Action on agricultural emissions

Technical appendix 8

Counting carbon sequestration by trees and vegetation on farms

Counting carbon sequestration by trees and vegetation on farm

1. Purpose

A key concern raised by stakeholders throughout our inquiry is that it is unfair to face obligations for agricultural emissions while excluding some activities that sequester carbon and offset those emissions.

The Committee agrees it is important to account for emission removals on farm alongside emission sources. There are however several challenges associated with counting all carbon sequestration actions.

This paper outlines the issue, challenges and possible options to overcome those challenges with recommendations for priority work by the Government to progress these issues in parallel with policy on agricultural greenhouse gases.

The issues have been broken down into the following sections:

(1) Whether to count carbon sequestered by all trees on farm. This includes:
    a. small blocks of trees that currently don't meet the definition of a forest under our international target accounting and New Zealand Emissions Trading Scheme (NZ ETS) accounting
    b. trees planted before 1990 that are still sequestering carbon
(2) Whether carbon sequestered by trees on farm can be netted off against farm level emissions at the farm gate, if agricultural emissions are priced.

2. Counting carbon sequestered by all trees and vegetation on farm

2.1. Introduction

A view repeatedly raised by a range of stakeholders and in submissions to the NZ ETS review is that all carbon sinks on farm (including those planted before 1990 and smaller than 1 ha etc) should be eligible to earn units in the NZ ETS or be used as an offset for their emissions.[1][2]

However, currently only post-1989 forests are eligible for units under the NZ ETS. They also need to:

- be larger than 1 ha in area
- reach at least 5m in height when mature
- have a tree crown cover of forest species of more than 30 percent in each hectare and

[1] http://www.mfe.govt.nz/sites/default/files/media/Consultations/108%20Te%20Whakakitenga%20o%20Waikato%20Incorporated.pdf#page=10&zoom=100,0,253

[2] http://www.mfe.govt.nz/sites/default/files/media/Consultations/213%20CNI%20Iwi%20Land%20Management.pdf

- be wider than 30m.[3]

This is seen by many as being intrinsically unfair.

Beef + Lamb New Zealand estimate that there is 1.4 million hectares of native forest on sheep and beef farm land. Some of these forests may be storing additional carbon that could be used to offset agricultural emissions. If additional carbon is being sequestered much of it would not be eligible to earn units under the NZ ETS as the forests were planted prior to 1990[4].

A significant amount, around 36%, of plantation pre-1990 forests are owned by Maori.[5,6]

The current NZ ETS rules are aligned with our international and domestic greenhouse gas emission reduction targets and the only trees receiving units through the NZ ETS are those that count towards our targets.[7] This is because the main purpose of the NZ ETS is to assist New Zealand to meet its agreed emission reduction targets.

New Zealand's first Nationally Determined Contribution (NDC) under the Paris Agreement makes it clear that any change in accounting rules would be matched by a change in its target, so that the overall level of effort to reduce emissions would not be diminished[8]. Therefore, from a national perspective, changing accounting rules to capture a wider range of sequestration actions wouldn't make meeting our target easier.

The following section discusses:

(1) what carbon sequestration currently counts toward our targets and why
(2) participation in the current forestry NZ ETS
(3) the scope to change target accounting to include carbon sequestered by
    (a) small blocks of trees and vegetation less than 1 ha, crown cover less than 30% etc. (will be referred to as small blocks of trees and vegetation in the rest of this paper)
    (b) forests planted prior to 1990
(4) how farmers could be rewarded for carbon sequestration that isn't currently eligible to earn units under the NZ ETS.

