Submission No. 31

To: House of Representatives Standing Committee on Agriculture, Resources, Fisheries and Forestry.

From: Greening Australia

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RE: Submission to the *Growing Australian Forestry* Inquiry

Submission Summary

- Forestry for the 21st century should be radically different to forestry of the past two centuries.
- 21st century environmental forestry should provide a wide range of goods and services.
- There is no longer a sole market imperative for uniform trees growing in straight lines. Rather 21st forestry enterprises, particularly carbon sinks, can be based on long-lived vegetation of any shape or size that can withstand the inevitable droughts, fires and floods that periodically affect all regions of Australia.
- 21st century forestry should be based on the stunning diversity of Australian species that have evolved over many periods of rapid climate change and adapted to every climate and soil on this ancient continent. There is a native woody plant solution to every financially viable opportunity to establish novel forestry enterprises any where in Australia.

Recommendations

1. Novel forestry systems, delivering a diversity of goods and services, require significant applied R&D. 20th century plantation forestry is based on 75 years of government and private investment in R&D to identify a handful of trees species that can yield profitable products carefully located in a few small corners of Australia. 21st century forestry requires $50 M over 10 years of government and non-government investment in R&D to take advantage of new markets, particularly carbon biosequestration.

2. 21st century forestry also requires investment in skills development for new and innovative jobs ($5 M over five years).

3. The development and implementation of 21st century environmental forestry requires new government policies and incentives, particularly the creation of a national carbon market with access to the international market.

Background to Greening Australia

Greening Australia is Australia's largest environmental NGO with offices in all states and territories and many rural and regional locations around Australia. We have been established for 28 years with a staff of 300 and a turnover of $40M per annum. Our work is focused on the large scale transformation of degraded landscapes. This is achieved through the restoration, expansion and establishment of biodiverse native forests, woodlands and other vegetation systems.

Greening Australia has been a pioneer in novel forestry systems including development offsets for biodiversity, native sandalwood and biodiverse carbon emissions offsets. We have worked in the voluntary carbon offset market for the last 3.5 years through our Breathe Easy program, which was developed in collaboration with Alcoa Australia. We were an accredited carbon abatement provider under the Government's former *Greenhouse Friendly Initiative* and intend to be accredited under the revamped *Carbon Farming Initiative*. Our Breathe Easy program is a mechanism for households and small businesses to offset their carbon emissions and restore biodiverse habitat in large scale landscape linkages.

We ensure that our native sandalwood and carbon sequestration plantings provide multiple environmental and social benefits by adhering to rigorous internal standards. Our novel forestry systems are based on comprehensive and participatory planning at property, landscapes and regional scales. Our carbon offsets are generated from carbon sequestered into diverse native forest that brings, in addition to fixed carbon, a range of environmental services including biodiverse habitat restoration, improved water quality and enhanced soil health. Greening Australia's carbon forestry delivers both carbon emissions mitigation and climate change adaptation.

Inquiry Terms of Reference

Opportunities for diversification, value adding and innovation

21st Century Environmental Forestry

Traditional plantation forestry is a well established niche. The plantation systems of Australia have been developed to maximize growth and uniformity of tree form for a narrow range of end uses including sawn timber, fibre board and wood chips for paper production. All plantation development has been in regions with relatively high rainfall (greater than 600 mm/yr). The technologies of establishment (e.g. seed trees, nurseries, land preparation, spacing, seedling planting and thinning) are mature. The costs and risks of plantation establishment and on-going management are well understood[1].

Demand for this narrow range of timber products from plantations will likely continue throughout this new century, however there are many new and 'over the horizon' forestry systems and markets including:

- Biosequestration of carbon emissions through self-replacing native vegetation planted on increasingly marginal agricultural land;
- High quality oils from native woody species (e.g. tea tree, sandalwood and eucalypts);
- Charcoal products including high quality activated charcoal used in industrial processes, and lower quality but persistent forms of charcoal suitable for soil amendment and biosequestration (biochar);
- Diverse habitat plantings for emerging biodiversity markets (e.g. development offsets);
- Whole of Paddock Rehabilitation (WOPR) forestry to reduce the risk of dryland salinity, limit soil erosion, improve catchment water quality, and supply woody fodder (browse) with a high protein content for livestock, particularly during inevitable droughts (see http://www.greeningaustralia.org.au/visionary-projects/wopr).
- Cellulose feedstocks for second generation biofuels (e.g. syngas)
- Multi-purpose environmental forestry that provides a multitude of environmental goods and services that generates both consumptive and non-consumptive commercial values (profit).

