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SUBMISSION TO THE INQUIRY INTO SOIL SEQUESTRATION VICTORIA

Black is Green Pty Ltd wishes to make the following submission addressing the inquiry into soil Sequestration in Victoria.

About us

Black is Green (BiG) is a private Australian company with offices in Maleny, South East Queensland and Mackay, Central Queensland.

BiG was established specifically to develop a pyrolysis process for the conversion of waste biomass to biochar. BiG has patented a fast rotary hearth process to meet the need for on-site biomass charcoal production. This technology can be deployed as a fully mobile pyrolysis operation, when it makes more sense to go to the biomass than to bring the biomass to a centralised processing plant.

The sources of biomass suitable for processing by BiG include municipal green waste, forestry waste, material from bush fire hazard reduction, weeds, crop residues and livestock manure (especially from poultry farms, piggeries and animal feed lots).

Our current standard unit is offered for lease, or for sale at $250,000 and can process up to 1200 kg per hour of feed, to produce 300-400 kg/hour of biochar. We also have also developed concepts that process up to 6000 kg/hr of feed and beyond.

BiG is a small company with limited capital, in the early phase of commercial roll out. We are actively seeking partnerships with government and private sector to demonstrate and roll out our technology.

With respect to the to the inquiry's terms of reference and from our particular area of expertise, we submit the following:

(a) Possible benefits to the agricultural industry;

Productivity

The primary benefit of biochar to the agricultural industry is improved productivity. Plant growth and therefore the productivity of agricultural activities is inherently dependant on water, nutrients and microbial activity. These requirements are mostly facilitated via soil, where carbon plays a pivotal role. With this in mind the possible benefits of biochar can be summarised as:

- An ability to increase/restore soil carbon.
- Enhancement of beneficial microbial activity
- Improved natural resistance to pests and diseases
- Restoration of microbial based nitrogen fixing.
- Restoration of soil pH closer to the optimum for crop growth
- Reduction in soluble fertiliser run-off, leaching and, for Nitrogen, losses to atmosphere.
- Recycling of key nutrients, especially phosphate.
- Reduction in the need for imported synthetic nutrients on commercial crops, potentially by much more than 25%.
- Increased water holding capacity, by as much as 4 fold.
- Enhancement/acceleration of composting processes, where this is used as an on farm residue disposal and nutrient recycling process.

Many of these benefits are inter-related, in so much as they derive largely from the ability of biochar to increase the adsorption capacity and microbial activity in soils.

While many of the claims about biochar are anecdotal or derived from a limited number of case studies, there is a rapidly growing body of scientific knowledge to support the claims. In fact we would argue that Australia is leading the way in the applied science of biochar. The recent research, from which we derive the claims outlined above, has been reported and summarised in detail by:

Johannes Lehmann and Stephen Joseph (Editors) (2009), *Biochar for Environmental Management: Science and Technology*, Earthscan, London.

William I. Woods, Wenceslau G. Teixeira, Johannes Lehmann, Christoph Steiner, Antoinette M. G. A. WinklerPrins, Lilian Rabellato (Editors) (2009), *Amazonian Dark Earths: Wim Sombroek's Vision*, Springer.

Saran Sohi, Elisa Lopez-Capel, Evelyn Krull and Roland Bol (2009) Biochar, Climate Change and Soil: A Review to Guide Future Research, CSIRO Land and Water Science Report 05/09. CSIRO, Sydney. Available on-line at www.csiro.au/files/files/poei.pdf

The International Biochar Initiative www.biochar-international.org

Additional income and employment

The on-farm production of biochar and energy, from residues that previously had no commercial value, or were even a cost to dispose of, can provide additional sources of income and employment. Realisation of new income and employment is obviously dependant on establishment of suitable market for the products in each given instance.

(b) Possible environmental benefits;

With reference the same literature sources outlined in part (a), the possible environmental benefits of biochar are:

- Carbon sequestration
    - 3.7 tonnes equivalent CO_2 for every tonne of carbon retained in the soil
    - Assuming at least 5 Million tonnes of the 50+ million tonnes of biomass residues produced annual in Australia is converted to biochar this equates to sequestering the equivalent of 2 Million tonnes of CO_2 annually.
- Reduction of nutrient leaching and run-off into waterways
- Reduction in NOx and methane emissions from soil
- Reduced carbon footprint in relation to the manufacture and transport of synthetic fertilisers
- Reduction in methane emissions from composting
- The creation of more so-called Green jobs
- Odour control (especially for manures and sewage sludges)
- Coal substitution (via briquetting or pelletising processes and/or co-firing of coal furnaces with off-gases from the biochar process)
- Production of heat from a renewable (nominally carbon neutral) resource
- Cogeneration of power from a renewable resource

(c) Methodologies for measurement of the effects of carbon sequestration, including any potential issues associated with the measurement of benefits.

The methodologies for carbon sequestration can be classified into two main groups, direct and indirect.

