Sustainable land use in New Zealand:
Climate benefits of agriculture development

A. Context for agriculture in New Zealand:

Sustainable Land Management in New Zealand covers:

- Conservation Forests
- Plantation Forests
- Agriculture

New Zealand agriculture is dominated by efficient pasture-based livestock systems. Agriculture contributes about 56% of total export earnings (dairy alone 27%), and about 90% of all agriculture products are exported. Agriculture provides economic and social benefits at both local and national level.

B. Changes in efficiency and production, and drivers for changes:

New Zealand farmers compete on the open market with products being sold globally. Pressure to remain cost competitive and to maintain and increase market access through quality and environmental credentials resulted in major efficiency and productivity gains since the removal of agricultural subsidies (in 1984) when compared to 1990. Examples of on-farm efficiency gains include:

- Genetic improvements through breeding programmes, resulting in stronger and more resilient animals and increased reproductive success
- Increased live weights of beef cattle and lambs at slaughter
- Enhanced productivity through improved feed and nutrition, using
  - Improved pasture management
  - More targeted use of fertilisers and irrigation (local government policies to protect water quality and cap nutrient use in sensitive areas; use of OVERSEER technology; adoption of precision agriculture for nutrient budgeting nationally and irrigation in drought prone regions)
  - Increased use of bought in feed in dairy production to supplement pasture based system. New Zealand dairy system remains approximately 90% pasture based, but a limited use of bought in feed can improve efficiency through the end of the production season (autumn) or through droughts (approximately 10% of total feed)
- Increased integration between beef and dairy production systems.

Dairy production per hectare has increased by 60% since 1990 (improved genetics, use of supplements, nutrient management, irrigation). Total production of lamb and beef meat has been nearly constant since 1990 despite significant reduction in hectares, to forestry and dairy and subsequent decreases in animal numbers. As a result of those efficiency gains, the total pastoral land area has declined since 1990, with some of the freed-up land moving to plantation forestry.

C. Climate benefits:

Two key implications from the increased productivity and efficiency for New Zealand are:

A. The emissions intensity of livestock production (emissions per kg of meat or milk solids) has declined by about 20% since 1990 (consistent trend of about 1% per annum).

B. Absolute agriculture emissions have increased by 15% since 1990

The reduced emissions intensity means that the total amount of food produced by New Zealand and sold on the global market in 2012 was delivered at a net saving of about 8.5Mt CO_2-eq, compared to the same amount of food being produced but at 1990 efficiency levels. This global emissions saving represents an even greater increase in productivity to satisfy a rising global demand and equates to more than 10% of New Zealand's total GHG emissions in 2012.

D. Challenges and lessons learned:

Emissions reduction associated with improved efficiency and economic development could eventually plateau out, as there are practical, farm-scale and physiological limits to pasture-based intensification of livestock production. However, there is no indication as yet when such limits may be reached in New Zealand.

Another limit to pasture-based intensification of livestock production can arise from nitrogen losses, with implications for local water quality; however, this also acts as a driver for further optimisation of nutrient inputs and precision application of fertiliser and pasture management. Increasing adoption of a precision approach to farming can also expose farmers to increased risk, given the continuing reliance on pastures as the dominant source of animal feed. Increasing supplementation of feed sources, particularly for the dairy sector, is one approach used by farmers to manage risks and, together with irrigation, delivers important co-benefits with adaptation to increasing drought risk under climate change.

A clear lesson from the past 20 years is that improvements in efficiency and the development and adoption of best practice takes time, even though there already are clear economic benefits for farmers to do so. This is related to complex interactions between the provision of information, social networks, international market drivers, and perceptions of and attitudes to risk associated with new technologies and practices. Synergies between local environmental objectives, such as reduced nitrogen losses to waterways, and global benefits from increased production, can be important drivers to support implementation of best practices.

E. Plans for scaling-up:

It is a high priority for New Zealand to deliver further economic improvements to farmers and nationally while also delivering global environmental benefits through reduced emissions intensity of food provided to the global market. The New Zealand Government is working closely with industry to achieve this, and to manage potential risks and local environmental trade-offs as a result of significant increase in production. Main mechanisms are research programmes that develop and test new farm practices and tools, and technology transfer mechanisms to accelerate adoption of best practice within changing market conditions and consumer perceptions.

New Zealand is also ensuring that emissions savings that may result from increased efficiencies on-farm can be monitored, reported and verified in its national emissions inventory.

There are a number of initiatives aimed at reducing emissions while helping farmers continue to achieve efficiency improvements. New Zealand is also investing into research to develop novel practices and technologies that are directly aimed at reducing GHG emissions from grazing livestock. This is occurring through:

- The Primary Growth Partnership (mobilised NZ$708 million of public and private finance) to fund projects that boost productivity and profitability, while delivering long-term economic growth and enhanced sustainability (including further reductions in emissions intensity).
- Establishing the New Zealand Agricultural Greenhouse Gas Research Centre, which focusses on practical ways to reduce methane and nitrous oxide emissions and enhance soil carbon sinks on agricultural land while improving productivity.
- Engaging on agricultural mitigation through the Climate and Clean Air Coalition on Short-lived Climate Pollutants (CCAC). New Zealand is taking a leadership role under the CCAC agriculture initiative by leading the development of a project that builds on collaboration between the Alliance, FAO and other partners, focussed on identifying methods of reducing methane emissions from enteric fermentation. Other CCAC Projects are either already underway or in development to reduce methane from rice paddies and manure management, and black carbon from agricultural burning.

New Zealand shares this knowledge internationally by:

- Leading the establishment of the Global Research Alliance on Agricultural Greenhouse Gases (the Alliance). The Alliance aims to increase international cooperation, collaboration and investment in agricultural research that will help deliver ways to grow more food (and more climate resilient food systems) without growing greenhouse gas emissions. The New Zealand government has committed $45 million to June 2019 to support the work of the Alliance. This funding supports collaborative research projects, scientist exchange schemes, technical workshops, capacity building initiatives, development of guidelines on measurement and mitigation techniques, and the creation of international research networks.
- Establishing the Livestock Emissions and Abatement Research Network (LEARN). LEARN is a collaborative, international network that facilitates the development of practical and cost effective agricultural greenhouse gas mitigation solutions, by providing training for technicians, researchers and scientists from developing countries.

F. Next steps

New Zealand seeks to contribute to decreasing global emissions by sharing the skills and expertise gained through the implementation of emission reduction-focussed policies, domestic action, scientific research and innovation, and development programmes. New Zealand can do this through:

- The Global Research Alliance: New Zealand is unique in the developed world, but not in the developed world so New Zealand has a story to share.
- Bilateral ag-cooperation initiatives: New Zealand is going global in a limited capacity through bilateral initiatives; while maintaining the rights to the intellectual property where applicable.
- The ADP Work Stream 2 (WS2):New Zealand will continue to share its expertise in this forum which enables the open exchange of ideas and best practices to mitigate climate change.

- The Technical Expert Meetings (TEMs): New Zealand will continue to be engaged in the TEM to advance options for increasing pre-2020 mitigation ambition.