Dung Beetles

Cascading biochar’s benefits as a carbon sequestration methodology
“Biochar may represent the single most important initiative for humanity’s environmental future. The biochar approach provides a uniquely powerful solution, for it allows us to address food security, the fuel crisis, and the climate problem, and all in an immensely practical manner.”

Prof Tim Flannery
2007 Australian of the Year
Do you want to:

- turn organic waste into profit?
- sequester carbon?
- reduce fertilizer inputs and maximize effectiveness?
- improve soil health and structure?
- produce energy — use or feed into the grid?
- produce gas, biofuels or condensates?

These are known benefits of BIOCHAR.

If your business is in orchards, vineyards, avocados, feedlots, poultry, agroforestry, swainills, export hay, municipal waste management and many other operations — you have the feedstock to fuel a BIOCHAR unit.

Warren Catchments Council Inc. is facilitating a workshop so interested parties can find out more about the production and use of BIOCHAR.

Mr Barry Batchelor, Director Black Earth Products, producers of Biochar and Biochar technology, will provide information and answer technical questions.

Time: 11th April 2011 — 11.30 registration, cuppa and snack, 12.00 start
Venue: Manjimup Community Meeting Room, Mount St
RSVP: 7th April — contact kathy.dawson@water.wa.gov.au

Prof Syd Shea
Research Director, Rainbow Bee Eater

July 2011

- Value-adding the timber industry
- Improving agricultural productivity
- Increasing community resilience in the form of energy production and employment
The use of biochar in cattle farming  Researcher: Achim Gerlach

- Diarrhoea (preventative and therapeutic)
- Excretion of parasitic cysts
- Growth rate
- Feed conversion
- Acidosis
- Methane formation
- Toxin adsorption
Observations of 21 farmers after 4 weeks of biochar:

• Generally improved health and appearance
• Improved vitality
• Minimisation of hoof problems
• Stabilisation of post-partum health
• Reduced diarrhoea 1 -2 days, faeces more solid
• Decline in mortality rate
Nutrient analysis of soil around dung tunnels and control soil

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Unit</th>
<th>Limit of reporting</th>
<th>With biochar 0-5cm</th>
<th>No biochar 0-5cm</th>
<th>Biochar 25cm</th>
<th>No Biochar 25cm</th>
<th>Biochar 35-40cm</th>
<th>No biochar 40-45cm</th>
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<tbody>
<tr>
<td>EC</td>
<td>Ds/m</td>
<td>0.01</td>
<td>0.14</td>
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<td>0.12</td>
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<td>pH (CaCl2)</td>
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<tr>
<td>Total Nitrogen</td>
<td>%</td>
<td>0.02</td>
<td>0.47</td>
<td>0.48</td>
<td>0.24</td>
<td>0.13</td>
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<td>Total Carbon</td>
<td>%</td>
<td>0.2</td>
<td>6</td>
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<td>KCl extractable Ammonium-N</td>
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<td>31</td>
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<td>Total Organic Carbon (TOC)*</td>
<td>%</td>
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<td>Particulate Organic Carbon (POC)*</td>
<td>%</td>
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<td>Char (ROC)*</td>
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<td>Humus (HUM)*</td>
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<td>Biochar 35-40cm</td>
<td>No biochar 40-45cm</td>
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<td>Aluminium</td>
<td>cmol(+)/kg</td>
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<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>0.19</td>
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<td>Potassium</td>
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<td>CEC</td>
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<td>%</td>
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<td>No Biochar 25cm</td>
<td>Biochar 35-40cm</td>
<td>No biochar 35-40cm</td>
<td>Biochar 40-45cm</td>
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<td>Copper</td>
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<tr>
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<td>130</td>
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<td>46</td>
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<tr>
<td>Molybdenum</td>
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<td>1.4</td>
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<td>1.1</td>
<td>1.3</td>
<td>1.6</td>
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<tr>
<td>Sodium</td>
<td>%</td>
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<td>0.006</td>
<td>0.0036</td>
<td>0.0038</td>
<td>0.0026</td>
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<td>Nickel</td>
<td>mg/kg</td>
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<td>5.6</td>
<td>5.4</td>
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<td>5.2</td>
<td>6.4</td>
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<td>Phosphorus</td>
<td>%</td>
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<td>0.034</td>
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<td>Lead</td>
<td>mg/kg</td>
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<td>6.1</td>
<td>6.8</td>
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<td>Sulfur</td>
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<td>Selenium</td>
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<td>Zinc</td>
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</table>
“I sent off another truckload of calves today, lovely animals. No fertilizer, yet more fertile soil than last year! No hay! No drenches! No red legged earth mite spray! No lucerne flea spray. Lovely soft water-absorbing soil! Economic no brainer!”

