

Submission to the Commonwealth Government on the Carbon Pollution Reduction Scheme Green Paper

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The Commonwealth Government proposes that ‘reforestation’ be covered by the proposed Carbon Pollution Reduction Scheme on a voluntary basis from scheme commencement in 2010 (Commonwealth of Australia 2008, p. 132). Under the Kyoto protocol definition, ‘reforestation’ includes plantations established after 1 January 1990 on previously cleared land. With a government-created new market for plantation biomass carbon, relative prices will be a key factor in the decision-making of plantation owners to sell their resources into either the wood³ or carbon market.

This paper presents a simple model to investigate the potential effect of the proposed Carbon Pollution Reduction Scheme on the use of Australia’s Kyoto compliant plantation biomass. After presenting our findings, we discuss the implications for plantation processing in Australia and climate change. We also discuss the implications for the policy objectives of the proposed Carbon Pollution Reduction Scheme. Our recommendations conclude the paper.

The model

We present a simple model that links the physical relationship between total plantation living biomass (in roots, stem, branches and leaves) and merchantable wood to the price of carbon relative to the price of wood. We use the model to answer the question: given a specified price for logs, what is the CO₂ price that would provide the plantation owner with an equal revenue from selling all the carbon stored in the plantation instead of harvesting the logs?

The model was developed for hardwood plantations managed for woodchip production, these being the majority of Australia’s Kyoto compliant plantations. Such plantations have

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³ We focus on conventional uses of wood for sawn timber, panels and pulp but comment on the issue of biofuels in the discussion.

a relatively simple management regime—generally all wood is harvested at clearfell logging for a single product (woodchips)—and therefore easy to model for our task. We adopt the Kyoto greenhouse gas accounting framework and also make the following simplifying assumptions:

1. The revenue for CO₂ sequestered in the plantation is not realised until the end of the wood producing rotation (i.e. around 10 years for hardwood chip plantations).
2. Sequestration based revenue beyond harvest age (i.e. around 10 years) is excluded from the analysis. The model also excludes the biomass breakdown of unharvested plantations some longer time into the future.
3. Carbon stored in wood products is excluded from the analysis. Current IPCC rules under the Kyoto Protocol account for all emissions at the time of harvest. In any case, carbon in long-lived sawn timber and panels is a very small proportion of the carbon in total plantation biomass. For hardwood pulplog plantations (the bulk of Australia's Kyoto-compliant plantations), the great majority of the carbon is in short-lived products (pulp and paper) and waste.
4. Soil carbon is excluded from the analysis in accordance with Australia's Kyoto accounting methodology.

Given:

T - the rotation time in years;

MAI - the mean annual increment of merchantable wood (m³/ha/yr);

P_w - the (stumpage) price of logs (\$A/m³);

P_c - the price of carbon (CO₂/tonne);

R_w - the revenue from wood sales per hectare;

R_c - the revenue from carbon sequestration per hectare;⁴

C_w - the mass of carbon dioxide equivalent per cubic metre of merchantable wood (this is equal to the mass of C per cubic metre of merchantable wood (0.29 t C/m³)⁵ multiplied by the ratio of atomic masses of CO₂ and Carbon (3.66); $C_w = 0.29 * 3.66 = 1.06$);

⁴ The model focuses on the fundamental question: will plantation owners get more money for wood or for carbon? Whether plantations generate revenue or are a liability depends on whether plantations are included in emissions trading and the rules.

⁵ The carbon content of wood (0.29tC/m³) was calculated using wood density and carbon content data for eucalypt plantations reported in Australian Government (2006, Table 7.B5).

S_w - the carbon in merchantable wood as a portion of total carbon in plantation biomass.

The revenue from wood sales per hectare will be:

$$R_w = P_w * T * MAI$$

and the revenue from the sequestered carbon per hectare will be:

$$R_c = P_c * T * MAI * C_w / S_w$$

When revenue from wood sales is equal to the revenue from sequestered carbon, we will have that $R_w = R_c$, in which case:

$$P_w * T * MAI = P_c * T * MAI * C_w / S_w,$$

which implies (cancelling out T, MAI) $P_w = P_c * C_w / S_w$,

which implies (rearranging) $P_c = S_w * P_w / C_w$.

