Ministry for Primary Industries
Manatū Ahu Matua

Potential impacts of NZ ETS accounting rule changes for forestry – averaging and harvested wood products

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Contents

Page

Executive summary

MPI and MfE have requested a quantitative and qualitative analysis exploring the likely behaviour from different types of forest growers and potential forest growers in the event that New Zealand Emissions Trading Scheme (NZ ETS) settings are changed. These settings could change how forest carbon is accounted for in the NZ ETS for post-1989 participants. Qualitative analysis was completed via a telephone survey and quantitative analysis was completed using an afforestation projection model. The main findings from this research and analysis are:

Responses from survey

A telephone survey was carried out in which 26 respondents were asked about the impact of different forestry accounting approaches in the NZ ETS; namely the inclusion of averaging or Harvested Wood Products (HWP) for post-1989 forestry participants. Participants were asked what impact these accounting options could have on their participation in the NZ ETS, carbon trading strategy, harvest intentions, and afforestation and replanting decisions.

Many respondents noted the complexity (and associated cost) of the current NZ ETS and the need for simplification. Respondents had a range of understanding about the current NZ ETS and knowledge of averaging and HWP. In addition, some questions were not relevant for some respondents. Consequently not all questions were answered by all respondents.

To date, the majority of NZ ETS participants have adopted a conservative carbon trading strategy. Although some have a more aggressive strategy and are selling more units, most participants are only selling units that they do not envisage having to repurchase and surrender. Respondents were generally aware that both averaging and HWP could create the opportunity for a higher level of 'safe' carbon (ie, that either approach will increase the minimum level of carbon that occurs after harvesting when replanting is assumed). Consequently, most respondents expect the inclusion of averaging or HWP could have a substantial impact on afforestation. However a limiting factor is the availability and cost of land.

Most survey respondents also expect that averaging or HWP will:

- Have limited impact on harvest intentions.
- Reinforce the likelihood of replanting following harvesting (rather than deforestation), although this is already intended in most cases.
- Make it more attractive for non-participants with young 1st rotation forest to join the NZ ETS.

There were a diverse range of views on whether averaging or HWP will have an impact on non-participants joining the NZ ETS with 2nd rotation forest. This diversity reflects different interpretations of liabilities relating to 1st rotation residues.

Given the limited number of responses and the fact that responses were to the concepts of averaging and HWP (rather than specific legislation), results should be treated as indicative only.

Afforestation model

Historically there has been a strong correlation between the rate of afforestation and LEV (Land Expectation Value[1]). A key determinant of LEV is log price. Afforestation since 2009 has been strongly correlated with carbon price. Consequently historical data has been used to develop a model to predict the level of afforestation from log price and carbon price as well as land cost. The model explains 99% of the variation in the annual afforestation rate over the period 1996 to 2015. It was used to estimate the impact of including averaging and HWP in the NZ ETS.

Estimates indicate that either averaging or HWP could double the afforestation rate compared to model estimates for current NZ ETS settings. Although the impacts of averaging and HWP are not additive, inclusion of HWP in the calculation of an average would provide an additional impact and therefore could drive afforestation higher. The driving factor in the afforestation response is the increase in 'safe' carbon available for sale if averaging and/or HWP are included in the NZ ETS

[1] LEV represents the maximum that can be paid for land to achieve a given rate of return from forestry. Here 8% is used as the required rate of return.

Supplementary analysis shows that averaging and/or HWP increase the age in the 1st rotation up to which financial benefit is obtained by joining the NZ ETS if only 'safe' carbon is traded. For the example analysed, either averaging or HWP increase the age up to which 'safe' carbon is earned from 10 years (under current NZ ETS settings) to 17 years. Inclusion of HWP in the calculation of the average increases this age to 21 years.

However there is much less financial benefit from joining the NZ ETS with a 2nd rotation forest when residues (and HWP) from the 1st rotation are included in the estimation of carbon stock change.

Introduction

BACKGROUND

As part of the New Zealand Emissions Trading Scheme (NZ ETS) review, officials from the Ministry for Primary Industries (MPI) and the Ministry for the Environment (MfE) are evaluating alternative accounting settings for post-1989 forests within the NZ ETS. Options being analysed include averaging and the inclusion of harvested wood products (HWP) in post-1989 forestry accounting.

As yet there is no preferred position on whether averaging and/or HWP will be implemented into the NZ ETS let alone the details for either approach were it to be implemented. However the general concepts were described in the Forestry Technical Note released by MfE in March 2016 as part of the 2015/16 review of the NZ ETS. Relevant passages are:

"Averaging accounting for post-1989 forests in the NZ ETS would allow foresters to receive New Zealand Units (NZUs) as their forest grows to the long-term average carbon storage for that forest. A long-term average would take into account future harvest and replanting cycles, and could potentially recognise the carbon that continues to be stored in short- and long-lived harvested wood products. An averaging approach would mean that foresters would not have to surrender units at harvest, provided forest is re-established on the land (ie, is not deforested)." (MfE 2016, p.8)[2]

"Deferred liabilities for emissions from HWPs could be implemented by incorporating emissions from the decay of HWPs and on-site residuals (stumps and roots) into second rotation look-up tables over standard rotation lengths. This would mean that a participant would have fewer emissions to report at harvest, and would have fewer units to claim in the second rotation. If averaging were introduced into the NZ ETS, deferred liability for HWPs could also be incorporated into the long-term average carbon stored in forests." (MfE 2016, p.10)[2]

This report has been commissioned to inform NZ ETS option analysis and the modelling of NZ ETS unit flows, and also assess any likely land use or forest management impacts.

OBJECTIVES

MPI and MfE require quantitative and qualitative analysis exploring the likely behaviour from different types of forest growers and potential forest growers in the event that NZ ETS settings are changed. The overarching issue is whether changes to the NZ ETS will have an impact on:

- Afforestation; ie, new planting.
- Harvesting intentions; ie, extended rotations.
- Existing participants replanting after harvest rather than deforesting.
- Non-participants with 1st rotation post-1989 forest joining the NZ ETS with their current 1st rotation forest.
- Non-participants joining the NZ ETS with their 2nd rotation forest.

Changes to be evaluated are the inclusion of averaging and/or harvested wood products.

1. Averaging scenarios

In this analysis the two ways of estimating the average carbon stock in post-1989 production forests were:

- The long-term average calculated under specified conditions.
- Then for simplicity the average is fixed at 20 years with 16 and 24 years to provide sensitivity.

2. HWP scenarios

[2] The New Zealand Emissions Trading Scheme Review 2015/16. Forestry Technical Note.

Three HWP scenarios were evaluated:

- Current ETS + linear HWP (to zero in 10 years)
- Current ETS + linear HWP (to zero in 20 years)
- Current ETS + exponential HWP (half-life aligned to MfE National Inventory Report (NIR) approach).

The operational implications of these scenarios are not considered, for example different compliance costs of the alternatives. While these are important considerations they are beyond the scope of this report.

STRUCTURE

Two complementary approaches have been taken:

- A telephone survey of 26 respondents was undertaken to gauge the likely response to the inclusion of averaging or HWP into the NZ ETS.
- A model to estimate afforestation was developed. This model was then used to estimate the impact on afforestation of including averaging and HWP into the NZ ETS. Supplementary analysis was carried out to assess the impact of these changes on the relative attractiveness of participation in the NZ ETS to owners of existing 1st rotation forests and future 2nd rotation forests.

Approach

SURVEY

There were 26 respondents to the phone survey representing target groups of current and potential forest growers:

- Forestry consultants & managers 12
- Carbon specialists 3
- Forest owner or entity 5
- Iwi or Maori entity 3
- Farmer or Farming entity 3

The initial selection was of individuals who had made a response on the Forestry Technical Note as part of a submission to the current NZ ETS review. This was done in an attempt to obtain respondents who had an understanding of the concepts of averaging and harvested wood products. Subsequently other individuals were selected to ensure coverage of a range of individuals and entities.

Respondents were asked whether the inclusion of averaging or HWP in the NZ ETS will have an impact on:

- Afforestation.
- Harvesting intentions.
- Existing participants replanting after harvest rather than deforesting.
- Non-participants with 1st rotation post-1989 forest joining the NZ ETS with their current 1st rotation forest.
- Non-participants joining the NZ ETS with their 2nd rotation forest.

Additional information was sought on

- The background of the respondents.
- Whether averaging or HWP, if included in the NZ ETS, should be voluntary or mandatory.
- Whether NZ ETS participants have different target rotation ages than non-participants.
- Current carbon trading strategy.
- Whether the inclusion of averaging or HWP would affect the carbon trading strategy.
- The sensitivity of decisions to carbon price.
- Other relevant issues.

MODEL TO ESTIMATE AFFORESTATION

The general approach taken is similar to the approach of Horgan (2007)[3] who looked at the correlation between new planting rate and IRR (Internal Rate of Return). Here LEV rather than IRR has been used in order to make it simpler to include an additive carbon effect and to provide an indicator of land affordability.

The steps involved are

1. Specify a standard silvicultural regime.
2. Analyse historic MPI log prices.
3. Analyse the correlation between historic (pre-ETS) afforestation rate in New Zealand and LEV (Land Expectation Value).
4. Extend the afforestation model to include the LEV associated with the carbon trading opportunity as well as the LEV associated with selling logs.
5. Include the cost of land.
6. Use the model to estimate afforestation for current and potential ETS settings at different carbon prices.

The modelling extends the preliminary analysis undertaken in January 2016 for my report for MPI on 'Afforestation responses to carbon price changes and market certainties'. As noted in that report: "Given the deadlines for the ETS review process there was limited time to undertake the analysis. Consequently a number of afforestation model refinements could not be fully evaluated." These refinements have been included in this report.

The approach taken in the January 2016 report was similar for steps 1 to 3 but step 4 was based on interpretation rather than the statistical modelling that has been undertaken for this current report.

Silvicultural regime

A pruned regime has been assumed because the majority of the estate has been pruned in the past and it is anticipated that a significant proportion will continue to be pruned, particularly in the small-scale estate[4]. The regime assumed:

- Plant 800 stems/ha
- Prune in 2 lifts to 5.5 m
- Thin to 250 stems/ha at age 8 years
- Clearfell at age 28 years
- Replanting in the same year as harvest

An average New Zealand ex-farm site was assumed:

- Site index 30.2 m
- 300 Index of 29 m^3/ha/year

These are the same regime and site assumptions as used by Maclaren et al (2008)[5]. Log yields were estimated using the Radiata Pine Calculator.

Carbon yields were estimated using the Look-up table for Hawkes Bay/Southern North Island because this region aligns with the site productivity estimates.

Land Expectation Value (LEV)

LEV is the benchmark for forest profitability. It represents the maximum that can be paid for land to achieve a given rate of return from forestry. It is calculated as the NPV (Net Present Value) of future revenues and costs associated with:

[3] G. Horgan. 2007. Financial returns and forestry planting rates.

[4] See Table 3-4 on p.13 of Wood Availability Forecasts – New Zealand 2014-2050 prepared for MPI by Indufor Asia Pacific Limited.

[5] Maclaren, P., Manley, B., and final year School of Forestry students. 2008. Impact of the New Zealand Emissions Trading Scheme on Forest Management. New Zealand Journal of Forestry, 53(3): 33-39.

- Forestry on the land in perpetuity.
- The land currently bare of trees.
- No cost included for land rental.
- Best management practice.

For this analysis a required rate of return of 8% has been adopted. This rate was the mid-range response in the 2015 Discount Rate Survey to the question "What discount rate do you use to evaluate new planting investments[6]".

In the analysis two different components of overall LEV are considered: LEV_{logs} which is the LEV associated with forestry operations and LEV_{carbon} which is the LEV associated with the carbon trading opportunity.

LEV_{logs} is the net present value at an 8% discount rate of future forestry costs and revenues in perpetuity. Revenues come from the sale of logs at the time of harvest while costs come from establishing, tending, maintaining, harvesting and managing the tree crop.

LEV_{carbon} is the net present value at an 8% discount rate of future carbon costs and revenues in perpetuity. Revenues come from annual NZU sales while costs come from joining the NZ ETS, compliance costs and harvesting liabilities. All property and forest management/maintenance costs are included in the LEV_{logs}.

LEV_{carbon} assumes the annual sale of NZUs up to the 'safe' level of carbon (ie, the minimum level of carbon that occurs after harvesting when replanting is assumed) with any further NZUs retained to meet harvesting liabilities[7]. The minimum level of 210 t CO_2/ha is reached in year 38, some 10 years after harvest of the 1st rotation in year 28 (Fig. 1).

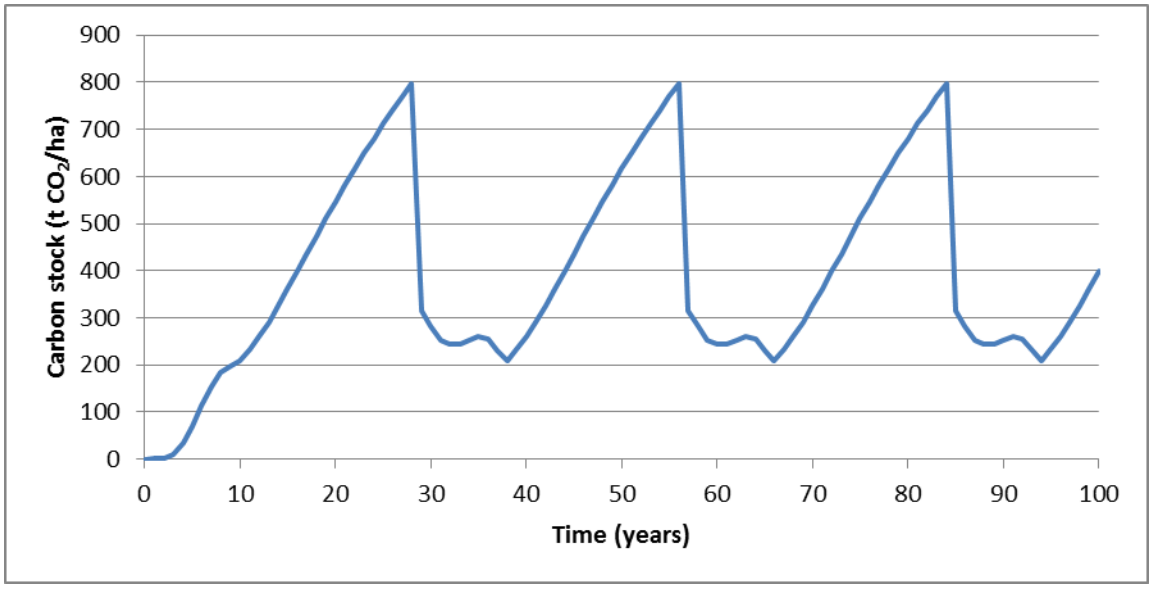

Figure 1: Carbon stock (expressed as t CO_2/ha) for radiata pine pruned regime grown on a 28 year rotation. (Look-up table values for Hawkes Bay/Southern North Island).