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[3] Climate Change Response Act 2002

[4] https://www.stuff.co.nz/business/farming/105298445/quarter-of-nzs-native-vegetation-found-on-sheep-and-beef-farms

[5] BERL. (2010). *The Māori Economy - A sleeping giant about to awaken?* Retrieved from http://www.berl.co.nz/economic-insights/economic-development/maori-economy/the-maori-economy-a-sleeping-giant-about-to-awaken/

[6] Warren, A. (2013). *Opportunities for Māori land and forest owners to influence the future direction of Māori forestry*. Paper presented at the Mai i te ngahere oranga (Māori Forest Forum), Rotorua. http://www.scionresearch.com/__data/assets/pdf_file/0016/42235/9.-Arthur-OPPORTUNITIES.pdf

[7] To reduce complexity there are some differences between NZ ETS and target accounting for example, pre-1990 land that is deforested is classified as post-1989 forest under the NZ ETS but not in target accounting

[8] "We reserve the right to adjust our selection of methodologies, without reducing ambition". New Zealand, 2016, Submission under the Paris Agreement New Zealand's Nationally Determined Contribution.https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/New%20Zealand%20First/New%20Zealand%20first%20NDC.pdf

2.2. What carbon sequestration currently count towards targets and why?

2.2.1. The 2020 target

New Zealand adopted the rules of the Kyoto Protocol for its 2020 target. Therefore, carbon sequestration that can count toward our 2020 target is sequestration from native and exotic forests planted after 1989 that:

- are a minimum area of 1 hectare
- are a height of 5 metres at maturity
- have a minimum crown cover of 30 per cent at maturity
- have a minimum forest width of 30 metres of canopy cover.

Forests planted prior to 1990 that are cut and replanted (reforested) are considered pre-1990 forests. Sequestration occurring in these forests is not counted towards the 2020 target, unless specific management practices (e.g. specific pruning or selective harvesting approaches, additional pest control that increases net carbon stocks, etc.) have been implemented since 1990 that increase the rate of carbon sequestration over and above what would be expected under business as usual.

Since 2013 an additional 91,500 kt carbon dioxide has been sequestered in pre-1990 forests because of changed forest management practice.[9] However, the amount of additional sequestration that can be counted toward the 2020 target is capped at 3.5% of New Zealand's gross emissions so only a portion of this will be counted towards the 2020 target.[10]

Removal of any forest that meets the current definition of forest (regardless of whether the forest was planted before or after 1990) is debited against our 2020 target.

As a party to the Kyoto Protocol, New Zealand had to adopt the agreed international accounting rules and guidelines for its 2020 target; in line with these guidelines only new and additional changes in forest carbon stocks since 1990 are counted.

Choices are allowable within these guidelines to balance what could be robustly and cost effectively measured and verified with what might lead to greater deforestation liabilities. New Zealand chose to apply 30m minimum average width in addition to the minimum forest dimensions. This enabled satellite images to be used to map land use in 1990, and to ensure New Zealand did not face deforestation liabilities for highly variable areas of trees not typically managed as forest, such as shelterbelts.

[9] Ministry for the Environment, 2019, New Zealand's Greenhouse Gas Inventory (1990–2017)

[10] Ministry for the Environment, 2019, New Zealand's Greenhouse Gas Inventory (1990–2017)

2.2.2. Beyond 2020

To maintain consistency between targets, New Zealand has indicated in its first NDC under the Paris Agreement that it will use the same accounting method for the 2030 target as for the 2020 target.[11] New Zealand has however reserved the right to adjust its accounting method for the 2030 target on the proviso that any adjustment does not reduce the ambition of the target.[12] The accounting method for the 2030 target is likely to be confirmed in New Zealand's first communication under the Paris Agreement (2024).

While New Zealand could have adopted a completely different accounting method for its first National Determined Contribution (NDC) under the Paris Agreement (the 2030 target), any method is subject to the integrity principles set out in the Paris Agreement (article 4.13). The Paris Agreement also requires countries to take into account the existing rules and guidance under the United National Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol.

2.3. Participation in the NZ ETS

Under the current NZ ETS, participants must first map and register their block(s) of trees. This includes confirming trees were established after 1989, which can be challenging. To earn units participants then submit an emissions return setting out how much carbon was sequestered in the forest over a set time period. When that forest is harvested/removed, land owners must surrender units reflecting the amount of carbon lost.

