# HE WAKA EKE NOA STEERING GROUP PAPER

## 9 September 2021

## Price Exposure Options

Paper No: 4 UNCLASSIFIED



### 1. PURPOSE

1.1. The purpose of this Programme Office paper is to support the Steering Group to make a decision on which price exposure options to take to farmer engagement.

1.2. The paper attaches as Appendices additional analysis from: government on a land-based rebate; processors on an output-based rebate; and proponents of an enhanced processor level levy option.

### 2. DECISIONS REQUIRED

2.1. **Agree** to take the following price exposure options to farmer engagement: 1) fully exposed, split gas; 2) a land-based rebate option; and 3) an output-based rebate option.

2.2. **Agree/Disagree** to include an enhanced processor level option in the package of options to take to farmer engagement.

### 3. DIRECTION FROM STEERING GROUP AND KEY CONSIDERATIONS

3.1. At your last meeting the Steering Group directed the Programme Office to provide a clear Programme Office view and recommendations to help the Steering Group work through the different perspectives of the individual HWEN Partners. This is a Programme Office paper. The analysis in this paper has been tested and discussed through the Price Exposure Working Group and the Policy Group and we have highlighted where Partner views differ from the Programme Office.

3.2. To aid readability of this paper we have attached the sector level modelling results to date in Appendix 1. This includes updated modelling using Beef+Lamb data. The two models are different. The DairyNZ model incorporates some farm system optimisation changes e.g. stocking rates, fertiliser applied and milk production. The model using Beef+Lamb data does not optimise in this way; it focusses more on the impact of land use change associated with sequestration options prior to mitigations becoming available.

3.3. The aggregate level impacts are consistent across the dairy and sheep and beef modelling. The higher the fully exposed price the greater the impact on farm production, profit and viability, especially when mitigations are not available or are more expensive than the cost of emissions. The sheep, beef and deer modelling also shows a wide variability of impact across farming systems, and the assumptions you make about farmer responsiveness to carbon prices (particularly at higher ETS carbon prices), which result in land use change decisions become crucial in the results the model generates.

3.4. Note, at the time of writing results from the modelling of the output-based rebate option (that has been supplied by processor partners), and the land-based rebate option (that has been supplied by government partners), had not been finalised. These results will be provided to the Steering Group prior to the meeting.

3.5. The sector modelling undertaken to date has confirmed that in the absence of cost-effective short-term mitigation options there is a trade-off between achieving emissions reductions and impacting farm viability.

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3.7. HWEN Case Study analysis indicates that efficiency gains from optimisation of existing farming systems could result in between 2-10% emissions reductions but that this is very farm and farmer specific (i.e. it is dependent on farmer capability and being able to overcome a range of existing constraints). Part of this upper bound also relates to the fact that the best farmers have already optimised their farming systems and therefore are limited in the additional efficiency gains they can achieve without significant and fundamental change.

3.8. The Programme Office is flagging this analysis and the emerging conclusions from our farm level experts because the sector level modelling at this point is indicating a low price (under any option), will not result in emission reductions as it assumes farmers are profit maximisers and will only make changes to what they do currently when the costs of doing so are lower than the HWEN charges they face. It is important to caveat this result with expert opinion on farmer behaviour which suggests that even a low farm level price could incentivise some farmers to better optimise their farming systems and achieve emissions reductions. This is being picked up in the Case Study work but not the sector modelling.



[1] https://www.agfirst.co.nz/wp-content/uploads/2020/09/Achieving-Zero-Carbon-Act-Reduction-Targets-on-Farm-AGF.pdf

3.9. We have based this assessment on an initial presentation of the Case Study analysis to the Policy Group. Further work is needed to write those results up. We will provide results to you and your teams as soon as they are available. It is worth noting that estimations of farm level optimisation have, at least in part, helped form a view in previous policy work on the appropriate level of the regulated target.

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*Programme Office analysis*

4.6. The policy analysis completed to date has focused on teasing out the implications of each of the price exposure options on the agreed HWEN objectives and criteria. The modelling work has helped guide some of this assessment (particularly in regard to effectiveness and equity).

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4.14. The Steering Group has agreed to focus on a fully exposed, split gas levy with complementary options because, so far, it has been assessed as meeting more of the criteria based on the analysis to date. The key downside of the fully exposed option is that the same price that will get one farm system to change could put another out of business. s 9(2)(g)(i) [redacted]t has been a Programme Office view that this option would need to start with a lower signal price to avoid unduly impacting on the sector's viability, particularly while there are few cost-effective mitigation options available. A low starting price would mean there is less marginal incentive to reduce emissions and farmers may 'pay the price' rather than reduce. s 9(2)(g)(i) [redacted]

4.15. Complementary options involving recycling of revenue to accelerate development and lower the cost of future mitigation, as well as, potentially, mechanisms that reward efforts of individual farmers or collectives to reduce emissions, become an important part of the system under any option that has lower marginal incentives (e.g. fully exposed with a low price on methane; or a processor level levy with 95% allocation). More detailed work on complementary options is being taken forward via the Policy sub-group's work on revenue recycling.

4.16. The reliance on revenue recycling to accelerate development and lower the cost of future mitigations has focused minds on the revenue that will be needed to support this critical work. There has also been progress on understanding the administration costs of the scheme and the impact these may have on the amount of revenue that may be available for reinvestment (see reporting paper 9 and summarised below).

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**Box 1: Pricing at the margin and marginal incentive**

**What do we mean by pricing at the margin and marginal incentive?**

To support a shared understanding of 'pricing at the margin and marginal incentive' in the context of price exposure we have summarised below what we have heard in terms of different ways of using these terms:

**Pricing at the margin:**

- Priced not more than the amount necessary to reach regulated targets taking into account action in other sectors to reduce emissions.
- Only a portion of methane priced – the key question then becomes of what is the baseline above which methane is priced (e.g. relative to historical emissions, carrying capacity of land).

**Marginal price incentive:**

The term marginal incentive is used to describe the incentive a price exposure option creates to reduce emissions. Maintaining the marginal incentive is used to described a strengthened price incentive to reduce emissions (or penalty to increase). This can be achieved by increasing the price in a fully exposed option, or having a different method for calculating emissions versus any rebate so a farmer can reduce their fully exposed cost on emissions without their rebate reducing at the same time (e.g. using a historical baseline rebate, land-based/carrying capacity rebate or output based rebate).

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## 5. NEXT STEPS

5.1. A critical priority will be creating the collateral to support the engagement with farmers in November.

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[redacted]

**Charlotte Glass**
**Consultant**
Co-Author

**Gus Charteris**
**Consultant**
Co- Author

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# HE WAKA EKE NOA STEERING GROUP PAPER

## 17 December 2020

## Emissions Pricing – Shortlist

Paper No: 5 UNCLASSIFIED

### 1. PURPOSE

1.1. This paper seeks the Steering Group's endorsement of the shortlisted pricing scheme options and approval to commence with detailed design with the aim to narrow the shortlist further.

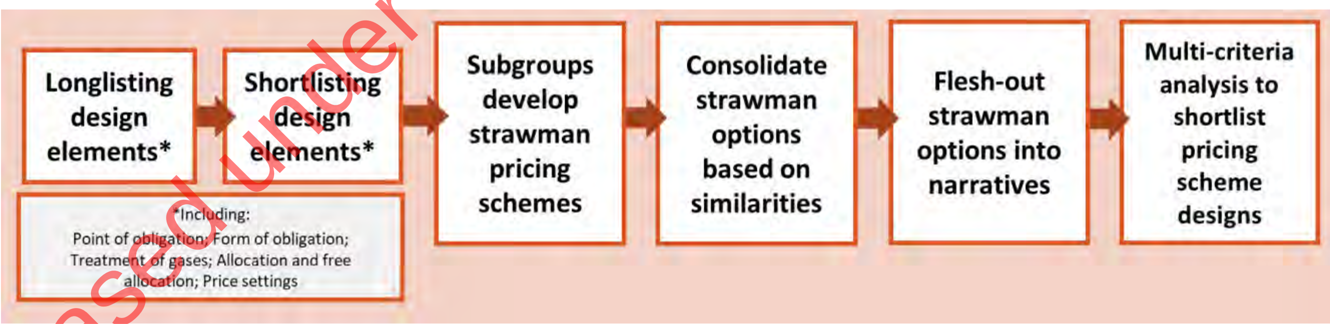
### 2. DECISIONS REQUIRED

2.1. We recommend that the Steering Group:

- **Endorse** the shortlist developed by the On-farm Emissions Pricing workstream.
- **Approve** the workstream commencing detailed design of these options to further refine the shortlist.
- **Note**, alongside other workstreams, we will seek your approval of a research plan in coming months to support analysis of the shortlist.

### 3. KEY POINTS

*Overview of process to shortlist pricing scheme designs*




*Shortlisting process for design elements*

3.1. At the October Steering Group meeting, the On-farm Emissions Pricing workstream (the workstream) provided a progress update on our work. This included an overview of the process to develop longlists of design elements for a pricing mechanism. Where appropriate, these were narrowed down to high-level shortlists.

*Strawman exercise to develop pricing scheme options*

3.2. The workstream broke into subgroups (with mixed participation of sector and government participants in each subgroup) and worked through a set of structured questions to develop the shortlisted design elements into high level strawman options for trading schemes and levy/tax schemes (the two forms of obligation shortlisted).

3.3. The subgroups drew on previously prepared literature reviews and options papers to develop their designs.

3.4. The conversations in subgroups were also supported by guidance (attached as Appendix Two) on key factors of importance in te ao Māori and of priority to Māori landholders in regards to the design of a pricing mechanism. The one-pager was developed by a sub-group of the workstream (Hilton Collier - Māori co-lead, Emma Wardle – MfE, Kirsten Green – MPI). The workstream discussed the guidance during the strawman process and will need to continue to consider how these perspectives are reflected in detailed design over the coming months.

3.5. 11 strawman pricing scheme options were presented back to the full workstream. These included three trading scheme variations, five simple levy options, and three other levy variations. Upon assessing the similarities and distinctions between the options, the options were consolidated to:

- **Option 1: Split-gas levy:**
  Participants would face the cost of the agricultural greenhouse gases they emit within a given period, minus any allowable sequestration and any free allocation. Long-lived gases would be treated as $CO_2$-e with a shared levy rate whereas methane would face a separate levy rate.

- **Option 2: Baseline and credit levy:**
  Participants would face a penalty or incentive based on a performance baseline. Sub-sector specific baselines would be determined which adopts a split gas approach. An emissions intensity baseline would be applied to methane and a nitrogen surplus baseline would be applied to nitrous oxide. Farmers who fail to meet the baseline would incur a penalty while farmers who exceed it would receive a credit. The baselines would be regularly revised to recognise changes in emissions performance levels.
  A split-gas approach would be taken for long-lived and short-lived gases.

- **Option 3: Single market cap and trade scheme:**
  Participants would participate in a separate agricultural trading scheme to the NZ ETS. A single cap for emissions would be set with all gases converted to $CO_2$-e using $GWP_{100}$. Participants would surrender units for the agricultural greenhouse gases they emit within a given period. It would be up to the emitter to decide whether to reduce their emissions or purchase units. The price the emitter pays for units would be set by supply and demand within the market.

- **Option 4: Split market cap and trade scheme:**
  Participants would participate in a separate agricultural trading scheme to the NZ ETS where two caps would be set: one for long-lived gases and one for short-lived gases. Participants would surrender separate units for the biogenic methane and long-lived greenhouse gases ($CO_2$ and $N_2O$) emitted within a given period. It would

be up to the emitter to decide whether to reduce their emissions or purchase units. The price the emitter pays would be set by supply and demand within the market.

- **Option 5: GMP-based levy:**
  Participants could opt to adopt a good management practice or technology or incur a cost relative to the emissions reduction which would have occurred if this action had been adopted. If a mitigation exists that has the potential to reduce on-farm emissions by a large amount, the participant will face a correspondingly large levy cost. However, if no mitigations are available to the participant, no cost exposure results.
  A split-gas approach would be taken for long-lived and short-lived gases.

3.6. The following elements are common across these options:

- The price applies by default at the farm level for livestock, however the approach for fertiliser emissions is still being considered.
- The system will include a mechanism to recognise on-farm sequestration.
- In principle, participants would be able to join and/or form clubs to face their obligation however this will be considered further in the next stages of design.
- Revenue will initially need to cover administrative and operational costs (potentially including sequestration). Consideration is needed as to whether any additional revenue would be ring-fenced (hypothecation), and where this occurs, what purposes it is used for. For example, to support the development of technology, mitigation uptake or sequestration.

3.7. The workstream also recognises that a price on emissions is only one element in creating behaviour change and achieving emissions reduction.

*Shortlisting process for pricing scheme options*

3.8. Workstream members fleshed out the design features of each of the five options into narratives. These were used as the basis of a multi-criteria analysis to determine the final shortlist to take through to further design and analysis. Workstream participants agreed that achieving a concise shortlist would be necessary to enable robust and detailed analysis of each option, given the time and resources available.

*Shortlist of pricing scheme options*

3.9. Following multi-criteria analysis (see Appendix one) the following pricing scheme options are proposed to take forward as a shortlist for detailed design and analysis:

- **Option 1 – Split-gas levy**
- **Option 2 – Baseline and credit levy**
- **Option 5 – GMP-based levy**

3.10. The single market and split market cap and trade schemes scored weakly against the criteria and were ruled out on the basis that the New Zealand Emissions Trading Scheme will be progressed to detailed design as the counterfactual.

## 4. NEXT STEPS

4.1. Immediate next steps will include detailed design of the shortlisted options to support next stages of analysis to further refine the shortlist.

4.2. The workstream will address gaps in the current narratives, flesh-out design variations under each option and consider a number of cross-cutting questions including:

- Should fertiliser emissions be priced via the farm level scheme or the ETS at processor level?
- How will on-farm sequestration integrate with the pricing options?
- What will the reporting component of the pricing options look like?
- What would clubs look like in practice?
- Is assistance or free allocation necessary under each option, and how would it be applied?

4.3. The detailed design will also incorporate feedback received through the October/November Farmer Reference Groups to ensure pricing scheme designs recognise farmers' concerns.

4.4. The workstream will work alongside the Programme Office and other workstreams to develop a research plan to develop an evidence base to assess the efficacy and impact of the shortlisted options. This will include coordinating with Te Aukaha to ensure robust analysis of impacts of the shortlisted options on Māori landowners is carried out. The research plan is scheduled for Steering Group approval in February.

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|---|---|
| **Emma Wardle** | **Kara Lok** |
| **Analyst, MfE** | **Team Leader, MfE** |
| Principal Author | Secondary Author |

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Out of Scope

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# HE WAKA EKE NOA STEERING GROUP PAPER

## 4 June 2021

## Price Exposure Options Analysis

Paper No: 5 UNCLASSIFIED

### 1. PURPOSE

1.1. The purpose of this paper is to identify price exposure options that should be progressed for further modelling and analysis.

1.2. This paper will share the findings from a numerical and qualitative analysis of shortlist options for price exposure and identify options that are feasible and most likely to achieve the He Waka Eke Noa objectives.

### 2. DECISIONS REQUIRED

2.1. **Agree** that further analysis is done for the following price exposure options:

a. Fully Exposed split gas option at various price levels for A and B.

b. Proportional Discount at 95 per cent.

c. Fully Exposed with a Land-based structured rebate.

d. Fully Exposed with an Output-based structured rebate.

2.2. **Note** the further analysis involves farm-scale and macro-economic modelling to quantify:

a. the likely reduction in biogenic emissions

b. the financial impact

### 3. KEY POINTS

3.1. The Pricing working group has undertaken analysis to narrow down potential pricing options to take forward to modelling.

3.2. The options considered in the analysis were.

a. Fully Exposed split gas option at various price levels for A and B.

b. Proportional Discount at 95 per cent.

c. Fully Exposed with an Output-based structured rebate.

d. Fully Exposed with a Land-based structured rebate.

e. Good Management Practice related price or rebate

f. Consideration of an historical baseline component to the price

*How the options were assessed.*

3.3. A diverse range of actual farm businesses were used as case studies. Each farm had a previously completed Overseer analysis where emissions had been modelled. The farms selected represented a wide diversity of farming production systems (including sheep, beef, deer, dairy, pigs, integrated with arable and horticulture) to test the advantages, disadvantages and unintended consequences of the pricing options. The price exposure options were applied to each of the farm businesses. The price settings assumed for the analysis are noted in the detailed document.

3.4. A detailed summary of the approach, analysis and conclusions is provided in Appendix 1.

*Options recommended to take forward to modelling*

Based on the Pricing working group's analysis as well as feedback from the Policy Group, it is recommended that four options be worked up to take forward to modelling. These options are to be progressed sequentially.

*Fully Exposed option*

3.5. The Fully Exposed price exposure option meets the most criteria applied in the analysis. However, when a high carbon price is applied (including when aligned with the ETS carbon price), the resulting price exposure will have a significant financial impact for low return livestock farming systems. Two approaches have been identified to address this problem:

a. Alter the price settings for A and B to a level that those livestock enterprises with limited mitigation opportunity can afford – under this option, alternative policy interventions will play a much more significant role to achieve reductions;

b. Create a structured rebate to equalise the impact felt across the different farm systems – under this option, some farmers may face a higher price for the same level of emissions. Alternatively, a conditional assistance package could be developed.

3.6. The sector-based modelling will provide insight to assist with future discussions and recommendations around the trade-offs between these approaches.

3.7. As the Fully Exposed calculation forms the basis of all the options being investigated, it will be the focus of the first modelling sprint.

*Discount rate*

3.8. A discount of 95% was applied in the analysis to align with the assumed level of assistance if agriculture enters the NZ ETS. As this discount rate is part of the legislative backstop, it has been assumed in options tested within the alternative pricing system also. This option will also be undertaken in the first modelling sprint.

*Options to further develop: Output-based and Land-based rebates*

3.9. Analysis of the land and output based structured rebates was not as clear cut as for the fully exposed and discount options. The Policy Group considered more focus on these options was warranted i) given the ICCC recommendation included these as approaches and ii) taking account different perspectives on the merit of these approaches across the working group and Policy group. As a result, alternative calculations for land-based and output-based structured rebates are being investigated.

The Output-based and Land-based structured rebates are modifications to the Fully Exposed calculation and will be integrated into the second modelling sprint.

## 4. NEXT STEPS

4.1. Progress the Fully Exposed option to sector modelling “sprint one”.

4.2. Fine tune calculations for the Output-based and Land-based structured rebates in preparation for sector modelling “sprint two”.

4.3. Consider other policy options to complement a potentially weaker pricing signal in order to achieve reduction targets, alongside a conditional assistance package to support a strong price signal.

