USDA Foreign Agricultural Service
GAIN Report
Global Agricultural Information Network

Voluntary _ Public

Date: 7/13/2015
GAIN Report Number: NZ1504

New Zealand

Post: Wellington

New Zealand Climate and Greenhouse Gas Emissions Policy

Report Categories:
Climate Change/Global Warming/Food Security
Agricultural Situation

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Report Highlights:
Even though New Zealand's total greenhouse gas emissions rose 21% during the period1990-2013, agricultural emissions rose at a slower pace of about 14% over the same period. However, emissions per unit of agricultural production have been declining by approximately 1% per year. The Government of New Zealand is committed to reducing emissions to below 1990 levels by 2020, with the ultimate goal of reducing emissions by 50% below 1990 levels by 2050. The Government of New Zealand stated in a recent cabinet paper that its climate change targets "are a stiff challenge given that half of our current emissions come from agriculture".

Research into and development of mitigation technologies for agriculture has become a key part of the Government of New Zealand's response to climate change. Already some world leading research has uncovered five compounds which significantly reduce animal methane production.

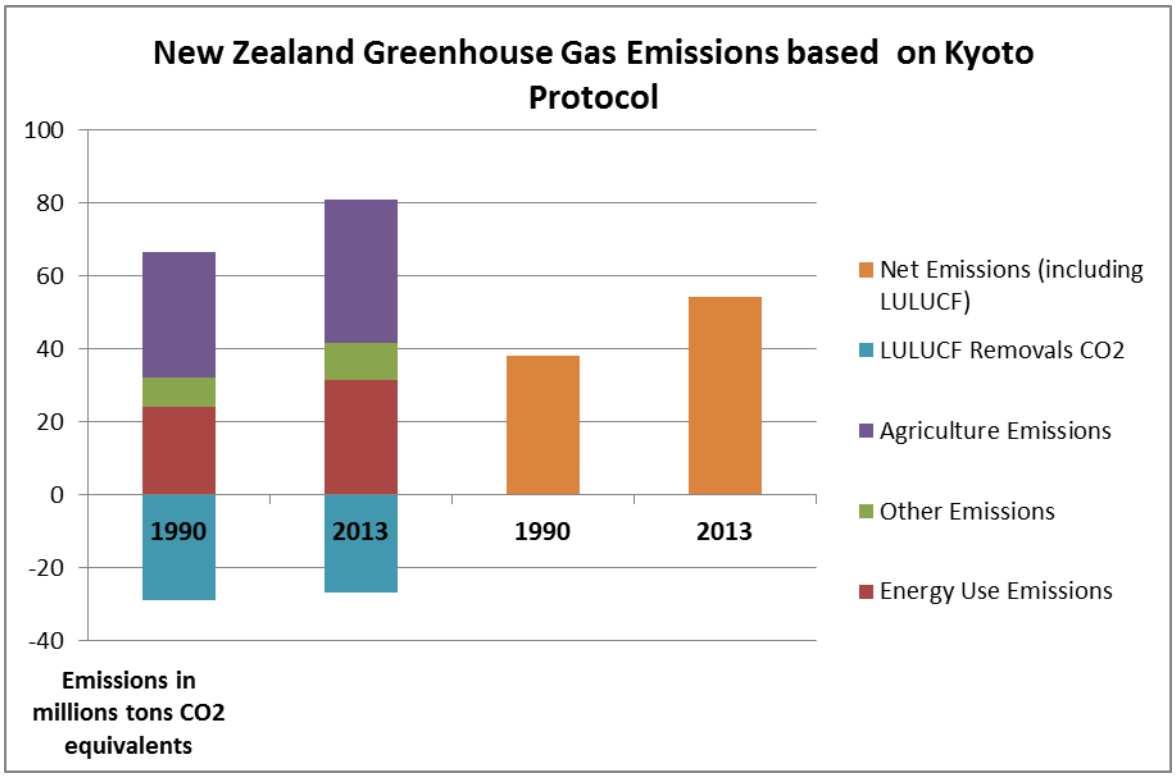
New Zealand Climate Change and Greenhouse Gas Emissions Policy and Responses in Relation to Agriculture

