Rod Donald
banks peninsula trust
te pātaka o rākaihautū

Facilitating Biodiversity Enhancement using Income from Carbon Credits

17 July 2019

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Executive summary

The report aims to inform the Rod Donald Banks Peninsula Trust and partner organisations on the potential for carbon credit income to support the enhancement of native biodiversity, particularly on land that is marginal for farming.

Carbon income is both facilitated and constrained by New Zealand's international commitments under the Kyoto Protocol and the domestic legislation enacting these commitments, specifically the Emissions Trading Scheme (ETS). The ETS is undergoing review to make registration easier and enable the carbon price to rise from its current cap of $25, albeit still within limits. The voluntary market is growing as companies and individuals become more aware of climate change, and seek to offset their emissions.

While these changes signal benefits for those sequestering carbon, the path forward for native regenerating areas will still not be easy. To register, a forest must:

- be established after 1990 as carbon sequestered in earlier forests is already included in the international commitment,
- contain sufficient species to eventually create a 30% canopy cover of 5.5m in height per hectare.

As naturally regenerating areas tend to be irregularly interspersed with ineligible pre 1990 areas, open pastureland and dense gorse- where it is hard to assess the level of regeneration- they need to be individually assessed before applying to MPI under the ETS. Most covenanted areas are disbarred as they tend to protect pre 1990 areas.

Land that is early in transition to forest has the greatest earning potential, as the carbon sequestered in native forests peaks at around 20 years after the regeneration establishes. However, ungrazed pasture can be slow to regenerate once a thick grass sward has developed. Planting provides a way to speed this, but it is expensive. The Billion Trees initiative provides grant funding for both native regeneration and at a higher level for native planting projects.

A basic model developed to test the likely carbon income yield from various scenarios and with the ***current carbon price of $25*** suggests that:

- Natural regeneration, particularly when supplemented with a $1000 per ha Billion Trees regeneration grant, is likely to generate a better return than large scale planting projects. Grants at about twice the level of the current Billion Trees maximum of $6000 would be needed before planting yields a greater profit than low cost natural regeneration.
- Some strategic minimal planting is worthwhile to speed carbon income where regeneration is already occurring, but is slow.
- Registering land managed for conservation is well worth while, and it may also be attractive for highly marginal areas, - provided the regeneration has started post 1990.
- Unless carbon prices rise significantly, (to at least $45 per credit), there is probably not enough profit to persuade farmers to retire land en-masse from grazing, particularly as this would fetter the future land use and carbon earnings will taper off after 30 years.

Contents

1 Introduction 1

2 Legislative framework 2
- 2.1 Kyoto protocol 2
- 2.2 Climate Response Act 2002 3
- 2.3 Emissions Trading Scheme (ETS) 3
- 2.4 Voluntary market 5
- 2.5 Legislative changes 5

3 Trading carbon credits (NZUs) 6
- 3.1 Tracking NZU prices 6
- 3.2 Carbon price crash 6
- 3.3 Price ceiling 7
- 3.4 Market opportunity 7

4 Registering Forests 8
- 4.1 Kyoto requirements 8
- 4.2 Rotational forests 8
- 4.3 Permanent Forests 8
- 4.4 Uneconomic plantation forests 9
- 4.5 Naturally regenerating areas and their inherent complexity 9
- 4.6 Using aerial photography to determine eligibility 10
- 4.7 Non qualifying areas 11
- 4.8 Receiving credits after registration 12

5 Barriers to registering naturally regenerating areas 12
- 5.1 Issues resolved in revised ETS 12
- 5.2 Barriers likely to remain 13

6 Potential income from naturally regenerating areas 15
- 6.1 Using registered properties to gauge income expectations 16
- 6.2 Net Income based on Waipuna Bush experience – check figures 17
- 6.3 Relevance for conversion of land from farming to native forest 18
- 6.4 Using planting to speed the process 19

7 Billion Trees – a potential short-term game changer 23
- 7.1 Direct Landowner Grants 23
- 7.2 Partnership grants 25
- 7.3 Potential Rod Donald Trust involvement in landscape scale change 25

8 Modelling potential income and profit 26
- 8.1 Forecasting Waipuna Bush 26

9 Generating income for Umbrella trusts 28

10 Threats to biodiversity 29
- 10.1 Large scale spraying 29
- 10.2 Exotic forestry 29
- 10.3 Turning these around with carbon credits 30

11 Conclusions 30

12 Next Steps 31

Appendix A. Waipuna Bush report 33

Appendix B. Model calculations 36

B.1 Waipuna Bush 37

Figure 1 MFE NZU trading diagram 4
Figure 2 Carbon price graph 6
Figure 3 Areas of the Peninsula available on Canterbury Maps for 1990-94 10
Figure 4 Sequestration rate for indigenous forest 14
Figure 5 Total carbon dioxide accumulated for indigenous forest 15
Figure 6 Projected carbon income based on Waipuna example 28
Figure 7 Extensive sprayed mature bush in Hickory Bay 29
Figure 8 Waipuna Bush carbon area map 35

Table 1 Billion Tree Direct Landowner Grant amounts 24
Table 2 Natural Regeneration, Eligible areas taking 10, 15 and 20 years to qualify – without and with Billion Trees Regeneration grant 38
Table 3 Planting Scenarios with different methods and grant levels 39

1 Introduction

Rod Donald Banks Peninsula Trust has a Biodiversity Goal in its Strategic Plan to *"Maximise income from carbon sequestration to support biodiversity regeneration on a landscape scale*." [1]

The original purpose of the research was to inform and update the Rod Donald Banks Peninsula Trust on the potential for carbon credit income to support the enhancement of native biodiversity on Banks Peninsula, and the flow-on effects to its other biodiversity goals and its access, knowledge and partnership goals. The Trust has been asked by partner organisations to make its research available, and does so in this release on a confidential basis, seeking comment and input to help refine it further.

There is interest from many landowners on Banks Peninsula in the potential to earn from carbon sequestration, but the process is not straightforward, particularly when the method includes naturally regenerating areas.

The Trust itself has a direct interest in the potential to receive income from its own property, Rod Donald Hut, and to better understand the carbon potential of other properties where it may be interested in securing access and enhancing biodiversity. Developing expertise in carbon credits earning may enable the Trust to further partnership projects, to assist partner organisations to augment their income, and to potentially take a larger role in encouraging more private landowners to convert marginal land from farming into permanent native forest.

The government is currently changing the legislation around carbon sequestration to make the process easier, and the price of carbon credits has risen significantly over the past year. The recently announced Billion Trees initiative incentivises both planting and natural regeneration, helping to unlock carbon income. These changes mean the cost/benefit of converting marginal land from pasture to native forest is changing in a positive direction.

At the same time, there are threats to biodiversity from changing land uses. Many farmers across the Peninsula are currently spraying off large and quite mature regenerating areas, and the new incentives for carbon sequestration and forestry are likely to increase landowner interest in planting exotic rotational forests, including pines. By moving quickly to build knowledge, the Trust may put itself in a position to influence land use choices toward natural native regeneration on a large scale and such intervention may be timely.

The report therefore provides a summary of:

- the legislative framework enabling the earning and trading of carbon credits and how this is changing,
- carbon credit prices,
- the constraints on and process of registering permanent native forests for carbon credits,
- the complexity and therefore issues with registering naturally regenerating land,
- the potential income for different sites and with different assumptions, using a model built from Waipuna Bush, and,
- how Billion Trees grants affect that potential income.

[1] The Trust has been recommended to change the wording to Utilise rather than Maximise – because maximising carbon income from carbon sequestration would mean planting exotic hardwoods (the income could then be used for biodiversity – but not what the Trust intends)

Threats to large areas of biodiversity from new farming practices and potentially from exotic forestry encouraged by carbon and grant opportunities are briefly canvassed.

The report concludes with the recommendation that the Trust continues to investigate and build knowledge on the topic in conjunction with progressing its own projects and partnering with other agencies and organisations working on the Peninsula to improve opportunities for earning from carbon sequestered in native forests.

2 Legislative framework

The Ministry for the Environment website states: *"New Zealand is a party to the United Nations Framework Convention on Climate Change, and this in turn provides the overarching legislative framework under which carbon credits are generated and traded internationally and in New Zealand. The UNFCCC was adopted by New Zealand at the Rio Earth Summit in 1992. The agreement recognised there was a climate change problem, put the onus on developed countries to lead the way in addressing it, directed funds to climate change activities in developing countries and charted the beginning of a path to strike a balance between economic development and mitigating climate change."*[2].

Subsequent to this, New Zealand signed the Kyoto Protocol and then passed the Climate Response Act in 2002 to begin the process of meeting its Kyoto commitments. The domestic Emissions Trading Scheme (ETS) was then developed to enable New Zealand to account for its emissions and sequestration. Since then an additional voluntary market has developed outside of the ETS (but interacting with it) and there have been and continue to be legislative changes, both internationally and nationally. Understanding the legislative framework helps to explain the criteria applied to native forest regeneration projects on the ground.

2.1 Kyoto Protocol

The Kyoto Protocol was ratified by New Zealand in 2002 and came into force in 2005 after 55 countries had signed up. The Kyoto Protocol facilitated global reduction in emissions over time through the introduction of an international cap-and-trade system.

Participating developed countries (including New Zealand) each committed themselves to a country-specific greenhouse gas emission reduction target for the first commitment period – 2008-2012. Taken together these reductions aimed to reduce emissions to 5% below their 1990 level. The New Zealand target was 0% reduction below 1990 levels.

Since then there have been targets negotiated and agreed for two further commitment periods. The Doha commitment covers 2013-2020. The most recent Paris agreement covers 2020-2030. New Zealand did not sign up to the Doha commitment, but in Ithis upcoming Paris period New Zealand has committed to reduce its emissions to 11% below 1990 levels by 2030.

The total level of emissions is measured through national greenhouse gas inventory reports to the UNFCCC. An assessment is made at the end of each five-year commitment period, and countries that have failed to meet their targets must make up the difference in the next compliance period plus an additional 30%. This is how the cap on emissions is enforced.

Emissions are measured in units, with each unit representing 1 tonne of carbon dioxide equivalent. International trading of units allows a country with a deficit of units at the end of a commitment period to meet its deficit through purchasing units from another country that has a surplus.

[2] http://www.mfe.govt.nz/climate-change/why-climate-change-matters/global-response/new-zealand-and-united-nations-framework

Countries are issued with Assigned Amount Units(AAUs) equivalent to their emissions under the agreed cap in each period, meaning that a country that comes in below its cap will have units to sell, whereas a country that is above its target will have a deficit.

Units can also be generated through various sequestration and reduction activities, provided that these are not double counted in the national accounts. These units include:

- RMUs (removal units) are generated by additional forestry over and above those forests that were already included when calculating the net emissions at 1990 levels.
- ERUs (Emission Removal generated by joint implementation project) allow a country to invest in reductions in another country. For instance British investment in a clean energy power plant in Poland may result in greater global reductions than Britain investing in cleaning up its own lower emitting power plants, so Britain can earn units for assisting with such a joint project.
- CERs are generated by the Clean Development Mechanism projects in developing countries where the units are sold to developed countries(see below)

2.1.1 Clean Development Mechanism projects

Developing countries are treated differently from developed countries, in recognition that they are not as responsible for the current levels of greenhouse gases already accumulated in the atmosphere and that they have a right to continue to develop. The Kyoto Protocol initiated the Clean Development Mechanism (CDM) to enable these countries to continue developing but skip the "fossil fuel" stage through projects that result in lower emissions than if the conventional path had been followed. Such projects then generate Certified Emission Reduction Units (CERs). The CDM allows developed countries to buy CERs and to invest in emission reductions where it is cheapest globally. CERs can then be used by a developed country to meet its reduction target at the end of the commitment period. (Hence units can be created from projects such as providing more efficient cookstoves in developing countries etc.)