Doug Pow 11th August 2015
Feeding Biochar to Cows: An Innovative Solution for Improving Soil Fertility and Farm Productivity

Stephen JOSEPH, Doug POW, Kathy DAWSON, David R. G. MITCHELL, Aditya RAWAL, James HOOK, Sarasadat TAHERYMOOSAVI, Lukas VAN ZWIETEN, Joshua RUST, Scott DONNE, Paul MUNROE, Ben PACE, Ellen GRABER, Torsten THOMAS, Shaun NIELSEN, Jun YE, Yun LIN, PAN Genxing, LI Lianqing and Zakaria M. SOLAIMAN
POTENTIAL BENEFITS OF BIOCHAR IN SOIL

Physical
• Increased water holding capacity of the soil
• Improved structure and consistency of the soil

Chemical
• Increased soil carbon levels
• Increase in pH (liming effect)
• Increased CEC, especially over the long-term

Biological
• Improved microbiology of the soil
• Improved conditions for earthworms

Toxicity waste
• Decrease toxicity: Aluminum, Cadmium, DDT, PAHs
• Decrease leaching of nutrients
• Decrease emissions of greenhouse gases CO₂, N₂O & CH₄

Economics
• Increased fertilizer use efficiencies
• Increased biomass (crop) production

NB Variates with feedstock, process, soil type and crop species.

Greatest benefits in degraded, acidic or nutrient-depleted soils

Prof Stephen Joseph
Examination from 45cm down. Biochar surface coated in Minerals; Pores on filled up with minerals.
Biochar

- Activated by microbes through cow rumen
- Additional microbes via *Bubas bison* gut
- Moisture laden
- Soaked in nutrients, especially P and N
- pH buffer
- Lowers soil bulk density
- Habitat for soil microbiology, including mycorrhizal fungi – enhances symbiosis
Figure 1: Total organic C concentration and total soil C stock (0-30cm) in your paddock (black) compared to the average result in your region for a similar land-use and soil type (green). The bar on the regional data indicates the range of values for this land-use/soil type in the region.
**Biochar and Zeolite**  
(Dr David Tomlinson – Castlemountain Zeolite)

Early stages of trial
Cattle and sheep readily consume mix of biochar and zeolite, with added molasses
• Better animal performance
• Reduction in methane produced

Currently in drought but expect (as a result of holistic grazing, biochar and zeolite and dung beetles burying the medicated manure):
• Higher digestibility of higher nutrient density pasture
• More sequestered carbon
• Compounding effect of further reduction in methane
• Extra carbon that will improve water infiltration and storage
Synergies of Biochar and Zeolite

Dr David Tomlinson (Castlemountain Zeolite)

Milled and ground to fine powder:
• More growth (breaks down N in gastro-intestinal tract)
• Less N exceted
• Better digestion
• Reduces ammonium toxicity
• Reduces respiratory distress in confined animals
• Chelates minerals
• May bind fungal toxins
• Binds heavy metals
• Binds some water eg in slurries
• Microbial habitat
• Less odour
• Fewer flies
• More solid dung pads
• Quicker dung beetle incorporation
• Reduced pig scouring
• Effective in intensive livestock production
Olsson’s Stockchar

One block per 25 cattle or 50 sheep
Consumption rate 50-100g/day for cattle
Stock will self regulate

• Stock health
• Weight gain
• Great soil fertiliser (when combined with dung beetles and regenerative agricultural practices)

Certified Organic

35% biochar
30% protein meal
27% salt
+ molasses and Calcium

18kg block
$40