvement:** We want to help local land-care and bush-care groups and local landowners to improve the biodiversity of their land and increase their soil carbon using biochar.
- **Biochar industry:** We want to cooperate with other biochar producers to establish a credible local biochar industry.
- **Emissions reduction:** We want to see local communities acting together to achieve 5% reduction in emissions each year for the next 10 years.
- **Carbon neutral clarity:** We want to see accurate and credible measurements of township carbon emissions that will allow us to assess how much biochar we need to make to help our community become carbon neutral.

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 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 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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