New Zealand Institute of Forestry (NZIF)
Te Pūtahi Ngāherehere o Aotearoa Inc

The ETS and Forest Valuation

Guidance material on how to incorporate the impact of the ETS on forest and forest land valuation

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Scope

The Ministry of Agriculture and Forestry (MAF) has developed a package of measures to address climate change in the land management sector. These include the Emissions Trading Scheme (ETS).

MAF recognises the need to fully explain the purpose and implementation of the ETS. Among those who must address its consequences are the valuers of land and tree crops. MAF accordingly awarded a contract to the NZ Institute of Forestry (NZIF) to assist in upskilling valuation providers. This document is part of the MAF process, to provide guidance and recommendations for practitioners.

This report deals with the valuation of forests including the components of

- Land
- Tree crop
- Carbon trading opportunity

The valuation objective adopted is the reporting of market value. When valuing a forest (or components of a forest) it is necessary to ensure that the value passes the market value definitions and a reality test; i.e., is the value struck likely to result in a transaction (should the forest, or components of it, actually be marketed) given all the evidence available to the valuer?

The application of the guidance material in this report for accounting and financial reporting purposes will need to be considered alongside the relevant accounting standards and related guidance. Related to this there will be considerations in terms of disclosure requirements.

1. PREAMBLE

1.1 LAND DIFFERENTIATION

The Emissions Trading Scheme (ETS) was effective for forestry from 1 January 2008.

The ETS defines forest land as an area of land of at least one hectare with forest species that have, or are likely to have;

- a tree crown cover of more than 30 percent on each hectare, and
- an average crown cover width of at least 30 metres.

For the purpose of the ETS a tree is defined as any non –horticultural vegetation (including tree ferns) capable of reaching 5 metres in height at maturity in the place it is located).

If an area does not temporarily meet the above definition due to human intervention or natural events but is likely to in the future it is still considered forest land.

The ETS further distinguishes land that was occupied by forest before and after 31st December 1989:

- ***Pre-1990 forest land*** is forest land that was forest land on 31 December 1989; remained as forest land on 31 December 2007; and where the forest species on the forest land on 31 December 2007 consisted predominantly of exotic forest species.

- ***Post-1989 forest land*** is primarily forest land that was established in exotic or indigenous forest species **after** 31 December 1989 on land that was not forest land on 31 December 1989.

The effect of the ETS on the valuation of a forest (land and crop) is determined by whether the forest land is pre-1990 or post-1989.

1.1.1 Pre-1990 forest land

- Only applies to forest that consisted predominantly of exotic forest species as at 31 December 2007.
- Sustained ongoing forest operations (harvesting and reestablishment in forest species) are possible without having to enter the scheme. However if a party deforests more than 2 hectares of non-exempt forest land in any five-year period starting 1 January 2008, they will automatically become Participants.
- Until 30 September 2011, a landowner can apply for an exemption for an area of pre-1990 forest land of less than 50 hectares, if the area was owned on 1 September 2007 by a person who owned in total less than 50 hectares of pre-1990 forest land.

- Until 30 November 2011, the landowner (as at 20 July 2010) can apply for an allocation of New Zealand Units (NZUs) under the Forestry Allocation Plan. The allocation is:
  - 18 units per hectare for Crown forest land subject to Crown Forestry Licence (CFL) land transferred after 1 January 2008, or
  - 39 units per hectare for land transferred since 31 October 2002, or
  - 60 units per hectare for all other eligible land.
- Eligible landowners will receive 38 percent of their entitlement before 31 December 2012 with the remaining 62 percent due for transfer during 2013 but if the law changes some or all of the second part may be cancelled.
- Allocation of NZUs (if applied for) is intended to partially compensate for loss in land value as a result of implementation of the ETS. The opportunity to exploit existing or future land uses that are "higher and better" than forestry is limited by the deforestation liability.
- Landowners have to make application and provide maps to receive an allocation.

If an area of more than two hectares of pre-1990 forest land that is not exempt is deforested in any five year period from 1 January 2008, the landowner becomes a *mandatory* Participant in the ETS. A number of actions are required by the Participant who must:

1. Notify MAF of becoming a Participant (clearing of 2 hectares in 5 years triggers this).
2. Obtain a holding account from the New Zealand Emissions Unit Register.
3. Calculate the emissions associated with deforestation.
4. File an emissions return by 31 March each year.
5. Surrender units within two months of the emission return (i.e. by 31 May) to meet emissions liabilities.

Most transactions of NZUs which relate to pre-1990 forest land do not trigger an income-tax liability. NZUs awarded under the Forestry Allocation Plan do not incur tax if they are sold by the landowner.

All transactions of emissions units are zero rated for GST but any GST incurred in dealing and supply can be claimed.

1.1.2 Post-1989 forest land

- Entry is voluntary for both exotic and indigenous forest.
- No NZUs are earned for carbon sequestered before 1st January 2008.
- Land has to be non forest land at 31 December 1989[1].

[1] Also eligible for the ETS is land that was forest land on 31 December 1989 but was deforested before 1 January 2008, and then later reforested; pre-1990 forest land or exempt land that was deforested after 31 December 2007 and was later reforested provided and deforestation liability has been met.

- All or part of the forest can be registered and additional areas added at any time.
- If a forest is not registered no NZUs are allocated and no deforestation liability applies.
- Once registered, deforestation will attract a requirement to pay back NZUs.
- The quantity of NZUs that may require surrender cannot exceed the quantity received.

If post-1989 forest land enters the ETS, then the Participant must register and carry out the following actions:

1. Obtain a holding account from the New Zealand Emissions Unit Register.
2. Map the land according to MAF's Geospatial Mapping Standard.
3. Determine the Carbon Accounting Areas. This allows the Participants to decide how they would like to specify the post-1989 forest so they can account for age classes and likely harvest patterns.
4. Calculate changes in carbon stocks on the forest. Note that for areas less than 100 hectares, national or regional lookup tables must be used for filing returns. In Commitment Period 1 (CP1), for areas of greater than 100 hectares lookup tables may only be used for interim returns and participant-specific lookup tables derived from field measurements will be required for the 2013 mandatory return. In CP2, if a participant already has participant-specific lookup tables, they must be used. If they don't have them, the national or regional tables may be used for interim returns until measurement is completed and participant-specific tables are provided. Participant-specific tables must be used for the five-yearly mandatory returns for areas over 100 hectares.
5. File an emissions return. Annual interim returns can be filed to receive NZUs and a mandatory return is required in 2013.
6. Receive or surrender NZUs as required.

Transfer of NZUs to Participants does not trigger an income-tax liability. However if NZUs are sold it is deemed to be income and is assessable income for tax purposes.

All transactions of emissions units are zero rated for GST but any GST incurred in dealing and supply is able to be claimed.

1.1.3 Default obligation

For all land, the default obligation rests with the participant. The participant is not necessarily the land-owner. It can instead be a party who does not own the forest land but has legal rights to the forest on the land. Specific examples are registered forestry right holders; registered lease-holders; or parties to a Crown conservation contract. If a registered forestry right holder or registered lease holder wishes to be registered as the Participant, the written permission of the forest landowner is required. In such a case, the land-owner is not liable for the obligations of the participant. However, if the land is not withdrawn from the ETS on termination, the landowner becomes the participant and is responsible for the unit balances (if any) of the Carbon Accounting Areas.