Environmental impacts of forestry

Beyond simple plantations

For the first time in modern history, the carbon and development offset markets provide a commercial value for forests *in situ*. A tree does not have to be harvested to have value in the national and international market places. Environmental forestry is no longer constrained by years to harvest and distance to markets. Rather, the market comes to the forest and photosynthesis and habitat provision are the value-add processes. This represents an opportunity to re-think forestry designs and

management practices rather than slavishly follow models of the past. Environmental forestry provides an outstanding opportunity to profitably restore marginal agricultural lands across Australia.

The few tree species developed for traditional plantation forestry provide limited options for getting the right tree into the right environment. In most Australian landscapes, the constraints to tree growth and survival are highly variable at the scale of just a few hectares (100s of meters). Soil-landscapes in ancient Australia are inherently heterogeneous. Soil depth, fertility, salinity, drainage and water holding capacity vary from ridge tops to valleys (Figure 1). North facing slopes are far drier and more hostile to tree growth than cooler and wetter south facing slopes just a few hundred meters over the hill. Well drained and infertile (e.g. acidic) soils derived from sedimentary parent material are often within just a few hundred meters of far more fertile and deeper alluvial soils.

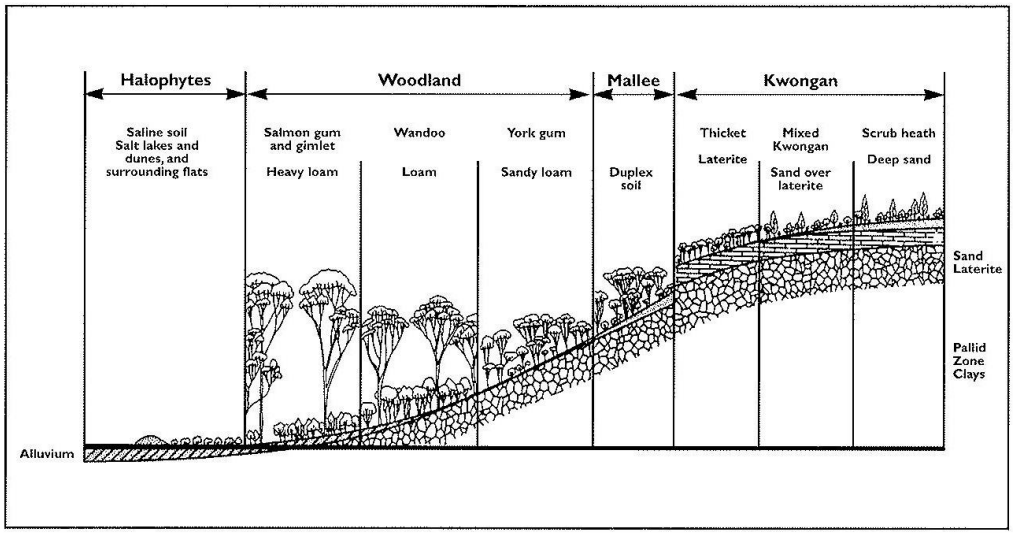

Figure 1. A Western Australian landscape profile illustrating the relationship between vegetative diversity and underlying soils and drainage[2].

20th century forestry that is based on just a few plantation species which restricts it to relatively small parts of Australia that are neither too hot, cold, nor dry for the handful of species that have been developed by the traditional plantation industry and its researchers. Traditional plantations are a limited option due to the vast and variable nature of Australia. Any future expansion of traditional plantation forestry is constrained by the inhospitable environmental conditions of much of our continents landmass.