Direct measurement

Direct measurement requires total soil carbon measurements, by independent parties or via self regulation with independent spot checks. The sampling and analytical requirements for this are similar to existing soil sample regimes currently practiced by many agriculturalists.

In addition to carbon measurements the soil emissions, such as NOx and methane can be directly measured, although the sampling techniques for this are infeasible for the purposes of routine measurement.

Indirect measurement

Indirect measurement relies on inferring the carbon sequestered from other measurements, often via scientifically established scaling factors or multipliers. Where direct measurements are difficult and expensive, indirect measurements are normally used. Examples of possible indirect measurement techniques applicable to biochar used in an agricultural setting include:

- Measurement of feedstock converted, with an assumed char carbon sequestration factor applied.

- Measurement of tonnes of biochar produced and analysis or assumed analysis, with a soil sequestration factor applied.
- Scientifically agreed factors for CO_2, NOx and CH_4 avoided per tonne of biochar applied to a given soil in a given region (net of emissions from the biochar production process).

Collation of the data necessary to estimate the carbon sequestration scaling factors is being performed by a variety of researchers around the world, however this a (a) not specifically targeted at this purpose and (b) there is no specific committee in place to agree on these assumptions for use by policy makers. At a global scale the Intergovernmental Panel on Climate Change (IPCC) would be an obvious choice.

(d) Implementation Costs, Capital and operating net of avoided costs

There are a handful of Australian biochar production technologies. Worldwide there are approximately 20 technologies suited to industrial scale operation. Capital costs for these vary widely, reflecting the different emphasis of each (eg. mobile vs fixed plant, biochar only or biochar and other products). For units in the 1 to 5 tonnes/hr range (feed basis) the range of capital costs varies from $200,000 per tonne per hour capacity to $1M per tonne per hour, excluding power cogeneration generation add-ons. Mobile plants tend towards the lower end of these costs, but usually at the expense of higher flue gas emissions, because mobile systems are not as clean as fixed systems and have limited opportunity to reuse the off-gases.

Operating costs can also vary widely, largely with respect to the feed preparation, feed and product transport and labour cost components. In rough terms the industry currently operates a production costs in the range of $400 to $4000 per tonne of biochar, with a medium term target of $250 per tonne of biochar. At present there is limited evidence of the potential for avoided costs, however there is an indication that these could be as great as $50 per tonne of feedstock ($200 per tonne of biochar) in a municipal greenwaste application.

(e) Possible harms or detriments;

The possible harms of detriments are:

- Air Emissions and dust, although these are controllable by conventional technologies, providing these are applied. In the US a number of biochar producers have come to grief by taking short-cuts with air and dust emission controls.
- Old growth and/or native forest destruction for biochar production is a risk, but quite controllable in Australia through existing environmental and conservation laws.
- Biochar does present a spontaneous combustion risk, which can result in hazards for storage facilities and transport. These risks can be managed by appropriate operational controls.
- Uncontrolled modification of soil pH. Inappropriate preparation and application of biochar can lead to elevation of soil pH to unacceptable levels. This is primarily a matter of educating producers and end users.
- Contamination of biochar with toxic components. Biochars made from feeds contaminated by heavy hydrocarbons or other feedstocks may become toxic to soils. Some non-biochar charcoal processes can also create toxic levels of PAHs. The risks are best controlled through the application of a minimum quality standard to biochar, facilitated via the trade practices act or Australian standards.

(f) Linkages with the proposed carbon pollution reduction scheme and other relevant Federal Government policies;

There is significant potential for biochar to sequester large quantities of carbon at a negative cost to the community, due to the concurrent benefits of biochar to agriculture and with respect to waste management issues.

Hence BiG advocates that biochar implementations should stand on their commercial merits irrespective of any financial benefit from the CPRS or other carbon credit/tax policies. BiG considers that legislative measures typically create project uncertainty, delays in decision making and temporary commercial anomalies that could hinder as much as help investment flow into a fledgling biochar industry.

(g) Linkages with existing Victorian Government policies.

BiG is not currently conversant with Victorian government policies.

(h) Options for the Victorian Government to support the benefits (if any) of soil sequestration.

Insurance and financing is a major hurdle for any new industry.

In terms of government support mechanisms we recommend that technologies and demonstration projects be supported on their merits, using a 12 or 24 month deferred payment loan scheme, as opposed to a grant scheme. Such an approach should discourage non-genuine and poorly prepared proponents and should also help any initial pool of money to go further. Alongside the loan scheme an independent soil carbon monitoring program should be initiated, with the intention of phasing this across to commercial providers as the industry matures.

The Victorian Government could also play a key role in educating the community about the benefits of biochar for simultaneous sequestration of carbon and improvement in soil health. This could be extended to taking and active role in assisting with applied research, facilitating the bringing together of key industry sectors (eg. organic farmers, composters, foresters and biochar proponents), financing demonstrations and facilitating technology transfer to the agricultural and waste sectors.

BiGchar ... sometimes Black is Green