1.2 NATURE OF CARBON OBLIGATIONS

Owners of pre-1990 forest land that exceeds 50 ha, and any ETS participants occupying post-1989 forest land that enters the ETS, effectively have a contract with the Crown to maintain forest or surrender carbon units. This requirement potentially imposes a financial impost on any owner of such land in the event that owner wishes to change the land use. This is a form of "encumbrance". The size of the "encumbrance" will vary from property to property based upon the assessed carbon being carried by the tree crop.

Land valuation requires that encumbrances be acknowledged. However the statutory definition of land value includes the phrase 'as if unencumbered by any mortgage or charge thereon' it is therefore important that valuers of forestry land are fully conversant with all of the issues arising from the effect of the ETS on the land being valued.

The nature of the "ETS encumbrance" differs for pre-1990 forest land and post-1989 forest land. In the case of pre-1990 forest land the "encumbrance" is that forestry remains the obligatory land use unless carbon units are surrendered. This "encumbrance" is better described as an economic impediment to a land use change will be reflected in the market price of the land as compared to post-1989 land which potentially has an additional income stream arising from the trading of carbon. For post-1989 forest land the owner has a choice as to enter the scheme or not. The "ETS encumbrance" is that any reduction in carbon stocks requires a corresponding surrender of carbon units.

Once a post-1989 participant is registered under the ETS, a notice is placed on the land title to this effect. The same treatment applies with the Permanent Forest Sink Initiative (PFSI) where the PFSI covenant is registered on the land title. The notice states that the title is subject to the CCRA (Climate Change Response Act). This notice is not a legal encumbrance against the land but it is a notice to a purchaser (valuer) that there may be issues under the ETS regulations that need to be checked to ensure that there is no liability to a purchaser or any interested party which would detract from the market value of the land.

***Proposals**:*

- For pre-1990 land, any encumbrances or notices associated with the ETS are recognised in the value of the land.

- For post-1989 land, any encumbrances or notices associated with the ETS are recognised in the value of carbon rather than the value of the land or trees.

- The extent to which future carbon potential is exploited is a matter of landowner initiative and discretion.

2. VALUING LAND

2.1 CURRENT MARKET

What are current transactions indicating?
The ETS is being tested in the market. Evidence for the period 2010 to mid 2011 suggests that prices paid for land that is available for new planting are at prices significantly above those prevailing prior to the ETS implementation.

The situation is nevertheless complicated. Rural land prices in New Zealand demonstrated a downturn in price in the wake of the Global Financial Crisis (GFC) of 2008. Following the GFC, there has been a perception in some international markets that land may represent a safer near term haven than other less tangible and riskier assets. Some commentators would attribute a measure of recent firming in land price to this source.

Within the New Zealand forestry sector there has simultaneously been a discernible increase in log prices over the same period of land price increase. The log prices (in NZ$) as at June 2011 have moderated but this is mostly due to currency exchange rates. There continues to be confidence to sustain market share and selling price.

Against this backdrop, the contribution that the carbon potential makes to post-1989 land prices is not clear. Some valuers have suggested that the increase in per hectare prices is all due to carbon with no increase arising from improved returns to the sector. Such claims can only be made if the apportionment is set out in the sale and purchase agreements or if there is good market evidence to support such claims.

The "compensation provisions" for pre-1990 forest land provide owners of pre-1990 land with some recognition for the effective restriction of land use that the legislation imposes. Owners of Crown Forestry Licence land will receive 18 NZUs per hectare. Other owners may receive 39 or 60 units depending upon the ownership status as at 31 October 2002. The allocation entitlement belongs to the landowner as at 20 July 2010 and it is intended that it will be provided in two tranches.

Securing the one off allocation involves the following:

- An application is necessary to secure the allocation.
- The application requires mapping which may incur some costs.
- Only 38 percent of the NZUs will be allocated before 31 December 2012.
- The recipient may market the NZUs immediately and incur transaction costs or hold them for later sale.

The land market can be expected to demonstrate some uncertainty until more empirical evidence becomes available and a clearer picture of the future regulatory environment emerges. Uncertainty remains around the market reaction to the ETS provisions in the longer term; i.e. whether the legislation will have its full impact on land prices if offsetting is allowed in Commitment Period 2 (CP2), the interim effect when NZU price is capped at NZ$25, and the longer term effect as NZU price alters.

Proposals:

- Current market transactions should be analysed but treated with caution.

- In the case of post-1989 forest land, apportionment of an increase in per hectare prices to carbon rather than improved returns to the sector cannot be made unless there is full disclosure of the purchaser's price for the land and the premium paid for the carbon potential.

2.2 LAND VALUE ANALYSIS AND ASSESSMENT

2.2.1 Land classification

Analysis and assessment of forest land values must address the status of the land.
As outlined above, the legislation effectively introduces a number of classes:

Pre-1990 Forest Land
After the allocation plan deadline has passed pre-1990 forest land can be classified as having:

- Allocation obtained,
- Exemption secured (less than 50 ha), or
- Nothing done.

Post-1989 Forest Land
Post 1989 forest land can be classified as having:

- No carbon trading
- Registered in ETS
- Contracted to Afforestation Grant Scheme (AGS)
- A Permanent Forest Sink Initiative (PFSI) covenant

Proposals:

- When reporting land value, its status under the ETS must be clearly identified and the potential liability of changing the use of both pre-1990 and post-1989 land in the ETS explained.

- Different ETS treatment of pre-1990 forest land and post-1989 forest land mean that market evidence for one category needs careful analysis to apply it to the other category.

2.2.2 Analysis and assessment of Pre-1990 Forest land value

Analysis and assessment of pre-1990 forest land values to exclude the NZUs received under the allocation plan
Pre-1990 forest land has lost property rights in that it is restricted to ongoing forestry use unless the ETS obligation is 'bought out'.

The Allocation Plan is a one-off opportunity for land owners who had ownership of the land on or before the 20 July 2010 to achieve compensation for the restrictions imposed on their land use. Any transaction after that date will not qualify the new owner to claim units. Land is restricted to forestry use unless required units are surrendered.

Pre-1990 land that is exempt has no limitations and can be treated the same as any other non ETS land. The title will record the exemption.

Application of Post 1989 land sales evidence
Market evidence of post 1989 land may have limited relevance to the assessment of pre 1990 land where the purchaser of that land is proposing to enter the ETS.

However if it is known that that purchaser had no intention to enter the ETS then that market evidence will be of some assistance in assessing the current market value of pre 1990 land. The weight given to that evidence must however recognise the post 1989 as having a greater bundle of property rights than pre 1990 land.

Highest and Best Use
Where the land has obtained exemption under the allocation plan the economic impediment of the ETS is removed so a Highest and Best Use (HBU) value needs to be assessed. Except that use cannot be for forestry use and entering the ETS as post 1989 land.

Proposals (for pre-1990 forest land)*:*

- Land value should be reported excluding any value due to future NZU compensation. Units that may be due are a separate matter to the value of the land.

- Any value attributed in the market for the compensation should be separately identified until the Allocation Plan expires.

- Land value will be estimated based on transactions where ongoing forestry use prevails (unless conversion to an alternative land-use is economically rational for the land being valued).

- Exempt land should be valued on HBU. It should be documented that it cannot be used as post-1989 forest land unless any deforestation liability has been met.

2.2.3 Analysis and assessment of Post-1989 Forest Land

Analysis and assessment of post 1989 forest land values must account for carbon trading

The ETS scheme will in due course become more widely understood and the potential benefits from carbon trading (if any) should become more universally recognised. Once this is the case then all transactions of post-1989 land acquired for forestry purposes can be used to define the market. The assignment of fair value will recognise the potential to trade carbon regardless of whether the purchaser actually enters the scheme.

The difficulty facing valuers, now and into the future, will involve identifying just what increase in the market price for post-1989 land can be attributed to the potential to trade carbon.

