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From: John White

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To: Committee, PIR (REPS)

Subject: House of Representatives Standing Committee - Inquiry into Australian farmers and climate change:- CO2 sequestration via Soil Carbon, to offset Australia's greenhouse gas emissions

ATTENTION: The Chair – House of Representatives Standing Committee – Adapting farming to climate change

Dear The Hon Dick Adams MP,

I apologise that this submission is a little late.

I attach a one-page data sheet that Ignite Energy Resources (IER) have just finalised with our Biological Fertiliser manufacturing/distribution partner, LawrieCo, and their independent scientists – The document describes the scale of opportunity to create soil carbon credits in cropping (and grazing) lands in Australia, utilising Biological Fertiliser products (and biological farming systems – BFS).

The meaning of this data is that by producing and distributing this proven BioLogic Fertiliser system, blended predominantly from Gippsland lignite (brown coal), farmers can economically implement biological farming systems that sustainably and profitably generate very significant quantities of carbon credits/offsets.

Note that the BioLogic Fertiliser is applied to cropping lands at a rate of between 100 kg to 200 kg per hectare, so the next 40,000 t/a Biologic Fertiliser plant at in Gippsland will fertilise (considerably) more than 200,000 hectares, thus generating a minimum of around 2.5 million tonnes of CO2 sequestration in the farm soils per annum (ie, 2.5 million carbon credits pa).

This can be rolled out very quickly to millions of hectares (by a number of suppliers) to create the CO2 reductions needed in Australia by 2020 (I estimate that 150 million tonnes CO2e sequestered per annum is easily achievable).

The point I want to make is that we don't need to do more trials to prove this, as the hundreds of farms already successfully implementing biological farming systems, and the soil carbon measurements there-on, are evidence.

We can identify new farms converting to BioLogic Fertiliser this month for this year's growing season that CSIRO and others can be engaged to validate, so that soil carbon can provide an immediate complementary solution for CPRS.

I also attach a proposal to carry out large scale soil carbon project with AAco and ACTEW/AGL.

This proven biological fertilisation/farming system can provide a low cost (I predict between $5 and $10 per tonne of CO2e is sufficient to encourage rapid transition by farmers) '**Carbon Bridge**' to meet Australia's post Kyoto obligations, and relieve the financial burden of CPRS on heavy emitters – both in the farming sector and the power generation, manufacturing and resources export sectors.

These systems improve farm profitability and will be exportable to countries like China and India.

I will be pleased to meet with you and/or your Committee to explain this opportunity for Australia to lead the world in sustainable agriculture through a proven, clean, and potentially large scale, use of brown coal - that can immediately reduce atmospheric CO2 levels on a nationally significant scale.

We are conducting a two day Tour of biological farms in Victoria and South Australia on 11th &12th

May that we wish to invite you and your members to attend (all or part of the tour). General Michael Jeffery, Australia's former Governor General, is participating on the Tour, based on his personal interest to highlight the imperative to remediate Australia's degraded landscape.

Best regards,

John White

Ignite ENERGY

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Biological Farming Systems - CO_2 Sequestration Estimate

Biological Farming Systems (BFS) is a pursuit of agricultural practices that creates soil mineral balance, promotes organic soil carbon and increases healthy soil biota to ensure sustainably productive soils.

Background

Australia's rangelands (tropical savannas, temperate woodlands, shrublands and grasslands used for extensive grazing) are estimated to comprise approximately 288M hectares. The land areas devoted to more intensive agricultural production comprise approximately 167M hectares (National Land and Water Resources Audit). The estimate below uses Australia's cropped area of 24.7M hectares which is dry land and irrigated area.

Cropping is therefore a relative small component of what could be achieved across all agricultural land use. An important example though, as CO_2 emissions in cropping currently is high and increasing because of fertiliser, chemical and diesel use as easy solutions to production problems.

CO_2 Sequestration Estimate

Table 1 illustrates the significant quantity of atmospheric CO_2 that can be sequestered per annum (by plant photosynthesis via the plant roots structure and biological/chemical interactions) by a given agricultural area adopting BFS with an absolute soil carbon increase of 0.15%. This increase is conservative and realistically achievable by adopting BFS. BFS field results have shown soil carbon to increase by 1.2% over 3 years, in samples taken from the top 15cm of soil.