2.2 Climate Response Act 2002

New Zealand meets its Kyoto commitments through the Climate Response Act. As the The Ministry for the Environment states:

"The Climate Change Response Act 2002 puts in place a legal framework to enable New Zealand to meet its international obligations under the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

The Act includes powers for the Minister of Finance to manage New Zealand's holdings of units that represent New Zealand's target allocation for greenhouse gas emissions under the Protocol. It enables the Minister to trade those units on the international market. It establishes a registry to record holdings and transfers of units. The Act also establishes a national inventory agency to record and report information relating to greenhouse gas emissions in accordance with international requirements."[3]

2.3 Emissions Trading Scheme (ETS)

The Emissions Trading Scheme is part of the Climate Response Act and provides the NZ Government with its main policy tool for reducing greenhouse gas emissions. Its objective is to assist NZ to meets its international obligations and reduce net emissions below business-as-usual levels, by providing emitters

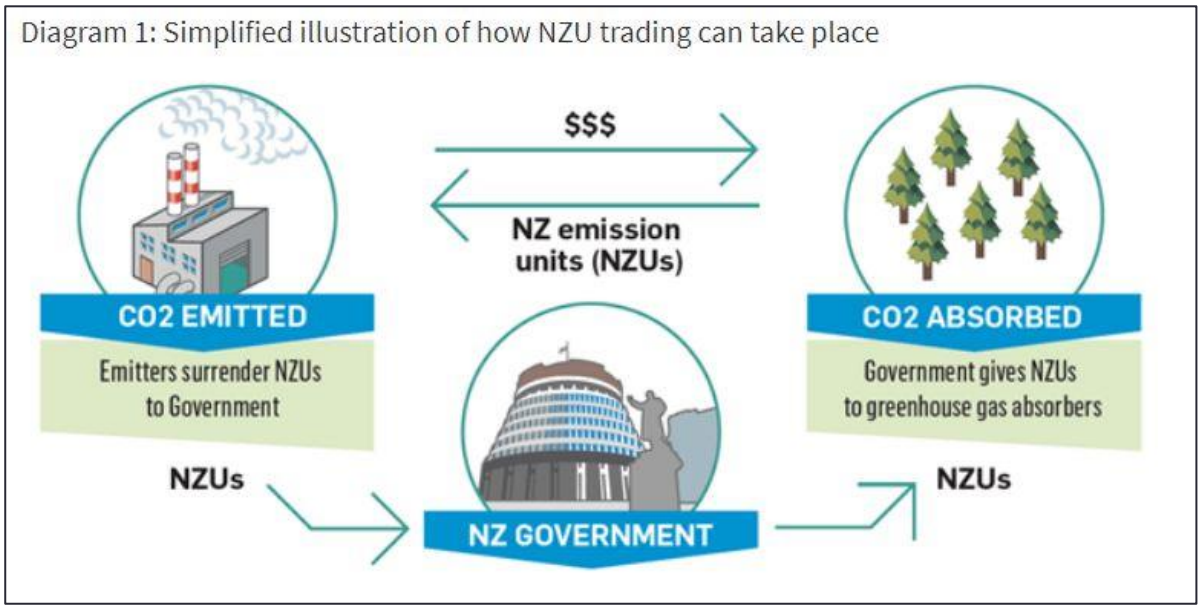
[3] http://www.mfe.govt.nz/climate-change/acts-and-regulations/climate-change-response-act-2002

with incentives to decrease emissions, others with an incentive to sequester carbon, and a method to count up and aggregate net emissions across the country and keep track of them in the NZ registry.

However, it is important to appreciate that while the ETS incentivises reductions (in theory) its principle purpose is to assist New Zealand's obligation to meet international reporting requirements.

The ETS creates the NZU as the primary domestic unit of trade. **1 NZU represents 1 tonne of carbon**. The following diagram shows how the government generates NZUs and allocates them to activities absorbing carbon – principally forestry. The owners of these NZUs can then sell them to emitters, who use them to meet their obligation to the government to surrender units equivalent to their emission levels.

Figure 1 MFE NZU trading diagram



https://www.mfe.govt.nz/climate-change/new-zealand-emissions-trading-scheme/about-nz-ets

2.3.1 Emitters purchase units

Under the ETS, obligated parties (fossil fuel importers and producers, industrial producers and landfill operators) are required to *surrender* to the government one emission unit for each tonne of emissions for which they were liable.[4] [5]

The cost to obligated parties of surrendering emission units gets passed on across the supply chain, raising the relative cost of higher-emission goods and services, making lower emission behaviour more competitive, and creating an incentive for businesses and consumers to reduce or avoid emissions. This is largely "invisible" to the public as it is done as high up the chain as possible (i.e. fuel importing companies) Obligated parties currently generate about 51% of New Zealand's emissions. The remaining 49% are biological emissions from agriculture which are not included in the ETS.

Trade exposed industrial producers also receive an ongoing free allocation of units (AAUs) to support their international competitiveness.[6]

[4] Prior to 2017 non-forestry participants were currently required to surrender *one eligible unit for every two whole tonnes of emissions* from each activity (50% surrender obligation), as assessed in the Participant's emissions return. This 'one for two' surrender obligation has been phased out in three equal steps. The 50% surrender obligation was increased to 67% from 1 January 2017, to 83% from 1 January 2018, with all sectors in the ETS paying the full market price from 1 January 2019

[5] Modified from : http://www.epa.govt.nz/e-m-t/taking-part/guidance/Pages/Surrendering-Units.aspx

[6] Kerr, A GUIDE TO THE NEW ZEALAND EMISSIONS TRADING SCHEME – need to fud this again and get a date

2.3.2 Sequestering Landowners sell units

Landowners are able to voluntarily enter the ETS and earn NZUs for the carbon sequestered by the post-1989trees on their land sequester, provided these trees meet the Kyoto definition of a forest.

The amount of carbon sequestered is measured and accrued over 5-year accounting periods. For areas of under 100ha, lookup tables are used to estimate the amount of carbon that is likely to have been sequestered. For areas of 100ha or more, a Field Measurements approach is used, involving consultants or landowners measuring the growth and sequestration and providing a report to MPI. These reports are expensive (e.g. $10k every 5 years). Land owners have the option to submit annual emission returns based on either the look up tables, or if over 100ha their own "landowner specific look-up tables".

Once the report is accepted by MPI, the landowner is allocated 1 NZU for each tonne of carbon sequestered. NZUs have no vintage date and do not expire, so they can be retained and sold when it suits the owner. NZUs are not able to be traded internationally but can be converted to AAUs by application to the Government.

2.4 Voluntary market

Petrol and power derived from coal generation is already "covered" by the ETS, through the surrender of NZUs or other approved units by the "obligated parties" at the top of the chain.

As well as the "obligated parties" under the ETS there is an increasing number of companies, organisations such as Councils and government departments, and private individuals also seeking to voluntarily reduce their carbon emissions and to offset what they are unable to reduce by purchasing carbon credits. The process here is to purchase and cancel units that are outside the national inventory accounts or units such as those backed by AAUs where they will be removed from the national accounts.This becomes a voluntary carbon offset.

2.4.1 Enviro-Mark Solutions - carboNZero programme

Enviro-Mark Solutions (based at Landcare Research) runs programmes that enable companies to have their emissions calculated and work toward annual reductions on a voluntary basis as above. If they also choose to participate in the carboNZero program they are able to purchase PFSI-AAUs to offset their remaining emissions. Enviro-Mark Solutions has maintained high standards and to date has only offered their clients AAUs issued to PFSI registered projects that are permanent native forestry with a covenant for 100 years or more, or CERs issued to international projects certified under the Clean Development Mechanism and additionally Gold Standard Certified to ensure that there are social and community co-benefits.. They also provide a calculator so that private individuals can calculate their emissions, and make a voluntary offset.

2.5 Legislative changes

The ETS was introduced in September 2008 under the outgoing Labour government. It was then amended several times by the National government, weakening its relationship with the international Kyoto market and moderating the price impact of the system. (Emitters being allowed two tonnes of emissions per unit is one example of how the ETS was weakened).

It has now undergone another review under the current government and changes to strengthen it will be brought in over the next few years which are likely to improve the carbon price and enlarge the market. The "two for one" deal has already ended, and the next changes are scheduled for later in 2019 when the overarching Climate Response Act is overhauled. Where relevant, these upcoming changes are noted in report sections below. Of particular relevance to the native forest sector is that the former PFSI (Permanent

Forest Sink Initiative) is to be discontinued. The permanent native forest projects will now become part of the ETS and identified as the Post 1989 Permanent Fores.

As well as improvements to the ETS listed above, the Climate Change Response (Zero Carbon) Amendment Billa (Zero Carbon Bill) making its way through the parliamentary process is likely to require emitters to reduce emissions and surrender units and this in turn should encourage more sequestration. This more favourable regulatory environment, new grants, and increasing carbon prices mean that setting aside land for regeneration or carbon forestry is becoming much more attractive than it has been to date.

3 Trading carbon credits (NZUs)

Trading can be done through a variety of mechanisms. There are carbon brokers who buy and sell credits including Permanent Forests Ltd (the Beltons' company). Alternative carbon brokers include OM Financial and Westpac commodities. Other options include selling direct to companies such as Air New Zealand.

The government maintains a NZ Emissions Trading Register (NZ-ETR). The register is updated when a trade takes place. Units have a unique serial number and can be traced back to the source. This is essential for transparency so that buyers can trace the source of their units.

3.1 Tracking NZU prices

The price of NZ ETS is determined by the supply and demand in the market. It can be tracked on various websites including www.carbonforestservices.co.nz. The chart below shows the movement in price since the low point of $1.60 per unit in March 2013.

Figure 2 Carbon price graph

3.2 Carbon price crash

Under Kyoto Commitment Period 1 (up to 2015), developed countries could issue AAUs (assigned amount units) up to the value of their capped emissions based on the 1990 base year. At the end of the five-year commitment period, they were then required to cancel AAUs equivalent to their actual verified emissions. If the country achieved an emissions level below its target, it would be able to retain the excess units. In the first Kyoto period developed countries were allocated AAUs (assigned amount units) up to the value of their commitment. This meant that a country that met its target at the end of the period would have these assigned amount units in its registry.

Countries such as the Ukraine and Russia, had been allocated AAU's based on emissions at 1990 levels, but suffered significant economic collapse in the mid 1990's. Therefore, they had a significant number of units for sale post 2008. Most countries and international trading schemes banned use of these "hot air" units – but New Zealand did not.

NZ obligated parties under the ETS were therefore able to purchase these AAU units cheaply and this had the effect of depressing the price of NZUs to very low levels.

3.2.1 Hinewai credits held up during the crash

During the low point crisis, Enviro-Mark Solutions maintained a higher price for units derived from PFSI natural native forest projects, principally sourced from Hinewai. Although the market price for NZUs had dropped to $2, they continued to pay $12.50 for Hinewai Reserve PFSI units credits for customers seeking to voluntarily offset their emissions; this protected Hinewai from the low market price.

3.2.2 Price recovery

New Zealand did not ratify the Doha Agreement (Kyoto Commitment Period 2) and as a result was required to stop accepting international Kyoto units into the ETS, although this change took until 2015 to come into effect. Now obligated emitters can only surrender NZUs that they have purchased through the domestic ETS, meaning the ETS is now a domestic-only system. The Paris agreement also helped solve this problem by ruling that international emission reductions can be traded only from government to government, and reductions sold will have to be additional to the seller's own Paris target.[7]

This has meant that the price of NZUs has responded to supply and demand and has now risen to the current price of $25 where it is held artificially by a price ceiling under the ETS. However, organisations using PFSI units as a voluntary offset are able to cancel AAUs in the ETS and these are commanding a price above $30 per unit.

3.3 Price ceiling

The NZU price is currently artificially constrained at $25 because the ETS operates with a price ceiling mechanism. This was put in place to protect emitters and New Zealand's exporters.

Obligated parties are able to purchase unlimited NZUs from the government for immediate surrender (not banking or trading) at a fixed price of NZ$25 per NZU, hence the market price does not rise above this ceiling level.

The government has signalled it will remove the price ceiling when it amends the Climate Change Response Act later this year. However, the market will still be constrained in favour of emitters because the NZU price will still be subject to a containment mechanism to give them a level of security. So while the NZU price will rise, it will not go as high as it would without the containment mechanism. Current signals are it will go to at least $30-$35.

Note that the price ceiling does not apply directly to the voluntary market, and hence the price in Figure 1 has risen above the ceiling. However, it may constrain the natural movement in the voluntary market and the relationship between the price ceiling and the voluntary market merits some further investigation.

3.4 Market opportunity

There is currently a shortage of units issued to PFSI projects in New Zealand, particularly the high quality credits based on permanent native forest sought after by the voluntary market. Enviro-Mark Solutions has more demand for good quality PFSI units than currently available in the market. (Ann Smith).

[7] https://theconversation.com/a-new-approach-to-emissions-trading-in-a-post-paris-climate-78746

Given that it will soon be easier to register under the ETS and that the carbon price is also likely to rise, this presents a favourable market condition for changing the land use of marginal land to natural regeneration and registering for carbon.

4 Registering Forests

To qualify under the ETS (or previously PFSI), a forest must

- meet the Kyoto protocol definition of a qualifying forest
- provide evidence to MPI that it qualifies
- be approved by MPI

4.1 Kyoto requirements

To qualify under Kyoto, a forest must be additional to what has already been "counted" by the government in its agreement to lower its emissions below 1990 levels. It must be able to demonstrate that

- It has been established after 1990
- has the *potential* to reach a canopy per ha of 30% crown cover with species that reach 5.5m or more in height
- be at least 1ha in size, and,
- be directly human induced – either through planting or a management regime deliberately encouraging regeneration.

This is straightforward to demonstrate for a planted forest, as the date of planting, species and density are known. It is much more complex when the land is naturally regenerating.

4.2 Rotational forests

Forests include both plantation forest areas subject to rotational harvest and permanent forests.

Rotational forests do absorb carbon, but when the forest is felled, it is treated as emissions. Though some of the carbon is retained in the form of wood products, cmuch of it is released from the slash rotting down.

Under the current ETS, rotational forests earn credits as they grown, but then must surrender most of them again on harvest, retaining only a few to account for carbon sequestered in the remaining roots. Under the revised ETS, rotational forests will only earn credits for the first rotation (equating to the average carbon sequestered during the life of that rotation) and must then be replanted. Provision is also being made for the carbon sequestered in the wood products.

