**Submission to Senate Standing Committee on Rural and Regional Affairs and Transport**

# Inquiry into the Implementation, Operation and Administration of the Legislation Underpinning Carbon Sink Forests and any Related Matter

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This submission addresses the following

I. recommendations pertaining to **Division 40 of the recently amended ITAA 1997**

II. global perspective on **soil as a verifiable carbon sink**

III. the need for a **project-based soil carbon offsets scheme,** similar to that currently operating for agricultural soils in the northern hemisphere (through CCX) and carbon sink forests in Australia, to be part of the national mitigation strategy

IV. the **potential for soils** under appropriately managed perennial grasslands (including those oversown with annual crops) to be **permanent and productive carbon sinks**

V. the **'Soil Carbon Solution'** for achieving carbon neutral status in Australia

Sincerely

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## RECOMMENDATIONS

- It is recommended that the 0-110cm soil profile beneath appropriately managed perennial grasslands be included as an eligible carbon sink under paragraphs 40-1010(2)(a)to(c) of Division 40 of the recently amended ITAA 1997. The legislation as it currently stands enables capital expenditure for the establishment of trees in carbon sink forests to be fully tax deductible in the year of expenditure

- The granting of equal status for carbon sink perennial grasslands and carbon sink forests would enable landholders to designate areas of their land for soil carbon sequestration purposes under appropriately managed perennial grasslands. Landholders would then be entitled, under the legislation, to the option of abating their own greenhouse gas emissions and/or generating offset credits that would be tradeable with emitters needing to purchase emission credits under the CPRS, when the latter becomes operational in 2010

- An amendment to the legislation to include carbon sink perennial grasslands would enable companies within the covered sectors of the CPRS to buy or lease agricultural land for the purposes of establishing perennial grasslands as a soil carbon sink

- 'Appropriate management' of carbon sink grasslands would require rest-rotation grazing and/or perennial cover cropping to enhance the rate of soil carbon sequestration. Under the provisions of (the suggested amendments to) Division 40 of the ITAA 1997, agricultural land used for the primary purpose of soil carbon sequestration would be able to be used for the secondary purpose of food production, provided approved soil carbon enhancement methodologies were employed

- The granting of legal status for carbon sink perennial grasslands would assist the agricultural sector to make the required transitions to a carbon and climate constrained rural economy

- Amendments to paragraphs 40-1010(2)(a)to(c) of Division 40 of the ITAA 1997 to include eligible soil sinks beneath perennial grasslands would assist Australia to meet the target under the Kyoto Protocol to limit emissions to 108 per cent of 1990 levels over the period 2008 to 2012

- As part of the national mitigation strategy, it is recommended that a project-based soil carbon offsets scheme, similar to that currently operating for agricultural soils in the northern hemisphere (through CCX) and for carbon sink forests in Australia, be implemented for soil carbon sinks beneath appropriately managed perennial grasslands

- It is further recommended that uniform national legislation be enacted to standardise the variable soil carbon rights legislation currently operating in different states and territories in Australia

## Global perspective on soil as a carbon sink

The world food crisis has seen the UN Food & Agriculture Organisation (FAO) call for farmers to have access to **soil** carbon trading to help increase food production and avoid the forced displacement of large populations in search of food. The FAO crisis meeting in Rome in June 2008 urged governments to help the world's farmers to participate in financial mechanisms to support climate change adaptation. The high-level conference on World Food Security: the Challenges of Climate Change and Bioenergy, convened by UN Food and Agriculture Organisation (FAO), 3-5 June, 2008 has called on the international community to increase the resilience of world's food systems to climate change. The conference declaration stated "It is essential to address question of how to increase the resilience of present food production systems to challenges posed by climate change... We support the establishment of agricultural systems and sustainable management practices that positively contribute to the mitigation of climate change and ecological balance"

**Bill number 08023** TAX LAWS AMENDMENT (2008 MEASURES No. 1) BILL 2008

EXPLANATORY MEMORANDUM

It is recommended that paragraphs 40-1010(2)(a)to(c) of Division 40 of the ITAA 1997 be amended to include perennial grasses and grasslands, as indicated in selected clauses below.