Executive Summary

Even though New Zealand's total greenhouse gas emissions rose 21% during the period 1990-2013, agricultural emissions rose at a slower pace of about 14% over the same period. However, emissions per unit of agricultural production have been declining by approximately 1% per year. In a new announcement the Government of New Zealand is now committing to reduce emissions by 30% below 2005 levels by 2030, with the ultimate goal of reducing emissions by 50% below 1990 levels by the year 2050. The Government of New Zealand stated in a recent cabinet paper that its climate change targets "are a stiff challenge given that half of our current emissions come from agriculture".

Research into and development of mitigation technologies for agriculture has become a key part of the Government of New Zealand's response to climate change. Already some world leading research has uncovered five compounds which significantly reduce animal methane production.

Overview of New Zealand's Greenhouse Gas Emissions Inventory



Source: NZ Greenhouse Gas Inventory Report 2013 published April 2015.

Note: LULUCF = Land Use, Land Use Change, & Forestry categories of reporting. For NZ, because of the quantity of exotic forest being grown this classification's inventory results in a net removal of CO2 from the atmosphere.

New Zealand's annual total greenhouse gas (GHG) emissions rose 21% from 1990 to 2013 (from 66.7 million tons CO2 equivalent to 81 million tons). However when adding back the CO2 that is estimated to have been removed by forest production, annual net emissions rose by 42% during the same period. Net removals of CO2 by the forestry estate dropped by seven percent between 1990 and 2013, which accounts for a proportion of the net emissions increase.

New Zealand has a unique GHG emissions profile among developed countries. A high proportion of electricity is generated from renewable sources (hydro and wind) and the small manufacturing sector relative to the large agriculture production base means that agricultural sector emissions comprise a major proportion of total emissions (48% in 2013). This can be contrasted with the OECD average of 12%. On a global scale New Zealand's emissions are small, comprising only 0.2% of the total global emissions in 2012.

Agricultural emissions in New Zealand rose only 14% between 1990 and 2013. Methane gas, the main component of agricultural emissions, only increased by 8% during this period. During the same period agricultural exports (as a proxy for production as 85-95% of production is exported) have risen approximately 100%. While not reducing emissions absolutely, by concentrating on the productivity of its animals, the NZ farm sector has reduced emissions per unit of production substantially.

Policy History

In September 2007 the Government of New Zealand (GONZ) announced its policy response to climate change. Earlier in the decade it had signed up to the Kyoto Protocol for commitment period 1, 2008 to 2012. The main plank in its response was to institute the Emissions Trading Scheme (ETS). The ETS was set up to encompass all greenhouse gases and all sectors into a type of cap and trade scheme, where emitters would have to surrender New Zealand Units (1 NZU = 1 metric ton CO2 equivalent) equal to the past twelve months emissions to the Government each year. NZU's could be traded and net carbon sequestering entities such as forest owners can claim NZU's from the government.

While forestry was brought into the ETS at its inception in early 2008, agricultural emissions (such as methane and nitrous oxide) were not scheduled to be brought into the ETS until 2012.