4.3 Permanent Forests

Permanent forests include any type of forest that is not intended for harvest – such as an area of native biodiversity naturally regenerating, an area planted in natives, or a plantation forest area that has been retired from rotational harvesting – such an abandoned pine forest. The type of forest the Trust is most interested in is areas of naturally regenerating native forest, protected in perpetuity by covenant, and hence this report focusses on this type of forest carbon sink.

As stated earlier, permanent forests currently register under the Permanent Forest Sink Initiative (PFSI) scheme, but this is to be discontinued due to reforms to the ETS, and permanent forests will then come under the ETS.

4.4 Uneconomic plantation forests

It is very likely that many Kyoto compliant forests that were established in the 1990s during the forestry planting boom, will be un-economic to harvest, or were placed in areas where clear-felling will be detrimental to the surrounding environment. In these instances, exotic forests may be entered into the ETS and gradually managed to a natural forest state, or if left to its own devices the forest will eventually revert back to native species.

The situation of managing exotic forests into native forests is a real opportunity if managed correctly.

4.5 Naturally regenerating areas and their inherent complexity

Naturally regenerating land is usually marginal land that has not been intensively farmed for some time and is likely to contain a mixture of forest ages, including:

- remnants or regenerating bush that was already established in 1989 and therefore does not qualify,
- areas of weed infestation such as gorse or blackberry that may have regenerating natives underneath;
- regenerating bush that has established since 1990;
- species that will never meet the 5.5m height, and,
- open pastureland dotted with some regeneration, but not yet enough to meet the 30% potential crown cover requirement.

None of this is likely to fall into neat 1ha blocks with straight boundaries, but instead is a patchy mixture making assessment for registration more complex again.

Another even more thorny issue is determining the age of the trees that are present. There is a lack of information on growth rates of different species (e.g. the relationship of height or trunk diameters to tree age), and destructive sampling to determine age is highly undesirable. At present there does not seem to be enough research into this topic or pooling of data derived from destructive sampling.

4.5.1 Classifying land

The land needs to be classified into three categories of areas and evidence supplied to MPI for their assessment before the registration can be accepted.

The categories are:

- Qualifying land – post 1989 forest with potential canopy cover of 30%
- Eligible but not yet qualifying land – area of open pasture without enough tree species to qualify, but in a management regime that means it will eventually qualify
- Non-qualifying land – pre 1990 forest (i.e. old growth covenants or long established regeneration), areas that cannot support 5.5m high trees (such as rocky outcrops), etc.

4.5.2 Use of consultants

Most landowners have used consultants to prepare their applications. On Banks Peninsula the main consultants are Permanent Forests NZ Ltd (Mark Belton and formerly Ollie Belton) and Greenco (Clayton Wallwork). These consultants will carry out the following steps, and provide some indication of the likely sequestration rates and potential earnings:

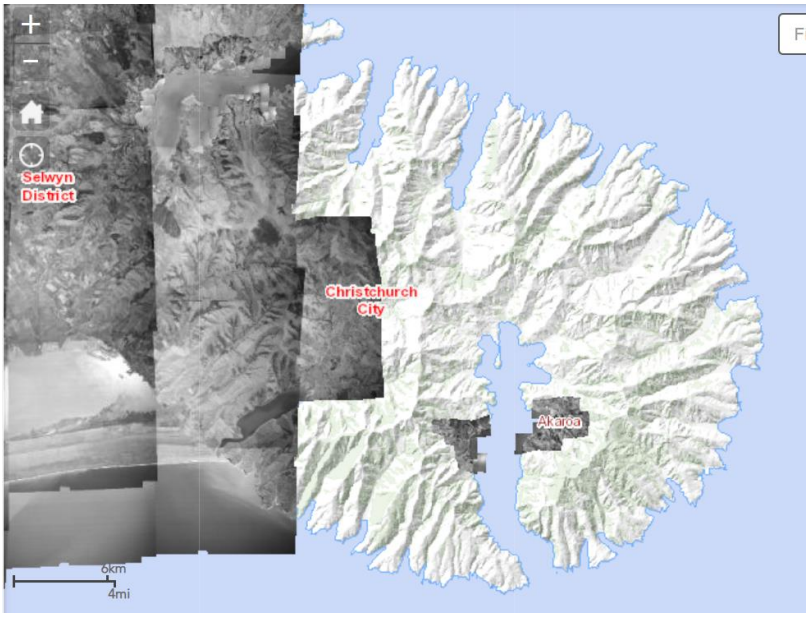
- Use photography to determine what vegetation cover was on the land in 1990 and therefore what category it falls into
- Conduct on-site testing if necessary to provide further evidence of the age of the native plants – this can include destructive sampling
- Submit the application for MPI

4.6 Using aerial photography to determine eligibility

Aerial photography of the site in 1990 is used where possible to show what vegetation was on the land at that point, and establish what has developed since then. This presents several difficulties for Peninsula properties.

The first is the difficulty in sourcing aerial imagery of the site from this time. The Canterbury Maps website has historical imagery for all of Canterbury from the period 1985 to 1989 except for Banks Peninsula where there is none. In the period 1990 to 1994 there is imagery for the western most parts of the Peninsula, Little River and Akaroa, but but the majority of the Peninsula is not covered.

Figure 3 Areas of the Peninsula available on Canterbury Maps for 1990-94



The second difficulty occurs when imagery shows there was some vegetation on the site prior to 1990. Most images from this period are monochrome and relatively poor resolution. It is therefore difficult to determine the nature and type of vegetation present.

4.6.1 Identifying Qualifying land

Land showing as bare on 1990 photography, but now covered with regenerating natives, or with a nurse crop such as gorse and sufficient native seedlings underneath is potentially qualifying land. Further assessment is then needed to determine the age and density of the plants on this land.

Land shown with vegetation on it prior to 1990 is more problematic, and unfortunately this is the situation applying to much regenerating land. The area covered may have increased since 1990, and the qualifying plants increased in density and height, but if there was vegetation of any kind present, it can be hard to persuade MPI that it is now qualifying, and destructive sampling is probably required to show that the qualifying plants are post 1990.

4.6.2 Identifying Eligible but not yet qualifying land

Where there is open pasture containing some regeneration, but not enough to meet the potential 30% canopy cover rule, the land can be registered but as not yet qualifying, if it is now in a management regime where forest is likely to develop. The speed with which this land now regenerates to the qualifying status is quite critical to the potential carbon income from the property.

4.6.3 MPI assessment

Once an application has been prepared, it is then submitted to MPI for consideration. MPI may challenge aspects of the application or decline it, using their own set of images which until now, they have not shared with the applicant.

The difficulty of convincing MPI of qualifying areas is one of the principal difficulties of the registration process. The Panama Reserve application prepared by Permanent Forests NZ Ltd for the Langer Trust application has been declined because MPI were not satisfied that the areas put forward were post 1989 forest.

MPI have clarified their position on making such determinations as follows:

"Issues relate to determining the age of the trees, and where older low resolution aerial photography indicates there may have been some form of woody cover in 1990.

- *As Gorse does not reach 5m, is not a forest species, therefore its presence alone does not constitute the land as forest land, as defined in the Act.*
- *The assessment team frequently finds it difficult to evidence that application land did not include any forest species seedlings (at a density which is likely to have at least 30% tree crown cover at maturity) nearly 30 years ago.*
- *Historical aerial imagery often just displays woody vegetation for which the species isn't clear. Also, what is regenerating under the canopy is not visible from the air.*
- *If there is no indisputable evidence to support that this vegetation did not include forest species (e.g. Manuka), then under law, the assessment team have to consider that there might be.*
- *If it is likely that forest species might be present as at 31 Dec 1989, they are unable to deem it eligible post 1989 land.*
- *This is often the case for applications which have a land history dominated by Gorse.*
- *As you are aware, Gorse is a known nursery species in the succession of native forest regeneration, therefore there is a high likelihood that forest species are present amongst the Gorse."*[8]

This is a critical area requiring further investigation and discussion with MPI, particularly around the management in the 30 years since 1989. If a potential forest was present amongst the gorse in 1989, then with appropriate management, that would now be a forest.

4.7 Non qualifying areas

It is important to appreciate that permanent forest existing prior to 1990 cannot be registered as a forest sink under the ETS and gain credits because it is not considered "additive" to the 1990 position.

This means old growth forests, such as most areas covenanted with QEII or BPCT are ineligible.

Other areas that are often covenanted, such as rocky outcrops that protect alpine plants or wetlands also fail to qualify under the ETS because they but do not meet the Kyoto forest height requirement.

[8] Pers comm email 20 March 2019 to Clayton Wallwork, Greenco from Rickaan Muirhead MPI

4.7.1 Donut covenants

Covenanting authorities such as BPCT and QEII may wish to bear this in mind when working with landowners to design future covenants. If landowners wish to set aside land for conservation and continue to receive some income from it, they may be better to develop "donut" covenants, with the old growth remnant or rocky outcrop area in the middle and a boundary further out, enabling the intervening land to regenerate and eventually gain an income from qualifying carbon sequestration. It may be sensible therefore to retire more land than planned, and base the boundary on the existing fence lines if possible, rather than just retiring the old growth area and tightly fencing it.

4.8 Receiving credits after registration

Participants in the Emissions Trading Scheme (ETS) must file emissions returns at certain times to calculate changes in the carbon stock of their forest. The ETS has mandatory emissions returns periods, the most recent being 2013-2017, or users voluntarily can file annually. Once MPI has accepted the return, NZUs will then be issued at the rate of 1 NZU per tonne of carbon dioxide sequestered.

5 Barriers to registering naturally regenerating areas

At present there are several barriers or additional costs involved with registering permanent native forests. Some of these are being resolved with the revised ETS expected in late 2019, but other barriers remain.

5.1 Issues resolved in revised ETS

Three issues that have made registration unattractive to date are being resolved in the changes to the ETS coming later this year, including:

- Disestablishment of the PFSI scheme
- Removing liability if a forest is destroyed; in this case, issue of units is stopped until the forest recovers
- Replacing the price ceiling with a containment cap, and,
- Streamlining the application process, including images

5.1.1 Disestablishment of the PFSI

To date permanent forests have been registered under the PFSI scheme. This required the forest to be protected with a PFSI covenant on the property title to ensure it could not be cut down, and if it was – that the credits earned would be paid back. However, this was an expensive process and a barrier to participation. Under the new changes, permanent forests will be registered under the ETS and the requirement for a specific covenant on the title is dropped.

While this removes a barrier to participation, it also leaves open the question as to how NZUs derived from a permanent native forest that is fully protected with a biodiversity covenant (such as QEII or BPCT) can continue to attract a premium in the market. The desire of some voluntary market purchasers to source such high quality credits is demonstrated by the way Enviro-Mark Solutions held the price of Hinewai credits during the sustained period when NZU prices had crashed. In its submission to the revised ETS, the Rod Donald Trust requested that credits derived from biodiversity areas protected with a covenanting agency were given a premium status under the ETS, but this change does not appear to have been adopted.

5.1.2 Liability removed

To date recipients of carbon credits have incurred the liability of repaying credits earnt if their forest accidentally burnt down or was otherwise removed. This has necessitated the need for insurance to cover

the liability. Hinewai faced this situation after the fire in 2011, but at that stage had not sold credits, so had them in reserve. Under the legislative changes, this liability is removed. Now if a forest that has earnt credits burns down, the forest owner will continue to hold the credits earnt, but will cease receiving credits until such a time as the forest is replaced and sequestered carbon back up to the level of the credits earnt. They then resume earning credits as normal.

5.1.3 Replacing Price ceiling with containment cap

The artificial price ceiling of $25 is in place solely to benefit emitters, and is detrimental to those sequestering carbon. The market has now reached the ceiling price and is being artificially held back. The government has indicated that it will replace the price ceiling under the revised ETS, but it will still be subject to a containment cap.

5.1.4 Streamlining the registration process for permanent forests

The government aims to reduce barriers to registering permanent forests under the revised ETS. It will have an online registration and a mapping feature (same as the current ETS), streamlining the application process and cost of application significantly. MPI are to make available their aerial image dataset, enabling landowners or consultants to have a good idea up-front of whether they are likely to agree with vegetation category assessment. The landowner will still be required to provide evidence of Kyoto eligibility, (aerial photos and management records, but having these records easily accessible will make the process straight forward and can be a desk top exercise.

5.2 Barriers likely to remain

5.2.1 Complexity of naturally regenerating areas

Even with the simplified registration process and on-line vegetation maps indicating areas that are pre-1990, there may still be disagreements with MPI about the 1990 vegetation cover due to poor quality aerial imagery. This may still require more detailed work and destructive sampling.

5.2.2 Treatment of naturally regenerating areas

Getting applications approved by MPI is a principal blockage at present making the application process difficult. The Langer Trust's Panama Reserve has been caught by this, with MPI disputing whether areas put forward as Qualifying in the application were existing pre 1990.

5.2.3 Cost and complexity of measurement process – for blocks over 100ha

Once a block has been registered, if it is over 100ha it will need to calculate its carbon stock using Field Measurement every 5 years. This is an expensive process as evidence needs to be provided of the sequestration and this is generally carried out by specialist consultants such as Permanent Forests NZ Ltd or Greenco. Some landowners have done this themselves but it does require assistance from an expert.