In calculating LEV all factors apart from log price and carbon price have been held constant. For model estimation, MPI survey log prices and AgriHQ carbon prices have been used. Weighted average log price in recent years (Fig. 2) have shown much less variation than carbon prices (Fig. 3).

[6] Manley, B. (2016): Discount rates used for forest valuation – results of 2015 survey. New Zealand Journal of Forestry 61(2):28-35

[7] This assumption was confirmed by the survey. Responses confirmed that most NZ ETS participants are adopting a risk-averse approach to carbon trading.

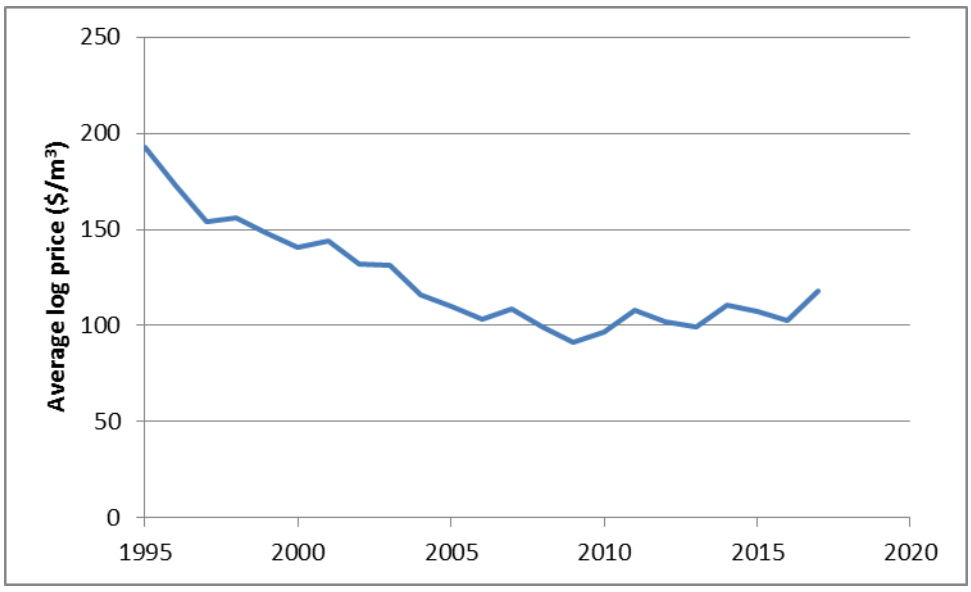

Figure 2: Weighted-average log price for 1995 to 2017 ($March2015/m³ at mill/wharf). Prices are derived by weighting the MPI survey log price for each grade by the estimated volume at age 28. Values shown are averages of the 4 quarters to March in each year (3 quarters to December 2016 for the 2017 value).

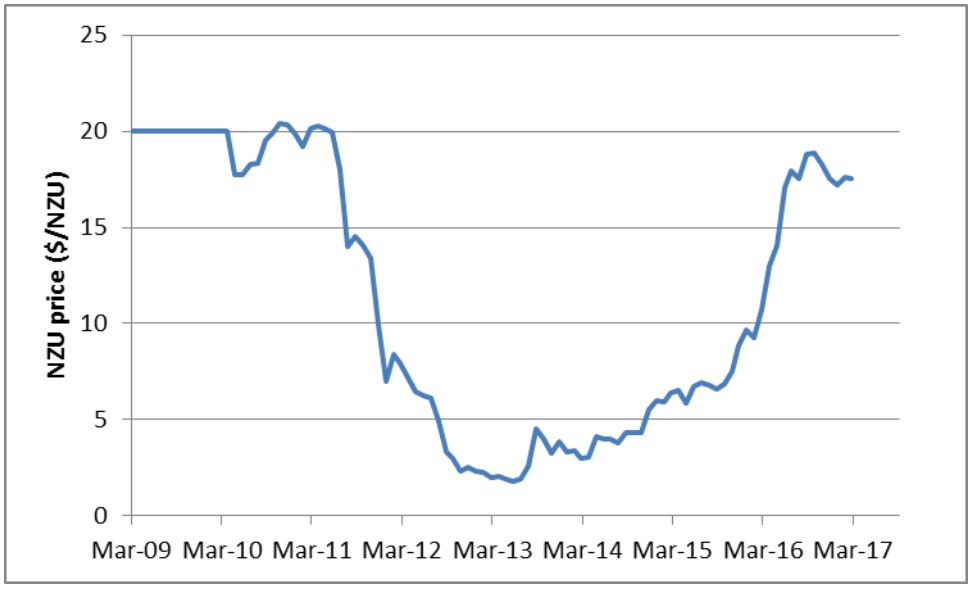

Figure 3: Carbon price since the start of the market for New Zealand Units. Prices shown are nominal prices. (Source: AgriHQ)

Land values

Land values were provided by Beef + Lamb New Zealand Ltd. As advised by Rob Gibson (pers. comm.; 17 March 2017):

- These are based on the value of land plus improvements but exclude the main homestead because this can inflate the value of a property significantly.
- Final data is collected from Quotable Value who estimate values for individual Survey farms every three years, but provide in-between year estimates.
- The latest final year is 2014-15. The same value is carried forward for 2015-16 and 2016-17.
- Updated data on capital values for the 2015-16 year won't be available until the Sheep and Beef Farm Survey is finalised in July/August this year.

Limitations

SURVEY

Although there were 26 respondents to the survey, there were only 7 to 23 responses to individual questions. In addition, responses were to the concepts of averaging and HWP (rather than specific legislation). Consequently, results should be treated as indicative only.

DATA LIMITATION

Data from 1996 to 2015 are used to develop the afforestation model. The start year was dictated by when the MPI survey of log prices commenced.

Modelling the impact of carbon price on forest profitability and afforestation rate is limited to data since the market for NZUs started to function in 2009. Given the limited empirical information to date on the impact of carbon price on afforestation, the model should be regarded as provisional and indicative only. In particular, estimating the impact of carbon prices above $20/NZU involves extrapolation beyond the range of available data.

TO WHAT EXTENT CAN THE PAST BE USED TO PREDICT THE FUTURE

Another limitation is that the historic correlation between afforestation rate and forest profitability (LEV) is assumed to continue into the future. Further it is assumed that, under the NZ ETS, profitability (LEV) can be calculated by combining the weighted contributions of growing logs and trading carbon.

DETAILS OF AVERAGING AND HWP YET TO BE DEVELOPED

As yet there is no preferred position on whether averaging and/or HWP will be implemented into the NZ ETS let alone the details for either approach were it to be implemented. In order to apply the afforestation model to averaging and HWP, specific assumptions have been made. Any variation from these assumptions will result in different estimates of afforestation.

Results - Survey

There were 26 respondents to the phone survey:

- Forestry consultants & managers 12
- Carbon specialists 3
- Forest owner or entity 5
- Iwi or Maori entity 3
- Farmer or Farming entity 3

There were not enough respondents to split responses by category. However no differences were discerned and there was a clear majority view for most questions. Some respondents just answered "yes" or "no" to a question while others provided more detailed responses. The latter are documented in the Appendix.

Respondents had a range of understanding about the current NZ ETS and knowledge of averaging and HWP. Consequently not all questions were answered by all respondents. For example, some respondents only had knowledge of the concept of either averaging or HWP but not both. Some respondents considered that some questions were not relevant for their situation. For example, some consultants had all their clients already participating in the NZ ETS. Consequently they did not answer questions relating to non-participants.

The questions asked in the phone survey and a summary of the responses are provided in the next section.

Target rotation age

Are there differences in target rotation age for participants vs non-participants?

There were 19 responses to this question:

- Yes 4
- No 10
- Possibly 5

The strongest 'Yes' respondent said that "Participants are extending radiata pine rotations from 28 years to 35-38 years and Douglas fir rotations from 40-50 years to 100 years." However, most respondents suggested that any difference would be small or that there would be no difference:

- "Yes. Those in ETS seem to know more about what they want to do and have a long term strategy to cut at age 26. Non-participants tend to cut younger with a high log price."
- "Only if have leased carbon – may have a minimum clearfell age of 25 years or 27 years imposed."
- "Only if participants had sold units and couldn't afford to pay them back so had to grow on. But participants generally aren't selling these units."
- "Small differences. Primarily harvest is based on wood production. Will spread harvest because of scale and spread of cashflows. Will also factor in carbon liabilities."
- "No – trigger is log price and personal circumstances"
- "No – harvesting is driven by log prices."

Averaging

Will averaging have an impact on afforestation?

There were 23 responses to this question:

- Yes 21
- No 2

Most respondents were very positive

- "Yes – will create a simple system for small growers that will provide income to cover forestry costs without liability. The current ETS is too complex."
- "Yes – the low-risk approach will encourage afforestation."
- "Yes. More safe units so more investment."
- "Yes – companies and individuals will. Averaging is very positive for forestry as it will bridge the value gap from forestry to farm land; ie, allow foresters to pay the market price for farm land."

There was often some qualification because of the cost of land. For example:

- "Yes. It will make it easier to sell the ETS to landowners. Farmers do not see the point in selling units that they have to surrender and instead focus on safe units. So averaging will make the ETS more attractive. The big issue is land cost".
- "Yes. It will bring in small landowners (20 to 50 ha). If simple it will help afforestation as it will help finance forest development. Expansion on land that is already owned is more likely so need to have farmers wanting trees on land. This is starting to happen. Some potential growers are looking at new land but there is limited land for sale and the price is too high."

Two respondents said no:

- "No – people won't understand. Need better information and understanding of the economics of forestry. Forestry hides under a rock."
- "No – land prices are too high. Need agriculture in the ETS so that farmers who have land to plant have the incentive to do so. In addition, landowners won't understand."

Will averaging have an impact on harvest intentions?

There were 14 responses to this question:

- Yes 1
- No 11
- Possibly 1
- Depends 1

Most respondents said no. Examples of responses that cover the range:

- "No – this depends on log prices".
- "No – however it will remove the requirement to monitor carbon".
- "Yes – growers will be able to manage for wood harvest and not for carbon liability"
- "Possibly – but the impact could be positive. In many cases the current harvest age (down to 24 years) is too young. It is hard to say if averaging will change that."
- "Depends on whether averaging reflects the actual rotation age or a set age."

Will averaging have an impact on existing participants replanting after harvest rather than deforesting?

There were 19 responses to this question:

- Yes 10
- No 9

This result does not suggest that respondents expect substantial deforestation. Rather it reflects the situation that the 'No' respondents (or their clients) will replant under current settings anyway regardless of the implementation of averaging. Consequently averaging will have no impact on their decision.

Examples of responses that cover the range:

- "Yes. Onus of repayment makes replanting more likely if only selling up to safe level."
- "Yes – the deforestation liability will be significant."
- "No. Virtually all area will be replanted anyway – most is on land where forestry is the HBU (Highest and Best Use)."
- "No – required to replant under resource consent. Question is whether to plant pine or manuka."
- "No - but may change species choice. Would prefer pine on some areas currently being planted in manuka."

Will averaging have an impact on non-participants with 1st rotation forest joining the NZ ETS?

There were 16 responses to this question:

- Yes 11
- No 2
- Depends 3

Most respondents said yes. For example:

- "Yes – some potential participants are stopped by uncertainty."
- "Yes – it simplifies process."

- "Yes. Have clients with recent afforestation who would be interested."

Two respondents said no:
- "No. Will make little impact. 95% of clients with post-1989 forest have joined the ETS. The other 5% have made their minds up and won't join as they don't trust the government."
- "No – if already above average."

Three respondents said it depends:
- "Depends on current age. Would increase supply of NZUs from owners currently holding them if their forests were eligible."
- "Depends. If have a carbon level below average then more likely to join. But it is too close to harvest for most to get any benefit from averaging. With high log prices these owners don't need the challenge of carbon."
- "It depends how rules are applied."
-

Will averaging have an impact on non-participants joining the NZ ETS with 2nd rotation forest?

There were 10 responses to this question:
- Yes 5
- No 2
- Depends 3

There were a diverse range of views on this question reflecting different understandings of liabilities relating to 1st rotation residues and also on how government should treat it. For example:
- "Yes – averaging is a game changer."
- "Yes. Will be an advantage – increases perceived safe level."
- "Yes – but get less carbon because of 1R residues if replant immediately so would deforest and wait 4 years to get full benefit."
- "Yes – but it shouldn't apply to 2R. It should only apply to 1R. Owners would have replanted anyway."
- "Yes it would make it more attractive. But perception is that 2R will be treated as 1R and that residues on site from 1R will be ignored. Government should treat as 1R ETS forest even if it is 2R physical forest otherwise it will be regarded as 'nickel & diming' by the government."
- "Equity issue – why should you be able to go back to 0 for 2R when someone starting with 15 year old forest in 1R wasn't able to get all the carbon."
- "Possibly – some forest owners who have not re-registered may join with 2R. It depends on how well they do from 1R. They are aware of the liability imposed by post-harvest residues."
- "Depends. Lot of people are thinking of joining in 2R. Question is whether MPI treat 2R as 1R and allow claims from planting without considering residues from 1R."
- "Depends. Comes down to price and how much get. View that government got benefit of 1R."

HWP

Will HWP have an impact on afforestation?

