

Contribution to the *Ecological Society Australia*

Occasional Paper on Plantations

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One necessary action to solve the serious problem of global warming problem is to protect and restore the world's forests. Emissions from deforestation represent about 18% of global emissions- a share greater than is produced by the global transport sector (Nakicenovic *et al.*, 2000; IPCC, 2006). Furthermore, Earth's environment has stayed within life-enabling bounds for the last 3.5 billion years due to natural regulatory processes (Gorshkov 1995). Terrestrial stocks and fluxes of carbon are one of the key natural processes, with forests constituting the most carbon rich and extensive biome. Following the logic that forests are an important part of the global carbon cycle and help regulate the concentration of greenhouse gases in the atmosphere, it can be argued that carbon sequestration by plantation forests may help mitigate human-forced global warming.

Chee (1999) estimated above ground living biomass carbon stocks of commercial *Pinus radiata* stands (~30 years age) to have a mean and SD of 190 (37) t ha⁻¹. By comparison, the above ground living biomass of unlogged mixed Eucalypt species native forests is around 350 t ha⁻¹ and that of mature *Eucalyptus regnans* dominated forests to be 400+ t ha⁻¹ (Roxburgh *et al.* 2006; Dean *et al.* 2003). Of course there are significant stocks of soil carbon in plantations and unlogged and logged native forests, along with variable amounts of carbon in the litter and coarse woody debris pools.

Once a commercial plantation stand is logged the amount of carbon in the above ground living biomass pool is effectively reduced to zero. Therefore, while there are substantial stocks of carbon in plantations, their contribution to reducing the concentration of CO₂ in the atmosphere depends largely on the logging cycle as this will determine the residency time of a unit of carbon in the living woody biomass. A key research concerns the length of time a unit of carbon has to removed out of the atmosphere in order to contribute to a significant reduction in the greenhouse affect. In any case, we can assume that the shorter the logging cycle the less likely the plantation carbon stock makes a significance contribution to reducing atmospheric levels of CO₂, radiative forcing, and hence climate change.

Given the substantial carbon stocks in native forest ecosystems, and particularly unlogged native forest ecosystems, clearing native forests for any use (including plantations) will cause a net carbon loss in terrestrial stocks that will take hundreds of years to recover; even if the native forest is allowed to regenerate (Roxburgh *et al* 2006). The significance of this fact is evident when we consider that 2 million ha of plantations have been planted to date for timber production, and approximately 25% of this has been the direct replacement of native forests. Any carbon benefits from plantations will only incur through their establishment on land that has previously been cleared for other land use activities. Presumably, even a short rotation plantation has a net carbon benefit compared to a cleared pasture.

References

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