5.2.4 Price containment

Although the price ceiling is to be removed, a price containment mechanism will be introduced to prevent the price of carbon rocketing up and disadvantaging NZ exporters on the international market. This will still favour emitters over sequesterers of carbon.

5.2.5 Length of time before carbon earnings come on stream

The length of time before significant carbon earnings come on stream is a major barrier, particularly when there are high costs of entry – such as fencing as well as application costs.

Carbon sequestration rates, and therefore earnings, increase as a forest grows in size and density. At the beginning there will be relatively little carbon absorbed, and therefore negligible income, but most of the costs are up front. There can be a long period before the investment starts making a return, particularly in

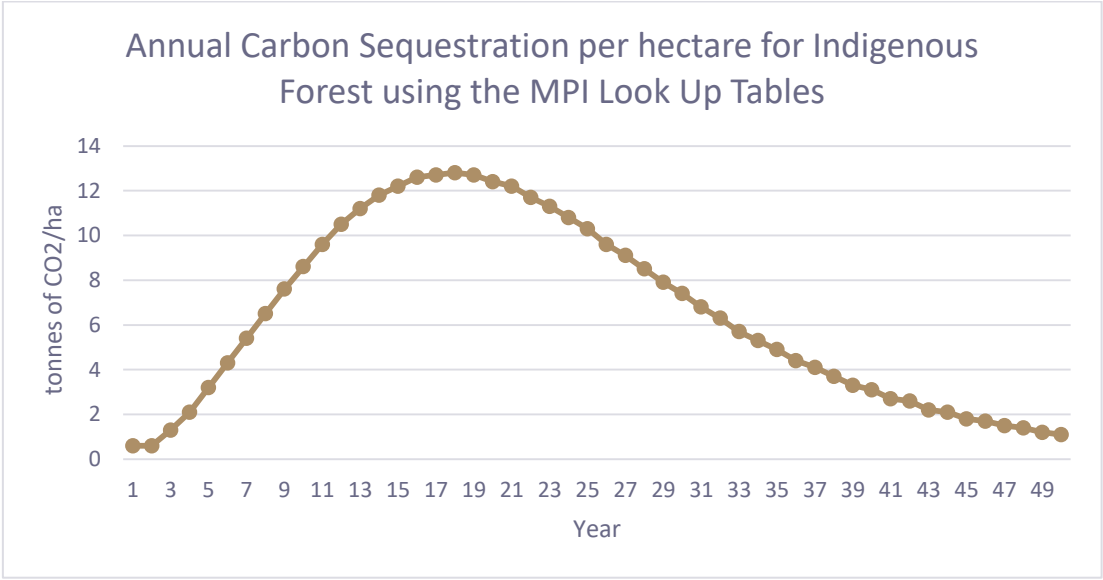
cases where there is a substantial amount of open pasture that has barely started on the regeneration process. There seems to be general agreement (pers comm Hugh Wilson, Mark Belton) that drier upland places like the open pastoral slopes of Mt Herbert will take 20 years before they have regenerated sufficiently to even qualify.

5.2.6 Carbon earnings have a finite life

Once a permanent forest reaches maturity and is not growing taller or thicker, it reaches a state of carbon equilibrium. At this point the carbon credit income ceases. This is a significant difference from conventional farming, where provided the land is looked after, animals can continue to graze and an income be earned with no finite life, or rotational forestry. Depending on permanent forest management objectives other income streams could be realised, for example tourism and recreation access, or sustainable timber harvesting.

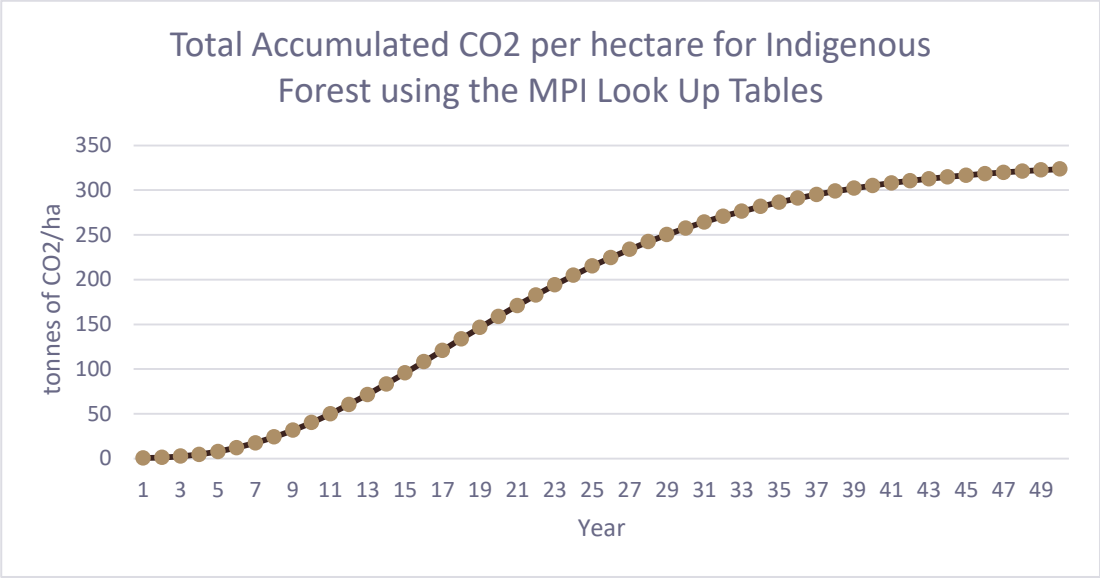
Below is a graph showing the carbon (tonnes of carbon dioxide) sequestered per hectare over 50 years. This graph is based on the MPI Look Up Tables.

Figure 4 Sequestration rate for indigenous forest



The graph above shows the annual increment (change in carbon dioxide) on an annual basis. This reflects the typical New Zealand average for native forest establishment. There is a slow start (first three years) then rapid growth (3 to 27 years) as shrubs occupy the site followed by a more slow and steady growth as tall trees establish and become dominant in the forest. The total accumulated carbon keeps rising, but the annual growth reduces.

Figure 5 Total carbon dioxide accumulated for indigenous forest



5.2.7 Are regenerating areas subject to a double standard?

There is a requirement for landowners deforesting pre-1990 forest land (that has not been granted an exemption or offset) to register with the ETS, let MPI know and to pay for any emissions created through deforesting[9].

Allocation was provided to owners of pre-1990 forests to help offset the decrease in land value which would therefore be caused by less flexibility in terms of how land could be used or to meet their obligations under the NZ ETS if the land use was changed from forestry (deforested).[10]

Interestingly, land that was indigenous forest on 31 December 1989 and was still so on 31 December 2007 is not considered pre-1990 forest land and doesn't have ETS obligations.[11]

Given the scrutiny given to naturally regenerating applications, this highlights the grey area around why MPI is so picky about whether the areas were established before or after 1989. It seems to be a double standard that potential regenerating forests were included in the NZ Kyoto 1990 baseline, and are precluded from registering in the ETS and gaining carbon credits if they are retained, but do not incur a liability if they are removed.

Further information is needed from MPI on this and until resolved, potential properties need to be scrutinised with this lens.

6 Potential income from naturally regenerating areas

Given the up-front expense involved with registration, and the potentially long period before there are significant returns, it is important to assess whether registration will be financially worthwhile. A landowner who is already engaged in a regeneration project needs to know whether the additional effort and expense of registration will return more than if the funds had been simply banked. A landowner converting from an

[9] Deforestation obligations don't apply if the forest was cleared by a natural event such as a river changing course, or on areas of less than 2ha.
[10] http://www.mfe.govt.nz/climate-change/new-zealand-emissions-trading-scheme/allocations
[11] MPI Deforestation: Definition and obligations under the Emissions Trading Scheme pamphlet, Jan 2017

existing activity (principally grazing), will need to know whether allowing natural regeneration to occur and registering will provide a greater return that the current activity.

This is not easy or straightforward to assess as each site presents different opportunities and constraints. The purpose of this section is to provide an idea of the potential income that can be earned from naturally regenerating areas based on local experience.

First the experience of two successfully registered properties is described, and based on one of these properties, Waipuna Bush, an analysis made of the cost/benefit of registration, and whether this would be sufficient to persuade farmers to convert marginal land to natural regeneration carbon forestry.

This is followed by a discussion about the issues of managing retired ungrazed pastureland. Such land is eligible for registration when part of a natural regeneration project, but won't earn any income until it hosts sufficient tree species to qualify and this can take a long time. Planting can speed the sequestration process, but comes at a high cost and may bring other biodiversity issues.

Subsequent sections of the report then look at the impact of the Billion Trees funding on such projects and attempt further financial modelling to assess the cost/benefit range on different properties, the impact of rising carbon prices, and the cost benefits of planting.

6.1 Using registered properties to gauge income expectations

There are a number of properties on Banks Peninsula already registered under the PFSI and receiving credits. These will transfer to the ETS once the PFSI ceases.

Two of these properties are now examined – Hinewai Reserve, and Waipuna Bush belonging to Trustee Bob Webster and wife Carol Jensen.

6.1.1 Hinewai reserve

Hinewai owns 1250ha in the southeastern side of Banks Peninsula and sets a benchmark for the successful transformation of retired farmland into regenerating native forest. Hinewai has earned over $1million through carbon credit sales to date[12], including the years when prices were much lower than now ($12 for many years). This has been sufficient to support its increased land acquisitions and provide a cushion to staff costs.

There have been several factors that have made Hinewai optimally placed for carbon registration and earnings. These include:

- The main part of the reserve was purchased in 1991, meaning the change of management from grazing to native regeneration took place almost immediately after the 1990 cut off
- There was a huge amount of gorse on the property at this point, and relatively little open pasture land, so retiring from grazing has resulted in almost the whole property regenerating, rather than large areas of pasture being retired and taking time to revegetate.
- Registration was done by Clayton Wallwork through a contract with EBEX – a service offered by Landcare but now discontinued

A video on the Landcare Research website gives a brief overview of the Hinewai carbon story,

https://www.landcareresearch.co.nz/about/news/video/from-gorse-farming-to-carbon-farming

[12] Pers comm Ann Smith, Enviromark

6.1.2 Waipuna Bush

Waipuna Bush is a 74.6ha property adjacent to the Trust's Rod Donald Hut property at the top of Western Valley. Bob Webster has kindly provided the Trust with a full report of his experience and carbon earnings - and this is attached in full as Appendix B.

Some comments are given below on how applicable this experience is to other properties, before it is used as a guide to the carbon incomes that might be expected on other conservation properties.

1. Qualifying percentage - although the entire 74.6ha property is registered under a BPCT covenant and managed for conservation through natural regeneration only 20% (15.9ha) has met the qualifying threshold and is earning credits. The remaining 80% is either pre 1989 forest (35.3ha) and therefore excluded, or is retired pastureland (23.4 ha) that does not yet meet the threshold of "potential 30%" canopy cover. When extrapolating the income received from this property to other places, it is important to keep in mind what percentage is likely to qualify, be excluded or be eligible once more regeneration has taken place. The map given in Appendix B provides a useful view of the different areas.
2. The net carbon income derived from the qualifying areas probably represents an optimal case per qualifying hectare because:
    - Carol and Bob were able to do much of the botanical assessment work, thereby minimising their up-front costs
    - The entire property was already operating as a conservation block. There was no need to remove stock or carry out fencing for the purpose of registration
    - The property is under 100ha and can therefore file a return based on lookup tables rather than incur the cost of field measurement every 5 years.
    - The property was registered at the end of a mandatory reporting period and therefore got allocated credits for that 5 year period.

6.2 Net Income based on Waipuna Bush experience – check figures

The only up-front costs Bob has identified are the small amount of work done by Permanent Forests Ltd and the registration fee, totalling to $1000. Note that although this is low for a PFSI registration due to the low consultant fee, $1,000 is about what the ETS registrations are anticipated to cost.

The qualifying 15.9 ha had earned 786 credits at the time of registration. This was due to good timing - because the registration was received at the end of the 2008-2012 mandatory emission return period it was able to claim the credits for these 4 years, even though it was only just entering the scheme. Normally applications can only back claim for the current period, and we are now part way through the 2018-2023 period, so current applications will only be able to claim for sequestration since 2018. This is well worth noting when considering the timing of registration on other properties.

The 15.9 ha have earned a further 988 units over the 5 years since, making a total of 1754 credits to date.

The estimated value of those credits based on the current $25 price is $43,800. Subtracting the costs of registration and the sale fees, registration has so far netted and estimated $40,518 over 9 years, and will continue to earn well into the future and at an increasing rate, particularly as eligible areas of open pasture start to qualify. This represents a huge gain over the initial investment of $1000, and even if the upfront costs had been higher through using a consultant instead of the owners doing the work, it would still be a substantial gain.

The raw returns per annum to date from the qualifying ha to date are estimated at:

- **$254 per ha averaged across the 15.9 qualifying ha.**
- **$57.72 per ha amortised across the whole block, and,**
- **$116 per ha amortised across the eligible (qualifying and not qualifying) 39ha** .

Given that the owners had already decided to use the block for natural regeneration this income is all additional to their baseline expectation.