# HE WAKA EKE NOA STEERING GROUP PAPER

## 9 September 2021

## Split gas levy design, settings, and governance

Paper No: 5 UNCLASSIFIED



### 1. PURPOSE

1.1. This paper provides the Steering Group with:

- o An updated paper (Appendix 1), from the Government Partners on split-gas levy rate settings and governance; and
- o Additional analysis from the Programme Office which supports consideration of the relationship between C and the NZU price; the relationship between B and C; whether C can be larger than A+B; and whether the system should allow the netting off of methane with sequestration.

### 2. DECISIONS REQUIRED

2.1. **Agree** to make an in-principle decision that C should be connected to the NZU price.

2.2. **Agree** to make an in-principle decision that B should be connected to C i.e., the initial levy rate for long-lived gases should be linked to the NZU price.

2.3. **Agree** to make an in-principle decision that the levy rate for short-lived gases should be a unique rate and not linked to the NZU price on an ongoing basis.

2.4. **Agree** to make an in-principle decision that the levy rate for long-lived gases should be regularly updated to maintain alignment with the NZU market price. This could be done on an annual basis to maintain close coupling to the NZU price. This could also be built into existing annual processes (e.g., Synthetic Greenhouse Gas Levy regulations updates), to streamline processes and ease administrative burden.

2.5. **Agree** to make an in-principle decision that the unique levy rate should be reviewed/updated periodically to ensure ongoing alignment with emissions budgets and targets. This should be carried out at a frequency that balances the need to give participants sufficient certainty and direction over each review period and avoids large jumps between each review period.

2.6. **Agree** to commission further work to explore in more detail options for transitioning to the full price of B where $B=$C.

2.7. **Agree** to:

- o Make an in-principle decision that C must be less than or equal to A+B i.e., individual farms or collectives would not get payment for C when greater than A+B; <u>**OR**</u>

- o Not make an in-principle decision on whether C must be less than or equal to A+B and take this to farmer consultation.

2.8. **Agree** to commission further work to explore whether there are benefits in allowing banking, and potentially borrowing, of credits when C is greater than A+B.

2.9. **Agree** to make an in-principle decision that C not be restricted to being less than or equal to B i.e., that C can be netted off from A+B, but that further testing will be required on an upper threshold for C in order to limit the extent to which C reduces the incentive to reduce emissions.

## 3. PRICE SETTNGS

*Background and key considerations for farmer consultation*

3.1. The core concept for the main split-gas pricing system under consideration is the equation A+B-C = $cost, where:

- o A is the cost of biogenic methane emissions (CH4) at the farm level.
- o B is the cost of nitrous oxide emissions (N2O) at the farm level.
- o C is the value of sequestration receiving recognition at the farm level.

3.2. The initial values of these variables and the process for review and updating as required are critical considerations as this will dictate each farm's annual emissions liability. The form of the equation and how we set the relationships between the prices will have an impact on the incentive that is applied to reduce methane and nitrous oxide at the farm (or other e.g., collectives) level.

3.3. The key decisions that need to be made are:

- o Whether initial levy rates should be linked to the NZU price or be unique levy rates, based on consideration of relevant factors;
- o The relationship between the price of B and the price of C (and transitioning to the full price of B where $B=$C);
- o Whether carbon sequestration can be used to offset the cost of biogenic methane (as well as nitrous oxide), at the farm level i.e., whether the equation should provide for 'netting off' of methane;
- o Whether it is possible to enable the value of sequestration to be greater than the cost of emissions at the farm (or other) level i.e. can C>A+B.

3.4. It is important to highlight the tension that currently exists between supporting you to have a targeted and focused conversation with farmers about system design (which requires removing as much complexity as possible by holding some things constant i.e. through making in-principle decisions), and pushing Partners too quickly to make decisions.

3.5. There is a real tension with this price setting work. There are critical linkages with other areas of the programme as price settings work alongside other levers to affect the overall incentives of the scheme. The key levers that adjust the overall incentives are:

- Price settings for A B and C and the relationships between those prices;

- Any rebates, discounts or assistance applied to A and B;
- The thresholds for including C;
- Whether C can be greater than A+B, at a farm or collective level;
- The ability to form collectives.

3.6. This paper considers the price settings for A, B, and C; the relationships between those prices; and whether C can be greater than A+B, at a farm or collective level. The sequestration paper outlines the technical challenges relating to any ETS overlap and explores options for upper thresholds for cyclical vegetation (see paras 3.105 - 3.112 and Appendix 2).

3.7. The Programme Office recommends that you take in-principle decisions recognising that further analysis (including modelling work underway), and testing is required as we bring all the incentive related decisions together to form a complete picture. In-principle decisions could be re-visited based on additional analysis and farmer feedback on questions of system design. A summary of the recommendations that are linked is provided in the table in Section 6 of this paper.

*Analysis of price settings*

*3.8.* The government paper attached provides a range of considerations in determining whether to link the initial levy rates for CH4 and N20 to the NZU price or to use a unique rate. The Programme Office supports the paper's recommendations:

*That the initial levy rate for long-lived gases should be linked to the NZU price and that the levy rate for short-lived gases should be unique and not be linked to the NZU price on an ongoing basis.*

3.9. The two key options for the initial setting of price are:

- Linked to the NZU price. The NZU price for a set point in time or average over a set period, is converted using a metric for each gas, and periodically updated to keep broadly in line with the NZU price; or
- Unique levy rates, based on a consideration of relevant factors. Could legislate a range of factors that Ministers need to consider in making their decision. This could include a requirement to consider external advice and public consultation.

3.10. Summary of two options for 'A' and 'B' and key considerations:

| | Unique levy rates | Linked to NZU |
|---|---|---|
| **Methane (A)** | • Potential to be more tailored to specific reductions we want to see in the agriculture sector.<br>• Enables a broader range of factors and consult on with public to be considered in setting the rate.<br>• Supports a split gas approach. | • Incentive not tailored for agriculture sector and the meeting of methane targets.<br>• Lacks flexibility to alter incentive.<br>• Does not support a split-gas approach for methane, and may not be the appropriate price to drive gross emissions reductions for methane. |
| **Nitrous oxide (and** | • Potential to be more tailored to specific reductions we want to see in the agriculture sector. | • Simple<br>• Levy rate for long lived gases aligns with rest of economy |

| | | |
|---|---|---|
| **CO2 from urea) (B)** | • More complex starting point.<br>• Inconsistent with price of other long lived gases<br>• More open to disagreement or contention. | • Sequestration in He Waka Eke Noa treated equal with sequestration in ETS<br>• Could be subject to significant changes in prices as NZU price changes |

3.11. The Programme Office also undertook high level analysis on the implications of C being greater than or less than the NZU price (i.e., not linked to the NZU price). This is summarised below:

| | |
|---|---|
| **C>Carbon Price** | • Could incentivise sequestration in He Waka Eke Noa relative to ETS (for those eligible for He Waka Eke Noa).<br>• Likely only to be an issue if ETS eligible categories are captured within He Waka Eke Noa and/or C is allowed to be greater than A+B and where payment is an option (which opens up the Government to greater fiscal risk and reduces companies' ability to hedge their emission liabilities, including the foresters themselves). Receiving credits where C > A+B may moderate this incentive.<br>• Note, the intent of the He Waka Eke Noa pricing system is to price methane and nitrous to incentivise change, not to create a revenue stream. |
| **C<Carbon Price** | • This might reflect that C in He Waka Eke Noa is less stringent/credible than ETS (but there is no evidence to suggest this at this point and this can also be managed through emission factors (see Sequestration paper and considerations for ETS overlap).<br>• Could incentivise sequestration in ETS relative to He Waka Eke Noa, but ETS is available anyway for available categories that meet the criteria. |

3.12. The Programme Office also undertook parallel analysis on linking B with C.

3.13. The table below captures the 3 main options available, along with 2 additional options that seek to preserve equity with the processor level ETS option (i.e., if fertiliser emissions were priced at processor level there would be an initial 95% free allocation). This is an important consideration as an in-principle decision has been made by the Steering Group to price fertiliser emissions at the farm level. If the price of B is higher than the processor level ETS option farmers will ask why a decision was made that will cost them more than the backstop option. This is worth exploring in more detail.

3.14. The analysis led the Programme Office to the same recommendation as government – that B should equal C and that the price of the long-lived gases should initially be connected to the NZU price. It is worth highlighting, however, that we think it is important to consider the implications of starting with a full price of B. If emissions were priced at the processor level in the ETS they would likely receive some free allocation to protect from the full ETS cost. The Programme Office recommends we test proportional free allocation phasing down on B through additional modelling. Note the only price exposure option that avoids the full cost of B is the proposal to apply a baseline rebate to nitrous oxide that transitions to zero by 2050 (see price exposure paper for more detail).

3.15. The Policy Group has also raised another issue with regard to a high price on nitrous oxide emissions. Nitrous oxide is likely to have greater uncertainty relative to A (methane) and C (carbon sequestration and emissions). At the national level, this uncertainty has been estimated at +/- 57% (Kelliher et al 2017), with most of this uncertainty coming from emission factor uncertainty. Within a farm level pricing scheme, this uncertainty will be realised as improved emissions factors are approved by the onboarding process described in the reporting paper. Farmers' reported nitrous oxide emissions could change substantially as improved emissions factors are incorporated into reporting methodologies.

3.16. Linking the price for nitrous oxide emissions to a potentially high ETS price (and C) therefore introduces a source of risk to farmer participants in the pricing scheme. This can be mitigated in part by using discounts or rebates to transition to the full price of B where \$B=\$C.

| Options | Considerations |
|---|---|
| **1. B=C** | • Both considered long lived gases.<br>• Aligns with target (net zero)<br>• Is more economically efficient in relation to the target than other options – i.e., in reaching zero net emissions at least cost, we are indifferent between less $N_2O$ or more sequestration.<br>• If we use the NZU as a basis for B and C then it may set a very high price (for some), so the risk worth exploring is whether we are creating a system that has a small stable levy for A, but a large and potentially more volatile and uncertain B-C. |
| **2. B>C** | • Is economically inefficient in relation to targets – incentivises nitrous emission reductions more than sequestration. |
| **3. B<C** | • Is economically inefficient in relation to the targets - reduces the incentive to decrease $N_2O$ relative to increasing sequestration.<br>• Reduces the impact on profit of an emissions price.<br>• Reduces amount of revenue available for recycling and could lead to paying out more on C (if C is greater than A+B).<br>• To achieve equity with processor level ETS this option would need to have price of B increasing over time.<br>• If fertiliser emissions were priced at processor level, they would face 95% free allocation, you could argue the N2O emissions that come from livestock should be treated equitably? |
| **4. Discount phasing down on B, with full C**<br><br>Note: discount could be proportional or via a rebate (output or land) | • B=C, so preserves the connection with the targets<br>• But same incentives as B<C<br>• Equity with processor level ETS option/supports a transition to a full price<br>• Reduces amount of revenue available for recycling and could lead to paying out more on C (if C can be greater than A+B)<br>• Trade off in framing between price of B is less than C and using proportional free allocation phasing down overtime<br>• Alternative is to have a baseline for B<br>• Proposal - test this through additional modelling |
| **5. Proportional free allocation, phasing down on B and C** | • B=C, so preserves connection<br>• Equity with processor level ETS option<br>• But no longer recognising that all sequestration is the same i.e., price on C won't align with price in ETS<br>• Reduces value of sequestration in HWEN<br>• Overall impact at farm level and will depend on levels of B and C<br>• Proposal - test this through additional modelling |

## 4. CAN C>A+B?

4.1. The table below captures the options available and provides key considerations for discussion.

4.2. **Recommendation**: Make an in-principle decision that C must be less than or equal to A+B at the individual farm or collective level in terms of being paid out from the scheme. Note, individual farms within a collective could have C greater than A+B.

4.3. The Programme Office also recommends further work to:

- Explore whether there are benefits in allowing banking, and potentially borrowing, of credits when C is greater than A+B; and
- Unpick an implication of the sheep and beef modelling (note, not dairy modelling as access to C is very limited for dairy), that indicates that constraining C to less than or equal to A+B could reduce the incentive to adopt mitigations in the future if this lowers A or B and in doing so the value farmers receive for the C.

4.4. Another important point to make is it acknowledged that regardless of any limits placed around C in the levy, participants can still participate in the ETS and get a financial reward for sequestration that would indirectly offset their emissions price. A consideration for this piece of analysis (and that of the upper threshold work), is not creating an additional incentive to plant non-native carbon forests under this scheme.

| Options | Considerations |
| --- | --- |
| **1. C>A+B (farm level)**<br>**$$ payment would be made** | • Lowers the incentive to reduce overall emissions<br>• Farms where C>A+B are extremely likely to have ETS eligible forests, there is a system that has been designed to reward those forests<br>• The intent of the system is to price methane and nitrous to incentivise change, not to create a revenue stream<br>• While it might be possible to have a financially sustainable system where a small number of farms have C>A+B this raises equity issues across farm systems, especially when less revenue is available to invest in developing mitigations for those who do not have access to C<br>• At an aggregate the level government has indicated they would not support a system that was not financially self-supporting i.e., the system should be fiscally neutral. |
| **2. C>A+B (collective)**<br>**$$ payment would be made** | • Again, the key consideration is that the intent of the system is to price methane and nitrous is to incentivise change, not to create a revenue stream.<br>• Allowing C>A+B at the collective level would have similar impacts as outlined above under farm level.<br>• Individual farms within a collective can have C greater than A+B but not at the collective level (see benefits in collectives) |
| **3. C <= than A+B**<br>**[At least in regard to paying out in $$$s]** | • Ensures intent of the system is focused on pricing methane and nitrous to incentivise change, not to create a revenue stream<br>• Avoids financial sustainability issues (i.e., avoids risk that system will have a net cost to the Crown)<br>• Helps maintain incentive to reduce overall emissions however once C has reached A+B there is no incentive for further reductions or increased sequestration<br>• Sheep and beef modelling (not dairy modelling as access to C is very limited for dairy), indicates that constraining C to less than or equal to A+B could reduce the incentive to adopt mitigations in the future if this lowers A or B and in doing so the value farmers receive for the C.<br>• We need to do further work on this. This would ordinarily suggest allowing C to be larger than A+B and limiting the overlap between HWEN and ETS. But separate analysis indicates this raises significant cost/benefit issues and is unlikely to meet the needs of HWEN partners. The Programme Office thinks that it would be worth exploring an alternative solution that could reconsider this rule/setting once cost-effective mitigations start to become available. This setting is being used to incentive behaviour change in the transition to cost effective mitigations becoming available and when the context changes this setting could be reconsidered. |
| **4. Could you have C>A+B if paying in credits (e.g., banking),** | • This could be useful to deal with the following issues:<br>  o Fluctuating emissions<br>  o New land purchase with no sequestration<br>  o You only get cyclical for one period |

| | |
|---|---|
| **instead of in $$$s** | • It could operate like the IRD tax equalisation scheme (IRD) – reconcile over a period of time<br>• C<A+B is averaged over three years – requires rolling average and reconciliation payment<br>• Would mean additional administrative costs, a new registry which could be expensive and would create a new asset<br>• Fairness – if you have more sequestration on one-year, adverse events, not many ruminants, a lot of sequestration<br>• Fairness issues could be resolved through collectives<br>• Need to think about ability to convert sequestration credit to NZUs – there is already a system (ETS) that does this<br>• Reduces incentive to reduce emissions |

4.5. Case study and modelling analysis is underway to identify the extent to which these equations affect the incentive to reduce emissions across a variety of farm types and we will be able to formally bring those insights together over the next week or two. Current insights suggest without an upper threshold on cyclical C, sheep and beef farms could reach A+B=C, conversely modelling by DairyNZ highlights the minimal sequestration on dairy farms.

## 5. CAN YOU NET OFF METHANE WITH SEQUESTRATION

5.1. The A+B-C equation has been designed to recognise on-farm sequestration as part of a farmer's overall set of choices i.e., each farmer would consider the cost of emissions in their day-to-day business decisions and choose the best way to manage it, by:

- Finding cost-effective ways to reduce emissions
- Mitigating or offsetting emissions through recognised on-farm carbon sequestration
- Paying the resulting emissions price.

5.2. We have adopted the working assumption of A+B-C for simplicity but we need to work through the implications of enabling the 'netting off' of methane while retaining an incentive to meet a gross target.

*What do we currently know?*

5.3. We know both conceptually and from the modelling to date that the value (quantity x price), of C affects the overall incentive of the system to reduce emissions and reduces the impact of the emission price on profit/production.

5.4. Those who have less short-term mitigation options, or where the cost of emissions is likely to be a greater proportion of profit, are generally more likely to have more sequestration opportunities.

5.5. There is a key interdependency of this work with considerations of an upper threshold for sequestration. Any upper threshold for C has implications for the incentive to reduce gross emissions.

5.6. The tables below capture the two options available for the form of the equation and the sub-options for the form A+B-C if we are concerned C will unduly reduce the incentive to reduce methane emissions. This will be more pronounced the lower of price of A relative to C.

5.7. We use the proposals outlined above e.g., C= NZU; B=C (noting options to transition to full price of B over time flagged above); and C<=A+B. We provide initial considerations for discussion.

5.8. **Recommendation**: Make an in-principle decision that C is not restricted to being less than or equal to B i.e., that C can be netted off from A+B, but that further testing will be required on an upper threshold for C in order to limit the extent to which C reduces the incentive to reduce emissions. E.g., if C can only be non ETS eligible vegetation, there is likely to remain a strong incentive within the scheme to reduce A+B.