Not only is Australia variable across space, it is also highly variable through time. Any given location can experience droughts, fire and flooding rains. Existing plantation species have not been selected to survive climatic extremes. All extensively planted plantation pine and eucalypt species are killed by a crown fire. Blue gums only regenerate from seed, since they do not have lignotubers, nor epicorms as sources of post-fire foliage. Unlike many native trees found on floodplains, plantation species can not survive months of water inundation. Again, traditional plantations are a limited option, only suitable in those few regions with reliable rainfall, limited flooding and infrequent periods of high fire risk. Climate change is further reducing the scope of traditional plantations.

Traditional plantation systems have evolved to provide one environmental service – provision of wood fibre. The provision of other ecosystem services (e.g. provision of habitat) is limited. Plantations provide more habitat niches for native species than cleared land dominated by exotic crops and

pastures[3,4]. But plantations provide far less habitat for indigenous flora and fauna than patches of native forests, woodlands and shrublands[5]. Plantations are not compatible with delivery of high quality water for human consumption. Roading and frequent disturbances due to harvesting multi-age coups result in high sediment loads into water catchments[6,7,8].

The fundamental advantage of environmental forestry for carbon, habitat and other non consumptive goods and services is the flexibility to match the appropriate trees and long-lived shrubs to local environmental conditions (climate soil and slopes) at each site. This complementary environmental matching can be done at a fine scale of individual hectares. Environmental forestry can be established from a diversity of regionally native trees and shrubs most likely to be suited to local conditions, since they have evolved locally over millions of years. High genetic diversity also creates the opportunity for populations to rapidly adapt to changing local conditions.

There is no one species of tree that can survive, nor thrive in all regions of Australia. This continent's extraordinarily diverse native vegetation has adapted over evolutionary time to hugely variable climates and soil-landscapes. There are over 1600 species of *Eucalypt* and *Acacia* species in Australia because this large continent is a variable place, from the tropics of the north to the alpine frost hollows of the southern mountain ranges. There are many hundreds of plant species that are adapted to water logged coastal sand plains and others adapted to the vast and arid interior of Australia. There are trees, long-lived shrub species and understory grasses and herbs that are suitable for every circumstance.

Unlike monoculture plantations, carbon sinks and habitat offsets do not need to produce uniform products to meet demanding markets. Environmental forestry can be just the opposite – heterogeneous in growth form. It doesn't matter if a tree is gnarled and twisted. Neither do carbon sinks need to be just trees. It is well known that understory species of tall and short shrubs can reduce tree growth in traditional plantations. But it is the total yield of carbon from all dead and living plants that qualifies for likely national and international markets for carbon emissions offsets. A diversity of native species fills a diversity of niches including shade-tolerant understory. As a resilient system, carbon yields per hectare over the long-term (50-100 years) are likely to be greater from a diversity of plantings than from monocultures[9,10,11].

Potential energy production from forestry –

Gas from natives

Greening Australia, with support from a major corporate foundation, is investigating the second generation biofuel potential of locally native eucalypts and acacias in western Victoria. We are also investigating the value of biochar that is commonly a secondary product of pyrolysis that generates biogas (or syngas). This applied R&D needs to occur in many more regions of Australia across many more native trees and shrubs. This research is needed to build an extensive and fundamental knowledge base for development of 21st century forestry.

We predict a high potential for environmental forestry to complement other forms of cellulose feedstock for syngas. For example, CSIRO has conducted scoping studies into the use of crop stubbles for syngas production (O'Connell, pers. comm.). However, a limiting factor of stubbles is seasonal variability in supply. There will be very little stubble available during dry years and over-supply during wet years. Environmental forestry could be selectively harvested to fill the feedstock supply gap during dry years and simply accumulate biomass during wet years.