This suggests that for any owner already carrying out a native regeneration project, it is well worth registering for carbon credits, provided that the areas are likely to meet the qualifying threshold – i.e. were bare land in 1989 and now have significant cover with species eventually reaching 5.5m.

6.3 Relevance for conversion of land from farming to native forest

The question then becomes – would this level of return be sufficient to persuade a conventional farmer to change the land use of a marginal property from grazing to active natural regeneration. In order to assess this, we need some understanding of the level of return from grazing and ideally the additional work or effort in achieving that over and above the effort needed to actively foster natural regeneration (i.e. fencing, pest and weed control).

The Trust has discussed this with a successful Peninsula farmer who runs his own large farm and also manages one of the largest farms on Banks Peninsula. Both include steep marginal areas. He states that the value of marginal scrubby land to farmers is essentially its insurance value in a drought year, particularly for cattle grazing, as they will push into bush areas and will eat the long grass that grows in these areas. He suggested that if the annual earning was over $100 per ha then he would be tempted to start looking seriously at the proposition of converting marginal land to carbon. If the annual return per ha was over $200 then although this would be below the income from grazing, it would be worth taking because less work would be involved, or the farm could be run with a lower stocking rate.

These figures have been roughly corroborated by landowners, who formerly grazed their 300ha block of marginal land but have now placed it under a covenant). They report that in their best year they earned approximately $166 per ha. The property is steep and south facing, and would be expected to generate a lower return rate than warmer land.

From both we can derive that the per annum return of $254.83 per ha for qualifying area is well above the suggested conversion threshold of $100 - $200 per ha per annum. However, the $116 amortised across the eligible area (qualifying and not-yet-qualifying) is at the low end of the threshold and the “whole block” return of $57 per ha is well below it. This is because in the Waipuna Bush property case only 20% of the block qualifies. As already discussed, because of the “untidy” nature of regenerating areas, typically interspersed with non-qualifying pre-1990 forest and eligible but not-yet-qualifying open pasture, and the high cost of fencing, it is likely that in most cases more land would need to be retired than just the qualifying areas. *A key determinant therefore will be how much of a particular block will qualify at the start of a project, and how much more is likely to come on stream quickly, and how much is permanently disqualified as pre 1989 forest.*

Carbon price is the other major factor. With the current price of carbon at $25 per credit, 75% of an area needs to qualify to meet the conversion threshold of earning more than $200 per ha per annum. However, if the government allows the new contained price to rise up to $45 per credit, then a bush area with only 20% qualifying, would meet the low end of the threshold for “getting interested”.

The above “back of an envelope” study shows how site and market dependent the decision is for a farmer on whether to retire marginal land from grazing to carbon farming. The initial calculations here have not attempted to predict future earnings. The rate of earning will increase as more eligible land starts to qualify, but the trees on the qualifying land are at their peak carbon sequestration and will start to decline. As shown in Figure 3 above, the earnings rise and peak about 20 years after the forest has been established and then decline over the next 20 as the sequestration rate declines, and then continue at a low level until the forest eventually reaches a state of equilibrium and the biomass is no longer increasing in volume and then they will cease.

A farmer will therefore also have to balance out that while grazing earnings may be less than the peak carbon earnings, under a grazing regime, earnings would continue indefinitely, whereas once a forest reaches a state of equilibrium, they will cease. The costs of continuing to remove regenerating forest to maintain that grazing potential would also need to be factored in.

6.4 Using planting to speed the process

As most natural regeneration blocks include a jumbled up mix of pre 1989 remnants, qualifying regeneration and open pasture, this raises the issue of how to manage the mixed land for optimal carbon sequestration.

Areas that are already strongly regenerating, and therefore qualifying, will regenerate most rapidly and with the full range of biodiversity if grazing is removed. This is because grazing stock eat the palatable natives stymying the regeneration process.

In open pasture, however, retirement from grazing can slow the initial process of regeneration, as a thick grass sward outcompetes colonising species such as kanuka or gorse, inhibiting their establishment.

6.4.1 Retiring from grazing

Typically areas that are already hosting enough “stems” to qualify are in wetter gullies and on shadier slopes, with open grassland and drier ridgeline areas slower to regenerate.

Regeneration across open grassland that is fully retired from grazing occurs principally from the forest margin. As the trees grow and expand they gradually shade out the grass, creating a better environment for native plants to germinate and thrive. The Rod Donald Hut property is a good example, where practically no regeneration is occurring in the open areas of retired pasture, but there is a creep on the bush margin.

The speed of regeneration of ungrazed pasture is site dependent, based on the thickness of the grass, rainfall, and the amount of native plants present when grazing was removed. At Panama Reserve, natives are getting away very quickly in some of the upper areas where the grass sward is naturally thinner. On other sites bracken manages to gradually establish and, once it has supressed the grass, can then act as a nurse for other natives.

Some people are of the view that retaining light grazing on such pasture encourages quicker regeneration by keeping grass competition down while allowing unpalatable species such as kanuka to get away, and suggest that grazing is removed once there is a kanuka cover.

The conundrum is that when qualifying areas and open pasture are intermixed, retaining grazing to speed the pasture into regeneration will harm the qualifying areas and may prevent their registration.

6.4.2 Regeneration assisted with planting

One option is to speed the natural regeneration process through active planting in the pasture. Planting in open pastureland makes it qualify immediately, provided the species selected have the potential to grow to 5.5m on the site and are planted at a sufficient density to eventually achieve 30% canopy cover.

6.4.3 Philosophical divide over planting

This raises a philosophical issue that currently divides the biodiversity community – whether to plant to speed the process of carbon sequestration, or leave nature to take its course.

Hugh Wilson and the Hinewai team argue that planting, even with eco-sourced natives, has the danger of unintended consequences such as non-appropriate strains of plants being introduced. They argue that up front planting is expensive and takes up management time, and that it is more effective to let nature take its course and wait, thereby incurring minimal costs up front.

On the other hand Mark Belton argues that planting speeds the process and can bring back desirable forest species such as Red Beech that are not regenerating naturally, and that drier areas with lower rainfall such as much of the Lyttelton basin do not experience regeneration with the success of wetter Hinewai.

To date the Trust view has probably leant more to the Hinewai view. It has principally supported projects focussed on natural regeneration and been reluctant to become involved in planting projects unless there were other pressing reasons such as the access benefits in the case of Living Springs.

6.4.4 Cost/benefit of planting

Setting aside the philopsophical arguments over biodiversity impacts, another factor is how much the planting will cost versus the financial benefit of speeding the process of earning carbon income. There is a considerable difference of opinion over this also, because many factors come into play here including:

- Cost of planting which depends on
    - purpose of the planting – whether to maximise carbon income or maximise biodiversity
    - accessibility of the site
    - cost of plants and materials
    - use of contract or voluntary labour
    - method used for planting including the amount of follow-up maintenance
    - density of planting
- environmental conditions on site including rainfall, soil and aspect

6.4.5 Density of planting

The density of planting, meaning the number of stems per hectare, is a critical factor as it affects the cost markedly.

6.4.5.1 Minimum planting to qualify for carbon

Te Uru Rakau informally suggested that to qualify for carbon credits, planting with 100 stems per ha (plus an allowance for plants that fail to establish) using species that will result in a crown size with a 6m diameter at maturity is the theoretical minimum needed for land to be eligible for registration (pers comm, Steven Cox Te Ur Rakau). Most native trees growing to the 5.5m height will reach this diameter at maturity, so this is an extremely low planting density, and done principally to qualify for carbon rather than maximise biodiversity.

6.4.5.2 Is this realistic?

This planting density is questioned by consultants from Permanent Forests NZ Ltd and Greenco, because native plants like to be clustered together to thrive.

Permanent Forests favours (pers comm Mark Belton and Panama Reserve report) a much higher, but still relatively low density method – compared to traditional planting projects. He suggests that mixed indigenous planting be done at 1100 stems per ha.

Clayton Wallwork from Greenco has worked extensively with Tane's Tree Trust. *Tāne's Tree Trust is a non-profit Charitable Trust focused on encouraging the use of New Zealand indigenous tree species for biodiversity, landscape enhancement, cultural benefits, and providing the option for sustainable production of high-quality timber and other resources. {Tane's Tree Trust] work with a range of interest groups from managing agencies and environmental trusts to iwi and landowners keen see the planting and management of indigenous trees nationwide and to share knowledge in successful establishment of indigenous forests for multiple purposes and use.*[13].

Their projects typically involve 3000 stems per hectare made up of 2400 shrubby hardwoods and 600 tree species.

6.4.5.3 Is this acceptable?

Both also questioned whether land planting at the minimum level of 100 stems per ha would meet purchasers expectations for high quality native forest credits. However, Look Up tables are based only on whether the area is "qualifying forest", not density of that forest, so this is consistent areas that are relatively thinly populated with stems naturally also. If a purchaser does seek accuracy as to carbon gained over the period concerned, then they may decide to limit themselves to purchasing credits from larger land blocks where the carbon stock is estimated by field measurement.

Clayton Wallwork felt however that this level of planting would be acceptable if it was being carried out to assist natural regeneration – essentially doing some in-filling to speed the process.

6.4.6 Method of planting and after care

Different methods of planting and aftercare produce markedly different costs for the overall project. The costs given below from two different consultants include paid labour and materials.

6.4.6.1 Permanent Forests NZ Ltd system

Permanent Forests NZ Ltd suggest that the cost per stem overall works out at $5.35 per plant, or $5,882 per ha based on the 1100 stems they recommend.

The relatively low cost per plant is achieved because of the planting method proposed. Areas for planting are sprayed once to remove grass and weed competition, planting is done by cutting an H shape into the ground with three jabs of the spade rather than digging a hole, a relatively small plant is then dropped in, and no hare guards or weed suppressing mats are used. Release follow-up only occurs in year 2.

It would be useful to follow up with Permanent Forests to visit a reference site.

6.4.6.2 Tāne's Tree Trust information

Clayton Wallwork suggests significantly higher costs based on work with the Tane's Tree Trust and other research. Planting is done more thoroughly and release work is required at least for the first 2 years to keep weeds at bay and sometimes combi guards are required if hares are a problem.

Work by David Bergin of the Tāne's Tree Trust summarised the following in a report about establishing native forests from seedlings:

[13] https://www.Tāne'strees.org.nz/

The full cost of planting natives from site preparation and supply of seedlings, to pest animal control and post-plant maintenance, on some sites for up to 5 years, is likely to be close to $10 per tree[14]. Here are some examples of cost per tree:

- Sainsbury Reserve - costs extracted from a recent OFOF report by Tane's Tree Trust for the Waipa District Council - cost calculated at **$8.86** per native planted and maintained for up to 5 years (Bergin et al. 2016).
- Native Tree Bulletin - published costs for planting range from **$6.62 to $8.90** per tree depending on planting density (Bergin and Gea 2007).
- MAF/Scion Review paper - indicates a cost of **$7.99** per plant for native trees (Davis et al. 2009).
- Environment Waikato website - cost for establishing natives for forestry at **$8.25** per tree includes plants, site preparation and maintenance. http://www.waikatoregion.govt.nz/Environment/Natural-resources/Land-and-soil/Managing-Land-and-Soil/Managing-farm-runoff/Planting-and-fencing-waterways-calculation-sheet/
- Trees That Count planting in 2016 - large scale plantings with nurse/shelter species and inter-planted conifers and tree hard woods up to **$7.50** per tree (Ian Brennan, TTT Trustee and Waikato farmer, pers. comm).

The cost per hectare for planting high native forest are consequently high, in the region of $15,000 to $25,000 per ha (e.g. Norton et al, 2018; Davis et al ,2009; Bergin and Gea 2007), because of the greater planting density and higher cost per plant. While the manuka industry are indicating planting costs of less than $5000 per ha, these sites may require supplementary planting of selected tree species to achieve in the long term a diverse, sustainable high native forest. [15]

The $15,000 to $25,000 is incurred over a 3-year period, the most being the upfront costs in year 1 for site preparation, seedlings and planting. The remainder is attributed to releasing of the seedlings in years 2 and 3.

6.4.6.3 Planting to assist regeneration

This in turn raises the question that if the planting is principally done to support native regeneration projects and enable open grass land interspersed among qualifying regenerating areas to also qualify from the outset, whether supplementary plantings can be strategically placed to both facilitate their growth, speed the transition of open land into regeneration and meet the threshold for registration to boost the income from regeneration projects with a relatively low number of stems. Stephen Cox, forestry consultant from Te Uru Rakau has suggested that 100 stems of plants that will eventually reach 5.5m in height and have a canopy of 6m in diameter would potentially qualify, but more than this, say 150, would need to be planted as planted natives have a relatively high failure rate.

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[14] Webster, Bob. Experience at Waipuna Bush suggests costs may be even higher.

[15] Bergin D.; Gea; L. 2007: Native Trees. Planting and early management for wood production. *New Zealand Indigenous Tree Bulletin no. 3* (revised edition). Forest Research Institute, Rotorua, 44 pp.

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Crowther, T. W.; Glick, H. B.; […]Bradford, M. A. 2015. Mapping tree density at a global scale. *Nature 525*: 201-205.