If $P_w = \$20/m^3$ then $P_w / C_w = \$18.87$. Given different values of S_w we obtain:

$$S_w = 40\% \implies P_c = \$7.55$$

$$S_w = \mathbf{50\%} \implies P_c = \mathbf{\$9.43}$$

$$S_w = 60\% \implies P_c = \$11.32$$

$$S_w = 70\% \implies P_c = \$13.21$$

In our example, for merchantable wood priced at $\$20/m^3$ grown in a plantation where merchantable wood accounts for 50% of the carbon in the total plantation biomass, the choice to retain the sequestered carbon (and forego harvesting revenue) cuts in when P_c is $\$9.44/t$ CO₂ or higher.

We provide a range of values for S_w . The 50% value used in the above example aligns with work by Snowdon *et al.* (2000) commissioned for the National Carbon Accounting System. They report a 1.3 ratio of merchantable wood biomass to total above ground woody biomass for a eucalypt plantation at 15 years (Snowdon *et al.* 2000, Figure 2.2) and a root biomass to above ground biomass ratio of 0.34 for eucalypt plantations (Snowdon *et al.* 2000, p. 63). These findings indicate that about half the biomass in a 15 year eucalypt plantation (i.e. at woodchip harvest age) is merchantable wood.

While only half the plantation biomass is suitable for wood production, all the plantation biomass is suitable for selling into a carbon market. Therefore, plantation owners can be expected to forgo wood production and preference carbon production at relatively low CO₂ prices (Table 1).

Table 1. CO₂ price required to equalise revenue for given stumpage wood prices and ratios of carbon in merchantable wood to total plantation biomass carbon.

Stumpage price (\$/m ³)	Carbon in wood as a portion of total plantation biomass carbon		
	40%	50%	60%
	Carbon price required for revenue equalisation (\$/tonne CO ₂)		
10.00	3.77	4.72	5.66
20.00	7.55	9.43	11.32
30.00	11.32	14.15	16.98
40.00	15.09	18.87	22.64
50.00	18.87	23.58	28.30
60.00	22.64	28.30	33.96

Discussion

Historically, wood production has been the purpose of plantation investment. By creating—through the Carbon Pollution Reduction Scheme—a market for plantation biomass carbon, the Government will introduce a new competitor for plantation resources. Since carbon is stored in all the plantation biomass and wood is stored in just half the plantation biomass, plantation owners will be presented with a higher volume commodity market alternative. At relatively low carbon prices, they are likely to switch to the carbon market and forgo harvesting revenue.

Australia's forestry industry is now heavily dependent on plantations, as are forestry industry jobs. The transition from native forests to plantations—largely achieved through market competition with plantation-based companies riding on scale economies and processing efficiencies—has enhanced fundamentally the Australian forestry industry's competitiveness.

In the form proposed by the Green Paper, the Carbon Pollution Reduction Scheme will create uncertainty about the current and future wood supply for both chips and sawn timber.

Hardwood pulplogs

Most of Australia's hardwood plantations are Kyoto compliant and projected to come on stream for pulplog production over 2010 to 2014. The Bureau of Rural Resources projects hardwood plantation pulplog supply at 13.8 million m³ per annum over 2010-14 (Parsons *et*

al. 2007, Table 1): 3.5 times the volume harvested from hardwood plantations in 2006/07 (ABARE 2008, Table 6). Australia is on the cusp of a hardwood plantation resource glut with projected pulplog resources able to substitute for all of Australia's native forest chip exports within two years (Ajani 2008) or, alternatively, to supply the wood for three new large scale pulp and paper mills: one each in Western Australia, Tasmania and the Green Triangle region of Victoria and South Australia. In 2006/07, hardwood plantations accounted for 35 per cent of Australia's hardwood chip trade (Ajani 2008).