Once the land is planted and in the ETS then a transaction could involve land, crop and potentially carbon. When entering the ETS the participant at any time can exit upon repaying all the carbon units in the unit balance. Thus, if an alternative HBU has emerged, it will be possible to transfer to it.

The AGS and PFSI options start with land that is unencumbered and then the land owner contracts to restrict his land use and is compensated for doing so.

For the AGS the landowner receives a payment after planting as a grant. In return the landowner must manage a forest for 10 years on the land but gets no carbon units. After 10 years the landowner is free to choose what to do (clear the forest, manage the forest and enter the ETS).

For the PFSI the landowner is restricted in land use for a minimum of 50 years. This represents more of an impost than is the case with pre-1990 land as it requires continuous forest cover (whereas pre-1990 can harvest and replant). The compensation in CP1 is in the form of AAUs. For some areas of land where conventional timber growing is not viable, deriving income from carbon units may increase land values. However there is currently no market evidence.

Proposals (for post-1989 forest land):

- The primary reference for post-1989 land value will be the acquisition of non forest land that is subsequently afforested but, as noted above, this has to be analysed to indentify the market drivers which may differentiate traditional use and that of any added value arising from carbon trading opportunities under the ETS, AGS or PFSI.

- A secondary reference may be obtained from the wider rural land market by comparing sales of pastoral land of similar locational, topographical and fertility characteristics to that being assessed.

2.3 LAND RENTALS

Impact of the ETS on land rentals

Pre-1990 land
Most pre-1990 land occupied under lease or licence restricts the occupier of the land to growing trees. The CFLs for sand forests, for instance, also contained this stipulation. In principle the rents for these properties could form a transaction comparison base for rents for pre-1990 forests now falling within the jurisdiction of the ETS.

Some care may be needed in the comparison. The CFLs, for instance, apply to whole title areas and thereby include not only the productive crop but also reserves. The lease/licence may also contain 'non market' specific requirements.

The more prevalent form of "rental" tenure has since become forestry rights, and these usually apply to just the productive areas within an estate.

Post-1989 land
NZIF has previously released a discussion paper on treatment of land value. This recommends that where a tree crop occupies freehold land, it should be charged with a notional rent. The charge should be equivalent to what the market is paying for corresponding land under its HBU[2]. Where land comes to be perceived as having a HBU other then forestry, the rent may move accordingly, provided the land use is not restricted to forest growing. A tree crop could therefore be charged for land influenced by the earning capacity in another use, even though this use might not be available until the clearfelling of the current crop.

Where the land is the subject of a rental arrangement, the rental terms will be recognised until its termination.

Post-1989 land suited to forestry is not necessarily constrained to forestry use in the manner that pre-1990 land is. The choice of the land use rests with the owner/ occupier, however that choice, where the land use is not optimised, will not affect its rental value. In the event that a land owner leases land under a lease agreement containing restrictive provisions the rental achieved would be expected to recognise those conditions. It would not provide a good market comparable unless the adjustments for those terms are clearly set out in the lease agreement. This would then enable adding them back to the lease payment to derive a correct market rental.

There may nevertheless be some disincentive to change land use resulting from the need to surrender previously uplifted credits. The surrender requirement can be reduced if another rotation proceeds, as illustrated in later figures. To the extent that such considerations limit the expectations of capacity for land use change, the rentals on post-1989 land may, depending upon the relative earning capacity of the land, be

[2] An adjustment may be necessary to recognise the costs of bringing the forest land to sufficient condition for the HBU.

lower than for rural land generally. In recent years forest land rentals have on a per hectare basis been much lower than those for land used for pastoral farming.

***Proposals**:*

- Pre-1990 land is restricted to forestry use and market rental evidence is expected to reflect this effect along with there being no ability to trade carbon sequestered on that land on an on-going basis.

- Post-1989 land rental assessment for forestry use could credibly start with more generally demonstrated rental levels. The valuer should expect to discuss and disclose any market frictions that registration within the ETS might introduce.

- Any rental variation is to be separately analysed/assessed by reference to the lease terms. Any restriction, imposed by the lessor, which results in a rental below the market level be identified and the reasons clearly set out in the valuation report.

3. COMPONENTS OF FOREST VALUE (POST-1989 LAND)

Carbon value should be valued as a separate asset/liability rather than as part of land value or part of crop value.

Carbon value arises because of the change in carbon stocks associated with the tree crop. However to accumulate carbon stocks requires use of the land. An argument could be made to include carbon value with either crop value or land value. Neither may be appropriate as carbon has some unique features.

In the terminology of the NZIF Forest Valuation Standards, we describe the forest value as follows:

Tree crop value
+ Land value
+ Other sources of value
Forest value

Special issues associated with carbon include the following:

- The essential characteristic of the financial reporting standard, NZ IAS 41 is that it is applied to things that are alive; for this reason an Australian prototype of the standard made reference to "Self-generating and regenerating" assets. Other descriptions of tree crops have referred to them as "Both the factory and the product". Once the subject assets are no longer alive, such as fruit in a tray, carcasses on hooks, or logs on a landing, then they are immediately the subject of another standard. Carbon creates some issues here:
    - While carbon is being sequestered in the tree, it is definitely the product of growth.
    - Claiming (and subsequently selling) the sequestered carbon does not require harvesting the tree crop.
    - Once the sequestered carbon has been claimed, the associated units have left the tree crop but there is potentially a liability for the participant.

- After the first tree crop is harvested, and possibly a next crop is underway, there is still a carbon residue from the stumps and other debris. This may persist for several years. It is no longer growing; instead it is actively decaying.

- In looking for a similar type of situation from elsewhere within agriculture, one possible example would be sheep and their wool. Growing the wool and then shearing and selling it periodically is in some respects equivalent to accumulating and then selling the carbon. As with the incremental carbon, it is not necessary to terminate the sheep to sell the wool. Once a fleece is gone from the sheep, the animal's value temporarily drops back, because it is no longer "in wool". In like manner, a stand that has just had its carbon increment claimed would drop back in value by the extent of the net sale proceeds.

- Unlike the sheep/wool example, the carbon itself is not a separable part of the tree. Despite the fact that carbon is progressively claimed, it remains an integral part of the tree. This leads to the situation (and doubtless not unique) where one part of the tree crop has already been sold, but an associated part – the timber - will not be sold until the tree crop is harvested.

- The cashflows associated with the carbon to some extent demonstrate a reversal of what happens with the forest as a whole. The forest goes through many years of net cash outflow, associated with the forest maintenance. Then, with the harvesting of the timber content, the tree crop produces a sizeable positive return. The carbon side to the business goes through many years of positive returns to be followed by a sizeable obligation to repay.

- The obligation to surrender credits on harvesting rests with the registered participant. To ensure a link to something tangible persists after the tree crop is removed, notice is placed on the land title and this is the major point of difference to the sheep /wool analogy.

- Should the carbon business become especially attractive, it may lead to the following outcomes for young forests:
  - We can expect in the first instance that forests that still have positive accretion potential will be attributed a higher value.
  - In due course, however, we would expect any super-profitability from the carbon sequestration opportunities to find its way into the price paid for land.

- For forests in which the tree crops are in net liability mode, higher carbon prices will amplify the liability.

