Carbon storage and the New Zealand Emissions Trading Scheme: rewards for new producers of an old product

The announcement of the New Zealand Emissions Trading Scheme (ETS) reflects new, enlightened attitudes towards cleaning up our own messes, and while foresters have much to contribute, we are heading for some speed bumps.

Atmospheric carbon absorbed by trees will become a tradable commodity, which is a double-edged sword for forest owners. Owners of post-1989 forests planted on grassland will be able to sell estimates of New Zealand Emission Units (NZUs are each equivalent to one tonne of CO2) absorbed by those forests. However, lawmakers have implicitly assumed that the ETS should encourage people to change their behaviours, rather than reward desirable, current behaviours. Therefore owners of pre-1990 forests will receive no credits for the carbon their forests have absorbed, but they will be liable for carbon emitted if they choose to deforest. There will be a small allocation of 39 free deforestation NZUs per hectare to all pre-1990 forest owners. To put this into perspective, consider that a typical radiata pine plantation absorbs around 30 NZUs per hectare per year. Those who wish to deforest beyond the limits of their allocations will either have to generate NZUs by planting new forests on grassland elsewhere, or purchase extra ones on the open market.

NZUs should increase in value as the scheme unfolds. Sectors will be brought into the scheme one by one, with forestry first off the blocks in 2008, followed by the transport sector in 2009, other energy and industry in 2010, and finally agriculture (methane from livestock contributes almost 50% of our total greenhouse gas emissions) and waste management in 2013, although this may depend on how well NZUs are linked to the international market for credits. Units sold in 2008 may therefore be considerably less valuable than those sold in 2013. Non-forestry sectors tend to be greenhouse gas (GHG) emitters, and they will initially have free NZU allocations, topped up annually, equivalent to 90% of their 2005 emissions. From 2013, they will experience a reduction in free NZU allocation of 7.5% of their 2005 emissions each year between 2014 and 2025, and have no free NZUs thereafter. This may further increase the value of NZUs.

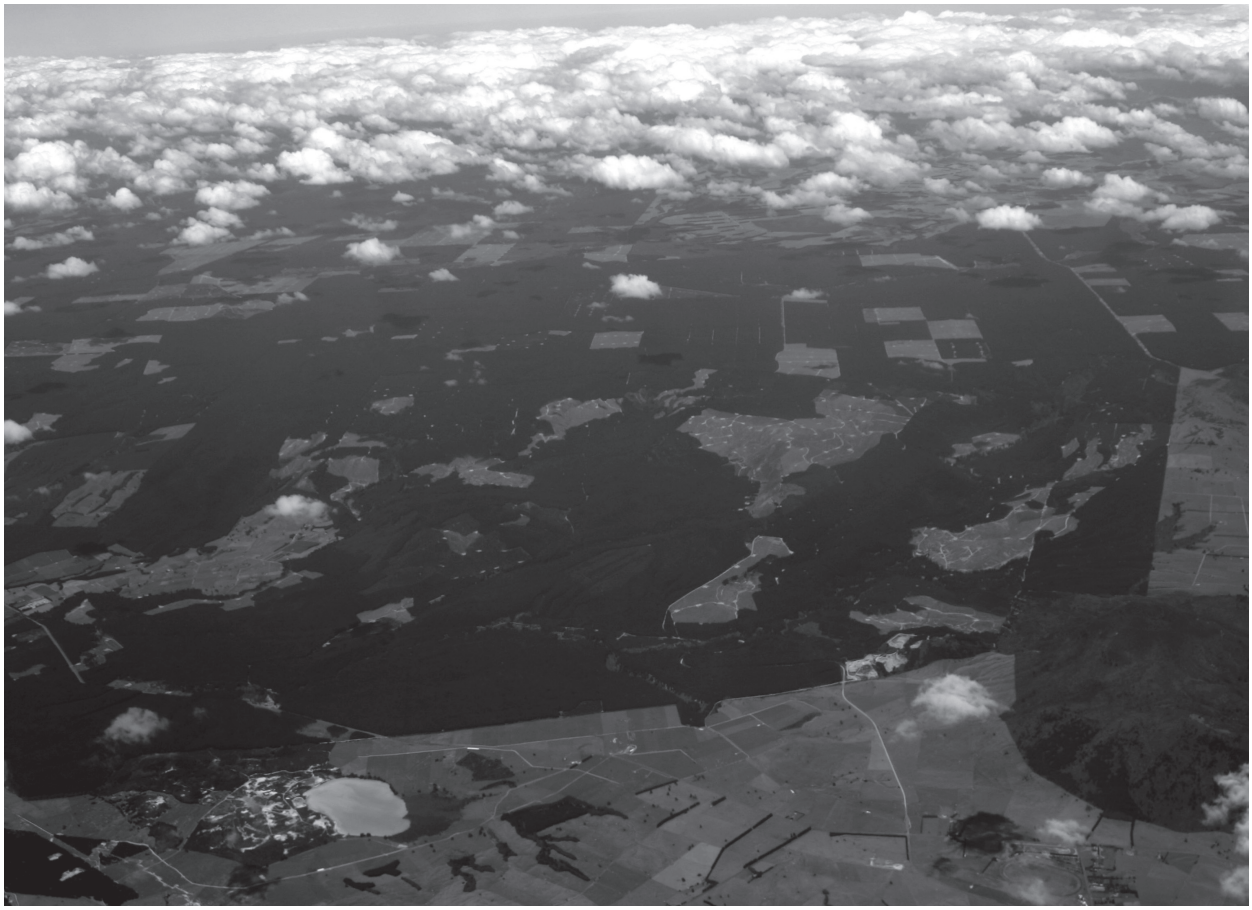
Pre-1990 forest owners stand to lose land value because changing to some other land use may become prohibitively expensive. If they deforest they will have to purchase increasingly scarce NZUs, with the amount most likely estimated from a table of values that is yet to be released. In addition, they would not be entitled to free allocations of NZUs for any subsequent land uses that emit GHGs (see further comment on this rule below).