**Chapter 3** Capital expenditure for the establishment of trees/perennial grasses in carbon sink forests/grasslands

**Outline of chapter**

Schedule 3 to this Bill amends Division 40 of the Income Tax Assessment Act 1997 (ITAA 1997) to provide a deduction for capital expenditure for the establishment of trees/perennial grasses in carbon sink forests/grasslands.

**Context of amendments**

Carbon sink forests/grasslands are forests/grasslands which are established for the primary and principal purpose of sequestering carbon from the atmosphere. The carbon stored in the growing forest/grassland can then be used for greenhouse gas abatement purposes.

The costs of establishing trees in a carbon sink forest/grassland are capital in nature and income may be generated from exploiting rights over the carbon sequestered in the trees/grasslands.

**Who is entitled to the deduction?**

Taxpayers carrying on a business can deduct capital expenditure incurred on establishing trees/ perennial grasses in a carbon sink forest/grassland. The requirement that taxpayers must be carrying on a business is sufficiently broad to allow those businesses who wish to abate their own greenhouse gas emissions via a carbon sink forest/grassland to be eligible for the deduction. [Schedule 3, item 6, paragraphs 40-1010(1)(a) to (c)]

The primary and principal purpose of establishing the trees/grasslands must be for carbon sequestration and can not include the purposes of felling the trees / removing the grasses or for using them in commercial horticulture. This deduction will only apply to those taxpayers who establish trees/perennial grasses as part of a carbon sink forest/grassland. [Schedule 3, item 6, paragraphs 40-1010(1)(d) and (e)]

A forestry/grassland manager entity may operate a separate business of carbon trading by establishing a qualifying carbon sink forest/grassland.

It is recommended that provisions under Division 40 of the ITAA 1997 include clauses to the effect that appropriately managed grazing and cropping activities conducted in perennial grassland will NOT constitute excluded purposes. These activities enhance the ability of perennial groundcover to provide an effective conduit for the sequestration of atmospheric carbon to the soil carbon sink. The soil under areas of perennial grassland 'set aside' and not managed appropriately will not sequester as much carbon as soil under perennial grassland managed in a rest-rotation grazing system, or in a perennial cover cropping system.

Australia is a party to the Kyoto Protocol to the United Nations Framework Convention on Climate Change. Australia has a target under the Kyoto Protocol to limit emissions to 108 per cent of 1990 levels over the period 2008 to 2012, and follows internationally agreed rules in accounting for progress towards this target. The conditions in paragraphs 40-1010(2)(a) to (c) align with the criteria for carbon sink forest/grassland activities that can contribute to Australia's greenhouse gas target. This ensures that the tax deduction encourages the establishment of forests/grasslands that can contribute to Australia's target.

- **Significance of soil as a carbon sink:-**

- the area of land suited to soil carbon sequestration in Australia is much greater than the area of land suited to timber production
- carbon sequestration in soil can continue indefinitely and be permanent, provided appropriate land management regimes are in place, whereas carbon sequestration in trees reaches a plateau
- appropriately managed perennial grasslands are self-replacing
- trees eventually die, or can be accidentally burned, or intentionally harvested
- carbon sequestered at depth in soil is less prone to accidental loss than carbon sequestered above ground in trees
- the rate at which carbon can be sequestered in soil is generally higher that the rate at which it can be sequestered in trees
- where soil carbon is actively being sequestered, the productivity of the land markedly improves - this has important implications for global food security
- nutritious food from carbon-rich soils supports a healthier human population
- the use of soil as a carbon sink fosters the economic growth and prosperity of rural communities, while the replacement of agricultural land with plantation timber often destroys the social fabric of rural communities
- soil carbon sequestration improves water balance and the water yield of catchments, while timber plantations can markedly reduce the water yield of catchments
- soil carbon sequestration reduces salinity hazards, while an increase in woody vegetation often exacerbates salinisation, increasing salt loads in rivers and streams
- the implementation of more resilient agricultural production systems would significantly reduce the need for federal government EC payments and drought assistance

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## PROJECT-BASED SOIL CARBON OFFSETS

As part of the national mitigation strategy, it is recommended that a **project-based soil carbon offsets scheme**, similar to that currently operating for agricultural soils in the northern hemisphere (through CCX) and for carbon sink forests in Australia, be implemented for soil carbon sinks beneath appropriately managed perennial grasslands.