Davis M, Douglas G, Ledgard N, Palmer D, Dhakal B, Paul T, Bergin D, Hock B, Barton I 2009. Establishing indigenous forest on erosion-prone grassland: land areas, establishment methods, costs and carbon benefits. Report for the Ministry of Agriculture and Forestry (Contract No. MAF POL 0809-11192). http://www.maf. govt.nz/news-resources/publications

Norton, D.A.; Butt, J.; Bergin, D.O. 2018 (in press): Upscaling restoration of native biodiversity: a New Zealand perspective. *Environmental Management and Restoration*.

Clayton Wallwork is sceptical that natives planted at low density will thrive in open pasture, and suggests they be clumped into islands. However, unless this is done very strategically, they may no longer meet the 30% canopy cover requirement if clumped. For this option to be successful it is more likely that shrubby hardwood species have already started to colonise the site, and the 150 stems of taller trees could then be planted strategically around them to gain protection and cover, suggestion this may be a way to speed the process for such areas, but not for big areas of open pasture.

7 Billion Trees – a potential short-term game changer

Billion Trees fund was launched on November 20, 2018, and information about how to make applications and the assessment criteria to be applied has now also been released.

Billion Trees offers $240million in grants to be issued through the Provincial Growth Fund and led by Te Uru Rakau – Forestry New Zealand within MPI. The $240million is only available until 30 June 2021 and there are no indications that this will continue after this date[16]. This short time frame has serious implications for seedling availability, and human resources for planning, management, preparation, planting and releasing.

There is a focus on lowering the planting barriers currently faced by landowners and improving incentives to support *the right trees, in the right place, for the right purpose*, and create wider social, environmental and economic benefits across New Zealand.

The fund is intended to provide grant support for landowners to grow both native and exotic trees, to create employment and workforce development, optimise land use (including reducing erosion and improving water quality), mitigate climate change, support Māori values and aspirations, protect the environment and support New Zealand's transition to a low emissions economy.

Grants are available for natural regeneration as well as planting, but not for land already registered for carbon credits, or with a 30% canopy cover already. The scheme is effectively for "bare land".

MPI have made it clear that projects will be assessed on how well they meet the criteria and on their likelihood of success. Projects therefore must be well thought out and able to demonstrate why they are likely to succeed, and include a management plan. Applicants may need to work with MPI around the finer points.

There are two types of grants available – direct landowner grants and partnership grants. Direct grants go to the landowner to support the regeneration or planting. Partnership grants are for projects moving the industry forward and creating landscape scale change. The fund is split into two streams $120 million for tree planting and $120 million for partnership funds.

7.1 Direct Landowner Grants

The grants available to landowners through Billion Trees are:

[16] Pers comms – Cathy Stephens – Te Uru Rakau, 12/02/2019

Table 1 Billion Tree Direct Landowner Grant amounts

Type of planting	Size	Top-up available/hectare			
		Base rate/hectare	Erosion prone land OR land in areas that support regional development goals	Fencing	Ecological restoration partnership projects
Indigenous mix (e.g. a mix of native trees and shrubs)	1 – 300 hectares	$4000	$500	Up to $500	Up to $2000
Mānuka/kānuka (particularly for erosion control or as a nurse crop for an indigenous forest)	5 – 300 hectares	$1800	$500	NA	NA
Indigenous natural regeneration (e.g. retiring land and managing it to naturally return back to trees)	5 – 300 hectares	$1000	$500	Up to $500	NA
Exotic (e.g. planting eucalypts, redwoods or pinus radiata to stabilise erosion-prone land)	5 – 300 hectares	$1500	$500	NA	NA

The Peninsula does not qualify for either the Erosion Prone or Regional Development criteria.

Using the above table therefore, natural regeneration projects could qualify for a maximum grant of $1,500 per ha (including fencing). Clayton Wallwork, Greenco, advises that the fencing grants are not based on the number of hectares forming the project, but assessed on a case by case basis. The area applied for must be at least 5ha, and if made up of discontinuous parts, each part must be at least 1ha. Again note that such land must have less than 30% potential canopy cover at the time of the application, meaning it is land that would not qualify to earn carbon credits under the ETS.

Areas planted with the indigenous mix could look to attract up to $4,500 per ha. Note that this does not cover the cost of planting even using the Permanent Forest Ltd method at 1100 stems per hectare, so falls well short of the cost of planting if a higher density method is used, or one with a greater degree of planting and after –care labour involved. MPI have indicated that a minimum of 750 stems are required, with a margin for loss – so the Permanent Forests NZ Ltd figure of 1100 probably represents the minimum to qualify for a planting grant.

MPI have stated that having a conservation covenant would be an advantage if it requires or encourages native regeneration or indigenous planting and is seeking funding for such management. Similarly, being listed as an SNA or RAP in a district plan would be a benefit to an application provided the planting proposed is not in conflict with the reason for listing.

However, areas that are already receiving carbon credits are not eligible for 1 Billion Trees funding, nor can those which already have a 30% canopy. Applications can be made for areas that qualify but are not yet receiving credits can apply.

The planting grant has the potential to be augmented by up to $2,000 per ha if the planting is part of an Ecological Restoration partnership project. If this can be tapped, then it would cover the $5,882 cost of the Permanent Forest planting method, but still be far short of the $15,000 to $25,000 Tane's Trees Trust cost.

MPI are still working on deciding quite what an ecological restoration partnership is, but have confirmed that it would be a project across a broad area of land (greater than 100ha) involving multiple players and

goals. It seems that this would be a top-up to a landowner who was participating in a project that also met the partnership grant criteria. A grant would not preclude future planting to speed the process of becoming eligible for carbon credits.

7.2 Partnership grants

Given that the Rod Donald Trust only owns one small property, if it does get involved with the Billion Trees funding, then it is more likely to be through the partnership grants.

The key areas that the government is looking to support through its partnership grants are:

- Labour and workforce development - Will the project result in increased availability of labour to establish, plant and maintain trees, and/or an upskilled workforce?
- Advice and information for landowners – Will the project result in increased advice and support for landowners through improved information, technical advice and/or extension services?
- Catchment-based or landscape scale tree planting and restoration projects – Will the project contribute to improved environmental outcomes (e.g. erosion control, freshwater quality, biodiversity) on a correspondingly greater scale? (This is probably where the Ecological Restoration top-ups slot in).
- Science and innovation – Will the project improve our knowledge, expertise or technology to support growing, planting and maintaining trees in the right place, for the right purpose?
- Seedlings and nursery production- Will the project contribute to up-scaled and more efficient production of seedlings relative to demand and will it deliver a diverse range of tree species?

Other projects will be considered where they will clearly contribute to more trees in the ground, or to getting the right trees, in the right place, for the right purpose.

7.3 Potential Rod Donald Trust involvement in landscape scale change

The implications are that Billion Tree grants need to be for large and ambitious partnership projects that will provide employment. This presents opportunity on a large scale for the Peninsula, and potentially for the Trust to take a support or leadership role in furthering this.

Mark Belton is strongly of the view that the Trust should take a leadership role, and that properties such as the Panama Reserve that have been knocked back by MPI (see below) would stand a greater chance of registration if they were seen as part of a larger project.

MPI have confirmed that they are looking for partnerships to lever landscape scale change, and recommended registering interest as soon as possible. Projects that roll out over several years would be appropriate. It appears that they are currently short of projects.

Other factors that could support this approach are the proximity and good connections with Landcare Research and Enviromark, and that DOC has a group of scientists monitoring biodiversity based at the Mahaanui Area office (though not managed by Andy Thompson).

However, the 1 Billion Trees scheme has limitations. In a mixed landscape applicants may hit similar issues as with registration under the ETS – the application process requires considerable investment, and it may be difficult to proof that marginal land does not already meet the definition of “Forest Land” – 30% *potential* canopy cover, the fund is only guaranteed for the short term.

8 Modelling potential income and profit

A basic model to forecast potential carbon income and profit, based on the Waipuna Bush experience to date and incorporating the Billion Trees grant funding has been developed. The purposes of the model are to

- to test whether using the Billion Trees grants tip the balance in favour of planting over natural regeneration
- to gauge the level of income sites of interest might generate, and whether the income from them would be sufficient to encourage conversion of marginal land from farming to biodiversity restoration.

8.1 Forecasting Waipuna Bush

For Waipuna Bush, the model takes into account that there are 15.9ha already earning NZUs and that the base year in which this qualifying area contained sufficient plants to qualify was 2000. This means that this area is close to its 20 year peak sequestration as shown in Figure 3 earlier. There is a further 23.4ha of eligible land that is currently starting on the regeneration process, but does not yet qualify.

7 different scenarios have been examined for Waipuna Bush, covering the range from continuing with natural regeneration and no grants to full planting of the 23.4ha with as many grants as possible. The income and net profit are then presented both as raw and NPV discounted figures, using two different carbon prices - $25 and $45.

The scenarios are:

Scenario 1. **Natural regeneration over the whole area with no planting or grants.** 15.9 ha earning NZUs starting in year 20 (applies to all scenarios) with the further 24.3ha eligible land coming on stream over either 10, 15 or 20 years. No use of grants or planting.

Scenario 2. **Natural regeneration over the whole area with no planting and a Billion Trees Regeneration grant** of $1000 per ha for the 23.4ha and the land coming on stream over 10,15 or 20 years.

Scenario 3. **Minimum Stem planting assisted regeneration** adding 150 stems per ha to the 23.4ha area enabling it to qualify immediately and a Billion Trees regeneration grant of $1000 per ha for the 23.4ha

Scenario 4. **Permanent Forests NZ Ltd planting method with Billion Trees Planting grant of $4000** on the 23.4 ha. This is the cheapest method and lowest stocking rate for planting.

Scenario 5. **Tane's Trees Trust planting method with Billion Trees Planting grant of $4000** on the 23.4 ha. This method is more expensive and has a higher stocking rate.

Scenario 6. **Tāne's Trees Trust method, with the Permanent Forest Ltd's lower stocking rate of 1100 stems per ha and getting the Direct Landowner Grant and a Partnership Grant.** This therefore represents the minimum planting and the maximum use of Billion Tree grants

Scenario 7. **Supplementing with additional grants –** the model is used to see how much additional grant funding is required before the method in Scenario 6 generates a sufficient income to meet the farming conversion threshold derived in section 6.3 above.

8.1.1 Method and Assumptions

The forecasting is based on the MPI Carbon Lookup tables for indigenous species, graphed in Figure 3 above. Waipuna Bush

- The 15.9ha of qualifying land has been calculated from the NZUs earned as being established (ie started to regenerate) in 2000.
- The time for the 24.3 “eligible but not qualifying” to naturally regenerate is tested at 10 years, 15 years and 20 years (qualifying in 2021, 2026 and 2031). Planted areas are assumed to come on stream in 2021.
- Cost of participating in the ETS/PFSI has been set at $1150 consultancy fee plus $562.22 MPI/Te Uru Rakau processing fee (Incl GST)
- Cost of annual voluntary and 5 yearly mandatory emissions returns is $362.25 consultancy fee plus $102.22 MPI/Te Uru Rakau processing fee.
- Stem density and cost varies between options, the Permanent Forest Ltd scenario is 1100 st/ha at a cost of $5.35 per stem, the Tane’s Tree Trust density is 3000 st/ha at a cost of $8.90 per stem.
- The planted assisted regeneration scenario is based on 150 stems per hectare at $8.90 per plant to establish.
- A price of $23.75 (net) has been used as the income per carbon unit – this is $25 less processing/commission of 5% - as indicated by Bob Webster in his report.
- A second price of carbon has been set to $45 less the 5% commission - $42.75 to test the sensitivity of carbon price change. This price has been chosen because as established in section 6.4 above, at $45 per credit a property 20% coverage as on Bob Webster’s property would generate sufficient income in its early years to get a farmer to consider shifting land use from grazing to carbon.
- Modelling starts from 2019 and is presented out to 2050, and the carbon price used across this period is constant – the model does not try to predict how carbon prices may change.
- Assumes 100% of all carbon is sold each year – this may not be the case in reality, some landowners may want to hold some carbon for self-insuring purposes.
- The grants are assumed to be paid out in the first year of the project. The model does not take account of the staging MPI proposes for Billion Trees grants which are to be paid out part up front and part after successful establishment. This refinement could be built in later. The impact is to make all scenarios using these grants slightly less profitable over time.
- No account is taken of the fencing grants, as these will be so site specific.
- The NPV discount rate used is 8% per annum. Permanent Forests NZ Ltd have cited this in their report to the Langer Trust as a forestry industry standard rate.
- The period over which income is calculated is 32 years.
- No inflation is included in any figures
- $ amounts are rounded to the nearest dollar.

8.1.2 Results

The results are given in Appendix B in 2 sets of tables, facilitating a comparison of income between natural regeneration, with its lower costs but delayed income stream and planting with its higher up front costs, but immediate income stream. The tables also distinguish between the cost/benefit of each planting method.

The profit figures discussed here are based on the current carbon price of $25 per ha. This price is likely to rise, but probably not to $45 in the near future as the government still intends to contain it.