To complete an emissions return, the age, area and rate of sequestration of the vegetation is required. If the participant has less than 100 hectares of eligible forest land, emissions returns must be calculated using default look-up tables that set out estimated rates of sequestration.

It costs a participant around $500 to register in the NZ ETS and around $100 to have an emissions return processed.[13] That does not include participant time to compile the information required for registration and the emissions return, including the costs of any advice sought to assist with the process.

The registration and submission cost paid by the participant only partially cover the administrative costs for government of confirming eligibility for registration and auditing emissions returns.

Only about 60% of currently eligible post-1989 plantation forest, and a smaller proportion of eligible blocks of reverting indigenous forest, have been registered in the NZ ETS.[14] Through our engagement several reasons for this have been raised – these include:

- some eligible plantation forests are nearing the time of harvest and any units received would soon need to be paid back
- a lack of knowledge about the scheme

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[11] The 2030 target includes one additional rule that means only carbon removals from plantation forests up to the long term average of a forest are counted. This rule been added because it smooths out the ups and downs arising from harvesting and subsequent replanting, and reduces the challenge that harvest of the "wall of wood" planted in the 1990s creates for meeting the target.

[12] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/New%20Zealand%20First/New%20Zealand%20first%20NDC.pdf

[13] https://www.mpi.govt.nz/growing-and-harvesting/forestry/forestry-in-the-emissions-trading-scheme/fees-and-charges/

[14] Manaaki Whenua, 2018, Carbon sequestration potential of non-ETS land on farms

- the admin costs of registering, monitoring and reporting the forests and selling units, outweigh the value of carbon units to be received
- the time and effort needed to register and submit emission returns have been considered to outweigh the benefits
- farmers prefer to avoid having an ongoing liability associated with the trees

The government is working at removing some of the barriers to entering eligible forests in the NZ ETS, such as introducing an averaging approach for plantation forests, and potentially mapping eligible land to make registration easier. The Committee consider this work should continue as a high priority to maximise the carbon sequestration benefits of forests to farmers and forest owners.

The Committee recommends that the Government prioritises work underway to improve the NZ ETS for forests, to make it easier for forest owners to identify eligible forest land and register it in the NZ ETS.

2.4. Small blocks of trees and vegetation

Some blocks of trees and vegetation on farms do not meet the definition of 'forest' and therefore don't count toward targets; these include small lots of exotic and native trees, shelterbelts, pole plantings, riparian plantings and wetlands. This could either be because they don't meet the minimum area or the height or density thresholds for a forest.

The following sections outline the scope to change target accounting rules to include carbon sequestered by those small blocks of trees and vegetation and the opportunities and challenges of rewarding that sequestration at the farm level.

2.4.1. Is there scope to change target accounting?

In principle, New Zealand could change its target accounting methodology for forestry and land use to include carbon sequestration in from small lots of trees and vegetation. This could be achieved through a change in the forest definition or by including a new land use activity that captures blocks of vegetation smaller than a hectare.

To ensure international credibility, any carbon sequestration counted toward targets must be able to be measured and monitored in a way that it meets international standards for accuracy.[15] This requires being able to:

1) robustly estimate the rate at which these trees or vegetation remove carbon dioxide from the atmosphere (this includes knowing the age of the trees/vegetation), and
2) robustly estimate the area, and change in area over time, of the trees or vegetation across the entire country (both additional plantings and loss of plantings).

There is a general lack of robust data on the rate at which these diverse types of trees and vegetation remove carbon dioxide from the atmosphere. However, recent research gives some indicative data which are summarised in Table 1 below.[16]

[15] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol

[16] Manaaki Whenua, 2018, Carbon sequestration potential of non-ETS land on farms

Table 1: *Indicative rates of sequestration of different types of trees and vegetation.*[17]

Vegetation type	**Rate of carbon sequestration (tonnes of CO_2e per hectare per year)**	**Years to reach maturity**
Small lots of exotic and native trees	6.5 (native) - 26.3 (exotic)	28 (exotic) >50 (native)
Shelterbelts	6.5 (native) - 26.3 (exotic) (Note: varies greatly depending on the plant type and size. Shelter belts managed at a constant height and width will have limited sequestration potential once they reach a farmer's desired dimensions)	28
Pole planting	2.0	30
Riparian planting	0 - 5.28 (Note: varies greatly depending on the plant type and size)	20
Wetlands	0 - 2.0	>50

Note this table does not include any carbon lost as a result of land use change from pasture to forest.