5.9. We have two main options for the equation:

| Options | Considerations |
|---|---|
| 1. **A + B – C** | • C can be netted off from A+B<br>• Options to moderate this would focus on the relative prices of A, B and C<br>• Note, we are proposing that the price on C=NZU Price and the price on B=price on C.<br>• Current modelling shows C is effective at moderating the profit impacts of an emission price for those farms less likely to have other mitigation options e.g., it helps with equity concerns.<br>• A high price of C relative to the price of A, could make C large relative to A through both the direct maths of a high carbon price relative to methane price, and also the greater incentive to deliver quantities of C into the system.<br>• This will be more pronounced the lower of price of A relative to C.<br>• See next table on sub options. |
| 2. **A + [B – C] where C cannot be greater than B.** | • C can only be netted off from B<br>• This would provide more certainty there will be gross emission reductions of methane<br>• It would also maintain a connection between the long-lived gases and the requirement to get to 'net zero'<br>• The modelling illustrates that at all price scenarios B is a small proportion of the overall emissions price. Limiting C so it can only net off B therefore only creates an incentive for a small amount of C and leads to greater impacts on profit/production.<br>• The profit/productions impacts could be mitigated through a lower price on A.<br>• Will also test this through the Case Study work. |

5.10. For Option 1: A + B - C, there are only 2 sub options given we have assumed C=B and that B and C are linked to the NZU price.

| Options | Considerations |
|---|---|
| 1. **Do nothing (initially)** | • Accept reduced certainty of achieving gross targets through pricing.<br>• Use price setting process and governance to manage risk of not meeting targets.<br>• Potentially use complementary measures to further incentivise reductions in emissions. |
| 2. **Constrain C via an upper threshold**<br><br>[Note: See Sequestration paper: Paras 3.105 - 3.112 and Appendix 2). | • Upper threshold (e.g., only include non ETS eligible sequestration in the scheme, or create an area or proportion of farm limit).<br>• Note the critical connection here to work on upper thresholds by the Sequestration Working Group.<br>• There is general support for no upper threshold on native vegetation (subject to more analysis), so the focus is really on the threshold for cyclical vegetation in C<br>• But note an upper threshold does not alter the fact that the ETS can still be used to indirectly offset the emissions price, so this becomes a bit theoretical from a farm level decision making perspective. That |

| | |
|---|---|
| | said, if there is a HWEN principle of doing "no more harm" in regard to afforestation then this could lead to an upper threshold. |
| **3. Increase A: Set the price of CH4 higher** | • We know from the modelling that this will have a negative effect on production/profit, and this will be proportionally larger for sheep and beef.<br>• It will likely lead to greater emissions reductions relative to a lower price of CH4 with the same value of C (as less of the cost can be offset so assuming rational behaviour this would lead to greater stock reductions to lower the cost in the absence of other mitigations). |

## 6. TYING THINGS TOGETHER AND NEXT STEPS

6.1. The table below captures current recommendations for the levers that adjust overall incentives i.e. where there are critical links:

| Element/Question | Recommendation |
|---|---|
| Initial Price Settings | • A = unique price<br>• B&C = linked to NZU |
| Process for updating price | • In principle - Agreement to process |
| Transitioning to full price of B | • Do further work on options/incentives |
| C can be greater than B (i.e. can be used to offset methane) | • In principle – Yes. |
| C can be greater than A+B | • In principle - No for payment (but do further work on potential to bank). |
| Upper thresholds for C (particularly cyclical) | • Engage on options (see sequestration paper, paras 3.105 - 3.112 and Appendix 2). |

6.2. In terms of next steps further modelling work will explore the impacts and implications of:

- Transitioning to the full exposure of $N_2O$ to the NZU price, noting were emissions be priced at the processor level, free allocation would have been provided to protect from the full cost. This could involve modelling of a proportional price on nitrous oxide. For example, we could assume 60% of $40 and $70 and 90% of $40 and $70 phasing down 1% per year.

- Thresholds e.g. no upper threshold for natives; 100ha for cyclical vegetation; and a % of farm for cyclical vegetation.

6.3. Case Study analysis will consider the impact C has on incentives to reduce emissions at the farm level. [NB: Dairy sector modelling to date has shown there is very limited opportunity for most dairy farms to take up C].

6.4. We will explore whether there are benefits in allowing banking, and potentially borrowing, of credits when C is greater than A+B.

6.5. The Sequestration Working Group will advance its work on any ETS overlap and the options for upper thresholds for cyclical vegetation.

**Gus Charteris**

**Consultant**

## One-Page Price Exposure Primer and Glossary

Before diving into the detailed policy options, it is important to first identify and explain the three broad core concepts that informed the working group's thinking around structuring assistance: how we are measuring emissions for price exposure and why it matters; the marginal incentive; and decoupling. Tracing the logic behind these concepts and how it influences the price exposure policy options will help enable reviewers to make informed decisions.

The purpose behind providing assistance to farmers is twofold. Firstly, any assistance should be provided in a way that still maintains an incentive for farmers to reduce their on-farm emissions; we describe this as maintaining the *marginal incentive*. Secondly, assistance should minimise the financial hardship farmers experience once the price on agricultural emissions is introduced. In short, assistance should reward farmers that reduce their emissions and discourage (through the price signal) farmers from increasing emissions. However, to maintain the marginal incentive, assistance cannot increase or decrease in direct proportion to a farmer's actual emissions reductions. If it does, a farmer who reduces their emissions receives a reduced assistance, and we risk losing the incentive to reduce emissions and encourage on-farm behaviour change. The glossary to the right defines the varying forms of assistance, but the primary form that is considered here is the 'structured rebate.'

The working group's overall thinking around structured rebates and price exposure was guided by a straightforward equation, where:

**Cost (price exposure) = (total emissions ✕ price) – structured rebate**

These two values (total emissions and structured rebate) cannot be calculated using the same data inputs without losing the marginal incentive to change behaviour, as described above. Therefore, while the 'total emissions' will come from the absolute weight of each gas that is reported (the data for this depending on the outcome of decisions on reporting options), but the emissions used to calculate the 'structured rebate' part of the equation uses different data.

The working group followed a simple equation for calculating a farmer's structured rebate:

**Structured rebate = emissions proxy** (e.g. kg milksolids) **✕ emissions factor** (e.g. kg$CH_4$/kgMS) **✕ price ✕ rebate rate**

However, if the data inputs used for the emissions proxy and factor are the same as those used to calculate total emissions in the first equation, we lose any differentiability between the options under consideration because they will all produce the same result – a simple proportional discount. This is not a negative judgment on the proportional discount lever, but we want to present options that will genuinely produce different, comparative ways of inducing behaviour change. We term this process (creating differentiability between the options by ensuring we use different metrics to calculate total emissions and the structured rebate) *decoupling*.

A straightforward way to decouple the structured rebate from the total emissions is to ensure that different benchmarks (such as a national or sector average per unit of product or per unit of area) is used to calculate the structured rebate.

### Glossary of Terms

| | |
|---|---|
| **Assistance** | Financial assistance provided to participants to support them to face and appropriately respond to a price on their emissions. |
| **Structured rebate** | A form of assistance that is automatic and applies to all participants, i.e. is calculated as part of their emissions return using an equation and their reported data. |
| **Price exposure** | The use of a structured rebate to modify how participants are exposed to the cost of their emissions.<br>*OR*: The residual cost that participants face after a structured rebate. |
| **Price exposure 'options' and 'variants'** | Different approaches that can be used to calculate structured rebates, such as historical baselines or the use of benchmarks.<br>The options discussed in this paper align with the high-level options price exposure agreed at the January 2021 sprint.<br>The sub-options or combinations of options are termed 'variants.' |
| **Fully exposed** | The full cost on a participant's emissions before a structured rebate is applied. |
| **Decoupling** | To maintain a strong price signal and reward those who reduce their emissions, a participant must be able to reduce their fully exposed cost on emissions without their assistance reducing at the same time.<br>In practice, this means that assistance needs to be based on something other the data used to calculate the fully exposed cost on emissions, such as a baseline or benchmark, which 'decouples' the assistance from the fully exposed cost.<br>Any option or variant where fully exposed emissions and assistance are not decoupled effectively becomes a proportional discount. |
| **Over allocation** | At a system level, this is when the structured rebates are cumulatively greater than the revenue received. This is likely to occur if decoupling does not happen in a way that gets regularly updated, i.e. using a historical baseline in perpetuity.<br>At a farm level, this is when the structured rebate is greater than the participant's fully exposed cost on emissions. This is likely to occur if the participant successfully reduces their emissions while their assistance is decoupled. Over allocation at a farm level is not inherently a problem, as it provides an incentive to continue reducing, but does need to be managed over time. |
| **Conditional assistance** | Assistance that is provided to participants on an eligibility basis, or is recycled back into the system through another means to support the sector, which is not provided automatically like structured rebates. This could include things such as:<br>– Revenue recycling (e.g. reverse auction for reductions)<br>– Investment into technology<br>– Support to establish infrastructure or uptake mitigation activities<br>– Hardship funds<br>– Compliance/administrative cost refunds<br>– Exit packages<br>– Additional assistance to Māori landowners |

# He Waka Eke Noa

## Pricing working group paper: Price Exposure

## 20/05/2021

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## Purpose

1. The He Waka Eke Noa Pricing working group and supporting consultant (Charlotte Glass) have conducted numerical and qualitative analysis of the shortlist options for price exposure agreed at the policy sprint in January 2021.

2. The aim of this paper is to identify the options that are feasible and most likely to achieve the He Waka Eke Noa objectives, and should be progressed for further modelling or analysis. It is therefore a technical paper, which attempts to contextualise price exposure within the wider system but primarily focuses on technical detail.

3. This paper:

   a. Steps through the logic of what price exposure is intended to achieve, and where price exposure sits within the pricing system and broader behaviour-change framework;

   b. Outlines high-level price exposure options (aligned to the sprint) and hypotheses for each;

   c. Presents the methodological approach Charlotte took to assessing the impacts and incentives of each lever on a diverse range of farm case studies, and interrogating the practical realities of implementing these; and presents the criteria against which the levers are later measured;

   d. Provides both numerical and qualitative results from how each price exposure lever worked on each of the farm case studies, or solely qualitative commentary where certain price exposure levers were not able to be applied in practice;

   e. Comments on the results and the conclusions that can be drawn from them, to answer four specific questions:

      i. How do the results measure against the hypotheses?
      ii. How do the results measure against the criteria?
      iii. Which levers can be progressed in practice?
      Which levers cannot be progressed in practice or should be ruled out because of major barriers? *(Note that any commentary on ruling out options is not a subjective decision on the basis of merit or effectiveness, but solely where the option could not be successfully implemented or creates significant perverse outcomes.)*

   f. Provides the next level of detail that has been developed under these price exposure levers, including permutations of multiple levers and other variations, which collective create the next set of options for analysis (though an initial assessment has been provided);

   g. Recommends a series of specific areas for the working group to progress their thinking in next;

   h. Recommends a set of scenarios based on the detailed options built from the Price Exposure levers, which could be taken through to modelling.

### *Pricing system narrative & decision tree*

4. Price exposure is only one aspect of the wider pricing system, which in turn sits within an overarching behaviour-change framework. However, it is likely to be one of the most important elements of the pricing system to land, as it ultimately determines how a price on agricultural greenhouse gas emissions will impact individual farmers and growers.

5. Charlotte and the working group have defined price exposure and its role through a 'decision tree' *(over page)*.

***Diagram: Pricing system & price exposure decision tree***

| | |
|---|---|
| **Problem or Opportunity** | Agricultural greenhouse gas emissions will face a price from 2025<br>The primary sector and the government, along with iwi/Māori, have agreed to develop a pricing system for on-farm emissions |
| **Solution(s)** | (A) Agriculture is put in the NZ ETS, at farm level or processor level (legislative backstop)<br>*OR*<br>(B) Agriculture participates in an alternative pricing system |
| **Prob/Opp** | A price can send a signal to create behaviour change and achieve emissions reductions |
| **Solution** | Participants face the full cost of their absolute emissions of biogenic methane from livestock, and nitrous oxide from livestock and fertiliser (i.e. fully exposed) |
| **Prob/Opp** | A high enough price to achieve reductions on one farm could put another farm out of business<br>A high enough price to achieve sector-wide reductions will impact some industries more than others<br>Farmers need an extended time horizon over which to make changes |
| **Solution** | Assistance may need to be provided to participants to face and respond appropriately to the price<br>This paper assumes a 95% level of assistance, as this is what would be provided if agriculture enters the NZ ETS |

**(This is as far as formal decisions have been reached within the Partnership)**

| | |
|---|---|
| **Prob/Opp** | How can assistance to participants be distributed effectively and equitably, and align with the agreed criteria? |
| **Solution(s)** | (A) Structured rebates<br>*AND*<br>(B) Conditional assistance |
| **Prob/Opp** | What could a regime for providing structured rebates look like? |
| **Solutions(s)** | We have identified a series of high-level 'levers' that can be used to calculate structured rebates<br>*This paper details these levers and provides detailed analysis of each using farm case studies* |
| **Prob/Opp** | Because the assumed level of assistance is high (95%), these levers need to ensure that the price signal is maintained, not diluted or undermined<br>We know that a proportional discount at 95% dilutes the price signal |
| **Solution** | Structured rebates need to be decoupled from the fully exposed cost on emissions (in the absence incentivised reductions through other means) |
| **Prob/Opp** | Levers utilised in different ways, or in different combinations, can create this decoupled effect and influence the price signal in more nuanced ways |
| **Solution** | We have developed a series of detailed 'options' that use one or more levers in different ways to achieve different outcomes (i.e. that maintain the price signal in different ways)<br>*This paper details these options and provides an initial assessment of each* |
| **Outstanding questions** | At 95%, what revenue will realistically be gathered for conditional assistance?<br>How can we mitigate the risks associated with over allocation, at a farm and a system level?<br>Will participants continue to change behaviour once they have minimised their obligation (i.e. face no final cost or start receiving an over allocation of assistance), or will we stop seeing further emissions reductions? |

## Price Exposure Options

### *Descriptions & hypotheses*

6. Charlotte and the Pricing working group have progressed five options for price exposure, based on those shortlisted at the January 2021 sprint. Each of these can be considered a 'lever' that could be used to calculate a structured rebate. The final formulae used by the regulator may make use of multiple options, or pull these levers in different ways.

7. The following table defines each option and how it would be calculated most simply (other variations and combinations of the levers are possible), and provides the working group's hypotheses relating to the expected the practicality, impacts, and incentives:

| Option | Definition & Hypothesis |
|---|---|
| **(I)**<br>**Fully exposed** | Definition:<br>This is the base option, where the participant is exposed to the full cost of their emissions of both biogenic methane and nitrous oxide.<br>It also forms the basis for all of the other options, which provide their structured rebates on top of the fully exposed cost on emissions. |
| | Hypothesis:<br>Simple to calculate.<br>Assuming a stable price, likely to be too blunt to achieve reductions without significant perverse impact on the sector. However, could gather revenue to mitigate this impact through conditional assistance. |
| **(II)**<br>**Proportional discount** | Definition:<br>A simple discount on the fully exposed cost on emissions, assumed to be 95% in this paper. |
| | Hypothesis:<br>Simple to calculate.<br>Assuming a stable price, likely to weaken the price signal and not achieve reductions, while maintaining some of the same perverse outcomes as fully exposed (but scaled down). Considerably less revenue gathered, so less likely to allow for comprehensive conditional assistance. |
| **(III)**<br>**Output-based** | Definition:<br>This has also been termed *Efficiency-based*, but this is avoided here as we also discuss efficiency/intensity on a land basis.<br>A structured rebate is provided that is equal to 95% of the farm's emissions calculated using national factors for the emissions intensity of each product. |
| | Hypothesis:<br>Likely to be difficult but possible to calculate. Some farms create multiple products and others do not create any direct products.<br>Will reward more efficient producers per unit of output. Participants who reduce their emissions to 5% below the national benchmark through efficiency gains should receive a structured rebate that covers all of their fully exposed cost on emissions.<br>Theoretically may incentivise the most efficient producers to increase production, as they will receive a greater rebate for every unit of production that they add. However, there may be practical or behavioural barriers that mitigate this.<br>It is likely to be difficult (with little benefit) to apply this approach to fertiliser emissions. |
| **(IV)**<br>**Land-based**<br>**(+ variant)** | Definition:<br>A structured rebate is provided that is equal to 95% of the farm's emissions calculated using national factors for the emissions intensity per hectare.<br>Variants would assign unique factors to categories of land using an additional metric, such as Land Use Class (LUC) or natural capital, and then provide the structured rebate per area in each category. |
| | Hypothesis:<br>Likely to be reasonably simple to calculate, but does require data additional to that required to calculate the fully exposed cost on emissions.<br>Will reward less intensive producers per unit of area. Participants who reduce their emissions to 5% below the national benchmark through reducing intensity per unit of area should receive a structured rebate that covers all of their fully exposed cost on emissions. |

| | |
|---|---|
| | Across sectors, especially between extremes (e.g. high-country sheep and beef vs. intensive dairy operation), may drastically over and under allocate assistance at the farm level, due to significant differences in intensity per unit of area. However, there is potentially more overlap between sectors than expected.<br>Overlaying LUC will likely be considerably more complex, or potentially not practically achievable given the limitations and low resolution of this metric.<br>We are not certain how to overlay any other metrics, as they are not sufficiently defined, let alone mapped, to practically calculate. |
| **(V)<br>Good management practices** | <u>Definition:</u><br>A structured rebate is provided that values good management practices on their abatement potential relative to the total set of GMPs applicable to a given farm, which if all adopted should total to 100% of the fully exposed cost on emissions. Participants receive the sum of the values of whichever GMPs they use. |
| | <u>Hypothesis:</u><br>This is not necessarily difficult to calculate per se, but we are likely unable to do so in practice without decisions made on the details of each applicable good management practice and how they should be valued.<br>This should incentivise participants to uptake specific practices relevant to their farm, and achieving whatever emissions reductions are associated with these changes.<br>May create a perverse impact if certain practices are valued more highly on some farms than others, not because of their mitigation potential, but because that participant has fewer mitigation options available and therefore each practice makes up a greater proportion of their possible practices. |

8. This paper also considers the use of a **historical baseline (VI)**, which could be applied across a range of the above options. This assessment assumes that a historical baseline will have similar effects across the options. Our hypothesis is that a historical baseline will reward historically high emitters with a high level of assistance, and restrict the opportunities for underdeveloped land (especially that owned by Māori) to be developed. It will also likely be complex to calculate, as it requires historical data that is not always available.

## Approach

### *Methodology*

9. The high-level price exposure options are assessed in this paper against seven farm business case studies:

   a. These businesses have a history of OverseerFM modelling and are in catchments currently constrained by freshwater obligations and changes.

   b. The ownership structure, business purpose, capability, and values (key aspects in decisions relating to risk and change management) were also familiar to Charlotte.

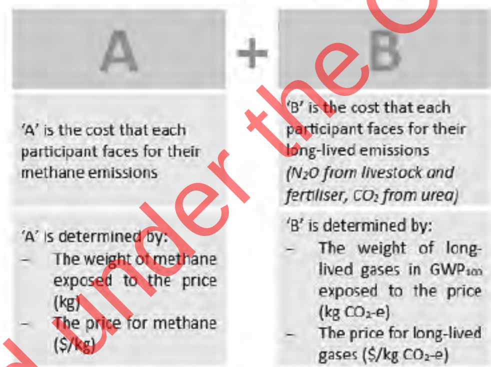
   c. This particular sample of farms was chosen to reflect as diverse a range of options as possible such that drawbacks, unintended consequences, and sector specific challenges of the pricing levers would be highlighted. They can therefore inform design of how farmers will be exposed to the cost on their emissions.

   d. Note that the farm business cases were not selected based on how well they represented or reflected the general make up of farming across New Zealand, though they do reflect the diversity and complexity of New Zealand farm businesses. Sector-wide conclusions from this approach can be better analysed through more detailed modelling, and are limited in this paper.

   e. Farm profitability information is also provided, which gives useful context when considering the impacts of the different price exposure options. Average profitability information is provided as it relates to each of the farms in the study.

10. The farm with the highest total emissions is the extensive high-country sheep, beef, and deer farm. Although this property has the highest total emissions, it is not the most profitable. The second highest emissions were contributed from the dairy operation, followed closely by the dairy support example. These examples do not represent sector averages.