***Proposal**:*

- The distinctive features of carbon suggest that it should be treated as a separate asset/liability. Thus, we would have:

Tree crop value
+ Land value
+ Carbon value
+ Other sources of value

Forest value

4. CARBON VALUE (POST-1989 LAND)

4.1 ESTIMATING THE VALUE OF THE CARBON TRADING OPPORTUNITY

The NZIF Forest Valuation Standards currently require that:

"The market value of a crop of trees shall be derived from transaction evidence where this is available and suitable for the purpose in terms of reliability, comparability and volume of transactions. Where transaction evidence is not available, market value shall be established using the Expectation Value approach….. Where the Expectation Value approach is used, the discount rate will be determined with reference to transaction information."

A review of the Forest Valuation Standards is imminent, and some modification of the existing wording may follow. Anticipated areas of attention include:

- The need to harmonise more closely with other pronouncements on value derivation techniques. There is, for instance, a current joint initiative from IASB/FASB regarding Fair Value derivation and reporting. Any such activity from those involved in financial reporting has unsurprisingly triggered attention and input from those whose primary target is valuation. IVSC, for instance, has released an exposure draft inviting comment.

- Distinctions in the derivation of the discount rate. Here, there is an emerging school of thought that proposes that *implied discount rates* are effectively a manifestation of the Comparable Sales approach. In contrast, discount rates derived using a Weighted Average Cost of Capital/Capital Asset Pricing Model (WACC/CAPM) approach are employed within the Expectation Value approach.

An outcome of the deliberations is that there may be less inclination to propose that the Expectation Value approach is the most credible alternative. On the other hand, there is general acceptance that whichever of the Comparable Sales, Expectation or Cost approaches may be considered, in the forestry environment they may need to be applied within a Discounted Cash Flow (DCF) framework.

DCF techniques are considered an essential component of the professional forester's toolkit. They are indispensible in valuing carbon's contribution to the forest value.

***Proposal**:*

- The same general approaches that are applied in the valuation of the timber crop should also be applied to the valuation of carbon. The target is the value of the future carbon trading opportunity, defined as what it would sell for in a market transaction. Transaction evidence and the expectation value approach should be used to estimate this value.

4.2 ESTIMATING THE NPV OF CASHFLOWS ASSOCIATED WITH CARBON

The general approach should be to

- Estimate the development of total carbon stocks over time for the specified silvicultural regime and site.
- Calculate the annual change in carbon stocks.
- Multiply these by the anticipated carbon price over time to get annual carbon revenues.
- Subtract off any costs associated with carbon trading (including registration, measurement, audit, filing emissions returns, commissions).
- Discount net cashflows using an appropriate discount rate.

4.3 ASSUMPTIONS TO BE MADE ABOUT CARBON STOCKS FOLLOWING HARVEST

Fig. 1 gives the total carbon stocks for a single rotation forest example that uses look-up tables for the Bay of Plenty and a rotation of 30 years. Carbon stocks increase to 755 t CO_2/ha at age 30 years. Total carbon stocks fall to 330 t CO_2/ha following harvest (under Kyoto rules instant oxidation is assumed for the 425 t CO_2/ha in the logs removed from the site). The residues of 330 t CO_2/ha are assumed to decay linearly over 10 years.

Fig. 1: Total carbon stocks (from look-up table) for a 30 year rotation of a radiata pine stand in the Bay of Plenty.

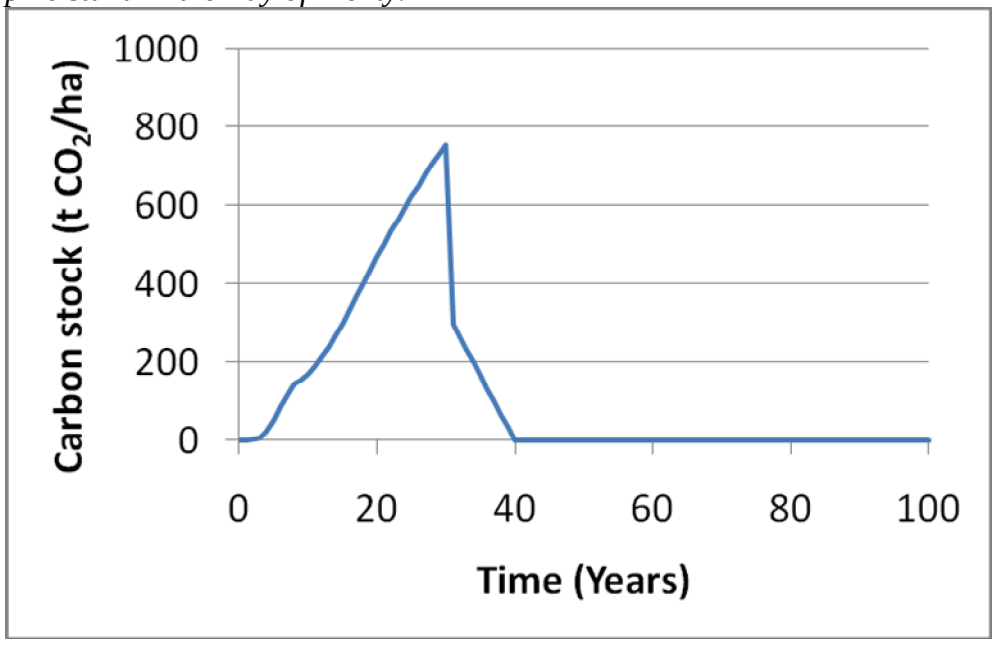
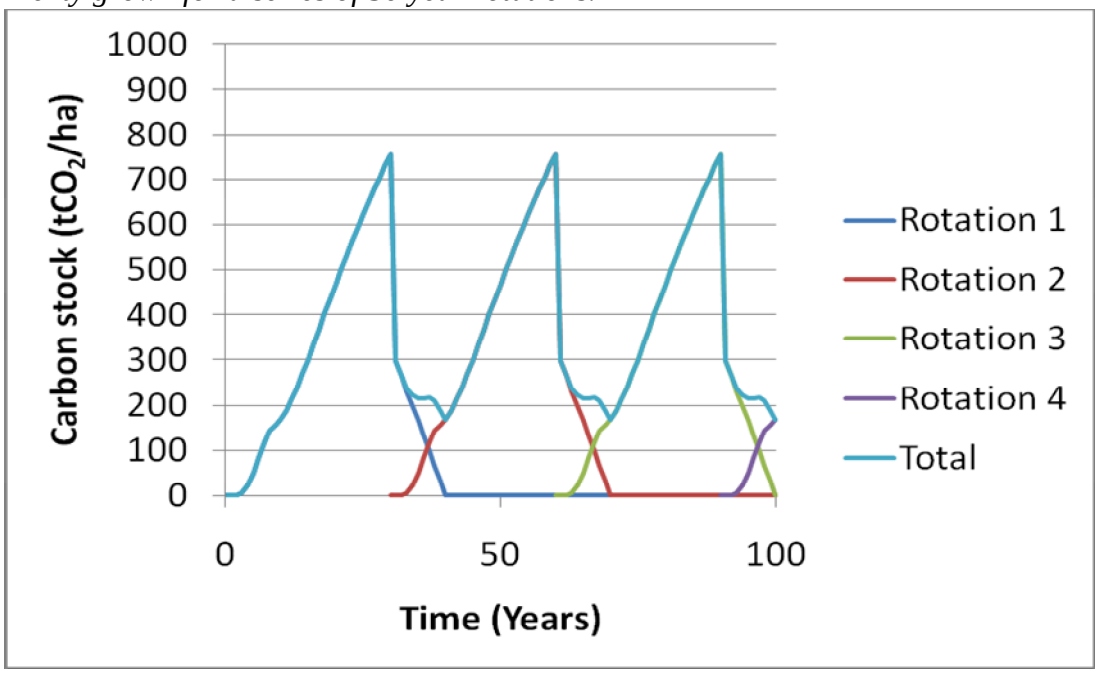


Fig. 2 shows total carbon stocks for a sequence of rotations. Rotation 1 is identical to that presented in Fig.1. However after the harvest of rotation 1 at age 30, the decay of residues occurs concurrently with the increase in carbon stocks associated with rotation 2. The total carbon stocks (rotations 1 and 2 combined) after harvest reaches a minimum of 169 t CO_2/ha.

