



Northern Poultry Cluster Ltd
3/30A Aitken Street
PO Box 842
Gisborne Vic 3437

Telephone (613) 5428 1488
Email northern.poultry@streetryan.com.au



December 7th 2009

**Inquiry into soil sequestration in Victoria
Submission no. 12**

The Hon. John Pandazopoulos, MP
Chair, Environment and Natural Resources Committee
Parliament of Victoria
Parliament House
Spring St
East Melbourne Vic 3002
enrc@parliament.vic.gov.au

Dear Mr Pandazopoulos,

INQUIRY INTO SOIL SEQUESTRATION IN VICTORIA

Thank you for the recent invitation to prepare a submission to the Environment and Natural Resources Committee (ENRC) inquiry into soil sequestration. We are pleased to provide this response on behalf of Northern Poultry Cluster Ltd, and our affiliated company Biochar-Energy Systems Pty Ltd.

Northern Poultry Cluster Ltd (NPC) works on commercial and regional projects with members in north-central Victoria's poultry industry (encompassing the local government areas of Bendigo, Buloke, Campaspe and Loddon). This region's poultry industry includes more than 40 businesses, supports over 2,000 jobs and generates more than \$400 million per annum in total regional economic contribution. The industry includes broiler, layer, turkey, duck and game bird production, processing and value adding. NPC members are committed to further growth and development of the sector within this State.

Since the establishment of NPC our members have been conscious of the importance of sustainable practices in managing poultry production environments and bio-waste, and this has led NPC to extensive investigations into converting waste products into biochar and renewable energy and, in the process sequestering carbon for soil improvement. We recently established Biochar-Energy Systems Pty Ltd to produce biochar and renewable energy from pyrolysis processing of bio-waste: A clear demonstration of NPC's commitment to, and belief in, soil sequestration as an important part of future sustainable and responsible agricultural production.

The following comments relate to some of the specific ENRC inquiry terms of reference.

a) and b) Benefits to the agricultural industry and the environment

It is well known the Australian continent has weathered and fragile soils and, even in fertile regions, soils have been eroded and leached by farming practices involving land clearing, application of chemical treatments and continuous cropping, over several generations.

NPC believes there is now a clear case, and a groundswell of support, for a major shift in farming practices towards “biological management” of soils rather than chemical. This will mean providing a whole new range of soil improvement and fertiliser solutions; biochar and other carbon sequestering options should be important components of these solutions.

Biological farming involves a whole systemic approach, and sequestration is not only achieved by adding material (such as biochar) to the soil. Many other methods to enhance carbon sequestration are becoming popular among a large number of Australian primary producers due to their dual agricultural and environmental benefits, such as no-till or minimal-till farming, residue mulching, cover cropping, and crop rotations.

NPC’s associated company Biochar-Energy Systems has produced a working pyrolysis system for converting waste poultry litter (and potentially a wide range of other biomasses) into biochar and syngas for energy. By pyrolysing biomass, most of its carbon is converted to charcoal. Bio-energy production using this modern pyrolysis system to produce biochar, can result in 30.6 kilograms C sequestration for each gigajoule of energy produced¹. Biochar production systems are cost and energy-efficient, producing more energy than is required to operate the process.

c) Measurements of the effects of carbon sequestration

There is ongoing work to be conducted in assessing the most appropriate forms of soil carbon sequestration and the range of products best suited to differing Australian soil conditions, but field trials and scientific investigations around the world have already provided substantial measurements. Technical literature encompasses a range of measures and measurement methodologies. For example,

- The Mean Residence Time for the stable, or fixed carbon content of biochar is measured in hundreds, if not thousands of years². This makes measuring the carbon added to topsoil via biochar a relatively simple process
- Biochar retains macro and micro nutrients present in the original biomass creating a closed loop plant available nutrient cycle³.
- Biochar additions to top soil reduce nutrient leaching⁴. Reducing the requirement for soluble fertilisers.
- Soil structure, particle distribution and soil aggregation are greatly improved with biochar addition⁵.
- Availability of bound soil nutrients to plants is enhanced due to the increase in soil micro-flora when biochar is added to top soil⁶

¹ Lehmann, J., Gaunt, J. and Rondon, M. 2006. *Department of Crop and Soil Sciences, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY 14853, USA; GY Associates Ltd., Harpenden, Herts, AL5 2DF, UK; Climate Change Program, Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia* ("Author for correspondence, E-mail: CL273@cornell.edu).