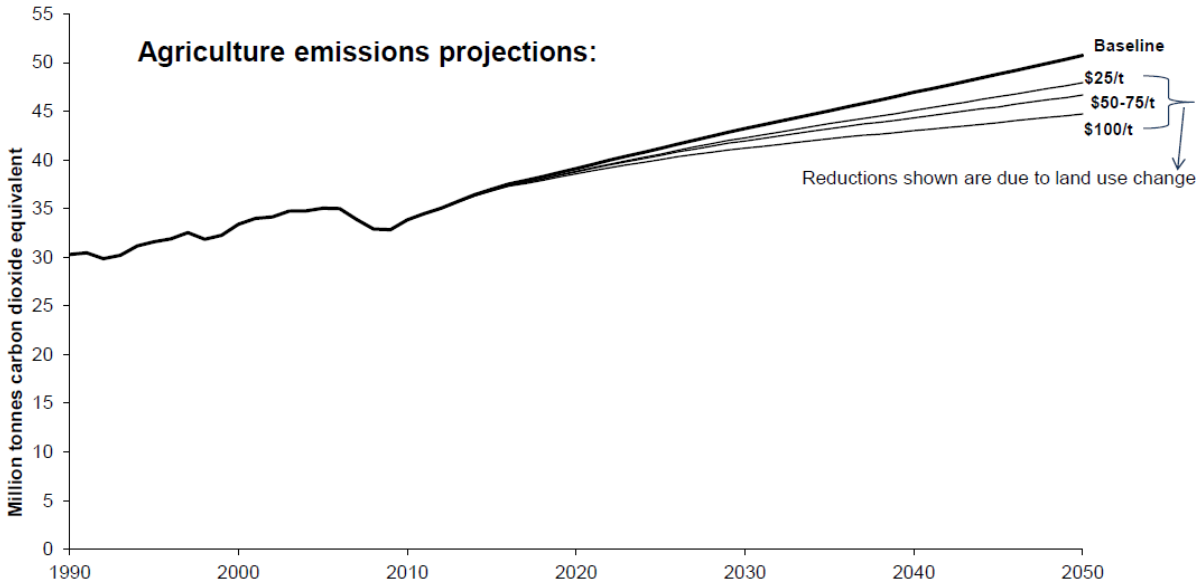
At the time, the Labor government had no real plan for bringing Agriculture into the ETS. In addition, research and development was not focused properly on solutions for mitigating agricultural emissions. The problem for the agricultural sector was it could not pass on the costs of its emissions like the liquid fuel sector could and there were no effective mitigation strategies.

When the right-of-center National Party won the 2008 general elections the ETS was maintained, but agriculture remained outside of the scheme. The main change the National party made was to make it a policy priority to streamline and significantly increase funding into research into mitigations for agriculture.

The reason that the National Party continued to exclude agriculture from the ETS was twofold: first, the dependence of the overall New Zealand economy on agriculture, and particularly dairy, made it difficult politically to regulate agricultural greenhouse gas emissions. Secondly, government models indicated that any reductions in emissions by the New Zealand farm sector through reduced production would be filled by competing countries with a higher carbon "footprint", leading to higher net global emissions. In addition, the models indicated that, given the current state of technology, even higher carbon prices would do little to achieve absolute emissions reductions given the current inability of New Zealand to mitigate emissions and maintain or increase production.

As a result, the GONZ decided to increase funding for research & development through the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) in 2010. The NZAGRC coordinates the research effort in concert with the Pastoral Greenhouse Gas Research Consortium (PGgRC). The PGgRC was founded in 2003. Its partners include animal and fertilizer entities as well as relevant government departments. Research is carried out under contract by: the Crown Research Institutes; Universities; Dairy New Zealand; and the Livestock Improvement Corporation.

Impact of Pricing Agricultural Emissions (Either by way of carbon tax or pricing of units that would be surrendered in the ETS)



Source: MPI

Since 2008 the main thrust of the NZ Government's response to climate change for the agricultural sector has been a long term search for technological breakthroughs to mitigate emissions while at the same time maintaining or increasing animal and land productivity.

Policy in 2015

While the GONZ still uses the inventory and measurement methodology and guidelines developed under the Kyoto Protocol, it is preparing to be part of a new global agreement on climate change which many hope will be negotiated and finalized in time for a major summit that is planned for Paris at the end of 2015. In early July 2015 GONZ announced a new emissions reduction target. By 2030 they are committing New Zealand to reduce emissions to 30% below 2005 emissions. If global cooperation achieved in France sets the right conditions, the GONZ may well commit to reducing emissions in the medium term at an even faster rate. This announcement equates to an eleven percent emissions reduction below 1990 levels. This target supersedes the previous commitment to reduce emissions by 2020 to be 5% below 1990 levels.