Quantity of CO_2 sequestered (t) by a total soil carbon increase of 0.15%, to 0-15cm soil depth and bulk density 1.5g/cm^3 over an area (ha) in one year.

Table 1.

Agricultural area to be treated (ha)	Area as a % of the Total Cropped Area in Australia (dryland & irrigated)	Equivalent CO_2 sequestered (tonnes)	% of Australian annual CO_2 emissions	Value of carbon credits to farmers
1		12.39		
200 000	0.8	2 478 000	0.41	$37.17 M
4 940 000	20	61 206 600	10.2	$918.1 M
12 350 000	50	153 016 500	25.5	$2.3 B

The conservative estimate is that 25% of Australia's annual CO_2 emissions can be sequestered by 50% of Australia's cropping land adopting biological farming systems and increasing soil carbon.

Table 1 Assumptions:

1. **Soil carbon content** is usually expressed as a concentration (%). To convert from concentration to stock (t/ha) the depth of measurement and soil bulk density parameters are required. Standard soil sampling methods used in agriculture are to a **depth of 15cm**, however sampling to greater depths is recommended for future assessment. Soil bulk density (g/cm^3) is the dry weight (g) of one cubic centimetre (cm^3) of soil and varies with different soils and depths. Most soils range from 1.0-1.8 g/cm^3. An average **bulk density of 1.5 g/cm^3** is assumed for the calculations. The soil carbon stock is determined by multiplying the carbon concentration (%) by the bulk density (BD) by the soil volume in a 15cm profile of a one hectare area.
2. **Carbon dioxide equivalent** sequestered will be calculated by multiplying the carbon stock by 3.67. Every one tonne increase in soil carbon represents **3.67 tonnes of carbon dioxide** sequestered from the atmosphere.
3. **Soil carbon increase** is a conservative **0.15% per annum**. BFS field results have shown soil carbon to increase by 1.2% over 3 years (0.4% per annum), in samples taken from the top 15cm of soil.
4. **Australian CO_2 emissions** currently total 600M tonnes per annum
5. **Carbon credits** are valued at $15 per tonne of CO_2 for calculations

Biological Farming Systems Field Results

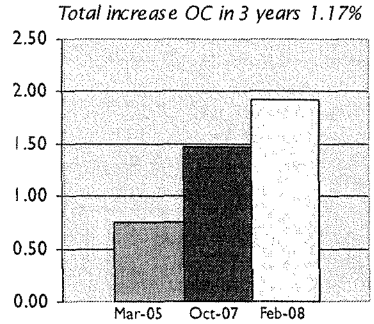
LawrieCo have established a precedent of outstanding increases in soil fertility with biological farming systems. On farm results indicate a high potential for Australian agriculture to sequester significant atmospheric carbon dioxide. Graphs showing increases in soil carbon and phosphorus on BFS farms are displayed below.

Snowtown SA

- Broadacre cropping on 580+ ha
- 2005 started biological approach
- Maintain yield & reduced disease
- **0.7-1.2% increase in soil organic carbon in 3yrs**

Soil Organic Carbon (%OC)

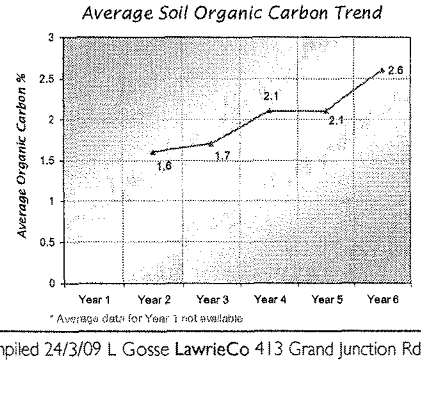
Total increase OC in 3 years 1.17%



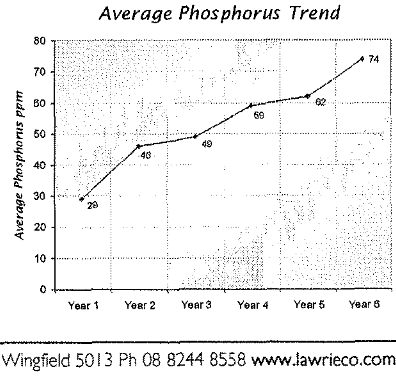
Bordertown SA

- **Average increase in soil organic carbon 1% over 4 years**
- Average of six paddock testing sites in the spring of each year
- Increase in key soil fertility indicators during 5 years of BFS
- Fertiliser input decreased proportionally to the increase in soil fertility over time
- Crop yield was maintained equivalent or above "good district practice" levels