### Chicago Climate Exchange™ Offsets for Carbon Capture and Storage in Agricultural Soils

The first sale of verified CO2 offsets generated from agricultural **soil** sequestration took place more than three years ago (April 2005) through the Chicago Climate Exchange (CCX).

Activities that increase on-farm **soil** carbon are explicitly **included** as credited activities in United States proposals to legislate a greenhouse gas cap-and-trade program, for both early action and inclusion going forward. Agricultural **soil** carbon crediting is also included in existing Canadian greenhouse gas reduction initiatives.

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The following excerpts are from FAQs: CCX Agricultural Soils Offsets © Copyright 2007 Chicago Climate Exchange

Chicago Climate Exchange (CCX) is an international rules-based greenhouse gas emission reduction, audit, registry and trading program based in the US. Launched as a pilot program in 2003, the market now includes over 350 entities. CCX participants in the industrial, governmental and academic sectors execute legally binding commitments to meet annual emission reduction goals of 4% below baseline for 2006 and 6% below baseline by 2010. CCX rules require that all emission baselines, annual reduction commitments and Offset projects are annually subjected to independent audit by authorized experts.

As of this writing (October 2007), the total included baseline emissions of Chicago Climate Exchange members is in excess of 500 million metric tons CO2. No country in the world has as much industrial emissions under a legally binding GHG emission reduction commitment. (note – this level of emission reduction is almost equivalent to Australia's current total emissions - CJ).

Every active or proposed GHG cap-and-trade program worldwide includes a role for project-based emission reduction credits - "Offsets". Offsets are tradeable credits produced by implementing mitigation projects in sectors not covered by the emissions cap. Every GHG mitigation project enrolled in CCX must meet eligibility standards and undergo independent verification before it can be issued tradeable Offsets in the CCX Registry.

Achieving the goals of Chicago Climate Exchange on a scale with global significance meant it was necessary to move beyond debate and set credible and practical standards for project-based crediting. Offset projects enrolled in CCX produce multiple social, economic and ecological co-benefits. The participation of Offset providers in CCX broadens market participation, and the carbon price produced by the CCX market rewards innovation and efficiency, and encourages investment and risk taking that stimulates development of superior environmental technologies.

It is noteworthy that as various proposals to activate carbon markets emerge around North America, the CCX principle of applying standardized, predictable rules for defining Offsets, and, as well, the specific CCX definitions of eligible projects, are becoming widely accepted practice.

US legislative proposals for limiting greenhouse gases call for major reductions in net emissions in the coming decades. The stringency of the proposed rules warrant the deployment of every possible mitigation option to achieve the legislated targets and to effect the needed scale of global emissions mitigation. Most of the currently viable GHG mitigation options identified by the Intergovernmental Panel on Climate Change can be fully implemented only if a robust and diverse program for engaging project-based mitigation is developed. CCX rules serve to proactively engage many of these diverse mitigation options, thereby advancing global environmental objectives.

***Frequently asked questions about CCX Offsets for Carbon Capture and Storage in Agricultural Soils***

Q: Do the existing scientific guidance and policy structures support use of agricultural **soils** management as an effective greenhouse gas mitigation strategy?

A: **Yes**. Management practices that allow soils to move carbon dioxide from the atmosphere (where it causes harm) to agricultural soils (where carbon improves soil health) are explicitly cited as an important GHG mitigation option in the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol to the UNFCCC, and the most recent report of the Intergovernmental Panel on Climate Change (IPCC). (see *Appendix 1* below).