There were 20 responses to this question:
- Yes 18
- No 2

Most respondents were positive although a number suggested the challenge would be getting people to understand the concept.
- "Yes. Fantastic for those who can get their head around it."
- "Yes. People would see that the ETS made sense. Instant oxidisation does not make sense."
- "Yes – surrender less carbon (or get higher average)."
- "Yes – allows payment of units back more gradually."
- "No – people will understand even less than averaging."
- "More complicated – less of a driver but would like to see within averaging."

Will HWP have an impact on harvest intentions?

There were 14 responses to this question:
- Yes 1

- No 9
- Possibly 2
- Depends 2

Most respondents said no although there were a number of conditional responses.

- "No – more dependent on log prices and carbon prices."
- "No – although it will reduce the constraint on harvesting the issue will still be price if more than the safe level of carbon has been sold."
- "Possibly. Could stop extension of rotation ages."
- "Possibly – if it is a fair reflection of HWP it may encourage longer rotations that produce fit-for-purpose logs."
- "Depends. No – if everyone gets the same decay curve. Yes – if get benefit from growing high value log that produces longer-lived products."
- "Depends. No for smaller owners. Yes for larger blocks."
- "Yes. Reduces liability – so less concerned about carbon and more concerned about wood."

Will HWP have an impact on existing participants replanting after harvest rather than deforesting?

There were 14 responses to this question:

- Yes 7
- No 7

As was the case for averaging, respondents were split on this question largely because the 'No' respondents (or their clients) will replant under current settings anyway regardless of the implementation of HWP.

- "Yes – replanting will allow maximum benefit from the decay curve; ie cumulatively build more carbon in later rotations. 2R peak is higher than 1R peak."
- "Yes – don't want to surrender."
- "Yes – but less so than averaging."
- "No - most are replanting anyway."
- "No - will replant anyway."

Will HWP have an impact on non-participants with 1st rotation forest joining the NZ ETS?

There were 10 responses to this question:

- Yes 8
- No 1
- Possibly 1

Most respondents said yes:

- "Yes probably – but averaging clearer on what you get from it."
- "Yes – will provide a carrot; eg, for participants who deregistered who have stayed out."

Will HWP have an impact on non-participants joining the NZ ETS with 2nd rotation forest?

There were 7 responses to this question:

- Yes 2
- No 3
- Possibly 1
- Depends 1

There were a range of responses to this question largely because of different views on the impact of 1st rotation residues.

- "Yes – but 1R harvest residues are an anomaly. This is unfair and needs fixing."
- "Yes – if consultants can explain."
- "No – will have a minor impact. Not a game changer unless add onto averaging."
- "Depends. It should be more attractive. However it depends on the decay of residues and HWP from 1R. It depends on the impact of HWP on the time of going from net carbon negative to net carbon positive."
- "Possibly – but would deforest and wait 4 years to get full benefit."

Voluntary or mandatory

Should averaging be voluntary?

There were 22 responses to this question:

- Yes 21
- No 1

There was almost unanimous support for averaging being voluntary. Some responses:

- "Some growers are carbon farmers and want to claim all units. Corporate foresters want to manage their estate. Permanent forests need to be left outside. Small growers are risk averse and would like averaging."
- "Many forests will have already exceeded long term average."
- "Have different age-classes and species so want to manage carbon from estate ourselves and use trading opportunities."
- "Some clients want maximum income. These owners know the ETS and want to make their own decisions."
- "Can't see why small growers wouldn't want averaging."
- "Should be voluntary at least up to some threshold. Less benefit to those with an estate. May be a disincentive for long rotation or different species or non-harvest forest."
- "Either voluntary for all or possibly voluntary for existing forests and mandatory for new forests."
- "Should only apply to post-2020 new forests (or after averaging becomes available). Deforestation liability should apply to all forests and offset should be available to everyone; ie, bring pre-1990 and post-1989 together. Should phase out post-1989 ETS."

Should HWP be voluntary?

There were 19 responses to this question:

- Yes 6
- No 12
- Not at all 1

There was strong support for making HWP mandatory:

- "Need to keep simple and avoid too many options."
- "No reason why you wouldn't want it."
- "No downside – want simplicity."
- "Forestry gets penalised with instant oxidisation. Want shelf-life to be recognised."
- "Need to be consistent across all forest classes – regardless of whether or not averaging is adopted; ie, it will add to average level or add to low point of sawtooth."

Some of the support for HWP being voluntary was based on principle:

- "On principle it should be voluntary but who wouldn't want to keep it."

One respondent suggested that HWP shouldn't be introduced at all:

"It will be an administrative nightmare. There is no additionality created by the forester. Harvesting sets in place the oxidation process so should stick with instant oxidation. Foresters have no control over what happens to the logs. Instead the government should use the equivalent value to support the wood processing sector, the development of new products and the use of wood products in the economy. Want to see the promotion of industry which will lead to higher log prices."

Carbon trading strategy

What is your current carbon trading strategy?

The majority of NZ ETS participants are adopting a conservative strategy and only selling 'safe' carbon. Some have a more aggressive strategy:

- "With radiata pine 1/3 sell all units, 1/3 sell some – most past safe level, 1/3 sell nothing (don't need the cash and don't want to pay tax). With Douglas fir most participants are selling all units."
- "Most clients have sold to the safe level although some clients don't know what their safe level is. Some clients sell above the safe level to pay off debt."

However most are only selling units that they do not envisage having to repurchase and surrender:

- "Few selling 2000s plantings even below safe level."
- "Only selling safe units. Don't see any point in selling and repurchasing."
- "Only sell unobligated units that are not required to pay back."
- "Growers tend to be conservative – only prepared to sell safe carbon."
- "Everyone is terrified of future market risk
  - None of 1990s plantings selling
  - None of 2000s planting selling
  - Only selling is of pre-1990 units and arbitrage unit"
- "Very few post-1989 units being sold. Concerned about liability. Issues are:
  - Price
  - Certainty & confidence
    - Need to believe that government will get away from boom & bust
    - Certainty about auction
    - Certainty about international units in NZ ETS
    - Ceiling price"

Some respondents expressed have concerns about participants' knowledge of the risk that they face:

- "Trading strategies lack sophistication. Most people don't appreciate differences between young and mid-age forests."
- "Ignorance – most participants don't know their obligations; ie, that folks with 1990s plantings don't have any safe carbon."
- "Many owners are not well informed. They are not aware of the issues and not confident that they know their true position."

Would averaging or HWP change your carbon trading strategy?

The vast majority of respondents stated that participants would continue with essentially the same trading strategy; ie, they would continue to only sell units that they do not envisage having to repurchase and surrender. However they expected clients to be able to have more 'safe' units to sell under averaging and/or HWP.

Issues affecting participation/afforestation in the NZ ETS

As part of the survey participants made comments about the NZ ETS.

What is the perception of the impact of the NZ ETS on profitability?

Some very positive responses were receieved:

- "Fundamentally good and encouraged clients to get in."
- "Good. If brought in HWP would be even better."
- "Recently sold some arbitrage units. Sent cheques to JV farmers. This has created interest in planting more."
- "In North Canterbury it has been the only source of income for some farmers. Word-of-mouth has spread this positive message."
- "Some people have done extremely well by selling units. Some have spent money on compliance (FMA) without seeing any income for it."

What are perceived barriers?

Many respondents noted the complexity (and associated cost) of the current NZ ETS and the need for simplification:

- "ETS is too complex for most people. Need to expand use of look-up tables. FMA too complex and costly."
- "Huge cost of measurement – why not have a regional measurement table that is jointly funded and based on a collective set of plots."
- "FMA process painful and inflexible. If want to add an area to CRA get given a new set of PSPs. FMA should be voluntary."
- "Biggest challenge is bureaucracy – navigating through (and getting information on) eligibility & rules; e.g. pre-1990 vs post-1989."
- "Whole of the ETS needs to be simplified."
- "Getting property information to confirm eligibility. Day-to-day workings – onus is on own record keeping."
- "Compliance costs (FMA). Hassles with mapping & convincing MPI that areas are correct."
- "Identification of what land is eligible and easy registration."
- "Audit process needs to be more user-friendly. Penalties regime is too inflexible with fines even for small mistakes (eg, $500 for wrong planting date)."
- "Forest owners don't understand ETS – need streamlining and simplification."
- "Need to simplify"

Others expressed the need for information or broadening of the NZ ETS:

- "Big ask to give people confidence in forestry and associated sale of carbon – no understanding."
- "Need agriculture in ETS to stimulate afforestation. Averaging and HWP changes are good but won't do much on their own. Need farmers with 5 to 20% of land better suited to trees to have the incentive to plant."

Results - Modelling

MODEL TO ESTIMATE AFFORESTATION

A very strong relationship exists between the afforestation rate for 1996 to 2008 and the average LEV_{logs} for the preceding 2 years[8] (Fig. 4). The quadratic function has an R^2 of 0.98 and an RSE (Residual Standard Error) of 3.52. Also plotted in Fig. 4 are data from 2009 to 2015 – it is apparent that the pre-2009 relationship is not a good fit after the NZ ETS was enacted. Afforestation during this period is correlated with carbon price (Fig. 5).

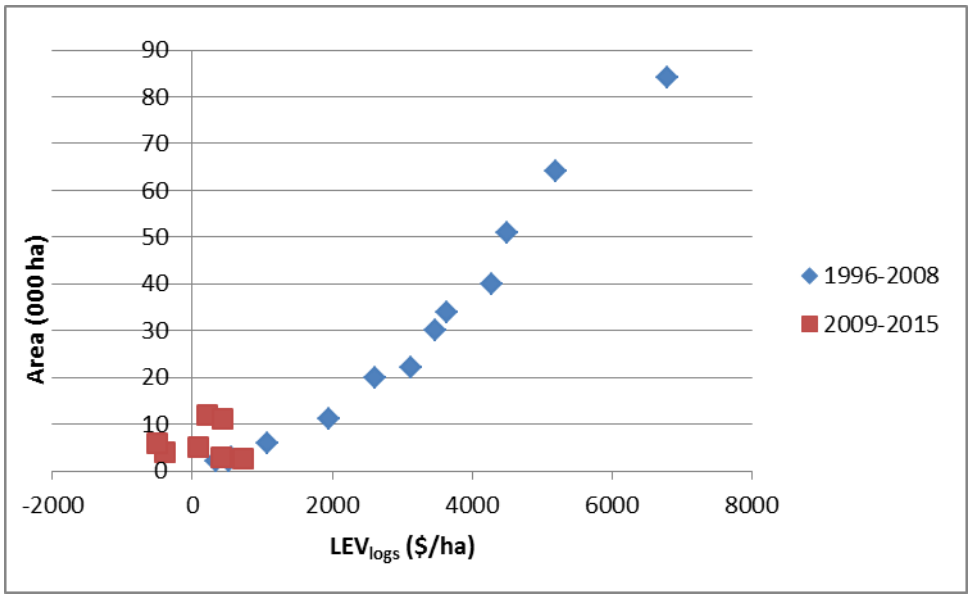

Figure 4: Annual area of new planting from 1996 to 2008 plotted against average LEV for the last 2 years. Also plotted is data for 2009 to 2015.

[8] A 3-year average has slightly higher explanatory power. Using a 2-year average allows an extra data point to be used in the analysis; ie, data for 1996.

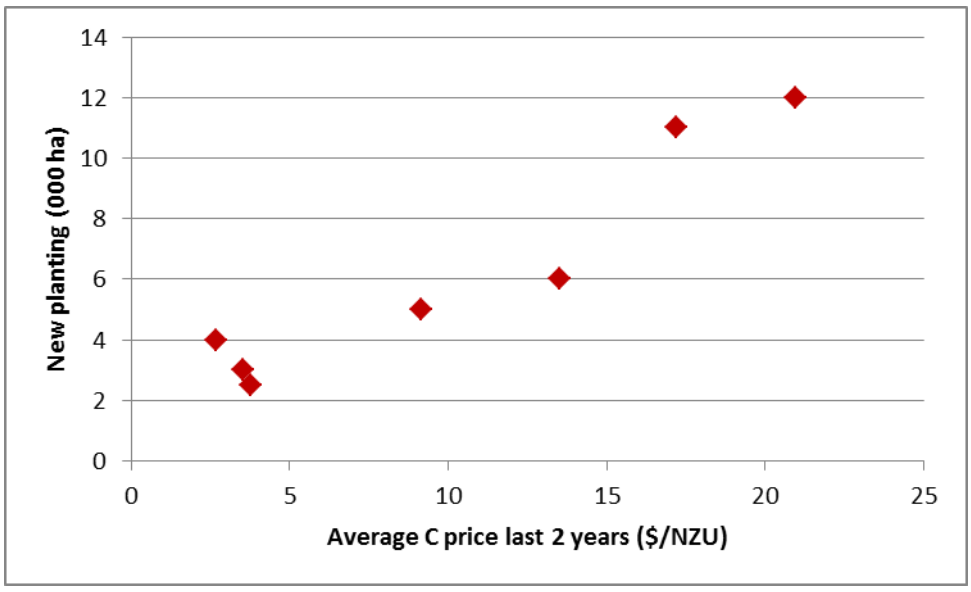

Figure 5: Annual area of new planting from 2009 to 2015 plotted against average NZU price ($March 2015) for the last 2 years.

The patterns evident in Figs. 4 and 5 suggest a model of the form:

Afforestation rate = a + b * LEV + c LEV^2 (Model 1)

Where LEV = LEV_{logs} + k * LEV_{carbon}

LEV_{logs} and LEV_{carbon} are averages for previous 2 years (to March of planting year)

Introduction of the factor k allows for LEV_{logs} and LEV_{carbon} to make different contributions to the relationship with the afforestation rate. The model developed has a RSE of 3.27 and an R^2 of 98%. Table 1 shows that all coefficients in the quadratic model are significant apart from the constant term (a). It is of interest to note that the coefficient for LEV carbon is 0.62. The combined LEV provides a good predictor for afforestation rate from 1996 to 2015 (Fig. 6).

Table 1: Model 1 coefficients fit to data from 1996 to 2015.