Average Soil Organic Carbon Trend



Average Phosphorus Trend



SOIL CARBON – AN AUSTRALIAN SOLUTION TO GLOBAL WARMING A PROPOSAL FOR A JOINT BUSINESS – GOVERNMENT PROJECT TO FACILITATE THE UPTAKE OF 300 MILLION TONNES OF LOW COST CO_2 PER ANNUM

Australian Agriculture Company
Ignite Energy Resources
LawrieCo
ACTEW-AGL

March 2009

With scientific consensus on the need to respond urgently to climate change there are two core tasks ahead of us. The first is to draw down existing atmospheric stocks of carbon dioxide (mitigation). The second is to restructure our production and consumption processes to reduce emissions (abatement). This paper deals with a major mitigation opportunity using soil sequestration of carbon. This opportunity is largely untapped and provides a way for Australia to take significant leadership in tackling climate change

Soils are the only solution that offers short-term beneficial impact on climate change

The experts agree: Only soils can sequester significant amounts of atmospheric carbon in the next 30 years. Every other solution will take 30 years to start avoiding meaningful volumes of CO_2 entering the atmosphere. Further, increases in soil carbon actually removes legacy CO_2 from the atmosphere.

Scientists now believe that increasing soil carbon can reduce CO_2 currently in the atmosphere fast enough to avert the very worst consequences of Global Warming.

A slight increase in soil carbon across a fraction of Australia's agricultural and pastoral regions (around 500 million hectares) can sequester more than half of Australia's greenhouse gas emissions (ie, a quarter percent soil carbon increase over two percent of Australia's farmlands each year will sequester around 300 million tonnes of CO_2 per annum).

Professor Ross Garnaut said in the final Garnaut Review report that biosequestration is "potentially Australia's most important contribution to the global effort to reduce greenhouse gases". Arid and semi arid land makes up 70% of Australia's land mass. The Garnaut Report quotes estimates that these lands alone could absorb at least half of Australia's present annual emissions.

Enhancing the natural processes that remove CO_2 from the atmosphere is thought to be the most cost-effective means of reducing atmospheric levels of CO_2. Estimates as low as $5 dollars per tonne of CO_2 have been calculated (and arguably GDP positive due to other benefits), compared with significantly higher costs per tonne for solar and wind power, and estimates of $80 to $140 per tonne for CO_2 capture and geo-sequestration from coal fired power stations (Cambridge Energy Research Associates).

Australia's soils are carbon poor and the problem has been accentuated through the use of carbon depleting synthetic chemical fertilisers, and excessive tillage and over-grazing..

Scientists have shown that soil carbon can be practically, and cost effectively increased through the application of fertiliser comprising a mixture of organic material and biochar. It can be applied in the same way as conventional fertiliser and can be produced at a lower cost than the chemical alternative, tied as it is to the cost of natural gas (its principal ingredient).

Soil carbon credits could underwrite the income of many farm families and communities more than enabling them to offset animal and land use methane and other greenhouse gases associated with agriculture.

It is recommended that the Federal Government regulates a **'carbon-bridge'**, alongside the CPRS, which will allow large Australian emitters to form alliances to generate carbon offsets from soil carbon. These offsets will be very low cost and abundant - and can allow Australia to meet targets in excess of 40% CO_2 reduction by 2020.

This is a major economic opportunity for Australia and it has the potential to be the fastest way to draw down atmospheric carbon. IPCC scientists have warned that the world is already over the danger threshold of concentrations.

We recommend that Commonwealth acts immediately to:

- Collaborate with business through co-funding the establishment of a series of pilot projects in different regions and with different soil and climate profiles to accurately measure the levels of soil carbon prior to enhancement; to measure increases in soil carbon following enhancement; and to calculate on a scientifically rigorous basis, the amount of increased CO_2 uptake resulting from added sequestration resulting from heightened photosynthesis.