Post-1989 forest owners can choose to register for the ETS, and accrue NZUs as their forests grow. They would have to surrender NZUs at time of harvest, however. If they chose to replant then the amount surrendered would probably be about 80% of the amount accrued, because roots and debris left after harvest take a few years to break down. Someone with many age classes in their estate might find that NZU liabilities generated by harvesting of some stands were balanced by NZUs absorbed by other stands. As the price of NZUs is projected to rise, commentators are suggesting that it may be wise for post-1989 forest owners to retain most of their NZUs. Retaining permanent forests with little or no harvesting may become an increasingly attractive, albeit risky alternative which would allow owners to capitalize their NZUs.

While designers of the ETS would ostensibly like to encourage afforestation on pastureland, two perverse rules of the scheme appear to discourage prospective farm foresters, at least until reductions in free NZU allocations become extremely painful for farmers. If GHG emitters cease trading then they lose their free allocations, and new emitters have no rights to free units. So your neighbouring dairy farmer is going to figure that she'll only lose free NZUs by establishing a forest, and changing back to dairy farming would be financially unworkable in at least the near future. We need new afforestation *now*; otherwise our unbalanced national estate will produce a carbon deficit in the landscape if trees planted during the 1990s are harvested on schedule.

The afforestation grants scheme may prove to be a more compelling incentive for planting, particularly on small land holdings. Criteria for elligibility include non-carbon benefits, however, so its impact may be limited to erosion-prone sites.

One little-noted hazard for forest owners is that changing land from grass to pine darkens the landscape, increasing the amount of energy absorbed. An email exchange between me and Dr Ken Caldeira, of Stanford University, yielded a "back of the envelope" calculation suggesting that a portion of the benefits of CO2 absorption by radiata pine might be negated because of this effect. This may mean that planting tree species with lighter leaves, such as Eucalypts, may provide greater climate change benefits. As responsible environmental stewards we should investigate the matter fully, and I am encouraging Dr Caldeira to publish his calculations in a peer reviewed journal. So far this "albedo" effect is ignored by the Kyoto



A prominent New Zealand carbon reservoir. Credit: Euan Mason

treaty and by the ETS, but there is no guarantee that policy makers will continue to overlook it.

Similarly, some notable solutions to climate change provided by forestry are recognized neither in the Kyoto agreement nor in the ETS. According to Lawson , air dried wood has an embodied energy footprint of 0.5 MJ/Kg, compared to 34 MJ/Kg for steel, 90 MJ/Kg for plastics, and 170 MJ/Kg for aluminium. As much of our marginal energy comes from fossil fuels, building with wood instead of these other materials can help us to reduce emissions. Furthermore, wood in use represents another reservoir for carbon, and forests offer carbon-neutral solutions for creating transport fuels or direct energy generation from wood combustion. We need to be just as forthright about these benefits as we are in acknowledging adverse features like the albedo effect.

Readers might be forgiven for assuming that I dislike the ETS, but they would be mistaken. We need to change our behaviours, and the ETS is a worthy attempt to encourage us to do so. In principle I support it, and the difficulties of making this kind of policy have been courageously confronted by government officials. I am concerned, however, that incentives for forestry may be inadequate, and it is ironic that a scheme designed to encourage change may initially reduce land-use flexibility, with farmers looking askance at afforestation that would lower land values while lobbying hard to have agriculture removed from the ETS altogether.

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