11. In order to assess this pricing option, the following approach was applied to each of the case studies:




12. In addition, as a point of comparison, the case studies have also been assessed with all gases facing a single price, to show the effect of the split-gas approach that has been agreed. To apply a single price for this exercise, methane has been treated as a carbon dioxide equivalent ($CO_2$-e) using $GWP_{100}$.

13. Therefore, methane emissions for each farm have been reported both as $CO_2$-e and as absolute kilograms of methane. The price exposure levers have been calculated for a range of absolute methane prices (1c, 5c, 10c, $1/kg) and $CO_2$-e methane prices (4c and 10c/kg $CO_2$-e). Nitrous oxide, and carbon dioxide from urea, have been calculated in all cases as $CO_2$-e, at price values of 4c and 10c/kg $CO_2$-e.

14. When methane was considered on a per kilogram basis, the absolute weight of methane (kg) produced from livestock emissions on each farm was back calculated from the $CO_2$-e output reported in OverseerFM, which was then applied as input **A**. Please see Appendix Four for more information about how the information was extracted from the OverseerFM reporting.

15. For both methane and long-lived gases, when treated as $CO_2$-e, a price of $40 per tonne of carbon was assumed (i.e. 4 cents per kg $CO_2$-e). This price was derived by rounding the current NZU value (i.e. 3.7 cents per kg $CO_2$-e). Note that the conversion rate is 1kg methane for 25kg $CO_2$-e, so 4c/kg $CO_2$-e is 4c X 25 = $1/kg methane.[1]

16. A price of $100 per tonne (10c/kg $CO_2$-e) was also assessed, to show the impact if the emissions price for long-lived gases was connected to the NZ ETS and the carbon price was to increase to $100/tonne.

17. Some of the price exposure levers (I, II, III, IV) were applied numerically to the case studies. The remaining price exposure levers (V, VI) were not applied numerically, but considered qualitatively. This decision was solely made on the basis that the data was not available to meaningfully analyse these levers.

18. Profitability data from each of the farm businesses was also used. Farm profitability information provides useful context when considering the impacts of the different price exposure options. This is shown in Table 1. Note: Regional financial averages are not available for the pork and crop case

*Table 1: Average farm profitability for farms similar to those included in this study (2019 year)*

| Farm Business | Traditional Mixed Cropping | Extensive High Country (rules constrained) | Dairy Support (ranges widely) | Dairy + some wintering (system 3.5) |
|---|---|---|---|---|
| Earnings before interest, rent & tax | $377,042 | $450,757 | $921,468 (236ha)<br>$605,711 (395ha) | $1,092,034 |
| Total term debt | $2,808,091 | $2,014,781 | Not available | $8,816,340 |
| Total Fixed Capital | $11,087,840 | $9,904,870 | | $18,779,519 |
| Net farm profit | $149,793 | $324,193 | | $631,020 |
| Annual principal repayment* | $77,000 | $55,000 | | $280,000 |

*principal has been calculated based on interest rates of 6% and amortisation over 20 years.

Out of Scope

[redacted]

[1] Throughout this paper, where the current, rounded NZU price is used to calculate all gases (in CO2-e), the row is shaded yellow.

Out of Scope

***Criteria***

22. The wider He Waka Eke Noa programme and the original policy workstreams each developed a series of objectives and criteria. These have all been taken into account in the assessments in this paper.

23. However, quantitatively measuring each option against this long list of criteria was not seen as a feasible way forward. Therefore, specific measurement has occurred against the three macro-criteria developed by the Pricing workstream:

    a. **Achieves agricultural sector emissions reductions**
    In the specific context of price exposure, we have evaluated against this criteria by considering: “Maintains the price signal and achieves behaviour change”; this macro-criteria also covered emissions leakage.

    b. **Is cost-effective and workable for the agricultural sector and the New Zealand economy**
    For price exposure: “Is practical and possible.”

    c. **Supports farm systems to align with wider government and industry objectives**
    For price exposure: “Doesn’t misalign with or fail because of other policies or initiatives.”

24. In addition, all or some members of the working group thought that several of the original sub-criteria were not captured sufficiently at the macro-criteria level, and have been separately assessment. These include:

    a. **Equity**
    This covers a handful of equity-focused criteria. For price exposure: “How impacts are distributed across participants and sectors, and whether the level of burden becomes a barrier for appropriately responding to the price signal.”

    b. **Is consistent with the Crown’s Treaty of Waitangi obligations**
    For price exposure: “Supports Māori development and the Treaty principles and creates opportunities for Māori land and Māori landowners.”

    c. **Supports a productive, profitable, and competitive NZ agricultural sector**

25. Appendix Two shows how we have rated the levers against these criteria, using a high-level rating of: + + / + / – / – –

## Consultant's Analysis (Results, Insights, Conclusions)

26. This section provides the results of each price exposure lever applied across the farm case studies, and the insights and conclusions drawn from these by Charlotte.

### *(I) Fully exposed*

27. In this option, the entire weight of each basket of gases (long-lived gases and biogenic methane) faces a price. This simply applies the **A + B** calculation outlined in the methodology section above with no structured rebate. Fully exposure to the cost on emissions was calculated for each gas as:

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[redacted]

*Insights*

29. It is important to consider the various price exposure levers in the context of net trading profits and debt loading across each farm. Regional averages relevant to the farms in the study have been provided in Table 1 in the Methodology section.

30. When methane was converted to $CO_2$-e and exposed to the price of 4c/kg $CO_2$-e, the full exposure is likely to be a large proportion of farm surplus, which may not be economically viable for most farms.

31. The analysis revealed that pricing methane differently to (and less than) nitrous oxide and carbon dioxide significantly reduces the overall price faced, and the price faced could come within a range that would encourage farmers to reduce their emissions without being so high as to leave no options to the farmer. An emissions price that would induce one farmer to act may be unduly onerous for another. This is mostly because product prices differ, e.g. milk vs. lamb vs. wool vs. venison and beef.

32. The extensive high-country property was negatively impacted under this price option as they have little option to reduce methane emissions in the short term given current mitigation options and would likely reduce stock numbers. Many South Island high-country properties would be constrained in similar ways, and future modelling could deliver more detail during the next stage of analysis. As methodology relating to **C** (on-farm sequestration) develops, the options for properties like this will come in to focus:
    a. An indication of the area required to offset **B** with **C** has been provided in Table 2. The Lincoln University carbon calculator tool was used to generate indicated area that a farm would need to plant to offset **B**.[2]

33. Traditional mixed crop and livestock farmers may look to reduce livestock carried as a result of facing a price on emissions relating to livestock production. Livestock integration in these systems enables farmers to convert crop residues into saleable products such as meat, enables them to minimise use of other herbicides and pesticides and is considered beneficial for the natural cycling of nutrient and organic matter within farm systems. A high price for methane may incentivise a reduction in livestock which could lead to an increase in the use of chemical inputs.

34. Where the full price faced by the dairy farm business is such that it should drive farmers to reduce emissions (nitrogen fertiliser and purchased feed contributing to methane), the same price for the extensive high-country property results in a far higher proportion of the annual business revenue. The extensive high-country farm in this scenario is not currently allowed to plant trees (indigenous or exotic) across much of the property due to the constraints under the district plan relating to landscape values. The options available to the extensive farmers to reduce emissions are also fewer. They are limited by climatic extremes and cannot reliably grow viable crop options outside of winter feed. Also, although this particular farm operation earns a significant amount of revenue from the sale of lamb, beef, and venison, the fine wool side of the business can only reduce emissions by running fewer animals.

35. Some seasons are climatically kinder than others and in conjunction with product volatility, returns from season to season can range widely. The highest emitting farm business would not be able to face the fully exposed price exposure and remain a viable business if also facing certain climatic events.

36. Those more extensive farms that are not constrained by rules about planting of trees, and that have a climate favourable to doing so, would be encouraged to identify areas of their more extensive country to plant trees to sequester carbon.

37. The success of this option to drive farmer behaviour change to reduce emissions is dependent on the price of methane and carbon relative to the returns gained by farmers for products sold. If the price exposure was connected back to the international price for carbon, and that price increased, farmers would be likely to plant trees to sequester carbon on land suitable for food and fibre production.

38. In nutrient-constrained catchments, a change to increased area growing crops could increase diffuse nutrient loss and therefore would not be tolerated. A reduction in stocking rate could reduce operating profits and could impact land value (there would be the odd unique exception if a property had previously been over stocked). Once the next level of detail for price exposure is narrowed further, it will be important that asset value impact is a consideration in the on-going modelling.

[2] Note that the Reporting work within the Partnership has identified inaccuracies in the Lincoln University carbon calculator tool for some farm types, but this information has been included here simply to provide context regarding the degree to which sequestration options could be applied to offset **B** with **C**.

*Conclusions*

39. Fully exposed is simple to calculate. The higher emitters face a higher price and the lower emitters face a relatively lower price.

40. The cost that each farmer is exposed to is dependent on price levels for **A** and **B**, and how the price is set needs to be considered further to understand the ultimate impact on farms.

41. The price burden that will drive one farm business toward making rapid reductions in emissions would be too harsh for a business farming lower revenue earning products, which could create significant perverse impacts.

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[redacted]

*Insights*

45. All farms would be able to either reduce emissions or afford to pay the price because the discounted price exposure is small relative to product returns. At a discount of 95%, it signals the change (reduction in emissions) required of farmers, but they can all face the price of their emissions.

46. The extensive high-country farm has the highest emissions and faces the highest price; however, the price is now reduced to an affordable amount.

47. This approach could work in conjunction with other extension and research opportunities planned.

48. This approach doesn't necessary dull the communicated signal and line of sight to the farm businesses, they all still have to face an appropriate price relative to their farm's emissions, albeit much reduced. However, the marginal price incentive is significantly dulled.

49. The price is small relative to revenue earnt across all businesses and may not drive farmers to reduce emissions when it is far easier for them to pay the price.

50. At a lower discount rate creates the same problems that emerge from fully exposed. As the proportion of the discount reduces, then the problem progressively increases whereby the price that drives some sectors to change may be too onerous for another to cope with.

51. This option could be a more subtle way of signalling that change is required and, if farmers do not respond to a subtle price signal, the discount could be reduced.

*Conclusions*

52. This option is simple to calculate. Higher emitters pay a relatively higher price.

53. With such a large discount, it weakens the price signal meaning that the residual price exposure alone may not drive the desired change. It is easier for famers to pay the price and not reduce emissions, and therefore could achieve the overall objective of emissions reductions in isolation.

54. As the proportion of the discount reduces, the perverse outcomes of a fully exposed option become more obvious.

***(III) Output-based***

55. A structured rebate is provided that is equal to 95% of the farm's emissions calculated using national factors for the emissions intensity of each product. For each product, the structured rebate with a 95% discount rate was calculated as:

**current output ✕ current emission intensity factor ✕ price ✕ discount rate**

56. This option requires specific emissions intensity factors (per unit of product) in order to calculate the rebate for each farm business. The emission factors provided were produced from New Zealand's Greenhouse Gas Inventory data.

57. Methane emissions have been broken down relative to each stock class or 'product' associated with the high-country extensive property and the dairy farm. Although OverseerFM does not report the total amount of product for each property, these totals can be derived from other details provided. This pricing option has only been calculated using methane priced at 10c/kg and long-lived gases at 4c/kg $CO_2$-e (which is equivalent to 4c/kg $CO_2$-e for all gases), because the available national factors used carbon equivalents.

58. This pricing option has been calculated using methane priced as $CO_2$-e, not on a per kg basis. This is because the national factors were not specified on an absolute basis. The calculations can be updated once that detail is available; however, the further detail in the calculation is unlikely to address the problem that this rebate was not able to be calculated for the traditional mixed cropping property, the pork and crop farm, or the dairy support, because either there was no suitable production factor available or the farm business did not finish animals and so kilograms of meat produced was not

captured. The output-based rebate was only calculated based on milksolids production for the dairy farm, because kilograms of meat was not reported.

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[redacted]

*Insights*

60. This option is complex to calculate because of the range of commodities considered in the case study farms, and the lack of national-level data from which to make an output-based option work for these products. Some members of the working group are keen to investigate it further to overcome this barrier.

61. The efficiency factors used reflect the entire lifecycle of the product at a national level. Many farm businesses specialise in parts of the product lifecycle (e.g. dairy platforms focus on lactating cows with young stock and wintering is often done on different farm businesses), so a rebate relative to the national factor may not direct farmers to continue to improve their efficiency if they are running a system that specialises in a more efficient component of the product lifecycle, and may not bear any practical relationship to the average efficiency for their farm.

62. For example, if a farmer was purchasing store lambs to grow them quickly to sell to the processor, then they would have a relatively efficient conversion of dry matter harvested into meat produced (and therefore methane emitted relative to meat produced). The lamb finishing component of the life cycle is dependent on a ewe flock existing somewhere other than the finishing farm. This ewe flock is less efficient at converting and dry matter to meat, whereas the finisher appears highly emissions efficient.

63. Equally, if a dairy farmer that had operated a grazing platform in the past has to meet a 10% reduction in methane, then they may need to choose to reduce their imported dry matter and may need to reduce the number of cows milked to hit this target. Some may choose to include a proportion of dairy support within their platform, instead of wintering cows on another farmer's property. In this instance, the dairy farmer may reduce the amount of total milksolids they produce from the original platform

for the same amount of feed harvested. Each cow may actually be more efficiently converting feed into milk, but, because the feed and efficiency associated with wintering was excluded in earlier reporting (because it was undertaken on another farmers property), it may imply that the farmer has reduced their emissions intensity, when in reality the production system has altered and hence is not fairly comparable.

64. Not all farm operations have an efficiency factor that can be applied to them. The dairy support property grows forage predominantly for the purpose of wintering dairy cows. If cows are simply being maintained at this time and are not gaining in live weight, then what efficiency factor should apply to them given that a measurable change in live weight may not reflect the final product associated with the farm.

65. Some farms are associated with many products (e.g. sheep, beef, and deer). The rebate calculation becomes complex in these situations.

66. Mixed cropping/arable and horticultural farms utilise livestock as a tool to assist with agronomy aspects particular to crops. For example, grass seed crops or crop residues. The rebate calculations become very complex on these farms, yet they are relatively low emitting farm systems. The farmer is unlikely to change more as a result of the increased complexity of calculation, reporting, and audit. Therefore, it is recommended that only livestock emissions use Output-based for price exposure, if this option is progressed. An alternative approach will be needed for fertiliser emissions.

67. In order to continue to operate a profitable business and reduce livestock emissions, farms that have appropriate soil and climate resources may look to increase the amount of crop they grow and reduce livestock numbers. The diversity of farm systems is likely to increase not decrease.

68. If the rebate calculation needs to provide clarity and direct farmers toward the appropriate lever to change in order to reduce emissions, then this particular efficiency option does not meet that need.

69. Further investigation could consider the potential to base the farm-level point of obligation at the end of the lifecycle, and have the cost passed on by the farmer as they manage the inclusion of grazing contracts, etc. in their systems.

*Conclusions*

70. Difficult to calculate for some farms and factors do not exist for others so could not be used in the comparison. This option was only able to be calculated for two of the farm businesses in the testing sample (extensive sheep and beef and the dairy unit), and livestock are likely to be the only source of emissions for which Output-based price exposure is feasible.

71. Will reward more efficient producers per unit of output; however, these farmers tend to be higher total emitters, so it results in a weakened price signal to higher emitters.

72. Further modelling would provide greater detail about the impact of those signals through behaviour change incentives for less efficient farmers.

73. Some aspects of production are less efficient, and others are more efficient. The national factors used did not relate to the specialisation within the production system that occurs on farms. If the efficiency factors do not relate to each farm business, they may not direct farmers to appropriate future changes.

74. Where this option can be calculated (dairy milk production and some sheep and beef operations), it may incentivise the most efficient producers to increase production, as they will receive a greater rebate for every unit of production that they add.

***(IV) Land-based***

75. A structured rebate is provided that is equal to 95% of the farm's emissions calculated using national factors for emissions intensity per hectare. The structured rebate with a 95% discount rate was calculated as:

**current output ✕ current per hectare emission factor ✕ price ✕ discount rate**

76. It has not been possible to calculate a rebate based on natural capital or land use classification (LUC) for the farms in the data set, because the farms have not been mapped to provide this information. There is still disagreement regarding LUC in relation to irrigated land and several of the farms in the data set are irrigated. The same issue arose with an attempt to consider a rebate based on natural capital.

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[redacted]

*Insights*

79. For three of the five farms reported in the table above, the rebate was greater than the original price exposure, implying that these farms could receive money back instead of paying a price on their emissions. Another assumption could then be applied to ensure that farmers didn't receive income when they hadn't reduced their emissions, with any negative price exposure just zeroing out.

80. This option is relatively more onerous on dairy and meat finishing farm systems (i.e. more intensive), because they receive a much lower rebate compared to lower intensity farms and face a higher price exposure.

81. This option rewards less intense producers per unit of area even if they have high total emissions. Therefore, emissions reductions may not be achieved from certain categories of high-emitting farms. Also under this option, the farm businesses that have more emissions intensive production (on a land basis, but not necessary per unit of product in the case of the dairy systems) pay more, and may consider it unfair to have to subsidise others that are also emitting, or for only some farm businesses to have to face the full price for their emissions.

82. A second assumption was applied to the calculation such that, where there was a negative result, it would become zero and no one could receive an over allocation following the price exposure calculation. Within our set of test-farms, the extensive high-country business had the highest farm emissions, but relatively low per hectare emissions. This option of calculating the rebate would mean that their price exposure would be $0, whilst the dairy farm business, with the second highest emissions, would face the highest price exposure. This reduces the risk of system-wide over-allocation, and mitigates the perception that some sectors would be paying other sectors. However, it also leaves no marginal price incentive on the farms that would otherwise be over allocated.

83. Charlotte also worked through an alternative approach, which replaced the national factor with the farm's own emissions per hectare, but varied the rebate rate, the more emissions intensive the farm was per hectare, the lower the rebate rate applied. This avoided over-allocation. Also under this approach, when methane was priced higher relative to the long-lived gases then the highest emitting farm faced the highest price exposure, and when sequestration opportunities are also added, this option could have some promise.

84. Overlaying LUC was not possible in this study because the farms have been mapped to the level of soil type and irrigation makes this extremely customised and complex in practice, and not practically achievable given the limitations and low resolution of this metric and disagreement of definitions at the farm level.

85. We are not certain how to overlay any other metrics, as they are not sufficiently defined, let alone mapped, to practically calculate.

*Conclusions*

86. The land based options were reasonably simple to calculate, however there are some extreme outcomes. Low per hectare emitting farms would theoretically receive payment rather than paying a price for their emissions assuming this option was applied to the discounted emissions price.

87. While this option resulted in an extreme outcome, it may warrant further consideration with efficiency factors more specific to the farm system.

