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To: New Zealand Productivity Commission
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Submission on: **Low-emissions economy - Issues Paper, August 2017**

From: DairyNZ

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1. EXECUTIVE SUMMARY

1.1 DairyNZ recognises the dairy sector's responsibility to contribute to New Zealand's greenhouse gas reduction targets, and supports the development of an economy wide plan that outlines what the expectation of each sector is in contributing to these targets.

1.2 New Zealand is currently operating within an environment that provides no clear pathway for the economy to transition to a low emission future. A nationwide discussion is needed about how we will meet the 2030 target and transition to a low carbon economy. To achieve this transition, the need to address greenhouse gas emissions across all sectors, including agriculture, must be presented as an opportunity as opposed to a threat. The signals Government and industry good organisations, such as DairyNZ, provide on how we can collectively tackle New Zealand's increasing greenhouse gas emissions must highlight the co-benefits of climate action for the economy, environment, community resilience, culture, and health.[1]

1.3 There is a lack of clarity and certainty on what New Zealand's transition to a low carbon economy looks like and what each sectors role in achieving this is under the current policy framework. As a result, the impacts of climate change is perceived as distant and outside of New Zealanders control.

1.4 DairyNZ is therefore supportive of the Productivity Commissions enquiry into identifying options for how New Zealand could reduce its domestic greenhouse gas emissions through a transition to a lower emissions future, while at the same time continuing to grow income and wellbeing.

1.5 The dairy industry, alongside other industry sectors, and New Zealand's wider economy, require policy certainty and clarity on what each sectors role in supporting New Zealand's transition to a lower emissions future looks like. Providing this certainty and highlighting the co-benefits which exist for the economy, the environment, including water quality and biodiversity, and the community will help incentivise on farm action.

1.6 A significant barrier in achieving positive change on farm to date is due to the binary policy debate examining whether agricultural emissions (nitrous oxide and methane) should face a price in the Emissions Trading Scheme (ETS). This has engendered a sense of fear across the agricultural sector regarding the costs associated with climate change with the resulting uncertainty paralysing action on farm.

1.7 DairyNZ therefore supports the focus being placed on what we can be done to address on farm emissions now and in the future and a pathway being established outlining the steps required to achieve a lasting reduction. A positively re-enforced signal needs to be sent which encourages on farm action to address biological emissions. This involves understanding the levers which could be applied to get an outcome which adequately balances the significant economic, social,

[1] Transition to a low-carbon economy for New Zealand, Royal Society, pp. 59.

and environmental objectives New Zealand is working towards. The pathway must be integrated with the freshwater management policy framework.

1.8 In identifying the opportunities for New Zealand to transition to a low emissions economy DairyNZ recommends the Productivity Commission considers the following:

A. *The current and future mitigations options for addressing on farm emissions and the implications of these*

i. What can be achieved on farm to address methane and nitrous oxide and what options could become available in the future;

ii. The co-benefit between addressing regional water quality and biological emissions.

iii. The capacity and capability requirements involved in upskilling dairy farmers and the wider rural professional community;

iv. The timeframes under which change is feasible; and

v. The market access and public perception risks associated with breakthrough technologies.

B. *Transitioning to low emissions land uses*

i. The drivers of transitioning to low emissions land uses are not well understood. There are several principles and considerations which would need to be worked through if the Government was to undertake measures to encourage land use change.

C. *Ability to account on farm emissions*

I. It is not possible to measure on farm greenhouse gas emissions, but it is possible to model them.

II. There are two methods for accounting on farm greenhouse gas emissions, OVERSEER and the National Greenhouse Gas Inventory methodology. OVERSEER is the most suitable tool at this point in time, provided the model is applied as an advisory tool to assist dairy farmers manage on farm emissions.

III. Using either Overseer or the Inventory methodology in a regulatory context has significant implications for dairy farmers and it is important these are well understood before a decision is made around on-farm reporting. This is evident from the way some regional councils are using Overseer nutrient budgets to implement farm specific nutrient limits.

D. *Lack of policy certainty*

I. Clarity is required regarding the dairy and wider agricultural industry long term low emissions pathway and how this interlinks with the expectation on the other sectors of New Zealand's economy.

II. This certainty must extend beyond the current three-year political cycle, climate change is a long term issue, which requires a long term plan. Political uncertainty simply creates an environment where inaction perpetuates.

E. *International environment*

I. Climate change is a global issue, and therefore the dairy and wider agricultural sectors role must be examined in the global context considering the need to address food security and increasing global greenhouse gas emissions.

II. When examining the role agriculture should play in supporting New Zealand's transition to a low emissions future, it is import to draw on what other countries are doing to address biological emissions (methane and nitrous oxide).

III. DairyNZ believes the dairy industry must be part of this transition, however when identifying what regulatory measures to implement, the effect on the competitive advantage of New Zealand's dairy and wider agricultural industry must be considered and the economic and social trade-offs must be well understood.