Coefficient	Estimate	p value[9]
a	0.8464	0.58
b	0.003839	0.007
c	1.343e-06	<<0.001
k	0.622	<<0.001

[9] For a coefficient to be significant at the 5% level the p value needs to be less than 0.05

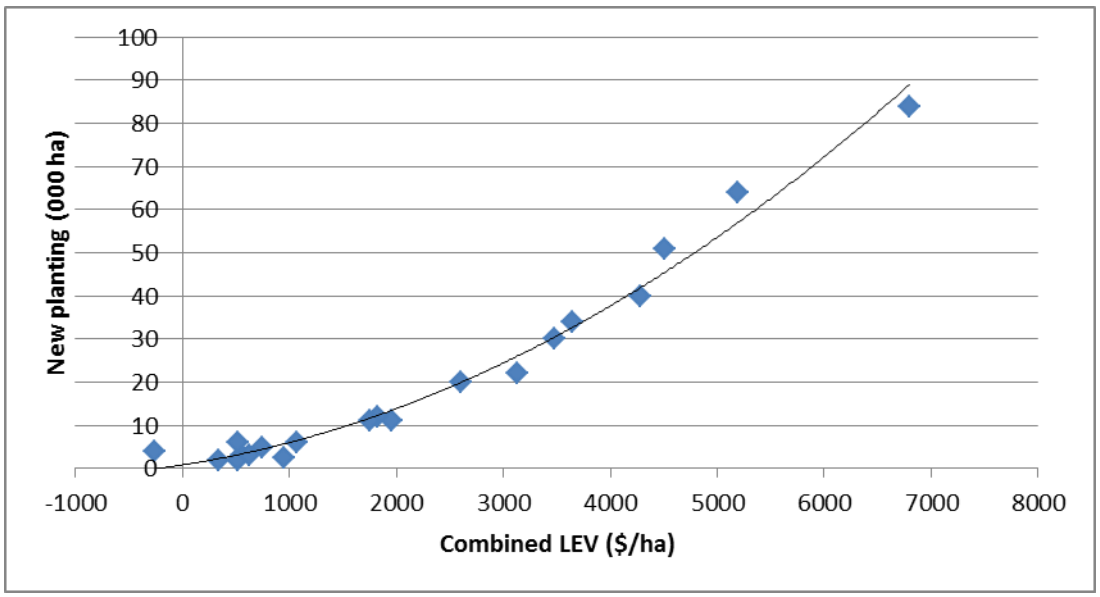

Figure 6: Annual area of new planting from 1996 to 2015 plotted against combined LEV (calculated as LEV_{logs} + 0.622 * LEV_{carbon} using the average LEVs for the last 2 years). The curve shows estimates from Model 1.

Inclusion of land

Although Model 1 is a good predictor of afforestation between 1996 and 2015 it considers only forestry. To implicitly account for other land uses, the cost of land has been added as an explanatory variable using data from Beef + Lamb New Zealand Ltd. The classes of land that are most relevant for afforestation in New Zealand are Hard Hill land in the North Island and Hill land in the South Island. The cost of this land has increased over the period 1988 to 2015 (Fig. 7).

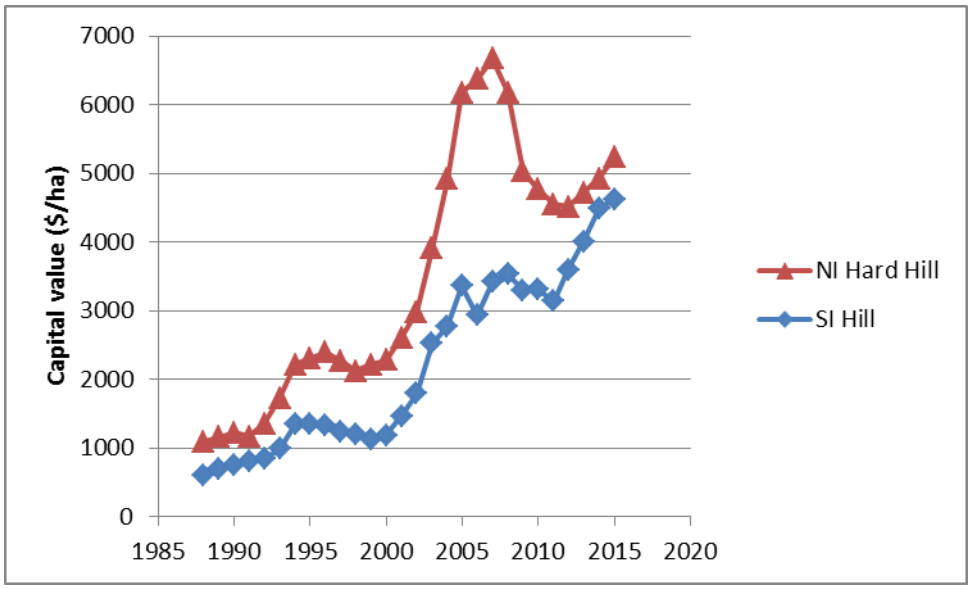

Figure 7: Capital cost of land ($2015) for North Island Hard Hill land and South Island Hill land. (Source: Beef + Lamb New Zealand Economic Service).

It was hypothesised that land affordability, the difference between what the forest grower can afford to pay for land (ie, LEV) and the cost of land, should be a driver of afforestation. Consequently a model was developed with the form:

$$\text{Afforestation rate} = a + b * (LEV - d * LMV) + c (LEV - d * LMV)^2 \qquad \text{(Model 2)}$$

Where Afforestation rate includes all afforestation including any area planted under the Afforestation Grant Scheme or East Coast Forestry Project.

$LEV = LEV_{logs} + k * LEV_{carbon}$

LEV_{logs} and LEV_{carbon} are averages for previous 2 years (to March of planting year)

LMV = cost of land calculated as the weighted average of North Island Hard Hill land (weight of 2) and South Island Hill land (weight of 1) over the previous two years. The relative weights reflect the proportion of afforestation that has occurred in the two islands since 1996.

Table 2: Model 2 coefficients fit to data from 1996 to 2015.

Coefficient	Estimate	p value
a	8.78	0.02
b	0.005589	0.007
c	1.292e-06	<<0.001
d	0.4359	0.05
k	0.8314	<<0.001

The model developed has a RSE of 2.84 and an R^2 of 99%. Table 2 shows that all coefficients in the model are significant although the coefficient for LMV has a p-value just on the 0.05 threshold. The coefficient for LEV carbon is 0.83 while the coefficient for the cost of land is 0.44.

Model performance

Model 2 is better at estimating actual afforestation than Model 1 (Table 3 & Fig. 8).

Table 3: Afforestation (in thousands of hectares) estimated by models compared to actual afforestation for 2009 to 2016. Actuals are total New Zealand new planting from NEFD. Data for 2009 to 2015 were included in the model estimation process. Estimates for 2016 and 2017 are estimates for years beyond the data used for model development. These are based on 2015 land values.

	Actual	Model 1	Model 2
2009	4	0.0	2.8
2010	6	3.2	4.4
2011	12	12.3	12.2
2012	12	11.7	11.1
2013	4	4.5	4.7
2014	3	3.8	3.7
2015	3	5.7	4.2
2016[f]	3	5.0	3.9
2017[f]		12.1	8.3

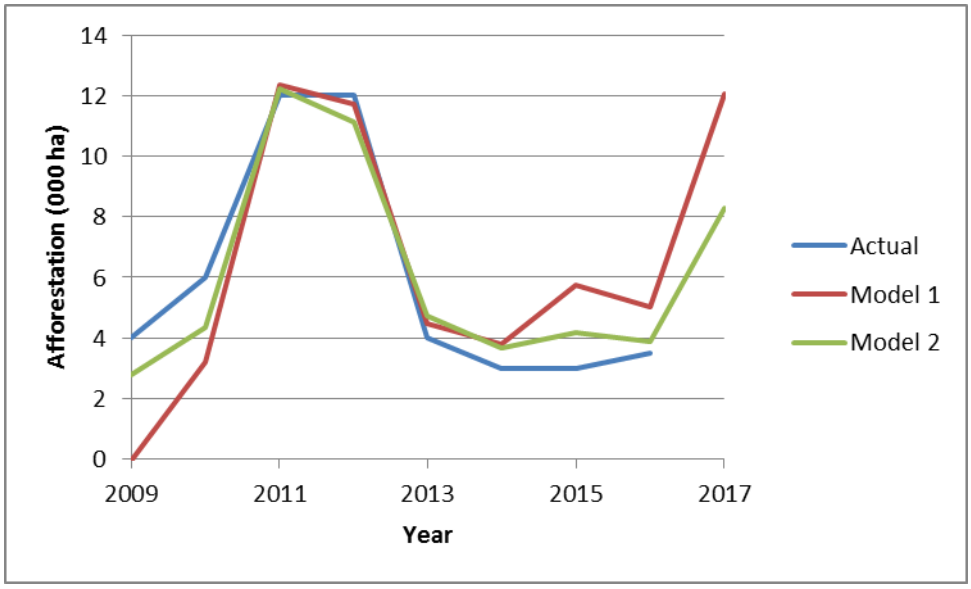

Figure 8: Afforestation estimated by models compared to actual afforestation for 2009 to 2016. Actuals are from NEFD.

Model 2 generally estimates a lower rate of afforestation than Model 1 (Fig. 9). Model 1 does not include the cost of land and implicitly assumes the average land price over the period 1996 to 2015. Model 2 does include the cost of land as a separate variable. Estimates in Fig. 9 assume the 2015 land price of $5035/ha. Given the marked increase in land cost over the last 20 years (Fig. 7) it is hardly surprising that, at this land cost, Model 2 estimates a lower afforestation rate.

Model 2 is used for subsequent analysis.

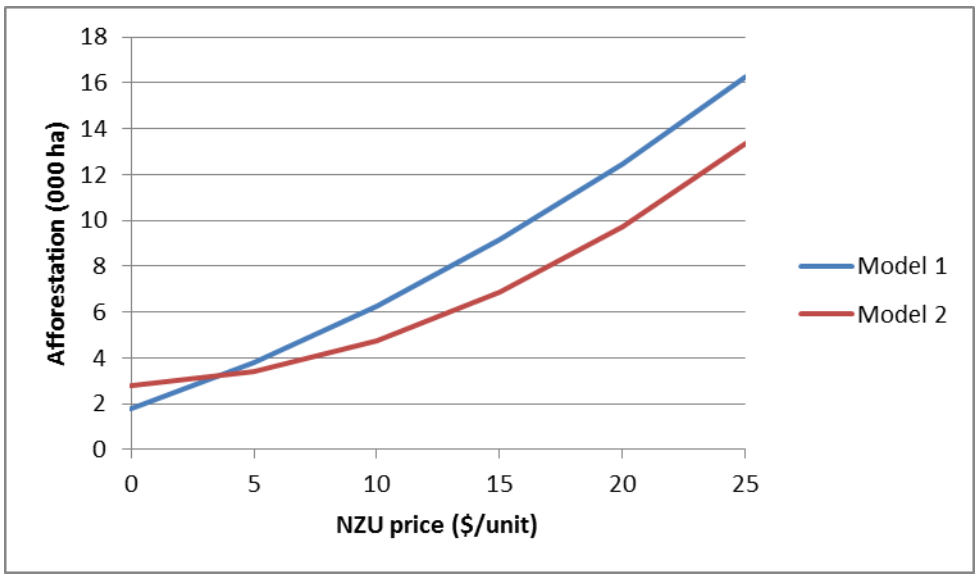

Figure 9: Afforestation estimated by Model 1 and Model 2 for different carbon prices. Log prices for both models are set at the average for the last 10 years ($103.50/m^3). Land prices (Model 2 only) are set at the 2015 level ($5035/ha).

IMPACT OF AVERAGING ON AFFORESTATION

The long-term average carbon level varies depending on the definition of long-term (Table 4). Here the asymptotic value of 426 t CO_2/ha is initially used. For the notional regime being grown on a 28-year rotation this value is reached at age 17 years (Fig. 10).

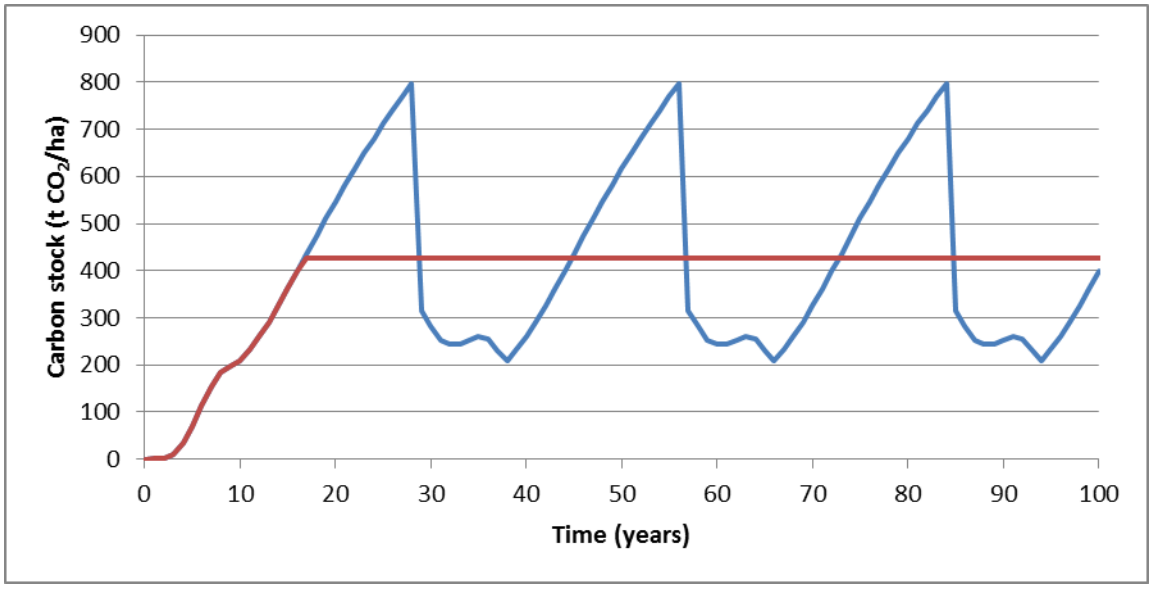

Figure 10: Carbon stock (expressed as t CO_2/ha) for radiata pine pruned regime grown on a 28 year rotation with long-term average (asymptotic) carbon stock also shown. (Look-up table values for Hawkes Bay/Southern North Island).