If plantation owners switch to the carbon market, plantation processing and unprocessed wood exports will contract as will the associated employment. The economically inferior native forest based sector is likely to increase production and recapture its lost market share because, under the Kyoto accounting framework, it is excluded from the Carbon Pollution Reduction Scheme and therefore neither attracts liabilities nor creates credits.⁶

Softwood

Softwood plantations currently account for a small proportion of Australia's Kyoto compliant estate because hardwood species have dominated Australia's post 1990 planting. But before 1990, softwood planting dominated and these plantations feed today's processing industry. In all respects—investment, production and employment—the softwood processing industry (manufacturers of sawn timber, wood panels, pulp and paper) dominates wood processing in Australia. It is likely to hold this position for many decades. Plantations (mostly softwood) provide 80 per cent of the wood processed into wood products in Australia (sawn timber, wood-based panels and pulp) and generate an estimated 75 to 80 per cent of forestry industry employment in Australia (Ajani 2008).

Future softwood expansion, on already cleared land, will be Kyoto compliant and therefore open to carbon trade. These plantings underpin the softwood processing industry's future growth but are threatened by carbon trading.⁷ Under the carbon market proposed in the Carbon Pollution Reduction Scheme, once CO₂ prices rise to the equalising level with wood production, the softwood processing industry will be confined within the specific land areas that were under plantations in 1990. New plantations will be eligible for carbon credits and reversion of pre-1990 plantations to agriculture will be treated as 'clearing' with implications yet to be clarified in the Carbon Pollution Reduction Scheme.

⁶ The Government proposes not to cover native forests in the emissions trading scheme. Sound arguments, although not advanced in the Green Paper, support this proposal, provided complementary measures are taken to reduce emissions from native forest logging (Ajani 2008).

⁷ Productivity improvements on the existing plantation estate will also increase log supply.

Climate change mitigation

The implications of the Carbon Pollution Reduction Scheme for climate change are negative. The model builds in a carbon price signal for 'reforestation' (covering carbon sequestered in hardwood plantations established after 1990), but it does not include emissions from logging native forests. If the Carbon Pollution Reduction Scheme creates price signals that switch wood production from plantations to native forests (the two resources being highly substitutable across virtually all wood products, including biomass energy), emissions will leak from the plantation forestry sector to the native forest logging sector. Because native forests are more carbon dense than plantations, and the proportion of usable wood is lower, the leakage is likely to lead to a net increase in emissions.

Furthermore, reversing Australia's transition from native forests to plantations undermines the opportunity to halt native forest logging and allow native forests to regrow their carbon stocks to their natural carbon carrying capacity. Recently reported scientific investigation into the carbon stocks and storage potential of Australia's native forests reveals the significance of such a strategy for Australia's contribution to tackling climate change. Mackey *et al.* (2008) investigated the carbon carrying capacity of 14.5 million hectares of south-east Australian eucalypt native forests (Southern Queensland, NSW, Victoria and Tasmania), about half of Australia's remaining eucalypt native forests. They estimated that in their natural condition these forests have the potential to store some 33 billion tonnes of CO₂-e (carbon dioxide equivalent). Australia emitted slightly less than 600 million tonnes of CO₂-e in 2006. About 56 per cent of the study area has been logged and is therefore below carbon carrying capacity. With carbon stocks in logged native forests considered to be around 40 per cent below their carbon carrying capacity (Roxburgh *et al.* 2006), the carbon sequestration potential of these forests could be as much as 7.5 billion tonnes of CO₂-e (Mackey *et al.* 2008, p. 38). Australia has a very significant potential for reducing emissions associated with land use in ways that are both environmentally rigorous and low cost (Mackey *et al.* 2008, Wood 2008, Blakers 2008).

Plantations are also less reliable as a form of mitigation than native forests (Mackey *et al.* 2008, pp.14-18). If plantations remain unlogged—because of commercial incentives created wittingly or otherwise by Government through emissions trading—they will become a ticking carbon 'bomb'. Plantations are an agricultural cropping regime and left unharvested and replanted will end in death, decay and carbon release. Plantations are fundamentally different from native forests and other natural ecosystems that, left unexploited, self-regenerate and remain in a dynamic equilibrium.