F. <u>There is a need to take an integrated approach to incentivising the management of water quantity and quality issues, climate change, and biodiversity on farm.</u>

I. The policy framework introduced to manage on farm methane and nitrous oxide emissions must interlink with the freshwater management policy framework and the nutrient limits being implemented by regional councils via the Resource Management Act.

II. DairyNZ supports a framework being introduced in the first instance which mirrors the Good Farming Principles approach, being led by the Ministry for the Environment, to address water quality to address on farm greenhouse gas emissions. This would build off the steps DairyNZ is undertaking via the Dairy Action for Climate Change and through our on-going investment in the research and development of breakthrough technologies to address methane and nitrous oxide.

III. DairyNZ supports a farm level risk assessment framework being introduced to underpin the different regulatory frameworks being implemented. This enables flexibility and allows dairy farmers to customise their actions in accordance with the issues facing their farm across climate change, freshwater management, biodiversity, and other areas

2. INTRODUCTION

2.1 DairyNZ appreciates the opportunity to submit to the Productivity Commission on the Low Emissions Economy Issues Paper.

2.2 We support the development of an economy wide plan, which identifies the role each sector, including the dairy and wider agricultural sectors, role in New Zealand's transition to a low emissions future. The dairy industry must be part of this transition.

2.3 In the following sections of this submission DairyNZ answers the Issue Paper's questions of relevance to DairyNZ's levy payers. Detail is provided on the current and future mitigation options, the opportunities and barriers from a dairy perspective, and the type of climate change framework which could support dairy farmers address on farm emissions over the longer term alongside the wider economy.

2.4 DairyNZ is happy to provide additional information to the Productivity Commission in undertaking its enquiry into how New Zealand can maximise the opportunities and minimise the costs and risks of transitioning to a lower net-emission economy. We would welcome the opportunity to be more involved in the enquiry.

3. QUESTION 2: CHAPTER 3 OF THIS ISSUES PAPER MOSTLY LOOKS AT WAYS TO REDUCE EMISSIONS DIRECTLY AT THEIR SOURCE. WHAT OTHER APPROACHES WOULD HELP IDENTIFY OPPORTUNITIES TO EFFECTIVELY REDUCE EMISSIONS?

3.1 Addressing agricultural biological emissions requires an approach which optimises the synergies between the environmental, economic, and social objectives the dairy industry and wider economy are working towards. It requires a multi-facetted pathway to be established which outlines how the dairy industry, alongside the wider agricultural sector and economy will transition to a low carbon economy, while meeting New Zealand's broader environmental, social, and economic objectives.

3.2 This requires defining what the feasible intermediate and long term objectives are for the dairy and wider agricultural sector.

3.3 DairyNZ therefore supports exploring the Parliamentary Commissioner for the Environment's proposal to implement a climate change framework in New Zealand which mirrors the United Kingdom's approach. Setting up an Independent Climate Change Commission to establish and recommend climate budgets and implementing a system where the Government establishes processes and policies to meet these budgets, will establish policy certainty and provide clarity on what New Zealand's transition entails.

3.4 The agricultural component could build off the Dairy Action for Climate Change, which is a partnership between Fonterra and DairyNZ and is supported by the Ministry for Primary Industries and the Ministry for the Environment. It could also incorporate the research and development being funded by the Pastoral Greenhouse Gas Research Consortium (PGgRc) and the New Zealand Agricultural Research Centre (NZAGRC). It would leverage the activities which are underway in the nutrient management space which have a co-benefit for climate change and incorporate the regional councils approach to managing water quality as they are implemented. This could include taking a similar approach to the Good Farming Principles approach being led by the Ministry for the Environment for addressing on farm biological emissions.

3.5 The subsequent sub-sections provide an overview of the mitigation options which are available now and the mitigations which may be available in future, which would be factored into the development of the five-year carbon budgets and the reduction which is feasible.

3.6 **Mitigations available**

3.7 Nitrous oxide and methane reductions on farm are possible by making farm system changes. This includes using less nitrogen fertiliser, applying a urease inhibitor, using low nitrogen supplementary feeds, using a stand-off pad, improving breeding worth, reducing total dry matter intake, and reducing replacement rates. These changes are not necessarily additive and not applicable to all farm systems. It is important to note altering a farm system is very challenging, takes time, and requires significant management skill.

3.8 Driving on farm change requires significant investment in building the management capacity and capability. This is why the Dairy Action for Climate Change includes several components to support knowledge transfer and uptake including, training 60 rural professions in greenhouse gasses, and educating rural professionals and dairy farmers on the options available now to reduce biological emissions.

3.9 It is essential when focusing on addressing on farm emissions, in conjunction with improving water quality and biodiversity at a farm, regional and national level to understand that change takes a substantial amount of time.

3.10 *Low nitrogen supplementary feeds*

3.11 Many supplementary feeds such as maize silage, brassica's, rape silage, maize silage, and hay have lower nitrogen content and therefore their accelerated use could result in a decrease in absolute nitrous oxide emissions. The fall in nitrous oxide emissions from dung and urine is directly proportional to the reduction in nitrogen content in the diet.