Landuse competition

Turbo-charging landcare

21st century environmental forestry could profitably improve agriculture sustainability across southern Australia. The principles of sustainable agricultural landscapes dominated by crops and pastures are simple but challenging: 100% plant cover 100% of the time. No-til cropping, pasture cropping and perennial pastures are achieving this goal on land with low slope and deep fertile soils. But alternative production systems are needed for rocky hill tops, steep slopes, fragile soils (e.g. deeps sands and shallow duplexes) and along creeks and river frontages. Environmental forestry can fill the landscape void of bare and eroding hills, deep gullies, rising salt and sediment polluted water.

No Australian farmer wants to lose all their iconic trees that provide shade and shelter for their livestock and habitat for the glorious dawn chorus of woodland song birds. But University and CSIRO research show that much farm tree cover will be lost during the lives of the next generation of farmers[12]. The iconic paddock gum tree is dying of old age and the stresses of modern agriculture. These Eucalypts rarely regenerate naturally, rather renewal of farmland trees needs human assistance. Greening Australia has developed the WOPR technology to replace farmland trees rapidly and at scale, but at a cost of $500-1000/ha, few farmers can afford this establishment cost, unless there is a real financial return. The development of a robust carbon market complemented by a biodiversity (habitat) market could provide the investment capital and incentives to secure farmland trees into the 22nd century. A price on carbon would also provide the incentives for rapid development of second generation biofuels that could utilise fast growing and highly tolerant acacias established on soils and slopes marginal for traditional agriculture.

The decades of *One Billion Trees*, *Landcare*, the *Natural Heritage Trust* and *Caring For Our Country* have 'primed' agricultural landscapes with farmers ready to go with sustainable farm plans, but without the markets and investment certainty to fully implement their deep understanding of practical sustainability. 21st century environmental forestry could transform landscapes considering that minds, dreams and plans of Australia's farmers have been transformed over the past 20 years.

Social and economic benefits

News skills and jobs for new industries

21st century forestry also requires investment in skills development including:

- Training in collection and propagation of high quality seed from a large diversity of native woody species;
- Planning skills to identify the most suitable combination of woody plants to establish on a diversity of soils, slopes, drainages and climates.
- Business skills to attract new investors to novel forestry systems

Government investment: R&D for 21st Century Forestry

Novel forestry systems delivering a diversity of goods and services requires significant applied R&D. 20th century plantation forestry is based on 75 years of government and private investment in R&D to identify a handful of trees species that can yield profitable products carefully located in a few small

corners of Australia. 21st century forestry requires government and commercial investment in R&D over the long term ($50 M over 10 years).

- Large scale establishment technologies for a diversity of woody native species;
- Technologies to improve the establishment and survival of plantings in low-rainfall, high variability regions of Australia that are too dry for plantations and too marginal for traditional agriculture;
- Soil inoculates (bacteria and fungi) required to improve survival and growth of a diversity of native woody species;
- The suitability of a wide range of native species for second generation biofuels;
- Commercialisation trials (e.g. pilot plants) for decentralized generation of biofuels and biochar (the market comes to the trees, not the other way around).
- Selection of woody species assemblages suitable for site specific soil conditions that have a high likelihood of survival in the face of rapid climate change (e. g. hotter temperatures, more frosts, and greater risks of drought, fire and floods).

The Australian Government's Rural Industries Research and Development Corporation (RIRDC) is well suited to manage this critically important R&D. This research portfolio should be managed in a similar fashion to RIRDC's former Joint Venture Agroforestry Program (JVAP).

Government policy

Lessons from plantation development

The development and implementation of 21st century environmental forestry requires leadership and innovation from government similar to that shown during the 20th century for plantation forestry. Government leadership is needed in the development of appropriate:

- Policy instruments including market frameworks (e.g. price on carbon) and incentives (e.g. taxation)
- Long term applied R&D leading to commercialisation
- Communication and community engagement strategies to facilitate equitable market participation and avoid perverse environmental and social outcomes

Recommendations

1. 21st century forestry requires $50 M over 10 years of government and non-government investment in R&D to take advantage of new markets, particularly carbon biosequestration.

2. 21st century forestry requires investment in skills development for new and innovative jobs ($5 M over five years).

3. The development and implementation of 21st century environmental forestry requires new government policies and incentives, particularly the creation of a national carbon market with access to the international market.

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