88. When per hectare factors specific to each farm business were applied to the rebate, the resulting price exposure was more palatable.

89. Some working group participants had concerns that the farm specific per hectare factor may be construed as a support payment or subsidy. If this option is taken further, appropriate trade representatives should be consulted.[4]

[4] This has been identified by some members as a topic of consultation that the programme should pursue across the range of pricing options, including beyond price exposure.

90. Note that adding the attitudinal segment consideration to the farm business analysis didn't seem to alter the findings at this stage. The price to which they are exposed should provide an incentive for all farm businesses to make changes, irrespective of which segment they fall under.

***(V) Good management practices***

91. The weight of each gas not mitigated through the use and uptake of good management practices (GMP) faces a price. The intention is that, if a farmer is doing everything that they can to reduce their emissions (except reducing production), they face no price. If new practices or breakthrough technologies are introduced, these then become associated with a price, and farmers' liabilities change to incentivise uptake.

92. This option required calculation of a rebate conditional on a range of GMPs. None of the pricing work to date was able to agree and define the GMPs for this price exposure option, nor value them in a way that could be calculated for a structured rebate.

93. Therefore, this option was not able to be calculated. However, some pros and cons, and other considerations associated with this option, have been noted in the sub-sections below.

*Insights*

94. While the intent behind the GMP option is understood, defining and robustly agreeing GMP for each farm in the country and applying a price would be onerous, and (based on experience in the freshwater policy space) would take many years. It is also not clear whether a farmer would be rewarded more for having more opportunities to apply good management practices to reduce emissions, over a farmer that had fewer; or whether a farmer with fewer opportunities, unable to make as many changes, would receive the greater benefit.

95. The GMP option effectively requires a rebate based on farm specific practices, which is the same as placing a rebate at the input stage rather that enabling a farmer to innovate by rewarding at the outcome. Many complications have arisen in the freshwater space where constraints are applied at the input stage.

96. An appropriate pricing option should reward farmers for reducing their livestock emissions, as they will pay a lesser price and should achieve the same outcome as the intent behind the GMP option.

97. It has also been demonstrated in several of the other price exposure options (despite any other challenges and barriers), that decoupling the structured rebate from the initial obligation allows farmers to adapt their farm management toward greater emissions efficiency, and that this can result in a minimised obligation, or even a reward through over-allocation. This could be a way of achieving the zero-price outcome that the GMP option intends to achieve.

98. What farmers may see as GMPs will not necessarily achieve the necessary reductions, whereas other practices that guarantee reductions (such as input controls) are potentially viewed as being beyond 'good management.'

99. The GMP concept fits best within a farm environment plan, or may be incentivised using conditional assistance, to support farmers to reach the zero-price outcome discussed above.

*Conclusions*

100. Defining GMP at a farm scale is both complex and subjective and was not possible for the purpose of this study.

101. Focussing on the practice can form input constraints that are difficult to manage.

102. An appropriate price exposure option should drive farmers to identify and adopt those GMPs that are appropriate for them without these being prescribed.

***(VI) Historical baselines***

103. This option can be applied in two ways:

a. In a pure form that fixes absolute emissions to a baseline year – this is what is classically considered to be 'grandparenting'; or

b. By fixing only one aspect of the equation to the past to some degree, whether this is the proxy for emissions (e.g. output or area) or the emissions factor, and whether this is a baseline year or a rolling average – this is not strictly grandparenting, but an alternative approach to decoupling the structured rebate and/or smoothing out the effect of updating factors, and has been considered under 'variants' in a later section.

104. The application of this option assessed here is (a) above. That is, a structured rebate is provided that is equal to a fixed percentage of the weight of each gas in a set historical baseline year. This structured rebate with a 95% discount rate can theoretically be calculated as:

**Fixed historical output × fixed historical emission factor × price × discount rate**

105. However, specific calculations were not generated for the analysis of this section, and it has instead been considered qualitatively.

*Insights*

106. This option more expensive and difficult to audit, especially if models move (relativity is important), and because farm-specific historical information is difficult to obtain and audit.

107. This option could harm farms that are already relatively low emitters (such as cropping), because land use would be restricted through potentially reduced land value (a farm with high historical emissions will have more options).

108. This option rewards those who have historically emitted more.

109. Using retrospective farm situations to set a price to impact the future is not acceptable for some Māori-owned businesses, where farms have not yet had the chance to develop the land. This would have a similar effect where there is a generational handover from older farmers to younger generations who wish to further or re-develop under-utilised land.

*Conclusions*

110. Connecting the price exposure calculation to fixed historical emissions and fixed historical emissions factors ('grandparenting') has significant perverse outcomes.

111. Alternative approaches to using historical baselines need further analysis.

***How do the results and conclusions measure against the criteria?***

112. The results have been reported against the high-level criteria and are reported in Appendix Two.

113. When the rating against all criteria was totalled, the Proportional Discount option appeared to be the most favourable. However, the significant weakness of this option is that, at a low price exposure, more farmers may choose to pay the price instead of reducing emissions, which means it may fail to meet the overall objective of reducing emissions across the agricultural sector.

114. Given the averages for net profit reported in Table 1 in the Methodology section, and the estimated principal repayments and living allowances that still need to be taken from that profit, most farming businesses will not be in a position to afford a large price exposure. Many have limited opportunities to reduce livestock emissions year on year, without reducing numbers carried. Generally speaking, a reduction in stock numbers will reduce profitability. The proportional discount option allows a price signal to be sent to farmers to encourage change without harsh adverse impacts on profitability.

115. Given that some of the options are not able to be fully analysed due to lack of data available, Charlotte's advice is that it may be a pragmatic approach to get started with a gentler pricing option, capture more data in doing so, and encourage farmers to choose to make change to reduce their emissions in line with targets to avoid the discount being reduced.

116. The Fully Exposed option with split-gas pricing is relatively simple to calculate. The farm businesses that emitted the most did face the highest price. The fact that returns differ across farm businesses and livestock classes means that the price that drives rapid change for one sector (e.g. dairy) may force another to change land use in order to maintain property values, because they have fewer options to reduce, are less profitable, and are less able to face the price. Because this option could be very difficult for some extensive properties to respond to and cope with, it was given a negative score against the "cost-effectiveness and workable for the agricultural sector and the New Zealand economy".

117. The Land-based option scored the third highest across the criteria considered. This option does provide a fairly simple and workable means for revenue to be recycled. It did fail against the equity criteria when calculated with one national factor, because it resulted in one sector or business funding another (to the extent that the highest emitting farm business included in the study would have no price exposure while the third highest emitter would pay the highest price simply because they emitted more per hectare).

118. Whilst the Land-based option calculated in this study resulted in extreme outcomes, when it is applied against a higher price of methane or when it uses on-farm factors but a variable discount rate, it may still have a place. When these alternative approaches were calculated, the highest emitters still faced a price, and they will have more options to offset with 'C'. It may have implications for the reporting stream of work and needs more analysis. It needs to be checked at various methane prices and should also be connected to 'C' for more analysis.

119. The Output-based option was complex to calculate in the two examples where it could be completed. Data was not available or possible for three of the five properties. This has been addressed by the recommendation to only apply this price exposure option to livestock emissions if implemented. This option diluted the impact on the higher emitters, and those that were more efficient at producing a kilogram of output were rewarded by a higher relative rebate. However, this option did not direct all farmers to become more efficient because the national factors did not reflect the component of the production system undertaken by some farm business.

120. Historical Baselines could be considered as part of any option or where a retrospective comparison is used. However, when fixing absolute emissions in the past ('grandparenting'), a historical baseline can tie land to historical land uses irrespective of its capacity and potential. This option is also not favoured by iwi/Māori. Whilst simple to calculate, the data is not always readily available to do this, and the equity issues that arise are significant as well.

121. The GMP option was not considered to be practical and possible, and therefore it scored poorly against that criteria. When considered as a concept, there may also be issues of equity with this option, so it was given a negative score. e.g. Do farmers get more reward for having more options, or less of a reward if you have many options but don't implement them all?

***Which options can be progressed in practice?***

122. Charlotte's recommendations for options to be progressed for further analysis and modelling include: **Fully Exposed**; **Proportional Discount**; and **Land-based**.

123. Charlotte's recommendations for options that should not be included in modelling or could not be practically implemented due to major barriers include: **Output-based**; **Good Management Practices**; and **Historical Baselines** as 'grandparenting'.

## Further Detail & Recommendations

***Detailed variants***

9(2)(f)(iv)

[redacted]

***Recommendations for future analysis***

*Specific organisational recommendations for future analysis*

s 9(2)(f)(iv)

[redacted]

*Additional design details to consider*

128. Some specific, additional design details have been identified that may mitigate the risk of over-allocation, while simultaneously returning more revenue from the system to be distributed as other forms of assistance. These are outlined in Table 7, along with recommendations for additional work that could be done to progress these design details.

*Table 7: Further work to address over-allocation*

| Design detail | Description | Recommended further analysis |
|---|---|---|
| Farm-level cap on structured rebate | Some options, especially the Land-based option, created significant over-allocation at the farm level.<br>This could be capped at a certain percentage of the initial obligation (e.g. 95%, 100%, 110%), to ensure that excessive over-allocation is avoided.<br>Another reason for this approach would be the potential that further reductions would not occur once a farmer has minimised their obligation. There remains an economic incentive, but other barriers may stop farmers from making further reductions if they reach a point where they receive more money than they owe.<br>However, it is possible that not allowing for an over-allocation would remove the incentive for further reductions also, but capping it at 95% of the initial obligation may simply create a proportional discount for some participants. | 1) Analysis of whether there remains an incentive to reduce emissions once the obligation has been minimised in practice. What further reductions can we expect?<br>2) Analysis of whether a marginal incentive remains if the structured rebate is capped at or below the full initial obligation.<br>3) Quantifying what additional revenue could be gained for other forms of assistance by capping structured rebates at the farm level. |
| System cap on structured rebate | If over-allocation became an issue on a large proportion of farms, this may cause over-allocation across the system (i.e. the system would not be revenue neutral).<br>Additionally, applying a 95% level of assistance purely to structured rebates may sufficiently weaken the incentive to reduce emissions regardless of which price exposure option is implemented.<br>Structured rebates could be capped at a lower percentage than 95% (e.g. 50%), while the remaining revenue that would have gone to structured rebates could be reserved for conditional assistance or sequestration (e.g. 45%).<br>This would potentially increase the burden on individual farmer businesses, but greater conditional assistance or sequestration benefits could mitigate this in a more effective manner while allowing for a larger marginal price incentive. | 4) Analysis of lower levels of assistance reserved for structured rebates, and the impact of this on the price exposure of different farm businesses.<br>5) Quantifying the residual revenue gathered that would make up the 95% at each of the lower levels assessed in (4).<br>6) More robust policy design around the use of conditional assistance, and how it might mitigate perverse outcomes and risks that are not addressed by structured rebates. |

***Recommendations for scenarios to model***

129. Based on Charlotte's analysis of which options are practically feasible on farm, and the assessment of variations and additional design details carried out by the working group, five detailed price exposure scenarios are recommended to progress to modelling and further detailed design, in addition to the NZ ETS counterfactual.

*Table 8: Recommended scenarios to model*[5]

| Scenario | Description |
|---|---|
| **Fully Exposed** | This matches the option as Charlotte assessed (no structured rebate).<br>Should model a range of prices for $CH_4$, and the NZU price and the Climate Change Commission's projected NZU prices for long-lived gases. |
| **Proportional Discount** | This matches the option as Charlotte assessed (simple 95% discount).<br>Should model a range of prices for $CH_4$, and NZU price and projected NZU price for long-lived gases. |

[5] A specific 'low price' should not be modelled under Fully Exposed, and a specific 'high price' should not be modelled under Proportional Discount. Fixed prices should be assumed, and Proportional Discount can create a low price.

| | |
|---|---|
| **Output-based Benchmarked (fixed historical factors)** | This uses the same calculation as the Output-based option that Charlotte assessed, but uses emissions factors fixed in the past (potentially updating periodically).<br>Fixed historical factors may mitigate the issue that using national factors for reporting may create, which would otherwise result in a Proportional Discount, but modelling and further analysis will be necessary to determine how effective this mitigation is.<br>The working group also agree with Charlotte's assessment that Output-based is not suitable for fertiliser emissions, and recommend that it should only be used for livestock emissions. An alternative price exposure approach will be needed for fertiliser.<br>Modelling could also consider an approach to Output-based price exposure that solely prices and provides structured rebates to farms that directly produce outputs (i.e. end of lifecycle), with these farmers then able to pass the costs on through their grazing contracts, etc.<br>More specific factors, including those that separate $CH_4$ by absolute weight, should be sourced.<br>Should model a range of prices for $CH_4$, and NZU price and projected NZU price for long-lived gases. |
| **Land-based National Benchmarked** | This uses the same calculation as the Land-based option that Charlotte assessed, but should be assessed at different rebate rates (both across the system and for specific farms).<br>Varying the rebate rates may mitigate the over-allocation that using national factors resulted in. Where over-allocation occurs at 95%, or if it still occurs at other rates, the modelling and further analysis should consider the outcome of capping structured rebates at the farm level at 95%, 100%, and >100% of the initial obligation.<br>More specific factors, based on Inventory data rather than StatsNZ data, should be sourced.<br>Should model a range of prices for $CH_4$, and NZU price and projected NZU price for long-lived gases. |
| **Rolling Average** | This uses the same calculation as a Proportional Discount, but averages the emissions data used in this calculation over a period of years.<br>A rolling average may create a greater year-on-year incentive to reduce emissions than a Proportional discount, without the complexity of some of the other options or the perverse outcomes of a historical baseline that 'grandparents.' However, the marginal incentive will be weakened to some extent.<br>Should model a range of prices for $CH_4$, and NZU price and projected NZU price for long-lived gases. |
| **NZ ETS (processor level)** | This is the legislated backstop being treated by the Partnership as a counterfactual.<br>Should model the NZU price and projected NZU price for long-lived gases. |

Out of Scope

[redacted]

Out of Scope

[redacted]

## **Appendix Two:** *Consultant's analysis of options again criteria*

| Criteria | Price Exposure Option | | | | | |
|---|---|---|---|---|---|---|
| | **Fully Exposed** | **Proportional Discount** | **Output-based** | **Land-based** | **GMP** | **Historical Baseline** |
| **Achieves agricultural sector emissions reductions:** Does the option maintain the price signal and achieve behaviour change? This sub-criteria also covered emissions leakage | + + *Depends on the price relative to product prices, as for some sectors, the price is too high* | – + *if in conjunction with broader suite of change drivers* | + *Rebate calculation too complex to maintain clear price signal; national factors not relative to the farm system and resulted in confused price signalling* | +/– *In some sectors only.* | + *Conceptually this lever should be possible, however it was not defined enough to analyse the detail* | + *Yes, but the change will only be relative to the historic year; farmers will not reduce more than they absolutely have to* |
| **Is cost effective and workable for the agricultural sector and the NZ economy:** Is it practical and possible? | – *Is cost effective to enforce from a reporting perspective, but some sectors could not cope with the full price and adversely impact the economy* | + + *Cost effective to enforce and doesn't require expensive overheads to redistribute a rebate.* | – *Would be extremely expensive to audit and measure at farm level for most sectors* | + *It is both practical and possible however some high emitters avoid price exposure so has limitations in workability* | – – | – |
| **Supports farm systems to align with wider government and industry objectives:** Does it misalign or fail because of other policies or initiatives? | + *Depends on the price settings. At prices used in this study it would severely impact community resilience and wellbeing* | + + | + | + | + | - *Is not supported by iwi* |
| **Equity:** How are the impacts distributed across the participants and sectors? | + + | + + | +/– *Unsure, the higher emitters receive a higher rebate, but this is the same across all sectors – if an approach could be found that worked equally across all sectors* | – – | – | – – |
| **Is consistent with the Crown's Treaty obligations:** Supports Māori development and the Treaty principles and creates opportunities for Māori land and Māori landowners | It will need to be up to the Crown to determine how these options can ensure consistency with the Treaty of Waitangi | | | | | – – *This option potentially restricts underdeveloped Māori land from being further developed* |
| **Supports a productive, profitable, and competitive NZ agricultural sector** | - *At a price of 4c/kg$CO_2$-e, the price exposure is unaffordable for most farm businesses* | + *Farmers can all face the discounted price, but price alone may not encourage them to reduce emissions* | + *Conceptually, this option should enable competitiveness through maintaining or improving emissions intensity, but there is a danger the price lever used to calculate it could be misleading and indicate a reduction in intensity (as was the case in this study – it couldn't differentiate between a system change and efficiency reduction)* | + *Farmers could face the price however some sectors pay more; price signals may get blurred and impact farmers ability to respond to international markets* | + *Conceptually, this option should have a positive impact; there are dangers it could hold farmers back from innovating because they are focussing on specific practices rather than innovating in line with the scientific principles; it may be costly in the longer term* | – *This option may be more onerous to report on and could punish early adopters. Farms would be limited based on historic farm operations and may be less able to respond to market forces* |

s 9(2)(f)(iv)