3.12 *Reductions in total nitrogen fertiliser*

3.13 A second, related mitigation option is to increase the efficiency in which nitrogen fertiliser is used so that the use of nitrogen fertiliser per unit area and per animal declines. This does not necessarily imply lower pasture production, but would require more careful management of nutrient flows, for example by using more purchased feed and/or the growing of forages with a higher yield per hectare. Nitrogen fertiliser can be a highly cost effective way of producing feed and this places a constraint on how much nitrogen fertiliser use is likely to be reduced in practice.

3.14 Reducing the nitrogen fertiliser applied per hectare requires significant skill and careful feed budgeting. If the amount of fertiliser applied is underestimated, then this could reduce a farm's productivity. It is important to note that seven percent[2] of agriculture's emissions come from nitrogen fertiliser.

3.15 *Improved pasture management in conjunction with improved breeding worth, and reduced replacement rates*

3.16 It is possible to reduce greenhouse gas emissions by improving herd reproductive performance and reducing the number of replacement animals needed on farm. This would result in fewer non milking cows producing methane which would lower emissions on farm. Under this option it is possible to maintain production. It is important to note that this option only reduces methane and nitrous oxide emissions if the total amount of dry matter intake does not increase. This is

[2] The Agricultural Inventory Model, used in the New Zealand's Greenhouse Gas Inventory 1999-2015 report, Ministry for the Environment.
http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932015

because the amount of feed a cow eats is directly related to how much methane is emitted, so the more feed a cow eats the more methane will be eructed.

3.17 Improving reproductive performance and reducing replacement rates requires considerable skill and is something the dairy industry continues to work towards. Improving reproductive performance to a significant extent nationwide will be a challenge and will take time.

3.18 *Expanded opportunity for manure management (biogas generation technologies)*

3.19 Biogas generation technologies are well developed for stand-off pads and house systems, however, they are costly and challenging to implement and run. Collecting and flaring any gas collected is a much cheaper and more practical option for New Zealand conditions, but even with this approach initial 'back of the envelope' estimates suggest the costs may be prohibitive. It is important to note that approximately five percent of the farms methane emissions come from effluent ponds, which means if biogas generation technologies were adopted only a small portion of the farms emissions would be targeted.

3.20 *Stand-off pads*

3.21 It is possible to use a stand-off pad to take stock off pasture at certain times of the year to manage both nitrate leaching and nitrous oxide emissions. However, the upfront capital cost required to build a stand-off pad may be a barrier for some farmers and could result in farmers increasing production to re-coup costs, which results in increased methane emissions, therefore outweighing any reductions in nitrous oxide emissions. In examining this option, it is important to bear in mind that nitrous oxide makes up on average 20 percent of a dairy farms footprint.

3.22 **Possible Future Mitigation Options**

3.23 New technologies that can reduce methane and nitrous oxide emissions are being developed by the Pastoral Greenhouse Gas Research Consortium (PGgRc) and the New Zealand Agricultural Greenhouse Research Centre (NZAGRC). Although promising results are being obtained and these solutions have significant potential it is important to note that the timeframe for commercialisation, market acceptance and on farm adoption is uncertain.

3.24 The technologies under development, some of which are identified on page 19 of the issues paper, include:

- Identifying low methane feeds that can help reduce GHG emissions;
- Developing a methane vaccine to inhibit methane production;
- Identifying genetic markers of naturally low methane- emitting sheep and cattle;
- Identify suitable inhibitors against methane –generating microbes.
- Developing and extending new and existing technologies and management techniques to reduce nitrous oxide emissions and nitrate leaching; and
- Identify opportunities to increase the carbon content of New Zealand grassland soils.

3.25 The development of new technologies that can reduce methane emissions from enteric fermentation through an anti-methanogen vaccine or inhibitors that target methanogens in the rumen are being pursued collectively in New Zealand by the PGgRc and the NZAGRC. Although promising results are being obtained, availability for use on-farm is unlikely for at least five years. After which point the technologies would have to be adopted on farm which would take further time. The suitability of the technology for different farm systems would need to be taken into consideration, in addition to the cost to the farmer. This assumes that international markets and milk supply companies would accept the technology.

3.26 The breeding of low emitting sheep has progressed to the stage where there is a realistic possibility that breeding indices could incorporate low methane by 2017. Work on cattle has only just begun, and although the lessons learned from sheep will allow faster progress it is likely to be five years at least before low emitting animals are commercially available.

3.27 There is insufficient information to even estimate emission reductions due to vaccination. Thirty percent is often quoted but that is the figure being targeted as the minimum reduction needed for technology to be worth developing further. It is also an open question as to whether the effects of an inhibitor and a vaccine are additive. As they are both targeting methanogens it is possible that they are not additive, although the diversity within the rumen microbial population does not rule out the possibility that complementary products could be developed. At a minimum a combined vaccine/inhibitor approach for grazing animals could reduce enteric fermentation emissions from individual animals by 30 per cent.