In Canada, the first provincial-level carbon reduction and trading program (in Alberta) explicitly includes crediting for agricultural soil carbon projects. The government of Saskatchewan targets increased soil carbon capture as one of its five core GHG mitigation strategies.

**Appendix 1** References to Inclusion of Agricultural Soils Management as a GHG Mitigation in the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol to the UNFCCC, and the Intergovernmental Panel on Climate Change (IPCC) *(emphasis added)*

**United Nations Framework Convention On Climate Change, United Nations, 1992,**

(http://unfccc.int/resource/docs/convkp/conveng.pdf)

*Article 3, section 3:*
"The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost. To achieve this, such policies and measures should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors. Efforts to address climate change may be carried out cooperatively by interested Parties.

*Article 4*
1. All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall:

(b) Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change;

(d) Promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems;

2. The developed country Parties and other Parties included in Annex I commit themselves specifically as provided for in the following: (a) Each of these Parties shall adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs.

Kyoto Protocol To The United Nations Framework Convention On Climate Change, United Nations, 1998 (http://unfccc.int/resource/docs/convkp/kpeng.pdf)

*Article 2*
1. Each Party included in Annex I, in achieving its quantified emission limitation and reduction commitments under Article 3, in order to promote sustainable development, shall:
a) Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as:

(ii) Protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol

(iii) Promotion of sustainable forms of agriculture in light of climate change considerations;

**IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate*** (http://www.ipcc.ch/SPM040507.pdf)

14. Agricultural practices collectively can make a significant contribution at low cost to increasing soil carbon sinks, to GHG emission reductions, and by contributing biomass feedstocks for energy use…..

• A large proportion of the mitigation potential of agriculture (excluding bioenergy) arises from soil carbon sequestration, which has strong synergies with sustainable agriculture and generally reduces vulnerability to climate change [8.4, 8.5, 8.8].

**Table SPM.3: Key mitigation technologies and practices currently commercially available**

Agriculture: Improved crop and grazing land management to increase soil carbon storage; restoration of cultivated peaty soils and degraded lands; improved rice cultivation techniques and livestock and manure management to reduce CH4 emissions; improved nitrogen fertilizer application techniques to reduce N2O emissions; dedicated energy crops to replace fossil fuel use; improved energy efficiency.

**Policies measures and instruments shown to be environmentally effective**

Financial incentives and regulations for improved land management, maintaining soil carbon content, efficient use of fertilizers and irrigation.

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## The **potential for Australian soils** under appropriately managed perennial grasslands (including those oversown with annual crops) to be **permanent and productive carbon sinks**

Carbon neutrality, via soil carbon sequestration, is an achievable target for Australia.

A soil carbon improvement of 0.5% in the top 30cm of 2% of Australia's estimated 445 million hectares of agricultural land would safely and permanently sequester 685 million tonnes of carbon dioxide, more than the entire nation's estimated annual emissions of 603 million tonnes.

### Significance of perennial groundcover in achieving this target

Where mycorrhizal perennial groundcover (eg C4 grasses) are appropriately managed, achieving a soil carbon improvement of 0.5% in the 0-30 cm soil profile is relatively easy. Landholders utilising soil building techniques have already achieved sequestration rates three or four times higher than the 0.5% required.

By way of example, the figures in the table (below) from Brown et al (1982) demonstrate that over a wide range of soil types and environments in Victoria, soil carbon levels in pasture soils are approximately double those in cropped soils. These data indicate a large potential for soil carbon sequestration where land is converted to perennial pastures, based on historic depletion. The better soils in each region would have been chosen for cropping, and these soils now contain only half the organic carbon of similar soils under pasture. A change from annual cropping (bare soils) to cropping into perennial groundcover (healthy living soils), has the potential to increase soil carbon levels by around 1% in low rainfall regions and up to 3% in high rainfall regions.