[redacted]

| Variant | Description | Initial Assessment | Structured Rebate Formula |
|---|---|---|---|
| ***Group 1: Possible candidates and/or worth modelling*** | | | |
| **Fully Exposed** | No structural rebate provided<br>*Matches Charlotte's 'Fully Exposed' assessment* | Creates a strong marginal incentive<br>No risk of over allocation<br>Assuming a fixed price high enough to achieve reductions, would likely put a very high burden on many participants that they would struggle to respond appropriately to. | $SR = 0$ |
| **Proportional** | Simple 95% discount<br>*Matches Charlotte's 'Proportional' assessment* | Creates a weak marginal incentive<br>No risk of over allocation<br>Likely to achieve limited emissions reductions while not fully mitigating the risks of fully exposed | $SR = [\text{total emissions}]_{y=c} \times P \times R$ |
| **Rolling average** | Assistance calculated using a rolling average for emissions<br>*Variant on Charlotte's 'Proportional' assessment* | Creates some marginal incentive (is similar to proportional over a long period of time, but if participants continue reducing emissions year on year, they continue to receive benefit for this)<br>Short-term risk of over allocation if steep reductions are made<br>Likely to smooth out the extremes of fully exposed/proportional and fixed historical, but also losing some of the positives | $SR = [\text{total emissions}]_{y=r} \times P \times R$ |
| **Output-based Benchmarked (fixed historical factors)** | Assistance calculated using current on-farm outputs and fixed historical national factors (emissions efficiency)<br>This option is the equivalent of the current EITE allocation regime in the NZ ETS<br>*Variant on Charlotte's 'Output-based' assessment* | Creates a strong marginal incentive to improve emissions efficiency<br>Creates a weak marginal incentive on absolute emissions except by efficiency gains<br>Will eventually over allocate to all participants unless the factors are updated periodically<br>The marginal incentive is possibly weakened if simple or intermediate reporting uses national factors<br>Faces the issue that all farms do not have products, or have multiple products from each animal | $SR = X(O)_{y=c} \times EF(N)_{y=f} \times P \times R$ |
| **Land-based National Benchmarked** | Assistance calculated using farm area and current national factors (emissions per unit of area)<br>*Matches Charlotte's 'Land-based' assessment and variable assistance level recommendation* | Creates a strong marginal incentive<br>High risk of over allocation for high-emitting, low-emissions-intensity (on a land basis) participants, high risk of comparatively little assistance to high-emissions-intensity (on a land basis) participants<br>*However,* the extremity of over and under allocation could be mitigated by varying the assistance level based on where each individual farm sat on the national distribution of emissions intensity per unit of area | $SR = X(A)_{y=c} \times EF(N)_{y=c,r} \times P \times R$ |

| Variant | Description | Initial Assessment | Structured Rebate Formula |
|---|---|---|---|
| ***Group 2: Useful comparisons and/or could be worth modelling*** | | | |
| **Fixed Historical** | Assistance calculated using a fixed historical baseline for emissions<br>*Matches Charlotte's 'Historical baseline' assessment* | Creates a strong marginal incentive<br>High risk of over allocation<br>Limits land-use flexibility (especially for underdeveloped Māori land), and likely to reward historically high-emitting participants<br>This option is what is classically considered 'Grandparenting' | $SR = [\text{total emissions}]_{y=f} \times P \times R$ |
| **Output-based Proportional** | Simple 95% discount calculated using outputs<br>*Variant on Charlotte's 'Proportional' and 'Output-based' assessments* | Creates a weak marginal incentive<br>No risk of over allocation<br>Effectively achieves a proportional discount by either using on-farm factors to calculate both the initial obligation and the assistance, or uses national factors to calculate both; that is, if your initial obligation and your assistance are both based on your actual emissions, and the latter is multiplied by 0.95, this is no different than multiplying your initial obligation by 0.05 | $SR = X(O)_{y=c} \times EF(N)_{y=c} \times P \times R$<br><br>*If reporting using national factors:*<br>$SR = X(O)_{y=c} \times EF(N)_{y=f} \times P \times R$ |
| **Output-based Benchmarked** | Assistance calculated using current on-farm outputs and current national factors (emissions efficiency)<br>*Matches Charlotte's 'Output-based' assessment* | Creates a strong marginal incentive to improve emissions efficiency<br>Creates a weak marginal incentive on absolute emissions except by efficiency gains<br>Some risk of over allocation to certain participants, but mitigated across the system<br>Becomes 'Output-based Proportional' if simple or intermediate reporting uses national factors<br>Faces the issue that all farms do not have products, or have multiple products from each animal | $SR = X(O)_{y=c} \times EF(N)_{y=c,r} \times P \times R$ |
| **Output-based Benchmarked (rolling average)** | Assistance calculated using rolling average on-farm outputs and rolling average national factors (emissions efficiency)<br>*Variant on Charlotte's 'Output-based' assessment* | Creates a strong marginal incentive to improve emissions efficiency<br>Creates a weak marginal incentive on absolute emissions except by efficiency gains<br>Moderate risk of over allocation to certain participants, but mitigated across the system and over time<br>The marginal incentive is possibly weakened if simple or intermediate reporting uses national factors<br>Faces the issue that all farms do not have products, or have multiple products from each animal | $SR = X(O)_{y=r} \times EF(N)_{y=r} \times P \times R$ |
| **Land-based Sector Benchmarked** | Assistance calculated using farm area and current factors for each sector (emissions per unit of area)<br>*Variant on Charlotte's 'Land-based' assessment* | Creates a high marginal incentive<br>Some risk of over or under allocation within sectors that include diverse operations (e.g. intensive lamb finishing within sheep and beef)<br>Would be almost impossible to assign participants to single sectors and calculate assistance; this could possibly be made to work following a few years of reporting, but would therefore need a transitional option | $SR = X(A)_{y=c} \times EF(S)_{y=c,r} \times P \times R$ |

| Variant | Description | Initial Assessment | Structured Rebate Formula |
|---|---|---|---|
| ***Group 3: Discarded and/or cannot be modelled*** | | | |
| **Historical/Rolling (mixed)** | Assistance calculated using a mix of fixed historical and rolling average for the emissions proxy and emissions factor<br>*Variant on Charlotte's 'Historical baseline' assessment* | This included multiple options that were theoretically possible, but would require multiple different types of historical data, and created strange effects on the marginal incentives<br>The structure of the formulae also did not align with reporting, as it calculated the initial obligation on a different basis to where reporting decisions have landed | N/A |
| **Output-based Benchmarked (fixed historical outputs)** | Assistance calculated using fixed on-farm outputs and fixed historical national factors (emissions efficiency)<br>*Variant on Charlotte's 'Output-based' and 'Historical baseline' assessments* | This option fixed both the outputs and emissions factors in the past, which created a strong marginal incentive, but over allocated to all participants in the system solely through BAU improvements and could not be revenue neutral | $SR = X(O)_{y=f} \times EF(N)_{y=f} \times P \times R$ |
| **Land-based Proportional** | Simple 95% discount calculated using area<br>Would require reporting to use area and national land-based factors to calculate the fully exposed cost on emissions, which does not appear to be the direction of travel<br>*Variant on Charlotte's 'Proportional' and 'Land-based' assessments* | This option is functionally the same as 'Output-based Proportional,' but assumes that emissions are calculated for reporting using area, which is not where reporting decisions have landed | N/A |
| **Land-based National or Sector Benchmarked (fixed historical or rolling average)** | Any land-based option that uses a historical benchmark or rolling average<br>*Variant on Charlotte's 'Land-based' and 'Historical baseline' assessments* | This option fixes the benchmark for emissions per unit of area in the past (to at least some degree), and therefore ties emissions to historical land use | $SR = X(A)_{y=c} \times EF(S,N)_{y=f,r} \times P \times R$ |
| **Land-based National or Sector Benchmarked (+ additional metric)** | Any land-based option that overlays an additional metric, such as LUC or natural capital<br>*Matches Charlotte's 'Land-based + LUC' assessment* | This option requires the use of either:<br>LUC, which has been analytically and legally deemed inappropriate for allocating natural resources, and does not have maps at farm-scale resolution<br>A new metric based on natural capital, which does not exist and would not be simple to create in a way that can be financially valued | *Per category:*<br>$SR = X(A)_{y=c} \times EF(N)_{y=c,r} \times P \times R$ |
| **Good Management Practices** | Assistance calculated using good management practices that reduce emissions on-farm<br>*Matches Charlotte's 'GMP' assessment* | This option has not been sufficiently defined in a way that can be successfully modelled, including the need to comprehensively identify and agree on individual good management practices and whether/how they apply on individual farms | N/A |

Out of Scope

Document 11

# HE WAKA EKE NOA STEERING GROUP PAPER

## 21 July 2021

## Price Exposure

Paper No: 07 UNCLASSIFIED

## 1. PURPOSE

1.1. The purpose of this paper is to:

- Update the Steering Group on the modelling and analysis of price exposure options, provide preliminary results, identify emerging issues and highlight gaps.
- Highlight the need to narrow down potential pricing options in order to meet HWEN timeframes.
- Seek guidance on next steps, including on exploring complementary and/or compensatory measures that could support preferred pricing options.

## 2. DECISIONS REQUIRED

2.1. **Note** the latest round of modelling has been useful in highlighting key trade-offs and principles that will need to be considered by the Steering Group. Like any modelling efforts we won't be able to answer every question through this work but the Programme Office believes we are getting to a point where we have enough insight to make key judgements in order to move forward.

2.2. **Note** that there are some clear and/or emerging insights from the modelling to date:

- There is a trade-off between profit/production on the one hand and emissions reductions on the other.
- The same emissions price/s will have differential impacts on sectors i.e. between dairy and sheep & beef.
- DairyNZ modelling suggests that the ETS processor-based legislated backstop will result in emissions reductions but that these will still not meet the regulated target.
- The ability to off-set A and B by subtracting C is an important factor in managing the differential impacts of pricing A and B between the sectors i.e. C is not a significant potential price response option for the dairy sector in general, but it is significant in offsetting the price faced on the more extensive sheep, beef and deer units. [Note, an important point is that the Steering Group would need to confirm that farm-level sequestration can offset methane emissions (given methane has a gross reduction target); the analysis to support consideration of this is underway.]
- The key reason we have been investigating (more complicated), rebate options is to see if these can deal with equity and/or intensity-related concerns/objectives. We now know from the modelling that just facing a price creates an incentive to reduce

emissions intensity, (but note the impact on production is greater than intensity), and adding 'C' into the equation may achieve a similar impact to what the land-based rebate is seeking to achieve (as the farms that are more likely to benefit from a land-based rebate generally have more opportunity to sequester).

- Both rebate options lead to a varying 'effective price per emission'. This is how much residual obligation is paid per total CH4 emitted. Under any option other than proportional/fully exposed this will vary, otherwise there would be no decoupling between assistance and the initial price on emissions, which would result in no 'marginal incentive'. Under the land-based option the 'marginal incentive' is not consistent (dairy saves more and is penalised more for every emission reduced/increased respectively; sheep and beef saves less and is penalised less for every emission reduced/increased respectively). This raises potential economic efficiency issues.

- The output-based option appeared to do well in the DairyNZ modelling in limiting the profitability impact while still delivering intensity outcomes. s 9(2)(f)(iv) [redacted]

  Nevertheless, an output-based option creates significant practical and technical difficulties in calculating an output rebate across all of the primary industry sectors because of the need to develop allocative baselines that can work for farms with different combinations of outputs. Some farm businesses don't have a means for capturing the information that is fundamental for calculating a rebate for output or efficiency e.g. mixed cropping.

2.3. **Note** a key issue is that the Working Group and Policy Group have not been able to have a full conversation on the trade-off between profit/production and emissions reduction at various prices across the pricing options because the Beef + Lamb modelling has not (yet) captured estimates of emissions reductions. Beef + Lamb modelling has not captured intensity outcomes under the pricing options, or analysed the output based rebate.

2.4. **Note** notwithstanding some gaps in the modelling at this point the Working Group considers there are two broad scenarios/packages of options that are worth exploring in more detail. Both these scenarios/packages use a fully exposed approach where the price of methane is different from the CO2e price. There is inherent risk in focusing on the potential pathways set out below if a decision is made at a future point to design an effective structured rebate. But because the HWEN system will need to be designed to a reasonable level of detail to meet legislative and government requirements it is important that decisions are made to narrow potential pricing options so that the detailed work can be completed within the timeframe with have, and with the resources we have available. The two potential pathways are:

- A low price + complementary measures (which would work to support a lower price signal in order to achieve emission reduction targets).
- A higher price + compensatory measures (which would work to soften the impact on farm-level profit).

2.5. **Note** to assist the work outlined in 2.4 above we would like to support the Steering Group to have a conversation (in August) on the emissions reduction target we are aiming for through HWEN i.e. we have a 'regulated target' of 10% reduction in methane by 2030, but we know that some existing policies (e.g. Essential Freshwater), baseline land use change (e.g. conversion to forestry, particularly from sheep & beef), and reductions in other areas (e.g. the waste sector's contribution to methane), will take us some way to meeting the

10% target. The Climate Change Commission advice is for all sectors to do as much as they can, and its recommendations are based on ambitious (rather than minimum), reductions for each sector, so there will need to be robust work undertaken to support a view/recommendation that we can rely on action in other areas to do some of the heavy lifting and that it doesn't all need to come from HWEN (given the clear trade-off between profit/production and emissions reduction).

2.6. **Discuss** whether having different prices for a unit of emission depending on the farming system would meet efficiency and equity considerations i.e. is it acceptable to have a system where different farms/farmers face different emissions prices? If the answer to this is yes, then further technical work to test a land-based rebate option is possible. If no, then this option should be parked, with modelling on this focused only on ensuring we have defined and applied the equation correctly in the modelling (which does not change the equity consideration) and we have a clear picture on likely impacts for the final write-up.

2.7. **Discuss** whether it is necessary to continue with further work into the output-based rebate calculation given that it has fundamental problems in implementation on mixed farms with several products or integrated livestock and cropping systems, and that analysis has already described how facing a total price on emissions through the fully exposed split gas levy is likely to result in improved production emissions intensity of production. Note, some members think that the practical difficulties relating to the red meat sector could be resolved through a rebate that is provided to those only selling to a processor. This, however, may have equity and other issues and has not been tested.

2.8. **Discuss** whether to 'park' land-based and output-based rebates for the next stage of analysis. As outlined in 2.2. above we now know from the modelling that just facing a price should deal with intensity, and adding 'C' into the equation appears to achieve some of what the land-based rebate is intending to achieve. A key question is why you would apply a complicated measure, and potentially blur the price signal, when a simple and straight-forward pricing mechanism is likely to have the same effects/impacts.

2.9. **Agree** that further modelling/analysis work will continue in order to:

- Support prioritised options;
- Align the models, assumptions and modelling runs to the greatest extent possible (given differences in the DairyNZ and Beef+Lamb models);
- Complete our understanding of other options where this will be necessary to support the judgements that have been made (i.e. where we need to tie up any loose ends to ensure our analysis on options that have not been prioritised is complete and in a state that can be communicated effectively);
- Better understand the emissions reductions that will be possible through existing policy, baseline land use change, and the contribution of other sectors, to support a conversation on the emissions reduction target we are aiming for through HWEN; and
- Provide more specificity on likely farm-level impacts e.g. case study work for, among others, Māori agribusiness operations.

2.10. **Agree** that we need to narrow down potential pricing options to help fine-tune any necessary complementary and\or compensatory measures to ensure that the policy is appropriate and that the overall package sends the right signal to farmers to achieve HWEN objectives.

2.11. **Agree** to explore in more detail the two broad scenarios of options outlined in 2.4 above, including the complementary and compensatory measures that could support preferred pricing options.

2.12. **Note** that further work has been commissioned on whole of economy and leakage considerations which will support decision making around options.

## 3. KEY POINTS

*What we are seeking to achieve*

3.1. Our modelling work has been seeking to understand:

- How different prices and pricing formulae/options used to calculate prices faced by farmers may incentivise change in reducing biogenic emissions across the farming sector; and
- The associated impacts on production and profitability of different prices and pricing formulae/options used to calculate prices faced by farmers.

3.2. A successful pricing option (with appropriate settings and complementary policies), would result in a price faced by farmers that provides a clear signal, rewards change, incentivises them to reduce the biogenic methane emissions from their farm operations AND enables them to farm in a productive and profitable way. It is also important that intensity/efficiency is maintained or improved because this is fundamental to our international competitiveness.

3.3. Steering Group feedback in June supported modelling of the fully exposed split levy option at discount rates and various prices for short (A) and long lived (B) gases. You also supported continued development of pricing options that involve a structured rebate calculated based on land or efficiency/output, but as a lesser priority.

3.4. Questions were posed from the Pricing Working Group to the two teams of modellers (DairyNZ and Beef+Lamb). The first run of modelling work focussed on model construction, establishing baselines and assumptions and then on identifying the impacts to the sectors of farmers facing a price where A and B were given the same prices. The second round of work delved into the impacts of a differential pricing of the split gas levy at a range of prices for A and B. The detailed brief is attached.

3.5. The first round of modelling concluded that exposing farmers to a price on their emissions would likely lead to reduce total biogenic emissions from farms and earn revenue, however it came at the cost of farm production, profitability and, in some cases, viability. The higher the price settings, the greater the magnitude of emissions reductions but also the greater the impact on farm profitability.

3.6. The Working Group will look more closely into the modelling assumptions to understand how the impact of mitigations modelled aligns with previous work undertaken (e.g. the BERG report), including consideration of how predicted mitigations are coming on-stream.

3.7. The first round of modelling also concluded that the value of “C” (sequestration) was relatively small on dairy farms based on areas identified within legal boundaries using the latest version of Agri Base. Conversely Beef and Lamb modelling concluded that the value of "C" would be significant on average across the sheep and beef sector (see Table 4 in Annex A).

3.8. The second round of modelling explored differential pricing of methane and nitrous oxide to identify if different price settings would alter the price faced by farmers and the corresponding impacts on emissions reductions, production, profitability and intensity.

3.9. The specific question posed to modellers was:

**Using the fully exposed pricing formulae below, with a range of prices for agricultural emissions of biogenic methane and nitrous oxide, what reduction in emissions could we expect beyond the baseline scenario with and without sequestration?**

*i.e. How far will a price on emissions get us (towards emissions reductions targets) and what will be the impact on the different farm systems modelled?* (For full modellers brief see Appendix one).

3.10. The second round of modelling also provided preliminary results for the land and output based rebate options. Modellers were asked to look at specific equations to provide results on these options.

*High-level insights from modelling*

3.11. Modelling to date, particularly the DairyNZ modelling, has provided some key insights about the extent to which various pricing options and settings would incentivise farmers to make reductions in emissions. Similar modelling for the sheep and beef sector is needed to fully understand the trade-off between reductions and costs.

3.12. Modelling results highlight a key trade-off between impact of different price exposure options on farm profitability and viability and the ability of the sector to reduce emissions. Key insights include:

- The higher the price faced by farmers, the greater the negative impact on farm profit and farm viability.
- The higher the price faced by farmers, the greater the incentive to reduce methane and nitrous emissions.
- Until methane mitigation options are available at the right price for farmers to adopt, their main option (once efficiency opportunities are exhausted), is to reduce the number of stock carried. This has a direct impact on production and profit.
- A mitigation option for more extensive sheep beef and deer farmers is to sequester more carbon (either into 'C' or the ETS). For every hectare that they use to sequester carbon, there will be a corresponding reduction in ruminants (in line with the carrying capacity of the land retired), and a reduction in methane. (this methane reduction has not yet been quantified).

3.13. Whilst Beef & Lamb modelling indicates that the potential for C to offset A and B (when priced at \$40/t CO2-e) is significant across the entire sector, there will be differences within the sector, and the distribution has not yet been considered. At higher prices for C (relative to A), then less area will be required to allow farmers to face a more manageable price under the split gas levy approach. Note, an important point is that the Steering Group would need to confirm that farm-level sequestration can offset methane emissions (given methane has a gross reduction target), and that the analysis to support consideration of this is underway.

3.14. The impact of the pricing options on emissions reductions for the sheep beef and deer sectors has not yet been provided by the Beef & Lamb modelling team. An indication of methane emission reductions that may result from estimated increases in areas on these farms being used for sequestration, and displacing ruminant grazing has been calculated from data provided by the modelling team. Although some rudimentary calculations have been completed, this aspect needs more work before it is presented.

3.15. It has been difficult to identify a pricing option formula that enables provision of rewards for change without also requiring a baseline or historical comparison element. Additional wrap-around/extension modelling approaches are likely to assist with strengthening the signal associated with a straight forward, but not necessarily high, pricing option.