Table 4: Impact of number of rotations on long-term average carbon for notional regime

Rotations	***Average (t CO_2/ha)***
1	370
2	398
3	407
4	412
5	415
asymptotic	426

An alternative would be to define fixed ages at which the average level of carbon is deemed to be achieved (Table 5).

Table 5: Impact of different 'averaging' ages on long-term average carbon for notional regime

Averaging age	***Average (t CO_2/ha)***
16	398
20	547
24	681

Averaging at any of these ages has a large impact on the estimated level of afforestation compared to the current NZ ETS (Fig. 11). For example, at a carbon price of $20/NZU estimated afforestation increases from 10,000 ha/year to between 18,000 and 28,000 ha/year. Note that these estimates assume that the increase in the area of land being afforested has no impact on land cost which is assumed to remain constant at $5035/ha. If significant areas were afforested, land price would be expected to increase, reducing afforestation in subsequent years.

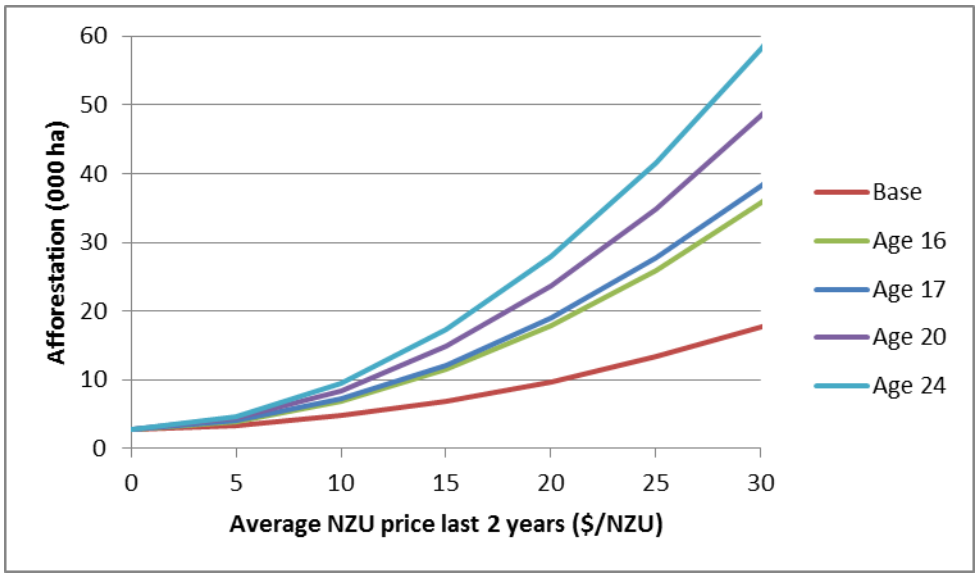

Figure 11: Afforestation estimated for different carbon prices with averaging at different ages. Base is the current ETS. Estimates assume the average (real) log price for the last 10 years ($103.50/m^3) and the 2015 land price ($5035/ha).

Averaging (to age 17) when NZ ETS is joined in the second rotation

A participant who joins the NZ ETS for the 1st rotation would be able to claim a total of 426 units by age 17. In contrast, a participant who joins the NZ ETS at the start of the 2nd rotation is only able to claim units once the total carbon stock starts to increase[10]. This occurs when the 2nd rotation is age 10 years and the carbon stock is 210 t CO_2/ha. Consequently only 216 units can be claimed (=426 – 210). The financial benefits of participation are much lower (Fig. 12). Nevertheless with averaging there is still some incentive to join the NZ ETS in the second rotation. Under current settings, and assuming only 'safe' carbon is traded, there is no benefit in joining the NZ ETS in the second rotation.

[10] It is assumed that a participant who joins the NZ ETS in the 2nd rotation is liable for 1st rotation residues. The *Climate Change (Forestry Sector) Regulations 2008 specify:*

Regulation 21(1)(a)(ii) states: if relevant, … …, to calculate the carbon stock of the sub-area from above ground residual wood and below ground roots from previously cleared trees that are to be treated as decaying on the land under regulation 22(h)…;

Regulation 22(h) states: if trees have been cleared but the land has not been deforested, the residual wood from above ground residual wood and below ground roots from the cleared trees is to be treated as decaying for a period of 10 years from the year of clearing.

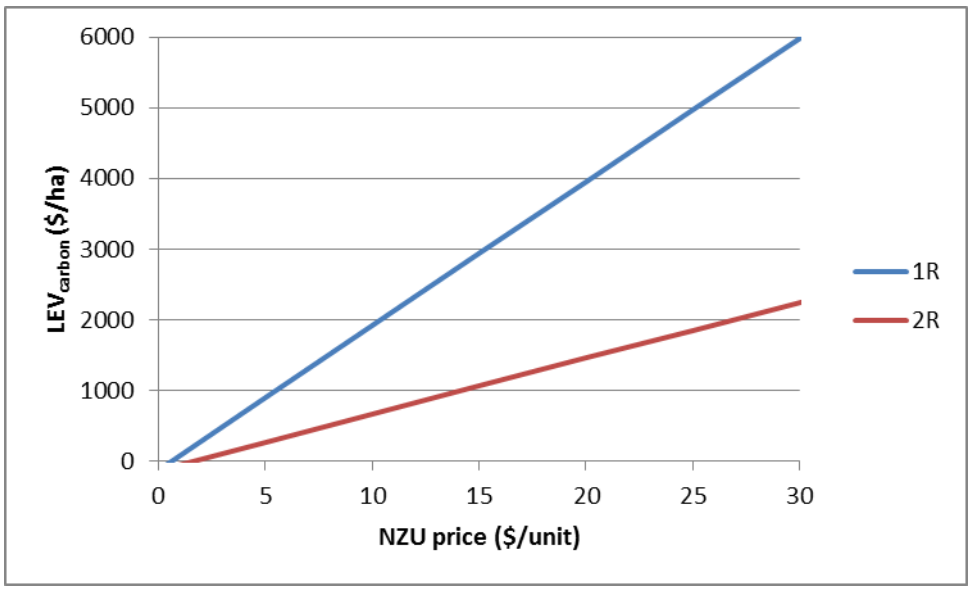

Figure 12: LEV_{carbon} (with averaging to age 17) for a participant who joins the ETS at the start of the 1st rotation compared to joining at the start of the 2nd rotation.

IMPACT OF HWP ON AFFORESTATION

Inclusion of HWP changes the post-harvest carbon profile (Fig. 13). Without HWP the minimum carbon stock in the 2nd rotation (210 t CO_2/ha) occurs 10 years after harvest. The safe carbon does not change if the HWP decays linearly over 10 years (as there is no HWP 'pool' left after 10 years. However the minimum carbon stock levels are higher in the 2nd rotation and the low point is later with both the NIR exponential decay curve and 20-year linear decay curve for HWP (Table 6).

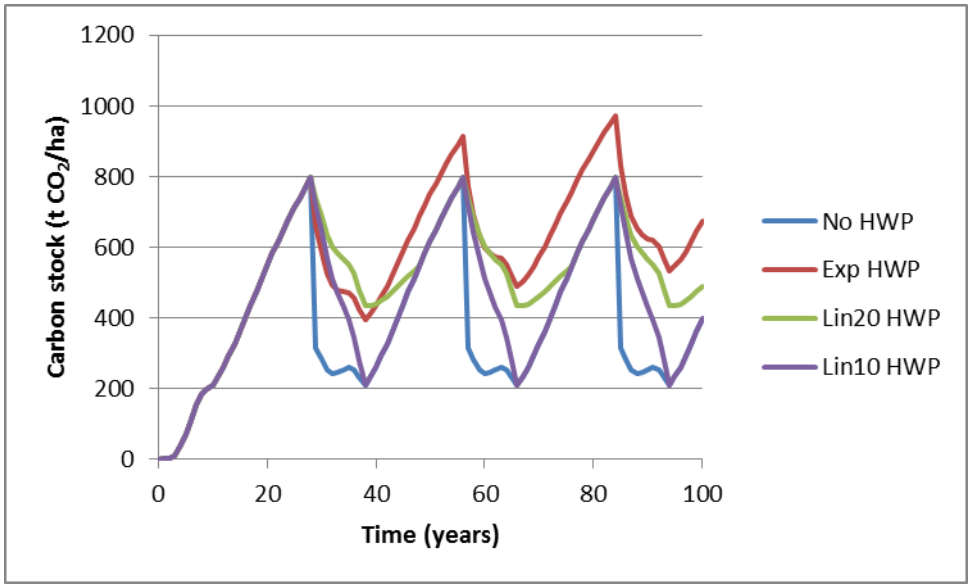

Figure 13: Carbon stock (expressed at t CO_2/ha) for radiata pine pruned regime grown on a 28 year rotation with harvested wood products included.

Table 6: Impact of HWP on the low point in carbon stocks in the 2nd rotation and the age at which it occurs.

	2R carbon low point (t CO_2/ha)	2R age it occurs at (years)	1R age that carbon is traded to (years)
No HWP (=Base)	210	10	10
Exponential HWP	396	10	16
20 year Linear HWP	435	10	17
10 year Linear HWP	210	10	10

Both the 20-year linear decay and the exponential decay of HWP produce a similar impact on estimated afforestation (Fig. 14). At a carbon price of $20/NZU estimated afforestation increases from 10,000 ha/year for the current NZ ETS to 18,000 ha/year (exponential decay) and 20,000 ha/year (20 year linear decay).

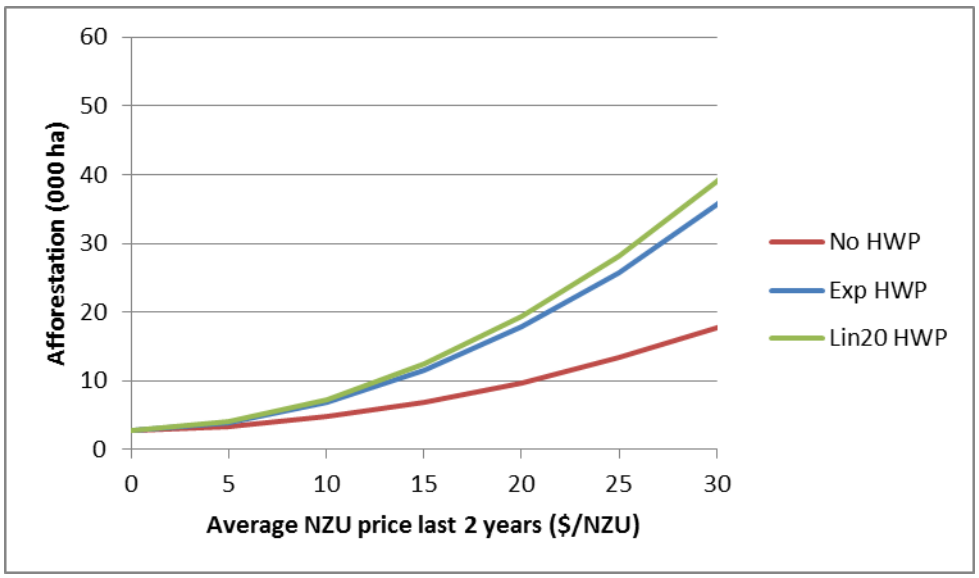

Figure 14: Afforestation estimated for different carbon prices with HWP included and decaying by (i) NIR exponential curve and (ii) 20-year linear decay. The curve for 10-year linear decay is identical to that for No HWP. No HWP (=Base) is the current ETS. Estimates assume the average (real) log price for the last 10 years ($103.50/m^3) and the 2015 land price ($5035/ha).

HWP (20 year linear decay) when NZ ETS is joined in the second rotation

A participant who joins the NZ ETS at the start of the 2nd rotation is only able to claim units once the total carbon stock starts to increase[11]. This occurs when the 2nd rotation is age 10 years and the total carbon stock is 435 t CO_2/ha. As this represents the 'safe' level of carbon, any units claimed would have to be surrendered after harvest. If a participant only wanted to sell units that they did not have to surrender (providing land was replanted after harvest) there in no advantage in joining the NZ ETS.

HWP (exponential decay)

In the case of exponential decay of HWP, the afforestation rate shown in Fig. 14 considers carbon trading only up to the low point for the 2nd rotation (396 t CO_2/ha). In fact the low point in subsequent rotations goes up to 487 t CO_2/ha in the 3rd rotation and 534 t CO_2/ha in the 4th rotation (see Fig. 14). This creates the opportunity for additional carbon to be traded in subsequent rotations. However the impact on LEV and hence additional estimated afforestation is small compared to only trading up to the 2nd rotation low point (Fig. 15).

If the exponential decay curve was adopted, there would be some benefit in joining the NZ ETS for the second rotation. The increasing peaks and, more importantly, troughs with subsequent rotations mean that some carbon could be sold without the need for subsequent surrender. Carbon trading could start once the second rotation low point of 396 t CO_2/ha had been passed and 91 units could be sold in the second rotation (= 487 – 396) with a further 47 units sold in the 3rd rotation (= 534 – 487) with smaller amounts in subsequent rotations. However the LEV_{carbon} of this option is small compared to that for participants who start in the 1st rotation; $658/ha compared to $3865/ha.

[11] It is assumed that a participant who joins the NZ ETS in the 2nd rotation is liable for 1st rotation residues and HWP.