3.28 Widespread adoption of an effective vaccine/inhibitor package, together with low-emitting animals, has the potential to deliver large emissions reductions, but this depends not only on their effectiveness per animal but also adoption rates, commercialisation, how they fit into the farm system, the effect they have on other environmental objectives, and market acceptance.

3.29 **Nutrient management and GHG emissions**

3.30 The measures being undertaken by dairy farmers to manage the nutrient limits being imposed by regional councils under the National Policy Statement for Freshwater Management (NPS-FM) are likely to have a beneficial effect on greenhouse gas emissions. Most of the management options undertaken to manage nitrate leaching, phosphate losses, E-coil, and sediment on farm will reduce greenhouse gas emissions. While the riparian and sediment control planting will sequester carbon. The emission reduction which occurs will be dependent on the limit which is imposed and the mitigations dairy farmers implement.

4. QUESTION 3: TO WHAT EXTENT IS IT TECHNICALLY AND ECONOMICALLY FEASIBLE TO RELIABLY MEASURE BIOLOGICAL EMISSIONS AT A FARM LEVEL?

4.1 It is possible to model on farm greenhouse gas emissions; it is not possible to measure them. There are two different approaches which could be utilised to model on farm emissions, the OVERSEER model, or the National Greenhouse Gas Inventory methodology.

4.2 *OVERSEER*

4.3 OVERSEER is a farm management advisory tool designed to help inform the management of nutrients in the soils. It enables the testing of scenarios by predicting the impact of different farm management practices or farm systems changes on the estimate of a farms nutrient losses, including nitrous oxide, methane, and carbon dioxide. While the greenhouse gas estimate for a farm is relatively robust from a science perspective, there are some issues surrounding how it aligns with the National Greenhouse Gas Inventory. The national methodology is continuously undergoing improvements resulting some divergence in the methodological approaches. This leads to different greenhouse gas estimates when using the same input data under the inventory approach and OVERSEER. These issues do not fundamentally effect the models greenhouse gas estimates, however it is something which must be addressed and is being examined as part of the Biological Emissions Reference Groups work programme. It is important to note OVERSEER can provide a robust nutrient or greenhouse gas estimate if the farms physiological information and input data are accounted for in the models algorithms.

4.4 Dairy farmers are already using OVERSEER as part of the regional nutrient limits being rolled out around the country under the NPS-FM. Fonterra uses the model to provide its suppliers with nitrogen reports, which includes the farms nitrogen leaching and nitrous oxide estimates. Fertiliser companies require a high level OVERSEER nitrogen report and some regional councils such as Environment Canterbury and Waikato Regional Council require farmers to employ a certified nutrient management consultant to produce a comprehensive nutrient OVERSEER budget. From a practicality and cost standpoint, provided the milk processors can provide the service, it is feasible to utilise OVERSEER to estimate on farm emissions as an advisory tool, provided the caveats and limitations of the model are well understood.

4.5 As part of the implementation of the regional nutrient limits under the NPS-FM some regional councils have adopted the model as the regulatory tool for ensuring farms stay within their catchments nutrient limit. This has resulted in significant issues regarding how the model interacts with the methodology, input standards, and proxies being utilised by the councils to determine the total catchment nutrient load.

4.6 It is inappropriate to use a model which utilises assumed good management practice data as opposed to real data, and then overlay further proxies and assumptions to estimate the total catchment nutrient load. The farm limit which is produced via this approach does not align with the practices which are being undertaken on farm to manage the nutrient loads, and therefore the limit imposed is meaningless.

4.7 It is important to note, based on how the model is being utilised to manage nutrient limits to improve water quality, there may be significant implications which would need to be worked

through and addressed if OVERSEER was to be used as a regulatory tool to manage on-farm greenhouse emissions.

4.8 *National Greenhouse Gas Inventory*

4.9 AgResearch has developed an on farm accounting methodology using the National Greenhouse Gas Inventory. The emission factors and mitigations align with what is included in the inventory. At this point in time this presents some limitations for accounting on farm emissions. This is due to the fact some of the mitigations which are currently available to farmers are not included in the inventory. For example, the inventory does not account for regional pasture differences, it assumes that all pasture is the same and does not account for differences in pasture quality or the emission factors associated with different supplementary feeds. There is work underway to include different emissions factors for pasture and different feeds, with the estimates estimated to be included in the 2019 inventory update.

5. QUESTION 4: WHAT ARE THE MAIN OPPORTUNITES AND BARRIERS TO REDUCING EMISSIONS IN AGRICULTURE?

5.1 While there is a level of awareness amongst dairy farmers and the wider industry that climate change is an issue, there is a lack of understanding of what it means for the dairy farm systems and the immediacy of need to address on farm biological emissions. If the dairy industry is to start addressing biological emissions, there are several barriers which will need to be overcome:

- Low awareness of the issue and national commitments taken under the multilateral Paris Climate Change Agreement and what it means for the dairy industry and wider agricultural sector.
- Limited scope (at present) to reduce biological emissions without curtailing milk production.
- No clear set of good management practices to guide appropriate behaviour.
- No robust system for accounting, recording and benchmarking on-farm greenhouse gas emissions.
- Lack of capacity and capability within rural professional networks. This is partially due to a lack of market demand for on farm greenhouse gas advice and services.
- Too many issues facing farmers and taking on additional staff may make their farm unviable.
- Long commercialisation lead times for potential breakthrough technologies.
- Lack of clarity on endpoint dairy farmers are striving for and intermediate steps to get there.