3.16. DairyNZ modelling suggests that the ETS processor-based legislated backstop will result in emissions reductions but that these will still not meet the regulated target.

3.17. DairyNZ modelling also indicates that facing a price on emissions resulted in improvements in emissions intensity (methane per unit of product) based upon the price exposure model tested. This confirms a hypothesis posed in earlier analysis. However, because of limited mitigation opportunities, results showed that there was more impact on reduced methane emissions from a reduction in production as a result of facing a price than as a result of improvements in emissions intensity.

3.18. The key remaining questions relate to:

- The extent to which the sheep and beef sector would be incentivised to reduce their emissions, beyond the impact of increasing areas of the farm in C or the ETS at different prices for A and B
- The distributional differences in opportunity to sequester (C) across different farm classes within the sheep and beef sector.

3.19. We are in process of confirming if the Beef and Lamb model can undertake this analysis within the timeframes necessary. In case this is not possible the Programme Office is looking at what wrap-around/extension modelling could be pursued that would help fill critical gaps with the limited time (and budget) that is available.

*Land-based and output-based price exposure: Key trade-offs*

3.20. A 'fully exposed' or 'proportional' price on emissions (i.e. an approach that applies a consistent value to a unit of emissions regardless of where or how it is produced), will have adverse effects on farm and sector profitability when at a sufficiently high price to achieve the necessary reductions. This approach is most economically efficient as it prices every emission equally and thus provides incentives for all emission reductions that can be undertaken for costs below that price. It might be regarded as equitable also, as it does not treat any participants or sectors differently.

3.21. However, the Pricing Working Group has identified that not all farms are incentivised to make changes on farm to reduce emissions at the same price signal. Many dairy farms would only change behaviour to reduce emissions at a price that would put many sheep and beef farms out of business, while many sheep and beef farms would be incentivised to make changes on farm to reduce emissions at a price that dairy could simply absorb. Note, this is a modelling outcome only. We know from real world experience and examples where a minimal price has resulted in behaviour change (e.g. milk composition, milk quality, lactation curve), due to the general loss aversion. These broader behaviour change mechanics could form part of the broader HWEN narrative.

3.22. As a result, the 'Price Exposure' (or 'structured rebate') work that has been carried out, especially relating to the 'land-based' and 'output-based' options described in this paper, has examined options that intentionally result in different effective prices per unit of emissions to different farms, depending on where and/or how those emissions are produced.

3.23. For the land-based option, the less emissions per hectare a farm emits, the lower the resulting effective price per unit of emissions, and the lower marginal incentive to reduce. For output-based, the less emissions per unit of product a farm emits, the lower the resulting effective price per unit of emissions, though the marginal incentive remains more consistent[1]. Both of these options did result in an incentive to reduce emissions, demonstrated by the sector modelling, but they did so to only a limited extent more than a proportional discount.

3.24. One argument for these approaches is that they set a direction for the kind of emissions reductions we could incentivise (e.g. high value products with low land impact, or low emissions intensity products), and in the case of land-based relieved some of the burden that the sheep and beef sector would struggle to bear under a fully exposed, proportional, or output-based rebate. Being able to offset emissions by considering C, however, goes a long way to balancing this aspect without the need of a rebate.

3.25. Both rebate options lead to a varying 'effective price per emission'. This is how much residual obligation is paid per total $CH_4$ emitted. Under any option other than proportional/fully exposed this will vary, otherwise there would be no decoupling between assistance and the initial price on emissions, which would result in no 'marginal incentive'. Under the land-based option the 'marginal incentive' is not consistent (dairy saves more and is penalised more for every emission reduced/increased respectively; sheep and beef saves less and is penalised less for every emission reduced/increased respectively). This raises potential economic efficiency issues.

*Overview of 'structured rebate' approach*

3.26. Providing assistance to participants through a structured rebate, while ensuring the marginal incentive to reduce emissions is maintained, can use a proxy for emissions. This allows the assistance to be 'decoupled' from the initial cost on emissions, meaning that the participant benefits from any reductions they achieve (and is penalised for any increases), in direct proportion to those reductions/increases. If the proxy is not sufficiently decoupled, an effectively proportional discount results.

3.27. The two most appropriate proxies that the Pricing workstream and working group identified were production and area. The following sub-sections describe the land-based and output-based price exposure options, which attempt to decouple assistance to participants through the use of area and production respectively as proxies for emissions in the assistance calculation.

[1] The rebate is based on the quantity of output but the initial Emission liability is based on total emissions. Thus, a farmer will gain the full benefit (tonnes of emissions reduced times the full emissions price) of every emission reduction achieved by intensity improvement without changing levels of output. However, changes in output will change the level of rebate, so they may be perversely incentivised to increase output.

*Land-based rebate*

3.28. The Interim Climate Change Committee (ICCC) proposed an option where all farms received assistance based on a common emissions factor per hectare. This means the assistance per hectare is consistent across farms, but because farms' actual emissions per hectare vary, the residual obligation varies, and farms with lower emissions per hectare benefit over farms with greater emissions per hectare. In order to achieve a greater level of granularity, and avoid significant over allocation, the ICCC used separate per hectare factors for sheep and beef versus dairy farms, and recommended developing an even more granular grass-growth-potential metric, so that the factor is more closely tied to the 'best' use of the land.

3.29. The Pricing Working Group determined that separating farms by sector in this way was unfeasible in most cases, and would end up being determined arbitrarily for many farms. In addition, the variation within sectors potentially meant even the more granular sector-based factors were not particularly appropriate to outlier systems within the sector (e.g. intensive finishing farms in the sheep and beef sector). The other recommendation from the ICCC (a new metric) was not seen as achievable within our timeframes.

3.30. The Pricing Working Group developed an approach where farms were provided with assistance relative to their own on-farm per hectare emissions factor on a sliding scale. This used a different formula to the ICCC option, to avoid generating an effectively proportional discount. We created a sliding scale between no emissions per hectare and a theoretical maximum emissions per hectare to determine a unique assistance rate per farm, which was then applied to their initial (fully exposed), cost on emissions. This meant a farm's individual intensity on a land basis was reflected directly in their final price, which achieved a very high level of granularity (down to the individual farm), and avoided entirely any risk of over allocation.

3.31. Initial analysis on this option by Charlotte Glass showed the pattern the Working Group expected: farms with fewer emissions per hectare benefitted most. Farms with fewer emissions per hectare also tended to be less profitable, and the residual obligation they faced after receiving their assistance was more in line with what they could bear (i.e. dairy tended to face higher relative prices, but also was more likely to be able to bear this price).

3.32. In order to somewhat mitigate the extent to which the difference in price was spread across types of farms, we introduced an absolute emissions modifier. This meant unique assistance rates were curbed by the farm's total emissions if they were high emitting but low intensity per hectare. This increased the cost on very extensive farms with much greater absolute emissions than the most intensive dairy farms, despite being efficient on a land basis. However, this would also disadvantage large farms even if they had similar land-based intensity to smaller farms, resulting in an incentive to split farms into smaller blocks.

Other ways of creating more targeted incentives or granularity are potentially possible if directed by the Steering Group.

*Modelling results*

3.33. DairyNZ modelling found:

- Dairy farms had high residual obligations on average, as they tended to be emissions intensive on a per hectare basis.

- The impact on profitability for dairy is comparable to the proportional (or low price) option and the output-based option.
- The reductions achieved in dairy are also comparable to the proportional (or low price) option and the output-based option, performing only marginally better.
- This modelling also suggested feedback loops within farming systems do not allow for the assistance to be decoupled, so approximates an effective proportional discount anyway. It is possible this result solely reflects the effect of the residual obligation from the land-based rebate, not the behavioural impact of the benefits of reducing under this option.

3.34. The Beef+Lamb modelling found:

- The modelling results identified the extent of the perverse incentive to split farms as above.
- Beef & Lamb modelling also considered the impact on profitability but at that stage they had not quantified the impact of C to the starting obligation and only reported the distributional change.
- However, we did not receive modelling on expected emissions reductions for sheep and beef farms under this option.

3.35. The Working Group's conclusion from these results is that there remain technical barriers and incentive issues, and a land-based rebate could be a means of delivering a low-price scenario (i.e. as an alternative to a proportional discount), but the option should be 'parked' at this stage until complementary measures and conditional assistance have been further considered.

*Output-based rebate*

3.36. The output-based rebate (where a factor in the rebate calculation is a farm's output relative to the industry average efficiency per unit of production), has been under consideration as a potential pricing option that might target both emissions reductions with a driver to maintain and improve the greenhouse gas efficiency of New Zealand agricultural production. This would enable exporters to leverage New Zealand's globally lower/lowest carbon footprint products. The Steering Group has directed modelling on an output-based model. Note, we acknowledge the concerns around impacts on intensity and production (and how that might impact on our international competitiveness) and note that specific modelling into emissions leakage has been commissioned.

*Modelling results for output-based rebate*

3.37. The Pricing Working Group has sought to apply the output-based rebate for pricing of methane for livestock industries – on the basis that the use of national efficiency averages will not work for nitrous oxide emissions or for other industries (e.g. horticulture).

3.38. To date modelling results for the output-based formula have only been calculated for the dairy industry. Work is continuing to model output in the sheep and beef sector. It is a more complex calculation to unpick and apply to the sheep and beef sector because these farms have multiple products rather than (predominantly) milk.

3.39. The dairy modelling indicates that the output-based formula does soften the price signal and, as a result, reduces the impact on profit/milk production, but also on total emissions reductions, than other options while maintaining or improving industry GHG intensity. Results for output are most closely comparable with the proportionate option: output performs more favourably than others when long lived gases are priced higher and when technology options are included in the DairyNZ model.

3.40. Specific concerns have been cited around the difficulty of obtaining data to apply an output-based pricing option for mixed farming systems. These data gaps at farm level have been clearly outlined in the paper to the June 2021 Steering Group. Questions have been asked about how the output-based option would deal with lifecycle issues and movements within and across mixed cropping and livestock industries (e.g. utilising crop residues as a feed source). Consensus on these aspects has not yet been reached in the Working Group and some individuals within the group have a strong preference to continue progressing this option. These members feel that this option could most effectively achieve the necessary emissions reductions, while minimising the cost to the economy.

3.41. A concern has also been expressed that a stronger focus on greenhouse gas intensity under this option might soften the signal on emissions reductions and motivate production (and emissions) increases. This is an important consideration and further consideration can be given to the extent to which this concern is mitigated by other environmental constraints to growth (e.g. EFW) and behavioural motivations in the farming sector. Complementary measures to incentivise emissions reductions under soft pricing being developed to support all pricing scenarios would also be relevant. Additionally, it is helpful to understand the impact of adjusting the national efficiency reference as a third lever to motivate emissions reductions, alongside methane and nitrous oxide prices.

3.42. Results for the sheep and beef sector, which replicate the dairy modelling, would be useful to further consider the value of this option and inform a decision on whether it is worthwhile to pursue efforts to (i) explore further the potential benefits of the option through adjustments to the price and national efficiency lever; and (ii) clarify and address the practicalities around data and reporting this option presents.

3.43. As previously outlined to the Steering Group, the output based rebate is more complex than current farm scale emissions tools can determine. To consider this option further reporting tools would need to be developed.

*Broad scenarios/packages of options to explore in more detail*

3.44. The Pricing Working Group considers there are two broad scenarios/packages of options that are worth exploring in more detail:

A. A low price + complementary measures (which would work to support a lower price signal in order to achieve emission reduction targets).

B. A higher price + compensatory measures (which would work to soften the impact on farm-level profit).

3.45. Pricing Working Group members are aware there is inherent risk in focusing on the potential pathways set out above (i.e. if we put all our eggs in one basket, and leave ourselves without enough time to design an effective structured rebate), as well as the parallel/joined up work required on 'how the price is set'. These pathways will need to be designed to a reasonable level of detail to meet legislative and government requirements, which is why it is important that decisions are made to narrow potential pricing options so that the detailed work can be completed within the timeframe with have, and with the resources available.

3.46. High-level work on Option A. has begun. The Pricing Working Group has brainstormed options/other policies that could be used to support a price by encouraging/incentivising greater change by those for whom change was relatively more affordable (and where a lower price signal may not motivate changes that could be possible while remaining profitable). Follow up meetings have also taken place with a group of the dairy ‘family’ (both DairyNZ and DCANZ, including processor representatives), and Beef+Lamb.

3.47. The outcome of those discussions suggest three key areas are worthy of further exploration and analysis. These are:

- Revenue recycling - into e.g. R&D, incentivising C, or the uptake of existing mitigations;
- The role of the eco-system supporting farmers and growers in providing additional incentives (where there is a market advantage for participants/providers to do so) e.g. the financial system; processors etc; and
- Instruments that sit alongside a price signal and/or target market friction or failure e.g. reverse auction-type initiatives.

3.48. Note, these options could either be independent or work alongside each other. For example, revenue recycling could be used to support all three options. The options will need to be carefully examined to ensure they bolster the incentive for emissions reductions where possible, and avoid creating perverse incentives in the system.

3.49. The Steering Group is being asked to endorse work to explore the broad scenarios/packages outlined in 3.44 above and each of these options outlined in 3.48 in more detail.

*Revenue recycling*

3.50. There is a consensus among the HWEN partners that one, very valuable, use of recycled revenue generated from the pricing system (less administration costs), would be in funding further R&D and support for recognition, implementation and adoption of technology that supports the mitigation that will be necessary to meet the regulated emissions targets.

3.51. The HWEN innovation workstream has been leading work on the technologies that are emerging internationally and what will be necessary to accelerate and deploy this technology to meet partnership objectives.

3.52. The use of scheme revenue in this way could also encourage farmer/grower engagement with the system as any revenue would be targeted to lowering the longer-term cost of emissions reduction (by increasing available mitigations), and retaining global competitiveness (which is potentially at risk as methane reducing technologies will likely be available first in feed-lot systems used by our competitors in North America in particular).

3.53. Another possible use of recycled revenue could be in incentivising ‘C’.

3.54. HWEN will need to make a case to government for revenue gathered by the scheme to be recycled back to farmers/the sector, rather than treated as Crown revenue more generally (which would then compete with other priorities for Budget allocation). Further work on revenue recycling would also need to take account of how much money was going to be available after administration costs of the system were taken into account.

*The role of the eco-system supporting farmers and growers in providing additional incentives (where there is a market advantage for them to do so) e.g. the financial system; processors etc; and*

3.55. Our discussions over the last few weeks have highlighted that farmers/growers sit within a broader eco-system of supporting market participants/companies along the value/supply chain. This eco-system shares an objective of ensuring its customers and suppliers are successful.

3.56. The banking system, for example, is actively thinking about the role it can play, in first, helping its farmer and grower customers understand emerging requirements and then, over time, in providing the appropriate 'nudges' through differently priced credit to incentivise clients toward best-practice. The banking system is also mindful of the increasing role climate change disclosure obligations and risk profiling will play in assessing financial sector health and balance sheet requirements i.e. the Reserve Bank of New Zealand will likely require 'stress-testing' of the exposure to climate change-risk.

3.57. Processors also recognise they can play a role in incentivising particular action or behaviours and there are examples of where this has worked to incentivise behaviour change in the past. They noted however the provision of incentives is typically market driven and ultimately a business decision. They expressed concern that processors would need to step in to support a framework or system that is designed in a way that cannot meet its objectives.

3.58. The key takeaway from these engagements is that we should capture the role of the eco-system in supporting appropriate price signals (and perhaps other complementary measures). This may well be very hard to quantify in any meaningful way but at the very least it will important for the overarching narrative that we are considering farmers and growers as part of a system and that means we need to take account of a wider set of levers and tools to influence and guide behaviour change.

*Instruments that sit alongside a price signal and/or target market friction or failure e.g. reverse auction-type initiatives*

3.59. The toolbox of 'market-based instruments' to incentivise and support environmental-related change usually consists of: price-based instruments (e.g. the pricing scheme we are developing); quantity-based (e.g. cap and trade systems, offsets etc); and market friction-related instruments (e.g. conservation tenders or reverse-auctions, green infrastructure incentive programmes etc).

3.60. This latter category of instruments has been raised a number of times in discussions over the last couple of weeks. In particular Pricing Group members think a reverse-auction or tender system should be explored in more detail.

3.61. A reverse auction is a type of auction in which sellers bid for the prices at which they are willing to sell their goods and services (or do something). The buyer puts up a request for a required good or service. Sellers then place bids for the amount they are willing to be paid for the good or service, and at the end of the auction the seller with the lowest amount wins.

3.62. These instruments have been used to fund conservation work on private land in both Australia and Canada. The initiatives are often focused on better vegetation management, erosion control, biodiversity, water quality, water environmental flows, salinity control and carbon sequestration.

3.63. In most cases, land owners submit bids to undertake conservation work on their property. The bids are assessed, ranked and funded based on value for money. Tenders do not estimate the economic benefit of actions or the value of the objective, but are used after an agreement is made that the particular actions will create a net benefit to society. The tender process is usually open to all landholders and the competitive nature keeps bid costs low. While the costs of development and implementation of tender programs can be higher than traditional grant programs, the literature tends to suggest that the effectiveness of tenders often outweighs any additional costs (this would need to be tested).

3.64. The Pricing Group has also flagged that the design of a scheme (or schemes) like this would need to be carefully thought through particularly if they are seeking to incentive the same action/behaviour change as a price signal. The reason this option is attractive to explore, however, is that if the pricing scheme ends up with a lower price (given the differential effects on farm types) then there may be potential to incentive additional emissions reductions for those farmers that are at the other end of the distribution (where they either have more mitigation options or are relatively more profitable).

## 4. NEXT STEPS

s 9(2)(ba)(i), s 9(2)(f)(iv)

[redacted]

**Charlotte Glass**

**Consultant**

Co-Author

**Gus Charteris**

**Consultant**

Co- Author

s 9(2)(ba)(i), s 9(2)(f)(iv)

[redacted]

*Key points from DairyNZ modelling*

5.1. Overall impacts of farmers facing a price:

- Farm profitability will be impacted.
    - o Severe reductions in profit were modelled for the fully exposed option when A and B are priced at NZ ETS prices using a metric of GWP100. The severity of the impact depended on the price applied.
    - o Less severe impacts were modelled for the proportional option.
    - o The proportional option had a similar impact to both the farm level and processor level ETS baselines.
- Production is expected to fall (profits reduce more as the price farmers face increases).
- Pricing is likely to result in a reduced number of cows in the dairy sector.
- Pricing is expected to achieve significant emissions reductions, even at a low carbon price. See Table 1 for the extent of the modelled reduction for A and B.
- Sequestration (or C) has little impact in terms of ability to off-set emissions within the dairy sector.