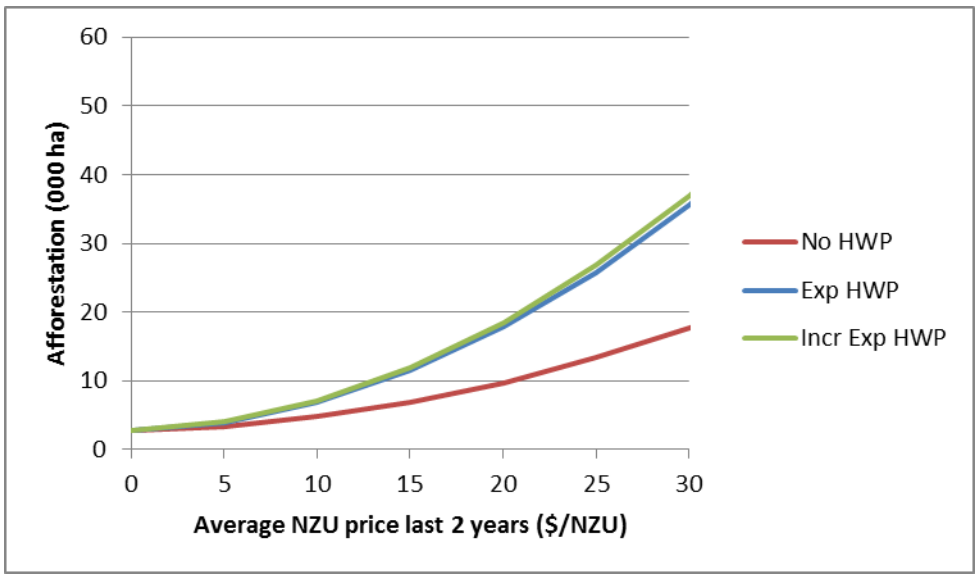

Figure 15: Afforestation estimated for different carbon prices with HWP included and decaying by the exponential curve with (i) trading up to the 2nd rotation low point and (ii) trading increasing up to the low point in each subsequent rotation. No HWP (=Base) is the current ETS. Estimates assume the average (real) log price for the last 10 years ($103.50/m^3) and the 2015 land price ($5035/ha).

COMBINED IMPACT OF HWP AND AVERAGING ON AFFORESTATION

Use averaging at age 17 and 20-year linear HWP decay

So far the impacts of averaging and HWP have been estimated separately. This section considers the impact when HWP is included within the average. The long-term average varies with the HWP decay function adopted as well as the number of rotations considered (Table 7). Here, the asymptotic long-term average for a 20-year linear decay function is assumed. The long-term average of 578 t CO_2/ha is reached at age 21 years (Fig. 16).

Table 7: Impact of number of rotations on long-term average carbon when HWP are included

Rotations	Exponential	Linear 20	Linear 10
1	370	370	370
2	487	474	434
3	554	509	455
4	599	526	466
5	628	537	472
Asymptotic	746	578	498

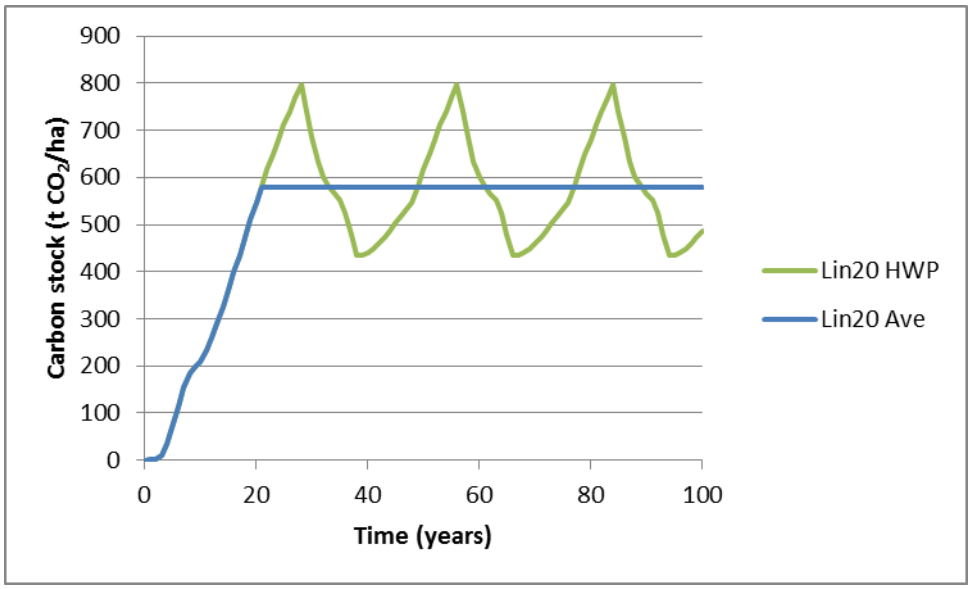

Figure 16: Carbon stock (expressed as t CO_2/ha) for radiata pine pruned regime grown on a 28 year rotation with HWP included. The long-term average (asymptotic) carbon stock of 578 t CO_2/ha is also shown.

With the assumed scenarios, averaging (to age 17 years) and the inclusion of HWP with a 20-year linear decay rate separately give a similar estimated response in afforestation. With a carbon price of $20/NZU, afforestation is estimated to be 20,000 ha/year compared to 10,000 ha/year for the current NZ ETS. This increases to 25,000 ha/year when averaging is applied in addition to the inclusion of HWP (Fig. 17). The relative impact is explained by the long-term average carbon level for each alternative (Table 8).

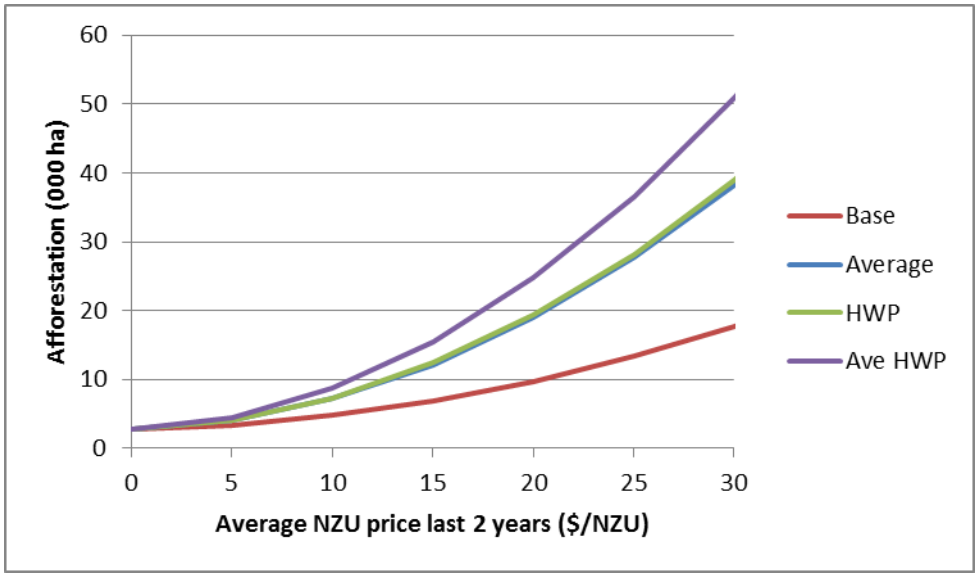

Figure 17: Afforestation estimated for different carbon prices with (i) Averaging until asymptotic LTA without HWP is reached at age 17, (ii) HWP included with 20-year linear decay and (iii) Averaging until asymptotic LTA with HWP is reached at age 21. Base (= No HWP) is the current ETS. Estimates assume the average (real) log price for the last 10 years ($103.50/m^3) and the 2015 land price ($5035/ha).

Table 8: Impact on carbon that is traded and age carbon is traded until for (i) Base, (ii)Averaging until asymptotic LTA without HWP (ii) HWP included with 20-year linear decay and (iii) Averaging until asymptotic LTA with HWP.

	Carbon traded (t CO_2/ha)	Age carbon is traded until (years)
No HWP (=Base)	210	10
Averaging	426	17
20 year Linear HWP	435	17
Averaging with HWP	578	21

Sensitivity to land price

Estimated afforestation rate is very sensitive to land price (Fig. 18).

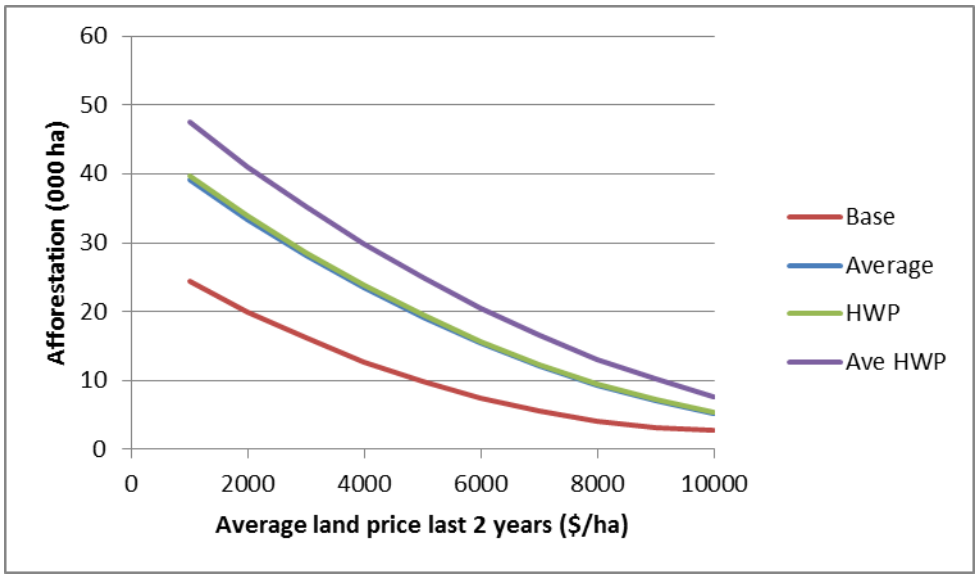

Figure 18: Afforestation estimated for different land prices with (i) Averaging until asymptotic LTA without HWP is reached at age 17, (ii) HWP included with 20-year linear decay and (iii) Averaging until asymptotic LTA with HWP is reached at age 21. Base (= No HWP) is the current ETS. Estimates assume the average (real) log price for the last 10 years ($103.50/m^3) and a carbon price of $20/NZU.

Averaging (at age 21) with HWP when NZ ETS is joined in the second rotation

A participant who joins the NZ ETS for the 1st rotation would be able to claim a total of 578 units by age 21. In contrast, a participant who joins the NZ ETS at the start of the 2nd rotation is only able to claim units once the total carbon stock starts to increase[12]. This occurs when the 2nd rotation is age 10 years and the total carbon stock is 435 t CO_2/ha. Consequently only 143 units can be claimed (=578 – 435). The financial benefits of participation are much lower (Fig. 19).

[12] It is assumed that a participant who joins the NZ ETS in the 2nd rotation is liable for 1st rotation residues and HWP.

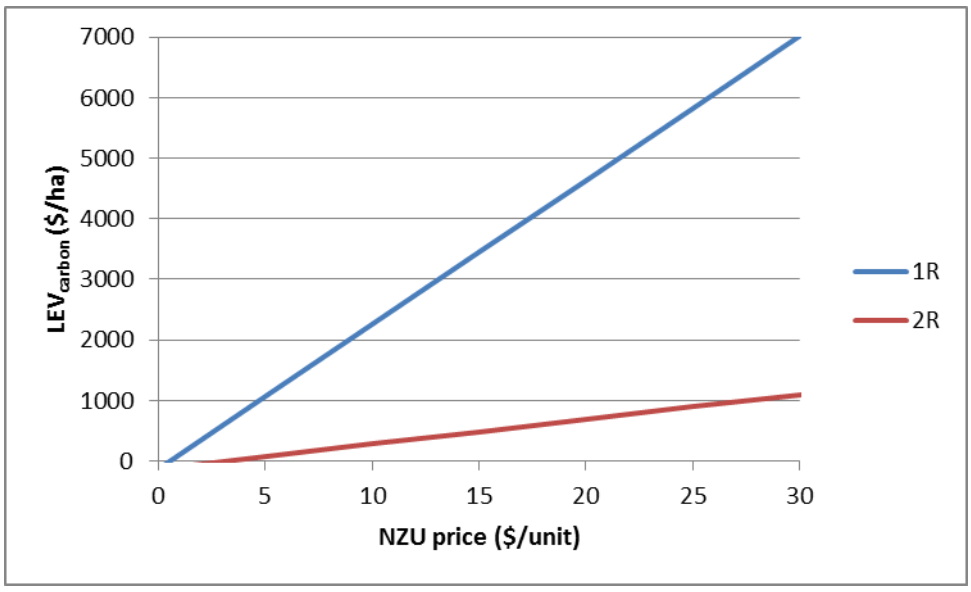

Figure 19: LEV_{carbon} (with HWP and averaging to age 21) for a participant who joins the ETS at the start of the 1st rotation compared to joining at the start of the 2nd rotation.

INCENTIVE FOR NON-PARTICIPANTS TO JOIN DURING 1ST ROTATION

Introducing averaging and HWP into the NZ ETS, either separately or in combination, increases the age up to which participants gain financial benefit if they only wish to trade 'safe' carbon. The benefit reduces rapidly as stand age approaches the year at which the 'safe' level is reached (Fig. 20). The dip around 8 years reflects the thinning that occurs at that age.

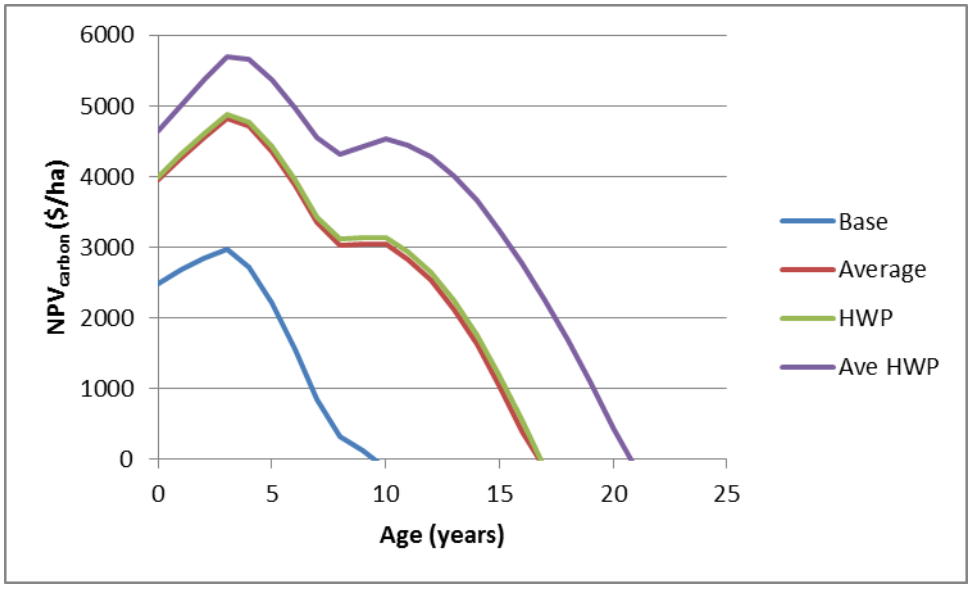

Figure 20: NPV_{carbon}[13] (with carbon price of $20/NZU) for different stand ages with (i) Averaging until asymptotic LTA without HWP is reached at age 17, (ii) HWP included with 20-year linear decay and (iii) Averaging until asymptotic LTA with HWP is reached at age 21. Base (= No HWP) is the current ETS.