The wide range of sequestration rates shown in the table reflect the diversity of ways in which such different vegetation types occur (i.e. different types of trees, different density of planting, different climate and soil conditions). Further research on the sequestration rates for all the types of trees and vegetation listed in this table, along with understanding of the factors that influence these rates, will be required before they can be considered robust enough for inclusion in target accounting.[18]

Data are also lacking on the area of these small blocks of trees and vegetation at a national scale, and, critically, how the area has changed over time. There is some indication that at the national level that since 1990 we have lost more of these small blocks of trees and vegetation than we have gained.[19]

Expanding the current programme of work that estimates the area of forests that already count toward our targets to include the area and change in area of small blocks of trees and vegetation is possible. However, the administrative costs of robustly estimating the change in area of these blocks and the carbon sequestered, may outweigh the benefit at the national scale of counting these types of vegetation towards New Zealand's targets.

These administrative costs could be reduced by:

- choosing a more recent base year for counting that vegetation e.g. 2008.[20] Advancements in satellite imagery and remote image classification since 1990 could mean it is easier and

[17] Manaaki Whenua, 2018, Carbon sequestration potential of non-ETS land on farms

[18] Manaaki Whenua, 2018, Carbon sequestration potential of non-ETS land on farms

[19] Land classified in the NZ GHG inventory as grassland with woody biomass (most closely representing land covered in small blocks of trees) has been in overall decline since 1990 (reference inventory)

[20] In 2008 the New Zealand government gained access to multispectral imaging data with a resolution of 10m https://www.mfe.govt.nz/more/data/available-datasets/satellite-data-search

therefore less costly to robustly estimate changes in the area and rates of sequestration by adopting a more recent date.
- using rapidly developing technologies, in particular developments in satellite and other aerial imagery and automated image processing.
- focussing only on those types of vegetation that have nationally significant potential to sequester carbon. Research undertaken for the Biological Emissions Reference Group suggests that at a national scale small lots of exotic and native trees have a much greater potential to sequester carbon and offset agriculture emissions than riparian planting or wetlands.

Overall, while there is an opportunity to change target accounting to include smaller blocks of trees and vegetation, further research is needed to:

- be able to robustly estimate the rate of sequestration occurring in those small blocks of trees and other vegetation
- determine if the costs of measuring and monitoring the change in area of those trees and vegetation at a national scale outweigh the benefits to the country.

As outlined above New Zealand's has committed to maintaining the ambition of the 2030 target if the target accounting rules change. If changing the accounting for the 2030 target made the target easier to meet, the overall ambition of that target will need to be revisited. This does not mean we should or could not change our forest accounting rule with respect of small blocks of trees and vegetation but it does mean that overall New Zealand should not benefit from any change unless we can increase the carbon stored beyond business as usual.

If a decision were made to include carbon dioxide emissions and removals by small blocks in our targets, the next step is to consider the practicality of devolving any such emissions and removals down to farm level.

2.4.2. Can NZ ETS units for carbon sequestration from small blocks be given at the farm level?

If carbon sequestration from small blocks of trees and vegetation could be made eligible for NZ ETS units there would be significant administrative costs and challenges for farmers and government in implementing this change at the farm level.

If they were included the current process of registration and submission of emissions returns would need to be followed. The cost of this may be a significant deterrent. It is possible that the costs of registering, measuring, monitoring and auditing small lots of vegetation may on its own outweigh the carbon sequestration benefits for some vegetation categories.