Fig. 2: Total carbon stocks (from look-up table) for a radiata pine stand in the Bay of Plenty grown for a series of 30 year rotations.



The issue here is whether total carbon stocks should be assumed to decrease to zero in the years following harvest or whether they should only decrease to the combined value of the current and previous rotations.

Proposals:

- When valuing carbon for a first rotation crop, only the carbon associated with the current crop should be considered. Although replanting may be planned, the carbon associated with the next rotation should not be included in valuation of carbon for the current crop.

- For subsequent rotations the carbon value for the current crop should be calculated in the same way. In addition, the carbon value associated with the decay of residues from the previous crop needs to be calculated and reported separately.

The example in Figs 1 and 2 apply to new planting after 1 January 2008. The same general principle applies to existing stands although there are some differences in detail. For example consider a stand that is 15 years old as at 1 January 2008. The carbon stock at age 15 is 300 t CO_2/ha. Units for 455 t CO_2/ha can be claimed as carbon stocks increase to 755 t CO_2/ha at age 30 years. After harvest the reduction in carbon stocks from 755 t CO_2/ha year 30 to 297 t CO_2/ha year 30 31) is 458 t CO_2/ha. However only the 455 t CO_2/ha claimed have to be surrendered.

In the second rotation, units cannot be claimed until total carbon stocks (rotation 1 and 2 combined) increase from the low point of 169 t CO_2/ha that occurs 10 years into the second rotation. In this case the first rotation affects the units that can be claimed for the second rotation.

4.4 ASSUMPTIONS ABOUT REESTABLISHMENT

Even though only the carbon associated with the current crop should be considered, the profile will depend on whether reestablishment is assumed. Under the ETS, deforestation is deemed to have occurred if "four years after clearing, a given hectare has not been replanted with at least 500 stems of forest species or has not naturally established a covering of at least 500 stems of forest species". Consequently if reestablishment does not occur the assumed carbon decay profile would drop to zero, four years after harvest rather than after 10 years if there is reestablishment.

Proposal:

- It should be assumed, unless there is evidence to suggest otherwise, that there will be reestablishment within four years of harvesting. Consequently it should be assumed that carbon stocks will decay over 10 years after harvest.

4.5 ENVISAGED STATE AT TIME OF TRANSACTION

There are a number of options:

1. The purchaser buys the future carbon trading opportunity (including the liability for all the units that the seller has received.)

2. The seller surrenders all units received to the NZ EUR (Emissions Unit Registry); i.e. there is a zero opening unit balance. The purchaser buys the future carbon trading opportunity (**excluding** the liability for the units that the seller received.)

3. The seller surrenders all units received to the purchaser. The purchaser receives the units and also buys the future carbon trading opportunity (**including** the liability for the units that the seller has given to them.)

Option 3 may ultimately lead to the same result as Option 1, but this is as a result of creating a money-go-round. The seller achieves a liability-free state for the purchaser by buying units, or handing over unsold accumulated units. The purchaser could promptly sell these into the same market in which they were purchased. Apart from any loss to commissions, the situation is essentially neutral.

Option 2 will lead to a leakage of value for transactions from 2013 on when the seller has claimed units in a previous commitment period. The purchaser is only able to reclaim units back to the start of the current 5-year commitment period and will be unable to reclaim units for previous commitment periods. If the seller is to clear the slate with NZ EUR at any intermediate stage in the rotation, they must immediately surrender the units that have been received to date. In contrast, if the purchaser assumes the responsibility, those same units will not need to be surrendered until the time of harvest. Putting aside any complications that might arise from real price changes, DCF principles remind us that the effective cost of surrender now will exceed the cost of surrendering the relevant units some years hence.

In economic terms, therefore, the notion of squaring up with the NZEUR at the time of sale (as per Option 2) should appear unlikely. It is economically disadvantageous to the vendor, without equivalent advantage to the purchaser.

In addressing the situation, the valuer should attempt to picture the negotiations between the seller and purchaser, and their respective negotiating strengths. A hypothetical discussion might take the form shown in Exhibit 1.

Exhibit 1: Example Negotiation

Seller: "In deriving my asking value, I expect you to take on the liabilities for eventual surrender of the units that I have previously claimed and sold."

Purchaser: "Liabilities? I am not at all comfortable in taking on unnecessary liabilities. Why don't you clear them first, and then I get a clean deal?"

Seller: "Well yes - I could, but if I have to clear them now, it will be for the full current value of the units. If you take them on, you would not have to clear them until the time at which you clearfell the forest. The present value of that expenditure is considerably less."

Purchaser: "But there is an expenditure nonetheless….."

Seller: "Yes, and I am acknowledging that in the value I expect for the forest. But the important thing is that I am recognising the outgoing as the present value of a future surrender, based on when you are actually likely to face it. This is, of course, when I would also face it, if I didn't sell the forest. I could clear the liability now, but if I did that, I would ask more for the forest. That would ensure that my net proceeds remain the same."

Purchaser: "But surely you have to face the reality that you want to sell the forest *now*, and so *you* do not have the option of deferring the surrender to the time of harvest. I don't see why your liability should become my concern"

Seller: "True, but I also have the choice of whether I sell at all, and you are not the only potential purchaser. Other parties have already indicated a willingness to negotiate on this matter."

Purchaser: "OK - I can only take your word for that. However I'll need talk to my professional advisors about taking on what seems to me to be your liability. Further, what discount rate are you assuming when you derive the present value of this liability? What are you expecting will happen to carbon prices? What if the forest suffers some loss in volume before it is ready to clearfell?"

As the exhibit suggests, a combination of factors may drive the way in which the way in which the inherited liabilities figure in the purchase price, if they figure at all:

- Assumptions relating to the discount rate
- Assumptions relating to treatment of risk factors
- Assumptions regarding future carbon prices
- The competitiveness of the market (as reflected in the number of competing purchasers)
- The recommendations received from professional advisors.

Of these, anecdotal evidence at the time of writing suggests that the last may not be insignificant for some smaller private forests - some buyers' solicitors have apparently been adamant that the seller should clear their liability before settlement.

A further issue, not addressed in the Exhibit, is just what the scale of the seller's liability amounts to. At the time of writing, the units claimed can only extend back to 2008, and the obligation is accordingly limited. In one to two decades from now, the situation may be very different, with the seller trying to pass on a very much larger liability.

The circumstances leading to sale will not uncommonly include some measure of financial compunction (with the attendant question as to whether the transaction really involves a willing buyer and willing seller). We cannot therefore realistically expect that sellers will be in a ready position to first clear a substantial obligation before they put their property on the market.

Proposal:

- The envisaged state is option 1. It should be assumed that the purchaser buys the future carbon trading opportunity (including the liability for the all units that the seller has received).

- There is nonetheless a prospect that circumstances may lead to Option 2. The valuer must be alert to this alternative and be prepared to explain where it prevails.

4.6 CARBON UNITS THAT HAVE ALREADY BEEN RECEIVED AND RETAINED TO BE EXCLUDED

The target of valuation is the future carbon trading opportunity. If a participant has filed an emissions return and received units, these units have value. However they are not part of the "bundle" being valued here. They are a separate asset that belongs to the Participant.