[13] This is an NPV rather than an LEV because the value of the carbon trading strategy associated with existing stands (rather than bareland) is being estimated.

Summary of results

SUMMARY - SURVEY

Many respondents noted the complexity (and associated cost) of the current NZ ETS and the need for simplification. Respondents had a range of understanding about the current NZ ETS and knowledge of averaging and HWP.

The majority of NZ ETS participants are adopting a conservative carbon trading strategy. Both averaging and HWP create the opportunity for a higher level of 'safe' carbon (ie, they will increase the minimum level of carbon that occurs after harvesting when replanting is assumed). Consequently, most respondents expect the inclusion of averaging or HWP could have a substantial impact on afforestation. However a limiting factor is the availability and cost of land.

Most survey respondents also expect that averaging or HWP will:

- Have limited impact on harvest intentions.
- Reinforce the likelihood of replanting following harvesting (rather than deforestation), although this is already intended in most cases.
- Make it more attractive for non-participants with young 1st rotation forest to join the NZ ETS.

There were a diverse range of views on whether averaging or HWP will have an impact on non-participants joining the NZ ETS with 2nd rotation forest. This diversity reflects different interpretations of liabilities relating to 1st rotation residues.

Given the limited number of responses and the fact that responses were to the concepts of averaging and HWP (rather than specific legislation), results should be treated as indicative.

SUMMARY – MODELLING

Historically there has been a strong correlation of the rate of afforestation with log price, carbon price and land cost. The model developed allows the impact of the inclusion in the NZ ETS of averaging and/or HWP to be estimated.

Estimates indicate that either averaging or HWP could double the afforestation rate compared to model estimates for current NZ ETS settings. Although the impacts of averaging and HWP are not additive, inclusion of HWP in the calculation of an average would provide an additional impact and therefore drive afforestation higher. The driving factor is the increase in 'safe' carbon available for sale under averaging and/or HWP.

Supplementary analysis shows that averaging and/or HWP increase the age in the 1st rotation up to which benefit is obtained by joining the NZ ETS. For the example analysed, either averaging or HWP increase the age up to which safe carbon is earned from 10 years (under current NZ ETS settings) to 17 years. Inclusion of HWP in the calculation of the average increases this age to 21 years.

However there is much less benefit from joining the NZ ETS with a 2nd rotation forest when residues (and HWP) from the 1st rotation are included in the estimation of carbon stock change.

Discussion

MODEL IS A CONSTRUCT

It is important to understand that the afforestation model is a construct that seeks to use past afforestation to predict the national level of afforestation. Individuals face their own particular set of circumstances and make their own afforestation decisions. The model predicts the aggregate effect of individual afforestation decisions based on the average log price, carbon price and land cost over the previous two years.

DETAILS OF AVERAGING AND HWP YET TO BE DEVELOPED

As yet there is no preferred position on whether averaging and/or HWP will be implemented into the NZ ETS let alone the details for either approach were it to be implemented. In order to apply the afforestation model to averaging and HWP, assumptions were made that:

- averaging will allow units to be claimed up to the asymptotic long-term average.
- HWP will follow 20-year linear decay.

Any variation from these assumptions will result in different estimates of afforestation.

Benefits of joining the NZ ETS in the 2nd rotation are based on assumptions that:

- 2R participants will be liable for 1R residues.
- 2R participants will be liable for 1R HWP.

Again, variation of these assumptions would result in the calculation of different benefits.

MODEL ESTIMATES ONLY VALID UNDER STANDARD ASSUMPTIONS

The afforestation model is based on a specific set of assumptions about:

- Species
- Silvicultural regime
- Site
- Growth model
- Carbon Look-up table
- Carbon trading strategy
- Costs
- Discount rate
- Log price series
- Carbon price series
- Land cost series

Using these standard assumptions a strong correlation is found between historic afforestation rate (for all species, regimes and sites combined across New Zealand) and the combined effect of LEV_{logs}, LEV_{carbon} and land cost calculated using specific assumptions. It would be possible to develop alternative models using different assumptions; for example alternative models might assume an unpruned silvicultural strategy, a different carbon look-up table and a different carbon trading strategy. However these models would have different coefficients. For example if a different carbon look-up table was used, the model coefficients would have to be re-estimated.

Estimates of afforestation using the model are only valid if the inputs to the model (ie, LEV_{logs}, LEV_{carbon} and land cost) adhere to the specific assumptions used in model development. For example land cost should be consistent with Beef + Lamb New Zealand capital cost of land for North Island Hard Hill land and South Island Hill land.

CARBON TRADING STRATEGY

The standard assumption used in model development is that only 'safe' carbon is traded. This was adopted because survey responses indicated that the majority of NZ ETS participants are risk averse in their carbon trading strategy and are generally not trading NZUs which they will have to subsequently repurchase and surrender. In reality individuals will have differing carbon trading strategies. Some individuals will not trade any carbon and, indeed, may not participate in the NZ ETS. Others might trade all units received. The fact that individuals have different strategies is not important

here. What is important is that adopting the convention that only 'safe' carbon is traded results in a model that has a very strong correlation with the aggregate area of afforestation at a national level.

SILVICULTURAL REGIME

Adoption of a pruned regime gives a model that estimates historical afforestation slightly better than an unpruned regime. The majority of afforestation since 1990 has been tended under a pruned regime. Although there has been a trend towards less pruning particularly by large-scale forest owners, it is anticipated (based on the consensus view of forest owners, managers and consultants in each Wood Availability Forecasts[14] region) that a significant proportion of the small-scale estate will be pruned in the second rotation.

K COEFFICIENT OF LEV_{CARBON}

The k value of 0.83 in model 2 indicates that, when a common discount rate is used, the LEV_{carbon} calculated for the carbon trading opportunity has a lesser impact than the forestry LEV_{logs}. This is plausible given the novelty and uncertainty associated with carbon.

As noted by Manley (2012)[15]: "Although the carbon cashflows arise because of the growth and harvest of the tree crop, they have quite different profiles and relate to different markets. Consequently, the appropriate discount rate for carbon cashflows could well be different to that used for forestry cashflows." Using a higher discount rate than 8% for carbon would have increased the k coefficient that scales the contribution of LEV_{carbon} to afforestation rate. At some discount rate, greater than 8%, the k factor would become 1.

LAND COST

The afforestation model assumes forestry in perpetuity on land of two land classes that is purchased or leased. The fact that, in reality, afforestation occurs on a wider range of land classes, tenures and durations does not matter. For example, that afforestation occurs on land that is already owned as well as land that is purchased or leased. What matters is that a model calculated using these specific assumptions is able to estimate national afforestation rate very well and explain 99% of the variation in annual afforestation rate.

Model 2 estimates the level of afforestation for the average log price, carbon price and land cost over the previous 2 years. The estimates provided (in Figs 11, 14, 15 and 17) assume a constant land cost of $5035/ha. In practice an increase in afforestation rate driven by increasing log or carbon prices, or a change in NZ ETS settings, is likely to impact on land cost.

OTHER FACTORS

Afforestation rate will also be influenced by factors that are not included in the model, or only implicitly included. For example:

- Land availability.
- Rates of return between forestry and other land uses.
- Nursery capacity.
- Future international and domestic accounting rules.

[14]Wood Availability Forecasts – New Zealand 2014-2050 prepared for MPI by Indufor Asia Pacific Limited

[15] Manley, B., 2012. Impact of the New Zealand Emissions Trading Scheme on forest valuation. Forest Policy and Economics 14: 83–89.

Appendix – Detailed survey responses

Averaging

Will averaging have an impact on afforestation?

Yes. It will make it easier to sell the ETS to landowners. Farmers do not see the point in selling units that they have to surrender and instead focus on safe units. So averaging will make the ETS more attractive. The big issue is land cost.

No – people won't understand. Need better information and understanding of the economics of forestry. Forestry hides under a rock.

Yes. No point in taking carbon units unless you can keep some. View forest as a crop that has to be harvested. Averaging would provide income and make the land work for the owner.

Yes – will provide an incentive.

Yes. Will bring in small landowners (20 to 50 ha). If simple it will help afforestation as it will help finance forest development. Expansion on land that is already owned is more likely - treat land as a sunk cost. So need to have farmers wanting trees on land. This is starting to happen. Some potential growers are looking at new land but there is limited land for sale and the price is too high.

Yes – all things being equal but it will depend on land cost. When you consider the land cost when carbon was $21 – with the current land cost carbon needs to be $30 to $50. Averaging appeals to small-scale growers with a single age-class, particularly those who are going to replant. But the sector has been burnt.

Yes – companies and individuals will. Averaging is very positive for forestry as it will bridge the value gap from forestry to farm land; ie, allow foresters to pay the market price for farm land.

Yes. Yes - it simplifies things and makes post-1989 land closer to pre-1990. Can plant and claim/sell units without having to surrender. If really want to incentivise should give all units up front. This will cover land costs & establishment costs.

Yes – it should encourage afforestation but need agriculture in the ETS to do so. A real issue is the cost of land – land that cost $3000/ha 2 to 3 years ago now costs $5000/ha. Afforestation is more likely to be done by people who already own land (farmers) so need to provide incentive for them to do so. AGS is good but doesn't have scale. Government needs to do it itself on land it already owns. There is also an equity issue – pre-1990 forest landowners only got 60 units for locking-in the forestry land-use. Averaging will provide post-1989 forest landowners with say 400 units for locking up.

Yes – but small beer. Fundamentals are the economics of forestry and who carries the risk.

Yes – will create a simple system for small growers that will provide income to cover forestry costs without liability. The current ETS is too complex.

Yes – the low-risk approach will encourage afforestation.

Yes. More safe units so more investment.

Yes – it will help but clients have a perception of volatility. It will need a sustained period of steady prices (say 2 to 3 years above $14) to overcome this perception.

Yes – forest growers will respond most quickly. They have the necessary level of knowledge.

Yes – it will improve the investment with reduced risk.

No – land prices are too high. Need agriculture in the ETS so that farmers who have land to plant have the incentive to do so. In addition, landowners won't understand.

Yes – it would provide a greater reward but most of our clients plant trees to produce timber. Carbon is an add-on.

Yes it will provide encouragement. We advise clients to only sell unobligated units so it will allow clients to sell more units.

Yes. The status quo ETS is attractive if you own land but not enough to tip an investor into buying new land. Averaging would be enough. Growers focus on 'enduring carbon' which can be traded rather than 'obligated carbon'. People understand pre-1990 obligations. They would understand that averaging requires replanting. Issues have been with obligated carbon.

Yes – it would be more attractive but the issue is land cost. Land cost was $2500/ha but it has increased to $5000/ha because of demand by 'bee guys'.

Yes – the only potential downside is that you are locked into forestry. For new afforestation – land is available on farms but farmers won't move until they are educated. Need an extension service – eg, woolshed talks.

Will averaging have an impact on harvest intentions?

No – however it will remove the requirement to monitor carbon.

Possibly – but the impact could be positive. In many cases the current harvest age (down to 24 years) is too young. It is hard to say if averaging will change that.

Depends on whether averaging reflects the actual rotation age or a set age.

No – this depends on log prices.

Yes – growers will be able manage for wood harvest and not for carbon liability.

Will averaging have an impact on existing participants replanting after harvest rather than deforesting?

No. Virtually all area will be replanted anyway – most is on land where forestry is the HBU (Highest and Best Use).

Yes – don't want to repay units.

No - would do so anyway. Once you have planted you would be nuts not to replant – it is hard to get back into grass.

No – required to replant under resource consent. Question is whether to plant pine or manuka.

Yes. Onus of repayment makes replanting more likely if only selling up to safe level.

Yes – the deforestation liability will be significant.

Yes – if don't replant will have a large carbon liability.

No. I will replant anyway because

- Have roads.
- Don't want the land to revert to weeds.
- Most of land has lifestyle potential – trees are compatible with this.
- Farming is too much hassle.

No – currently in forestry because of land – forestry is HBU. Easy to turn-around and plant the next rotation after harvest.

Yes – would encourage replanting to avoid surrender.

Yes – not replanting would cause a repayment of liabilities so they will lock into 2R.

Yes. Most of our clients' forests are farmer owned. Owners are asking whether they should replant especially the younger generation who didn't make the original decision to plant. However most land has forestry as the HBU.

Yes. Will make a difference if have sold units. Will be more likely to replant.

No - but may change species choice. Would prefer pine on some areas currently being planted in manuka.

No. Currently most area is being replanted (apart from some iwi groups which are still deciding what to do).

Will averaging have an impact on non-participants with 1st rotation forest joining the ETS

No. Non-participants are concerned about government influence and fear of a change of policy. They are concerned about price risk.

Depends. If have a carbon level below average then more likely to join. But it is too close to harvest for most to get benefit from averaging. With high log prices these owners don't need challenge of carbon.

Yes – is a simple scheme.

Yes – owners don't want to have carbon that they have to surrender but will join under averaging. Don't believe that ETS should apply to existing forest. The transfer of wealth represents a gift to forest owners who have already planted.

Yes – it simplifies process.

Yes – more certainty.

Yes. Have clients with recent afforestation who would be interested.

Yes – repayment of liabilities puts people off joining.

It depends how rules are applied.

No – if already above average.

Yes – some potential participants are stopped by uncertainty.

No. Will make little impact. 95% of clients with post-1989 forest have joined the ETS. The other 5% have made their minds up and won't join as "Don't trust government".