- **Scenario 1 – Natural Regeneration** presents the baseline that can be achieved through natural regeneration alone. Using the current carbon price of $25, depending on whether the 23.4ha takes 10, 15 or 20 years to qualify, this method would generate a raw income of **$125, $97 or $70** per ha

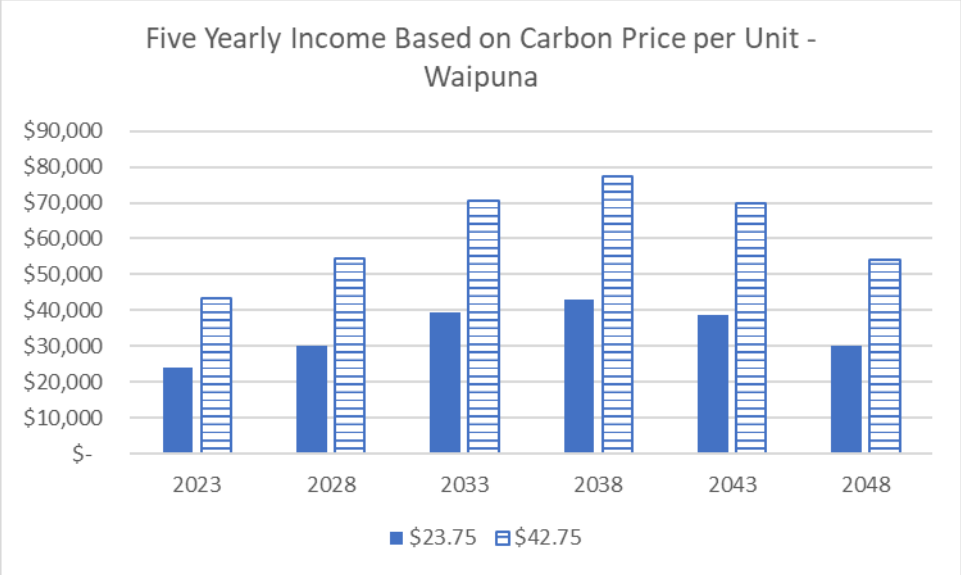
per annum or **$64, $52 or $51 discounted**. This is below Tim Coop's $100 lower conversion threshold, but if carbon prices rise to $45 per unit, then it would just squeak for a 10 to 15 year regeneration timeframe.

- **Scenario 2 – Natural Regeneration with a with a Billion Trees regeneration grant of $1000 per ha**, is the best option, yielding **$83, $70 and $60 discounted** respectively as the profit per ha. This is therefore still below the $100 lower farming conversion threshold at the $25 carbon price, but again if the carbon price rises to $45 and the regeneration happens in 10 years, then the picture improves.
- **Planting assistance is worthwhile only if the land is likely to take 15 to 20 years to regenerate.**
- **Bulk planting is not worthwhile** even if costs are cut using the Permanent Forests NZ Ltd method and all Billion Trees grants are taken up. Using the more expensive (or as most people seem to feel – realistic) Tane's Trees Trust method results in a loss per hectare. Using the Tane's Trees planting method (cost) with the Permanent Forests NZ Ltd stocking rate and both Billion Trees grants still doesn't provide a better return than Natural regeneration with no grants.
- **Further grant funding of $5,500 per ha would be needed to lift a planting based project above the $100 threshold**, and it would take carbon prices rising to $45 to get over the $200 threshold.

8.1.3 Income spread over time

Below is a graph showing total carbon income every 5 years for the Waipuna example, based on both $25 and $45 per unit ($23.75 and $42.75 with 5% costs of sale taken into account.)

Figure 6 Projected carbon income based on Waipuna example



As can be seen in the graph above, income peaks around 2038, then begins to drop off. The change is more noticeable when the carbon price is set to $45.

9 Generating income for Umbrella trusts

When considering carbon income previously, there has been discussion about whether the Banks Peninsula Conservation and QEII Trusts could provide some form of service to enable more of their covenanted properties to register for carbon credits to provide both the landowners and the covenanting organisations with an income.

So far there does not appear to be movement in the proposed ETS changes that would enable such umbrella organisations to directly register or claim credits. However, if the registration process does become less onerous, then these organisations could potentially work out an arrangement with their landowners to clip the ticket in exchange for assistance with registration and filing returns.

10 Threats to biodiversity

Left to its own devices, nature is promoting rapid regeneration of native biodiversity on Banks Peninsula, principally through kanuka and gorse colonising marginal grazed land.

However, the regime of "benign neglect" that has allowed much natural regeneration may be replaced by practices much less conducive to biodiversity enhancement.

This threat to the status quo comes from the implementation of new farming practices and potentially an increase in exotic rotational forestry.

10.1 Large scale spraying

In the last few years, huge areas of well-developed regenerating kanuka biodiversity have been aerial sprayed. This is evident in places such as Hickory Bay, Le Bons Bay, Okains Bay, Robinsons Bay and Western Valley.

Vast swathes of kanuka on hillslopes and faces have been sprayed as shown below.

Figure 7 Extensive sprayed mature bush in Hickory Bay

The reasons why this is happening are under investigation, including the desire of farmers to have their land in "productive" use, manage stock, and whether recent changes to the District Plan are a contributing factor.

10.2 Exotic forestry

Another growing concern is that marginal land, including land that is currently regenerating, may be planted in rotational exotic forests.

- Carbon prices and Billion Trees grants are likely to encourage exotic forestry especially pine plantations as they are cheaper to plant, the planting grants are an effective incentive for pines, and they are seen as absorbing more carbon, at least in the short term
- Consultants recommending pines as sequestering much more than natives and therefore earning more (https://www.stuff.co.nz/business/farming/109400721/to-make-money-from-carbon-farming-plant-pines-not-natives-says-consultant)

- The process for registering for carbon credits is much easier for planted forestry than natural regeneration

10.3 Turning these around with carbon credits

Given the international need to create more carbon sinks, the government's commitment to reducing New Zealand's footprint, the changes to legislation and funding, and the emphasis on partnership driven landscape scale change, carbon sequestrations seem set to become a potential earner on marginal land on Banks Peninsula.

The models and figures given above indicate that retention of native forest may be a way to bring in income to landowners instead of spraying bush for pasture or planting exotic forests, but that it is extremely site dependent.

However, landowners are only likely to move in this direction if they see that it has worked for others, perceive benefits to their own income and property, and the process is not too onerous.

11 Conclusions

Conclusions formed from the work to date are:

- Income from carbon credits through native biodiversity restoration has the potential to leverage partnerships and projects meeting all of the Trust's pillars, including key strategic goals of securing and extending access on Te Ara Pātaka and Pest Free Banks Peninsula.
- The legislative environment is currently moving rapidly to create a more favourable landscape for sequestration through afforestation, including native regeneration, but there are still barriers to native regeneration and a systemic bias toward planting exotics.
- There is a lot of interest in the topic of from both conservation and farming landowners and other agencies but a lack of leadership for Banks Peninsula into how to move forward.
- Leadership in this field is needed to facilitate landscape scale goals.
- For landowners already engaged in conservation, there are likely to be worthwhile financial gains, provided the area they seek to register includes substantial areas of post 1989 forest or potential forest. Carbon credits are not available for covenants protecting old growth. Designers of future covenant areas should bear this in mind and aim to protect a wider area so that biodiversity can expand and generate a carbon income.
- It is worth being strategic about when the registration takes place to maximise the initial allocation of credits, i.e. before 2022.
- More communication and work is needed with MPI to facilitate registrations on Banks Peninsula and avoid rejection such as the Langer Trust has experienced
- The income from carbon credits is probably not sufficient to leverage a land use change on marginal land from grazing to sequestration across the board on the Peninsula, but *may be on individual sites*. Each site needs to be assessed to determine what percentage is likely to qualify, the returns from the area and compare this with the return from the current land use
- Billion Trees grants

- The Natural Regeneration grant will provide a useful boost to income for natural regeneration projects, but applications need to get in the system relatively soon as it has a finite life. These will need to be well researched
- Planting grants do not appear to cover the additional costs of planting, even for the cheapest planting model, so if used, they probably need to be supplemented with grants at a similar level from other organisations.
- It is therefore probably not worth leading a large ecological partnership project across the Peninsula based on accessing the planting grants, but leveraging the natural regeneration grants would be well worth while.

- Strategically assisting natural regeneration where it has already started with minimal planting will help bring income forward in time and may be worthwhile, particularly where nature left to its own devices is likely to take a long time. However, it is unlikely to work on broad swathes of open pasture, so is more likely to be used for infilling, and better value on blocks of less than 100ha that use lookup tables to calculate carbon rather than field measurement.
- Carbon credit income could potentially lever a vision for the Peninsula as a net carbon sink through retiring marginal land into native forest largely through natural regeneration. However, carbon prices would need to rise considerably before this is likely to work, and the difficulties of registering land that contained evidence of woody vegetation prior to 1990 eased. Each site needs to be carefully assessed to work out how much qualifies.
- There is a strong interest in the potential for carbon income to leverage native biodiversity projects across a wide range of agencies and from private landowners. Carbon income alone may not provide the complete financial solution for all biodiversity enhancement projects, but could form an important part of the mix
- The information and modelling done for this report is of interest to many parties.

12 Next Steps

The Trust has committed to maximising income from carbon sequestration using and to benefit native biodiversity.

The Trust is working with representatives from Department of Conservation, QEII Trust, BPCT and Greenco to foster enhancement projects on Banks Peninsula, principally based on natural regeneration.

To date the group has taken the following steps.

1. Obtaining the aerial imagery from MPI so that a common data set is in use.
2. Invited MPI to visit Banks Peninsula, meet a range of stakeholders and see properties including the Panama Reserve and Hinewai to better understand the potential for much more native regeneration and improved biodiversity outcomes if carbon income from the ETS is harnessed. Issues to be discussed would include:
    a. Assessing potential forest at the 1990 cut-off date and how the presumption that it exists in images showing gorse or woody covered can be changed to a presumption that it does not
    b. Assessing tree ages and pooling of destructive sampling data

The next steps will depend on the progress made with MPI, and are likely to include.

3. Continuing to assess whether carbon income can assist particular projects for access and biodiversity protection (principally through natural regeneration)
4. Refining where a Billion Trees partnership supplemented with other grants could make it worthwhile to plant parts of the property.
5. Participating in the legislative submission process to ensure that properties with native vegetation covenants and public access can gain a higher carbon price and encourage others to convert to this landuse.

The carbon report is now released as a draft to these partner organisations for review, contributions and to assist with joint understanding and preparation for the next steps. The Scenario spreadsheet is also shared for review, refinement and high level testing of potential incomes from different mixes of qualifying and eligible land.

Appendix A. **Waipuna Bush report**

Prepared by Bob Webster

Waipuna Bush – Carbon Credits

Waipuna Bush has been registered for carbon credits under the Permanent Forest Sink Initiative (PFSI) since 2013.

Land classification:

The attached map shows the area that already qualifies for carbon credits, being 'post 1989 forest land' (15.9 ha), the area which we have registered for future carbon credits but which does not yet qualify (not yet 'forest land') (23.4 ha), with the remaining area not qualifying as it is regarded as 'pre 1989 forest' (35.3 ha).

'Forest land' is an area of land of at least 1 ha with forest species with a potential cover of more than 30% of the land area.

Only land that has reach this state since 1989 is eligible for carbon credits.

Carbon stocks and value:

Carbon accumulation can be determined by the area of qualifying forest and how many years since it became qualifying forest, simply using look-up tables. For larger forests this has to be determined by actual measurement, which would be expensive.

The New Zealand Emissions Trading Register records that we started with 786 carbon units at the time we first registered in 2013 and that we have accumulated a further 988 units since that time, giving us a current total credit of 1754 carbon units (tonnes of carbon).

Back in 2013 carbon prices were about $6/tonne, which would have yielded $6 x 786 units = $4,700.

Carbon prices for PFSI units have recently been able to attract up to about $25/tonne, which would yield $25 x 1754 units = $43,800 assuming all current units were sold.

Price depends on attracting a buyer and what the market will pay, which can depend also on other identified conservation benefits on the land concerned. We may be able to achieve a premium price if we put effort into marketing our land and conservation efforts.

Process and costs:

Firstly we approached Permanent Forests International Limited (PFI) (Mark and Ollie Belton) to assist us register for carbon credits. Ollie Belton did a desktop map from air photos, without any site visit.

Carol and I then spent quite a few days adjusting this map, and describing and photographing the vegetation in the different areas. This was all attached to our application to the Ministry for Primary Industries (MPI), which we submitted through PFI. MPI then did a site visit and disputed some of our areas. To move forwards we largely accepted their adjustments, given the difficulty of proving otherwise.

We continue to use PFI to complete mandatory returns to update our carbon stocks. We would probably use them as a broker if we wanted to sell units.