Proposal:

- Carbon units that have been received following filing an emissions return should not be included in the value of the carbon trading opportunity.

4.7 CARBON UNITS FOR PREVIOUS YEARS THAT HAVE NOT YET BEEN CLAIMED TO BE REPORTED SEPARATELY

Situations will arise where a participant has not claimed all units that they are eligible for. For example, they might not claim annually but instead claim at the end of each 5 years at the mandatory reporting date. Essentially there are two categories:

- Carbon available but not yet claimed
- Future carbon trading opportunity.

It is important to clearly report assumptions – and separate out the component of value related to units not yet claimed for which the participant is eligible to receive.

(Accountants would already have recognised units that the participant is entitled to but which are unclaimed.)

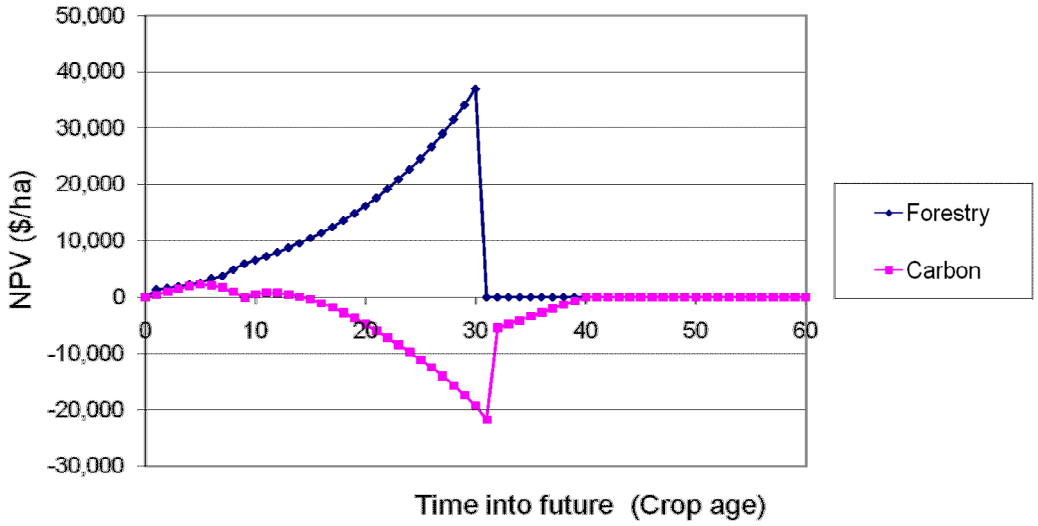
***Proposal**:*

- Carbon units that have not been claimed, but which the participant is eligible to receive, should not be included in the value of the carbon trading opportunity but should be reported separately. The asset being valued is the carbon trading opportunity from the settlement date (real or notional) forward. (There is a compulsory emissions return at that date.)

4.8 DEALING WITH NEGATIVE CARBON VALUES

Fig. 3 shows how crop value and carbon value vary over time as a stand (planted in 2011) grows in age. Crop value increases with age. However, in this example, carbon value becomes negative from age 19 years on. Moreover, a negative carbon value persists after harvest occurs while residues decay (although if replanting occurred the liability would soon be offset by the carbon value of the next rotation).

Fig. 3: Tree crop and carbon value over time for a radiata pine clearwood regime grown on an average New Zealand ex-farm site for a 30 year rotation. It is assumed that the crop is planted in 2011 (= time 0). (From Manley, 2011[3])



Proposal:

- Carbon value can be positive or negative depending on the time in the rotation because of the profile of future cashflows; i.e. initial revenues followed by costs after harvest. This reinforces the proposal above for carbon to be treated as a separate entity.

[3] Impact of the New Zealand Emissions Trading Scheme on forest valuation. Forest Policy and Economics. (2011), doi:10.1016/j.forpol.2011.07.012

4.9 IS THERE A CONFLICT WITH THE REQUIREMENTS OF NZ IAS 41?

Paragraph 22 of NZ IAS 41 requires that:
"An entity does not include any cash flows for …. re-establishing biological assets after harvest (for example, the cost of replanting trees in a plantation forest after harvest"

The expression of IAS41 raises the question of whether in valuing the carbon, inclusion of cashflows after harvest of the current crop conflicts with the Standard.

A first response is that it is by no means axiomatic that NZ IAS 41 is the relevant and appropriate standard for carbon. If there is a reason it may be considered, it is because no carbon-specific standard is about to be developed.

Should NZ IAS 41 be applied, there need not be a conflict. The standard does not require that all cashflows following harvest are excluded. It instead specifies that cashflows associated with subsequent crops are not attributed to the current crop.

4.10 FREQUENCY OF CARBON RETURNS TO ASSUME IN ESTIMATING CARBON VALUE

Participants are required to file an emissions return for the period 2008 to 2012 between 1 January and 31 March 2013. Participants are also able to file an annual emissions return. The question is whether carbon value should be calculated assuming annual returns, 5-yearly returns or a way that maximises value. The last option would involve annual returns while carbon stocks increase but delaying the return until the end of the 5 year period in which harvesting occurs.

It is unclear what the mandatory reporting requirements will be subsequent to the first Kyoto Protocol Commitment period (2008-2012). The requirement could be for mandatory reporting every 5 years – but with the reporting years specified (2013, 2018, 2023,….).

Proposal:

- Annual carbon returns should be assumed. Future mandatory reporting requirements are unclear. Consequently it would be unwise to assume fixed reporting years which could produce arbitrary results (for example, the optimum rotation age might be increased so that harvesting occurs at the start of a 5-year period in order for the surrender of units to be deferred.)

Note that in the cashflow model it will be necessary to base cashflows around the timing of receipt of units within the year.

4.11 CARBON TRADING STRATEGY TO APPLY

Participants will receive NZUs for the increase in carbon stocks. They then have the opportunity to sell all these units, some of these units or none of these units. Different trading strategies have different risk/return profiles. For example, Fig. 4 (from Manley & Maclaren (2010)) shows the trade-off between the percentage of units traded for the example clearwood regime and the LEV. Trading fewer units results in a lower LEV but requires fewer units to be surrendered on harvest (the low point of 25% corresponds to the "safe" level of carbon that would not have to be surrendered following harvesting provided that replanting occurs).

Fig. 4: Trade-off between percentage of carbon units received that are traded and LEV. Radiata pine clearwood regime with a 30 year rotation. (From Manley & Maclaren, 2010[4])