Depends on current age. Would increase supply of NZUs from owners currently holding them if their forests were eligible.

Yes. Owners with small areas would join.

Will averaging have an impact on non-participants joining the ETS with 2nd rotation forest

Yes. Will be an advantage – increases perceived safe level.

Depends. Lot of people thinking of joining in 2R. Question is whether MPI treat 2R as 1R and allow claims from planting without considering residues from 1R.

Depends. Comes down to price and how much get. View that government got benefit of 1R.

Yes – but It shouldn't apply to 2R. It should only apply to 1R. Owners would have replanted anyway.

Yes – averaging is a game changer.

Equity issue – why should go back to 0 for 2R when someone starting with 15 year old forest in 1R wasn't able to get all the carbon.

Possibly – some forest owners who have not re-registered may join with 2R. It depends on how well they do from 1R. They are aware of the liability imposed by post-harvest residues.

Yes – but get less carbon because of 1R residues if replant immediately so would deforest and wait 4 years to get full benefit.

Yes it would make it more attractive. But perception is that 2R will be treated as 1R and that residues on site from 1R will be ignored. Government should treat as 1R ETS forest even if it is 2R physical forest otherwise it will be regarded as 'nickel & diming' by the government.

HWP

Will HWP have an impact on afforestation?

Yes. Great to recognise HWP. Will need to be simple and well explained. If it raises the safe level it will be beneficial and more attractive to growers.

No – people will understand even less than averaging.

Yes. People would see that the ETS made sense. Instant oxidisation does not make sense.

Yes – allows payment of units back more gradually.

Yes. Fantastic for those who can get their head around it.

HWP appeals more to the big guys. It is more complicated but allows a higher safe level. Big guys would prefer HWP over averaging.

Yes – it will provide a larger pool of safe carbon. No benefit from the delayed surrender – just the higher safe level. The delayed surrender will create an administrative nightmare.

Yes – surrender less carbon (or get higher average).

Will make ETS more attractive & equitable. It annoys people that they don't get HWP now.

Yes – anything that can get greater value from is good. Takes out risk but no upside after first rotation.

Yes. Motivates more because less surrender if in forestry for the long-term. Gives the grower more skin in the game.

Yes. Probably – as more safe carbon.

Yes – less risk in carbon trading.

Yes it will have a more significant impact than harvesting. It will appeal to large-scale forest growers who have an estate and professional advice so they can benefit from it.

Yes – reduces liability and allows owners to sell units. Perception is also important.

Yes. Huge impact – will reduce future liability and reduce concern about carbon price risk.

No – land prices are too high. Need agriculture in the ETS so that farmers who have land to plant have the incentive to do so. In addition, landowners won't understand.

Yes. Will provide encouragement and enhance credibility of ETS. Clients know that in reality that carbon doesn't oxidise instantly at time of harvest.

More complicated – less of a driver but would like to see within averaging.

Will HWP have an impact on harvest intentions?

Possibly. Could stop extension of rotation ages.

No – although it will reduce the constraint on harvesting the issue will still be price if more than the safe level of carbon has been sold.

Yes. Reduces liability – so less concerned about carbon and more concerned about wood.

Possibly – if it is a fair reflection of HWP it may encourage longer rotations that produce fit-for-purpose logs.

Depends. No – if everyone gets the same decay curve. Yes – if get benefit from growing high value log that produces longer-lived products.

No – more dependent on log prices & carbon prices.

Depends. No for smaller owners. Yes for larger blocks.

Will HWP have an impact on existing participants replanting after harvest rather than deforesting?

Yes – but less so than averaging.

No - will replant anyway.

Yes – replanting will allow maximum benefit from the decay curve; ie cumulatively build more carbon in later rotations. 2R peak is higher than 1R peak.

No - most are replanting anyway.

Yes – don't want to surrender.

Will HWP have an impact on non-participants with 1st rotation forest joining the ETS?

Yes probably – but averaging clearer on what you get from it.

Yes – will provide a carrot; eg, for participants who deregistered who have stayed out.

Will HWP have an impact on non-participants joining the ETS with 2nd rotation forest?

No – will have a minor impact. Not a game changer unless add onto averaging.

Depends. It should be more attractive. However it depends on the decay of residues and HWP from 1R. It depends on the impact of HWP on the time of going from net carbon negative to net carbon positive.

Possibly – but would deforest and wait 4 years to get full benefit.

Yes – but 1R harvest residues are an anomaly. This is unfair and needs fixing.

Yes – if consultants can explain

Voluntary or mandatory

Should averaging be voluntary?

Growers of permanent forests want to be able to get full carbon benefit

Large growers want to manage their carbon.

Can't see why small growers wouldn't want averaging.

Some clients have 5 blocks of 10 ha and understand estate concept so want to claim all units and repay if required.

Should only apply to post-2020 new forests (or after averaging becomes available). Deforestation liability should apply to all forests and offset should be available to everyone; ie, bring pre-1990 and post-1989 together. Should phase out post-1989 ETS.

Won't suit some owners.

Traders would like to play the game.

Should be voluntary at least up to some threshold. Less benefit to those with an estate. May be a disincentive for long rotation or different species or non-harvest forest.

Either Voluntary for all or Possibly Voluntary for existing forests and mandatory for new forests.

Many forests will have already exceeded long term average.

Have different age-classes and species so want to manage carbon from estate ourselves and use trading opportunities.

Some clients want maximum income. These owners know the ETS and what to make their own decisions.

Some growers are carbon farmers and want to claim all units. Corporate foresters want to manage their estate. Permanent forests need to be left outside. Small growers are risk averse and would like averaging.

Should HWP be voluntary?

Mandatory. Need to keep simple and avoid too many options.

Mandatory. Keep it simple to administer.

Mandatory. No reason why you wouldn't want it.

Mandatory. Keep it simple.

On principle it should be voluntary but who wouldn't want to keep it.

Shouldn't be introduced at all. It will be an administrative nightmare. There is no additionality created by the forester. Harvesting sets in place the oxidation process so should stick with instant oxidation. Foresters have no control what happens to the logs. Instead the government should use the equivalent value to support the wood processing sector, the development of new products and the use

of wood products in the economy. Want to see the promotion of industry which will lead to a flow-on to log prices.

Mandatory. Too complicated otherwise.

Mandatory. Forestry gets penalised with instant oxidisation. Want shelf-life to be recognised.

Mandatory. Need to be consistent across all forest classes – regardless of whether or not averaging is adopted; ie, it will add to average level or add to low point of sawtooth.

Mandatory. No downside – want simplicity.

Mandatory. Better than instant oxidisation.

Carbon trading strategy

What is your current carbon trading strategy?

Expect current clients to only sell safe units. Had one larger client with strategy to only sell safe units but at an estate-level.

Differs by age:
- 1990s plantings – no clear pattern. Some selling above $17. Clients are aware that will have to repay.
- 2000s plantings – Most are conservative and only sell to safe level. Some have strategy to sell all and fund silviculture.

Have some safe carbon on younger plantings. Holding out for averaging – would encourage to sell some carbon especially for Douglas fir plantings.

With radiata pine 1/3 sell all units, 1/3 sell some – most past safe level, 1/3 sell nothing (don't need the cash and don't want to pay tax). With Douglas fir most selling all units.

Very few post-1989 units being sold. Concerned about liability. Issues are:
- Price
- Certainty & confidence
  - Need to believe that government will get away from boom & bust
  - Certainty about auction
  - Certainty about international units in NZ ETS
  - Ceiling price

Some selling units for 1990s plantings – but only those that re-registered. Few selling 2000s plantings below safe level.

Only selling safe units. Don't see any point in selling and repurchasing.

A lot of clients are only interested in selling carbon that don't have to repay – including clients who deregistered. Forestry investors tend to be risk averse. Only have one client who sells above safe level.

Most clients aren't selling encumbered units – only client selling has non-harvest native regeneration where some units are sold if needed for cashflow.

Depends on age:
- Mixed bag with 1990s plantings. Some selling units because either they don't intend to harvest or they are prepared to take the risk. They know that the upside risk is the price cap of $25. Many are not selling because of harvest liability and price risk.
- Recent planting – most are active sellers and selling carbon but still under safe level because of age of stands.

Some post-1989 owners are selling units reservedly – they are nervous about repayment. Most owners are not selling. By nature forest owners are patient.

Everyone is terrified of future market risk
- None of 1990s plantings selling
- None of 2000s planting selling
- Only selling of pre-1990 units & arbitrage unit

Most clients have sold to safe level although some clients don't know what their safe level is. Some clients sell above the safe level to pay off debt.

Some clients have younger plantings and most have only sold up to the safe level. The odd client has sold all units. We advise clients to only sell safe units.

Only sell unobligated units that are not required to pay back.

Growers tend to be conservative – only prepared to sell safe carbon.

Sensitivity of decisions

What impact would changing carbon price have on decisions (if any)? ie, at what carbon price would a different decision be made?

Clients are interested in more afforestation but need carbon price to be consistently above $20.

Focus is on land cost. Have a farmer selling 500 ha of rough hill country 50 km from the port (too hot & dry and not enough manuka for competition from bees). Likely to be $5000/ha. Would have been $2500 to $3000 8 years ago, increasing to $4000/ha 5 years ago.

Example of land under a radiata pine forestry right being purchased by bee company for $4500 when previously worth $2000/ha – will plant manuka.

If own land then $20 is enough to incentivise planting. If purchase land then need $25 to $30 (Used to be $15 to $18 but land cost has increased).

Key issue is that have farmers who don't like trees.

Land prices might have moved by 5 to 10% over last 2 years. Need about $5000 to $5500/ha up front so that can afford to buy the sort of land that you want.

Now have carbon price > $15 but new land planting has taken off because:

1. Don't trust government
2. Uncertainty about auction process and international units; ie concern that government will control price
3. Forestry ROI is not good enough
4. Cost of bush.
    a. Need to aggregate fragmented forests to achieve economies of scale but if sell mid-rotation have to pay tax whereas buyer must use COB.

$15 gives confidence but challenge is buying land. 8 years ago could buy rough North Island land for $2000/ha. This now costs $4500 to $5000/ha because of demand from bee keepers.

$15 to $18 needed for afforestation but have to pay $3500/ha for scrub land that would take $2000/ha of land prep.

Land price is the key limiting factor.

On the way up $18 to 20 makes people interested in afforestation. On the way down $10 stops them being interested.

$15/NZU is key price for afforestation.

What are your perceptions of future carbon price level and volatility?

Price has become relatively stable. Nerve-racking when it went down.

Prefer the AGS – simple and easy. It gives cash up front. It should be extended to cover all carbon. Not just carbon for the first 10 years. There should also be a charge for deforestation.

Uncertainty about overseas units has dampened enthusiasm.

From now to 2020 expect an ok price in the $16 to $21 range. Although there are lots of units in the registry many are encumbered (needed for future surrender) or being stockpiled. Uncertain past 2020 because of auctions and international units.

Suspicion of political interference.

Key is perception that government is not treating ETS as a political football.

Target rotation age

Are there differences in target rotation age for participants vs non-participants?

Yes. Those in ETS seem to know more about what they want to do and have long term strategy to cut at age 26. Non-participants tend to cut younger with high log price.

Yes – expect some of Douglas fir to be ready for harvest at age 35 but likely to defer harvest if getting good carbon income.

No – specified by carbon lease that can't harvest until age 27

Yes – Non-participants with radiata pine 28 years. Participants extending to 35 to 38 years. Douglas fir extending from 40 to 50 years to 100 years.

Not doing so yet but may do so in 5 to 10 years' time. Woodflows are more important.

Only if participants had sold units and couldn't afford to pay them back so had to grow on. But participants generally aren't selling these units.

Small differences. Primary harvest based on wood production. Will spread harvest because of scale and spread of cashflows. Will also factor in carbon liabilities.

No –other drivers are more important

No – trigger is log price and personal circumstances

Only for one client with long lead distance who might extend past 30 years and play carbon market.

No – harvesting is driven by log prices.

Only if have leased carbon – may have a minimum clearfell age of 25 years or 27 years imposed.

Yes. CAI is steep around 20 to 25 and encourages later harvest.

Issues affecting participation/afforestation in the ETS?

What is the perception of the impact of the ETS on profitability?

Fundamentally good and encouraged clients to get in.

Good. If brought in HWP would be even better.

Recently sold some arbitrage units. Sent cheques to JV farmers. This has created interest in planting more.

In North Canterbury it has been the only source of income for some farmers. Word-of-mouth has spread this positive message.

Some people have done extremely well by selling units. Some have spent money on compliance (FMA) without seeing any income for it.

What are perceived barriers?

Need agriculture in ETS to stimulate afforestation. Averaging and HWP changes are good but won't do much on their own. Need farmers with 5 to 20% of land better suited to trees to have the incentive to plant.

FMA process painful and inflexible. If want to add an area to CRA get given a new set of PSPs. FMA should be voluntary.

Biggest challenge is bureaucracy – navigating through (and getting information on) eligibility & rules; e.g. pre-1990 vs post-1989.

Whole of the ETS needs to be simplified.

Big ask to give people confidence in forestry and associated sale of carbon – no understanding.

Getting property information to confirm eligibility. Day-to-day workings – onus is on own record keeping.

Compliance costs (FMA). Hassles with mapping & convincing MPI that areas are correct.

ETS is too complex for most people. Need to expand use of look-up tables. FMA too complex & costly.

Identification of what land is eligible and easy registration.

FMA process is fraught. There has been a large variation in results that get back from MPI for FMA plots.

Audit process needs to be more user-friendly. Penalties regime is too inflexible with fines even for small mistakes (eg $500 for wrong planting date)

Forest owners don't understand ETS – need streamlining and simplification.

Huge cost of measurement – why not have a regional measurement table that is jointly funded and based on a collective set of plots.

HWP is important and understanding how repayment works.

Investors don't trust government.

- Don't think that government is serious about ETS.
- Could pull rug out.
- Had investor wanting 9% rather than normal 5 to 6%.

Need to simplify

There are two main issues

- Cost of admin and audit
- Future liabilities and carbon price risk

AGS is good – it provides certainty about income.

Simplify administration