- Commission CSIRO to provide the scientific oversight and monitoring of the pilot projects and to report to the collaborators on the findings.

- Following the trials, seek the inclusion of soil carbon sequestration as a valid offset under the CPRS and in the accounting rules of the FCCC.

- Support the rapid uptake of the soil carbon strategy through the provision of national enabling policy and infrastructure support.

The Basic Proposition

Carbon is a key ingredient in soil organic matter. The photosynthesis process takes CO_2 from the atmosphere and locks away this carbon in the soil. A soil with high carbon and organic content is much more productive and stable than soils whose organic matter has been destroyed through poor soil management practices - excessive tillage, over-use of synthetic chemical fertilisers and rapid crop rotation or over-grazing.

It is apparent, on the basis of compelling science, that if additional carbon, nutrients and microbiology (bio-organic fertiliser) is added to Australia's depleted agricultural and pastoral soils, large amounts of legacy CO_2 can be taken from the atmosphere and sequestered.

This revitalisation of the soils occurs through the reactivation of the natural processes that, via photosynthesis through crops/grasses/native vegetation/forestry, sequester CO_2 from the atmosphere as soil carbon.

Recent research is showing that 'grass' crops in particular store carbon in a way that locks it up for hundreds of years. These plants store carbon in silica phytoliths or 'plant stones' in leaves, stems and roots. These 'plant stones' do not break down as plants decompose and they are impervious to fire.

Plant stone carbon storage helps improve the overall structure of the soil making it better able to transfer other sources of carbon to improve plant growth.

The benefits of improved soil carbon, in addition to CO_2 sequestration, are many and include:

- Better plant resistance to pests and diseases.
- Increased ability of soils to transfer nutrients to plants, for greater productivity which can improve farmers' incomes.
- Increased soil water-holding capacity, holding the water until it can be used by the plants rather than letting it run off into waterways, ie, increased drought resistance.
- Increased soil stability which means greater resistance to erosion, which in turn means cleaner waterways.
- Unlocking of nutrient overload from synthetic chemical fertilisers
- Reduced recharge to groundwater and reduction or elimination of salination.
- Improved biodiversity: soil organic matter contributes to the health of soil microbial 'wildlife' and micro-flora which are the very start of the food chain.
- Healthier, climate-change compliant products that should avoid trade restrictions and attract premium prices.

There is extensive evidence that by adding bio-organic fertiliser to the soil significant increases in soil carbon can be achieved.

The Carbon Cycle

In Australia, human activity including land clearing, poor grazing practices, poor land cultivation techniques and the prolonged use of synthetic chemical fertilisers and associated insecticides/pesticides has reduced the amount of carbon being sequestered and this has resulted in a marked reduction in the level of soil carbon in many of the country's agricultural and pastoral regions.

The Australian farming sector has been drawing down its soil carbon levels for the last 100 years (to a half to a third its original levels) and the reduction in soil carbon has impacted the soil's ability to retain rainwater and microbiological activity in the upper soil profile.

Across the Australian dryland cropping and grazing sector it would be unusual to find actively farmed soils with a carbon content of 1.5% or more. Normal soil carbon levels for quality agricultural soils should be above 5%.

Soil carbon sequestration transfers CO_2 from the atmosphere into the soil, catalysed by the use of bio-organic fertiliser, with the CO_2 being stored permanently in the soil. Soil carbon sequestration is accomplished by farming systems that add biomass, use minimum tillage and enhance soil biota.

It would take many decades before even a fraction of the farming soils would be saturated with soil carbon.

The Opportunity for Australia

Australia has a huge carbon sequestration opportunity available to it through the restoration of its degraded soils. When extrapolated out across Australia's agricultural and pastoral regions, this opportunity provides a significant offset for the country's emissions for well over 40 years. While it should not be considered an alternative to changing industrial and energy provision practices, it is a major complementary tool that could help buy some 'global economic adjustment time' as new low-emissions technologies and infrastructure are brought on line.

In addition, boosting soil carbon levels offers economic benefits. It has the potential to increase productivity, improve drought resistance and reduce the need for costly inputs (synthetic chemical fertilisers and insecticides/pesticides). Further, these benefits can reduce the cost of carbon offsets, thus providing Australia with a low cost, environmentally beneficial pathway to a low carbon economy. This '**carbon-bridge**' expertise is exportable to other countries, for example China and India, who also have old and 'over-used' soils.