Over the long term the GONZ is committed to reducing emissions by 50% below 1990 levels by the year 2050.

Scientific Progress being Made – Agriculture Mitigation Technologies

Government, industry and researchers are making a concerted effort to develop practical new tools to help reduce emissions intensity and total emissions without curtailing production. This effort is driven jointly by the government funded New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) and the industry-led and jointly industry/government-funded Pastoral Greenhouse Gas Research Consortium (PGgRc).

Research and development work is currently organized around the following work streams:

- animal feed and nutrition;
- animal genetics and breeding programs;
- rumen modification;
- manure and fertilizer management which is centered on Nitrous Oxide gas reduction;
- increasing soil carbon content by increasing humus levels or the use of bio-char;
- animal health – better disease control and increased animal longevity reduces the emission intensity per unit of production; and
- improved farm systems – translating the scientific knowledge developed to reduce emissions into good farm management practice which is both profitable, and practical.

By far the largest source of agricultural emissions arise from enteric fermentation in animal rumens which emit methane gas. Methane emissions from enteric fermentation comprise 73% of agricultural emissions and 35% of total NZ GHG emissions. Research into animal-produced methane forms a large component of the programs being run by both NZAGRC and PGgRc. Work on methane cuts across three of the work streams shown above: animal feed and nutrition; animal genetics and breeding programs; and rumen modification. The methane science program is focused on the following:

- animal selection and genetic discovery;
- research into feeds/forage species which result in lower methane emissions;
- vaccines to immunize the animal against methanogen bacteria/microbes;
- Methane inhibitors (compounds which administered to animals will reduce the volume of methane emitted)

After 10 years of work, scientists are making significant progress on all four fronts. Perhaps the most groundbreaking work has been achieved with the methane inhibitor research. Over 100,000 potential inhibitor compounds have been screened. From that five lead inhibitor compounds have been shown to reduce methane emissions from animals by 30-90%. These are dramatic results but further trials are needed to confirm these compounds can reduce emissions in the long term and have no adverse effects on productivity and leave no residues in meat or milk. NZAGRC is already looking to engage with a commercial partner and says that a commercial product may be available within five years. Internationally there only seems to be one or two other methane inhibitor compounds being actively worked on at present.

New Zealand scientists are also working to produce a vaccine that stimulates the animal to produce antibodies that suppress key methane-generating microbes in the rumen of livestock.

Prototype vaccines have demonstrated that they can generate antibodies that can alter the microbial populations in the rumen of sheep. Further trials are underway to demonstrate that these have an effect on methane emissions in both sheep and cattle. A vaccine would have to achieve a minimum 20% emissions reduction per animal, without reducing productivity, to make its development worthwhile.

Another line of enquiry is the use of nano-beads, which are microscopic beads produced by bacteria, to carry enzymes that can suppress methane-generating microbes in the rumen. While still at the fundamental inquiry stage, such approaches hold promise because they offer new and additional ways of interrupting methane production in the rumen, and could possibly be integrated with other technologies.

International Linkages

NZ is a founding member, along with the United States, of the Global Research Alliance on Agricultural Greenhouse Gases (GRA), which was launched in December 2009. The GRA is now comprised of 45 member countries. The GRA is focused on collaboration in the areas of research, development and extension of technologies and practices that will help deliver ways to grow more food (and more climate-resilient food systems) without growing greenhouse gas emissions. Joining the GRA is voluntary and its membership and governance arrangements are underpinned by a charter signed by all participating countries. There are three research groups focusing on livestock, croplands, and paddy rice respectively. The livestock group is co-chaired by NZ and the Netherlands.

The NZAGRC maintains international linkages with other researchers. One example of the strong collaborative effort is the Rumen Microbiology team at AgResearch Grasslands in Palmerston North, which has teamed together with the US Department of Energy's Joint Genome Institute (JGI) in San Francisco, California to work on identifying methanogen microbe genes.