3.10 Differential pricing of methane 'A", compared to nitrous oxide & carbon dioxide "B":

- When A is priced higher relative to B then a greater reduction in methane is expected, however this is coupled with a greater impact on profitability. This may be reflective of the fact that there are currently few mitigation options available for farmers to adopt to reduce their methane emissions, other than to reduce the dry matter harvested by ruminants – which often implies a reduction in stock numbers carried.
- Similarly, when A is priced lower relative to B then the total price is reduced resulting in a lesser reduction in emissions, and reduced impact on profitability and production.
- Given that there are limited methane reduction mitigations available, it may be useful to focus on applying a higher relative price for B in the short term.
- The Working Group have identified a need to unpick the mitigations applied in the DairyNZ modelling assumptions and to reconcile these with previous reports and assumptions (for example the BERG report). This will be important because we will need a shared understanding of the impact of mitigations in order to properly assess the impact on both emission reductions and profitability. A key point here is if farmers are unable to reduce the price they face through the adoption of mitigations then profitability will be impacted.

3.11 Land based rebate:

- When a land-based rebate was applied to the fully exposed option (at two price settings), the outcome was to reduce the price faced by farmers which resulted in a smaller reduction in emissions.
- The modellers are looking into this option further and will compare between the Northland and Canterbury regions as a proxy for differences in emissions per hectare.

3.12 Output based (efficiency) rebate:

- This rebate had a similar impact in that it dulled the price signal, however it did indicate a slight additional benefit in intensity whilst maintaining milk production (noting that reduced milk production will reduce exports and have flow on impacts).

3.13 Revenue collected

- Revenue collected would be significant. See Table 2 below for details.

s 9(2)(ba)(i), s 9(2)(f)(iv)

[redacted]

s 9(2)(ba)(i), s 9(2)(f)(iv)

[redacted]

5.6. As the price of C increases, the area needed to off-set A+B reduces. This is reflected in the reduced total exposure calculated at the $70/t price setting used for B&C.

5.7. Overall impacts of farmers facing a price:

- When price settings for A and B are higher it results in extremely large reductions in profitability across the beef and lamb classes. These prices are likely to severely impact farm viability.
- In general, the modelling indicates that the more extensive farm systems are likely to face a greater reduction in profit compared to more intensive classes. These farms may have more opportunity to sequester carbon on non-effective areas of the properties. Note that the off-set associated with “C” has NOT yet been modelled.
- Conclusions relating to land-based rebate are not yet available.

5.8. Conclusions relating to the output-based/efficiency rebate are not yet available. The missing inputs from farm data sets used in the modelling have made this aspect challenging for calculation in the dry stock sector.

# HE WAKA EKE NOA STEERING GROUP PAPER

## 9 September 2021

## On-farm Sequestration

Paper No: 7 UNCLASSIFIED

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### 1. PURPOSE

s 9(2)(f)(iv)

[redacted]

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### 2. DECISIONS REQUIRED

Out of Scope

[redacted]

Out of Scope

[redacted]

2.3. **Agree in principle** a 2008 reference year be adopted for a total stock approach to accounting of post-89 native planting or regeneration. [Note this recommendation has not been agreed by the Policy Group].

2.4. **Agree in principle** that the modified averaging approach with annualised accounting for C to mimic the growth curve is adopted for cyclical categories within He Waka Eke Noa. [Note that this recommendation has not been considered to by the Policy Group, there are also implications in terms of ETS overlap which may need further consideration].

Out of Scope

[redacted]

## 3. KEY POINTS

Out of Scope

[redacted]

Out of Scope

*Price paid for liabilities*

3.6. In the previous cycle, the Steering Group were presented with the proposed approach for dealing with emissions/liabilities where vegetation is cleared deliberately or by an adverse event. There was broad agreement on the proposed approach. However, the price paid for liabilities had not been considered. This has now been assessed by the working group which looked at two preferred options:

a. Liability is attached to the price of C on the day the liability is faced.

b. Liability is based on what has been received for C up until that point.

*For clarity the liability for both options only relates to the sequestration claimed under the farm-level pricing system.*

3.7. The Steering Group suggested that a further option was for either the price of the day or the value of the benefit received to-date to be used, whichever is greater. However, the working group did not progress this option as it is inconsistent with the ETS. While we are not necessarily seeking alignment with the ETS, there was agreement that the penalties should not be greater than the ETS.

3.8. From the analysis the decision is a trade-off between:

a. A simple system that aligns with the ETS versus a potentially more complex administration system.
b. Risk of cyclic deforestation and afforestation based on the carbon price rather than the focus being achieving long-term national emissions reduction targets.
c. Potential fairness and intergenerational equity issues particularly due to changes in the carbon price.

Out of Scope

3.11. The two options are analysed in the table below.

| | Market Price | Payment Received |
|---|---|---|
| ***Effective*** | Acts as a disincentive to change land use when the carbon price is high, however when the price is low it provides flexibility for land use change.<br><br>Cost of maintaining an area of sequestration could be higher or lower than market price.<br><br>If discount is applied immediately and cost linked to market price the flexibility to realise the loss at a different point in-time is limited (e.g., ETS). | The sequestration is not treated as an asset.<br><br>Doesn't reflect the actual value of the emissions at that time. |
| ***Practical*** | Aligns with the Forestry ETS approach.<br><br>Easy to administer from both a regulatory and farmer viewpoint.<br><br>Potential to align with the price of nitrous oxide which keeps the system clear and simple. | Potentially more challenging to administer from both a regulatory and farmer viewpoint, noting an automated system could overcome this. This is particularly the case for a farm where ownership has changed and there is no information available around the level of sequestration claimed and at what price. |
| ***Credible*** | Reflects the actual value of the carbon emissions at that time.<br><br>Some risk of arbitrage (simultaneous sale and purchase in different markets) noting if the price were linked to the ETS this would control this, alternatively rules could be put in place. There is still risk from the voluntary carbon market. | Does not reflect the actual value of carbon emissions at that time.<br><br>Risk of arbitrage as the payment received would almost certainly differ from the ETS market price. Rules could be put in place to manage this. |
| ***Integrated*** | Potentially conflicts with intergenerational values as liabilities transfer to future generations. | Better aligns with intergenerational values as received value is returned. |
| ***Equitable*** | Depending on the carbon price farmers and growers could pay more or less than they receive.<br><br>Potentially transfers a higher liability to future generations who haven't received the benefit. | If CPI adjusted, it is a fair transaction.<br><br>May result in other farmers and growers having to pay more for their emissions over time. |

3.12. It is difficult to make a final recommendation on the price paid for liabilities until there is greater clarity on the degree of overlap the farm-level pricing system will have with the ETS. The greater the overlap the more difficult it becomes to move away from the approach adopted in the ETS, i.e., potential inequities between two government schemes providing for the same outcome and the risk of arbitrage. The working group was in agreement that it would be worth testing with the Farmer Reference Group.

3.13. Despite this, the group was evenly split between the two approaches. Some parties perceived the current market to be the fair price as it would reflect the value at that point in time of the cleared vegetation; others perceived the fair price to be what had been paid (CPI adjusted) as they were concerned about intergenerational inequities.

3.14. **Recommendation:** Steering Group agree on a preferred option for price paid for liabilities or agree to engage on options.

Out of Scope

[redacted]

Out of Scope

[redacted]



*Other considerations*

3.34. The cost of meeting the minimum standard and the active ecological management standard is likely to vary by region. This should be considered in the revenue recycling work, but also look at other policy instruments (e.g., rates relief like QEII). Suggestion of having different rates for C by region was ruled out as increasing complexity, practically challenging to implement, and the value of C being difficult to identify at a national scale, let alone by region.

3.35. There is currently a wide range of funding sources available to farmers for looking after native vegetation – although this varies depending on which region farmers are in. The working group would like to ensure that the standards used by He Waka Eke Noa do not exclude farmers from accessing restoration funding such as those provided by MfE, DOC or regional councils.

Out of Scope

[redacted]

s 9(2)(f)(iv)

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[redacted]

Out of Scope

[redacted]

Out of Scope

[redacted]

d. The reasoning for the ETS not retrospectively rewarding sequestration past 5 years is not applicable to the He Waka Eke Noa On-farm Sequestration system. With reference to the above points (see 3.95b):

- In He Waka Eke Noa, sequestration is recognised at the farm-level and will be used to offset the cost of farm emissions. The ETS is designed to ensure people register their forests early to enable them to account for sequestration in international reporting. This is not the purpose of He Waka Eke Noa.
- By retrospectively accounting for sequestration, He Waka Eke Noa will be able to recognise co-benefits of existing vegetation. This will allow better influence of forest/vegetation outcomes from an ecological/biodiversity perspective.
- Sequestration recognition under He Waka Eke Noa will not be a payment. Reward is in the form of 'offsetting' the cost associated with methane and nitrous oxide emissions.
- A potential risk is that retrospectively rewarding sequestration dampens the price signal to reduce emissions.
- The purpose of He Waka Eke Noa sequestration is to enable farmers and growers to understand and be recognised for sequestration that is occurring on farm; and to empower farmers to increase sequestration (and prevent carbon losses from these sources). Although the system needs to drive establishment of new vegetation, it is important it also recognises existing sequestration.

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3.107. A more detailed analysis of the challenges created through the farm-level pricing system overlapping with the Forestry ETS is being undertaken to better inform this trade-off. This includes identifying potential solutions and the costs associated with these. ***Once this has been undertaken a final recommendation will be made.***

3.108. The disincentive for reducing methane emissions is likely a perceived rather than real risk. The Forestry ETS and voluntary carbon market already provide incentives for off-setting. Farmers and growers will undertake a cost-benefit and make an off-setting decision regardless of the farm-level pricing system cyclical vegetation threshold.

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*Overlap with ETS and voluntary markets*

3.124. There is a need to better understand the potential overlap between the He Waka Eke Noa farm-level pricing system and the Forestry ETS, the challenges this may create, and the range of possible solutions to these. This will support the final recommendations for:

a. Cyclical vegetation:

i. Upper threshold (or not)

ii. Full cycle eligibility (or not).

b. Liabilities

i. How they are paid for (market price versus price paid)

3.125. The categories for which there is overlap with the Forestry ETS include:

a. Post-1989 Forestry >1ha

b. Post-1989 Regenerating Bush >1 ha

c. Post-1989 Native Plantings >1ha

d. Post-1989 Riparian >1ha, 30 m wide, 30 % crown cover

e. Post-1989 Scattered Exotics >1ha, 30 m wide, tree crown cover 30% per ha

3.126. The process being undertaken involves:

a. Identify potential challenges created through the overlap

b. Identify solutions for these

c. Assess feasibility of proposed solutions with the Forestry ETS team

d. Analyse feasible solutions against criteria to determine preferred options

3.127. The options being considered include:

a. No overlap

b. Limited overlap (threshold – area-based or proportional or combination)

c. Total Overlap (no threshold)

d. No overlap and no sequestration in the He Waka Eke Noa pricing system, instead the Forestry ETS is updated to allow for:

i. areas under 1 ha

ii. shelter belts

iii. fruit trees, vines, and nuts

iv. additionality from pre-1990 indigenous bush

3.128. The following table provides an overview of the key challenges and the range of potential solutions to be explored with the Forestry ETS team.

| Challenges | Solutions |
|---|---|
| Credibility risk through double counting of sequestration between the Forestry ETS and He Waka Eke Noa pricing system | • Single vegetation portal<br>o He Waka Eke Noa and ETS operate through the same portal that either:<br>▪ allows for complete or limited overlap; or<br>▪ channels users into the appropriate system for their vegetation category.<br>This would provide additional benefits:<br>o One-stop shop for farmers<br>o The creation of a more rigorous voluntary market (supports avoidance of double counting)<br>• Separate but fully interoperable systems<br>o Full data interoperability would require a geo-spatial based system to be in use for both and data privacy issues to be resolved<br>• Separate manual systems<br>o Provision of land title to He Waka Eke Noa pricing system to demonstrate vegetation not registered in the ETS<br>o Provision of a geo-spatial map of He Waka Eke Noa registered vegetation for the ETS to check if vegetation registered in the He Waka Eke Noa system |
| Credibility risk for both He Waka Eke Noa and Forestry ETS if different methodology used but same price of C received | • Same methodology used for both<br>• Different methodologies used but of equal integrity<br>• Different methodologies used and one is of lesser integrity - a price differential is applied (less integrity receives less reward):`<br>o Same price for C; differential sequestration rate<br>o Same price of C; same sequestration rate; resulting price discounted<br>o Different price of C<br>***Links to price settings for C**** |
| Equity risk if the price of C is the same in both systems but there are different requirements for the same categories within them (process or methodology) | • Same process and methodology used for both<br>• Different methodologies used but of equal integrity<br>• Different methodologies used and one is of lesser integrity - a price differential is applied (less integrity receives less reward):<br>a. Same price for C; differential sequestration rate<br>b. Same price of C; same sequestration rate; resulting price discounted<br>c. Different price of C<br>***Links to price settings for C**** |
| Potential for increased administration cost for farmers (and their advisors) due to increased complexity in understanding the | • Same methodology and processes used for both<br>• Capital investment in He Waka Eke Noa system design (user experience focused)<br>• Short-term investment in extension and communication including the key differences between the two systems:<br>o He Waka Eke Noa - farm emissions off-set (no direct financial reward)<br>o ETS - tradable NZU |

| | |
|---|---|
| benefits and risks of each system and ultimately decision-making | |
| Increased cost for regulator from:<br>Complexity results in more time spent dealing with queries and incorrect reporting<br>Duplication (two systems with similar objectives) results in additional capital and operating costs | • User pays system<br>• Same methodology and processes used for both<br>• Capital investment in He Waka system design (user experience focused)<br>• Short-term investment in extension and communication including the key differences between the two systems:<br>  o He Waka Eke Noa - farm emissions off-set (no direct financial reward)<br>  o Forestry ETS - tradable NZU<br>• Single vegetation portal<br>  o He Waka Eke Noa and ETS operate through the same portal that either:<br>    ▪ allows for complete or limited overlap; or<br>    ▪ channels users into the appropriate system for their vegetation category.<br>This would provide additional benefits:<br>  o One-stop shop for farmers<br>  o The creation of a more rigorous voluntary market (supports avoidance of double counting) |

3.129. **Note:** There are still significant considerations for ETS overlap and how it influences other components of the sequestration system (and system as a whole). No recommendation is able to be made but will be considered out of cycle. However, guidance from the Steering Group as to how to progress this would be valuable.

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| | | | |
|---|---|---|---|
| Erica van Reenen | Andrew Curtis | Sophie MacAskill | Jamie Ash |
| **Consultant** | **Consultant** | **DairyNZ** | **MPI** |
| **Principal Author** | | | |

Out of Scope

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**APPENDIX 2 - ASSESSMENT OF OPTIONS FOR UPPER THRESHOLD**

Note: For the purpose of the analysis, the working group selected 100ha. It is not necessarily the right area, a percentage threshold may be more equitable. The area was chosen to be able to provide some analysis and inform decisions around progressing an actual upper threshold.

| | Under 1 ha | 100 ha | No Threshold |
|---|---|---|---|
| ***Effective*** | Limiting cyclical sequestration opportunities may better support the achievement of methane reduction targets, noting the Forestry ETS and voluntary carbon market would still indirectly provide for off-setting.<br><br>Disincentivises appropriate land use, i.e., limits opportunities for retiring less productive land or erosion prone land from grazing.<br><br>Depending on the farm-level pricing systems administrative costs and apportionment there is likely no incentive for the inclusion of cyclical vegetation under the farm-level pricing system.<br><br>Potential to reduce farmer trust and buy-in for the farm-level pricing system; the approach does not align with the whole of farm approach currently being promoted by He Waka Eke Noa (A+B-C).<br><br>Depending on the carbon price, the incentive for cyclical vegetation for small blocks may be completely removed. The Forestry ETS administration costs mean it is uneconomic to register blocks when the carbon price is low. The only option for small blocks would be the voluntary market. | Allows for farmers and growers to be credited for many of their sequestration opportunities.<br><br>Encourages appropriate land use to a greater degree.<br><br>Creates greater farmer buy-in.<br><br>Removes additional encouragement for blanket afforestation. | Provides full flexibility for farmers and growers to make decisions as best suits their business<br><br>Fully encourages appropriate land use<br><br>Maximises farmer-buy-in<br><br>May provide additional encouragement for blanket afforestation. However, given the farm-level pricing system is unlikely to financially reward sequestration directly there is little or no additional incentive for this beyond what already exists through the Forestry ETS or voluntary carbon market. |

| | | | |
|---|---|---|---|
| ***Practical*** | Reduces the farm-level pricing system establishment and administration costs as eligible cyclical vegetation forest land is entered in the Forestry ETS.<br><br>The verification expectations could be simplified for Post 1989 forest land without creating conflict with foresters, noting If a 2008 baseline were set for P89 forest land the availability of quality satellite imagery would resolve this.<br><br>No overlap with the Forestry ETS simplifies the farm-level pricing systems audit requirements, i.e., removes the need for cross-checking of cyclical vegetation with the Forestry ETS. If a linked spatial registration system were established this issue may be negated however, this could be challenging due to data privacy requirements. | Some overlap with the Forestry ETS, but if the 2008 baseline and linked spatial registration system were developed this is less problematic. | Overlap with the Forestry ETS potentially problematic, but if the 2008 baseline and linked spatial registration system were developed this is less problematic. |
| ***Credible*** | Removes the risk of gaming. | Risk of gaming unless Forestry ETS rules and pricing is aligned | Risk of gaming unless Forestry ETS rules and pricing is aligned |
| ***Integrated*** | Conflicts with *Māori* values around the appropriate use of land.<br><br>Potentially removes the incentive for new orchard and vineyard plantings, noting the farm definition will likely mean most orchards and vineyards will be excluded from the farm-level pricing system. The costs from emissions and benefits from sequestration are insignificant when compared to the cost of new orchard or vineyard development. | Better aligns with *Māori* values around the appropriate use of land. | Strongly aligns with *Māori* values around the appropriate use of land.<br><br>The threshold will have little to no impact on large scale afforestation of pastoral farms. The Forestry ETS rules, voluntary market and carbon price will drive this land use change regardless of where the farm-level cyclical vegetation threshold is set. |

| | | | |
|---|---|---|---|
| ***Equitable*** | Least equitable for farmers and growers as potentially reduces the opportunity to gain credit for any small blocks of cyclical vegetation.<br>Foresters will perceive this as the most equitable option as no overlap with Forestry ETS. | More equitable for farmers and growers as they have alternative opportunities (through Forestry ETS and voluntary markets) to gain credit for all their cyclical vegetation.<br>Foresters may perceive this option as inequitable unless farm-level pricing system expectations strongly aligned with the Forestry ETS | Most equitable option for farmers and growers as full flexibility to enter their cyclical vegetation in either the farm-level pricing system or Forestry ETS.<br>Foresters may perceive this option as inequitable unless farm-level pricing system expectations strongly aligned with the Forestry ETS |