For example, a dairy farm with riparian planting consisting of a mix of native grasses, shrubs and trees along 3.2 km of stream with a total area of planting of 4.5ha is estimated to sequester between 0.45 and 13.5 tCO_2e per year.[21] At a carbon price of \$25/tCO_2e, this has a value between \$10 and \$340 per year.

Overall, it is possible that the costs to a farmer of registering small blocks of trees and vegetation that don't currently meet eligibility thresholds in the NZ ETS, might outweigh the financial benefits,

[21] As above

particularly for those classes of vegetation that sequester very little carbon. It may be preferable to wait and use new aerial and remote sensing technologies to reward small blocks in a simpler way.

Further work is needed to quantify those costs and benefits.

2.4.3. Could rewards be given for carbon sequestration that doesn't count toward targets?

Even if the government decided not to change the accounting method used for our target to cover small blocks of trees and vegetation, it could still provide rewards for those who plant or facilitate regeneration of small areas. However, the Government would have to justify the public benefit of that spending on grounds other than it helps meet climate change targets.

People don't plant trees solely for carbon units. There is a broader suite of reasons and a broader set of values from planting trees, particularly natives. New Zealand Treasury's Living Standards Framework recognises the wider values of biodiversity and water quality from native trees.[22] The government could choose to reward planting of trees for a range of public good services, including biodiversity, soil erosion, water quality and benefits to the global climate even if those benefits do not count towards New Zealand's national emissions target.

An example of where this is already happening is Horizons Regional Council's Sustainable Land Use Initiative. The programme includes incentives for tree planting on marginal land on farms. It is funded through general rates and by central government because the wider benefits to the region and country from increased flood protection, better water quality, prevention of hill country erosion and protection of native habitats are explicitly recognised.[23] Another example is the One Billion Trees programme. This programme is targeted at delivering improved social, environmental and economic outcomes for New Zealand.[24]

At the same time, in some locations planting trees can also have negative implications such as additional water withdrawals, risks of 'wilding' or damage during harvest.

2.4.4. Conclusions and recommendations on small blocks of trees and vegetation

At the moment carbon dioxide removed by small blocks of trees and vegetation doesn't count toward our national emission targets and these blocks are not eligible for units via the NZ ETS.

While there is an opportunity for New Zealand to amend the accounting method used for our national target to count these trees and vegetation, the costs of measuring and monitoring them at a national scale could be significant with current technology. As some types of trees and vegetation have considerable potential to sequester carbon, it could be cost effective to focus on counting those with the greatest potential, such as small lots of native and exotic trees.

However, existing information suggests that at national scale, net emissions from small woodlots may have decreased over time rather than increased. New Zealand has committed to update its emissions target if it changes its accounting method; this means that including smaller woodlots in its accounting would not make achieving the target any easier.

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[22] https://treasury.govt.nz/sites/default/files/2018-12/lsf-background-future-work.pdf

[23] Sustainable Land Use Initiative http://www.horizons.govt.nz/managing-natural-resources/land

[24] https://www.mpi.govt.nz/funding-and-programmes/forestry/planting-one-billion-trees/

It would be possible to credit or debit farmers for these trees and vegetation at the farm level, but again this would come at a cost – both to the farmer in measuring and monitoring that vegetation and its carbon sequestration (including any debits arising from removal of small lots of trees and other vegetation), and to the government in verifying its existence and permanence. Further work is needed to quantify the costs and benefits.

If the costs of counting small blocks of trees and vegetation toward the target outweigh the benefits, Government could choose to reward farmers for planting those trees, outside of the NZ ETS. Government would have to justify the public benefit of that spending on grounds other than it helps meet climate change targets. Any reward could recognise the wider benefits associated with planting, particularly of native trees. Given the potential climate and non-climate benefits of trees the Committee feels that undertaking more work on the ability to recognise and reward small plantings on farm is justified.

The Committee recommends that the Government investigates opportunities to recognise and reward small plantings on farms.