5.2 In examining how we can overcome these barriers there is an opportunity:

- To equip dairy farmers and the wider dairy industry via the Dairy Action for Climate Change so action can be undertaken to address biological emissions as part of the 2030 target and over the longer term;

- To enable the adoption of the mitigation options which are available now on dairy farms to start addressing on farm nitrous oxide emissions in the first instance and then start addressing methane emissions over the longer term.
- For the dairy and wider agricultural industry to work with the Government to understand how the sector will contribute alongside the wider economy to New Zealand's 2030 target and the country's transition to a low carbon economy; and
- To develop an integrated policy framework to address biological emissions, freshwater Management, and Biodiversity.
- Enable the development of alternative land uses that have low emissions, adequate economic returns, and can be scaled up.

6. WHAT ARE THE ISSUES FOR GOVERNMENT TO CONSIDER IN ENCOURAGING ALTERNATIVE LOW-EMISSIONS LAND USES?

6.1 The drivers of transitioning to low emissions land uses are not well understood. There are several questions and principles which would need to be worked through if the Government was to consider undertaking measures to encourage alternative low-emissions land uses. It is also important when examining the question of land use change, that an integrated approach is taken which examines how to achieve a broader set of sustainable development objectives.

6.2 Limited analysis has been undertaken in New Zealand examining what land-use change could look like across the array of objectives the dairy and broader agricultural sector is working towards. This includes improving water quality, doubling the value of exports by 2020 under the Business Growth Agenda, reducing national greenhouse gas emissions, and improving biodiversity. A significant amount of work is being undertaken overseas which could be drawn on is examining what land use change could mean for New Zealand. The International Institute for Applied Systems Analysis (IIASA) is undertaking an Integrated Solutions for Water, Energy, and Land project (IS-WEL) which aims to identify integrated solutions to energy, water, food, and ecosystem security in selected regions of the world. The project aims to answer several questions in relation to climate change and sustainable development, which are applicable for New Zealand, including:

- How these goals can be jointly addressed;
- The costs of inaction; and
- How problems in one area may exacerbate or mitigate problems in other areas.

6.3 A similar multifaceted approach is required to identify what a plausible scenario could look like in New Zealand. In examining what the drivers for encouraging sustainable land uses the following should be considered:

- The need to remain cognisant of the wider environmental, social, and economic impacts of encouraging land use change, such as land-value and equity implications.
- Land-use change will not be driven solely by market based instruments.
- Land-use change can also change within a farm boundary, where farmers move to more diversified systems.

- Identifying the agro-ecological aspects of different regions, this includes soil type, climatic variability, and identifying what land use may be applicable in accordance with the regions environmental limits.
- How to overcome the high capital costs involved in changing land-use and implementing a new system.
- Identifying measures to overcome the capability and capacity requirements which would be required to transition to an alternative land-use.
- The timeframe at which change is possible.
- The need to undertake Agroecology based research, this would enable the identification of options in a much more integral way. Agroecology is based on applying ecological concepts and principles to optimize interactions between plants, animals, humans, and the environment while taking into consideration the social aspects that need to be addressed for a sustainable and fair food system (FAO).[3]

6.4 If sustainable land-use change is to occur a well-designed long-term focussed policy framework which optimises land-use must be implemented. This would need to apply a rural planning type approach, which is underpinned by catchment level analysis and is driven by a set of multi-faceted regionalised objectives, which interlink with the broader national objectives.

7. QUESTION SIX: WHAT ARE THE MAIN BARRIERS TO SEQUESTERING CARBON IN FORESTS IN NEW ZEALAND?

7.1 Policy uncertainty and the lack of clarity regarding how New Zealand will transition to a low carbon economy is a barrier to afforestation. In determining whether to afforest a block of land for the purposes of carbon sequestration or enter an existing forest into the Emissions Trading Scheme, a level of certainty is required regarding the return on investment.

7.2 If a policy framework was adopted which outlined what the expectation of each sector is in New Zealand's transition to a low carbon economy, and this framework extended beyond the three-year political term then this would provide certainty to landowners and businesses who may be more inclined to afforest for the purposes of carbon sequestration.

7.3 In addition to this, the definition of a carbon forest, which interlinks to the international rules, is a significant barrier to afforestation in the dairy industry. Dairy farmers are already undertaking a significant amount of planting on their farms to provide shelter for stock, as wind brakes and to manage nutrients and sediment flows into waterways.