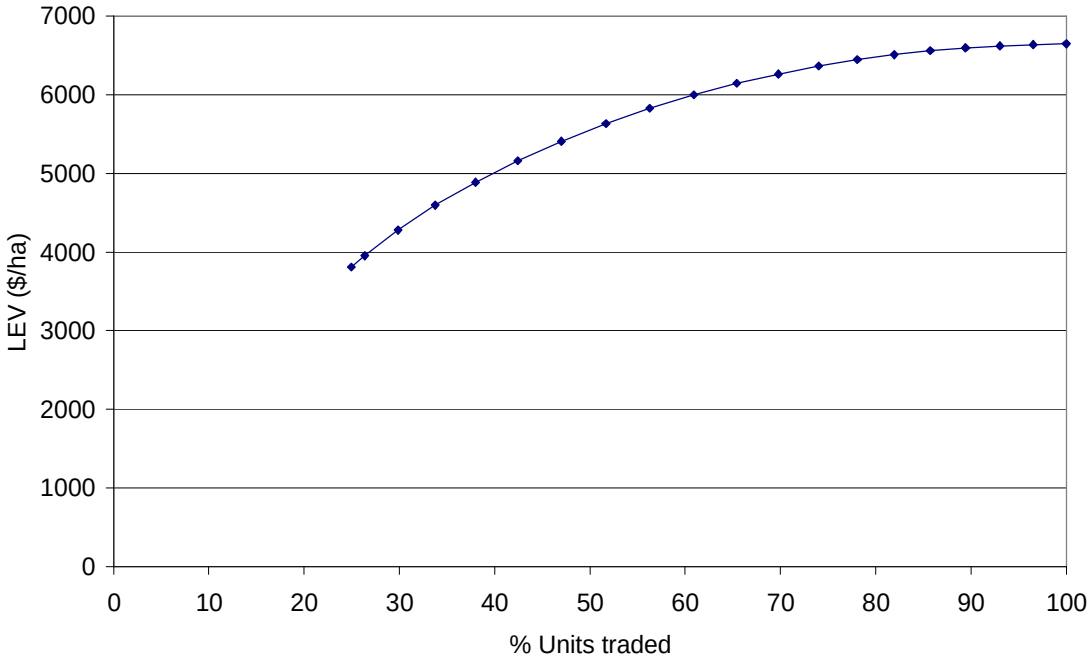


Fig 4 is based on a constant carbon price of \$30/t CO_2 and a real discount rate of 8%. Additional analysis using a range of discount rates and carbon price change assumptions indicates that, although the level of the curve changes, there is a generally consistent form to the LEV curves with some evidence of a "shoulder" to the curves. All continue to rise across the full span of the rotation. The corresponding implication is that in each case the optimal strategy would be to sell all units.

Despite this, current anecdotal evidence suggests that some investors may be inclined to a more cautious approach - they are requesting of their valuers that they examine scenarios that assume the sale of just a "safe" level of carbon units. Among the

[4] Impact of carbon trading on forest management in New Zealand. Forest Policy and Economics. (2010), doi:10.1016/j.forpol.2010.01.001

apparent justifications are a concern with physical risks to the forest and an unease with the markets capacity to absorb all units without depressing price.

It is evident from Fig. 4 that adjusting the assumed percentage of units traded may have a marked effect on the value attributed to the carbon. This points to a need, in the first instance, to explain as thoroughly as possible the market's perspectives on the matter. Any such discussion must address possible differences in the perspectives of those owners with a spread of forest maturity and those whose tree crops have a confined age class distribution. The consequences of different trading levels can and should be tested within sensitivity analyses.

The responsiveness of the carbon value to the assumed trading level does suggest that this parameter may offer an important role in "tuning" calculated values to make them consistent with such market evidence as becomes available. Trading level may indeed be a more workable adjustor than discount rate.

Proposal:

- Valuers should declare the level NZU trading that they have applied.

4.12 FORECASTING CARBON STOCKS

The legislation identifies that for less than 100 hectares the lookup tables have to be used. Above 100 hectares measurement must be used at mandatory returns but look up tables can be used for voluntary emissions returns.

Proposal:

- The method of forecasting future carbon stocks should be disclosed – in particular whether the look-up table or measurement approach has been used. If the latter is used, the models used to forecast carbon stocks need to be documented.

4.13 POSSIBILITY OF FUTURE CHANGES TO THE ETS

The ETS legislation is as yet untested and may change due to international agreement or further refinement. As with any legislation, changes can be expected but it is not the domain of the valuer to anticipate such change as the brief it to assess current value. Nevertheless, the valuer's responsibility in producing fair value is to try to see the situation through the eyes of market participants. If market participants were inclined to factor in some allowance for regulatory uncertainty then the valuer must do the same.

Proposal*:*

- The valuer should adopt the market's perspectives and provide clear explanation if this involves some change from the current legislation.

4.14 CARBON PRICES

The NZIF Forest Valuation Standards include a Standard for Disclosure of Prices. The stated purpose of the standard is "to provide for the full disclosure of product prices, their source and applicability …". Although the focus of this standard is on log prices, much of it is also applicable to carbon prices.

Proposal:

- The same general approach adopted in the NZIF Forest Valuation Standards for log prices should be applied to carbon prices. The focus should be on disclosure and justification.

Disclosure of prices should include:

- Clear identification of the nature of the units - NZUs?, AAUs? – and any conversion assumptions.
- Price for units.
- Currency in which the price is denominated.
- Exchange rate to convert to NZ$ (if applicable).
- Allowance for trading costs (commission)
- Whether future prices are real or nominal. Preferably they should be in real terms (rather than nominal), in order to be consistent with crop-related cashflows

Disclosure of the sources of prices should include

- Sources of data.
- Relevance of data.
- Reliability of data.
    - Including observations on the independence of the source of price projections
- Quantity of credits transacted – within actual evidence and within the projected carbon sales.
- Price volatility
- How the carbon price used for valuation purposes was derived
    - The time span over which the data was collected.
    - Any analysis undertaken
    - Duration of trends
    - There should be a distinction between actual empirical evidence and price projections

Disclosure of the impact of prices

- Show impacts in risk/sensitivity analysis

4.15 DISCOUNT RATES

There is every likelihood that the discount rate used for valuing carbon cashflows will be different from that used for the timber component. Capital Asset Pricing Model theory, for instance, tells us that the cost of capital should be specific to the investment project, and not to the investment entity.

At present there is considerable uncertainty surrounding the carbon trading business. The measurement and modelling of carbon quantity has been advancing and shares a common technical footing with the estimation of timber content. In comparison, there is considerable uncertainty associated with:

- Future prices for carbon
- The administrative environment.

There could be an inclination to reflect such uncertainty in a higher discount rate, but this, as always may be unduly simplistic. Ideally, cashflows should be adjusted to allow for risk (See section 4.16).
The valuer should remain mindful that beyond some stand age, increasing the discount rate will increase the carbon value.

Proposal:

- The discount rate may be different for carbon cashflows and timber growing cashflows. Rates should be derived using all available evidence, including implied discount rates from available transactions, declared discount rates, and WACC/CAPM methodology.

4.16 ALLOWING FOR RISK

It is a general observation that the discount rate is not the best place to accommodate any and all forms of risk. Not least among the considerations is that selecting a discount rate adjustment with which to proxy risk may involve testing the effect of cashflow adjustments on the NPV. If it is feasible to represent risk in the cashflows, then that is the place that is the place that the process can start and finish.

Factors that invite cashflow-based sensitivity analysis include:

Movement in carbon price
Climatic and pathogenic depression of growth rate (assuming the measurement approach)
Catastrophic loss
Change in legislation

Not included in this list are such matters as the timing of harvest, and other interactions with the timber-growing business. These may have a profound effect on the timing of the carbon cashflow stream, but are expected to be part of the routine modelling of the collective timber/carbon enterprise.

The increasingly prevalent approach to modelling risks recognizes that the likelihood that all will be simultaneously favourable or unfavourable is remote. There is instead

the prospect of some counterbalancing. Testing such effects warrants the application of techniques such as Monte Carlo analysis.

4.17 LAND RENTAL

In deriving the carbon value using the expectation value approach, the opportunity cost of using the land needs to be included in the cashflows. The opportunity cost should be calculated as the market-based land rental.

The forest valuer needs to distinguish

- the rental relating to the tree crop.
- the rental relating to the carbon trading opportunity.

4.18 REALITY CHECKS

The target of valuation is market value. It is necessary to ensure that whatever value is attributed to the collective forest resource can pass a reality check; would there be a willing buyer and willing seller at the attributed value?