It is possible that including 'reforestation' (plantations) in the proposed Carbon Pollution Reduction Scheme will reduce the price of emissions for all sectors. This would normally be a good thing, but because the carbon price reductions would be from an activity that will

most probably have the perverse effect of increasing emissions, this will further undermine the environmental integrity of the scheme. Inclusion of 'reforestation' would therefore also significantly increase the implementation risk of the scheme.

Australia does not adequately account for its emissions from native forest degradation (logging) at present. If inclusion of 'reforestation' in the Carbon Pollution Reduction Scheme were to increase emissions from native forest degradation, and Australia did not properly account for these emissions, this would undermine the accountability and transparency of the scheme.

Covering 'reforestation' in the emission trading scheme would also present a complication to linking with the EU emissions trading market. This will be more of a complication if reforestation is not included in a credible way.

Biofuels and biomass energy

The government proposes (Preferred Position 2.17) to 'zero rate' emissions from combustion of biofuels and biomass energy in the Carbon Pollution Reduction Scheme. Given the findings of Mackey *et al.* (2008), native forest biomass energy carries a large lost opportunity for climate change mitigation. Native forest biofuels and biomass energy developments should be ruled out⁸ with plantations capable of supplying an alternative resource. This however does not imply that plantations (or any other agricultural biomass system) generates a superior energy (including energy efficiency) product from a climate change mitigation perspective. The issues are complex and cannot simply be dismissed, as the Green Paper does, by assuming that biofuels and biomass are carbon-neutral. Biofuels and biomass energy create boundary issues between sectors covered and not covered by the Carbon Pollution Reduction Scheme. Before embarking on the implementation rules for individual sectors, reconciliation processes are required to avoid outcomes generating increased net emissions or disadvantaging potentially superior alternatives (especially energy efficiency and non-biomass renewable energy).

Conclusion

The essence of the problem for plantations, native forests and climate change in the Government's Green Paper proposal is that land use has been incorrectly assigned to the competing objectives of industry efficiency and climate change mitigation. Native forests, the less efficient resource for forestry industry competitiveness, are tagged for wood

⁸ The issue is not confined to 'forests'. Generally, the onus is on biofuels and bioenergy projects to prove that they are greenhouse positive and environmentally benign, especially any that cause loss or degradation of permanent carbon stores in native vegetation, including savannas and rangelands.

production with lost opportunities for the job they do best, carbon storage. Plantations, the less efficient and less reliable resource for carbon storage, are tagged for carbon storage with lost opportunities for the job they do best, wood supply.

Recommendations

We acknowledge that attending to the land use/objective mismatch requires government attention beyond the Carbon Pollution Reduction Scheme, in particular to ensure that existing carbon stores in native forests are protected and new sequestration is encouraged by regrowing native forests to maturity and through permanent biodiverse replanting. For plantations, we recommend that:

1. The Commonwealth Government should not implement *Preferred Position 2.10* of the Green Paper, which is to include all reforestation activities, on a voluntary basis, from scheme commencement in 2010, with design details to be determined.

This preferred position undermines the objectives of the Carbon Pollution Reduction Scheme, including *environmental integrity, minimisation of implementation risk, and accountability and transparency*. Preferably, plantations should be excluded from the emissions trading system in recognition of their biomass carbon neutrality and to avoid perverse effects and unnecessary compliance costs. Plantations, therefore, would be unable to create either liabilities or credits (but fuel emissions from plantation management and harvesting would be captured as for any other industry).

2. As a matter of urgency, the Government should investigate alternative mechanisms to an emissions trading scheme for reducing emissions associated with land use, land use change, and forestry, including emissions from native forest degradation. These mechanisms should be implemented no later than 2010.
3. The Government should not implement *Preferred Position 2.17*, zero-rating biofuels and biomass energy. It should instead investigate the boundary issues between covered and non-covered sectors in the emissions trading scheme.

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