What the Experts Say

Sequestering carbon in soil has the backing of environmentalist and former Australian of the Year, Professor Tim Flannery - "It does seem too good to be true but I have looked at it from every angle and I failed to see the fault in the system", he says.

Dr John Williams, the scientific adviser to the Board of Landcare Australia Limited and a member of the Wentworth Group of Concerned Scientists, has said that "carbon stored in vegetation and soils alone has the potential to create a self funding mechanism to restore degraded landscapes and provide a new source of income for farmers at no additional cost to taxpayers or the Commonwealth budget".

CSIRO research has found that the rate of carbon sequestration resulting from improved pasture management is sufficient to increase soil carbon.

Australian soil scientist, Dr Christine Jones, has undertaken a 10-year crusade to raise the profile of soil carbon processes and what she calls the microbial 'carbon highway'. The fundamental biological processes which produce soil carbon are part of Dr Jones's '**microbial bridge**' and the key to the formation and maintenance of healthy soils. Dr Jones says, "This cannot happen where farm chemicals kill the essential soil microbes. When chemical use is added to intensive cultivation which exposes and oxidises the humus already in soil it is easy to see why soil has become a huge net source rather than a net sink for atmospheric CO_2 under current farming practices."

Dr Christine Jones said in a recent Senate Enquiry that boosting soil carbon by half a percent on two percent of farmland could sequester about 685 million tonnes of CO_2, more than the 603 million tonnes emitted nationally from all sources.

Carbon Credits

The capacity for appropriately managed soils to sequester atmospheric carbon is enormous. The world's soils hold around twice as much carbon as the atmosphere and almost three times as much carbon as the vegetation. Soil represents the largest carbon sink over which we have control. Improvements in soil carbon levels could be made in all rural areas, whereas the regions suited to carbon sequestration in plantation timber are limited.

If financial incentives in the form of 'carbon credits' became a focus of primary production, this would reduce the potential for destructive farm practices and provide a large incentive for 'greener' forms of agriculture.

Just as plans to geosequester CO_2 (CCS) are being implemented in advance of international agreements, Australia should proceed immediately to implement soil sequestration of carbon. We should not wait on outcomes of international negotiations before proceeding.

Soil carbon is easily measured, it is in the farmers' economic interests to maintain the improved soil carbon levels in perpetuity - and soil carbon generated 'carbon credits' are already trading in USA.

There are well established scientific values for calculating the correlation between the amount of carbon in soil and the amount of CO_2 it can sequester.

Carbon credits for sequestered carbon are not an annual payment. In order to receive further credits, the level of soil carbon would need to be further increased. It is also important that the soil carbon level for which payment was received is maintained.

This is not difficult with regenerative regimes in which new topsoil is being formed. Biological activity is concentrated in the top 10cm of most agricultural soils, but regenerative practices rapidly expand this activity zone to 30cm and deeper. Many benefits in addition to potential carbon credits accrue to increased root biomass and increased levels of biological activity in soil.

The modified farming/fertilisation techniques have lower input costs and reduce/avoid the use of damaging, expensive, high emissions synthetic chemical fertilisers and insecticides/pesticides.

The EU legislated the phasing out of synthetic chemical fertiliser use from the early 1990s, and major European food distributors and governments have indicated to Australian suppliers that they are expected to follow-suit.

The Pilot

The Australian Agriculture Company (AAco) is the world's largest beef producer and is the owner of 8.5 million hectares in northern Australia. Ignite Energy Resources has the rights to vast resources of humate/fulvate rich lignite (brown coal) in Gippsland, Victoria and with LawrieCo are manufacturers of BioLogic fertiliser (which has the capacity to substantially increase soil carbon – demonstrated by many field measurements). ACTEW-AGL is a major power supply company in the ACT and has an interest in securing low cost carbon offsets. The companies have agreed to establish a series of soil carbon pilot project on several thousand hectares of AAco's properties.

What is required is an involvement by the Commonwealth to contribute to the costs of the pilot and the scientific evaluation of its capacity to sequester CO_2.

We propose an early meeting with government officials to agree the design, funding and monitoring of the pilot.