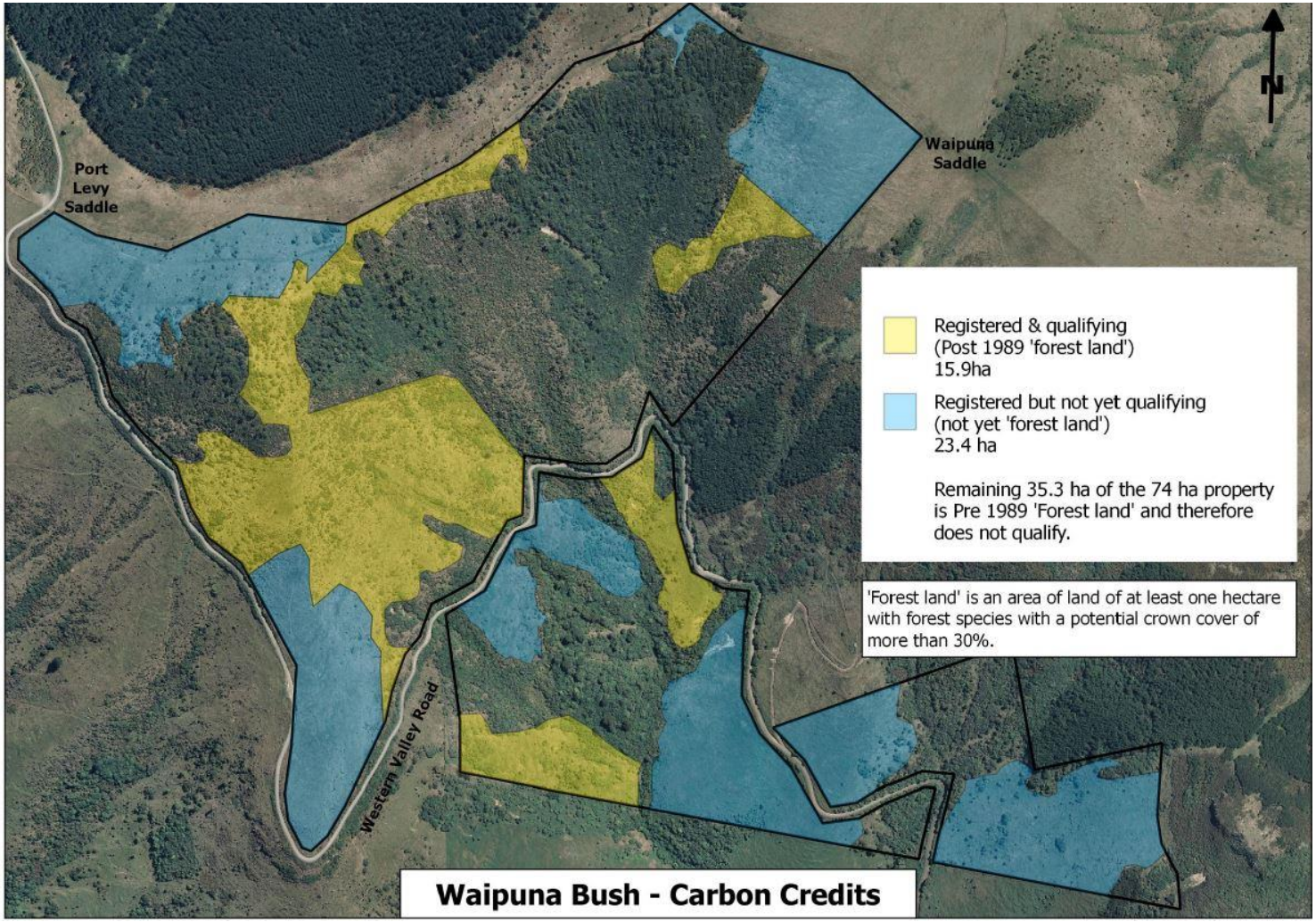
PFI charged $414 back in 2012 to make the application to MPI. In addition, MPI charged an application fee at that time of $575.

PFI's fees are currently about $150 to do a mandatory carbon units return, and 5% plus GST on the purchase price if selling units.

The Permanent Forest Sink Initiative, under which we are registered, came into effect in 2008. The scheme is aimed at forests (mostly native forests) that are intended to remain permanently, rather than at production forestry. The government is currently considering merging the PFSI and the wider New Zealand Emissions Trading Scheme under the same legislative and processing framework. The changes proposed could simplify registration and management of carbon from permanent forests.

Bob Webster
3rd Sept 2018

Figure 8 Waipuna Bush carbon area map



Appendix B. **Model calculations**

A model has been created to enable calculation of net carbon profit (income less costs), parameterised so that it can be applied to different sites and projects by altering the following variables:

- Number of qualifying hectares, and the start year in which they qualified
- Number of eligible hectares, with different starting years for qualification depending on whether this occurs through natural regeneration or a planting project
    - For natural regeneration, three different time lengths are used - 10,15 or 20 years
    - When planting is used, then it is assumed these areas become qualifying at the start of the project (ie not staggered over years)
- Natural regeneration projects are modelled both with and without the Billion Trees Regeneration Grant of $1000 per hectare.
    - There is also a "Planting Assisted" regeneration method considered which involves strategically planting 150 of 5.5m type stems per hectare to enable the area to qualify immediately. This is the minimum number of stems needed to qualify, and it is considered this method is only applicable in areas that are already under some form of regeneration where the new plants can be sheltered by other regenerating plants (such as coprosmas).
- Large scale planting using costs based on 3 different planting methods and stem rate.
    - The Permanent Forests NZ Ltd method is a minimum stocking rate and minimum cost.
    - The Tāne's Trees Trust is a maximum planting rate at the high end (or more realistic cost)
    - A hybrid combines the Tane Trees planting cost, but the Permanent Forests NZ Ltd lower stocking rate.
- Grants for large scale planting including:
    - Billion Trees Direct Landowner,
    - Billion Trees both Direct Landowner plus Partnership,
    - Billion Trees Direct Landowner plus Partnership and additional supplementary grants from another partners (such as ECAN for catchment protection)
- Costs taken into account include registration and participation in the ETS process as well as the costs of planting. The costs of managing natural regeneration blocks is currently set to 0, but can be tested at different levels.
- No fencing costs or grants are taken into account.
- The model can be run over a different number of years into the future. This has been set to 32 years in all the modelling so far.
- The NPV discount rate. This has been set to 8% based on the forestry industry standard stated in the Permanent Forests NZ Ltd report on the Panama Reserve
- Different carbon prices of $25, $45 and $10, less sale costs are tested.

The net profit is then presented as:

- Net profit over the whole period
- Average net profit per year
- Average net profit per year per hectare. This amortises the profit across both the qualifying and eligible, on the basis that the entire area has been withdrawn from any other type of farming
- Net discounted profit taking into account the value of the upfront costs and the reduced worth of future income. This is important when comparing natural regeneration that takes a long time to start generating an income, versus speeding this up by planting which has high up front costs.

B.1 Waipuna Bush

The model has then been applied to the existing Waipuna Bush property using its current mix of 15.9ha already qualifying and 23.4ha eligible. The assumptions here are that the qualifying areas are already in the system, so won't receive any grants and became qualifying in 2000, so are quite far along in the carbon sequestration tables.

The following Scenarios are then tested.

Scenario 1. Existing situation of natural regeneration with no grants, assuming that regeneration takes 10,15 or 20 years before it qualifies

Scenario 2. Existing situation of natural regeneration with a Billions Trees regeneration grant of $1000 per ha taken up for the 23.4ha, and assuming that regeneration takes 10,15 or 20 years before it qualifies

Scenario 3. Assisting the natural regeneration on the 23.4ha with the minimum planting of 150 stems per ha to qualify immediately and taking up a Billions Trees regeneration grant.

Scenario 4. Planting the 23.4 ha using the Permanent Forests NZ Ltd method and taking up a Direct Landowner Billion Trees Grant of $4000 per ha for the 23.4ha planted –the cheapest method.

Scenario 5. Planting the 23.4 ha using the Tāne's Trees Trust method and taking up a Direct Landowner Billion Trees Grant of $4000 per ha for the 23.4ha planted – the more expensive, but probably also more realistic method.

Scenario 6. Planting the 23.4 ha using the Tāne's Trees Trust method, but the Permanent Forests NZ Ltd's lower stocking rate of 1100 stems per ha. MPI have indicated that to qualify for a planting grant at least 750 stems, plus a margin for failure, must be planted, so the Permanent Forests NZ Ltd stem rate is probably the minimum possible. Getting the Direct Landowner Grant and a Partnership Grant. This therefore represents the minimum planting for the maximum Billion Tree grants

Scenario 7. Planting as for Scenario 6 to minimise planting costs and maximise Billion Tree grants,and adding further grants from other organisations to reach the threshold where the NPV per year per ha profit might be sufficient for a farmer to convert marginal land to native regeneration. The grant needed to reach an NPV rate of just over $200per ha was $5,500. Grants may be available from other sources such as ECAN for biodiversity and catchment reasons.

Table 2 Natural Regeneration, Eligible areas taking 10, 15 and 20 years to qualify – without and with Billion Trees Regeneration grant

Carbon Price	Years until eligible qualifies	Total income iincluding grants	Total Cost	Net Profit	Average net profit/year	Average net profit per year per ha	NPV Carbon Income	NPV Combined total income	Total Discounted Cost	Net Discounted Profit	Average net discounted profit pa	Average net discounted profit pa per ha
Scenario 1 – Natural Regeneration No Grants												
$25	10	$173,153	$16,575	$156,578	$4,893	$125	$90,522	$90,522	$10,014	$80,508	$2,516	$64
$45	10	$311,676	$16,575	$295,100	$9,222	$235	$162,939	$162,939	$10,014	$152,925	$4,779	$122
$25	15	$138,808	$16,575	$122,233	$3,820	$97	$74,785	$74,785	$10,014	$64,771	$2,024	$52
$45	15	$249,854	$16,575	$233,279	$7,290	$185	$134,614	$134,614	$10,014	$124,600	$3,894	$99
$25	20	$105,185	$16,575	$88,610	$2,769	$70	$62,071	$62,071	$10,014	$52,057	$1,627	$41
$45	20	$189,333	$16,575	$172,758	$5,399	$137	$111,727	$111,727	$10,014	$101,713	$3,179	$81
Scenario 2– Natural Regeneration, with Billion Trees Regeneration Grant of $1000 per eligible ha												
$25	10	$196,553	$16,575	$179,978	$5,624	$143	$90,522	$113,922	$10,014	$103,908	$3,247	$83
$45	10	$335,076	$16,575	$318,500	$9,953	$253	$162,939	$186,339	$10,014	$176,325	$5,510	$140
$25	15	$162,208	$16,575	$145,633	$4,551	$116	$74,785	$98,185	$10,014	$88,171	$2,755	$70
$45	15	$273,254	$16,575	$256,679	$8,021	$204	$134,614	$158,014	$10,014	$148,000	$4,625	$118
$25	20	$128,585	$16,575	$112,010	$3,500	$89	$62,071	$85,471	$10,014	$75,457	$2,358	$60
$45	20	$212,733	$16,575	$196,158	$6,130	$156	$111,727	$135,127	$10,014	$125,113	$3,910	$99

Table 3 Planting Scenarios with different methods and grant levels

Carbon price	Total grant	Total income including grants	Total Cost	Net Profit	Average net profit/year	Average net profit per year per ha	NPV Carbon Income	NPV Combined total income	Total Discounted Cost	Net Discounted Profit	Average net discounted profit pa	Average net discounted profit pa per ha
Scenario 3– Natural Regeneration, with Billion Trees Regeneration Grant of $1000 per eligible ha and minimal planting to qualify												
$25	$23,400	$196,553	$47,814	$148,739	$4,648	$118	$126,496	$149,896	$41,253	$108,643	$3,395	$86
$45	$23,400	$335,076	$47,814	$287,261	$8,977	$228	$227,693	$251,093	$41,253	$209,840	$6,557	$167
Scenario 4 – Permanent Forests NZ Ltd method planting (lowest cost) and BT Planting Grant of $4000 per ha												
$45	$93,600	$266,753	$154,214	$112,539	$3,517	$89	$126,496	$220,096	$147,653	$72,443	$2,264	$58
$25	$93,600	$405,276	$154,214	$251,062	$7,846	$200	$227,693	$321,293	$147,653	$173,640	$5,426	$138
Scenario 5 – Tane's Trees Trust method planting (highest cost) and BT Planting Grant of $4000 per ha												
$25	$93,600	$266,753	$484,575	-$217,822	-$6,807	-$173	$126,496	$220,096	$478,014	-$257,918	-$8,060	-$205
$45	$93,600	$405,276	$484,575	-$79,300	-$2,478	-$63	$227,693	$321,293	$478,014	-$156,721	-$4,898	-$125
Scenario 6 – Tane's Trees Trust method planting with lower Permanent Forests NZ Ltd density, and BT Planting and Partnership Grant of $6000 per ha												
$25	$140,400	$313,553	$245,661	$67,892	$2,122	$54	$126,496	$266,896	$239,100	$27,796	$869	$22
$45	$140,400	$452,076	$245,661	$206,414	$6,450	$164	$227,693	$368,093	$239,100	$128,993	$4,031	$103
Scenario 7 – Tane's Trees Trust method planting with lower Permanent Forests NZ Ltd density, BT Planting and Partmership Grant of $6000 per ha plus further grants of $5,500												
$25	$269,100	$442,253	$245,661	$196,592	$6,143	$156	$126,496	$395,596	$239,100	$156,496	$4,890	$124
$45	$269,100	$580,776	$245,661	$335,114	$10,472	$266	$227,693	$496,793	$239,100	$257,693	$8,053	$205