8. QUESTION SEVEN: WHAT POLICIES, INCLUDING ADJESTMENTS TO THE NEW ZEALAND EMISSIONS TRADING SCHEME, WILL ENCOURGAE MORE SEQUESTING OF CARBON IN FORESTS?

8.1 As noted above and in response to question two DairyNZ supports New Zealand adopting a climate change policy framework which includes establishing an independent climate change

[3] http://www.fao.org/agroecology/overview/en/

commissions, setting carbon budgets, and developing policies and plans to incentivise cross-sectoral climate change action.

8.2 This framework would extend to incentivising further carbon sequestration through planting and would require the current definition of a carbon forest under the Emissions Trading Scheme to broadened to include more planting. DairyNZ proposes establishing an afforestation scheme for the agricultural industry, which captures the carbon sequestered from shelter belts and riparian planting and includes additional mechanisms to incentivise afforestation. It could include community based afforestation blocks where farmers collectively purchase land for the purposes of carbon sequestration. It could enable Dairy companies to plant trees to offset on-farm emissions which make up 85 percent of the dairy supply chains footprint on behalf of suppliers. This would be similar to Air New Zealand's afforestation scheme where they plant trees on behalf of their customers who voluntarily opt into the scheme.

9. QUESTION 18: POLICIES TO LOWER EMISSIONS FROM PARTICULAR SOURCES, TECHNOLOGIES AND PROCESSES CAN HAVE INTERACTIONS WITH EMISSIONS SOURCES IN OTHER PARTS OF THE ECONOMY. WHAT ARE THE MOST IMPORTANT INTERACTIONS TO CONSIDER FOR A TRANSITION TO A LOW ECONOMY?

9.1 When examining how to reduce agricultural emissions it is important to examine the emissions which occur across the supply chain. As noted in response to question two increasing the amount of low-nitrogen supplementary feeds is a way dairy farmers can reduce nitrous oxide emissions, however in examining this option it is important to be mindful of the greenhouse gas emissions attributed to growing and transporting the feeds. It is important to prevent emissions swapping where ever possible and to also be mindful of the reduction which can be achieved of difference options at a national level across the supply chain.

10. QUESTION 19: WHAT TYPE OF DIRECT REGULATION WOULD BEST HELP NEW ZEALAND TRANISTION TO A LOW EMISSIONS ECONOMY?

10.1 The agricultural industry and the Government need to focus on what can be achieved now and in the future to address biological emissions and to examine the costs, opportunities, and barriers. This is why we are a member of and co-chair the cross government-industry Biological Emissions Reference Group, which is focussed on establishing an agreed evidence base so we can start collectively having a discussion about what the appropriate levels are to ensure the agricultural sector does its part alongside the wider New Zealand economy to address emissions over the longer term.

11. QUESTION 20: ACKNOWLEDGING THE CURRENT REVIEW, WHAT CHANGES TO THE EMISSIONS TRADING SCHEME ARE NEEDED IF IT IS TO PLAY AN IMPORTATN PART OF NEW ZEALAND'S TRANSITION TO A LOW EMISSIONS ECONOMY?

11.1 DairyNZ is concerned focussing on whether agricultural should face a price under the Emissions Trading Scheme (EST), polarises the agricultural sector from the wider New Zealand economy. If

the debate is re-visited, New Zealand runs the risk of the momentum on what can be done to address on farm emissions stalling and the focus being once again solely focussed on the binary debate of keeping agriculture out of the ETS. This is not conducive to a constructive conversation between the agricultural sector, the government, and wider economy on the role agriculture must play in New Zealand's transition to a low emissions economy.

11.2 We believe there are other policy mechanisms, aside from the ETS, which should also be considered and weighed up in incentivising agriculture and the wider economy to contribute to New Zealand's transition to a low emissions economy.

12. QUESTION 21: WHAT TYPE OF MARKET BASED INSTRUMENTS WOULD BEST HELP NEW ZEALAND TRANSITION TO A LOW EMISSIONS ECONOMY?

12.1 As noted above in response to question 20, DairyNZ believes a range of options, including a market based instrument, must be considered, and weighed up by the Government, the agricultural sector and wider economy in examining the best way for New Zealand to transition to a low emissions economy.

13. QUESTION 22: WHAT TYPE OF SUPPORT FOR INNOVATION AND TECHNOLOGY WOULD BEST HELP NEW ZEALAND TRANSITION TO A LOW-EMISSIONS ECONOMY?

13.1 DairyNZ supports the continued investment in the research and development being jointly funded by the agricultural industry and the Government via the PGgRc and the NZAGRC into finding a suite of breakthrough technologies to reduce biological methane and nitrous oxide emissions.

13.2 The technologies under development, covered in section 3 of this submission, will be a game changer in helping New Zealand transition to a low emissions economy.

14. QUESTION 24: WHAT TYPE OF ALTERNATIVE APPROACHES (SUCH AS VOLUNTARY AGREEMENTS OR SUPPORT FOR GREEN INFRASTRUCTURE) WOULD BEST HELP NEW ZEALAND TRANSTITION TO A LOW EMISSIONS ECONOMY?