² Neves, E.G., Peterson, J.B., Bartone, R.N., and Silva, C.A.D. (2003) "Historical and Sociocultural Origins of Amazonian Dark Earths", in *Amazonian Dark Earths: Origin, Properties, Management*,

³ Lehmann, J., da Silva Jr., J.P., Steiner, C., Nehls, T., Zech, W. and Glaser, B.: 2003a, 'Nutrient availability and leaching in an archaeological Anthrosol and a Ferralsol of the Central Amazon basin: fertilizer, manure and charcoal amendments', *Plant and Soil* **249**, 343–357.

Lehmann, J., Kern, D.C., German, L.A., McCann, J., Martins, G.C. and Moreira, A.: 2003b, 'Soil Fertility and Production Potential', in J. Lehmann, D.C. Kern, B. Glaser and W.I. Woods (eds.), *Amazonian Dark Earths: Origin, Properties, Management*, (pp. 105–124) Dordrecht, Kluwer Academic Publishers.

⁴ Downie, A., Van Zwieten, I., Chan, K.Y., Dougherty, W. and Joseph, S. (2007) "Retention Properties of wood residues and their potential for soil amelioration", Poster presented at the international Agrichar Initiative Conference, April 2007, Terrigal NSW, Australia.

⁵ Rondon, M., Lehmann, J., Ramirez, J. and Hurtado, M.P.: 2004, 'Biological nitrogen fixation by common beans (*Phaseolus vulgaris*) increases with charcoal additions to soils', in *Integrated Soil Fertility Management in the Tropics*, (pp. 58–60) 2004 Annual Report of the TSBF Institute, CIAT, Cali, Colombia.

⁶ Steiner, C., DAS, K.C., Garcia, M., Farster, B. And Zech, W. (2008) Charcoal and Smoke extract stimulate the soil microbial community in a highly weathered xanthic ferrasol, *Pedobiologia*, vol 51, pp359-366.

d) Costs of converting agriculture to soil sequestration systems

The costs of converting agricultural operations from “conventional practices” to biological practices (involving carbon sequestration) are unlikely to be significant since the disruption to productivity should be minimal⁷ and, in fact, there are likely to be relatively rapid improvements to crop yield and soil performance. Of course there will be requirements to invest in new capital equipment (such as no-till implements and, perhaps, modified sprayers and planters) but these purchases could be implemented as part of normal equipment replacement programs of farmers, and proving trials could be undertaken through outsourcing to contractors.

e) Possible harms or detriments

Most carbon sequestration initiatives involve natural processes and are, therefore, low risk. In the case of biochar production, NPC understands that quality standards in production can make a large difference in the extent to which the char provides nutrients that are bio-available to plants and soil fungi. Biochar that is produced at temperatures below 500° Celsius is reported to potentially have a deleterious effect on soil environments⁸. Other detriments of biochar can also result from

- the “lightness” of the biochar, creating difficulties in applying it in the field (this could be addressed by granulation, mixing, blending or palletisation)
- high proportion of particulates (or dust) which can be hazardous from occupational health and safety and combustion aspects.

NPC is addressing marketing, cost, production and quality assurance issues and potential detriments associated with the production of biochar and renewable energy from pyrolysis through Biochar-Energy Systems Pty Ltd. We believe we are the first Victorian organisation to reach this level of commercialisation with a biomass pyrolysis system, to date. NPC would be very pleased to explore prospects to collaborate with Victorian government initiatives and any support mechanisms that may assist in this developmental work, and in implementing some of the benefits.

We would welcome a visit from the ENRE Committee during its inquiry, or an opportunity to present further details on our soil sequestration work.

Yours sincerely,

Michael Cowie
Chairman, NPC

Wayne Street
General Manager, NPC

Russell Burnett
Managing Director, BES

⁷ Unlike conversion from traditional agriculture to organic production systems, where there can be a long period of low productivity during transition.

⁸ Incitec Pivot Business Development Unit (2009)