2.5. Pre-1990 Forests

2.5.1. Is there scope to change target accounting?

The Committee has sympathy with those who feel it is unfair that owners of forests planted before 1990 are not eligible to earn units for all the carbon sequestered by those forests, nor can use them to offset sources of emissions on farm.[25]

The Committee recognises that the year 1990 is to some extent arbitrary. An important principle underpinning any climate policy is that it should reward only additional actions taken to reduce emissions, but it is difficult to argue that a forest planted in 1991 was planted with a fundamentally different motivation with regard to the global climate than a forest planted in 1989. If anything, this policy principle of additionality would argue for bringing the reference year forward (e.g. to 1997 when the Kyoto Protocol was signed), not to push it back to an even earlier year.

Changing the 2030 target accounting to include business as usual sequestration in pre-1990 forests would not lead to any additional carbon sequestration, that is, there is no benefit for the climate. If it made it easier for New Zealand to achieve its current target of a 30% reduction below 2005 levels, the stringency of that target would need to be increased until there was no reduction in effort or cost. Thus there is no economic benefit to the country from changing the target in this way. Revising the target would also lead to additional cost in developing and consulting on the revised target and additional uncertainty around the quantum of emission reductions New Zealand seeks to achieve (or take responsibility for) by 2030.

On balance the Committee considers that the challenges created by the necessary changes to the 2030 targets would outweigh the benefits at this time. For the post-2030 targets it may be more feasible to explore different accounting methods, including accounting methods that count all carbon sequestered by pre-1990 forests (see section 2.5.3 for more detail).

[25] An assistance package equal to 55 million units was made available to owners of pre-1990 exotic forest to offset some of the economic impact of the NZ ETS (Ministry for Environment (2007)).

2.5.2. Rewarding individual farmers for enhanced sequestration in pre-1990

As described in section 2.2.1, under the existing accounting rules beyond business as usual increases in the rate of carbon sequestration arising as a result of management practices in specific pre-1990 forests (e.g. forest restoration or increased pest control efforts) can be counted towards the 2020 and 2030 targets. The government estimates the aggregate impact of these changes in management practice when communicating progress toward New Zealand's targets. Those estimates are determined using a national grid-based network of permanent plots that provide an unbiased averaged estimate of carbon stored in forests across the country.[26]

At the level of an individual forest, there are currently insufficient data to robustly quantify the extent to which specific management practices enhance carbon storage and the extent to which such management practices are being undertaken.

Once there are robust and cost-effective methods to quantify additional carbon sequestration at the individual forest scale, it could be possible to reward owners of forests who undertake such practices through the NZ ETS. It is important to note that the corollary of such an approach would be that where forest owners are not undertaking at least business as usual practices, a liability could arise if carbon sequestration was below the business as usual average.

Any approach to include forest management practices as credit or debit at farm level is likely to result in significant administrative costs for both government and forest owners in measuring, monitoring and verifying forests and eligible practices. These costs may be able to be reduced in the future through use of new technologies, such as advanced satellite and other aerial imagery/sensing.

Other options for crediting such activities exist (e.g. a project-based crediting approach such as that currently used in California).[27] The details and potential merits of these alternative approaches have not been considered by the Committee but they are likely to have similar challenges to recognising and rewarding the additional sequestration through the NZ ETS.

Further work is required to better understand the feasibility of rewarding any additional carbon sequestration arising from improved management of pre-1990 forests.

2.5.3. Beyond 2030

It may be possible for New Zealand to adopt different forestry accounting rules for meeting post-2030 targets that would allow us to count all carbon sequestration, including removals occurring as business as usual in pre-1990 forests – e.g. full carbon stocks accounting.[28]

It is still unclear to what extent New Zealand will have discretion to choose its own forestry accounting rules for post-2030 NDCs under the Paris Agreement, and where internationally-negotiated rules will constrain our options. It is unclear whether a 1990 base year will still apply.