The reference to "collective forest resource" is applied advisedly. An alternative approach would be to suggest that each of the component parts to the value should be individually capable of passing a reality check. Then, by extension, the sum of these parts should also be credible. In practice, however, the rationale and procedures for partitioning value are not universally agreed or understood. It may only be feasible to consider the whole.

4.19 COMPONENTS OF VALUE REVISITED

The different components of value are

Tree crop value
+ Land value
+ Carbon value
+ Other sources of value
———————
Forest value

It is necessary to declare not just this apportionment, but the means by which the components have been derived. This leads to the need to distinguish further subcomponents, as shown in Table 1.

Table 1: Components of forest value

	Value Component	Asset class	Discount rate	Real price change	Contribution
1	Tree crop - costs and revenues -1R	Crop			
2	Tree crop - 2R+	Land			
3a	Land rental – tree crop- 1R	Land			
3b	Land rental – carbon - 1R	Land			
4a	Land rental - tree crop- 2R+	Land			
4b	Land rental - carbon- 2R+	Land			
5	Land appreciation component	Land			
6	Carbon revenue - 1R	Carbon			
7	Carbon liabilities - 1R	Carbon			
8	Carbon revenue - 2R+	Land			
9	Carbon liabilities - 2R+	Land			

As indicated, the table should identify what discount rate has been applied to each of the contributing cashflows. It should also identify any real price growth assumptions.

Influencing factors in defining the components are:

- The distinction between cashflow components associated with the current rotation (1R) and succeeding rotations (2R+). The distinction is highlighted by the financial reporting standard, IAS41 (Agriculture). The Standard requires that where a DCF-based approach is applied, the value of the biological asset can only be derived from the cashflows associated with the current rotation.

- The IAS41 stipulation has a logical underpinning. It recognises that if the next rotation of tree crop has a positive value, this cannot be attributed to a biological asset because any such asset is, as yet, hypothetical[5]. Further, economic theory proposes that if there is a positive value associated with the next rotation before it has even started, this is unlikely to belong with the tree crop. It is instead expected that market forces will lead to any such surplus being captured within the land. This justifies the separation of "tree crop" values associated with 1R and 2R+.

- Valuer's experience also tells us that the value derived for 2R+ is characteristically hypersensitive to key variables such as log prices and the discount rate. A justification for itemising the 2R+ value is to ensure that it is available for scrutiny, and individual sensitivity analysis.

- Land rental does deserve to be split between the timber growing and carbon trading activities. This is for a combination of reasons:
    - There is an existing body of evidence for timber growing land rentals. Evidence of the rentals that may yet prevail for carbon growing is yet to be established.

[5] If it is not yet living, then it cannot meet the definition of being a "biological asset".

- There are inherent reasons why there may be no consistent relationship between rentals for carbon growing and timber growing. The profitability of land for carbon production is essentially indifferent to issues of harvesting cost and transport to market. In contract, these are profoundly influential factors in the attractiveness of land for timber growing.
- Much as timber growing and carbon growing share the same trees, the market prices that each venture enjoys may be unrelated and have different risk characteristics. The investment profiles, in terms of timing of cash inflows and outflows are also quite different. This raises the prospect that the investor pools for the respective activities may also be different. There is already evidence that some forest ventures will involve separate participation by tree-growing and carbon-growing investors. It is credible to expect that they be charged a distinct rent, and face different trends in real rent charges.

- Like the tree crops, the rents do also deserve to be split between those attributable to the current rotation and 2R+. This provides the means of accommodating real increases in land value as a result of improved profitability of the timber and carbon activities.

- The land appreciation component is addressed within a discussion document released by the NZIF in 2007[6]. It recognises that land may have a value attributable to expectations of its ongoing real appreciation. A tenant of the land engaged in timber and/or carbon cropping should not have to pay rent for this component. The appreciation component can be derived by subtracting the capitalised rental streams from the land's market value.

- Carbon revenues and liabilities are distinguished given that there is already some apparent equivocation among accountants on how these will be reported.

- Note that item 7, the carbon liabilities associated with the current rotation, may need to acknowledge inherited carbon liabilities. These refer to the situation where the vendor has not cleared the carbon liability associated with an existing crop before selling it.

[6]NZIF Forest Valuation Working Party Discussion Paper. How to recognise the opportunity cost of land in the valuation of a tree crop. Proposal for a change to the NZIF Forest Valuation Standards. June 2007

5. CROP VALUE

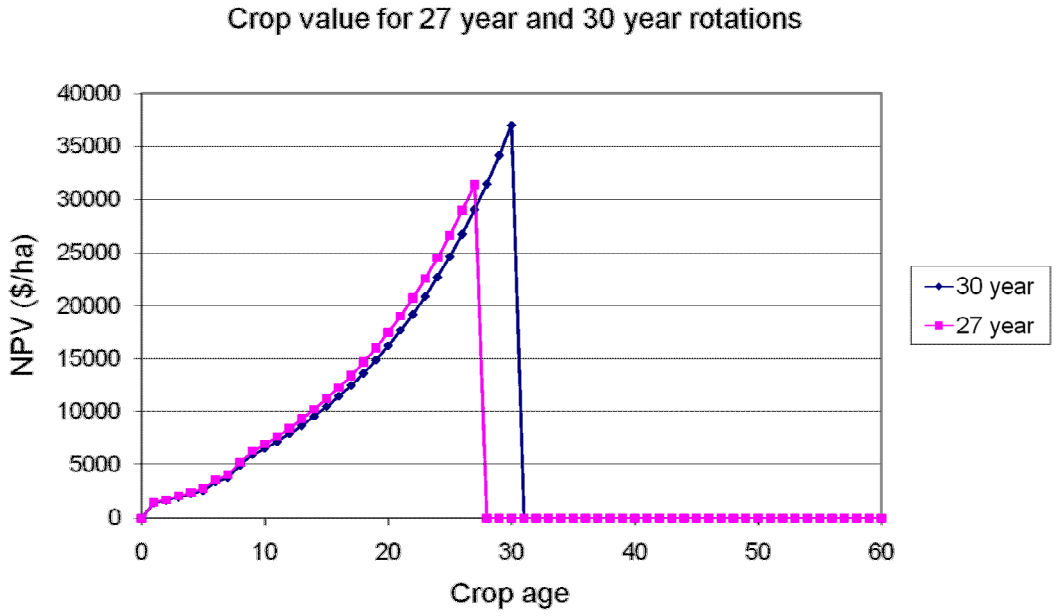
Carbon trading may impact on crop value in two ways:

- Land rental
- Interaction of carbon on optimum rotation age and silviculture

The first point is covered elsewhere. The second point arises because as carbon price increases rotation ages tend to increase and, under the measurement approach, the preferred silviculture involves less thinning and higher final crop stockings. In some cases the optimum strategy might be to not harvest.

Suppose that, for the example clearwood regime, the optimum rotation age is 27 years when only log revenues are considered but increases to 30 years when carbon trading is also considered. Fig. 5 shows that crop value is higher at all ages for the 27 year rotation. The question is whether the crop (and carbon) should be valued using a 27 year rotation or a 30 year rotation. (In reality a range of factors will come into consideration when the optimum rotation age is determined. For example, estate-level yield regulation will be an important factor for owners with multiple stands).

Fig. 5: Crop value for example clearwood regime with rotation ages of 27 years and 30 years.



Proposal:

- Crop value (and carbon value) should be determined using the Forest Valuation Standards requirement that "there needs to be an underlying management and harvesting strategy which is realistic for the forest being valued. This strategy should reflect what an 'economically rational' owner would do taking into account wood supply commitments and logistical, marketing, social, political and environmental factors."