An increase of 1% in the level of soil carbon in the 0-30cm soil profile equates to sequestration of 154 $tCO_2$/ha if an average bulk density of 1.4 g/$cm^3$ is assumed, while an increase of 3% in the level of soil carbon equates to sequestration of 462 $tCO_2$/ha. Given that Victorian pastures were originally perennial and are now mostly annual, historic rates of soil carbon depletion (and hence potential for increase) would be even greater than indicated by the data in this table.

**Low, normal and high ranges for average soil organic carbon levels (% by weight) in crop and pasture soils in low rainfall (< 500mm) and high rainfall (> 500mm) regions in Victoria**

| | Low rainfall (< 500 mm) | | High rainfall (> 500 mm) | |
|---|---|---|---|---|
| | **Crops** | **Pasture** | **Crops** | **Pasture** |
| **Low** | 0.9 | 1.7 | 1.45 | <2.9 |
| **Normal** | 0.9 – 1.4 | 1.7 – 2.6 | 1.45 – 2.9 | 2.9 – 5.8 |
| **High** | >1.45 | >2.6 | >2.9 | >5.8 |

Source: Brown A.J., Fung K.K.H. and Peverill K.K.I. (1982) "A manual on the soil testing service provided by the Division of Agricultural Chemistry" Reprinted by East Gippsland Landcare Network

High rates of soil carbon sequestration per hectare require active humification (a tree cannot grow without lignification, soils cannot grow without humification). The simplest and most cost effective way to achieve humification is by utilising Yearlong Green Farming (YGF) techniques such as perennial cover cropping, which support the mycorrhizal fungi required to transport soluble carbon into the soil matrix. The technique of perennial cover cropping performs extremely well as a soil carbon sequestration mechanism in arable regions of eastern, southern and western Australia.

Rates of soil carbon sequestration in crops sown into mycorrhizal perennial groundcover range from 5-10tCO2/ha/yr in low rainfall regions on sandy soils to 20-30tCO2/ha/yr in higher rainfall regions on finer textured soils.

Innovative (frontier-type) land management technologies that promote soil building are more productive and less expensive than conventional farming practices that deplete soil carbon. When biology friendly fertilisers and continuous sequestration (via perennial cover cropping) are used in

place of conventional fossil-fuel based fertilisers in traditional crop-fallow systems, the carbon footprint is reversed (that is, more carbon is sequestered than emitted).

**Cost of adoption**

Perennial grasses no longer occur naturally on most continuously farmed or continuously grazed carbon depleted soils in the southern half of Australia. The main cost for soil carbon sequestration will therefore be the re-establishment of an appropriately managed perennial pasture base for cropping and grazing enterprises. The granting of the same status for 'carbon sink soils' (under appropriately managed perennial pasture) as currently applies to the plantations forest industry, would help fast-track adoption and rapidly move Australia towards the goal of carbon neutrality achieved through 0.5% annual soil carbon sequestration on 2% of land.

The recognition of soil as a verifiable carbon sink would ideally be accompanied by national workshop tours involving leading soil carbon educators, visiting major regions and assisting landholders to make the changes required to sequester carbon in soil.

**Measuring soil carbon**

Farmers and advisers have been collecting soil samples and measuring soil carbon levels at the paddock scale, for several decades, with very few problems. 'Measurement' per se is relatively easy. The two main issues for the accurate accounting of soil carbon sequestration for carbon sink or carbon offset purposes are:-

i) reliable estimation over large areas

and ii) depth and volume of soil measured

**i) Estimation over large areas**. Verification of soil carbon sequestration is currently based on stock change accounting requiring direct soil measurement. Once accurate databases become established, it should be possible to use a rate change method based on environmental parameters (as used for tree carbon), with remote sensing to determine the boundaries of defined soil carbon sequestration areas.