14.1 As noted in section three of this submission, DairyNZ supports the adoption of an approach which looks at the bigger picture and develops a long term plan to transition to a low carbon economy. This requires a pathway to be established with stepping stones which looks at what can be done now and over the longer term to address on-farm emissions, in the context of the wider agricultural sector and economy.

14.2 We support exploring the Parliamentary Commissioner for the Environment's proposal to implement a climate change framework in New Zealand which mirrors the United Kingdom's Climate Change framework. Setting up an Independent Climate Change Commission to establish and recommend climate budgets and implementing a system where the Government establishes processes and policies to meet these budgets will establish policy certainty and provide clarity on what New Zealand's transition entails.

14.3 The agricultural component could build off the Dairy Action for Climate Change, which is a partnership between Fonterra and DairyNZ and is supported by the Ministry for Primary Industries and the Ministry for the Environment. It could also incorporate the research and development being funded via the PGgRc and NZAGRC. It would leverage the activities which are underway in the nutrient management space which have a co-benefit for climate change and incorporate the regional councils approach to managing water quality as they are implemented. This could include taking a similar approach to the Good Farming Principles approach being led by the Ministry for the Environment for addressing on farm biological emissions. It could also include an industry specific afforestation scheme, which is outlined in section 8 of this submission.

14.4 It is essential that any climate change policy framework which is implemented, integrates with the Freshwater Management policy framework and the National Policy Statement for Biodiversity which is under development and the other objectives such as the BGA New Zealand is working towards.

15. QUESTION 28: IS NEW ZEALAND'S STATUTORY FRAMEWORK TO DEAL WITH CLIMATE CHANGE ADEQUATE? WHAT OTHER TYPES OF LEGISLATION MIGHT BE NEEDED TO EFFECTIVELY TRANSITION TOWARDS A LOW-EMISSIONS ECONOMY?

15.1 As noted above DairyNZ does not believe New Zealand's current climate change statutory framework is fit for purpose. The Climate Change Response Act does not provide any policy certainty or clarity over what the dairy sector, the wider agricultural industry, and economy's role is in New Zealand's transition to a low emissions economy.

16. QUESTION 29: DOES NEW ZEALAND NEED AN INDEPENDENT BODY TO OVERSEE NEW ZEALAND'S DOMESTIC AND INTERNATIONAL CLIMATE CHANGE COMMITMENTS? WHAT OVERSEAS EXAMPLES OFFER USEFUL MODEL FOR NEW ZEALAND TO CONSIDER?

16.1 DairyNZ supports New Zealand exploring whether a similar climate change framework to the United Kingdom would be feasible. Establishing an independent commission who oversees New Zealand's domestic and international climate change commitments and develops carbon budgets outlining how the country will meet these will provide businesses the certainty they need in factoring in climate change mitigation into their strategies and therefore support the transition to a low emissions economy.

17. WHAT ARE THE MAIN CO-BENEFITS OF POLICIES TO SUPPORT A LOW EMISSIONS TRANSITION IN NEW ZEALAND? HOW SHOULD THEY BE VALUED AND INCORPORATED INTO DECISION MAKING?

17.1 The policy framework being rolled out under the NPS-FM and the National Policy Statement for Biodiversity under development and any subsequent accompanying policies must be integrated with policies implemented to support a low emissions transition in New Zealand. Dairy farmers

grapple with a multitude of factors at a farm level, the approach which is taken across the broader environmental spectrum must be integrated into the farm system if lasting change is to occur.

17.2 DairyNZ supports a farm level risk assessment framework being introduced to underpin the different regulatory frameworks being implemented. This enables flexibility and allows farmers to customise their actions in accordance with the issues facing their farm across climate change, freshwater management, biodiversity, and other areas.

17.3 As noted in section three of this submission there is a co-benefit between the mitigations adopted to manage nitrate leaching and addressing nitrous oxide emissions. In addition to this the riparian zones implemented to manage sediment flows into waterways also sequester carbon, despite not counting towards New Zealand's national and international climate change commitments.

17.4 Measures undertaken to improve biodiversity on farm will also have a co-benefit for greenhouse gasses. Farmers are already covenanting areas of native bush on their farms in the Queen Elizabeth II Trust and this has a co-benefit for biodiversity and carbon sequestration. In addition to this DairyNZ invests in the management of TB, which also has a co-benefit for both biodiversity and climate change.

18. WHO ARE THE MOST IMPORTANT PLAYERS IN DRIVING FORWARD NEW ZEALAND'S TRANSITION TO A LOW EMISSIONS ECONOMY?

18.1 It is important to note when examining New Zealand's transition to a low emissions economy that biological emissions do not have to go to zero. However, given the portion of emissions which come from agriculture, the sector has an important role to play in New Zealand's transition.

18.2 When examining who the most important players are in driving forward to transition, there is a role for Government, regional councils, businesses, and industry good organisations across all sectors in driving change. It requires action across all sectors of New Zealand's economy, a unified vision of what New Zealand's transition entails, and where the low hanging fruit lie and the trades New Zealanders are willing to make as we reduce our emissions.