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[26] MfE, 2010, Measuring carbon emissions from land-use change and forestry, The New Zealand Land-use and Carbon Analysis System

[27] https://theredddesk.org/markets-standards/california-us-forestry-offset-projects-ab-32

[28] Complete accounting for changes in carbon stocks across all carbon pools

Again, the Paris Agreement obliges us to take on progressively more ambitious targets beyond 2030. This means that if target accounting changes enable additional sequestration to be counted we would be expected to adjust our targets accordingly.

While changing our accounting rules in post-2030 targets should not make meeting our targets any easier, any change to the NZ ETS rules to mirror that change (i.e. to make business as usual sequestration in pre-1990 forests eligible to earn units) would alter the distribution of the costs of meeting our targets. Allowing farmers to gain from this sequestration would need to be matched by reductions elsewhere in the economy. How to distribute the cost of meeting any target across the economy will have to be the subject of a much wider national conversation.

2.5.4. Conclusion and Recommendations on pre-1990 forests:

Farmers cannot earn units for sequestration in pre-1990 forests but incur a liability if these forests are harvested but not replanted. This creates a perception of unfairness among farmers and foresters but reflects the rules that applied under the Kyoto Protocol and which New Zealand has committed to apply until at least 2030. Changing those rules would be challenging and mean that New Zealand would have to alter its 2030 target to ensure that it at least maintains the same level of ambition.

Rewarding farmers for sequestration that occurs under business as usual in pre-1990 forests would not lead to additional sequestration and any gain to farmers would need to be matched by reductions elsewhere in the economy. It may be more feasible to explore different rules for targets and related domestic policy options after 2030.

There is scope to reward farmers for forestry management practices that increase how much carbon is sequestered in pre-1990 forests. However, the impact from these intentional practices is not yet easy to quantify for individual forests. The Government should further investigate how additional removals could be robustly measured at such scales and if so, how farmers and foresters could benefit from this.

The Committee recommends that the Government investigates opportunities to recognise and reward forestry management practices that store additional carbon in pre-1990 forests.

3. Netting off removals at the farm gate

Stakeholders have also called for 'netting off' of emissions at the farm gate if agricultural emissions are priced or regulated. This would involve calculating the methane and nitrous oxide emissions on farm for a given period, calculating any eligible sequestration that occurred on farm in that period and subtracting the latter from the former to get a net liability. Netting off could potentially be applied to any pricing (NZ ETS or levy) or rule/limit based policy.

Stakeholders are seeking the opportunity for netting off because they want to:

- take a holistic approach for all their emissions – think about their farm as a single unit
- reduce transaction costs such as those incurred when trading units via brokers or trading platforms, and
- minimise administrative burden of being a forestry participant in the NZ ETS

Like the NZ ETS, a participant in a netting off scheme would still be subject to certain obligations that ensure the scheme has integrity. These obligations would need to include:

- determination of eligibility of trees and vegetation for netting off
- robust monitoring and reporting of forest sequestration and livestock emissions.
- verification of eligibility and accuracy of emissions returns by government officials
- acceptance of liabilities for any loss of carbon stocks.

Netting off would therefore not avoid the administrative costs associated with monitoring and reporting forest sequestration. As such it is unlikely that netting off would substantially reduce the administrative burden as compared to NZ ETS participation.

The main benefit of a netting off approach is that it would avoid some of the transaction costs that farmers would face if they wanted to cover any costs arising from a levy/rebate scheme by selling units from their forests earned through the NZ ETS.

More work is needed to understand all the implications and practicalities of implementing a netting off scheme including:

- how any scheme would align with the NZ ETS to avoid creating an opportunity to exploit differences between the schemes or create perverse incentives.
- the implications of any differences in the levy/rebate scheme price(s) and NZ ETS emissions price
- the potential for and implications of any misalignment between the 'participant' in the NZ ETS for forestry and the levy/rebate scheme.

On balance there is merit in considering the feasibility of netting off further alongside work to implement a farm-level levy/rebate scheme.

The Committee recommends Government investigates the feasibility of 'netting-off' carbon removals and agricultural emissions within the farm-level levy/rebate scheme.