Rate-change methodology for soil carbon sequestration could revolutionise soil carbon accounting if proved reliable, repeatable and internally consistent with stock change measurements. Where mycorrhizal perennial groundcover is appropriately managed, a consistent pattern is emerging in terms of kg CO2 sequestered per mm soil water. It will be interesting to evaluate this rate-change estimation in the light of the 2008 data generated from the Australian Soil Carbon Accreditation Scheme (ASCAS) sites across Australia.

**ii) Depth and volume of soil measured**.

***Soil depth***: Prior to the recent interest in soil carbon as a sink for greenhouse gases, soil tests by farmers and advisers were mostly taken to provide an indication of soil fertility. Sampling commonly involved the 0-10cm or 0-15cm soil horizon.

Mycorrhizal fungi only function in the vicinity of actively growing root tips. Hence if newly formed humus is to be measured, the soil needs to be sampled to rooting depth. In deep sands in Western Australia, the roots of perennial grasses are frequently found below 6 metres. At the other end of the scale, vertisols overlaying weathered basalt in Central Queensland are often only 60 cm deep.

For the ASCAS project, a depth of 0-110cm was chosen to provide an indication of soil carbon sequestration in the range where most roots occur. The 0-110 cm soil cores are divided into standardised increments at the time of collection. Preliminary data indicate that under perennial groundcover, soil carbon sequestration occurs in all profile increments from 0 to 110cm.

Unlike the labile carbon formed under traditional crop-fallow rotations, the humified carbon formed under perennial cover cropping is highly resistant to both oxidative and microbial decomposition. With appropriate management it is 'permanent;' for all intents and purposes. Carbon dating

reveals that humus can be hundreds, sometimes thousands, of years old. The residence time of humus in soil increases with soil depth, hence there are many advantages to sequestering carbon deep in the soil profile.

***Soil volume:*** It is relatively easy to determine the percentage carbon in soil (and relatively easy to determine the percentage carbon in a tree). The issue with estimating the rate of carbon sequestration in carbon sink soil (or a carbon sink forest) is knowing the volume of soil (or the volume of wood), to which the percentage carbon relates. In a forest, the volume of wood is constantly changing as trees grow. Because individual trees grow at different rates, estimating the volume of wood and hence tonnage of carbon, in a carbon sink forest, can be difficult.

Fortunately, soil volumes remain relatively constant. When levels of humified soil carbon are increasing, new soil is being formed, reducing soil bulk density. However, the changes in soil volume are not rapid. New technologies, such as ultrasound techniques, are improving the ease and accuracy of soil volume (bulk density) determination.

## The **'Soil Carbon Solution'** for achieving carbon neutral status in Australia

*Australia's annual emissions of CO2 are predicted to reach 603 million tonnes in 2008.*

As previously stated, it would require only a 0.5% increase in soil carbon on 2% of agricultural land to sequester all Australia's annual carbon dioxide emissions.

This would provide Australia with a 50 year window of opportunity to be carbon neutral while implementing viable technology to meet future energy needs.

Australia is ideally suited to becoming the first country in the world to be completely carbon neutral, due to our large geographical area and relatively low population. There is no doubt that we can achieve carbon neutral status through soil carbon sequestration.

Even with the best case scenario of stringent emission reduction measures combined with a rapid transition to renewable energy, greenhouse emissions will continue to escalate for a considerable period. Further, the atmospheric response to emission reduction will be slow.

The average longevity of carbon dioxide in the atmosphere is around 100 years. If all emissions ceased today, the legacy load of CO2 could still be sufficient to tip the planet into abrupt climate change.

While emission reduction strategies are important, particularly in the longer term, the critical short and medium term issue is carbon sequestration.

After the oceans, the second largest carbon sink is land. Around 82% of terrestrial carbon is stored in soil, with 18% in aboveground vegetation. Soil is also the planet’s largest reservoir of terrestrial diversity, with over 95% of life forms being underground (that is, less than 5% of biodiversity is above ground).

Provided land management is appropriate, the soil carbon sink represents the largest, most immediate, most permanent and most beneficial solution to removing excess carbon dioxide from the atmosphere.

All that is required is a level playing field.