19. QUESTION 36: WHAT ARE THE ESSENTIAL COMPONENTS OF AN EFFECTIVE EMISSIONS-MITIGATION STRATEGY FOR NEW ZEALAND THAT WILL ALSO BE ECONOMICALLY AND POLITICALLY SUSTAINABLE?

19.1 DairyNZ believes in identifying the key components of an effective emissions mitigation strategy for New Zealand, which encompasses the broader environmental, social, and economic objectives, the following components need to be considered:

- The need to safe-guard the prosperity of New Zealand's environment, economy, and society;
- The need for climate change mitigation measures to interlink with other environmental, economic, and social measures;

- The relative action being undertaken by New Zealand's competitors and what that means for New Zealand's mitigation strategy;
- The rate and timeframe under which change is feasible and the phasing at which different sectors can respond.
- The effect New Zealand's greenhouse gas reduction will have on global emissions; and
- The ability for New Zealand to assist countries with comparative emissions profiles address their agricultural emissions by adopting more efficient farm systems, and the global benefit of assisting other countries.

19.2 From a dairy perspective the following mitigations would form part of the sectors low emissions pathway:

- Baseline good management practices for Greenhouse gases, water quality management, and biodiversity are identified and communicated to dairy farmers, this would be achieved through the Ministry for the Environments Good Farming Principles approach;
- The carbon sequestered from the dairy industry's planting initiatives is captured towards New Zealand's national and international commitments;
- Dairy farmers have the tools and knowledge to address on farm emissions;
- The required capability and capacity is available to assist dairy farmers address on farm emissions;
- The breakthrough technologies under development to reduce methane and nitrous oxide come to fruition;
- These technologies are adopted on farm and there is market and consumer acceptance;
- A dairy industry afforestation scheme is established;
- The National Greenhouse Gas Inventory captures the mitigation options which are available to dairy farmers.

20. HOW SHOULD THE ISSUE OF EMISSIONS LEAKAGE INFLUENCE NEW ZEALAND'S STRATEGY IN TRANSITIONING TO A LOW-EMISSIONS ECONOMY?

20.1. New Zealand is currently one of world's most efficient producers. Analysis undertaken by the NZIER and NZAGRC for DairyNZ and Fonterra shows the average New Zealand dairy farm is four times as efficient as the global average dairy farm. If a policy framework was introduced which resulted in New Zealand's milk production curtailing, it is likely a less efficient producer would fill the gap resulting in an increase in global emissions and carbon leakage.

20.2. NZIER and NZAGRC's estimates this could amount to 13 mega tonnes of biological emissions entering the atmosphere from 2020-2030[4] if New Zealand's milk production is displaced. This equates to 34 percent more global biological emissions in 2030 than if New Zealand was to produce the milk.

[4] NZIER – report provided to DairyNZ and Fonterra (2015)

21. WHAT DO YOU SEE AS THE BENEFITS AND OPPORTUNITES TO NEW ZEALAND FROM A TRANSITION TO A LOW-EMISSIONS ECONOMY?

21.1 Consumers are becoming increasingly interested in the environmental footprint of produce. There is an opportunity for the dairy industry and the wider agricultural industry as world leaders in emissions efficient food to continue to improve the environmental footprint of the industry's produce. This will benefit New Zealand Inc., contributing to New Zealand's clean green brand.

21.2 There are also some real opportunities for New Zealand to build on the work the Government and dairy processors such as Fonterra are undertaking in assisting developing countries lower the environmental footprint of their agricultural industries.

22. WHAT DOES YOUR LONG TERM VISION FOR A LOW-EMISSIONS ECONOMY LOOK LIKE? COULD A SHARED VISION FOR NEW ZEALAND BE CREATED, AND IF SO, HOW?

22.1 DairyNZ's long term vision for New Zealand's low emissions economy entails:

- The dairy industry is profitable and sustainable, safeguarding New Zealand's environment across climate change, biodiversity, and freshwater management;
- There is increased diversification amongst the agricultural industry;
- Extensive afforestation on marginal and non-profitable land, and community and dairy processor blocks;
- The breakthrough technologies have come to fruition and there is market and consumer acceptance;
- New Zealand is carbon neutral;
- New Zealand has a stable and robust economy and continues to be a world leader in emissions efficient milk; and
- There continues to be a global demand for New Zealand's dairy produce.

23. ABOUT DAIRYNZ

23.1. DairyNZ is the industry good organisation representing New Zealand's dairy farmers. Funded by a levy on milksolids and through Government investment, our purpose is to secure and enhance the profitability, sustainability, and competitiveness of New Zealand dairy farming.

23.2. We deliver value to farmers through leadership, influencing, investing, partnering with other organisations and through our own strategic capability. Our work includes research and development to create practical on-farm tools, leading on-farm adoption of best practice farming, promoting careers in dairying and advocating for farmers with central and regional government. For more information visit www.dairynz.co.nz.